

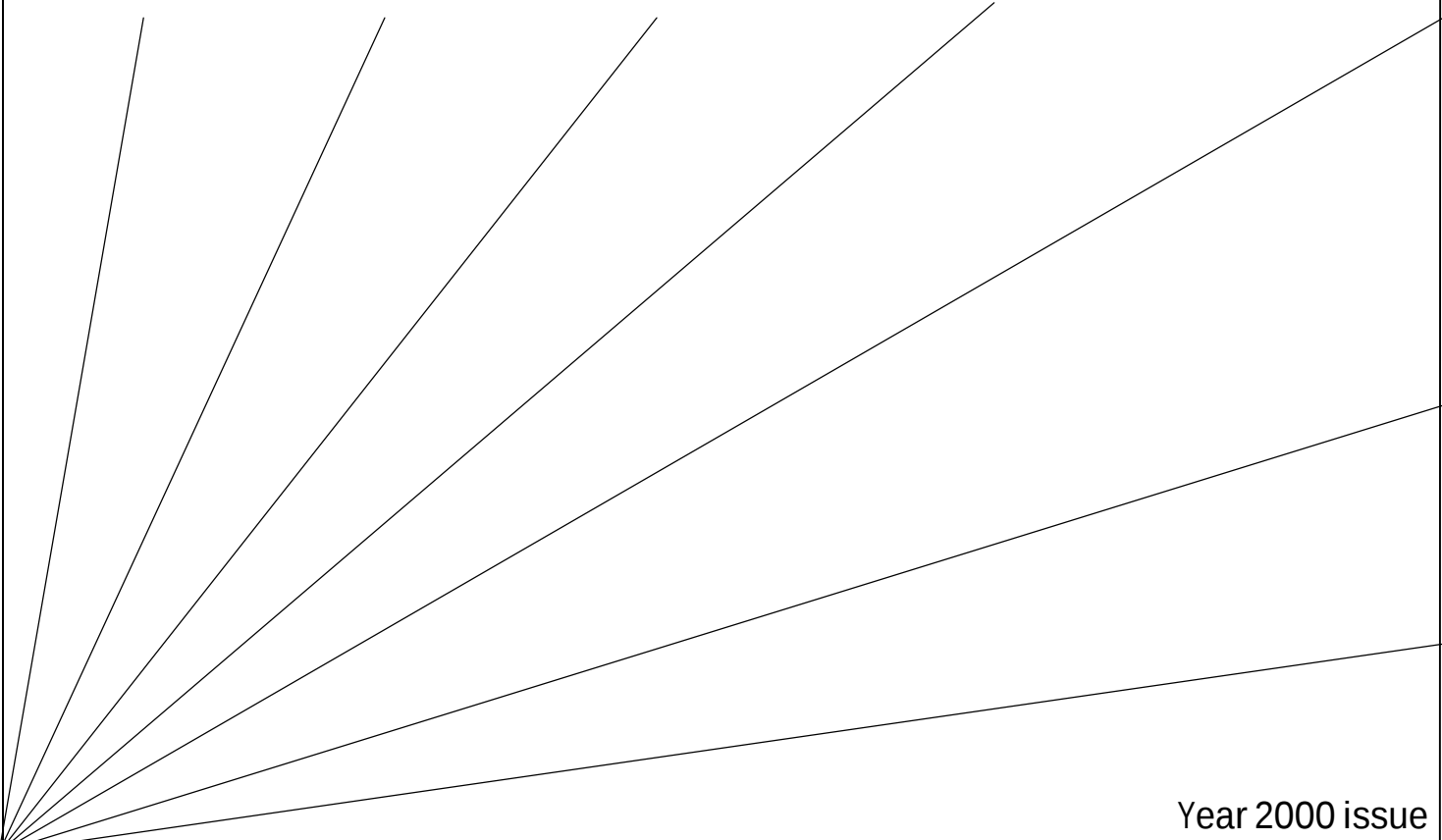


**Panasonic®**

The background of the top half of the page features several thin, light gray diagonal lines. Two lines originate from the left side and extend towards the center. Two other lines originate from the right side and extend towards the center. A long line runs from the top right corner towards the center. Another line runs from the right side towards the center.

**Large Can**

**Aluminum Electrolytic Capacitors**

The bottom half of the page is decorated with a series of thin, light gray diagonal lines that all originate from the bottom left corner and fan out towards the right side of the page.

Year 2000 issue



Matsushita Electronic Components Corporation of America (ACOM) has been manufacturing aluminum electrolytic capacitors since 1982.

ACOM initially produced the popular 2 pin, snap-in capacitor. Manufacturing has expanded with the introduction of multi-pin snap-in and computer grade capacitors.

New and expanded range products in this catalog include:

- ***Expanded capacitance ratings (TS-UP series)***
- ***Expanded case sizes***
  - ***40mm diameters (TS-UP, TS-HA, TS-HB series)***
  - ***50mm diameters, lengths to 105mm (T-UP, T-HA series)***
- ***Screw terminal products (G-AA, G-BA series)***
- ***500WV products (TS-UP, T-UP, G-AA series)***

This catalog contains general information and standard product listings for aluminum electrolytic capacitors produced by Matsushita Electronic Components Corporation of America (ACOM).

Special designs and more comprehensive technical information are available upon request. Contact your Panasonic sales representative for details.

The information contained herein is believed to be accurate at the time of publication. Design and specifications are subject to change without notice.

No ozone depleting substances (ODS) under the Montreal Protocol are used in the manufacturing process for these products.

The ACOM capacitor plant is ISO 9001 registered.

## Capacitor Quick Guide

| Series                                                | Features                                 | Endurance<br>(Load Life) | Voltage<br>Range (WV) | Cap. Range<br>( $\mu$ F) | Size Range<br>D x L (mm) | Comments                                                   | Page      |
|-------------------------------------------------------|------------------------------------------|--------------------------|-----------------------|--------------------------|--------------------------|------------------------------------------------------------|-----------|
| <b>2 terminal snap-in style (TS Type)</b>             |                                          |                          |                       |                          |                          |                                                            | <b>7</b>  |
| <b>TS-UP</b>                                          | High CV                                  | 85°C<br>2000 ~<br>3000h  | 16 ~ 500              | 33 ~ 68,000              | 20 x 25 ~<br>40 x 50     | Extended CV ratings,<br>40mm diameters,<br>500WV available | <b>8</b>  |
| <b>TS-HA</b>                                          | High CV<br>High Ripple<br>Long Life      | 105°C<br>2000 ~<br>3000h | 10 ~ 450              | 33 ~ 68,000              | 20 x 25 ~<br>40 x 50     | 20mm low profile<br>lengths available                      | <b>13</b> |
| <b>TS-HB</b>                                          | Very High CV<br>High Ripple<br>Long Life | 105°C<br>3000h           | 160 ~ 450             | 82 ~ 2,700               | 22 x 30 ~<br>40 x 50     | 40mm diameters<br>available                                | <b>17</b> |
| <b>TS-XB</b>                                          | Premium<br>Industrial Grade              | 105°C<br>7000h           | 160 ~ 450             | 39 ~ 2,200               | 22 x 25 ~<br>35 x 50     | Longest life TS type                                       | <b>19</b> |
| <b>TS-EX</b>                                          | VDE-0806<br>Specification                | 105°C<br>2000h           | 250                   | 100 ~ 1,200              | 22 x 25 ~<br>35 x 50     | VDE-0806 over-<br>voltage capability                       | <b>22</b> |
| <b>4 / 5 terminal snap-in style (T Type)</b>          |                                          |                          |                       |                          |                          |                                                            | <b>23</b> |
| <b>T-UP</b>                                           | High CV<br>High Ripple                   | 85°C<br>3000h            | 16 ~ 500              | 470 ~ 120,000            | 35 x 40 ~<br>50 x 105    | 50mm diameters,<br>500WV ratings<br>available              | <b>24</b> |
| <b>T-HA</b>                                           | Long Life<br>High Ripple                 | 105°C<br>3000h           | 16 ~ 450              | 390 ~ 120,000            | 35 x 40 ~<br>50 x 105    | 50mm diameter sizes<br>available                           | <b>27</b> |
| <b>Screw terminal "computer grade" style (G Type)</b> |                                          |                          |                       |                          |                          |                                                            | <b>29</b> |
| <b>G-AA</b>                                           | High CV<br>Industrial Grade              | 85°C<br>3000h            | 16 ~ 500              | 150 ~<br>1,200,000       | 35 x 40 ~<br>77 x 220    | English and metric<br>terminals available                  | <b>30</b> |
| <b>G-BA</b>                                           | Long Life<br>Industrial Grade            | 105°C<br>2000h           | 10 ~ 450              | 220 ~<br>1,200,000       | 35 x 40 ~<br>77 x 220    | English and metric<br>terminals available                  | <b>34</b> |

## 1 General Specifications

### Capacitance

Nominal capacitance is specified at 120Hz frequency and 20°C temperature. Unless specified otherwise, standard capacitance tolerance is ±20% of the nominal value.

### Working Voltage

The maximum allowable sum of continuous DC voltage plus peak ripple voltage which can be applied to the capacitor.

### Surge Voltage

The maximum transient voltage level allowed for short periods of time without sustaining permanent damage to the capacitor. Values are listed in the standard product ratings.

### Leakage Current

$I = 3\sqrt{CV}$  (μA) maximum after 5 minutes of applying rated voltage. Capacitance is the nominal value in μF, voltage in VDC.

### Ripple Current

The standard product tables list ripple current allowable limits at specified maximum operating temperatures.

Correction factors for other temperatures and frequencies are listed in the general sections for the general product type.

### Endurance (Life) Test

Duration: Specified hours of life  
 Ambient Temp.: Maximum specified operating temperature  
 Applied Voltage: DC voltage with maximum specified ripple current applied (the sum of the applied DC voltage plus the peak ripple voltage should not exceed rated working voltage)

*Post test requirements at +20°C:*

Leakage Current: ≤ Initial specified value  
 Cap. change: ≤ ±20% of initial measured value  
 D. F. / E.S.R.: ≤ 200% of initial specified value

### Shelf Life

Duration: 1000 hours  
 Ambient Temp.: Maximum specified operating temperature  
 Applied Voltage: None

*Post test requirements at +20°C:*

Same as Endurance Test requirements above.

*Measurements are to be performed after applying DC working voltage for 30 minutes.*

## 2 Life Expectancy

Panasonic capacitors have a specified life at a maximum temperature and ripple current. Typical life can be considerably longer based on actual life test results performed by the factory. This data can be provided to help the designer estimate expected life. This information is given with a 60% confidence level.

Capacitor life at lower temperatures follows "The Doubling 10°C Rule" where life is doubled for each 10°C reduction in operating temperature. The following equation is useful for determining the life of a capacitor in the application;

$$L_2 = L_1 \times 2^{\frac{T_1 - (T_2 + \Delta T)}{10}}$$

where:

$L_1$  = Specified life (hours) at maximum operating temperature. Typical life may be substituted (at a 60% confidence level).

$L_2$  = Expected life (hours) at actual operating temperature.

$T_1$  = Maximum operating temperature.

$T_2$  = Ambient temperature (°C).

$\Delta T$  = Ripple current temperature rise (°C).

It is recommended that the ripple current heat rise be limited to 15°C at lower ambient temperatures as higher temperature rises may reduce operating life.

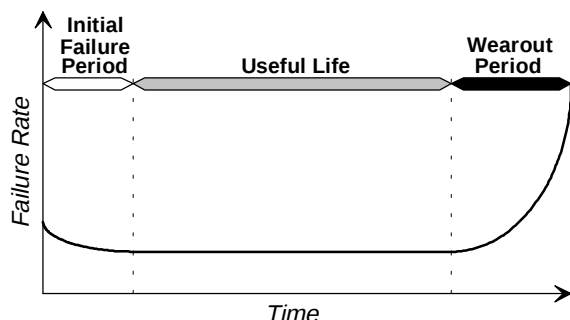
End of life is defined by the occurrence of one of the following when stabilized at 20°C;

◆ Capacitance change exceeds ±20% of the initial measured value.

◆ Dissipation Factor exceeds 200% of the initial specified value.

## 2 Life Expectancy (continued)

- ◆ Leakage Current exceeds the initial specified value.



Life Cycle of an Aluminum Electrolytic Capacitor

## 3 Circuit Design Considerations

### Operating Temperature and Frequency

Aluminum electrolytic capacitor electrical characteristics are normally specified at a temperature of 20°C and a frequency of 120Hz. Electrical parameters are temperature and frequency dependent as follows;

#### (1) Effects of operating temperature

At higher temperatures, capacitance and leakage current increase while ESR decreases.

At lower temperatures, capacitance and leakage current will decrease while ESR increases.

#### (2) Effects of frequency

Capacitance, impedance, and ESR will decrease as frequency increases.

At lower frequencies, ripple current generated temperature will rise due to increasing ESR.

### Reverse Voltage

DC capacitors have polarity which must be verified before insertion.

Avoid use in circuits with changing or uncertain polarity.

Ensure that allowable ripple currents superimposed on low DC bias voltages do not cause reverse voltage conditions.

### Charge / Discharge Applications

Standard capacitors are not suitable for use in repeating charge / discharge applications.

### Capacitors Connected in Parallel

Circuit resistance can approximate the series resistance of the capacitor, resulting in ripple current load imbalances. Careful design of wiring methods can minimize excessive ripple currents applied to a capacitor.

### Capacitors Connected in Series

Normal DC leakage current variations among capacitors can cause voltage differences. The use of voltage dividing sharing resistors with consideration to leakage currents can compensate for voltage imbalances.

### Electrical Precautions

Transient recovery voltage may be generated in the capacitor due to dielectric absorption. Typical voltage levels are less than 10% of the rated capacitor voltage. If required, this voltage can be discharged with a resistor.

The aluminum case of the capacitor has an indeterminate resistance to the cathode terminal. The vinyl sleeve on the capacitor is for marking and identification purposes and is not meant to electrically isolate the capacitor.

***When designing circuits, consider worst case capacitor failure modes such as open or short circuits.***

***The effects of hot, electrically conductive, combustible, electrolyte liquid or vapor escaping from the safety vent should also be considered.***

## 4 Capacitor Mounting Considerations

### Circuit Board Design

Avoid wiring pattern runs which pass between the mounted capacitor and the circuit board. When dipping into a solder bath, excessive solder may collect under the capacitor by capillary action and short circuit the anode and cathode terminals.

## 4 Mounting Considerations (continued)

The vinyl sleeve of the capacitor can be damaged if solder passes through a lead hole for subsequently processed parts.

Electrically isolate the extra terminal(s) on T type products from the anode terminal, cathode terminal, and other circuit paths.

### Clearance Requirements

Case mounted pressure relief vents require sufficient clearance to operate properly. The minimum clearance is diameter dependent as follows: 20~ 35mm diameters, 3mm minimum. 40mm diameters or greater, 5mm minimum.

### Circuit Board Cleaning

Aluminum electrolytic capacitors can withstand immersion or ultrasonic cleaning with "safe" cleaning solvents for up to 5 minutes and 60°C maximum temperatures.

Most aqueous based cleaning solvents and detergents are acceptable. Some solvent groups could damage capacitors as follows:

- ♦ Halogenated cleaning solvents may permeate the capacitor seal, causing internal corrosion and failure.
- ♦ Alkali solvents may attack and dissolve the aluminum case.
- ♦ Petroleum based solvents may deteriorate the rubber seal.
- ♦ Xylene may deteriorate the rubber seal.
- ♦ Acetone may remove vinyl sleeve ink printing.

A thorough rinsing and drying process will prevent entrapment of residual solvents between the capacitor and the circuit board. Excessive drying temperatures and / or radiant heat drying sources may result in splitting or excessive shrinkage of the vinyl sleeve.

### Mounting Adhesives and Coating Agents

When using mounting adhesives or coating agents, avoid materials with halogenated cleaning solvents including chloroprene based polymers.

A thorough drying process after application is required to prevent solvent entrapment between the capacitor and the circuit board.

Mounting adhesives or reinforcement clamps are recommended on 2 terminal, TS types with case sizes of  $\phi$  35 x 45mm or larger. Additional mounting support is also recommended for 4 or 5 terminal, T types with lengths exceeding 63mm.

## 5 Storage

Leakage current will increase with long storage times.

Storage times in ambient temperatures of 40°C or less can be four years or more before leakage current should be checked for conformance to the specified limit.

Longer storage times may require reforming of the capacitor to reduce leakage current below the specified limit. This can be accomplished by applying rated voltage in series with a 1000 $\Omega$  resistor for a time period of 30 ~ 60 minutes.

Under normal conditions, shelf life can exceed 10 years, providing that leakage current is checked before use.

Long term storage in high humidity conditions could cause oxidation of the terminal plating which could adversely affect solderability.

## 6 Safety Precautions

If the pressure relief vent of the capacitor should operate, immediately turn off the equipment and disconnect from the power source. This will minimize additional damage caused by the vaporizing electrolyte.

Avoid contact with the escaping electrolyte which can exceed 100°C temperatures.

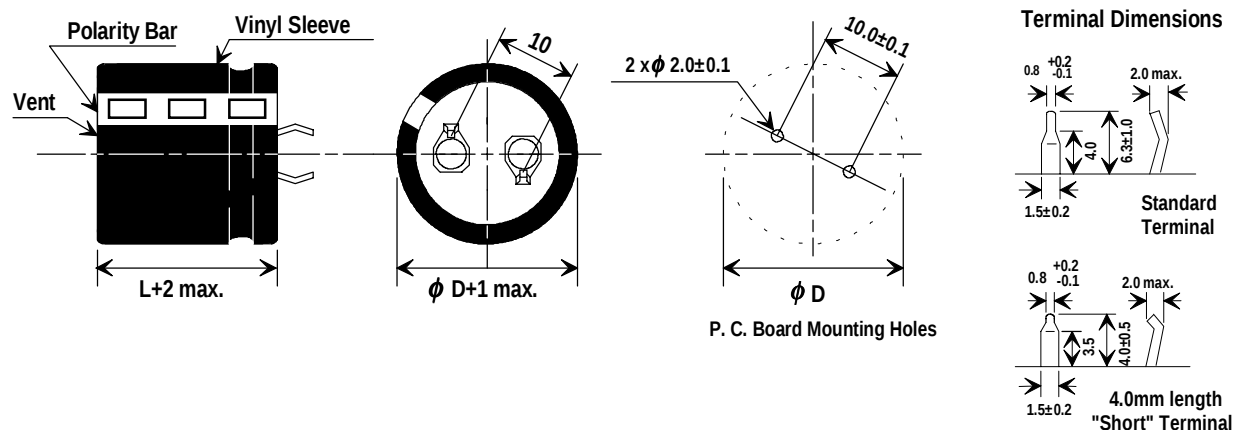
***If electrolyte or vapors enter the eye, immediately flush the eye with large amounts of water and seek medical attention.***

***If electrolytes or vapors are ingested by mouth, gargle with water.***

***If electrolyte contacts the skin, wash with soap and water.***

## TS Type General Information

### Dimensions



### Ripple Current Multipliers

| Ripple Current Frequency Correction Factors |             |             |            |             |             |             |
|---------------------------------------------|-------------|-------------|------------|-------------|-------------|-------------|
| Frequency (Hz):                             | 50          | 60          | 100~120    | 500         | 1k          | 10k~50k     |
| 16~100WV:                                   | <b>0.93</b> | <b>0.95</b> | <b>1.0</b> | <b>1.05</b> | <b>1.08</b> | <b>1.15</b> |
| 160~500WV:                                  | <b>0.75</b> | <b>0.8</b>  | <b>1.0</b> | <b>1.2</b>  | <b>1.25</b> | <b>1.4</b>  |

| Ripple Current Temperature Correction Factors |            |            |            |            |             |
|-----------------------------------------------|------------|------------|------------|------------|-------------|
| Max. Temperature                              | 105°C      | 85°C       | 70°C       | 60°C       | ≤45°C       |
| <b>TS-UP</b>                                  | ---        | <b>1.0</b> | <b>1.3</b> | <b>1.4</b> | <b>1.5</b>  |
| <b>TS-HA, HB, XB, EX</b>                      | <b>1.0</b> | <b>1.7</b> | <b>2.0</b> | <b>2.2</b> | <b>2.35</b> |

Note: Use of temperature correction factors can limit load life to the hours specified for the maximum operating temperature of the series.

- |                                                                                                             |                                                                                                                                                                                                                                                                                                                       |                             |    |    |    |    |    |    |     |                      |  |    |    |    |    |    |    |     |           |                |  |    |    |    |    |    |    |    |    |
|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----|----|----|----|----|----|-----|----------------------|--|----|----|----|----|----|----|-----|-----------|----------------|--|----|----|----|----|----|----|----|----|
| Rated Working Voltage:                                                                                      | 16 ~ 250 VDC                                                                                                                                                                                                                                                                                                          | 350 ~ 500 VDC               |    |    |    |    |    |    |     |                      |  |    |    |    |    |    |    |     |           |                |  |    |    |    |    |    |    |    |    |
| Operating Temperature:                                                                                      | -40 ~ +85°C                                                                                                                                                                                                                                                                                                           | -25 ~ +85°C                 |    |    |    |    |    |    |     |                      |  |    |    |    |    |    |    |     |           |                |  |    |    |    |    |    |    |    |    |
| Nominal Capacitance:                                                                                        | 120 ~ 68000µF (±20% tolerance)                                                                                                                                                                                                                                                                                        | 33 ~ 680µF (±20% tolerance) |    |    |    |    |    |    |     |                      |  |    |    |    |    |    |    |     |           |                |  |    |    |    |    |    |    |    |    |
| Dissipation Factor:<br>(120 Hz, +20°C)                                                                      | <table border="1"> <tr> <td colspan="2">Working Voltage [V]:</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>80</td><td>100</td><td>160 ~ 500</td></tr> <tr> <td colspan="2">Max. D.F. (%):</td><td>50</td><td>40</td><td>35</td><td>30</td><td>25</td><td>20</td><td>20</td><td>15</td></tr> </table> |                             |    |    |    |    |    |    |     | Working Voltage [V]: |  | 16 | 25 | 35 | 50 | 63 | 80 | 100 | 160 ~ 500 | Max. D.F. (%): |  | 50 | 40 | 35 | 30 | 25 | 20 | 20 | 15 |
|                                                                                                             | Working Voltage [V]:                                                                                                                                                                                                                                                                                                  |                             | 16 | 25 | 35 | 50 | 63 | 80 | 100 | 160 ~ 500            |  |    |    |    |    |    |    |     |           |                |  |    |    |    |    |    |    |    |    |
|                                                                                                             | Max. D.F. (%):                                                                                                                                                                                                                                                                                                        |                             | 50 | 40 | 35 | 30 | 25 | 20 | 20  | 15                   |  |    |    |    |    |    |    |     |           |                |  |    |    |    |    |    |    |    |    |
| For capacitance values > 33000µF, add the value of: $\frac{(\text{rated cap. } \mu\text{F}) - 33000}{1000}$ |                                                                                                                                                                                                                                                                                                                       |                             |    |    |    |    |    |    |     |                      |  |    |    |    |    |    |    |     |           |                |  |    |    |    |    |    |    |    |    |
| Endurance:                                                                                                  | 3000 hours* at +85°C with maximum specified ripple current (see page 4)<br>*2000 hours for 20mm diameter or 20mm length sizes                                                                                                                                                                                         |                             |    |    |    |    |    |    |     |                      |  |    |    |    |    |    |    |     |           |                |  |    |    |    |    |    |    |    |    |

**Common Code/Terminal Type**

|      |                                  |
|------|----------------------------------|
| ECOS | 6.3mm Length Terminal (Standard) |
| ECEC | 4.0mm Length "Short" Terminal    |

(See page 7)

**Voltage Code**

**Series**

**Capacitance Code**

|   |      |
|---|------|
| A | 20mm |
| B | 22mm |
| C | 25mm |
| D | 30mm |
| E | 35mm |
| F | 40mm |

**Case Diameter**

**Suffix, Top Vinyl Plate**

|                              |               |
|------------------------------|---------------|
| 25 ~ 50mm lengths            |               |
| A                            | With Plate    |
| B                            | Without plate |
| 20mm length                  |               |
| L                            | With Plate    |
| G                            | Without plate |
| Extended Capacitance Ratings |               |
| X                            | With plate    |

| Cap.<br>(μF)                 | Size (mm)<br>D x L | Max 85°C R.C. (A <sub>rms</sub> ) |           | Max. 20°C ESR (Ω) |       | Panasonic<br>Part Number | Cap.<br>(μF)                 | Size (mm)<br>D x L | Max 85°C R.C. (A <sub>rms</sub> ) |           | Max. 20°C ESR (Ω) |       | Panasonic<br>Part Number |  |
|------------------------------|--------------------|-----------------------------------|-----------|-------------------|-------|--------------------------|------------------------------|--------------------|-----------------------------------|-----------|-------------------|-------|--------------------------|--|
|                              |                    | 120Hz                             | 10k~50kHz | 120Hz             | 20kHz |                          |                              |                    | 120Hz                             | 10k~50kHz | 120Hz             | 20kHz |                          |  |
| 16 VDC Working, 20 VDC Surge |                    |                                   |           |                   |       |                          | 25 VDC Working, 32 VDC Surge |                    |                                   |           |                   |       |                          |  |
| 6800                         | 20 x 25            | 3.15                              | 3.62      | 0.098             | 0.083 | ECOS1CP682AA             | 4700                         | 20 x 25            | 3.05                              | 3.51      | 0.113             | 0.090 | ECOS1EP472AA             |  |
| 8200                         | 20 x 30            | 3.47                              | 3.99      | 0.081             | 0.069 | ECOS1CP822AA             | 5600                         | 20 x 30            | 3.36                              | 3.86      | 0.095             | 0.076 | ECOS1EP562AA             |  |
| 10000                        | 20 x 35            | 3.78                              | 4.35      | 0.066             | 0.056 | ECOS1CP103AA             | 6800                         | 20 x 35            | 3.47                              | 3.99      | 0.078             | 0.062 | ECOS1EP682AA             |  |
| 12000                        | 20 x 35            | 4.52                              | 5.20      | 0.062             | 0.053 | ECOS1CP123AA             | 8200                         | 20 x 40            | 3.57                              | 4.11      | 0.065             | 0.052 | ECOS1EP822AA             |  |
| 15000                        | 20 x 40            | 5.26                              | 6.05      | 0.053             | 0.045 | ECOS1CP153AA             | 3300                         | 22 x 20            | 1.60                              | 1.84      | 0.176             | 0.141 | ECOS1EP332BL             |  |
| 4700                         | 22 x 20            | 1.60                              | 1.84      | 0.159             | 0.135 | ECOS1CP472BL             | 6800                         | 22 x 30            | 3.47                              | 3.99      | 0.078             | 0.062 | ECOS1EP682BA             |  |
| 10000                        | 22 x 30            | 3.78                              | 4.35      | 0.075             | 0.063 | ECOS1CP103BA             | 8200                         | 22 x 30            | 3.57                              | 4.11      | 0.065             | 0.052 | ECOS1EP822BA             |  |
| 12000                        | 22 x 30            | 4.52                              | 5.20      | 0.062             | 0.053 | ECOS1CP123BA             | 10000                        | 22 x 35            | 3.78                              | 4.35      | 0.058             | 0.046 | ECOS1EP103BA             |  |
| 15000                        | 22 x 35            | 5.26                              | 6.05      | 0.053             | 0.045 | ECOS1CP153BA             | 12000                        | 22 x 40            | 4.10                              | 4.72      | 0.048             | 0.039 | ECOS1EP123BA             |  |
| 18000                        | 22 x 40            | 5.57                              | 6.41      | 0.046             | 0.039 | ECOS1CP183BA             | 15000                        | 22 x 50            | 4.63                              | 5.32      | 0.039             | 0.031 | ECOS1EP153BA             |  |
| 22000                        | 22 x 45            | 6.10                              | 7.02      | 0.038             | 0.032 | ECOS1CP223BA             | 4700                         | 25 x 20            | 1.80                              | 2.07      | 0.123             | 0.099 | ECOS1EP472CL             |  |
| 6800                         | 25 x 20            | 1.80                              | 2.07      | 0.110             | 0.093 | ECOS1CP682CL             | 6800                         | 25 x 25            | 3.47                              | 3.99      | 0.078             | 0.062 | ECOS1EP682CA             |  |
| 10000                        | 25 x 25            | 3.78                              | 4.35      | 0.075             | 0.063 | ECOS1CP103CA             | 8200                         | 25 x 25            | 3.57                              | 4.11      | 0.065             | 0.052 | ECOS1EP822CA             |  |
| 12000                        | 25 x 25            | 4.52                              | 5.20      | 0.062             | 0.053 | ECOS1CP123CA             | 10000                        | 25 x 30            | 3.78                              | 4.35      | 0.058             | 0.046 | ECOS1EP103CA             |  |
| 15000                        | 25 x 30            | 5.26                              | 6.05      | 0.053             | 0.045 | ECOS1CP153CA             | 12000                        | 25 x 35            | 4.10                              | 4.72      | 0.048             | 0.039 | ECOS1EP123CA             |  |
| 18000                        | 25 x 30            | 5.57                              | 6.41      | 0.046             | 0.039 | ECOS1CP183CA             | 15000                        | 25 x 40            | 4.63                              | 5.32      | 0.039             | 0.031 | ECOS1EP153CA             |  |
| 22000                        | 25 x 35            | 6.10                              | 7.02      | 0.038             | 0.032 | ECOS1CP223CA             | 18000                        | 25 x 45            | 5.47                              | 6.29      | 0.035             | 0.028 | ECOS1EP183CA             |  |
| 27000                        | 25 x 45            | 6.31                              | 7.26      | 0.031             | 0.026 | ECOS1CP273CA             | 22000                        | 25 x 50            | 6.10                              | 7.02      | 0.029             | 0.023 | ECOS1EP223CA             |  |
| 33000                        | 25 x 50            | 6.84                              | 7.87      | 0.025             | 0.021 | ECOS1CP333CA             | 6800                         | 30 x 20            | 2.30                              | 2.65      | 0.078             | 0.062 | ECOS1EP682DL             |  |
| 10000                        | 30 x 20            | 2.40                              | 2.76      | 0.083             | 0.070 | ECOS1CP103DL             | 10000                        | 30 x 25            | 3.78                              | 4.35      | 0.058             | 0.046 | ECOS1EP103DA             |  |
| 22000                        | 30 x 30            | 6.10                              | 7.02      | 0.038             | 0.032 | ECOS1CP223DA             | 12000                        | 30 x 30            | 4.10                              | 4.72      | 0.048             | 0.039 | ECOS1EP123DA             |  |
| 27000                        | 30 x 35            | 6.31                              | 7.26      | 0.031             | 0.026 | ECOS1CP273DA             | 15000                        | 30 x 30            | 4.63                              | 5.32      | 0.039             | 0.031 | ECOS1EP153DA             |  |
| 33000                        | 30 x 40            | 6.84                              | 7.87      | 0.025             | 0.021 | ECOS1CP333DA             | 18000                        | 30 x 35            | 5.47                              | 6.29      | 0.035             | 0.028 | ECOS1EP183DA             |  |
| 39000                        | 30 x 45            | 6.94                              | 7.98      | 0.021             | 0.018 | ECOS1CP393DA             | 22000                        | 30 x 40            | 6.10                              | 7.02      | 0.029             | 0.023 | ECOS1EP223DA             |  |
| 47000                        | 30 x 50            | 7.47                              | 8.59      | 0.019             | 0.017 | ECOS1CP473DA             | 27000                        | 30 x 45            | 6.21                              | 7.14      | 0.023             | 0.019 | ECOS1EP273DA             |  |
| 15000                        | 35 x 20            | 3.20                              | 3.68      | 0.055             | 0.047 | ECOS1CP153EL             | 33000                        | 30 x 50</          |                                   |           |                   |       |                          |  |

## TS-UP Standard Ratings (continued)

| Cap.<br>( $\mu$ F)            | Size (mm)<br>D x L | Max 85°C R.C. ( $A_{rms}$ ) |           | Max. 20°C ESR ( $\Omega$ ) |       | Panasonic<br>Part Number |
|-------------------------------|--------------------|-----------------------------|-----------|----------------------------|-------|--------------------------|
|                               |                    | 120Hz                       | 10k~50kHz | 120Hz                      | 20kHz |                          |
| 35 VDC Working, 44 VDC Surge  |                    |                             |           |                            |       |                          |
| 3300                          | 20 x 25            | 2.73                        | 3.14      | 0.111                      | 0.083 | ECOS1VP332AA             |
| 3900                          | 20 x 30            | 2.94                        | 3.38      | 0.094                      | 0.070 | ECOS1VP392AA             |
| 4700                          | 20 x 35            | 3.26                        | 3.75      | 0.078                      | 0.058 | ECOS1VP472AA             |
| 5600                          | 20 x 40            | 3.36                        | 3.86      | 0.080                      | 0.060 | ECOS1VP562AA             |
| 2200                          | 22 x 20            | 1.40                        | 1.61      | 0.181                      | 0.136 | ECOS1VP222BL             |
| 4700                          | 22 x 30            | 3.26                        | 3.75      | 0.078                      | 0.058 | ECOS1VP472BA             |
| 5600                          | 22 x 30            | 3.36                        | 3.86      | 0.080                      | 0.060 | ECOS1VP562BA             |
| 6800                          | 22 x 35            | 3.68                        | 4.23      | 0.066                      | 0.049 | ECOS1VP682BA             |
| 8200                          | 22 x 40            | 4.00                        | 4.60      | 0.057                      | 0.042 | ECOS1VP822BA             |
| 10000                         | 22 x 45            | 4.42                        | 5.08      | 0.050                      | 0.037 | ECOS1VP103BA             |
| 3300                          | 25 x 20            | 1.70                        | 1.96      | 0.121                      | 0.090 | ECOS1VP332CL             |
| 4700                          | 25 x 25            | 3.26                        | 3.75      | 0.078                      | 0.058 | ECOS1VP472CA             |
| 5600                          | 25 x 25            | 3.36                        | 3.86      | 0.080                      | 0.060 | ECOS1VP562CA             |
| 6800                          | 25 x 30            | 3.68                        | 4.23      | 0.066                      | 0.049 | ECOS1VP682CA             |
| 8200                          | 25 x 35            | 4.00                        | 4.60      | 0.057                      | 0.042 | ECOS1VP822CA             |
| 10000                         | 25 x 40            | 4.42                        | 5.08      | 0.050                      | 0.037 | ECOS1VP103CA             |
| 12000                         | 25 x 45            | 5.05                        | 5.81      | 0.044                      | 0.033 | ECOS1VP123CA             |
| 15000                         | 25 x 50            | 5.57                        | 6.41      | 0.036                      | 0.027 | ECOS1VP153CA             |
| 4700                          | 30 x 20            | 2.00                        | 2.30      | 0.088                      | 0.066 | ECOS1VP472DL             |
| 10000                         | 30 x 30            | 4.42                        | 5.08      | 0.050                      | 0.037 | ECOS1VP103DA             |
| 12000                         | 30 x 35            | 5.05                        | 5.81      | 0.044                      | 0.033 | ECOS1VP123DA             |
| 15000                         | 30 x 40            | 5.57                        | 6.41      | 0.036                      | 0.027 | ECOS1VP153DA             |
| 18000                         | 30 x 45            | 5.68                        | 6.53      | 0.030                      | 0.023 | ECOS1VP183DA             |
| 22000                         | 30 x 50            | 6.10                        | 7.02      | 0.026                      | 0.020 | ECOS1VP223DA             |
| 6800                          | 35 x 20            | 2.40                        | 2.76      | 0.071                      | 0.053 | ECOS1VP682EL             |
| 10000                         | 35 x 25            | 4.42                        | 5.08      | 0.050                      | 0.037 | ECOS1VP103EA             |
| 12000                         | 35 x 30            | 5.05                        | 5.81      | 0.044                      | 0.033 | ECOS1VP123EA             |
| 15000                         | 35 x 30            | 5.57                        | 6.41      | 0.036                      | 0.027 | ECOS1VP153EA             |
| 18000                         | 35 x 35            | 5.68                        | 6.53      | 0.030                      | 0.023 | ECOS1VP183EA             |
| 22000                         | 35 x 40            | 6.10                        | 7.02      | 0.026                      | 0.020 | ECOS1VP223EA             |
| 27000                         | 35 x 45            | 6.84                        | 7.87      | 0.021                      | 0.017 | ECOS1VP273EA             |
| 33000                         | 35 x 50            | 7.15                        | 8.22      | 0.018                      | 0.014 | ECOS1VP333EA             |
| 27000                         | 40 x 40            | 6.84                        | 7.87      | 0.021                      | 0.017 | ECOS1VP273FA             |
| 39000                         | 40 x 50            | 7.98                        | 9.18      | 0.017                      | 0.014 | ECOS1VP393FA             |
| 63 VDC Working, 79 VDC Surge  |                    |                             |           |                            |       |                          |
| 2200                          | 20 x 35            | 2.52                        | 2.90      | 0.151                      | 0.113 | ECOS1JP222AA             |
| 2700                          | 20 x 40            | 3.73                        | 4.29      | 0.123                      | 0.092 | ECOS1JP272AA             |
| 1000                          | 22 x 20            | 1.20                        | 1.38      | 0.381                      | 0.286 | ECOS1JP102BL             |
| 2200                          | 22 x 30            | 2.52                        | 2.90      | 0.151                      | 0.113 | ECOS1JP222BA             |
| 2700                          | 22 x 35            | 3.73                        | 4.29      | 0.123                      | 0.092 | ECOS1JP272BA             |
| 3300                          | 22 x 40            | 4.10                        | 4.72      | 0.105                      | 0.079 | ECOS1JP332BA             |
| 3900                          | 22 x 45            | 4.44                        | 5.11      | 0.098                      | 0.073 | ECOS1JP392BA             |
| 4700                          | 22 x 50            | 4.86                        | 5.59      | 0.081                      | 0.061 | ECOS1JP472BA             |
| 1500                          | 25 x 20            | 1.30                        | 1.50      | 0.254                      | 0.191 | ECOS1JP152CL             |
| 2200                          | 25 x 25            | 2.52                        | 2.90      | 0.151                      | 0.113 | ECOS1JP222CA             |
| 2700                          | 25 x 30            | 3.73                        | 4.29      | 0.123                      | 0.092 | ECOS1JP272CA             |
| 3300                          | 25 x 30            | 4.10                        | 4.72      | 0.105                      | 0.079 | ECOS1JP332CA             |
| 3900                          | 25 x 35            | 4.44                        | 5.11      | 0.098                      | 0.073 | ECOS1JP392CA             |
| 4700                          | 25 x 40            | 4.86                        | 5.59      | 0.081                      | 0.061 | ECOS1JP472CA             |
| 5600                          | 25 x 45            | 5.36                        | 6.16      | 0.068                      | 0.051 | ECOS1JP562CA             |
| 6800                          | 25 x 50            | 5.84                        | 6.72      | 0.061                      | 0.046 | ECOS1JP682CA             |
| 2200                          | 30 x 20            | 1.50                        | 1.73      | 0.173                      | 0.130 | ECOS1JP222DL             |
| 3300                          | 30 x 25            | 4.10                        | 4.72      | 0.105                      | 0.079 | ECOS1JP332DA             |
| 3900                          | 30 x 30            | 4.44                        | 5.11      | 0.098                      | 0.073 | ECOS1JP392DA             |
| 4700                          | 30 x 30            | 4.86                        | 5.59      | 0.081                      | 0.061 | ECOS1JP472DA             |
| 5600                          | 30 x 35            | 5.36                        | 6.16      | 0.068                      | 0.051 | ECOS1JP562DA             |
| 6800                          | 30 x 40            | 5.84                        | 6.72      | 0.061                      | 0.046 | ECOS1JP682DA             |
| 8200                          | 30 x 45            | 6.00                        | 6.90      | 0.051                      | 0.038 | ECOS1JP822DA             |
| 3300                          | 35 x 20            | 1.70                        | 1.96      | 0.126                      | 0.094 | ECOS1JP332EL             |
| 4700                          | 35 x 25            | 4.86                        | 5.59      | 0.081                      | 0.061 | ECOS1JP472EA             |
| 5600                          | 35 x 30            | 5.36                        | 6.16      | 0.068                      | 0.051 | ECOS1JP562EA             |
| 6800                          | 35 x 30            | 5.84                        | 6.72      | 0.061                      | 0.046 | ECOS1JP682EA             |
| 8200                          | 35 x 35            | 6.00                        | 6.90      | 0.051                      | 0.038 | ECOS1JP822EA             |
| 10000                         | 35 x 40            | 6.52                        | 7.50      | 0.041                      | 0.033 | ECOS1JP103EA             |
| 12000                         | 35 x 50            | 7.15                        | 8.22      | 0.035                      | 0.028 | ECOS1JP123EA             |
| 12000                         | 40 x 40            | 7.15                        | 8.22      | 0.035                      | 0.028 | ECOS1JP123FA             |
| 15000                         | 40 x 50            | 7.53                        | 8.66      | 0.033                      | 0.027 | ECOS1JP153FA             |
| 80 VDC Working, 100 VDC Surge |                    |                             |           |                            |       |                          |
| 1200                          | 20 x 30            | 2.08                        | 2.39      | 0.221                      | 0.166 | ECOS1KP122AA             |
| 1500                          | 20 x 35            | 2.26                        | 2.60      | 0.177                      | 0.133 | ECOS1KP152AA             |
| 1800                          | 20 x 40            | 2.52                        | 2.90      | 0.147                      | 0.111 | ECOS1KP182AA             |
| 2200                          | 20 x 50            | 2.73                        | 3.14      | 0.136                      | 0.102 | ECOS1KP222AA             |
| 680                           | 22 x 20            | 1.00                        | 1.15      | 0.439                      | 0.329 | ECOS1KP681BL             |
| 1500                          | 22 x 30            | 2.26                        | 2.60      | 0.177                      | 0.133 | ECOS1KP152BA             |
| 1800                          | 22 x 35            | 2.52                        | 2.90      | 0.147                      | 0.111 | ECOS1KP182BA             |
| 2200                          | 22 x 40            | 2.73                        | 3.14      | 0.121                      | 0.090 | ECOS1KP222BA             |
| 2700                          | 22 x 45            | 2.78                        | 3.20      | 0.098                      | 0.074 | ECOS1KP272BA             |
| 3300                          | 22 x 50            | 3.21                        | 3.69      | 0.085                      | 0.064 | ECOS1KP332BA             |
| 1000                          | 25 x 20            | 1.20                        | 1.38      | 0.298                      | 0.224 | ECOS1KP102CL             |
| 1500                          | 25 x 25            | 2.26                        | 2.60      | 0.177                      | 0.133 | ECOS1KP152CA             |
| 1800                          | 25 x 30            | 2.52                        | 2.90      | 0.147                      | 0.111 | ECOS1KP182CA             |
| 2200                          | 25 x 30            | 2.73                        | 3.14      | 0.121                      | 0.090 | ECOS1KP222CA             |
| 2700                          | 25 x 35            | 2.78                        | 3.20      | 0.098                      | 0.074 | ECOS1KP272CA             |
| 3300                          | 25 x 40            | 3.21                        | 3.69      | 0.085                      | 0.064 | ECOS1KP332CA             |
| 3900                          | 25 x 45            | 3.59                        | 4.13      | 0.077                      | 0.057 | ECOS1KP392CA             |
| 4700                          | 25 x 50            | 4.09                        | 4.70      | 0.063                      | 0.048 | ECOS1KP472CA             |
| 1500                          | 30 x 20            | 1.40                        | 1.61      | 0.199                      | 0.149 | ECOS1KP152DL             |
| 2200                          | 30 x 25            | 2.73                        | 3.14      | 0.121                      | 0.090 | ECOS1KP222DA             |
| 2700                          | 30 x 30            | 2.78                        | 3.20      | 0.098                      | 0.074 | ECOS1KP272DA             |
| 3300                          | 30 x 30            | 3.21                        | 3.69      | 0.085                      | 0.064 | ECOS1KP332DA             |
| 3900                          | 30 x 35            | 3.59                        | 4.13      | 0.077                      | 0.057 | ECOS1KP392DA             |
| 4700                          | 30 x 40            | 4.09                        | 4.70      | 0.063                      | 0.048 | ECOS1KP472DA             |
| 5600                          | 30 x 45            | 4.55                        | 5.23      | 0.056                      | 0.042 | ECOS1KP562DA             |
| 6800                          | 30 x 50            | 5.16                        | 5.93      | 0.046                      | 0.035 | ECOS1KP682DA             |
| 2200                          | 35 x 20            | 1.70                        | 1.96      | 0.136                      | 0.102 | ECOS1KP222EL             |
| 5600                          | 35 x 35            | 4.55                        | 5.23      | 0.056                      | 0.042 | ECOS1KP562EA             |
| 6800                          | 35 x 40            | 5.16                        | 5.93      | 0.046                      | 0.035 | ECOS1KP682EA             |
| 8200                          | 35 x 50            | 5.83                        | 6.70      | 0.038                      | 0.029 | ECOS1KP822EA             |
| 8200                          | 40 x 40            | 5.83                        | 6.70      | 0.038                      | 0.029 | ECOS1KP822FA             |
| 10000                         | 40 x 50            | 6.56                        | 7.54      | 0.033                      | 0.025 | ECOS1KP103FA             |

## TS-UP Standard Ratings (continued)

| Cap.<br>( $\mu$ F)             | Size (mm)<br>D x L | Max 85°C R.C. ( $A_{rms}$ ) |           | Max. 20°C ESR ( $\Omega$ ) |       | Panasonic<br>Part Number |
|--------------------------------|--------------------|-----------------------------|-----------|----------------------------|-------|--------------------------|
|                                |                    | 120Hz                       | 10k-50kHz | 120Hz                      | 20kHz |                          |
| 100 VDC Working, 125 VDC Surge |                    |                             |           |                            |       |                          |
| 560                            | 20 x 25            | 1.35                        | 1.55      | 0.385                      | 0.250 | ECOS2AP561AA             |
| 820                            | 20 x 30            | 1.59                        | 1.83      | 0.263                      | 0.171 | ECOS2AP821AA             |
| 1000                           | 20 x 35            | 1.96                        | 2.25      | 0.216                      | 0.140 | ECOS2AP102AA             |
| 1200                           | 20 x 40            | 2.31                        | 2.66      | 0.180                      | 0.117 | ECOS2AP122AA             |
| 1500                           | 20 x 50            | 2.57                        | 2.96      | 0.144                      | 0.093 | ECOS2AP152AA             |
| 470                            | 22 x 20            | 1.00                        | 1.15      | 0.459                      | 0.298 | ECOS2AP471BL             |
| 680                            | 22 x 25            | 1.61                        | 1.85      | 0.317                      | 0.206 | ECOS2AP681BA             |
| 1000                           | 22 x 30            | 1.96                        | 2.25      | 0.216                      | 0.140 | ECOS2AP102BA             |
| 1200                           | 22 x 35            | 2.31                        | 2.66      | 0.193                      | 0.126 | ECOS2AP122BA             |
| 1500                           | 22 x 40            | 2.57                        | 2.96      | 0.155                      | 0.101 | ECOS2AP152BA             |
| 1800                           | 22 x 45            | 2.84                        | 3.27      | 0.129                      | 0.084 | ECOS2AP182BA             |
| 2200                           | 22 x 50            | 3.14                        | 3.61      | 0.121                      | 0.078 | ECOS2AP222BA             |
| 680                            | 25 x 20            | 1.10                        | 1.27      | 0.366                      | 0.238 | ECOS2AP681CL             |
| 1000                           | 25 x 25            | 1.96                        | 2.25      | 0.216                      | 0.140 | ECOS2AP102CA             |
| 1200                           | 25 x 30            | 2.31                        | 2.66      | 0.180                      | 0.117 | ECOS2AP122CA             |
| 1500                           | 25 x 30            | 2.57                        | 2.96      | 0.155                      | 0.101 | ECOS2AP152CA             |
| 1800                           | 25 x 35            | 2.84                        | 3.27      | 0.138                      | 0.090 | ECOS2AP182CA             |
| 2200                           | 25 x 40            | 3.14                        | 3.61      | 0.121                      | 0.078 | ECOS2AP222CA             |
| 2700                           | 25 x 45            | 3.71                        | 4.27      | 0.104                      | 0.068 | ECOS2AP272CA             |
| 3300                           | 25 x 50            | 4.06                        | 4.67      | 0.090                      | 0.059 | ECOS2AP332CA             |
| 1000                           | 30 x 20            | 1.20                        | 1.38      | 0.249                      | 0.162 | ECOS2AP102DL             |
| 1500                           | 30 x 25            | 2.57                        | 2.96      | 0.155                      | 0.101 | ECOS2AP152DA             |
| 1800                           | 30 x 30            | 2.84                        | 3.27      | 0.138                      | 0.090 | ECOS2AP182DA             |
| 2200                           | 30 x 30            | 3.14                        | 3.61      | 0.121                      | 0.078 | ECOS2AP222DA             |
| 2700                           | 30 x 35            | 3.71                        | 4.27      | 0.104                      | 0.068 | ECOS2AP272DA             |
| 3300                           | 30 x 40            | 4.06                        | 4.67      | 0.090                      | 0.059 | ECOS2AP332DA             |
| 3900                           | 30 x 45            | 4.54                        | 5.22      | 0.077                      | 0.050 | ECOS2AP392DA             |
| 4700                           | 30 x 50            | 5.13                        | 5.90      | 0.071                      | 0.049 | ECOS2AP472DA             |
| 1500                           | 35 x 20            | 1.50                        | 1.73      | 0.177                      | 0.115 | ECOS2AP152EL             |
| 2200                           | 35 x 25            | 3.14                        | 3.61      | 0.121                      | 0.078 | ECOS2AP222EA             |
| 2700                           | 35 x 30            | 3.71                        | 4.27      | 0.104                      | 0.068 | ECOS2AP272EA             |
| 3900                           | 35 x 35            | 4.54                        | 5.22      | 0.081                      | 0.052 | ECOS2AP392EA             |
| 4700                           | 35 x 40            | 5.13                        | 5.90      | 0.071                      | 0.049 | ECOS2AP472EA             |
| 5600                           | 35 x 45            | 5.75                        | 6.61      | 0.059                      | 0.041 | ECOS2AP562EA             |
| 6800                           | 35 x 50            | 6.60                        | 7.59      | 0.049                      | 0.037 | ECOS2AP682EA             |
| 5600                           | 40 x 40            | 5.75                        | 6.61      | 0.059                      | 0.044 | ECOS2AP562FA             |
| 8200                           | 40 x 50            | 7.28                        | 8.37      | 0.040                      | 0.030 | ECOS2AP822FA             |
| 200 VDC Working, 250 VDC Surge |                    |                             |           |                            |       |                          |
| 270                            | 20 x 30            | 1.41                        | 1.97      | 0.614                      | 0.276 | ECOS2DP271AA             |
| 330                            | 20 x 35            | 1.56                        | 2.18      | 0.553                      | 0.249 | ECOS2DP331AA             |
| 470                            | 20 x 40            | 1.85                        | 2.59      | 0.388                      | 0.175 | ECOS2DP471AX             |
| 680                            | 20 x 50            | 2.52                        | 3.53      | 0.268                      | 0.121 | ECOS2DP681AX             |
| 150                            | 22 x 20            | 0.65                        | 0.91      | 1.326                      | 0.597 | ECOS2DP151BL             |
| 270                            | 22 x 25            | 1.41                        | 1.97      | 0.614                      | 0.276 | ECOS2DP271BA             |
| 330                            | 22 x 25            | 1.56                        | 2.18      | 0.553                      | 0.249 | ECOS2DP331BX             |
| 390                            | 22 x 30            | 1.68                        | 2.35      | 0.468                      | 0.210 | ECOS2DP391BA             |
| 470                            | 22 x 35            | 1.85                        | 2.59      | 0.388                      | 0.175 | ECOS2DP471BA             |
| 560                            | 22 x 40            | 2.43                        | 3.40      | 0.326                      | 0.147 | ECOS2DP561BA             |
| 680                            | 22 x 45            | 2.68                        | 3.75      | 0.268                      | 0.121 | ECOS2DP681BA             |
| 220                            | 25 x 20            | 0.87                        | 1.22      | 0.904                      | 0.407 | ECOS2DP221CL             |
| 390                            | 25 x 25            | 1.68                        | 2.35      | 0.468                      | 0.210 | ECOS2DP391CA             |
| 470                            | 25 x 30            | 1.85                        | 2.59      | 0.388                      | 0.175 | ECOS2DP471CA             |
| 560                            | 25 x 30            | 2.43                        | 3.40      | 0.326                      | 0.147 | ECOS2DP561CX             |
| 680                            | 25 x 35            | 2.68                        | 3.75      | 0.268                      | 0.121 | ECOS2DP681CA             |
| 820                            | 25 x 45            | 2.93                        | 4.10      | 0.222                      | 0.100 | ECOS2DP821CA             |
| 1000                           | 25 x 45            | 3.25                        | 4.55      | 0.199                      | 0.090 | ECOS2DP102CX             |
| 1000                           | 25 x 50            | 3.25                        | 4.55      | 0.199                      | 0.090 | ECOS2DP102CA             |
| 330                            | 30 x 20            | 1.00                        | 1.40      | 0.603                      | 0.271 | ECOS2DP331DL             |
| 560                            | 30 x 25            | 2.43                        | 3.40      | 0.326                      | 0.147 | ECOS2DP561DA             |
| 680                            | 30 x 30            | 2.68                        | 3.75      | 0.268                      | 0.121 | ECOS2DP681DA             |
| 820                            | 30 x 30            | 2.93                        | 4.10      | 0.222                      | 0.100 | ECOS2DP821DX             |
| 820                            | 30 x 35            | 2.93                        | 4.10      | 0.222                      | 0.100 | ECOS2DP821DA             |
| 1000                           | 30 x 35            | 3.25                        | 4.55      | 0.199                      | 0.090 | ECOS2DP102DX             |
| 250 VDC Working, 300 VDC Surge |                    |                             |           |                            |       |                          |
| 180                            | 20 x 30            | 1.07                        | 1.50      | 0.921                      | 0.368 | ECOS2EP181AA             |
| 220                            | 20 x 35            | 1.17                        | 1.64      | 0.754                      | 0.301 | ECOS2EP221AA             |
| 120                            | 22 x 20            | 0.45                        | 0.63      | 1.658                      | 0.663 | ECOS2EP121BL             |
| 180                            | 22 x 25            | 1.07                        | 1.50      | 0.921                      | 0.368 | ECOS2EP181BA             |
| 220                            | 22 x 25            | 1.17                        | 1.64      | 0.754                      | 0.301 | ECOS2EP221BX             |
| 270                            | 22 x 30            | 1.31                        | 1.83      | 0.614                      | 0.246 | ECOS2EP271BA             |
| 330                            | 22 x 35            | 1.75                        | 2.45      | 0.553                      | 0.221 | ECOS2EP331BA             |
| 390                            | 22 x 40            | 1.91                        | 2.67      | 0.468                      | 0.187 | ECOS2EP391BA             |
| 470                            | 22 x 45            | 2.11                        | 2.95      | 0.388                      | 0.155 | ECOS2EP471BA             |
| 150                            | 25 x 20            | 0.65                        | 0.91      | 1.326                      | 0.531 | ECOS2EP151CL             |
| 270                            | 25 x 25            | 1.31                        | 1.83      | 0.614                      | 0.246 | ECOS2EP271CA             |
| 330                            | 25 x 30            | 1.75                        | 2.45      | 0.502                      | 0.201 | ECOS2EP331CA             |
| 390                            | 25 x 30            | 1.91                        | 2.67      | 0.468                      | 0.187 | ECOS2EP391CX             |
| 390                            | 25 x 35            | 1.91                        | 2.67      | 0.468                      | 0.187 | ECOS2EP391CA             |
| 470                            | 25 x 35            | 2.11                        | 2.95      | 0.388                      | 0.155 | ECOS2EP471CX             |
| 470                            | 25 x 40            | 2.11                        | 2.95      | 0.388                      | 0.155 | ECOS2EP471CA             |
| 560                            | 25 x 40            | 2.25                        | 3.15      | 0.326                      | 0.130 | ECOS2EP561CX             |
| 560                            | 25 x 45            | 2.25                        | 3.15      | 0.326                      | 0.130 | ECOS2EP561CA             |
| 680                            | 25 x 45            | 2.50                        | 3.50      | 0.268                      | 0.107 | ECOS2EP681CX             |
| 680                            | 25 x 50            | 2.50                        | 3.50      | 0.268                      | 0.107 | ECOS2EP681CA             |
| 220                            | 30 x 20            | 0.87                        | 1.22      | 0.829                      | 0.332 | ECOS2EP221DL             |
| 390                            | 30 x 25            | 1.91                        | 2.67      | 0.425                      | 0.170 | ECOS2EP391DA             |
| 470                            | 30 x 25            | 2.11                        | 2.95      | 0.353                      | 0.141 | ECOS2EP471DX             |
| 470                            | 30 x 30            | 2.11                        | 2.95      | 0.388                      | 0.155 | ECOS2EP471DA             |
| 560                            | 30 x 30            | 2.25                        | 3.15      | 0.326                      | 0.130 | ECOS2EP561DX             |

## TS-UP Standard Ratings (continued)

| Cap.<br>( $\mu$ F)                         | Size (mm)<br>D x L | Max. 85°C R.C. ( $A_{rms}$ ) |           | Max. 20°C ESR ( $\Omega$ ) |       | Panasonic<br>Part Number |
|--------------------------------------------|--------------------|------------------------------|-----------|----------------------------|-------|--------------------------|
|                                            |                    | 120Hz                        | 10k-50kHz | 120Hz                      | 20kHz |                          |
| 200 VDC Working, 250 VDC Surge (continued) |                    |                              |           |                            |       |                          |
| 1000                                       | 30 x 40            | 3.25                         | 4.55      | 0.199                      | 0.090 | ECOS2DP102DA             |
| 1200                                       | 30 x 40            | 3.50                         | 4.90      | 0.166                      | 0.075 | ECOS2DP122DX             |
| 1200                                       | 30 x 45            | 3.50                         | 4.90      | 0.166                      | 0.075 | ECOS2DP122DA             |
| 1500                                       | 30 x 45            | 3.87                         | 5.42      | 0.144                      | 0.072 | ECOS2DP152DX             |
| 1500                                       | 30 x 50            | 3.87                         | 5.42      | 0.144                      | 0.072 | ECOS2DP152DA             |
| 1800                                       | 30 x 50            | 4.32                         | 6.05      | 0.120                      | 0.060 | ECOS2DP182DX             |
| 470                                        | 35 x 20            | 1.30                         | 1.82      | 0.459                      | 0.206 | ECOS2DP471EL             |
| 820                                        | 35 x 25            | 2.93                         | 4.10      | 0.243                      | 0.109 | ECOS2DP821EA             |
| 1000                                       | 35 x 30            | 3.25                         | 4.55      | 0.199                      | 0.090 | ECOS2DP102EA             |
| 1200                                       | 35 x 30            | 3.50                         | 4.90      | 0.166                      | 0.075 | ECOS2DP122EX             |
| 1200                                       | 35 x 35            | 3.50                         | 4.90      | 0.166                      | 0.075 | ECOS2DP122EA             |
| 1500                                       | 35 x 35            | 3.87                         | 5.42      | 0.144                      | 0.072 | ECOS2DP152EX             |
| 1500                                       | 35 x 40            | 3.87                         | 5.42      | 0.144                      | 0.072 | ECOS2DP152EA             |
| 1800                                       | 35 x 40            | 4.32                         | 6.05      | 0.120                      | 0.060 | ECOS2DP182EX             |
| 1800                                       | 35 x 45            | 4.32                         | 6.05      | 0.120                      | 0.060 | ECOS2DP182EA             |
| 2200                                       | 35 x 45            | 4.92                         | 6.89      | 0.098                      | 0.054 | ECOS2DP222EX             |
| 2200                                       | 35 x 50            | 4.92                         | 6.89      | 0.098                      | 0.054 | ECOS2DP222EA             |
| 2200                                       | 40 x 40            | 4.92                         | 6.89      | 0.098                      | 0.054 | ECOS2DP222FA             |
| 2700                                       | 40 x 50            | 5.41                         | 7.57      | 0.080                      | 0.044 | ECOS2DP272FA             |
| 250 VDC Working, 300 VDC Surge (continued) |                    |                              |           |                            |       |                          |
| 560                                        | 30 x 35            | 2.25                         | 3.15      | 0.326                      | 0.130 | ECOS2EP561DA             |
| 680                                        | 30 x 35            | 2.25                         | 3.15      | 0.268                      | 0.107 | ECOS2EP681DX             |
| 680                                        | 30 x 40            | 2.50                         | 3.50      | 0.268                      | 0.107 | ECOS2EP681DA             |
| 820                                        | 30 x 40            | 2.50                         | 3.50      | 0.222                      | 0.089 | ECOS2EP821DX             |
| 820                                        | 30 x 45            | 2.77                         | 3.88      | 0.222                      | 0.089 | ECOS2EP821DA             |
| 1000                                       | 30 x 45            | 3.32                         | 4.65      | 0.182                      | 0.073 | ECOS2EP102DX             |
| 1000                                       | 30 x 50            | 3.32                         | 4.65      | 0.199                      | 0.090 | ECOS2EP102DA             |
| 330                                        | 35 x 20            | 1.10                         | 1.54      | 0.553                      | 0.221 | ECOS2EP331EL             |
| 560                                        | 35 x 25            | 2.25                         | 3.15      | 0.326                      | 0.130 | ECOS2EP561EA             |
| 680                                        | 35 x 30            | 2.50                         | 3.50      | 0.268                      | 0.107 | ECOS2EP681EA             |
| 820                                        | 35 x 30            | 2.77                         | 3.88      | 0.222                      | 0.089 | ECOS2EP821EX             |
| 820                                        | 35 x 35            | 2.77                         | 3.88      | 0.243                      | 0.109 | ECOS2EP821EA             |
| 1000                                       | 35 x 35            | 3.32                         | 4.65      | 0.199                      | 0.090 | ECOS2EP102EX             |
| 1000                                       | 35 x 40            | 3.32                         | 4.65      | 0.199                      | 0.099 | ECOS2EP102EA             |
| 1200                                       | 35 x 40            | 3.53                         | 4.94      | 0.166                      | 0.083 | ECOS2EP122EX             |
| 1200                                       | 35 x 45            | 3.53                         | 4.94      | 0.166                      | 0.083 | ECOS2EP122EA             |
| 1500                                       | 35 x 50            | 4.04                         | 5.66      | 0.133                      | 0.066 | ECOS2EP152EA             |
| 1500                                       | 40 x 40            | 4.04                         | 5.66      | 0.133                      | 0.066 | ECOS2EP152FA             |
| 1800                                       | 40 x 50            | 4.49                         | 6.29      | 0.111                      | 0.055 | ECOS2EP182FA             |
| 350 VDC Working, 400 VDC Surge             |                    |                              |           |                            |       |                          |
| 82                                         | 20 x 30            | 0.83                         | 1.16      | 2.022                      | 0.708 | ECOS2VP820AA             |
| 100                                        | 20 x 35            | 0.91                         | 1.27      | 1.658                      | 0.580 | ECOS2VP101AA             |
| 82                                         | 22 x 25            | 0.83                         | 1.16      | 2.022                      | 0.708 | ECOS2VP820BA             |
| 100                                        | 22 x 30            | 0.91                         | 1.27      | 1.658                      | 0.580 | ECOS2VP101BA             |
| 120                                        | 22 x 30            | 1.00                         | 1.40      | 1.382                      | 0.484 | ECOS2VP121BA             |
| 150                                        | 22 x 35            | 1.12                         | 1.57      | 1.105                      | 0.387 | ECOS2VP151BA             |
| 180                                        | 22 x 40            | 1.22                         | 1.71      | 0.921                      | 0.322 | ECOS2VP181BA             |
| 220                                        | 22 x 45            | 1.44                         | 2.02      | 0.754                      | 0.264 | ECOS2VP221BA             |
| 120                                        | 25 x 25            | 1.00                         | 1.40      | 1.382                      | 0.484 | ECOS2VP121CA             |
| 150                                        | 25 x 25            | 1.12                         | 1.57      | 1.105                      | 0.387 | ECOS2VP151CX             |
| 150                                        | 25 x 30            | 1.12                         | 1.57      | 1.105                      | 0.387 | ECOS2VP151CA             |
| 180                                        | 25 x 30            | 1.22                         | 1.71      | 0.921                      | 0.322 | ECOS2VP181CX             |
| 180                                        | 25 x 35            | 1.22                         | 1.71      | 0.921                      | 0.322 | ECOS2VP181CA             |
| 220                                        | 25 x 35            | 1.44                         | 2.02      | 0.754                      | 0.264 | ECOS2VP221CX             |
| 220                                        | 25 x 40            | 1.44                         | 2.02      | 0.754                      | 0.264 | ECOS2VP221CA             |
| 270                                        | 25 x 40            | 1.66                         | 2.32      | 0.614                      | 0.215 | ECOS2VP271CX             |
| 330                                        | 25 x 50            | 1.88                         | 2.63      | 0.502                      | 0.176 | ECOS2VP331CA             |
| 390                                        | 25 x 50            | 2.06                         | 2.88      | 0.425                      | 0.149 | ECOS2VP391CX             |
| 150                                        | 30 x 25            | 1.12                         | 1.57      | 1.105                      | 0.387 | ECOS2VP151DA             |
| 180                                        | 30 x 25            | 1.22                         | 1.71      | 0.921                      | 0.322 | ECOS2VP181DA             |
| 220                                        | 30 x 25            | 1.44                         | 2.02      | 0.754                      | 0.264 | ECOS2VP221DX             |
| 220                                        | 30 x 30            | 1.44                         | 2.02      | 0.754                      | 0.264 | ECOS2VP221DA             |
| 270                                        | 30 x 30            | 1.66                         | 2.32      | 0.614                      | 0.215 | ECOS2VP271DX             |
| 270                                        | 30 x 35            | 1.66                         | 2.32      | 0.614                      | 0.215 | ECOS2VP271DA             |
| 330                                        | 30 x 35            | 1.88                         | 2.63      | 0.502                      | 0.176 | ECOS2VP331DX             |
| 330                                        | 30 x 40            | 1.88                         | 2.63      | 0.502                      | 0.176 | ECOS2VP331DA             |
| 390                                        | 30 x 40            | 2.06                         | 2.88      | 0.425                      | 0.149 | ECOS2VP391DX             |
| 390                                        | 30 x 45            | 2.06                         | 2.88      | 0.468                      | 0.164 | ECOS2VP391DA             |
| 470                                        | 30 x 50            | 2.40                         | 3.36      | 0.388                      | 0.136 | ECOS2VP471DA             |
| 560                                        | 30 x 50            | 2.60                         | 3.64      | 0.326                      | 0.114 | ECOS2VP561DX             |
| 220                                        | 35 x 25            | 1.44                         | 2.02      | 0.754                      | 0.264 | ECOS2VP221EA             |
| 270                                        | 35 x 25            | 1.66                         | 2.32      | 0.614                      | 0.215 | ECOS2VP271EX             |
| 270                                        | 35 x 30            | 1.66                         | 2.32      | 0.614                      | 0.215 | ECOS2VP271EA             |
| 330                                        | 35 x 30            | 1.88                         | 2.63      | 0.502                      | 0.176 | ECOS2VP331EA             |
| 390                                        | 35 x 30            | 2.06                         | 2.88      | 0.425                      | 0.149 | ECOS2VP391EX             |
| 390                                        | 35 x 35            | 2.06                         | 2.88      | 0.425                      | 0.149 | ECOS2VP391EA             |
| 470                                        | 35 x 35            | 2.40                         | 3.36      | 0.353                      | 0.123 | ECOS2VP471EX             |
| 470                                        | 35 x 40            | 2.40                         | 3.36      | 0.353                      | 0.123 | ECOS2VP471EA             |
| 560                                        | 35 x 40            | 2.60                         | 3.64      | 0.296                      | 0.104 | ECOS2VP561EX             |
| 470                                        | 35 x 45            | 2.40                         | 3.36      | 0.353                      | 0.123 | ECOS2VP471EA             |
| 560                                        | 35 x 45            | 2.60                         | 3.64      | 0.355                      | 0.142 | ECOS2VP561EA             |
| 680                                        | 35 x 45            | 2.96                         | 4.14      | 0.293                      | 0.117 | ECOS2VP681EX             |
| 680                                        | 35 x 50            | 2.96                         | 4.14      | 0.293                      | 0.117 | ECOS2VP681EA             |
| 820                                        | 35 x 50            | 3.55                         | 4.97      | 0.243                      | 0.097 | ECOS2VP821EX             |
| 680                                        | 40 x 40            | 2.96                         | 4.14      | 0.293                      | 0.117 | ECOS2VP681FA             |
| 1000                                       | 40 x 50            | 3.80                         | 5.32      | 0.199                      | 0.080 | ECOS2VP102FA             |
| 385 VDC Working, 435 VDC Surge             |                    |                              |           |                            |       |                          |
| 68                                         | 20 x 30            | 0.76                         | 1.06      | 2.438                      | 0.853 | ECOS2TP680AA             |
| 82                                         | 20 x 30            | 0.83                         | 1.16      | 2.022                      | 0.708 | ECOS2TP820AA             |
| 100                                        | 20 x 35            | 0.92                         | 1.29      | 1.658                      | 0.580 | ECOS2TP101AA             |
| 120                                        | 20 x 40            | 1.02                         | 1.43      | 1.382                      | 0.553 | ECOS2TP121AA             |
| 47                                         | 22 x 20            | 0.25                         | 0.35      | 4.233                      | 1.481 | ECOS2TP470BL             |
| 68                                         | 22 x 25            | 0.76                         | 1.06      | 2.438                      | 0.853 | ECOS2TP680BA             |
| 82                                         | 22 x 25            | 0.83                         | 1.16      | 2.022                      | 0.708 | ECOS2TP820BA             |
| 100                                        | 22 x 30            | 0.92                         | 1.29      | 1.658                      | 0.580 | ECOS2TP101BA             |
| 120                                        | 22 x 35            | 1.02                         | 1.43      | 1.382                      | 0.553 | ECOS2TP121BA             |
| 150                                        | 22 x 35            | 1.16                         | 1.62      | 1.105                      | 0.442 | ECOS2TP151BX             |
| 150                                        | 22 x 40            | 1.16                         | 1.62      | 1.105                      | 0.442 | ECOS2TP151BA             |
| 180                                        | 22 x 40            | 1.44                         | 2.02      | 0.921                      | 0.368 | ECOS2TP181BX             |
| 180                                        | 22 x 45            | 1.44                         | 2.02      | 0.921                      | 0.368 | ECOS2TP181BA             |
| 220                                        | 22 x 45            | 1.49                         | 2.09      | 0.829                      | 0.373 | ECOS2TP221BX             |
| 220                                        | 22 x 50            | 1.49                         | 2.09      | 0.829                      | 0.373 | ECOS2TP221BA             |
| 68                                         | 25 x 20            | 0.35                         | 0.49      | 2.926                      | 1.024 | ECOS2TP680CL             |
| 100                                        | 25 x 25            | 0.92                         | 1.29      | 1.658                      | 0.580 | ECOS2TP101CA             |
| 120                                        | 25 x 25            | 1.02                         | 1.43      | 1.382                      | 0.553 | ECOS2TP121CX             |
| 120                                        | 25 x 30            | 1.02                         | 1.43      | 1.382                      | 0.553 | ECOS2TP121CA             |
| 150                                        | 25 x 30            | 1.16                         | 1.62      | 1.105                      | 0.442 | ECOS2TP151CA             |
| 180                                        | 25 x 30            | 1.44                         | 2.02      | 0.921                      | 0.368 | ECOS2TP181CX             |
| 180                                        | 25 x 35            | 1.44                         | 2.02      | 0.921                      | 0.368 | ECOS2TP181CA             |
| 220                                        | 25 x 40            | 1.49                         | 2.09      | 0.829                      | 0.373 | ECOS2TP221CA             |
| 270                                        | 25 x 45            | 1.67                         | 2.34      | 0.675                      | 0.304 | ECOS2TP271CA             |
| 330                                        | 25 x 50            | 1.90                         | 2.66      | 0.553                      | 0.249 | ECOS2TP331CX             |
| 100                                        | 30 x 20            | 0.47                         | 0.66      | 1.989                      | 0.696 | ECOS2TP101DL             |
| 150                                        | 30 x 25            | 1.16                         | 1.62      | 1.105                      | 0.442 | ECOS2TP151DA             |
| 180                                        | 30 x 25            | 1.44                         | 2.02      | 0.921                      | 0.368 | ECOS2TP181DX             |
| 180                                        | 30 x 30            | 1.44                         | 2.02      | 0.921                      | 0.368 | ECOS2TP181DA             |
| 220                                        | 30 x 30            | 1.49                         | 2.09      | 0.829                      | 0.373 | ECOS2TP221DA             |
| 270                                        | 30 x 35            | 1.67                         | 2.34      | 0.675                      | 0.304 | ECOS2TP271DA             |
| 330                                        | 30 x 40            | 1.90                         | 2.66      | 0.553                      | 0.249 | ECOS2TP331DA             |
| 390                                        | 30 x 45            | 2.13                         | 2.98      | 0.468                      | 0.210 | ECOS2TP391DA             |
| 470                                        | 30 x 50            | 2.39                         | 3.35      | 0.388                      | 0.175 | ECOS2TP471DA             |
| 150                                        | 35 x 20            | 0.60                         | 0.84      | 1.326                      | 0.531 | ECOS2TP151EL             |
| 270                                        | 35 x 25            | 1.67                         | 2.34      | 0.675                      | 0.304 | ECOS2TP271EX             |
| 270                                        | 35 x 30            | 1.67                         | 2.34      | 0.675                      | 0.304 | ECOS2TP271EA             |
| 330                                        | 35 x 30            | 1.90                         | 2.66      | 0.553                      | 0.249 | ECOS2TP331EX             |
| 330                                        | 35 x 35            | 1.90                         | 2.66      | 0.553                      | 0.249 | ECOS2TP331EA             |
| 390                                        | 35 x 35            | 2.13                         | 2.98      | 0.468                      | 0.210 | ECOS2TP391EX             |
| 390                                        | 35 x 40            | 2.13                         | 2.98      | 0.468                      | 0.210 | ECOS2TP391EA             |
| 470                                        | 35 x 40            | 2.39                         | 3.35      | 0.388                      | 0.175 | ECOS2TP471EX             |
| 470                                        | 35 x 45            | 2.39                         | 3.35      | 0.388                      | 0.175 | ECOS2TP471EA             |
| 560                                        | 35 x 45            | 2.69                         | 3.77      | 0.326                      | 0.147 | ECOS2TP561EX             |
| 560                                        | 35 x 50            | 2.69                         | 3.77      | 0.326                      | 0.147 | ECOS2TP561EA             |
| 680                                        | 35 x 50            | 3.00                         | 4.20      | 0.268                      | 0.121 | ECOS2TP681EX             |

## TS-UP Standard Ratings (continued)

| Cap.<br>( $\mu$ F)             | Size (mm)<br>D x L | Max. 85°C R.C. ( $A_{rms}$ )<br>120Hz | Max. 85°C R.C. ( $A_{rms}$ )<br>10k-50kHz | Max. 20°C ESR ( $\Omega$ )<br>120Hz | Max. 20°C ESR ( $\Omega$ )<br>20kHz | Panasonic<br>Part Number |
|--------------------------------|--------------------|---------------------------------------|-------------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| 400 VDC Working, 450 VDC Surge |                    |                                       |                                           |                                     |                                     |                          |
| 82                             | 20 x 30            | 0.83                                  | 1.16                                      | 2.022                               | 0.708                               | ECOS2GP820AA             |
| 100                            | 20 x 35            | 0.92                                  | 1.29                                      | 1.658                               | 0.580                               | ECOS2GP101AA             |
| 120                            | 20 x 40            | 1.02                                  | 1.43                                      | 1.382                               | 0.484                               | ECOS2GP121AA             |
| 47                             | 22 x 20            | 0.25                                  | 0.35                                      | 3.527                               | 1.235                               | ECOS2GP470BL             |
| 82                             | 22 x 25            | 0.83                                  | 1.16                                      | 2.022                               | 0.708                               | ECOS2GP820BA             |
| 100                            | 22 x 30            | 0.92                                  | 1.29                                      | 1.658                               | 0.580                               | ECOS2GP101BA             |
| 120                            | 22 x 35            | 1.02                                  | 1.43                                      | 1.382                               | 0.484                               | ECOS2GP121BA             |
| 150                            | 22 x 40            | 1.16                                  | 1.62                                      | 1.105                               | 0.387                               | ECOS2GP151BA             |
| 180                            | 22 x 45            | 1.44                                  | 2.02                                      | 0.921                               | 0.322                               | ECOS2GP181BA             |
| 220                            | 22 x 50            | 1.49                                  | 2.09                                      | 0.754                               | 0.264                               | ECOS2GP221BA             |
| 68                             | 25 x 20            | 0.35                                  | 0.49                                      | 2.926                               | 1.024                               | ECOS2GP680CL             |
| 100                            | 25 x 25            | 0.92                                  | 1.29                                      | 1.658                               | 0.580                               | ECOS2GP101CA             |
| 120                            | 25 x 25            | 1.02                                  | 1.43                                      | 1.382                               | 0.484                               | ECOS2GP121CX             |
| 150                            | 25 x 30            | 1.16                                  | 1.62                                      | 1.105                               | 0.387                               | ECOS2GP151CA             |
| 180                            | 25 x 30            | 1.44                                  | 2.02                                      | 0.921                               | 0.322                               | ECOS2GP181CX             |
| 180                            | 25 x 35            | 1.44                                  | 2.02                                      | 0.921                               | 0.322                               | ECOS2GP181CA             |
| 220                            | 25 x 40            | 1.49                                  | 2.09                                      | 0.754                               | 0.264                               | ECOS2GP221CA             |
| 270                            | 25 x 45            | 1.67                                  | 2.34                                      | 0.675                               | 0.236                               | ECOS2GP271CA             |
| 100                            | 30 x 20            | 0.47                                  | 0.66                                      | 1.989                               | 0.696                               | ECOS2GP101DL             |
| 150                            | 30 x 25            | 1.16                                  | 1.62                                      | 1.105                               | 0.387                               | ECOS2GP151DA             |
| 220                            | 30 x 30            | 1.49                                  | 2.09                                      | 0.754                               | 0.264                               | ECOS2GP221DA             |
| 270                            | 30 x 35            | 1.67                                  | 2.34                                      | 0.675                               | 0.236                               | ECOS2GP271DA             |
| 330                            | 30 x 40            | 1.90                                  | 2.66                                      | 0.553                               | 0.193                               | ECOS2GP331DA             |
| 390                            | 30 x 45            | 2.13                                  | 2.98                                      | 0.468                               | 0.164                               | ECOS2GP391DA             |
| 150                            | 35 x 20            | 0.60                                  | 0.84                                      | 1.326                               | 0.464                               | ECOS2GP151EL             |
| 270                            | 35 x 30            | 1.67                                  | 2.34                                      | 0.675                               | 0.236                               | ECOS2GP271EA             |
| 330                            | 35 x 30            | 1.90                                  | 2.66                                      | 0.553                               | 0.193                               | ECOS2GP331EX             |
| 330                            | 35 x 35            | 1.90                                  | 2.66                                      | 0.553                               | 0.193                               | ECOS2GP331EA             |
| 390                            | 35 x 35            | 2.13                                  | 2.98                                      | 0.468                               | 0.164                               | ECOS2GP391EX             |
| 390                            | 35 x 40            | 2.13                                  | 2.98                                      | 0.468                               | 0.164                               | ECOS2GP391EA             |
| 470                            | 35 x 40            | 2.39                                  | 3.35                                      | 0.388                               | 0.136                               | ECOS2GP471EX             |
| 470                            | 35 x 45            | 2.39                                  | 3.35                                      | 0.388                               | 0.136                               | ECOS2GP471EA             |
| 560                            | 35 x 45            | 2.69                                  | 3.77                                      | 0.326                               | 0.114                               | ECOS2GP561EX             |
| 560                            | 35 x 50            | 2.69                                  | 3.77                                      | 0.326                               | 0.114                               | ECOS2GP561EA             |
| 680                            | 35 x 50            | 3.00                                  | 4.20                                      | 0.268                               | 0.094                               | ECOS2GP681EX             |
| 560                            | 40 x 40            | 2.69                                  | 3.77                                      | 0.326                               | 0.114                               | ECOS2GP561FA             |
| 820                            | 40 x 50            | 3.38                                  | 4.73                                      | 0.222                               | 0.078                               | ECOS2GP821FA             |
| 450 VDC Working, 500 VDC Surge |                    |                                       |                                           |                                     |                                     |                          |
| 56                             | 20 x 30            | 0.70                                  | 0.98                                      | 2.960                               | 1.184                               | ECOS2WP560AA             |
| 82                             | 20 x 35            | 0.83                                  | 1.16                                      | 2.022                               | 0.809                               | ECOS2WP820AA             |
| 33                             | 22 x 20            | 0.20                                  | 0.28                                      | 6.028                               | 2.411                               | ECOS2WP330BL             |
| 56                             | 22 x 25            | 0.70                                  | 0.98                                      | 2.960                               | 1.184                               | ECOS2WP560BA             |
| 82                             | 22 x 30            | 0.83                                  | 1.16                                      | 2.022                               | 0.809                               | ECOS2WP820BA             |
| 100                            | 22 x 35            | 0.93                                  | 1.30                                      | 1.658                               | 0.663                               | ECOS2WP101BA             |
| 120                            | 22 x 40            | 1.04                                  | 1.46                                      | 1.382                               | 0.553                               | ECOS2WP121BA             |
| 150                            | 22 x 50            | 1.19                                  | 1.67                                      | 1.105                               | 0.442                               | ECOS2WP151BA             |
| 47                             | 25 x 20            | 0.29                                  | 0.41                                      | 4.233                               | 1.693                               | ECOS2WP470CL             |
| 82                             | 25 x 25            | 0.83                                  | 1.16                                      | 2.022                               | 0.809                               | ECOS2WP820CA             |
| 120                            | 25 x 30            | 1.04                                  | 1.46                                      | 1.382                               | 0.553                               | ECOS2WP121CA             |
| 150                            | 25 x 40            | 1.19                                  | 1.67                                      | 1.105                               | 0.442                               | ECOS2WP151CA             |
| 180                            | 25 x 40            | 1.35                                  | 1.89                                      | 0.921                               | 0.368                               | ECOS2WP181CX             |
| 180                            | 25 x 45            | 1.35                                  | 1.89                                      | 0.921                               | 0.368                               | ECOS2WP181CA             |
| 220                            | 25 x 45            | 1.55                                  | 2.17                                      | 0.754                               | 0.301                               | ECOS2WP221CX             |
| 220                            | 25 x 50            | 1.55                                  | 2.17                                      | 0.754                               | 0.301                               | ECOS2WP221CA             |
| 68                             | 30 x 20            | 0.38                                  | 0.53                                      | 2.926                               | 1.170                               | ECOS2WP680DL             |
| 120                            | 30 x 25            | 1.04                                  | 1.46                                      | 1.382                               | 0.553                               | ECOS2WP121DA             |
| 150                            | 30 x 30            | 1.19                                  | 1.67                                      | 1.105                               | 0.442                               | ECOS2WP151DA             |
| 180                            | 30 x 30            | 1.35                                  | 1.89                                      | 0.921                               | 0.368                               | ECOS2WP181DX             |
| 180                            | 30 x 35            | 1.35                                  | 1.89                                      | 0.921                               | 0.368                               | ECOS2WP181DA             |
| 220                            | 30 x 35            | 1.55                                  | 2.17                                      | 0.754                               | 0.301                               | ECOS2WP221DX             |
| 220                            | 30 x 40            | 1.55                                  | 2.17                                      | 0.754                               | 0.301                               | ECOS2WP221DA             |
| 270                            | 30 x 45            | 1.78                                  | 2.49                                      | 0.675                               | 0.270                               | ECOS2WP271DA             |
| 330                            | 30 x 50            | 2.01                                  | 2.81                                      | 0.553                               | 0.249                               | ECOS2WP331DA             |
| 100                            | 35 x 20            | 0.52                                  | 0.73                                      | 1.989                               | 0.796                               | ECOS2WP101EL             |
| 180                            | 35 x 25            | 1.35                                  | 1.89                                      | 0.921                               | 0.368                               | ECOS2WP181EA             |
| 220                            | 35 x 30            | 1.55                                  | 2.17                                      | 0.754                               | 0.301                               | ECOS2WP221EA             |
| 270                            | 35 x 30            | 1.78                                  | 2.49                                      | 0.614                               | 0.246                               | ECOS2WP271EX             |
| 270                            | 35 x 35            | 1.78                                  | 2.49                                      | 0.675                               | 0.270                               | ECOS2WP271EA             |
| 330                            | 35 x 35            | 2.01                                  | 2.81                                      | 0.553                               | 0.221                               | ECOS2WP331EX             |
| 330                            | 35 x 40            | 2.01                                  | 2.81                                      | 0.553                               | 0.249                               | ECOS2WP331EA             |
| 390                            | 35 x 45            | 2.24                                  | 3.14                                      | 0.510                               | 0.255                               | ECOS2WP391EA             |
| 470                            | 35 x 45            | 2.53                                  | 3.54                                      | 0.423                               | 0.233                               | ECOS2WP471EX             |
| 470                            | 35 x 50            | 2.53                                  | 3.54                                      | 0.423                               | 0.233                               | ECOS2WP471EA             |
| 470                            | 40 x 40            | 2.53                                  | 3.54                                      | 0.423                               | 0.233                               | ECOS2WP471FA             |
| 680                            | 40 x 50            | 3.15                                  | 4.41                                      | 0.293                               | 0.161                               | ECOS2WP681FA             |
| 500 VDC Working, 550 VDC Surge |                    |                                       |                                           |                                     |                                     |                          |
| 47                             | 22 x 25            | 0.63                                  | 0.88                                      | 3.527                               | 1.411                               | ECOS2HP470BA             |
| 56                             | 22 x 30            | 0.70                                  | 0.98                                      | 2.960                               | 1.184                               | ECOS2HP560BA             |
| 68                             | 22 x 35            | 0.78                                  | 1.09                                      | 2.438                               | 0.975                               | ECOS2HP680BA             |
| 82                             | 22 x 40            | 0.88                                  | 1.23                                      | 2.022                               | 0.809                               | ECOS2HP820BA             |
| 100                            | 22 x 45            | 0.99                                  | 1.39                                      | 1.658                               | 0.663                               | ECOS2HP101BA             |
| 120                            | 22 x 50            | 1.13                                  | 1.58                                      | 1.382                               | 0.553                               | ECOS2HP121BA             |
| 68                             | 25 x 25            | 0.78                                  | 1.09                                      | 2.438                               | 0.975                               | ECOS2HP680CA             |
| 82                             | 25 x 30            | 0.88                                  | 1.23                                      | 2.022                               | 0.809                               | ECOS2HP820CA             |
| 100                            | 25 x 35            | 0.99                                  | 1.39                                      | 1.658                               | 0.663                               | ECOS2HP101CA             |
| 120                            | 25 x 40            | 1.13                                  | 1.58                                      | 1.382                               | 0.553                               | ECOS2HP121CA             |
| 150                            | 25 x 45            | 1.29                                  | 1.80                                      | 1.105                               | 0.442                               | ECOS2HP151CA             |
| 180                            | 25 x 50            | 1.38                                  | 1.93                                      | 0.921                               | 0.368                               | ECOS2HP181CA             |
| 120                            | 30 x 30            | 1.13                                  | 1.58                                      | 1.382                               | 0.553                               | ECOS2HP121DA             |
| 150                            | 30 x 35            | 1.29                                  | 1.80                                      | 1.105                               | 0.442                               | ECOS2HP151DA             |
| 180                            | 30 x 40            | 1.38                                  | 1.93                                      | 0.921                               | 0.368                               | ECOS2HP181DA             |
| 220                            | 30 x 45            | 1.50                                  | 2.10                                      | 0.754                               | 0.339                               | ECOS2HP221DA             |
| 150                            | 35 x 25            | 1.20                                  | 1.68                                      | 1.105                               | 0.442                               | ECOS2HP151EA             |
| 180                            | 35 x 30            | 1.36                                  | 1.90                                      | 0.921                               | 0.368                               | ECOS2HP181EA             |
| 220                            | 35 x 35            | 1.54                                  | 2.16                                      | 0.754                               | 0.301                               | ECOS2HP221EA             |
| 270                            | 35 x 40            | 1.76                                  | 2.46                                      | 0.614                               | 0.276                               | ECOS2HP271EA             |
| 330                            | 35 x 45            | 1.99                                  | 2.79                                      | 0.502                               | 0.251                               | ECOS2HP331EA             |
| 390                            | 35 x 50            | 2.22                                  | 3.11                                      | 0.425                               | 0.234                               | ECOS2HP391EA             |
| 330                            | 40 x 40            | 2.16                                  | 3.02                                      | 0.502                               | 0.276                               | ECOS2HP331FA             |
| 470                            | 40 x 50            | 2.70                                  | 3.78                                      | 0.353                               | 0.194                               | ECOS2HP471FA             |

- 3000 hour\* life at 105°C with high ripple current capability
- Wide range of case sizes including 20mm, low profile lengths
- **NEW:** 40mm diameter sizes through 100WV.
- Can vent construction



|                                        |                                                                                                                                |                                              |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Rated Working Voltage:                 | 10 ~ 250 VDC                                                                                                                   | 385 ~ 450 VDC                                |
| Operating Temperature:                 | -40 ~ +105°C                                                                                                                   | -25 ~ +105°C                                 |
| Nominal Capacitance:                   | 68 ~ 68000µF (±20% tolerance)                                                                                                  | 33 ~ 470µF (±20% tolerance)                  |
| Dissipation Factor:<br>(120 Hz, +20°C) | Working Voltage [V]:                                                                                                           | 10   16   25   35   50   63   80   100 - 450 |
|                                        | Max. D.F. (%):                                                                                                                 | 55   45   35   30   25   20   17   15        |
|                                        | For capacitance values > 33000µF, add the value of: $\frac{(\text{rated cap. } \mu\text{F}) - 33000}{1000}$                    |                                              |
| Endurance:                             | 3000 hours* at +105°C with maximum specified ripple current (see page 4)<br>*2000 hours for 20mm diameter or 20mm length sizes |                                              |

The diagram illustrates the layout of a PCB terminal. It includes a top row of labels: **Common Code/ Terminal Type** (with codes E, C, and two empty boxes), **Voltage Code** (with two empty boxes), **Series** (with code A and an empty box), **Capacitance Code** (with three empty boxes), **Case Diameter** (with one empty box), and **Top Vinyl Plate** (with one empty box). Below these labels are two tables. The first table, connected to the Common Code/ Terminal Type label, lists ECOS (6.3mm Length Terminal (Standard)) and ECEC (4mm Length "Short" Terminal), with a note (See page 7). The second table, connected to the Case Diameter label, lists case diameters: A (20mm), B (22mm), C (25mm), D (30mm), E (35mm), and F (40mm). To the right of the Case Diameter table is a table for the Top Vinyl Plate, showing options A (With Plate) and B (Without plate) for 25 ~ 50mm lengths, and options L (With Plate) and G (Without plate) for 20mm length.

| Common Code/<br>Terminal Type | Voltage<br>Code | Series | Capacitance<br>Code | Case<br>Diameter | Top Vinyl Plate   |
|-------------------------------|-----------------|--------|---------------------|------------------|-------------------|
| ECOS                          |                 | A      |                     |                  | 25 ~ 50mm lengths |
| ECEC                          |                 |        |                     |                  | A With Plate      |
|                               |                 |        |                     |                  | B Without plate   |
|                               |                 |        |                     |                  | 20mm length       |
|                               |                 |        |                     |                  | L With Plate      |
|                               |                 |        |                     |                  | G Without plate   |

| Cap.<br>( $\mu$ F)           | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ )<br>120Hz | 20°C ESR ( $\Omega$ , max.)<br>10k-50kHz | 20°C ESR ( $\Omega$ , max.)<br>120Hz | 20°C ESR ( $\Omega$ , max.)<br>20kHz | Panasonic<br>Part Number |
|------------------------------|--------------------|---------------------------------------|------------------------------------------|--------------------------------------|--------------------------------------|--------------------------|
| 10 VDC Working, 13 VDC Surge |                    |                                       |                                          |                                      |                                      |                          |
| 6800                         | 20 x 25            | 1.30                                  | 1.50                                     | 0.110                                | 0.093                                | ECOS1AA682AA             |
| 8200                         | 20 x 30            | 1.60                                  | 1.84                                     | 0.091                                | 0.077                                | ECOS1AA822AA             |
| 10000                        | 20 x 30            | 1.80                                  | 2.07                                     | 0.075                                | 0.063                                | ECOS1AA103AA             |
| 12000                        | 20 x 35            | 2.20                                  | 2.53                                     | 0.062                                | 0.053                                | ECOS1AA123AA             |
| 15000                        | 20 x 40            | 2.30                                  | 2.65                                     | 0.053                                | 0.045                                | ECOS1AA153AA             |
| 10000                        | 22 x 25            | 1.80                                  | 2.07                                     | 0.075                                | 0.063                                | ECOS1AA103BA             |
| 12000                        | 22 x 30            | 2.20                                  | 2.53                                     | 0.062                                | 0.053                                | ECOS1AA123BA             |
| 15000                        | 22 x 35            | 2.30                                  | 2.65                                     | 0.053                                | 0.045                                | ECOS1AA153BA             |
| 18000                        | 22 x 40            | 2.40                                  | 2.76                                     | 0.044                                | 0.038                                | ECOS1AA183BA             |
| 22000                        | 22 x 45            | 2.60                                  | 2.99                                     | 0.038                                | 0.032                                | ECOS1AA223BA             |
| 27000                        | 22 x 50            | 3.10                                  | 3.57                                     | 0.033                                | 0.028                                | ECOS1AA273BA             |
| 15000                        | 25 x 25            | 2.30                                  | 2.65                                     | 0.053                                | 0.045                                | ECOS1AA153CA             |
| 18000                        | 25 x 30            | 2.40                                  | 2.76                                     | 0.044                                | 0.038                                | ECOS1AA183CA             |
| 22000                        | 25 x 35            | 2.60                                  | 2.99                                     | 0.038                                | 0.032                                | ECOS1AA223CA             |
| 27000                        | 25 x 40            | 3.10                                  | 3.57                                     | 0.033                                | 0.028                                | ECOS1AA273CA             |
| 33000                        | 25 x 45            | 3.40                                  | 3.91                                     | 0.027                                | 0.023                                | ECOS1AA333CA             |
| 39000                        | 25 x 50            | 3.70                                  | 4.26                                     | 0.025                                | 0.021                                | ECOS1AA393CA             |
| 22000                        | 30 x 25            | 2.60                                  | 2.99                                     | 0.038                                | 0.032                                | ECOS1AA223DA             |
| 27000                        | 30 x 30            | 3.10                                  | 3.57                                     | 0.033                                | 0.028                                | ECOS1AA273DA             |
| 33000                        | 30 x 35            | 3.40                                  | 3.91                                     | 0.027                                | 0.023                                | ECOS1AA333DA             |
| 39000                        | 30 x 40            | 3.70                                  | 4.26                                     | 0.025                                | 0.021                                | ECOS1AA393DA             |
| 47000                        | 30 x 45            | 4.20                                  | 4.83                                     | 0.023                                | 0.020                                | ECOS1AA473DA             |
| 56000                        | 30 x 50            | 5.00                                  | 5.75                                     | 0.022                                | 0.019                                | ECOS1AA563DA             |
| 27000                        | 35 x 25            | 3.10                                  | 3.57                                     | 0.033                                | 0.028                                | ECOS1AA273EA             |
| 33000                        | 35 x 30            | 3.40                                  | 3.91                                     | 0.027                                | 0.023                                | ECOS1AA333EA             |
| 39000                        | 35 x 30            | 3.70                                  | 4.26                                     | 0.025                                | 0.021                                | ECOS1AA393EA             |
| 47000                        | 35 x 35            | 4.20                                  | 4.83                                     | 0.023                                | 0.020                                | ECOS1AA473EA             |
| 56000                        | 35 x 40            | 5.00                                  | 5.75                                     | 0.022                                | 0.021                                | ECOS1AA563EA             |
| 68000                        | 35 x 50            | 5.50                                  | 6.33                                     | 0.021                                | 0.020                                | ECOS1AA683EA             |
| 62000                        | 40 x 40            | 5.42                                  | 6.23                                     | 0.023                                | 0.022                                | ECOS1AA623FA             |
| 82000                        | 40 x 50            | 7.36                                  | 8.46                                     | 0.018                                | 0.017                                | ECOS1AA823FA             |

| Cap.<br>( $\mu$ F)           | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ )<br>120Hz | 20°C ESR ( $\Omega$ , max.)<br>10k-50kHz | 20°C ESR ( $\Omega$ , max.)<br>120Hz | 20°C ESR ( $\Omega$ , max.)<br>20kHz | Panasonic<br>Part Number |
|------------------------------|--------------------|---------------------------------------|------------------------------------------|--------------------------------------|--------------------------------------|--------------------------|
| 16 VDC Working, 20 VDC Surge |                    |                                       |                                          |                                      |                                      |                          |
| 6800                         | 20 x 30            | 2.20                                  | 2.53                                     | 0.085                                | 0.068                                | ECOS1CA682AA             |
| 8200                         | 20 x 35            | 2.40                                  | 2.76                                     | 0.071                                | 0.057                                | ECOS1CA822AA             |
| 10000                        | 20 x 40            | 2.60                                  | 2.99                                     | 0.066                                | 0.053                                | ECOS1CA103AA             |
| 3300                         | 22 x 20            | 1.30                                  | 1.50                                     | 0.216                                | 0.173                                | ECOS1CA332BL             |
| 6800                         | 22 x 25            | 2.20                                  | 2.53                                     | 0.085                                | 0.068                                | ECOS1CA682BA             |
| 8200                         | 22 x 30            | 2.40                                  | 2.76                                     | 0.071                                | 0.057                                | ECOS1CA822BA             |
| 10000                        | 22 x 30            | 2.60                                  | 2.99                                     | 0.066                                | 0.053                                | ECOS1CA103BA             |
| 12000                        | 22 x 35            | 2.90                                  | 3.34                                     | 0.055                                | 0.044                                | ECOS1CA123BA             |
| 15000                        | 22 x 40            | 3.20                                  | 3.68                                     | 0.046                                | 0.037                                | ECOS1CA153BA             |
| 18000                        | 22 x 45            | 3.50                                  | 4.03                                     | 0.040                                | 0.034                                | ECOS1CA183BA             |
| 4700                         | 25 x 20            | 1.60                                  | 1.84                                     | 0.152                                | 0.121                                | ECOS1CA472CL             |
| 10000                        | 25 x 25            | 2.60                                  | 2.99                                     | 0.066                                | 0.053                                | ECOS1CA103CA             |
| 12000                        | 25 x 30            | 2.90                                  | 3.34                                     | 0.055                                | 0.044                                | ECOS1CA123CA             |
| 15000                        | 25 x 35            | 3.20                                  | 3.68                                     | 0.046                                | 0.037                                | ECOS1CA153CA             |
| 18000                        | 25 x 40            | 3.50                                  | 4.03                                     | 0.040                                | 0.034                                | ECOS1CA183CA             |
| 22000                        | 25 x 45            | 3.80                                  | 4.37                                     | 0.033                                | 0.028                                | ECOS1CA223CA             |
| 27000                        | 25 x 50            | 4.20                                  | 4.83                                     | 0.028                                | 0.025</                              |                          |

## TS-HA Standard Ratings (continued)

| Cap.<br>(μF)                 | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> )<br>120Hz | 20°C ESR (Ω, max.)<br>10k-50kHz | 20°C ESR (Ω, max.)<br>120Hz | 20kHz | Panasonic<br>Part Number |
|------------------------------|--------------------|---------------------------------------------|---------------------------------|-----------------------------|-------|--------------------------|
| 25 VDC Working, 32 VDC Surge |                    |                                             |                                 |                             |       |                          |
| 4700                         | 20 x 30            | 2.00                                        | 2.30                            | 0.106                       | 0.079 | ECOS1EA472AA             |
| 5600                         | 20 x 35            | 2.20                                        | 2.53                            | 0.089                       | 0.067 | ECOS1EA562AA             |
| 6800                         | 20 x 40            | 2.40                                        | 2.76                            | 0.073                       | 0.055 | ECOS1EA682AA             |
| 2200                         | 22 x 20            | 1.30                                        | 1.50                            | 0.241                       | 0.181 | ECOS1EA222BL             |
| 4700                         | 22 x 25            | 2.00                                        | 2.30                            | 0.106                       | 0.079 | ECOS1EA472BA             |
| 5600                         | 22 x 30            | 2.20                                        | 2.53                            | 0.089                       | 0.067 | ECOS1EA562BA             |
| 6800                         | 22 x 30            | 2.40                                        | 2.76                            | 0.073                       | 0.055 | ECOS1EA682BA             |
| 8200                         | 22 x 35            | 2.70                                        | 3.11                            | 0.061                       | 0.045 | ECOS1EA822BA             |
| 10000                        | 22 x 40            | 3.00                                        | 3.45                            | 0.051                       | 0.039 | ECOS1EA103BA             |
| 12000                        | 22 x 45            | 3.20                                        | 3.68                            | 0.044                       | 0.033 | ECOS1EA123BA             |
| 3300                         | 25 x 20            | 1.60                                        | 1.84                            | 0.161                       | 0.121 | ECOS1EA332CL             |
| 6800                         | 25 x 25            | 2.40                                        | 2.76                            | 0.073                       | 0.055 | ECOS1EA682CA             |
| 8200                         | 25 x 30            | 2.70                                        | 3.11                            | 0.061                       | 0.045 | ECOS1EA822CA             |
| 10000                        | 25 x 35            | 3.00                                        | 3.45                            | 0.051                       | 0.039 | ECOS1EA103CA             |
| 12000                        | 25 x 40            | 3.20                                        | 3.68                            | 0.044                       | 0.035 | ECOS1EA123CA             |
| 15000                        | 25 x 45            | 3.60                                        | 4.14                            | 0.036                       | 0.031 | ECOS1EA153CA             |
| 18000                        | 25 x 50            | 3.90                                        | 4.49                            | 0.030                       | 0.027 | ECOS1EA183CA             |
| 4700                         | 30 x 20            | 1.80                                        | 2.07                            | 0.113                       | 0.085 | ECOS1EA472DL             |
| 8200                         | 30 x 25            | 2.70                                        | 3.11                            | 0.061                       | 0.045 | ECOS1EA822DA             |
| 10000                        | 30 x 30            | 3.00                                        | 3.45                            | 0.051                       | 0.039 | ECOS1EA103DA             |
| 12000                        | 30 x 30            | 3.20                                        | 3.68                            | 0.044                       | 0.035 | ECOS1EA123DA             |
| 15000                        | 30 x 35            | 3.60                                        | 4.14                            | 0.036                       | 0.031 | ECOS1EA153DA             |
| 18000                        | 30 x 40            | 3.90                                        | 4.49                            | 0.030                       | 0.027 | ECOS1EA183DA             |
| 22000                        | 30 x 45            | 4.30                                        | 4.95                            | 0.025                       | 0.022 | ECOS1EA223DA             |
| 6800                         | 35 x 20            | 2.30                                        | 2.65                            | 0.080                       | 0.060 | ECOS1EA682EL             |
| 12000                        | 35 x 25            | 3.20                                        | 3.68                            | 0.044                       | 0.035 | ECOS1EA123EA             |
| 15000                        | 35 x 30            | 3.60                                        | 4.14                            | 0.036                       | 0.031 | ECOS1EA153EA             |
| 18000                        | 35 x 35            | 3.90                                        | 4.49                            | 0.030                       | 0.027 | ECOS1EA183EA             |
| 22000                        | 35 x 35            | 4.30                                        | 4.95                            | 0.025                       | 0.022 | ECOS1EA223EA             |
| 27000                        | 35 x 45            | 4.80                                        | 5.52                            | 0.021                       | 0.019 | ECOS1EA273EA             |
| 33000                        | 35 x 50            | 5.50                                        | 6.33                            | 0.018                       | 0.016 | ECOS1EA333EA             |
| 33000                        | 40 x 40            | 5.50                                        | 6.33                            | 0.018                       | 0.016 | ECOS1EA333FA             |
| 47000                        | 40 x 50            | 6.47                                        | 7.44                            | 0.015                       | 0.014 | ECOS1EA473FA             |
| 50 VDC Working, 63 VDC Surge |                    |                                             |                                 |                             |       |                          |
| 1800                         | 20 x 30            | 1.50                                        | 1.73                            | 0.129                       | 0.097 | ECOS1HA182AA             |
| 2200                         | 20 x 35            | 1.70                                        | 1.96                            | 0.105                       | 0.079 | ECOS1HA222AA             |
| 2700                         | 20 x 40            | 1.80                                        | 2.07                            | 0.086                       | 0.064 | ECOS1HA272AA             |
| 1000                         | 22 x 20            | 0.90                                        | 1.04                            | 0.265                       | 0.199 | ECOS1HA102BL             |
| 1800                         | 22 x 25            | 1.50                                        | 1.73                            | 0.129                       | 0.097 | ECOS1HA182BA             |
| 2200                         | 22 x 30            | 1.70                                        | 1.96                            | 0.105                       | 0.079 | ECOS1HA222BA             |
| 2700                         | 22 x 30            | 1.80                                        | 2.07                            | 0.086                       | 0.064 | ECOS1HA272BA             |
| 3300                         | 22 x 35            | 2.00                                        | 2.30                            | 0.070                       | 0.053 | ECOS1HA332BA             |
| 3900                         | 22 x 40            | 2.20                                        | 2.53                            | 0.064                       | 0.048 | ECOS1HA392BA             |
| 4700                         | 22 x 45            | 2.50                                        | 2.88                            | 0.053                       | 0.040 | ECOS1HA472BA             |
| 5600                         | 22 x 50            | 2.80                                        | 3.22                            | 0.050                       | 0.038 | ECOS1HA562BA             |
| 1500                         | 25 x 20            | 1.20                                        | 1.38                            | 0.177                       | 0.133 | ECOS1HA152CL             |
| 2700                         | 25 x 25            | 1.80                                        | 2.07                            | 0.086                       | 0.064 | ECOS1HA272CA             |
| 3300                         | 25 x 30            | 2.00                                        | 2.30                            | 0.070                       | 0.053 | ECOS1HA332CA             |
| 3900                         | 25 x 35            | 2.20                                        | 2.53                            | 0.064                       | 0.048 | ECOS1HA392CA             |
| 4700                         | 25 x 40            | 2.50                                        | 2.88                            | 0.053                       | 0.040 | ECOS1HA472CA             |
| 5600                         | 25 x 40            | 2.80                                        | 3.22                            | 0.050                       | 0.038 | ECOS1HA562CA             |
| 6800                         | 25 x 50            | 3.30                                        | 3.80                            | 0.046                       | 0.035 | ECOS1HA682CA             |
| 2200                         | 30 x 20            | 1.40                                        | 1.61                            | 0.121                       | 0.090 | ECOS1HA222DL             |
| 3900                         | 30 x 25            | 2.20                                        | 2.53                            | 0.064                       | 0.048 | ECOS1HA392DA             |
| 4700                         | 30 x 30            | 2.50                                        | 2.88                            | 0.053                       | 0.040 | ECOS1HA472DA             |
| 5600                         | 30 x 35            | 2.80                                        | 3.22                            | 0.050                       | 0.038 | ECOS1HA562DA             |
| 6800                         | 30 x 40            | 3.30                                        | 3.80                            | 0.046                       | 0.035 | ECOS1HA682DA             |
| 8200                         | 30 x 45            | 3.60                                        | 4.14                            | 0.038                       | 0.029 | ECOS1HA822DA             |
| 10000                        | 30 x 50            | 4.00                                        | 4.60                            | 0.033                       | 0.025 | ECOS1HA103DA             |
| 3300                         | 35 x 20            | 1.70                                        | 1.96                            | 0.085                       | 0.064 | ECOS1HA332EL             |
| 4700                         | 35 x 25            | 2.50                                        | 2.88                            | 0.053                       | 0.040 | ECOS1HA472EA             |
| 5600                         | 35 x 30            | 2.80                                        | 3.22                            | 0.050                       | 0.038 | ECOS1HA562EA             |
| 6800                         | 35 x 30            | 3.30                                        | 3.80                            | 0.046                       | 0.035 | ECOS1HA682EA             |
| 8200                         | 35 x 35            | 3.60                                        | 4.14                            | 0.038                       | 0.029 | ECOS1HA822EA             |
| 10000                        | 35 x 40            | 4.00                                        | 4.60                            | 0.033                       | 0.025 | ECOS1HA103EA             |
| 12000                        | 35 x 45            | 4.50                                        | 5.18                            | 0.028                       | 0.022 | ECOS1HA123EA             |
| 15000                        | 35 x 50            | 4.80                                        | 5.52                            | 0.022                       | 0.018 | ECOS1HA153EA             |
| 15000                        | 40 x 40            | 4.80                                        | 5.52                            | 0.022                       | 0.018 | ECOS1HA153FA             |
| 22000                        | 40 x 50            | 5.15                                        | 5.92                            | 0.016                       | 0.013 | ECOS1HA223FA             |
| 35 VDC Working, 44 VDC Surge |                    |                                             |                                 |                             |       |                          |
| 3300                         | 20 x 30            | 1.90                                        | 2.19                            | 0.121                       | 0.090 | ECOS1VA332AA             |
| 3900                         | 20 x 35            | 2.00                                        | 2.30                            | 0.111                       | 0.083 | ECOS1VA392AA             |
| 4700                         | 20 x 40            | 2.20                                        | 2.53                            | 0.088                       | 0.066 | ECOS1VA472AA             |
| 1500                         | 22 x 20            | 1.10                                        | 1.27                            | 0.287                       | 0.216 | ECOS1VA152BL             |
| 3300                         | 22 x 25            | 1.90                                        | 2.19                            | 0.121                       | 0.090 | ECOS1VA332BA             |
| 3900                         | 22 x 30            | 2.00                                        | 2.30                            | 0.111                       | 0.083 | ECOS1VA392BA             |
| 4700                         | 22 x 35            | 2.20                                        | 2.53                            | 0.088                       | 0.066 | ECOS1VA472BA             |
| 5600                         | 22 x 35            | 2.40                                        | 2.76                            | 0.074                       | 0.056 | ECOS1VA562BA             |
| 6800                         | 22 x 40            | 2.60                                        | 2.99                            | 0.061                       | 0.046 | ECOS1VA682BA             |
| 8200                         | 22 x 50            | 2.90                                        | 3.34                            | 0.051                       | 0.038 | ECOS1VA822BA             |
| 2200                         | 25 x 20            | 1.40                                        | 1.61                            | 0.196                       | 0.147 | ECOS1VA222CL             |
| 4700                         | 25 x 25            | 2.20                                        | 2.53                            | 0.088                       | 0.066 | ECOS1VA472CA             |
| 5600                         | 25 x 30            | 2.40                                        | 2.76                            | 0.074                       | 0.056 | ECOS1VA562CA             |
| 6800                         | 25 x 35            | 2.60                                        | 2.99                            | 0.061                       | 0.046 | ECOS1VA682CA             |
| 8200                         | 25 x 40            | 2.90                                        | 3.34                            | 0.051                       | 0.038 | ECOS1VA822CA             |
| 10000                        | 25 x 45            | 3.20                                        | 3.68                            | 0.041                       | 0.031 | ECOS1VA103CA             |
| 12000                        | 25 x 50            | 3.50                                        | 4.03                            | 0.035                       | 0.026 | ECOS1VA123CA             |
| 3300                         | 30 x 20            | 1.70                                        | 1.96                            | 0.131                       | 0.098 | ECOS1VA332DL             |
| 5600                         | 30 x 25            | 2.40                                        | 2.76                            | 0.074                       | 0.056 | ECOS1VA562DA             |
| 6800                         | 30 x 30            | 2.60                                        | 2.99                            | 0.061                       | 0.046 | ECOS1VA682DA             |
| 8200                         | 30 x 30            | 2.90                                        | 3.34                            | 0.051                       | 0.038 | ECOS1VA822DA             |
| 10000                        | 30 x 35            | 3.20                                        | 3.68                            | 0.041                       | 0.031 | ECOS1VA103DA             |
| 12000                        | 30 x 40            | 3.50                                        | 4.03                            | 0.035                       | 0.026 | ECOS1VA123DA             |
| 15000                        | 30 x 45            | 3.90                                        | 4.49                            | 0.030                       | 0.022 | ECOS1VA153DA             |
| 4700                         | 35 x 20            | 2.00                                        | 2.30                            | 0.095                       | 0.071 | ECOS1VA472EL             |
| 8200                         | 35 x 25            | 2.90                                        | 3.34                            | 0.051                       | 0.038 | ECOS1VA822EA             |
| 10000                        | 35 x 30            | 3.20                                        | 3.68                            | 0.041                       | 0.031 | ECOS1VA103EA             |
| 12000                        | 35 x 30            | 3.50                                        | 4.03                            | 0.035                       | 0.026 | ECOS1VA123EA             |
| 15000                        | 35 x 35            | 3.90                                        | 4.49                            | 0.030                       | 0.022 | ECOS1VA153EA             |
| 18000                        | 35 x 40            | 4.30                                        | 4.95                            | 0.028                       | 0.021 | ECOS1VA183EA             |
| 22000                        | 35 x 50            | 5.00                                        | 5.75                            | 0.023                       | 0.017 | ECOS1VA223EA             |
| 22000                        | 40 x 40            | 5.00                                        | 5.75                            | 0.023                       | 0.017 | ECOS1VA223FA             |
| 27000                        | 40 x 50            | 5.44                                        | 6.26                            | 0.020                       | 0.015 | ECOS1VA273FA             |
| 63 VDC Working, 79 VDC Surge |                    |                                             |                                 |                             |       |                          |
| 1200                         | 20 x 30            | 1.40                                        | 1.61                            | 0.235                       | 0.176 | ECOS1JA122AA             |
| 1500                         | 20 x 35            | 1.50                                        | 1.73                            | 0.188                       | 0.141 | ECOS1JA152AA             |
| 1800                         | 20 x 40            | 1.70                                        | 1.96                            | 0.157                       | 0.117 | ECOS1JA182AA             |
| 680                          | 22 x 20            | 0.90                                        | 1.04                            | 0.463                       | 0.347 | ECOS1JA681BL             |
| 1200                         | 22 x 25            | 1.40                                        | 1.61                            | 0.235                       | 0.176 | ECOS1JA122BA             |
| 1500                         | 22 x 30            | 1.50                                        | 1.73                            | 0.188                       | 0.141 | ECOS1JA152BA             |
| 1800                         | 22 x 30            | 1.70                                        | 1.96                            | 0.157                       | 0.117 | ECOS1JA182BA             |
| 2200                         | 22 x 35            | 2.00                                        | 2.30                            | 0.128                       | 0.096 | ECOS1JA222BA             |
| 2700                         | 22 x 40            | 2.20                                        | 2.53                            | 0.104                       | 0.078 | ECOS1JA272BA             |
| 3300                         | 22 x 50            | 2.50                                        | 2.88                            | 0.090                       | 0.068 | ECOS1JA332BA             |
| 1000                         | 25 x 20            | 1.20                                        | 1.38                            | 0.315                       | 0.236 | ECOS1JA102CL             |
| 1800                         | 25 x 25            | 1.70                                        | 1.96                            | 0.157                       | 0.117 | ECOS1JA182CA             |
| 2200                         | 25 x 30            | 2.00                                        | 2.30                            | 0.128                       | 0.096 | ECOS1JA222CA             |
| 2700                         | 25 x 35            | 2.20                                        | 2.53                            | 0.104                       | 0.078 | ECOS1JA272CA             |
| 3300                         | 25 x 40            | 2.50                                        | 2.88                            | 0.090                       | 0.068 | ECOS1JA332CA             |
| 3900                         | 25 x 45            | 2.70                                        | 3.11                            | 0.077                       | 0.057 | ECOS1JA392CA             |
| 4700                         | 25 x 50            | 3.00                                        | 3.45                            | 0.063                       | 0.048 | ECOS1JA472CA             |
| 1500                         | 30 x 20            | 1.30                                        | 1.50                            | 0.210                       | 0.157 | ECOS1JA152DL             |
| 2700                         | 30 x 25            | 2.20                                        | 2.53                            | 0.104                       | 0.078 | ECOS1JA272DA             |
| 3300                         | 30 x 30            | 2.50                                        | 2.88                            | 0.090                       | 0.068 | ECOS1JA332DA             |
| 3900                         | 30 x 35            | 2.70                                        | 3.11                            | 0.077                       | 0.057 | ECOS1JA392DA             |
| 4700                         | 30 x 40            | 3.00                                        | 3.45                            | 0.063                       | 0.048 | ECOS1JA472DA             |
| 5600                         | 30 x 45            | 3.30                                        | 3.80                            | 0.053                       | 0.040 | ECOS1JA562DA             |
| 6800                         | 30 x 50            | 3.60                                        | 4.14                            | 0.049                       | 0.037 | ECOS1JA682DA             |
| 2200                         | 35 x 20            | 1.50                                        | 1.73                            | 0.143                       | 0.107 | ECOS1JA222EL             |
| 3300                         | 35 x 25            | 2.50                                        | 2.88                            | 0.090                       | 0.068 | ECOS1JA332EA             |
| 3900                         | 35 x 30            | 2.70                                        | 3.11                            | 0.077                       | 0.057 | ECOS1JA392EA             |
| 4700                         | 35 x 30            | 3.00                                        | 3.45                            | 0.063                       | 0.048 | ECOS1JA472EA             |
| 5600                         | 35 x 35            | 3.30                                        | 3.80                            | 0.053                       | 0.040 | ECOS1JA562EA             |
| 6800                         | 35 x 40            | 3.60                                        | 4.14                            | 0.049                       | 0.037 | ECOS1JA682EA             |
| 8200                         | 35 x 45            | 3.90                                        | 4.49                            | 0.040                       | 0.030 | ECOS1JA822EA             |
| 10000                        | 35 x 50            | 4.40                                        | 5.06                            | 0.033                       | 0.028 | ECOS1JA103EA             |
| 12000                        | 40 x 40            | 4.52                                        | 5.20                            | 0.030                       | 0.026 | ECOS1JA123FA             |
| 15000                        | 40 x 50            | 4.80                                        | 5.52                            | 0.027                       | 0.023 | ECOS1JA153FA             |

## TS-HA Standard Ratings (continued)

| Cap.<br>( $\mu$ F)             | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ )<br>120Hz | 20°C ESR ( $\Omega$ , max.)<br>10k-50kHz | 20°C ESR ( $\Omega$ , max.)<br>120Hz | 20°C ESR ( $\Omega$ , max.)<br>20kHz | Panasonic<br>Part Number |
|--------------------------------|--------------------|---------------------------------------|------------------------------------------|--------------------------------------|--------------------------------------|--------------------------|
| 80 VDC Working, 100 VDC Surge  |                    |                                       |                                          |                                      |                                      |                          |
| 820                            | 20 x 30            | 1.20                                  | 1.38                                     | 0.222                                | 0.145                                | ECOS1KA821AA             |
| 1000                           | 20 x 35            | 1.30                                  | 1.50                                     | 0.182                                | 0.119                                | ECOS1KA102AA             |
| 1200                           | 20 x 40            | 1.50                                  | 1.73                                     | 0.166                                | 0.116                                | ECOS1KA122AA             |
| 470                            | 22 x 20            | 0.80                                  | 0.92                                     | 0.459                                | 0.298                                | ECOS1KA471BL             |
| 820                            | 22 x 25            | 1.20                                  | 1.38                                     | 0.222                                | 0.145                                | ECOS1KA821BA             |
| 1000                           | 22 x 30            | 1.30                                  | 1.50                                     | 0.182                                | 0.119                                | ECOS1KA102BA             |
| 1200                           | 22 x 30            | 1.50                                  | 1.73                                     | 0.166                                | 0.116                                | ECOS1KA122BA             |
| 1500                           | 22 x 35            | 1.70                                  | 1.96                                     | 0.133                                | 0.093                                | ECOS1KA152BA             |
| 1800                           | 22 x 40            | 1.80                                  | 2.07                                     | 0.111                                | 0.077                                | ECOS1KA182BA             |
| 2200                           | 22 x 45            | 2.10                                  | 2.42                                     | 0.090                                | 0.063                                | ECOS1KA222BA             |
| 680                            | 25 x 20            | 1.00                                  | 1.15                                     | 0.317                                | 0.206                                | ECOS1KA681CL             |
| 1000                           | 25 x 25            | 1.30                                  | 1.50                                     | 0.182                                | 0.119                                | ECOS1KA102CA             |
| 1200                           | 25 x 25            | 1.50                                  | 1.73                                     | 0.166                                | 0.116                                | ECOS1KA122CA             |
| 1500                           | 25 x 30            | 1.70                                  | 1.96                                     | 0.133                                | 0.093                                | ECOS1KA152CA             |
| 1800                           | 25 x 35            | 1.80                                  | 2.07                                     | 0.111                                | 0.077                                | ECOS1KA182CA             |
| 2200                           | 25 x 35            | 2.10                                  | 2.42                                     | 0.090                                | 0.063                                | ECOS1KA222CA             |
| 2700                           | 25 x 45            | 2.40                                  | 2.76                                     | 0.074                                | 0.055                                | ECOS1KA272CA             |
| 3300                           | 25 x 50            | 2.60                                  | 2.99                                     | 0.065                                | 0.049                                | ECOS1KA332CA             |
| 1000                           | 30 x 20            | 1.20                                  | 1.38                                     | 0.216                                | 0.140                                | ECOS1KA102DL             |
| 1800                           | 30 x 25            | 1.80                                  | 2.07                                     | 0.111                                | 0.077                                | ECOS1KA182DA             |
| 2200                           | 30 x 30            | 2.10                                  | 2.42                                     | 0.090                                | 0.063                                | ECOS1KA222DA             |
| 2700                           | 30 x 35            | 2.40                                  | 2.76                                     | 0.074                                | 0.055                                | ECOS1KA272DA             |
| 3300                           | 30 x 40            | 2.60                                  | 2.99                                     | 0.065                                | 0.049                                | ECOS1KA332DA             |
| 3900                           | 30 x 45            | 3.00                                  | 3.45                                     | 0.060                                | 0.045                                | ECOS1KA392DA             |
| 4700                           | 30 x 50            | 3.30                                  | 3.80                                     | 0.049                                | 0.037                                | ECOS1KA472DA             |
| 1500                           | 35 x 20            | 1.40                                  | 1.61                                     | 0.155                                | 0.108                                | ECOS1KA152EL             |
| 2200                           | 35 x 25            | 2.10                                  | 2.42                                     | 0.090                                | 0.063                                | ECOS1KA222EA             |
| 2700                           | 35 x 30            | 2.40                                  | 2.76                                     | 0.074                                | 0.055                                | ECOS1KA272EA             |
| 3300                           | 35 x 30            | 2.60                                  | 2.99                                     | 0.065                                | 0.049                                | ECOS1KA332EA             |
| 3900                           | 35 x 35            | 3.00                                  | 3.45                                     | 0.060                                | 0.045                                | ECOS1KA392EA             |
| 4700                           | 35 x 40            | 3.30                                  | 3.80                                     | 0.049                                | 0.037                                | ECOS1KA472EA             |
| 5600                           | 35 x 45            | 3.70                                  | 4.26                                     | 0.050                                | 0.038                                | ECOS1KA562EA             |
| 6800                           | 35 x 50            | 3.90                                  | 4.49                                     | 0.041                                | 0.031                                | ECOS1KA682EA             |
| 6800                           | 40 x 40            | 3.90                                  | 4.49                                     | 0.041                                | 0.031                                | ECOS1KA682FA             |
| 8200                           | 40 x 50            | 4.29                                  | 4.93                                     | 0.036                                | 0.027                                | ECOS1KA822FA             |
| 100 VDC Working, 125 VDC Surge |                    |                                       |                                          |                                      |                                      |                          |
| 560                            | 20 x 30            | 1.10                                  | 1.65                                     | 0.296                                | 0.178                                | ECOS2AA561AA             |
| 820                            | 20 x 35            | 1.40                                  | 2.10                                     | 0.202                                | 0.121                                | ECOS2AA821AA             |
| 1000                           | 20 x 40            | 1.70                                  | 2.55                                     | 0.182                                | 0.109                                | ECOS2AA102AA             |
| 330                            | 22 x 20            | 0.80                                  | 1.20                                     | 0.653                                | 0.392                                | ECOS2AA331BL             |
| 560                            | 22 x 25            | 1.10                                  | 1.65                                     | 0.296                                | 0.178                                | ECOS2AA561BA             |
| 820                            | 22 x 30            | 1.40                                  | 2.10                                     | 0.202                                | 0.121                                | ECOS2AA821BA             |
| 1000                           | 22 x 35            | 1.70                                  | 2.55                                     | 0.182                                | 0.109                                | ECOS2AA102BA             |
| 1200                           | 22 x 40            | 1.80                                  | 2.70                                     | 0.152                                | 0.091                                | ECOS2AA122BA             |
| 1500                           | 22 x 45            | 2.10                                  | 3.15                                     | 0.122                                | 0.073                                | ECOS2AA152BA             |
| 470                            | 25 x 20            | 1.00                                  | 1.50                                     | 0.459                                | 0.275                                | ECOS2AA471CL             |
| 820                            | 25 x 25            | 1.40                                  | 2.10                                     | 0.202                                | 0.121                                | ECOS2AA821CA             |
| 1000                           | 25 x 30            | 1.70                                  | 2.55                                     | 0.182                                | 0.109                                | ECOS2AA102CA             |
| 1200                           | 25 x 35            | 1.80                                  | 2.70                                     | 0.152                                | 0.091                                | ECOS2AA122CA             |
| 1500                           | 25 x 40            | 2.10                                  | 3.15                                     | 0.122                                | 0.079                                | ECOS2AA152CA             |
| 1800                           | 25 x 45            | 2.30                                  | 3.45                                     | 0.111                                | 0.072                                | ECOS2AA182CA             |
| 2200                           | 25 x 50            | 2.60                                  | 3.90                                     | 0.090                                | 0.059                                | ECOS2AA222CA             |
| 680                            | 30 x 20            | 1.10                                  | 1.65                                     | 0.317                                | 0.190                                | ECOS2AA681DL             |
| 1200                           | 30 x 25            | 1.80                                  | 2.70                                     | 0.152                                | 0.091                                | ECOS2AA122DA             |
| 1500                           | 30 x 30            | 2.10                                  | 3.15                                     | 0.122                                | 0.079                                | ECOS2AA152DA             |
| 1800                           | 30 x 35            | 2.30                                  | 3.45                                     | 0.111                                | 0.072                                | ECOS2AA182DA             |
| 2200                           | 30 x 40            | 2.60                                  | 3.90                                     | 0.090                                | 0.059                                | ECOS2AA222DA             |
| 2700                           | 30 x 45            | 2.90                                  | 4.35                                     | 0.080                                | 0.052                                | ECOS2AA272DA             |
| 3300                           | 30 x 50            | 3.20                                  | 4.80                                     | 0.075                                | 0.053                                | ECOS2AA332DA             |
| 1000                           | 35 x 20            | 1.20                                  | 1.80                                     | 0.216                                | 0.129                                | ECOS2AA102EL             |
| 1500                           | 35 x 25            | 2.10                                  | 3.15                                     | 0.122                                | 0.079                                | ECOS2AA152EA             |
| 1800                           | 35 x 30            | 2.30                                  | 3.45                                     | 0.111                                | 0.072                                | ECOS2AA182EA             |
| 2200                           | 35 x 30            | 2.60                                  | 3.90                                     | 0.090                                | 0.059                                | ECOS2AA222EA             |
| 2700                           | 35 x 35            | 2.90                                  | 4.35                                     | 0.080                                | 0.052                                | ECOS2AA272EA             |
| 3300                           | 35 x 40            | 3.20                                  | 4.80                                     | 0.075                                | 0.053                                | ECOS2AA332EA             |
| 3900                           | 35 x 45            | 3.60                                  | 5.40                                     | 0.064                                | 0.045                                | ECOS2AA392EA             |
| 4700                           | 35 x 50            | 3.80                                  | 5.70                                     | 0.053                                | 0.040                                | ECOS2AA472EA             |
| 4700                           | 40 x 40            | 3.80                                  | 5.70                                     | 0.053                                | 0.040                                | ECOS2AA472FA             |
| 6800                           | 40 x 50            | 4.57                                  | 6.86                                     | 0.037                                | 0.027                                | ECOS2AA682FA             |
| 160 VDC Working, 200 VDC Surge |                    |                                       |                                          |                                      |                                      |                          |
| 220                            | 20 x 25            | 1.00                                  | 1.40                                     | 0.829                                | 0.373                                | ECOS2CA221AA             |
| 270                            | 20 x 30            | 1.10                                  | 1.54                                     | 0.675                                | 0.304                                | ECOS2CA271AA             |
| 330                            | 20 x 35            | 1.20                                  | 1.68                                     | 0.653                                | 0.294                                | ECOS2CA331AA             |
| 390                            | 20 x 40            | 1.30                                  | 1.82                                     | 0.468                                | 0.210                                | ECOS2CA391AA             |
| 150                            | 22 x 20            | 0.55                                  | 0.77                                     | 1.437                                | 0.647                                | ECOS2CA151BL             |
| 270                            | 22 x 25            | 1.10                                  | 1.54                                     | 0.675                                | 0.304                                | ECOS2CA271BA             |
| 330                            | 22 x 30            | 1.20                                  | 1.68                                     | 0.553                                | 0.249                                | ECOS2CA331BA             |
| 390                            | 22 x 30            | 1.30                                  | 1.82                                     | 0.553                                | 0.249                                | ECOS2CA391BA             |
| 470                            | 22 x 35            | 1.40                                  | 1.96                                     | 0.529                                | 0.238                                | ECOS2CA471BA             |
| 560                            | 22 x 40            | 1.50                                  | 2.10                                     | 0.385                                | 0.173                                | ECOS2CA561BA             |
| 680                            | 22 x 45            | 1.70                                  | 2.38                                     | 0.317                                | 0.143                                | ECOS2CA681BA             |
| 220                            | 25 x 20            | 0.75                                  | 1.05                                     | 0.980                                | 0.441                                | ECOS2CA221CL             |
| 390                            | 25 x 25            | 1.30                                  | 1.82                                     | 0.553                                | 0.249                                | ECOS2CA391CA             |
| 470                            | 25 x 30            | 1.40                                  | 1.96                                     | 0.459                                | 0.206                                | ECOS2CA471CA             |
| 560                            | 25 x 30            | 1.50                                  | 2.10                                     | 0.385                                | 0.173                                | ECOS2CA561CA             |
| 680                            | 25 x 35            | 1.70                                  | 2.38                                     | 0.317                                | 0.143                                | ECOS2CA681CA             |
| 820                            | 25 x 40            | 2.00                                  | 2.80                                     | 0.263                                | 0.118                                | ECOS2CA821CA             |
| 1000                           | 25 x 45            | 2.20                                  | 3.08                                     | 0.216                                | 0.108                                | ECOS2CA102CA             |
| 1200                           | 25 x 50            | 2.30                                  | 3.22                                     | 0.180                                | 0.090                                | ECOS2CA122CA             |
| 330                            | 30 x 20            | 1.00                                  | 1.40                                     | 0.553                                | 0.249                                | ECOS2CA331DL             |
| 560                            | 30 x 25            | 1.50                                  | 2.10                                     | 0.385                                | 0.173                                | ECOS2CA561DA             |
| 680                            | 30 x 30            | 1.70                                  | 2.38                                     | 0.317                                | 0.143                                | ECOS2CA681DA             |
| 820                            | 30 x 30            | 2.00                                  | 2.80                                     | 0.263                                | 0.118                                | ECOS2CA821DA             |
| 1000                           | 30 x 35            | 2.20                                  | 3.08                                     | 0.216                                | 0.108                                | ECOS2CA102DA             |
| 1200                           | 30 x 40            | 2.30                                  | 3.22                                     | 0.180                                | 0.090                                | ECOS2CA122DA             |
| 1500                           | 30 x 45            | 2.50                                  | 3.50                                     | 0.166                                | 0.083                                | ECOS2CA152DA             |
| 1800                           | 30 x 50            | 2.70                                  | 3.78                                     | 0.138                                | 0.083                                | ECOS2CA182DA             |
| 470                            | 35 x 20            | 1.15                                  | 1.61                                     | 0.459                                | 0.206                                | ECOS2CA471EL             |
| 1500                           | 35 x 35            | 2.50                                  | 3.50                                     | 0.166                                | 0.083                                | ECOS2CA152EA             |
| 1800                           | 35 x 40            | 2.70                                  | 3.78                                     | 0.138                                | 0.069                                | ECOS2CA182EA             |
| 2200                           | 35 x 50            | 2.90                                  | 4.06                                     | 0.113                                | 0.057                                | ECOS2CA222EA             |
| 200 VDC Working, 250 VDC Surge |                    |                                       |                                          |                                      |                                      |                          |
| 220                            | 20 x 30            | 1.00                                  | 1.40                                     | 0.754                                | 0.339                                | ECOS2DA221AA             |
| 270                            | 20 x 35            | 1.10                                  | 1.54                                     | 0.614                                | 0.276                                | ECOS2DA271AA             |
| 330                            | 20 x 40            | 1.20                                  | 1.68                                     | 0.502                                | 0.226                                | ECOS2DA331AA             |
| 100                            | 22 x 20            | 0.50                                  | 0.70                                     | 1.989                                | 0.895                                | ECOS2DA101BL             |
| 220                            | 22 x 25            | 1.00                                  | 1.40                                     | 0.754                                | 0.339                                | ECOS2DA221BA             |
| 270                            | 22 x 30            | 1.10                                  | 1.54                                     | 0.614                                | 0.276                                | ECOS2DA271BA             |
| 330                            | 22 x 30            | 1.20                                  | 1.68                                     | 0.502                                | 0.226                                | ECOS2DA331BA             |
| 390                            | 22 x 35            | 1.30                                  | 1.82                                     | 0.425                                | 0.191                                | ECOS2DA391BA             |
| 470                            | 22 x 40            | 1.40                                  | 1.96                                     | 0.353                                | 0.159                                | ECOS2DA471BA             |
| 560                            | 22 x 45            | 1.50                                  | 2.10                                     | 0.296                                | 0.133                                | ECOS2DA561BA             |
| 150                            | 25 x 20            | 0.65                                  | 0.91                                     | 1.326                                | 0.597                                | ECOS2DA151CL             |
| 270                            | 25 x 25            | 1.10                                  | 1.54                                     | 0.614                                | 0.276                                | ECOS2DA271CA             |
| 330                            | 25 x 25            | 1.20                                  | 1.68                                     | 0.502                                | 0.226                                | ECOS2DA331CA             |
| 390                            | 25 x 30            | 1.30                                  | 1.82                                     | 0.425                                | 0.191                                | ECOS2DA391CA             |
| 470                            | 25 x 35            | 1.40                                  | 1.96                                     | 0.353                                | 0.159                                | ECOS2DA471CA             |
| 560                            | 25 x 35            | 1.50                                  | 2.10                                     | 0.296                                | 0.133                                | ECOS2DA561CA             |
| 680                            | 25 x 40            | 1.70                                  | 2.38                                     | 0.244                                | 0.110                                | ECOS2DA681CA             |
| 820                            | 25 x 50            | 2.00                                  | 2.80                                     | 0.222                                | 0.111                                | ECOS2DA821CA             |
| 220                            | 30 x 20            | 0.87                                  | 1.22                                     | 0.904                                | 0.407                                | ECOS2DA221DL             |
| 390                            | 30 x 25            | 1.30                                  | 1.82                                     | 0.425                                | 0.191                                | ECOS2DA391DA             |
| 470                            | 30 x 25            | 1.40                                  | 1.96                                     | 0.353                                | 0.159                                | ECOS2DA471DA             |
| 560                            | 30 x 30            | 1.50                                  | 2.10                                     | 0.296                                | 0.133                                | ECOS2DA561DA             |
| 680                            | 30 x 30            | 1.70                                  | 2.38                                     | 0.244                                | 0.110                                | ECOS2DA681DA             |
| 820                            | 30 x 35            | 2.00                                  | 2.80                                     | 0.222                                | 0.111                                | ECOS2DA821DA             |
| 1000                           | 30 x 45            | 2.20                                  | 3.08                                     | 0.199                                | 0.099                                | ECOS2DA102DA             |
| 1200                           | 30 x 50            | 2.30                                  | 3.22                                     | 0.166                                | 0.083                                | ECOS2DA122DA             |
| 330                            | 35 x 20            | 1.10                                  | 1.54                                     | 0.603                                | 0.271                                | ECOS2DA331EL             |
| 820                            | 35 x 30            | 2.00                                  | 2.80                                     | 0.222                                | 0.111                                | ECOS2DA821EA             |
| 1000                           | 35 x 35            | 2.20                                  | 3.08                                     | 0.199                                | 0.099                                | ECOS2DA102EA             |
| 1200                           | 35 x 40            | 2.30                                  | 3.22                                     | 0.166                                | 0.083                                | ECOS2DA122EA             |
| 1500                           | 35 x 50            | 2.50                                  | 3.50                                     | 0.144                                | 0.072                                | ECOS2DA152EA             |

## TS-HA Standard Ratings (continued)

| Cap.<br>(μF)                   | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> )<br>120Hz | 20°C ESR (Ω, max.)<br>10k-50kHz | 20°C ESR (Ω, max.)<br>120Hz | 20kΩ  | Panasonic<br>Part Number |
|--------------------------------|--------------------|---------------------------------------------|---------------------------------|-----------------------------|-------|--------------------------|
| 250 VDC Working, 300 VDC Surge |                    |                                             |                                 |                             |       |                          |
| 180                            | 20 x 35            | 0.90                                        | 1.26                            | 0.921                       | 0.461 | ECOS2EA181AA             |
| 220                            | 20 x 40            | 1.00                                        | 1.40                            | 0.754                       | 0.377 | ECOS2EA221AA             |
| 68                             | 22 x 20            | 0.40                                        | 0.56                            | 2.926                       | 1.463 | ECOS2EA680BL             |
| 180                            | 22 x 30            | 0.90                                        | 1.26                            | 0.921                       | 0.461 | ECOS2EA181BA             |
| 220                            | 22 x 30            | 1.00                                        | 1.40                            | 0.754                       | 0.377 | ECOS2EA221BA             |
| 270                            | 22 x 35            | 1.10                                        | 1.54                            | 0.614                       | 0.307 | ECOS2EA271BA             |
| 330                            | 22 x 40            | 1.20                                        | 1.68                            | 0.502                       | 0.251 | ECOS2EA331BA             |
| 390                            | 22 x 45            | 1.30                                        | 1.82                            | 0.425                       | 0.213 | ECOS2EA391BA             |
| 100                            | 25 x 20            | 0.50                                        | 0.70                            | 1.989                       | 0.995 | ECOS2EA101CL             |
| 180                            | 25 x 25            | 0.90                                        | 1.26                            | 0.921                       | 0.461 | ECOS2EA181CA             |
| 220                            | 25 x 25            | 1.00                                        | 1.40                            | 0.754                       | 0.377 | ECOS2EA221CA             |
| 270                            | 25 x 30            | 1.10                                        | 1.54                            | 0.614                       | 0.307 | ECOS2EA271CA             |
| 330                            | 25 x 35            | 1.20                                        | 1.68                            | 0.502                       | 0.251 | ECOS2EA331CA             |
| 390                            | 25 x 35            | 1.30                                        | 1.82                            | 0.425                       | 0.213 | ECOS2EA391CA             |
| 470                            | 25 x 45            | 1.40                                        | 1.96                            | 0.353                       | 0.176 | ECOS2EA471CA             |
| 560                            | 25 x 50            | 1.50                                        | 2.10                            | 0.296                       | 0.148 | ECOS2EA561CA             |
| 150                            | 30 x 20            | 0.65                                        | 0.91                            | 1.326                       | 0.663 | ECOS2EA151DL             |
| 270                            | 30 x 25            | 1.10                                        | 1.54                            | 0.614                       | 0.307 | ECOS2EA271DA             |
| 330                            | 30 x 25            | 1.20                                        | 1.68                            | 0.502                       | 0.251 | ECOS2EA331DA             |
| 390                            | 30 x 30            | 1.30                                        | 1.82                            | 0.425                       | 0.213 | ECOS2EA391DA             |
| 470                            | 30 x 35            | 1.40                                        | 1.96                            | 0.353                       | 0.176 | ECOS2EA471DA             |
| 560                            | 30 x 35            | 1.50                                        | 2.10                            | 0.296                       | 0.148 | ECOS2EA561DA             |
| 680                            | 30 x 45            | 1.70                                        | 2.38                            | 0.244                       | 0.122 | ECOS2EA681DA             |
| 820                            | 30 x 50            | 2.00                                        | 2.80                            | 0.202                       | 0.101 | ECOS2EA821DA             |
| 220                            | 35 x 20            | 0.87                                        | 1.22                            | 0.904                       | 0.452 | ECOS2EA221EL             |
| 470                            | 35 x 30            | 1.40                                        | 1.96                            | 0.353                       | 0.176 | ECOS2EA471EA             |
| 560                            | 35 x 30            | 1.50                                        | 2.10                            | 0.296                       | 0.148 | ECOS2EA561EA             |
| 680                            | 35 x 35            | 1.70                                        | 2.38                            | 0.244                       | 0.122 | ECOS2EA681EA             |
| 820                            | 35 x 40            | 2.00                                        | 2.80                            | 0.202                       | 0.101 | ECOS2EA821EA             |
| 1000                           | 35 x 45            | 2.20                                        | 3.08                            | 0.199                       | 0.099 | ECOS2EA102EA             |
| 1200                           | 35 x 50            | 2.30                                        | 3.22                            | 0.166                       | 0.083 | ECOS2EA122EA             |
| 400 VDC Working, 450 VDC Surge |                    |                                             |                                 |                             |       |                          |
| 56                             | 20 x 30            | 0.51                                        | 0.71                            | 2.368                       | 0.829 | ECOS2GA560AA             |
| 68                             | 20 x 35            | 0.56                                        | 0.78                            | 1.950                       | 0.683 | ECOS2GA680AA             |
| 82                             | 20 x 40            | 0.64                                        | 0.90                            | 1.617                       | 0.566 | ECOS2GA820AA             |
| 33                             | 22 x 20            | 0.20                                        | 0.28                            | 5.024                       | 1.758 | ECOS2GA330BL             |
| 56                             | 22 x 25            | 0.51                                        | 0.71                            | 2.368                       | 0.829 | ECOS2GA560BA             |
| 68                             | 22 x 30            | 0.56                                        | 0.78                            | 1.950                       | 0.683 | ECOS2GA680BA             |
| 82                             | 22 x 35            | 0.64                                        | 0.90                            | 1.617                       | 0.566 | ECOS2GA820BA             |
| 100                            | 22 x 35            | 0.69                                        | 0.97                            | 1.326                       | 0.464 | ECOS2GA101BA             |
| 120                            | 22 x 40            | 0.75                                        | 1.05                            | 1.105                       | 0.387 | ECOS2GA121BA             |
| 150                            | 22 x 50            | 0.82                                        | 1.15                            | 0.884                       | 0.309 | ECOS2GA151BA             |
| 47                             | 25 x 20            | 0.25                                        | 0.35                            | 3.527                       | 1.235 | ECOS2GA470CL             |
| 68                             | 25 x 25            | 0.56                                        | 0.78                            | 1.950                       | 0.683 | ECOS2GA680CA             |
| 82                             | 25 x 25            | 0.64                                        | 0.90                            | 1.617                       | 0.566 | ECOS2GA820CA             |
| 100                            | 25 x 30            | 0.69                                        | 0.97                            | 1.326                       | 0.464 | ECOS2GA101CA             |
| 120                            | 25 x 35            | 0.75                                        | 1.05                            | 1.105                       | 0.387 | ECOS2GA121CA             |
| 150                            | 25 x 40            | 0.82                                        | 1.15                            | 0.884                       | 0.309 | ECOS2GA151CA             |
| 180                            | 25 x 45            | 0.95                                        | 1.33                            | 0.737                       | 0.258 | ECOS2GA181CA             |
| 220                            | 25 x 50            | 1.10                                        | 1.54                            | 0.603                       | 0.211 | ECOS2GA221CA             |
| 68                             | 30 x 20            | 0.35                                        | 0.49                            | 2.438                       | 0.853 | ECOS2GA680DL             |
| 120                            | 30 x 25            | 0.75                                        | 1.05                            | 1.105                       | 0.387 | ECOS2GA121DA             |
| 150                            | 30 x 30            | 0.82                                        | 1.15                            | 0.884                       | 0.309 | ECOS2GA151DA             |
| 180                            | 30 x 35            | 0.95                                        | 1.33                            | 0.737                       | 0.258 | ECOS2GA181DA             |
| 220                            | 30 x 40            | 1.10                                        | 1.54                            | 0.603                       | 0.211 | ECOS2GA221DA             |
| 270                            | 30 x 45            | 1.20                                        | 1.68                            | 0.491                       | 0.172 | ECOS2GA271DA             |
| 330                            | 30 x 50            | 1.35                                        | 1.89                            | 0.402                       | 0.161 | ECOS2GA331DA             |
| 100                            | 35 x 20            | 0.47                                        | 0.66                            | 1.658                       | 0.580 | ECOS2GA101EL             |
| 180                            | 35 x 25            | 0.95                                        | 1.33                            | 0.737                       | 0.258 | ECOS2GA181EA             |
| 220                            | 35 x 30            | 1.10                                        | 1.54                            | 0.603                       | 0.211 | ECOS2GA221EA             |
| 270                            | 35 x 35            | 1.20                                        | 1.68                            | 0.491                       | 0.172 | ECOS2GA271EA             |
| 330                            | 35 x 40            | 1.35                                        | 1.89                            | 0.402                       | 0.161 | ECOS2GA331EA             |
| 390                            | 35 x 45            | 1.55                                        | 2.17                            | 0.340                       | 0.136 | ECOS2GA391EA             |
| 470                            | 35 x 50            | 1.75                                        | 2.45                            | 0.282                       | 0.127 | ECOS2GA471EA             |
| 385 VDC Working, 435 VDC Surge |                    |                                             |                                 |                             |       |                          |
| 56                             | 20 x 30            | 0.51                                        | 0.71                            | 2.368                       | 0.829 | ECOS2TA560AA             |
| 68                             | 20 x 35            | 0.56                                        | 0.78                            | 1.950                       | 0.683 | ECOS2TA680AA             |
| 82                             | 20 x 40            | 0.64                                        | 0.90                            | 1.617                       | 0.566 | ECOS2TA820AA             |
| 33                             | 22 x 20            | 0.20                                        | 0.28                            | 5.024                       | 1.758 | ECOS2TA330BL             |
| 56                             | 22 x 25            | 0.51                                        | 0.71                            | 2.368                       | 0.829 | ECOS2TA560BA             |
| 68                             | 22 x 30            | 0.56                                        | 0.78                            | 1.950                       | 0.683 | ECOS2TA680BA             |
| 82                             | 22 x 35            | 0.64                                        | 0.90                            | 1.617                       | 0.566 | ECOS2TA820BA             |
| 100                            | 22 x 35            | 0.69                                        | 0.97                            | 1.326                       | 0.464 | ECOS2TA101BA             |
| 120                            | 22 x 35            | 0.75                                        | 1.05                            | 1.105                       | 0.387 | ECOS2TA121BA             |
| 150                            | 22 x 50            | 0.82                                        | 1.15                            | 0.884                       | 0.309 | ECOS2TA151BA             |
| 47                             | 25 x 20            | 0.25                                        | 0.35                            | 3.527                       | 1.235 | ECOS2TA470CL             |
| 68                             | 25 x 25            | 0.56                                        | 0.78                            | 1.950                       | 0.683 | ECOS2TA680CA             |
| 82                             | 25 x 25            | 0.64                                        | 0.90                            | 1.617                       | 0.566 | ECOS2TA820CA             |
| 100                            | 25 x 30            | 0.69                                        | 0.97                            | 1.326                       | 0.464 | ECOS2TA101CA             |
| 120                            | 25 x 30            | 0.75                                        | 1.05                            | 1.105                       | 0.387 | ECOS2TA121CA             |
| 150                            | 25 x 40            | 0.82                                        | 1.15                            | 0.884                       | 0.309 | ECOS2TA151CA             |
| 180                            | 25 x 45            | 0.95                                        | 1.33                            | 0.737                       | 0.258 | ECOS2TA181CA             |
| 220                            | 25 x 50            | 1.10                                        | 1.54                            | 0.603                       | 0.211 | ECOS2TA221CA             |
| 68                             | 30 x 20            | 0.35                                        | 0.49                            | 2.438                       | 0.853 | ECOS2TA680DL             |
| 150                            | 30 x 30            | 0.82                                        | 1.15                            | 0.884                       | 0.309 | ECOS2TA151DA             |
| 180                            | 30 x 35            | 0.95                                        | 1.33                            | 0.737                       | 0.258 | ECOS2TA181DA             |
| 220                            | 30 x 40            | 1.10                                        | 1.54                            | 0.603                       | 0.211 | ECOS2TA221DA             |
| 270                            | 30 x 45            | 1.20                                        | 1.68                            | 0.491                       | 0.172 | ECOS2TA271DA             |
| 330                            | 30 x 50            | 1.35                                        | 1.89                            | 0.402                       | 0.161 | ECOS2TA331DA             |
| 100                            | 35 x 20            | 0.47                                        | 0.66                            | 1.658                       | 0.580 | ECOS2TA101EL             |
| 180                            | 35 x 25            | 0.95                                        | 1.33                            | 0.737                       | 0.258 | ECOS2TA181EA             |
| 220                            | 35 x 30            | 1.10                                        | 1.54                            | 0.603                       | 0.211 | ECOS2TA221EA             |
| 270                            | 35 x 35            | 1.20                                        | 1.68                            | 0.491                       | 0.172 | ECOS2TA271EA             |
| 330                            | 35 x 40            | 1.35                                        | 1.89                            | 0.402                       | 0.161 | ECOS2TA331EA             |
| 390                            | 35 x 45            | 1.55                                        | 2.17                            | 0.340                       | 0.136 | ECOS2TA391EA             |
| 470                            | 35 x 50            | 1.75                                        | 2.45                            | 0.282                       | 0.127 | ECOS2TA471EA             |
| 450 VDC Working, 500 VDC Surge |                    |                                             |                                 |                             |       |                          |
| 56                             | 22 x 25            | 0.40                                        | 0.56                            | 2.368                       | 0.947 | ECOS2WA560BA             |
| 68                             | 22 x 30            | 0.50                                        | 0.70                            | 1.950                       | 0.780 | ECOS2WA680BA             |
| 82                             | 22 x 35            | 0.56                                        | 0.78                            | 1.617                       | 0.647 | ECOS2WA820BA             |
| 100                            | 22 x 40            | 0.64                                        | 0.90                            | 1.326                       | 0.531 | ECOS2WA101BA             |
| 120                            | 22 x 45            | 0.72                                        | 1.01                            | 1.105                       | 0.442 | ECOS2WA121BA             |
| 150                            | 22 x 50            | 0.79                                        | 1.11                            | 0.884                       | 0.354 | ECOS2WA151BA             |
| 68                             | 25 x 25            | 0.50                                        | 0.70                            | 1.950                       | 0.780 | ECOS2WA680CA             |
| 100                            | 25 x 30            | 0.64                                        | 0.90                            | 1.326                       | 0.531 | ECOS2WA101CA             |
| 120                            | 25 x 35            | 0.72                                        | 1.01                            | 1.105                       | 0.442 | ECOS2WA121CA             |
| 150                            | 25 x 40            | 0.79                                        | 1.11                            | 0.884                       | 0.354 | ECOS2WA151CA             |
| 180                            | 25 x 45            | 0.87                                        | 1.22                            | 0.737                       | 0.295 | ECOS2WA181CA             |
| 220                            | 25 x 50            | 1.00                                        | 1.40                            | 0.678                       | 0.271 | ECOS2WA221CA             |
| 100                            | 30 x 25            | 0.64                                        | 0.90                            | 1.326                       | 0.531 | ECOS2WA101DA             |
| 150                            | 30 x 30            | 0.79                                        | 1.11                            | 0.884                       | 0.354 | ECOS2WA151DA             |
| 180                            | 30 x 35            | 0.87                                        | 1.22                            | 0.737                       | 0.295 | ECOS2WA181DA             |
| 220                            | 30 x 40            | 1.00                                        | 1.40                            | 0.678                       | 0.271 | ECOS2WA221DA             |
| 270                            | 30 x 45            | 1.17                                        | 1.64                            | 0.614                       | 0.246 | ECOS2WA271DA             |
| 330                            | 30 x 50            | 1.38                                        | 1.93                            | 0.502                       | 0.201 | ECOS2WA331DA             |
| 150                            | 35 x 25            | 0.79                                        | 1.11                            | 0.884                       | 0.354 | ECOS2WA151EA             |
| 220                            | 35 x 30            | 1.00                                        | 1.40                            | 0.678                       | 0.271 | ECOS2WA221EA             |
| 270                            | 35 x 35            | 1.17                                        | 1.64                            | 0.614                       | 0.246 | ECOS2WA271EA             |
| 330                            | 35 x 40            | 1.38                                        | 1.93                            | 0.502                       | 0.201 | ECOS2WA331EA             |
| 390                            | 35 x 50            | 1.55                                        | 2.17                            | 0.425                       | 0.170 | ECOS2WA391EA             |

## TS-HB Series two terminal snap-in

- Very compact size (20 ~ 25% smaller than TS-HA series)
- Long 3000 hour life at 105°C with high ripple current capability
- **NEW:** 40mm diameter case sizes
- Can vent construction



|                                        |                                                                         |                   |
|----------------------------------------|-------------------------------------------------------------------------|-------------------|
| Rated Working Voltage:                 | 160 ~ 250 VDC                                                           | 385 ~ 450 VDC     |
| Operating Temperature:                 | -40 ~ +105°C                                                            | -25 ~ +105°C      |
| Nominal Capacitance:                   | 330 ~ 2700μF (±20%)                                                     | 82 ~ 560μF (±20%) |
| Dissipation Factor:<br>(120 Hz, +20°C) | Working Voltage [V]:                                                    | 160 ~ 450         |
|                                        | Max. D.F. (%):                                                          | 15                |
| Endurance:                             | 3000 hours at +105°C with maximum specified ripple current (see page 4) |                   |

### Part Number System

|                                              |                   |          |                            |                  |                        |
|----------------------------------------------|-------------------|----------|----------------------------|------------------|------------------------|
| <b>E</b> <b>C</b> <b> </b> <b> </b>          | <b> </b> <b> </b> | <b>B</b> | <b> </b> <b> </b> <b> </b> | <b> </b>         | <b> </b>               |
| Common Code/<br>Terminal Type                | Voltage<br>Code   | Series   | Capacitance<br>Code        | Case<br>Diameter | Top Vinyl Plate        |
| <b>ECOS</b> 6.3mm Length Terminal (Standard) |                   |          |                            | <b>A</b> 20mm    | <b>A</b> With Plate    |
| <b>ECEC</b> 4.0mm Length "Short" Terminal    |                   |          |                            | <b>B</b> 22mm    | <b>B</b> Without plate |
| (See page 7)                                 |                   |          |                            | <b>C</b> 25mm    |                        |
|                                              |                   |          |                            | <b>D</b> 30mm    |                        |
|                                              |                   |          |                            | <b>E</b> 35mm    |                        |
|                                              |                   |          |                            | <b>F</b> 40mm    |                        |

### TS-HB Standard Ratings

| Cap.<br>(μF)                   | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> )<br>120Hz | 10k-50kHz | 20°C ESR (Ω, max.)<br>120Hz | 20kHz | Panasonic<br>Part Number |
|--------------------------------|--------------------|---------------------------------------------|-----------|-----------------------------|-------|--------------------------|
| 160 VDC Working, 200 VDC Surge |                    |                                             |           |                             |       |                          |
| 470                            | 22 x 30            | 1.40                                        | 1.96      | 0.423                       | 0.190 | ECOS2CB471BA             |
| 560                            | 22 x 35            | 1.50                                        | 2.10      | 0.355                       | 0.160 | ECOS2CB561BA             |
| 680                            | 22 x 40            | 1.70                                        | 2.38      | 0.293                       | 0.132 | ECOS2CB681BA             |
| 820                            | 22 x 45            | 2.00                                        | 2.80      | 0.243                       | 0.109 | ECOS2CB821BA             |
| 1000                           | 22 x 50            | 2.20                                        | 3.08      | 0.199                       | 0.090 | ECOS2CB102BA             |
| 680                            | 25 x 30            | 1.70                                        | 2.38      | 0.293                       | 0.132 | ECOS2CB681CA             |
| 820                            | 25 x 35            | 2.00                                        | 2.80      | 0.243                       | 0.109 | ECOS2CB821CA             |
| 1000                           | 25 x 40            | 2.20                                        | 3.08      | 0.199                       | 0.090 | ECOS2CB102CA             |
| 1200                           | 25 x 45            | 2.30                                        | 3.22      | 0.180                       | 0.090 | ECOS2CB122CA             |
| 1000                           | 30 x 30            | 2.20                                        | 3.08      | 0.199                       | 0.090 | ECOS2CB102DA             |
| 1200                           | 30 x 35            | 2.30                                        | 3.22      | 0.180                       | 0.090 | ECOS2CB122DA             |
| 1500                           | 30 x 40            | 2.50                                        | 3.50      | 0.144                       | 0.072 | ECOS2CB152DA             |
| 1800                           | 30 x 45            | 2.70                                        | 3.78      | 0.129                       | 0.064 | ECOS2CB182DA             |
| 1000                           | 35 x 25            | 2.20                                        | 3.08      | 0.199                       | 0.090 | ECOS2CB102EA             |
| 1200                           | 35 x 30            | 2.30                                        | 3.22      | 0.180                       | 0.090 | ECOS2CB122EA             |
| 1500                           | 35 x 30            | 2.50                                        | 3.50      | 0.144                       | 0.072 | ECOS2CB152EA             |
| 1800                           | 35 x 35            | 2.70                                        | 3.78      | 0.129                       | 0.064 | ECOS2CB182EA             |
| 2200                           | 35 x 45            | 2.90                                        | 4.06      | 0.105                       | 0.063 | ECOS2CB222EA             |
| 2700                           | 35 x 50            | 3.10                                        | 4.34      | 0.086                       | 0.052 | ECOS2CB272EA             |
| 2200                           | 40 x 40            | 2.90                                        | 4.06      | 0.105                       | 0.063 | ECOS2CB222FA             |
| 3300                           | 40 x 50            | 3.36                                        | 4.70      | 0.070                       | 0.042 | ECOS2CB332FA             |
| 200 VDC Working, 250 VDC Surge |                    |                                             |           |                             |       |                          |
| 390                            | 22 x 30            | 1.30                                        | 1.82      | 0.510                       | 0.230 | ECOS2DB391BA             |
| 470                            | 22 x 35            | 1.40                                        | 1.96      | 0.423                       | 0.190 | ECOS2DB471BA             |
| 560                            | 22 x 40            | 1.50                                        | 2.10      | 0.355                       | 0.160 | ECOS2DB561BA             |
| 680                            | 22 x 45            | 1.70                                        | 2.38      | 0.293                       | 0.132 | ECOS2DB681BA             |
| 390                            | 25 x 25            | 1.30                                        | 1.82      | 0.510                       | 0.230 | ECOS2DB391CA             |
| 470                            | 25 x 30            | 1.40                                        | 1.96      | 0.423                       | 0.190 | ECOS2DB471CA             |
| 560                            | 25 x 30            | 1.50                                        | 2.10      | 0.355                       | 0.160 | ECOS2DB561CA             |
| 680                            | 25 x 35            | 1.70                                        | 2.38      | 0.293                       | 0.132 | ECOS2DB681CA             |
| 820                            | 25 x 45            | 2.00                                        | 2.80      | 0.263                       | 0.118 | ECOS2DB821CA             |
| 1000                           | 25 x 50            | 2.20                                        | 3.08      | 0.216                       | 0.108 | ECOS2DB102CA             |
| 560                            | 30 x 25            | 1.50                                        | 2.10      | 0.355                       | 0.160 | ECOS2DB561DA             |
| 820                            | 30 x 30            | 2.00                                        | 2.80      | 0.263                       | 0.118 | ECOS2DB821DA             |
| 1000                           | 30 x 35            | 2.20                                        | 3.08      | 0.216                       | 0.108 | ECOS2DB102DA             |
| 1200                           | 30 x 40            | 2.30                                        | 3.22      | 0.193                       | 0.097 | ECOS2DB122DA             |
| 1500                           | 30 x 50            | 2.50                                        | 3.50      | 0.155                       | 0.077 | ECOS2DB152DA             |
| 820                            | 35 x 25            | 2.00                                        | 2.80      | 0.263                       | 0.118 | ECOS2DB821EA             |
| 1000                           | 35 x 30            | 2.20                                        | 3.08      | 0.216                       | 0.108 | ECOS2DB102EA             |
| 1200                           | 35 x 35            | 2.30                                        | 3.22      | 0.193                       | 0.097 | ECOS2DB122EA             |
| 1500                           | 35 x 40            | 2.50                                        | 3.50      | 0.155                       | 0.077 | ECOS2DB152EA             |
| 1800                           | 35 x 45            | 2.70                                        | 3.78      | 0.129                       | 0.077 | ECOS2DB182EA             |
| 2200                           | 35 x 50            | 2.90                                        | 4.06      | 0.105                       | 0.063 | ECOS2DB222EA             |
| 1800                           | 40 x 40            | 2.70                                        | 3.78      | 0.129                       | 0.077 | ECOS2DB182FA             |
| 2700                           | 40 x 50            | 3.55                                        | 4.97      | 0.086                       | 0.052 | ECOS2DB272FA             |

## TS-HB Standard Ratings (continued)

| Cap.<br>( $\mu$ F)             | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |       | Panasonic<br>Part Number |
|--------------------------------|--------------------|------------------------------|-----------|-----------------------------|-------|--------------------------|
|                                |                    | 120Hz                        | 10k-50kHz | 120Hz                       | 20kHz |                          |
| 250 VDC Working, 300 VDC Surge |                    |                              |           |                             |       |                          |
| 180                            | 22 x 25            | 0.90                         | 1.26      | 0.921                       | 0.461 | ECOS2EB181BA             |
| 220                            | 22 x 30            | 1.00                         | 1.40      | 0.754                       | 0.377 | ECOS2EB221BA             |
| 270                            | 22 x 35            | 1.10                         | 1.54      | 0.614                       | 0.307 | ECOS2EB271BA             |
| 330                            | 22 x 40            | 1.20                         | 1.68      | 0.502                       | 0.251 | ECOS2EB331BA             |
| 390                            | 22 x 45            | 1.30                         | 1.82      | 0.425                       | 0.213 | ECOS2EB391BA             |
| 470                            | 22 x 50            | 1.40                         | 1.96      | 0.353                       | 0.176 | ECOS2EB471BA             |
| 330                            | 25 x 30            | 1.20                         | 1.68      | 0.502                       | 0.251 | ECOS2EB331CA             |
| 470                            | 25 x 40            | 1.40                         | 1.96      | 0.353                       | 0.176 | ECOS2EB471CA             |
| 560                            | 25 x 45            | 1.50                         | 2.10      | 0.296                       | 0.148 | ECOS2EB561CA             |
| 680                            | 25 x 50            | 1.70                         | 2.38      | 0.244                       | 0.134 | ECOS2EB681CA             |
| 390                            | 30 x 25            | 1.30                         | 1.82      | 0.425                       | 0.213 | ECOS2EB391DA             |
| 470                            | 30 x 30            | 1.40                         | 1.96      | 0.353                       | 0.176 | ECOS2EB471DA             |
| 680                            | 30 x 40            | 1.70                         | 2.38      | 0.244                       | 0.134 | ECOS2EB681DA             |
| 820                            | 30 x 45            | 2.00                         | 2.80      | 0.202                       | 0.111 | ECOS2EB821DA             |
| 1000                           | 30 x 50            | 2.20                         | 3.08      | 0.199                       | 0.109 | ECOS2EB102DA             |
| 560                            | 35 x 25            | 1.50                         | 2.10      | 0.296                       | 0.148 | ECOS2EB561EA             |
| 680                            | 35 x 30            | 1.70                         | 2.38      | 0.244                       | 0.134 | ECOS2EB681EA             |
| 820                            | 35 x 35            | 2.00                         | 2.80      | 0.202                       | 0.111 | ECOS2EB821EA             |
| 1000                           | 35 x 40            | 2.20                         | 3.08      | 0.199                       | 0.109 | ECOS2EB102EA             |
| 1200                           | 35 x 45            | 2.30                         | 3.22      | 0.166                       | 0.099 | ECOS2EB122EA             |
| 1500                           | 35 x 50            | 2.50                         | 3.50      | 0.144                       | 0.093 | ECOS2EB152EA             |
| 1200                           | 40 x 40            | 2.66                         | 3.72      | 0.180                       | 0.117 | ECOS2EB122FA             |
| 1800                           | 40 x 50            | 3.25                         | 4.55      | 0.120                       | 0.078 | ECOS2EB182FA             |
| 400 VDC Working, 450 VDC Surge |                    |                              |           |                             |       |                          |
| 82                             | 22 x 30            | 0.64                         | 0.90      | 2.022                       | 0.708 | ECOS2GB820BA             |
| 100                            | 22 x 30            | 0.69                         | 0.97      | 1.658                       | 0.580 | ECOS2GB101BA             |
| 120                            | 22 x 35            | 0.75                         | 1.05      | 1.382                       | 0.484 | ECOS2GB121BA             |
| 150                            | 22 x 40            | 0.82                         | 1.15      | 1.105                       | 0.387 | ECOS2GB151BA             |
| 180                            | 22 x 45            | 0.95                         | 1.33      | 0.921                       | 0.322 | ECOS2GB181BA             |
| 100                            | 25 x 25            | 0.69                         | 0.97      | 1.658                       | 0.580 | ECOS2GB101CA             |
| 120                            | 25 x 30            | 0.75                         | 1.05      | 1.382                       | 0.484 | ECOS2GB121CA             |
| 150                            | 25 x 30            | 0.82                         | 1.15      | 1.105                       | 0.387 | ECOS2GB151CA             |
| 180                            | 25 x 35            | 0.95                         | 1.33      | 0.921                       | 0.322 | ECOS2GB181CA             |
| 220                            | 25 x 45            | 1.10                         | 1.54      | 0.754                       | 0.264 | ECOS2GB221CA             |
| 270                            | 25 x 50            | 1.20                         | 1.68      | 0.614                       | 0.215 | ECOS2GB271CA             |
| 150                            | 30 x 25            | 0.82                         | 1.15      | 1.105                       | 0.387 | ECOS2GB151DA             |
| 180                            | 30 x 30            | 0.95                         | 1.33      | 0.921                       | 0.322 | ECOS2GB181DA             |
| 220                            | 30 x 30            | 1.10                         | 1.54      | 0.754                       | 0.264 | ECOS2GB221DA             |
| 270                            | 30 x 35            | 1.20                         | 1.68      | 0.614                       | 0.215 | ECOS2GB271DA             |
| 330                            | 30 x 45            | 1.35                         | 1.89      | 0.502                       | 0.201 | ECOS2GB331DA             |
| 390                            | 30 x 50            | 1.55                         | 2.17      | 0.425                       | 0.170 | ECOS2GB391DA             |
| 220                            | 35 x 25            | 1.10                         | 1.54      | 0.754                       | 0.264 | ECOS2GB221EA             |
| 270                            | 35 x 30            | 1.20                         | 1.68      | 0.614                       | 0.215 | ECOS2GB271EA             |
| 330                            | 35 x 35            | 1.35                         | 1.89      | 0.502                       | 0.201 | ECOS2GB331EA             |
| 390                            | 35 x 40            | 1.55                         | 2.17      | 0.425                       | 0.170 | ECOS2GB391EA             |
| 470                            | 35 x 45            | 1.75                         | 2.45      | 0.353                       | 0.141 | ECOS2GB471EA             |
| 560                            | 35 x 50            | 1.80                         | 2.52      | 0.296                       | 0.118 | ECOS2GB561EA             |
| 470                            | 40 x 40            | 1.75                         | 2.45      | 0.353                       | 0.141 | ECOS2GB471FA             |
| 680                            | 40 x 50            | 2.10                         | 2.94      | 0.244                       | 0.098 | ECOS2GB681FA             |
| 450 VDC Working, 500 VDC Surge |                    |                              |           |                             |       |                          |
| 82                             | 22 x 30            | 0.56                         | 0.78      | 2.022                       | 0.708 | ECOS2WB820BA             |
| 100                            | 22 x 35            | 0.64                         | 0.90      | 1.658                       | 0.580 | ECOS2WB101BA             |
| 120                            | 22 x 40            | 0.72                         | 1.01      | 1.382                       | 0.484 | ECOS2WB121BA             |
| 150                            | 22 x 50            | 0.79                         | 1.11      | 1.105                       | 0.387 | ECOS2WB151BA             |
| 82                             | 25 x 25            | 0.56                         | 0.78      | 2.022                       | 0.708 | ECOS2WB820CA             |
| 100                            | 25 x 30            | 0.64                         | 0.90      | 1.658                       | 0.580 | ECOS2WB101CA             |
| 120                            | 25 x 35            | 0.72                         | 1.01      | 1.382                       | 0.484 | ECOS2WB121CA             |
| 150                            | 25 x 40            | 0.79                         | 1.11      | 1.105                       | 0.387 | ECOS2WB151CA             |
| 180                            | 25 x 45            | 0.87                         | 1.22      | 0.921                       | 0.322 | ECOS2WB181CA             |
| 220                            | 25 x 50            | 1.00                         | 1.40      | 0.754                       | 0.264 | ECOS2WB221CA             |
| 120                            | 30 x 25            | 0.72                         | 1.01      | 1.382                       | 0.484 | ECOS2WB121DA             |
| 150                            | 30 x 30            | 0.79                         | 1.11      | 1.105                       | 0.387 | ECOS2WB151DA             |
| 180                            | 30 x 35            | 0.87                         | 1.22      | 0.921                       | 0.322 | ECOS2WB181DA             |
| 220                            | 30 x 40            | 1.00                         | 1.40      | 0.754                       | 0.264 | ECOS2WB221DA             |
| 270                            | 30 x 45            | 1.19                         | 1.67      | 0.614                       | 0.215 | ECOS2WB271DA             |
| 330                            | 30 x 50            | 1.38                         | 1.93      | 0.502                       | 0.176 | ECOS2WB331DA             |
| 150                            | 35 x 25            | 0.79                         | 1.11      | 1.105                       | 0.387 | ECOS2WB151EA             |
| 220                            | 35 x 30            | 1.00                         | 1.40      | 0.754                       | 0.264 | ECOS2WB221EA             |
| 270                            | 35 x 35            | 1.19                         | 1.67      | 0.614                       | 0.215 | ECOS2WB271EA             |
| 330                            | 35 x 40            | 1.38                         | 1.93      | 0.502                       | 0.176 | ECOS2WB331EA             |
| 390                            | 35 x 45            | 1.55                         | 2.17      | 0.425                       | 0.149 | ECOS2WB391EA             |
| 470                            | 35 x 50            | 1.74                         | 2.44      | 0.353                       | 0.123 | ECOS2WB471EA             |
| 390                            | 40 x 40            | 1.68                         | 2.35      | 0.425                       | 0.170 | ECOS2WB391FA             |
| 560                            | 40 x 50            | 2.17                         | 3.04      | 0.296                       | 0.118 | ECOS2WB561FA             |

## TS-XB Series two terminal snap-in

- 7000 hour life at 105°C
- Suitable for long life industrial applications
- Very compact size (40 ~ 60% smaller than TS - NXA series)
- Can vent construction



|                        |                                                                         |               |
|------------------------|-------------------------------------------------------------------------|---------------|
| Rated Working Voltage: | 160 ~ 250 VDC                                                           | 315 ~ 450 VDC |
| Operating Temperature: | -40 ~ +105°C                                                            | -25 ~ +105°C  |
| Nominal Capacitance:   | 180 ~ 2200μF                                                            | 39 ~ 680μF    |
| Capacitance Tolerance: | ± 20%                                                                   |               |
| Dissipation Factor:    | 15% maximum (120Hz, +20°C)                                              |               |
| Endurance:             | 7000 hours at +105°C with maximum specified ripple current (see page 4) |               |

### Part Number System

**E E T**  
Common Code/  
Terminal Type

**X B**  
Series  
Code

**□ □**  
Voltage

**□ □ □**  
Capacitance  
Code

**□ □**  
Case Dia. /  
Terminal

| Case Dia. | Terminal Length |       |
|-----------|-----------------|-------|
|           | 6.3mm           | 4.0mm |
| 22mm      | B               | H     |
| 25mm      | C               | J     |
| 30mm      | D               | K     |
| 35mm      | E               | L     |

Top Vinyl Plate

|   |               |
|---|---------------|
| A | With plate    |
| B | Without plate |

### TS-XB Standard Ratings

| Cap.<br>(μF)                   | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> )<br>120Hz | 10k-50kHz | 20°C ESR (Ω, max.)<br>120Hz | 20kHz | Panasonic<br>Part Number |
|--------------------------------|--------------------|---------------------------------------------|-----------|-----------------------------|-------|--------------------------|
| 160 VDC Working, 200 VDC Surge |                    |                                             |           |                             |       |                          |
| 270                            | 22 x 25            | 1.10                                        | 1.54      | 0.655                       | 0.295 | EETXB2C271B□             |
| 330                            | 22 x 30            | 1.20                                        | 1.68      | 0.536                       | 0.241 | EETXB2C331B□             |
| 390                            | 22 x 30            | 1.30                                        | 1.82      | 0.453                       | 0.204 | EETXB2C391B□             |
| 470                            | 22 x 35            | 1.40                                        | 1.96      | 0.376                       | 0.169 | EETXB2C471B□             |
| 560                            | 22 x 40            | 1.50                                        | 2.10      | 0.316                       | 0.142 | EETXB2C561B□             |
| 680                            | 22 x 45            | 1.70                                        | 2.38      | 0.260                       | 0.117 | EETXB2C681B□             |
| 390                            | 25 x 25            | 1.30                                        | 1.82      | 0.453                       | 0.204 | EETXB2C391C□             |
| 470                            | 25 x 30            | 1.40                                        | 1.96      | 0.376                       | 0.169 | EETXB2C471C□             |
| 560                            | 25 x 30            | 1.50                                        | 2.10      | 0.316                       | 0.142 | EETXB2C561C□             |
| 680                            | 25 x 35            | 1.70                                        | 2.38      | 0.260                       | 0.117 | EETXB2C681C□             |
| 820                            | 25 x 40            | 2.00                                        | 2.80      | 0.216                       | 0.097 | EETXB2C821C□             |
| 1000                           | 25 x 45            | 2.20                                        | 3.08      | 0.177                       | 0.080 | EETXB2C102C□             |
| 1200                           | 25 x 50            | 2.30                                        | 3.22      | 0.160                       | 0.080 | EETXB2C122C□             |
| 560                            | 30 x 25            | 1.50                                        | 2.10      | 0.316                       | 0.142 | EETXB2C561D□             |
| 680                            | 30 x 30            | 1.70                                        | 2.38      | 0.260                       | 0.117 | EETXB2C681D□             |
| 820                            | 30 x 30            | 2.00                                        | 2.80      | 0.216                       | 0.097 | EETXB2C821D□             |
| 1000                           | 30 x 35            | 2.20                                        | 3.08      | 0.177                       | 0.080 | EETXB2C102D□             |
| 1200                           | 30 x 40            | 2.30                                        | 3.22      | 0.160                       | 0.080 | EETXB2C122D□             |
| 1500                           | 30 x 45            | 2.50                                        | 3.50      | 0.128                       | 0.064 | EETXB2C152D□             |
| 1800                           | 30 x 50            | 2.70                                        | 3.78      | 0.115                       | 0.057 | EETXB2C182D□             |
| 1200                           | 35 x 35            | 2.30                                        | 3.22      | 0.160                       | 0.080 | EETXB2C122E□             |
| 1500                           | 35 x 35            | 2.50                                        | 3.50      | 0.128                       | 0.064 | EETXB2C152E□             |
| 1800                           | 35 x 40            | 2.70                                        | 3.78      | 0.115                       | 0.057 | EETXB2C182E□             |
| 2200                           | 35 x 50            | 2.90                                        | 4.06      | 0.094                       | 0.056 | EETXB2C222E□             |
| 180 VDC Working, 225 VDC Surge |                    |                                             |           |                             |       |                          |
| 220                            | 22 x 25            | 1.00                                        | 1.40      | 0.804                       | 0.36  | EETXB2P221B□             |
| 270                            | 22 x 25            | 1.10                                        | 1.54      | 0.655                       | 0.29  | EETXB2P271B□             |
| 330                            | 22 x 30            | 1.20                                        | 1.68      | 0.536                       | 0.24  | EETXB2P331B□             |
| 390                            | 22 x 30            | 1.30                                        | 1.82      | 0.453                       | 0.20  | EETXB2P391B□             |
| 470                            | 22 x 35            | 1.40                                        | 1.96      | 0.376                       | 0.17  | EETXB2P471B□             |
| 560                            | 22 x 40            | 1.50                                        | 2.10      | 0.316                       | 0.14  | EETXB2P561B□             |
| 680                            | 22 x 50            | 1.70                                        | 2.38      | 0.260                       | 0.12  | EETXB2P681B□             |
| 330                            | 25 x 25            | 1.20                                        | 1.68      | 0.536                       | 0.24  | EETXB2P331C□             |
| 390                            | 25 x 25            | 1.30                                        | 1.82      | 0.453                       | 0.20  | EETXB2P391C□             |
| 470                            | 25 x 30            | 1.40                                        | 1.96      | 0.376                       | 0.17  | EETXB2P471C□             |
| 560                            | 25 x 35            | 1.50                                        | 2.10      | 0.316                       | 0.14  | EETXB2P561C□             |
| 680                            | 25 x 40            | 1.70                                        | 2.38      | 0.260                       | 0.12  | EETXB2P681C□             |
| 820                            | 25 x 45            | 2.00                                        | 2.80      | 0.216                       | 0.10  | EETXB2P821C□             |
| 470                            | 30 x 25            | 1.40                                        | 1.96      | 0.376                       | 0.17  | EETXB2P471D□             |
| 560                            | 30 x 25            | 1.50                                        | 2.10      | 0.316                       | 0.14  | EETXB2P561D□             |
| 680                            | 30 x 30            | 1.70                                        | 2.38      | 0.260                       | 0.12  | EETXB2P681D□             |
| 820                            | 30 x 35            | 2.00                                        | 2.80      | 0.234                       | 0.11  | EETXB2P821D□             |
| 1000                           | 30 x 40            | 2.20                                        | 3.08      | 0.192                       | 0.10  | EETXB2P102D□             |
| 1200                           | 30 x 45            | 2.30                                        | 3.22      | 0.160                       | 0.08  | EETXB2P122D□             |
| 1500                           | 30 x 50            | 2.50                                        | 3.50      | 0.138                       | 0.07  | EETXB2P152D□             |
| 820                            | 35 x 30            | 2.00                                        | 2.80      | 0.234                       | 0.11  | EETXB2P821E□             |
| 1000                           | 35 x 30            | 2.20                                        | 3.08      | 0.192                       | 0.10  | EETXB2P102E□             |
| 1200                           | 35 x 35            | 2.30                                        | 3.22      | 0.172                       | 0.09  | EETXB2P122E□             |
| 1500                           | 35 x 40            | 2.50                                        | 3.50      | 0.138                       | 0.07  | EETXB2P152E□             |
| 1800                           | 35 x 45            | 2.70                                        | 3.78      | 0.115                       | 0.07  | EETXB2P182E□             |
| 2200                           | 35 x 50            | 2.90                                        | 4.06      | 0.094                       | 0.06  | EETXB2P222E□             |

## TS-XB Standard Ratings (continued)

| Cap.<br>( $\mu$ F)             | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |       | Panasonic<br>Part Number |
|--------------------------------|--------------------|------------------------------|-----------|-----------------------------|-------|--------------------------|
|                                |                    | 120Hz                        | 10k-50kHz | 120Hz                       | 20kHz |                          |
| 200 VDC Working, 250 VDC Surge |                    |                              |           |                             |       |                          |
| 220                            | 22 x 25            | 1.00                         | 1.40      | 0.804                       | 0.36  | EETXB2D221B□             |
| 270                            | 22 x 30            | 1.10                         | 1.54      | 0.655                       | 0.29  | EETXB2D271B□             |
| 330                            | 22 x 30            | 1.20                         | 1.68      | 0.536                       | 0.24  | EETXB2D331B□             |
| 390                            | 22 x 35            | 1.30                         | 1.82      | 0.453                       | 0.20  | EETXB2D391B□             |
| 470                            | 22 x 40            | 1.40                         | 1.96      | 0.376                       | 0.17  | EETXB2D471B□             |
| 560                            | 22 x 45            | 1.50                         | 2.10      | 0.316                       | 0.14  | EETXB2D561B□             |
| 270                            | 25 x 25            | 1.10                         | 1.54      | 0.655                       | 0.29  | EETXB2D271C□             |
| 330                            | 25 x 25            | 1.20                         | 1.68      | 0.536                       | 0.24  | EETXB2D331C□             |
| 390                            | 25 x 30            | 1.30                         | 1.82      | 0.453                       | 0.20  | EETXB2D391C□             |
| 470                            | 25 x 35            | 1.40                         | 1.96      | 0.376                       | 0.17  | EETXB2D471C□             |
| 560                            | 25 x 35            | 1.50                         | 2.10      | 0.316                       | 0.14  | EETXB2D561C□             |
| 680                            | 25 x 40            | 1.70                         | 2.38      | 0.260                       | 0.12  | EETXB2D681C□             |
| 820                            | 25 x 50            | 2.00                         | 2.80      | 0.216                       | 0.10  | EETXB2D821C□             |
| 390                            | 30 x 25            | 1.30                         | 1.82      | 0.453                       | 0.20  | EETXB2D391D□             |
| 470                            | 30 x 30            | 1.40                         | 1.96      | 0.376                       | 0.17  | EETXB2D471D□             |
| 560                            | 30 x 30            | 1.50                         | 2.10      | 0.316                       | 0.14  | EETXB2D561D□             |
| 680                            | 30 x 35            | 1.70                         | 2.38      | 0.260                       | 0.12  | EETXB2D681D□             |
| 820                            | 30 x 40            | 2.00                         | 2.80      | 0.216                       | 0.10  | EETXB2D821D□             |
| 1000                           | 30 x 45            | 2.20                         | 3.08      | 0.177                       | 0.09  | EETXB2D102D□             |
| 1200                           | 30 x 50            | 2.30                         | 3.22      | 0.160                       | 0.08  | EETXB2D122D□             |
| 820                            | 35 x 30            | 2.00                         | 2.80      | 0.216                       | 0.10  | EETXB2D821E□             |
| 1000                           | 35 x 35            | 2.20                         | 3.08      | 0.177                       | 0.09  | EETXB2D102E□             |
| 1200                           | 35 x 40            | 2.30                         | 3.22      | 0.160                       | 0.08  | EETXB2D122E□             |
| 1500                           | 35 x 50            | 2.50                         | 3.50      | 0.128                       | 0.06  | EETXB2D152E□             |
| 250 VDC Working, 300 VDC Surge |                    |                              |           |                             |       |                          |
| 180                            | 22 x 30            | 0.90                         | 1.26      | 0.819                       | 0.41  | EETXB2E181B□             |
| 220                            | 22 x 30            | 1.00                         | 1.40      | 0.670                       | 0.33  | EETXB2E221B□             |
| 270                            | 22 x 35            | 1.10                         | 1.54      | 0.546                       | 0.27  | EETXB2E271B□             |
| 330                            | 22 x 40            | 1.20                         | 1.68      | 0.447                       | 0.22  | EETXB2E331B□             |
| 390                            | 22 x 45            | 1.30                         | 1.82      | 0.378                       | 0.19  | EETXB2E391B□             |
| 180                            | 25 x 25            | 0.90                         | 1.26      | 0.819                       | 0.41  | EETXB2E181C□             |
| 220                            | 25 x 25            | 1.00                         | 1.40      | 0.670                       | 0.33  | EETXB2E221C□             |
| 270                            | 25 x 30            | 1.10                         | 1.54      | 0.546                       | 0.27  | EETXB2E271C□             |
| 330                            | 25 x 35            | 1.20                         | 1.68      | 0.447                       | 0.22  | EETXB2E331C□             |
| 390                            | 25 x 35            | 1.30                         | 1.82      | 0.378                       | 0.19  | EETXB2E391C□             |
| 470                            | 25 x 45            | 1.40                         | 1.96      | 0.314                       | 0.16  | EETXB2E471C□             |
| 560                            | 25 x 50            | 1.50                         | 2.10      | 0.263                       | 0.13  | EETXB2E561C□             |
| 270                            | 30 x 25            | 1.10                         | 1.54      | 0.546                       | 0.27  | EETXB2E271D□             |
| 330                            | 30 x 25            | 1.20                         | 1.68      | 0.447                       | 0.22  | EETXB2E331D□             |
| 390                            | 30 x 30            | 1.30                         | 1.82      | 0.378                       | 0.19  | EETXB2E391D□             |
| 470                            | 30 x 35            | 1.40                         | 1.96      | 0.314                       | 0.16  | EETXB2E471D□             |
| 560                            | 30 x 35            | 1.50                         | 2.10      | 0.263                       | 0.13  | EETXB2E561D□             |
| 680                            | 30 x 45            | 1.70                         | 2.38      | 0.217                       | 0.12  | EETXB2E681D□             |
| 820                            | 30 x 50            | 2.00                         | 2.80      | 0.180                       | 0.10  | EETXB2E821D□             |
| 470                            | 35 x 30            | 1.40                         | 1.96      | 0.314                       | 0.16  | EETXB2E471E□             |
| 560                            | 35 x 30            | 1.50                         | 2.10      | 0.263                       | 0.13  | EETXB2E561E□             |
| 680                            | 35 x 35            | 1.70                         | 2.38      | 0.217                       | 0.12  | EETXB2E681E□             |
| 820                            | 35 x 40            | 2.00                         | 2.80      | 0.180                       | 0.10  | EETXB2E821E□             |
| 1000                           | 35 x 45            | 2.20                         | 3.08      | 0.177                       | 0.10  | EETXB2E102E□             |
| 1200                           | 35 x 50            | 2.30                         | 3.22      | 0.147                       | 0.09  | EETXB2E122E□             |
| 315 VDC Working, 365 VDC Surge |                    |                              |           |                             |       |                          |
| 82                             | 22 x 25            | 0.64                         | 0.90      | 1.797                       | 0.90  | EETXB2F820B□             |
| 100                            | 22 x 30            | 0.69                         | 0.97      | 1.474                       | 0.74  | EETXB2F101B□             |
| 120                            | 22 x 30            | 0.75                         | 1.05      | 1.228                       | 0.61  | EETXB2F121B□             |
| 150                            | 22 x 35            | 0.82                         | 1.15      | 0.982                       | 0.49  | EETXB2F151B□             |
| 180                            | 22 x 40            | 0.90                         | 1.26      | 0.819                       | 0.41  | EETXB2F181B□             |
| 220                            | 22 x 45            | 1.00                         | 1.40      | 0.737                       | 0.37  | EETXB2F221B□             |
| 120                            | 25 x 25            | 0.75                         | 1.05      | 1.228                       | 0.61  | EETXB2F121C□             |
| 150                            | 25 x 30            | 0.82                         | 1.15      | 0.982                       | 0.49  | EETXB2F151C□             |
| 180                            | 25 x 35            | 0.90                         | 1.26      | 0.819                       | 0.41  | EETXB2F181C□             |
| 220                            | 25 x 40            | 1.00                         | 1.40      | 0.737                       | 0.37  | EETXB2F221C□             |
| 270                            | 25 x 45            | 1.10                         | 1.54      | 0.600                       | 0.30  | EETXB2F271C□             |
| 330                            | 25 x 50            | 1.20                         | 1.68      | 0.491                       | 0.25  | EETXB2F331C□             |
| 150                            | 30 x 25            | 0.82                         | 1.15      | 0.982                       | 0.49  | EETXB2F151D□             |
| 180                            | 30 x 25            | 0.90                         | 1.26      | 0.819                       | 0.41  | EETXB2F181D□             |
| 220                            | 30 x 30            | 1.00                         | 1.40      | 0.737                       | 0.37  | EETXB2F221D□             |
| 270                            | 30 x 35            | 1.10                         | 1.54      | 0.600                       | 0.30  | EETXB2F271D□             |
| 330                            | 30 x 40            | 1.20                         | 1.68      | 0.491                       | 0.25  | EETXB2F331D□             |
| 390                            | 30 x 45            | 1.30                         | 1.82      | 0.453                       | 0.23  | EETXB2F391D□             |
| 470                            | 30 x 50            | 1.40                         | 1.96      | 0.376                       | 0.19  | EETXB2F471D□             |
| 270                            | 35 x 30            | 1.10                         | 1.54      | 0.600                       | 0.30  | EETXB2F271E□             |
| 330                            | 35 x 30            | 1.20                         | 1.68      | 0.491                       | 0.25  | EETXB2F331E□             |
| 390                            | 35 x 35            | 1.30                         | 1.82      | 0.453                       | 0.23  | EETXB2F391E□             |
| 470                            | 35 x 40            | 1.40                         | 1.96      | 0.376                       | 0.19  | EETXB2F471E□             |
| 560                            | 35 x 45            | 1.50                         | 2.10      | 0.316                       | 0.16  | EETXB2F561E□             |
| 680                            | 35 x 50            | 1.70                         | 2.38      | 0.260                       | 0.14  | EETXB2F681E□             |
| 350 VDC Working, 400 VDC Surge |                    |                              |           |                             |       |                          |
| 82                             | 22 x 25            | 0.64                         | 0.90      | 1.797                       | 0.90  | EETXB2V820B□             |
| 100                            | 22 x 30            | 0.69                         | 0.97      | 1.474                       | 0.74  | EETXB2V101B□             |
| 120                            | 22 x 35            | 0.75                         | 1.05      | 1.228                       | 0.61  | EETXB2V121B□             |
| 150                            | 22 x 40            | 0.82                         | 1.15      | 0.982                       | 0.49  | EETXB2V151B□             |
| 180                            | 22 x 45            | 0.90                         | 1.26      | 0.819                       | 0.41  | EETXB2V181B□             |
| 220                            | 22 x 50            | 1.00                         | 1.40      | 0.737                       | 0.37  | EETXB2V221B□             |
| 100                            | 25 x 25            | 0.69                         | 0.97      | 1.474                       | 0.74  | EETXB2V101C□             |
| 120                            | 25 x 30            | 0.75                         | 1.05      | 1.228                       | 0.61  | EETXB2V121C□             |
| 150                            | 25 x 30            | 0.82                         | 1.15      | 0.982                       | 0.49  | EETXB2V151C□             |
| 180                            | 25 x 35            | 0.90                         | 1.26      | 0.819                       | 0.41  | EETXB2V181C□             |
| 220                            | 25 x 40            | 1.00                         | 1.40      | 0.737                       | 0.37  | EETXB2V221C□             |
| 270                            | 25 x 50            | 1.10                         | 1.54      | 0.600                       | 0.30  | EETXB2V271C□             |
| 150                            | 30 x 25            | 0.82                         | 1.15      | 0.982                       | 0.49  | EETXB2V151D□             |
| 180                            | 30 x 30            | 0.90                         | 1.26      | 0.819                       | 0.41  | EETXB2V181D□             |
| 220                            | 30 x 30            | 1.00                         | 1.40      | 0.737                       | 0.37  | EETXB2V221D□             |
| 270                            | 30 x 35            | 1.10                         | 1.54      | 0.600                       | 0.30  | EETXB2V271D□             |
| 330                            | 30 x 45            | 1.20                         | 1.68      | 0.491                       | 0.25  | EETXB2V331D□             |
| 390                            | 30 x 50            | 1.30                         | 1.82      | 0.453                       | 0.23  | EETXB2V391D□             |
| 270                            | 35 x 30            | 1.10                         | 1.54      | 0.600                       | 0.30  | EETXB2V271E□             |
| 330                            | 35 x 35            | 1.20                         | 1.68      | 0.491                       | 0.25  | EETXB2V331E□             |
| 390                            | 35 x 40            | 1.30                         | 1.82      | 0.453                       | 0.23  | EETXB2V391E□             |
| 470                            | 35 x 40            | 1.40                         | 1.96      | 0.376                       | 0.19  | EETXB2V471E□             |
| 560                            | 35 x 50            | 1.50                         | 2.10      | 0.316                       | 0.16  | EETXB2V561E□             |

## TS-XB Standard Ratings (continued)

| Cap.<br>( $\mu$ F)             | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |       | Panasonic<br>Part Number |
|--------------------------------|--------------------|------------------------------|-----------|-----------------------------|-------|--------------------------|
|                                |                    | 120Hz                        | 10k-50kHz | 120Hz                       | 20kHz |                          |
| 400 VDC Working, 450 VDC Surge |                    |                              |           |                             |       |                          |
| 56                             | 22 x 25            | 0.51                         | 0.71      | 2.631                       | 0.92  | EETXB2G560B□             |
| 68                             | 22 x 30            | 0.56                         | 0.78      | 2.167                       | 0.76  | EETXB2G680B□             |
| 82                             | 22 x 35            | 0.64                         | 0.90      | 1.797                       | 0.63  | EETXB2G820B□             |
| 100                            | 22 x 35            | 0.69                         | 0.97      | 1.474                       | 0.52  | EETXB2G101B□             |
| 120                            | 22 x 40            | 0.75                         | 1.05      | 1.228                       | 0.43  | EETXB2G121B□             |
| 150                            | 22 x 50            | 0.82                         | 1.15      | 0.982                       | 0.34  | EETXB2G151B□             |
| 68                             | 25 x 25            | 0.56                         | 0.78      | 2.167                       | 0.76  | EETXB2G680C□             |
| 82                             | 25 x 25            | 0.64                         | 0.90      | 1.797                       | 0.63  | EETXB2G820C□             |
| 100                            | 25 x 30            | 0.69                         | 0.97      | 1.474                       | 0.52  | EETXB2G101C□             |
| 120                            | 25 x 35            | 0.75                         | 1.05      | 1.228                       | 0.43  | EETXB2G121C□             |
| 150                            | 25 x 40            | 0.82                         | 1.15      | 0.982                       | 0.34  | EETXB2G151C□             |
| 180                            | 25 x 45            | 0.90                         | 1.26      | 0.819                       | 0.29  | EETXB2G181C□             |
| 220                            | 25 x 50            | 1.00                         | 1.40      | 0.670                       | 0.23  | EETXB2G221C□             |
| 120                            | 30 x 25            | 0.75                         | 1.05      | 1.228                       | 0.43  | EETXB2G121D□             |
| 150                            | 30 x 30            | 0.82                         | 1.15      | 0.982                       | 0.34  | EETXB2G151D□             |
| 180                            | 30 x 35            | 0.90                         | 1.26      | 0.819                       | 0.29  | EETXB2G181D□             |
| 220                            | 30 x 40            | 1.00                         | 1.40      | 0.670                       | 0.23  | EETXB2G221D□             |
| 270                            | 30 x 45            | 1.10                         | 1.54      | 0.546                       | 0.19  | EETXB2G271D□             |
| 330                            | 30 x 50            | 1.20                         | 1.68      | 0.447                       | 0.18  | EETXB2G331D□             |
| 180                            | 35 x 25            | 0.90                         | 1.26      | 0.819                       | 0.29  | EETXB2G181E□             |
| 220                            | 35 x 30            | 1.00                         | 1.40      | 0.670                       | 0.23  | EETXB2G221E□             |
| 270                            | 35 x 35            | 1.10                         | 1.54      | 0.546                       | 0.19  | EETXB2G271E□             |
| 330                            | 35 x 40            | 1.20                         | 1.68      | 0.447                       | 0.18  | EETXB2G331E□             |
| 390                            | 35 x 45            | 1.30                         | 1.82      | 0.378                       | 0.15  | EETXB2G391E□             |
| 470                            | 35 x 50            | 1.40                         | 1.96      | 0.314                       | 0.13  | EETXB2G471E□             |

| Cap.<br>( $\mu$ F)             | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |       | Panasonic<br>Part Number |
|--------------------------------|--------------------|------------------------------|-----------|-----------------------------|-------|--------------------------|
|                                |                    | 120Hz                        | 10k-50kHz | 120Hz                       | 20kHz |                          |
| 450 VDC Working, 500 VDC Surge |                    |                              |           |                             |       |                          |
| 39                             | 22 x 25            | 0.37                         | 0.52      | 3.779                       | 1.32  | EETXB2W390B□             |
| 47                             | 22 x 30            | 0.40                         | 0.56      | 3.135                       | 1.10  | EETXB2W470B□             |
| 56                             | 22 x 35            | 0.47                         | 0.66      | 2.631                       | 0.92  | EETXB2W560B□             |
| 68                             | 22 x 40            | 0.53                         | 0.74      | 2.167                       | 0.76  | EETXB2W680B□             |
| 82                             | 22 x 45            | 0.56                         | 0.78      | 1.797                       | 0.63  | EETXB2W820B□             |
| 100                            | 22 x 50            | 0.64                         | 0.90      | 1.474                       | 0.52  | EETXB2W101B□             |
| 56                             | 25 x 25            | 0.47                         | 0.66      | 2.631                       | 0.92  | EETXB2W560C□             |
| 68                             | 25 x 30            | 0.53                         | 0.74      | 2.167                       | 0.76  | EETXB2W680C□             |
| 82                             | 25 x 35            | 0.56                         | 0.78      | 1.797                       | 0.63  | EETXB2W820C□             |
| 100                            | 25 x 40            | 0.64                         | 0.90      | 1.474                       | 0.52  | EETXB2W101C□             |
| 120                            | 25 x 45            | 0.72                         | 1.01      | 1.228                       | 0.43  | EETXB2W121C□             |
| 150                            | 25 x 50            | 0.79                         | 1.11      | 0.982                       | 0.34  | EETXB2W151C□             |
| 82                             | 30 x 25            | 0.56                         | 0.78      | 1.797                       | 0.63  | EETXB2W820D□             |
| 100                            | 30 x 30            | 0.64                         | 0.90      | 1.474                       | 0.52  | EETXB2W101D□             |
| 120                            | 30 x 30            | 0.72                         | 1.01      | 1.228                       | 0.43  | EETXB2W121D□             |
| 150                            | 30 x 40            | 0.79                         | 1.11      | 0.982                       | 0.34  | EETXB2W151D□             |
| 180                            | 30 x 45            | 0.87                         | 1.22      | 0.819                       | 0.29  | EETXB2W181D□             |
| 220                            | 30 x 50            | 1.00                         | 1.40      | 0.670                       | 0.23  | EETXB2W221D□             |
| 150                            | 35 x 30            | 0.79                         | 1.11      | 0.982                       | 0.34  | EETXB2W151E□             |
| 180                            | 35 x 35            | 0.87                         | 1.22      | 0.819                       | 0.29  | EETXB2W181E□             |
| 220                            | 35 x 40            | 1.00                         | 1.40      | 0.670                       | 0.23  | EETXB2W221E□             |
| 270                            | 35 x 45            | 1.19                         | 1.67      | 0.546                       | 0.19  | EETXB2W271E□             |
| 330                            | 35 x 50            | 1.38                         | 1.93      | 0.447                       | 0.16  | EETXB2W331E□             |

- High reliability design for abnormal overvoltage conditions
- 2000 hour, 105°C endurance with high ripple current capability
- VDE-0806 Specification

|                              |                                                                                                                                                                                     |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rated Working Voltage:       | 250 VDC                                                                                                                                                                             |
| Operating Temperature:       | -40 ~ +105°C                                                                                                                                                                        |
| Nominal Capacitance:         | 100 ~ 1200μF                                                                                                                                                                        |
| Dissipation Factor:          | 20% max. (120 Hz, +20°C)                                                                                                                                                            |
| Endurance:                   | 2000 hours at +105°C with maximum specified ripple current (see page 4)                                                                                                             |
| Overvoltage Characteristics: | Capacitor shall not vent or short-circuit when 360 VDC is applied for a time period of 7 hours;<br>Condition A: 70°C ambient temperature      Condition B: 35°C ambient temperature |

Common Code/  
Terminal Type

Voltage  
Code

Series

Capacitance  
Code

Case  
Diameter

Overvoltage Temperature

|      |                                  |
|------|----------------------------------|
| ECOS | 6.3mm length terminal (Standard) |
| ECEC | 4.0mm length terminal            |

|   |                    |
|---|--------------------|
| X | Condition A (70°C) |
| K | Condition B (35°C) |

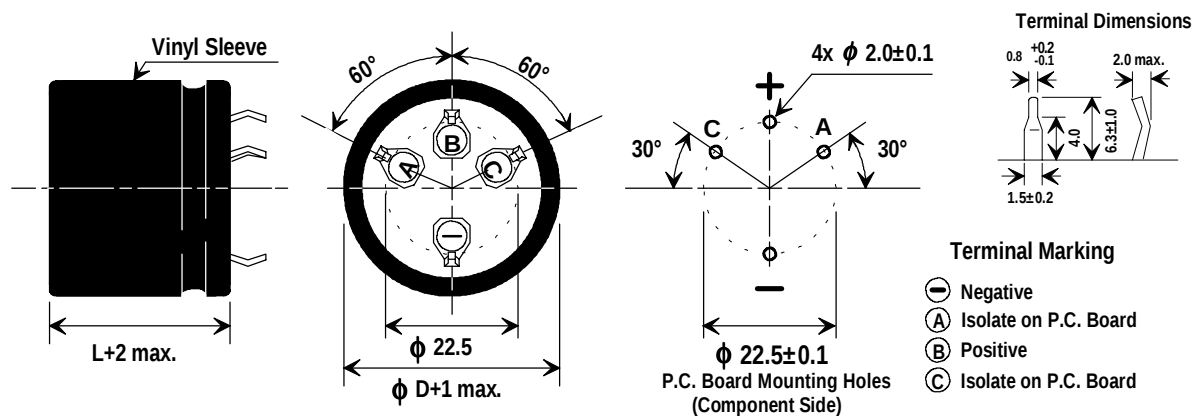
| Cap.<br>(μF)                        | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> )<br>120Hz 10k~50kHz |      | Max 20°C ESR (Ω)<br>120Hz 20kHz |       | Panasonic<br>Part Number |
|-------------------------------------|--------------------|-------------------------------------------------------|------|---------------------------------|-------|--------------------------|
| 250 VDC Working, Condition A (70°C) |                    |                                                       |      |                                 |       |                          |
| 100                                 | 22 x 25            | 0.70                                                  | 0.98 | 1.768                           | 0.884 | ECOS2EG101DX             |
| 120                                 | 22 x 30            | 0.75                                                  | 1.05 | 1.474                           | 0.737 | ECOS2EG121EX             |
| 150                                 | 22 x 30            | 0.80                                                  | 1.12 | 1.179                           | 0.589 | ECOS2EG151EX             |
| 180                                 | 22 x 35            | 0.90                                                  | 1.26 | 0.982                           | 0.491 | ECOS2EG181FX             |
| 220                                 | 22 x 40            | 1.00                                                  | 1.40 | 0.804                           | 0.402 | ECOS2EG221GX             |
| 270                                 | 22 x 45            | 1.10                                                  | 1.54 | 0.655                           | 0.327 | ECOS2EG271GX             |
| 330                                 | 22 x 50            | 1.20                                                  | 1.68 | 0.536                           | 0.268 | ECOS2EG331HX             |
| 150                                 | 25 x 25            | 0.80                                                  | 1.12 | 1.179                           | 0.589 | ECOS2EG151JX             |
| 180                                 | 25 x 30            | 0.90                                                  | 1.26 | 0.982                           | 0.491 | ECOS2EG181KX             |
| 220                                 | 25 x 30            | 1.00                                                  | 1.40 | 0.804                           | 0.402 | ECOS2EG221KX             |
| 270                                 | 25 x 35            | 1.10                                                  | 1.54 | 0.655                           | 0.327 | ECOS2EG271LX             |
| 330                                 | 25 x 40            | 1.20                                                  | 1.68 | 0.536                           | 0.268 | ECOS2EG331MX             |
| 390                                 | 25 x 45            | 1.30                                                  | 1.82 | 0.453                           | 0.227 | ECOS2EG391MX             |
| 470                                 | 25 x 50            | 1.40                                                  | 1.96 | 0.376                           | 0.188 | ECOS2EG471NX             |
| 220                                 | 30 x 25            | 1.00                                                  | 1.40 | 0.804                           | 0.402 | ECOS2EG221QX             |
| 270                                 | 30 x 30            | 1.10                                                  | 1.54 | 0.655                           | 0.327 | ECOS2EG271RX             |
| 330                                 | 30 x 30            | 1.20                                                  | 1.68 | 0.536                           | 0.268 | ECOS2EG331RX             |
| 390                                 | 30 x 35            | 1.30                                                  | 1.82 | 0.453                           | 0.227 | ECOS2EG391SX             |
| 470                                 | 30 x 40            | 1.40                                                  | 1.96 | 0.376                           | 0.188 | ECOS2EG471TX             |
| 560                                 | 30 x 45            | 1.50                                                  | 2.10 | 0.316                           | 0.158 | ECOS2EG561TX             |
| 680                                 | 30 x 50            | 1.70                                                  | 2.38 | 0.260                           | 0.130 | ECOS2EG681UX             |
| 330                                 | 35 x 25            | 1.20                                                  | 1.68 | 0.536                           | 0.268 | ECOS2EG331WX             |
| 390                                 | 35 x 30            | 1.30                                                  | 1.82 | 0.453                           | 0.227 | ECOS2EG391XX             |
| 470                                 | 35 x 30            | 1.40                                                  | 1.96 | 0.376                           | 0.188 | ECOS2EG471XX             |
| 560                                 | 35 x 35            | 1.50                                                  | 2.10 | 0.316                           | 0.158 | ECOS2EG561VX             |
| 680                                 | 35 x 40            | 1.70                                                  | 2.38 | 0.260                           | 0.130 | ECOS2EG681YX             |
| 820                                 | 35 x 45            | 2.00                                                  | 2.80 | 0.252                           | 0.126 | ECOS2EG821YX             |
| 1000                                | 35 x 50            | 2.20                                                  | 3.08 | 0.206                           | 0.103 | ECOS2EG102ZX             |

| Cap.<br>(μF)                        | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> )<br>120Hz 10k~50kHz |      | Max 20°C ESR (Ω)<br>120Hz 20kHz |       | Panasonic<br>Part Number |
|-------------------------------------|--------------------|-------------------------------------------------------|------|---------------------------------|-------|--------------------------|
| 250 VDC Working, Condition B (35°C) |                    |                                                       |      |                                 |       |                          |
| 120                                 | 22 x 25            | 0.75                                                  | 1.05 | 1.474                           | 0.737 | ECOS2EG121DK             |
| 150                                 | 22 x 30            | 0.80                                                  | 1.12 | 1.179                           | 0.589 | ECOS2EG151EK             |
| 180                                 | 22 x 30            | 0.90                                                  | 1.26 | 0.982                           | 0.491 | ECOS2EG181EK             |
| 220                                 | 22 x 35            | 1.00                                                  | 1.40 | 0.804                           | 0.402 | ECOS2EG221FK             |
| 270                                 | 22 x 40            | 1.10                                                  | 1.54 | 0.655                           | 0.327 | ECOS2EG271GK             |
| 330                                 | 22 x 45            | 1.20                                                  | 1.68 | 0.536                           | 0.268 | ECOS2EG331GK             |
| 390                                 | 22 x 50            | 1.30                                                  | 1.82 | 0.453                           | 0.227 | ECOS2EG391HK             |
| 180                                 | 25 x 25            | 0.90                                                  | 1.26 | 0.982                           | 0.491 | ECOS2EG181JK             |
| 220                                 | 25 x 30            | 1.00                                                  | 1.40 | 0.804                           | 0.402 | ECOS2EG221KK             |
| 270                                 | 25 x 30            | 1.10                                                  | 1.54 | 0.655                           | 0.327 | ECOS2EG271KK             |
| 330                                 | 25 x 35            | 1.20                                                  | 1.68 | 0.536                           | 0.268 | ECOS2EG331LK             |
| 390                                 | 25 x 40            | 1.30                                                  | 1.82 | 0.453                           | 0.227 | ECOS2EG391LK             |
| 470                                 | 25 x 45            | 1.40                                                  | 1.96 | 0.376                           | 0.188 | ECOS2EG471NK             |
| 560                                 | 25 x 50            | 1.50                                                  | 2.10 | 0.316                           | 0.158 | ECOS2EG561NK             |
| 270                                 | 30 x 25            | 1.10                                                  | 1.54 | 0.655                           | 0.327 | ECOS2EG271QK             |
| 330                                 | 30 x 30            | 1.20                                                  | 1.68 | 0.536                           | 0.268 | ECOS2EG331RK             |
| 390                                 | 30 x 30            | 1.30                                                  | 1.82 | 0.453                           | 0.227 | ECOS2EG391RK             |
| 470                                 | 30 x 35            | 1.40                                                  | 1.96 | 0.376                           | 0.188 | ECOS2EG471SK             |
| 560                                 | 30 x 40            | 1.50                                                  | 2.10 | 0.316                           | 0.158 | ECOS2EG561TK             |
| 680                                 | 30 x 45            | 1.70                                                  | 2.38 | 0.260                           | 0.130 | ECOS2EG681TK             |
| 820                                 | 30 x 50            | 2.00                                                  | 2.80 | 0.216                           | 0.108 | ECOS2EG821UK             |
| 390                                 |                    |                                                       |      |                                 |       |                          |

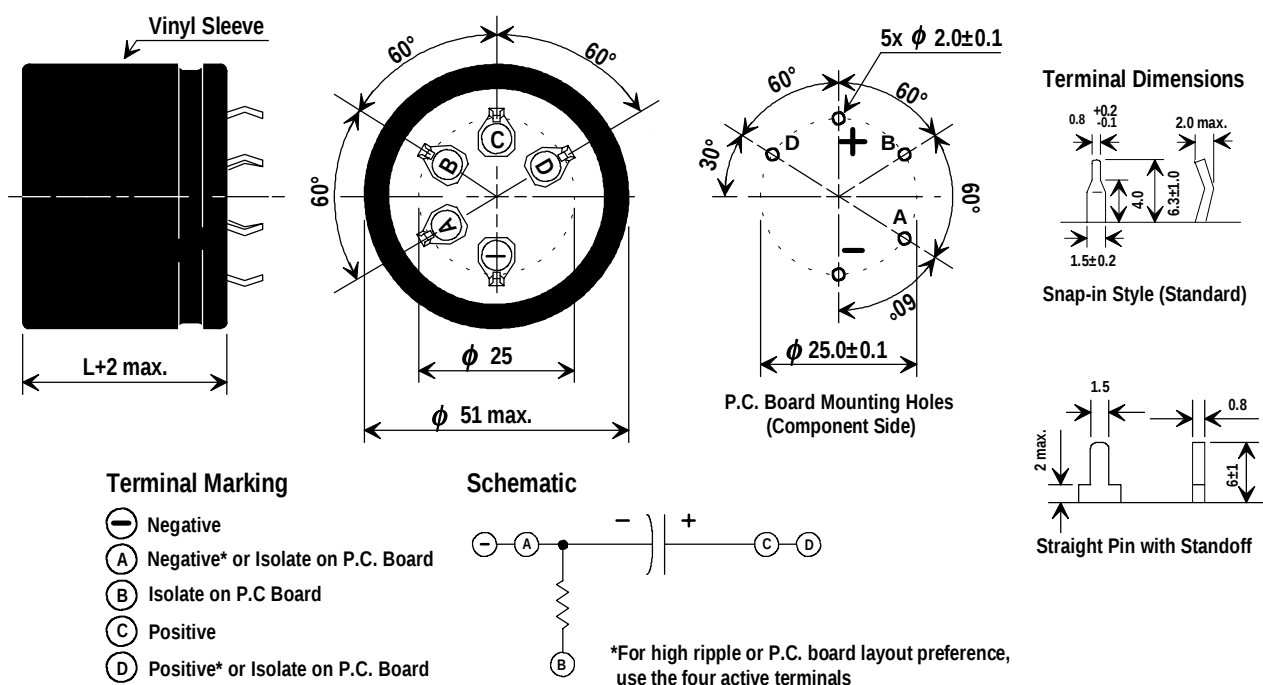
## T Type General Information

### Dimensions

#### T Type $\phi 35$ & 40mm Diameters



#### T Type $\phi 50$ mm Diameter



### Ripple Current Multipliers

| Ripple Current Frequency Correction Factors |      |      |         |      |      |         |
|---------------------------------------------|------|------|---------|------|------|---------|
| Frequency (Hz):                             | 50   | 60   | 100~120 | 500  | 1k   | 10k~50k |
| 16~100WV:                                   | 0.93 | 0.95 | 1.0     | 1.05 | 1.08 | 1.15    |
| 160~450WV:                                  | 0.75 | 0.8  | 1.0     | 1.2  | 1.25 | 1.4     |

| Ripple Current Temperature Correction Factors |       |      |      |      |       |
|-----------------------------------------------|-------|------|------|------|-------|
| Max. Temperature                              | 105°C | 85°C | 70°C | 60°C | ≤45°C |
| T-UP                                          | ---   | 1.0  | 1.3  | 1.4  | 1.5   |
| T-HA                                          | 1.0   | 1.7  | 2.0  | 2.2  | 2.35  |

Note: Use of temperature correction factors can limit load life to the hours specified for the maximum operating temperature of the series.

**T-UP Series** multi terminal snap-in

- **NEW** 50mm diameter sizes with five P. C. mount terminals
- **NEW** lengths up to 105mm
- Endurance rating of 3000 hours at 85°C
- 4 or 5 terminal mounting provides stability and keyed polarity
- Can vent construction



|                        |                                                                        |                               |
|------------------------|------------------------------------------------------------------------|-------------------------------|
| Rated Working Voltage: | 16 ~ 250 VDC                                                           | 350 ~ 500 VDC                 |
| Operating Temperature: | -40 ~ +85°C                                                            | -25 ~ +85°C                   |
| Nominal Capacitance:   | 1200 ~ 270000μF (±20% tolerance)                                       | 220 ~ 2700μF (±20% tolerance) |
| Endurance:             | 3000 hours at +85°C with maximum specified ripple current (see page 4) |                               |

**Part Number System**

|                                                 |                               |          |  |                     |               |                         |  |  |                      |                                                                  |
|-------------------------------------------------|-------------------------------|----------|--|---------------------|---------------|-------------------------|--|--|----------------------|------------------------------------------------------------------|
| <b>E</b>                                        | <b>C</b>                      | <b>E</b> |  |                     | <b>P</b>      |                         |  |  |                      | <b>A</b>                                                         |
| <b>T Type Common Code / Number of Terminals</b> |                               |          |  | <b>Voltage Code</b> | <b>Series</b> | <b>Capacitance Code</b> |  |  | <b>Diameter Code</b> | <b>Terminal Shape (see pg.23)</b>                                |
| <b>ECET</b>                                     | 4 terminal<br>φ35 & 40mm dia. |          |  |                     |               |                         |  |  |                      | <b>A</b> Snap-in (Standard)                                      |
| <b>ECEP</b>                                     | 5 terminal<br>φ 50mm dia.     |          |  |                     |               |                         |  |  |                      | <b>E</b> Straight pin with standoff<br>(Available on φ50mm dia.) |

**T-UP Standard Ratings**

| Cap.<br>(μF)                        | Size (mm)<br>D x L | Max 85°C R.C. (A <sub>rms</sub> )<br>120Hz | 10k-50kHz | Max 20°C E.S.R. (Ω)<br>120Hz | 20kHz | Panasonic<br>Part Number | Cap.<br>(μF)                        | Size (mm)<br>D x L | Max 85°C R.C. (A <sub>rms</sub> )<br>120Hz | 10k-50kHz | Max 20°C E.S.R. (Ω)<br>120Hz | 20kHz | Panasonic<br>Part Number |
|-------------------------------------|--------------------|--------------------------------------------|-----------|------------------------------|-------|--------------------------|-------------------------------------|--------------------|--------------------------------------------|-----------|------------------------------|-------|--------------------------|
| <b>16 VDC Working, 20 VDC Surge</b> |                    |                                            |           |                              |       |                          | <b>25 VDC Working, 32 VDC Surge</b> |                    |                                            |           |                              |       |                          |
| 47000                               | 35 x 40            | 7.47                                       | 8.59      | 0.021                        | 0.019 | ECET1CP473EA             | 33000                               | 35 x 40            | 6.84                                       | 7.87      | 0.019                        | 0.015 | ECET1EP333EA             |
| 68000                               | 35 x 50            | 9.05                                       | 10.41     | 0.018                        | 0.017 | ECET1CP683EA             | 47000                               | 35 x 50            | 8.00                                       | 9.20      | 0.014                        | 0.012 | ECET1EP473EA             |
| 82000                               | 35 x 63            | 10.02                                      | 11.52     | 0.016                        | 0.015 | ECET1CP823EA             | 56000                               | 35 x 63            | 8.85                                       | 10.18     | 0.015                        | 0.013 | ECET1EP563EA             |
| 100000                              | 35 x 80            | 11.00                                      | 12.65     | 0.015                        | 0.014 | ECET1CP104EA             | 68000                               | 35 x 80            | 10.43                                      | 11.99     | 0.013                        | 0.011 | ECET1EP683EA             |
| 120000                              | 35 x 105           | 12.81                                      | 14.73     | 0.014                        | 0.013 | ECET1CP124EA             | 100000                              | 35 x 105           | 11.97                                      | 13.77     | 0.010                        | 0.008 | ECET1EP104EA             |
| 56000                               | 40 x 40            | 9.05                                       | 10.41     | 0.022                        | 0.021 | ECET1CP563FA             | 39000                               | 40 x 40            | 8.00                                       | 9.20      | 0.020                        | 0.018 | ECET1EP393FA             |
| 82000                               | 40 x 50            | 10.29                                      | 11.83     | 0.016                        | 0.015 | ECET1CP823FA             | 56000                               | 40 x 50            | 8.96                                       | 10.30     | 0.016                        | 0.015 | ECET1EP563FA             |
| 100000                              | 40 x 63            | 11.36                                      | 13.06     | 0.018                        | 0.017 | ECET1CP104FA             | 68000                               | 40 x 63            | 10.25                                      | 11.79     | 0.017                        | 0.015 | ECET1EP683FA             |
| 120000                              | 40 x 80            | 12.42                                      | 14.28     | 0.017                        | 0.016 | ECET1CP124FA             | 100000                              | 40 x 80            | 12.08                                      | 13.89     | 0.012                        | 0.011 | ECET1EP104FA             |
| 180000                              | 40 x 105           | 14.85                                      | 17.08     | 0.013                        | 0.012 | ECET1CP184FA             | 150000                              | 40 x 105           | 14.07                                      | 16.18     | 0.011                        | 0.010 | ECET1EP154FA             |
| 120000                              | 50 x 50            | 13.17                                      | 15.15     | 0.014                        | 0.013 | ECEP1CP124HA             | 82000                               | 50 x 50            | 12.29                                      | 14.13     | 0.016                        | 0.015 | ECEP1EP823HA             |
| 150000                              | 50 x 63            | 14.40                                      | 16.56     | 0.012                        | 0.011 | ECEP1CP154HA             | 100000                              | 50 x 63            | 13.45                                      | 15.47     | 0.014                        | 0.013 | ECEP1EP104HA             |
| 180000                              | 50 x 80            | 15.69                                      | 18.04     | 0.011                        | 0.010 | ECEP1CP184HA             | 120000                              | 50 x 80            | 15.29                                      | 17.58     | 0.012                        | 0.011 | ECEP1EP124HA             |
| 220000                              | 50 x 92            | 16.73                                      | 19.24     | 0.010                        | 0.009 | ECEP1CP224HA             | 150000                              | 50 x 92            | 16.01                                      | 18.41     | 0.011                        | 0.010 | ECEP1EP154HA             |
| 270000                              | 50 x 105           | 17.79                                      | 20.46     | 0.009                        | 0.008 | ECEP1CP274HA             | 180000                              | 50 x 105           | 16.89                                      | 19.42     | 0.010                        | 0.009 | ECEP1EP184HA             |
| <b>35 VDC Working, 44 VDC Surge</b> |                    |                                            |           |                              |       |                          | <b>50 VDC Working, 63 VDC Surge</b> |                    |                                            |           |                              |       |                          |
| 22000                               | 35 x 40            | 6.10                                       | 7.02      | 0.026                        | 0.020 | ECET1VP223EA             | 15000                               | 35 x 40            | 6.44                                       | 7.41      | 0.028                        | 0.021 | ECET1HP153EA             |
| 33000                               | 35 x 50            | 7.15                                       | 8.22      | 0.018                        | 0.014 | ECET1VP333EA             | 22000                               | 35 x 50            | 7.57                                       | 8.71      | 0.021                        | 0.017 | ECET1HP223EA             |
| 39000                               | 35 x 63            | 7.94                                       | 9.13      | 0.015                        | 0.012 | ECET1VP393EA             | 27000                               | 35 x 63            | 8.31                                       | 9.56      | 0.018                        | 0.015 | ECET1HP273EA             |
| 47000                               | 35 x 80            | 9.53                                       | 10.96     | 0.014                        | 0.011 | ECET1VP473EA             | 33000                               | 35 x 80            | 9.23                                       | 10.61     | 0.015                        | 0.012 | ECET1HP333EA             |
| 68000                               | 35 x 105           | 10.62                                      | 12.21     | 0.010                        | 0.008 | ECET1VP683EA             | 47000                               | 35 x 105           | 10.27                                      | 11.81     | 0.014                        | 0.011 | ECET1HP473EA             |
| 27000                               | 40 x 40            | 6.84                                       | 7.87      | 0.021                        | 0.017 | ECET1VP273FA             | 18000                               | 40 x 40            | 6.94                                       | 7.98      | 0.023                        | 0.017 | ECET1HP183FA             |
| 39000                               | 40 x 50            | 7.98                                       | 9.18      | 0.017                        | 0.014 | ECET1VP393FA             | 27000                               | 40 x 50            | 8.12                                       | 9.34      | 0.018                        | 0.015 | ECET1HP273FA             |
| 47000                               | 40 x 63            | 9.58                                       | 11.02     | 0.016                        | 0.013 | ECET1VP473FA             | 33000                               | 40 x 63            | 9.10                                       | 10.47     | 0.018                        | 0.014 | ECET1HP333FA             |
| 56000                               | 40 x 80            | 10.30                                      | 11.85     | 0.015                        | 0.012 | ECET1VP563FA             | 39000                               | 40 x 80            | 10.12                                      | 11.64     | 0.015                        | 0.012 | ECET1HP393FA             |
| 82000                               | 40 x 105           | 12.02                                      | 13.82     | 0.012                        | 0.009 | ECET1VP823FA             | 56000                               | 40 x 105           | 11.47                                      | 13.19     | 0.012                        | 0.009 | ECET1HP563FA             |
| 56000                               | 50 x 50            | 10.94                                      | 12.58     | 0.015                        | 0.012 | ECEP1VP563HA             | 33000                               | 50 x 50            | 10.48                                      | 12.05     | 0.018                        | 0.014 | ECEP1HP333HA             |
| 68000                               | 50 x 63            | 11.93                                      | 13.72     | 0.013                        | 0.011 | ECEP1VP683HA             | 47000                               | 50 x 63            | 11.54                                      | 13.27     | 0.013                        | 0.010 | ECEP1HP473HA             |
| 82000                               | 50 x 80            | 13.06                                      | 15.02     | 0.012                        | 0.010 | ECEP1VP823HA             | 56000                               | 50 x 80            | 12.46                                      | 14.33     | 0.012                        | 0.009 | ECEP1HP563HA             |
| 100000                              | 50 x 92            | 13.97                                      | 16.07     | 0.011                        | 0.009 | ECEP1VP104HA             | 68000                               | 50 x 92            | 13.17                                      | 15.15     | 0.011                        | 0.009 | ECEP1HP683HA             |
| 120000                              | 50 x 105           | 14.86                                      | 17.09     | 0.010                        | 0.008 | ECEP1VP124HA             | 82000                               | 50 x 105           | 13.87                                      | 15.95     | 0.011                        | 0.008 | ECEP1HP823HA             |

## T-UP Standard Ratings (continued)

| Cap.<br>( $\mu$ F)             | Size (mm)<br>D x L | Max. 85°C R.C. ( $A_{rms}$ )<br>120 Hz | Max. 20°C E.S.R. ( $\Omega$ )<br>10k-50kHz | Max. 20°C E.S.R. ( $\Omega$ )<br>120Hz | Max. 20°C E.S.R. ( $\Omega$ )<br>20kHz | Panasonic<br>Part Number |
|--------------------------------|--------------------|----------------------------------------|--------------------------------------------|----------------------------------------|----------------------------------------|--------------------------|
| 63 VDC Working, 79 VDC Surge   |                    |                                        |                                            |                                        |                                        |                          |
| 10000                          | 35 x 40            | 6.52                                   | 7.50                                       | 0.041                                  | 0.033                                  | ECET1JP103EA             |
| 12000                          | 35 x 50            | 7.15                                   | 8.22                                       | 0.035                                  | 0.028                                  | ECET1JP123EA             |
| 15000                          | 35 x 63            | 7.71                                   | 8.87                                       | 0.028                                  | 0.022                                  | ECET1JP153EA             |
| 18000                          | 35 x 80            | 9.41                                   | 10.82                                      | 0.023                                  | 0.018                                  | ECET1JP183EA             |
| 27000                          | 35 x 105           | 10.38                                  | 11.94                                      | 0.015                                  | 0.012                                  | ECET1JP273EA             |
| 12000                          | 40 x 40            | 7.15                                   | 8.22                                       | 0.035                                  | 0.028                                  | ECET1JP123FA             |
| 15000                          | 40 x 50            | 7.53                                   | 8.66                                       | 0.033                                  | 0.027                                  | ECET1JP153FA             |
| 18000                          | 40 x 63            | 9.25                                   | 10.64                                      | 0.028                                  | 0.022                                  | ECET1JP183FA             |
| 27000                          | 40 x 80            | 9.97                                   | 11.47                                      | 0.018                                  | 0.015                                  | ECET1JP273FA             |
| 33000                          | 40 x 105           | 11.76                                  | 13.52                                      | 0.015                                  | 0.012                                  | ECET1JP333FA             |
| 27000                          | 50 x 50            | 10.86                                  | 12.49                                      | 0.018                                  | 0.015                                  | ECEP1JP273HA             |
| 33000                          | 50 x 63            | 11.67                                  | 13.42                                      | 0.017                                  | 0.013                                  | ECEP1JP333HA             |
| 47000                          | 50 x 80            | 12.78                                  | 14.70                                      | 0.013                                  | 0.010                                  | ECEP1JP473HA             |
| 51000                          | 50 x 92            | 13.34                                  | 15.34                                      | 0.012                                  | 0.010                                  | ECEP1JP513HA             |
| 56000                          | 50 x 105           | 13.93                                  | 16.02                                      | 0.012                                  | 0.009                                  | ECEP1JP563HA             |
| 100 VDC Working, 125 VDC Surge |                    |                                        |                                            |                                        |                                        |                          |
| 4700                           | 35 x 40            | 5.13                                   | 5.90                                       | 0.071                                  | 0.049                                  | ECET2AP472EA             |
| 6800                           | 35 x 50            | 6.60                                   | 7.59                                       | 0.049                                  | 0.037                                  | ECET2AP682EA             |
| 8200                           | 35 x 63            | 7.05                                   | 8.11                                       | 0.040                                  | 0.030                                  | ECET2AP822EA             |
| 10000                          | 35 x 80            | 7.74                                   | 8.90                                       | 0.033                                  | 0.025                                  | ECET2AP103EA             |
| 12000                          | 35 x 105           | 8.57                                   | 9.86                                       | 0.028                                  | 0.021                                  | ECET2AP123EA             |
| 5600                           | 40 x 40            | 5.75                                   | 6.61                                       | 0.059                                  | 0.044                                  | ECET2AP562FA             |
| 8200                           | 40 x 50            | 7.28                                   | 8.37                                       | 0.040                                  | 0.030                                  | ECET2AP822FA             |
| 10000                          | 40 x 63            | 7.97                                   | 9.17                                       | 0.033                                  | 0.025                                  | ECET2AP103FA             |
| 12000                          | 40 x 80            | 8.65                                   | 9.95                                       | 0.028                                  | 0.021                                  | ECET2AP123FA             |
| 15000                          | 40 x 105           | 10.12                                  | 11.64                                      | 0.022                                  | 0.017                                  | ECET2AP153FA             |
| 10000                          | 50 x 50            | 8.82                                   | 10.14                                      | 0.033                                  | 0.025                                  | ECEP2AP103HA             |
| 15000                          | 50 x 63            | 10.07                                  | 11.58                                      | 0.022                                  | 0.017                                  | ECEP2AP153HA             |
| 18000                          | 50 x 80            | 11.00                                  | 12.65                                      | 0.018                                  | 0.014                                  | ECEP2AP183HA             |
| 22000                          | 50 x 92            | 11.76                                  | 13.52                                      | 0.015                                  | 0.011                                  | ECEP2AP223HA             |
| 27000                          | 50 x 105           | 12.53                                  | 14.41                                      | 0.014                                  | 0.010                                  | ECEP2AP273HA             |
| 250 VDC Working, 300 VDC Surge |                    |                                        |                                            |                                        |                                        |                          |
| 1200                           | 35 x 40            | 3.32                                   | 4.65                                       | 0.166                                  | 0.083                                  | ECET2EP122EA             |
| 1500                           | 35 x 50            | 4.04                                   | 5.66                                       | 0.133                                  | 0.066                                  | ECET2EP152EA             |
| 1800                           | 35 x 63            | 4.49                                   | 6.29                                       | 0.111                                  | 0.055                                  | ECET2EP182EA             |
| 2200                           | 35 x 80            | 4.94                                   | 6.92                                       | 0.090                                  | 0.045                                  | ECET2EP222EA             |
| 3900                           | 35 x 105           | 7.47                                   | 10.46                                      | 0.051                                  | 0.026                                  | ECET2EP392EA             |
| 1500                           | 40 x 40            | 4.04                                   | 5.66                                       | 0.133                                  | 0.066                                  | ECET2EP152FA             |
| 1800                           | 40 x 50            | 4.49                                   | 6.29                                       | 0.111                                  | 0.055                                  | ECET2EP182FA             |
| 2200                           | 40 x 63            | 4.94                                   | 6.92                                       | 0.090                                  | 0.045                                  | ECET2EP222FA             |
| 3300                           | 40 x 80            | 7.00                                   | 9.80                                       | 0.060                                  | 0.030                                  | ECET2EP332FA             |
| 4700                           | 40 x 105           | 8.88                                   | 12.43                                      | 0.042                                  | 0.021                                  | ECET2EP472FA             |
| 2700                           | 50 x 50            | 6.77                                   | 7.79                                       | 0.074                                  | 0.037                                  | ECEP2EP272HA             |
| 3300                           | 50 x 63            | 7.79                                   | 10.91                                      | 0.060                                  | 0.030                                  | ECEP2EP332HA             |
| 4700                           | 50 x 80            | 9.65                                   | 13.51                                      | 0.042                                  | 0.021                                  | ECEP2EP472HA             |
| 5600                           | 50 x 92            | 10.80                                  | 15.12                                      | 0.036                                  | 0.018                                  | ECEP2EP562HA             |
| 6800                           | 50 x 105           | 12.16                                  | 17.02                                      | 0.029                                  | 0.015                                  | ECEP2EP682HA             |
| 400 VDC Working, 450 VDC Surge |                    |                                        |                                            |                                        |                                        |                          |
| 470                            | 35 x 40            | 2.39                                   | 3.35                                       | 0.388                                  | 0.136                                  | ECET2GP471EA             |
| 560                            | 35 x 50            | 2.72                                   | 3.81                                       | 0.326                                  | 0.114                                  | ECET2GP561EA             |
| 820                            | 35 x 63            | 3.55                                   | 4.97                                       | 0.222                                  | 0.078                                  | ECET2GP821EA             |
| 1200                           | 35 x 80            | 4.52                                   | 6.33                                       | 0.152                                  | 0.053                                  | ECET2GP122EA             |
| 1500                           | 35 x 105           | 5.44                                   | 7.62                                       | 0.122                                  | 0.043                                  | ECET2GP152EA             |
| 560                            | 40 x 40            | 2.69                                   | 3.77                                       | 0.326                                  | 0.114                                  | ECET2GP561FA             |
| 820                            | 40 x 50            | 3.38                                   | 4.73                                       | 0.222                                  | 0.078                                  | ECET2GP821FA             |
| 1200                           | 40 x 63            | 4.52                                   | 6.33                                       | 0.152                                  | 0.053                                  | ECET2GP122FA             |
| 1500                           | 40 x 80            | 5.50                                   | 7.70                                       | 0.122                                  | 0.043                                  | ECET2GP152FA             |
| 1800                           | 40 x 105           | 6.53                                   | 9.14                                       | 0.101                                  | 0.035                                  | ECET2GP182FA             |
| 1000                           | 50 x 50            | 4.76                                   | 5.47                                       | 0.199                                  | 0.080                                  | ECEP2GP102HA             |
| 1200                           | 50 x 63            | 5.47                                   | 7.66                                       | 0.166                                  | 0.066                                  | ECEP2GP122HA             |
| 1500                           | 50 x 80            | 6.47                                   | 9.06                                       | 0.133                                  | 0.053                                  | ECEP2GP152HA             |
| 1800                           | 50 x 92            | 7.35                                   | 10.29                                      | 0.111                                  | 0.044                                  | ECEP2GP182HA             |
| 2200                           | 50 x 105           | 8.43                                   | 11.80                                      | 0.090                                  | 0.036                                  | ECEP2GP222HA             |
| 80 VDC Working, 100 VDC Surge  |                    |                                        |                                            |                                        |                                        |                          |
| 6800                           | 35 x 40            | 5.16                                   | 5.93                                       | 0.046                                  | 0.035                                  | ECET1KP682EA             |
| 8200                           | 35 x 50            | 5.83                                   | 6.70                                       | 0.038                                  | 0.029                                  | ECET1KP822EA             |
| 10000                          | 35 x 63            | 6.38                                   | 7.34                                       | 0.033                                  | 0.025                                  | ECET1KP103EA             |
| 12000                          | 35 x 80            | 6.92                                   | 7.96                                       | 0.028                                  | 0.021                                  | ECET1KP123EA             |
| 22000                          | 35 x 105           | 9.86                                   | 11.34                                      | 0.015                                  | 0.011                                  | ECET1KP223EA             |
| 8200                           | 40 x 40            | 5.83                                   | 6.70                                       | 0.038                                  | 0.029                                  | ECET1KP822FA             |
| 10000                          | 40 x 50            | 6.56                                   | 7.54                                       | 0.033                                  | 0.025                                  | ECET1KP103FA             |
| 12000                          | 40 x 63            | 7.29                                   | 8.38                                       | 0.028                                  | 0.021                                  | ECET1KP123FA             |
| 15000                          | 40 x 80            | 8.93                                   | 10.27                                      | 0.024                                  | 0.018                                  | ECET1KP153FA             |
| 27000                          | 40 x 105           | 11.35                                  | 13.05                                      | 0.015                                  | 0.012                                  | ECET1KP273FA             |
| 18000                          | 50 x 50            | 10.00                                  | 11.50                                      | 0.023                                  | 0.017                                  | ECEP1KP183HA             |
| 22000                          | 50 x 63            | 11.08                                  | 12.74                                      | 0.019                                  | 0.014                                  | ECEP1KP223HA             |
| 27000                          | 50 x 80            | 12.33                                  | 14.18                                      | 0.015                                  | 0.012                                  | ECEP1KP273HA             |
| 33000                          | 50 x 92            | 13.37                                  | 15.38                                      | 0.014                                  | 0.010                                  | ECEP1KP333HA             |
| 39000                          | 50 x 105           | 14.34                                  | 16.49                                      | 0.013                                  | 0.010                                  | ECEP1KP393HA             |
| 200 VDC Working, 250 VDC Surge |                    |                                        |                                            |                                        |                                        |                          |
| 1800                           | 35 x 40            | 4.32                                   | 6.05                                       | 0.120                                  | 0.060                                  | ECET2DP182EA             |
| 2200                           | 35 x 50            | 4.92                                   | 6.89                                       | 0.098                                  | 0.054                                  | ECET2DP222EA             |
| 2700                           | 35 x 63            | 5.50                                   | 7.70                                       | 0.080                                  | 0.044                                  | ECET2DP272EA             |
| 3300                           | 35 x 80            | 6.44                                   | 9.02                                       | 0.065                                  | 0.036                                  | ECET2DP332EA             |
| 5600                           | 35 x 105           | 8.90                                   | 12.46                                      | 0.038                                  | 0.021                                  | ECET2DP562EA             |
| 2200                           | 40 x 40            | 4.92                                   | 6.89                                       | 0.098                                  | 0.054                                  | ECET2DP222FA             |
| 2700                           | 40 x 50            | 5.41                                   | 7.57                                       | 0.080                                  | 0.044                                  | ECET2DP272FA             |
| 3300                           | 40 x 63            | 6.32                                   | 8.85                                       | 0.065                                  | 0.036                                  | ECET2DP332FA             |
| 4700                           | 40 x 80            | 8.38                                   | 11.73                                      | 0.046                                  | 0.025                                  | ECET2DP472FA             |
| 6800                           | 40 x 105           | 8.65                                   | 12.11                                      | 0.032                                  | 0.017                                  | ECET2DP682FA             |
| 3900                           | 50 x 50            | 8.22                                   | 9.45                                       | 0.055                                  | 0.030                                  | ECEP2DP392HA             |
| 4700                           | 50 x 63            | 9.32                                   | 13.05                                      | 0.046                                  | 0.025                                  | ECEP2DP472HA             |
| 6800                           | 50 x 80            | 11.41                                  | 15.97                                      | 0.032                                  | 0.017                                  | ECEP2DP682HA             |
| 7500                           | 50 x 92            | 12.28                                  | 17.19                                      | 0.029                                  | 0.016                                  | ECEP2DP752HA             |
| 8200                           | 50 x 105           | 13.16                                  | 18.42                                      | 0.026                                  | 0.014                                  | ECEP2DP822HA             |
| 350 VDC Working, 400 VDC Surge |                    |                                        |                                            |                                        |                                        |                          |
| 470                            | 35 x 40            | 2.40                                   | 3.36                                       | 0.388                                  | 0.175                                  | ECET2VP471EA             |
| 680                            | 35 x 50            | 2.96                                   | 4.14                                       | 0.366                                  | 0.165                                  | ECET2VP681EA             |
| 1000                           | 35 x 63            | 3.80                                   | 5.32                                       | 0.249                                  | 0.112                                  | ECET2VP102EA             |
| 1200                           | 35 x 80            | 4.42                                   | 6.19                                       | 0.207                                  | 0.093                                  | ECET2VP122EA             |
| 1800                           | 35 x 105           | 5.79                                   | 8.11                                       | 0.138                                  | 0.062                                  | ECET2VP182EA             |
| 680                            | 40 x 40            | 2.96                                   | 4.14                                       | 0.366                                  | 0.165                                  | ECET2VP681FA             |
| 1000                           | 40 x 50            | 3.80                                   | 5.32                                       | 0.249                                  | 0.112                                  | ECET2VP102FA             |
| 1200                           | 40 x 63            | 4.42                                   | 6.19                                       | 0.207                                  | 0.093                                  | ECET2VP122FA             |
| 1800                           | 40 x 80            | 5.85                                   | 8.19                                       | 0.138                                  | 0.062                                  | ECET2VP182FA             |
| 2200                           | 40 x 105           | 6.91                                   | 9.67                                       | 0.113                                  | 0.051                                  | ECET2VP222FA             |
| 1200                           | 50 x 50            | 5.18                                   | 5.96                                       | 0.207                                  | 0.093                                  | ECEP2VP122HA             |
| 1500                           | 50 x 63            | 6.01                                   | 8.41                                       | 0.166                                  | 0.075                                  | ECEP2VP152HA             |
| 1800                           | 50 x 80            | 6.89                                   | 9.65                                       | 0.138                                  | 0.062                                  | ECEP2VP182HA             |
| 2200                           | 50 x 92            | 7.79                                   | 10.91                                      | 0.113                                  | 0.051                                  | ECEP2VP222HA             |
| 2700                           | 50 x 105           | 8.80                                   | 12.32                                      | 0.092                                  | 0.041                                  | ECEP2VP272HA             |
| 450 VDC Working, 500 VDC Surge |                    |                                        |                                            |                                        |                                        |                          |
| 330                            | 35 x 40            | 2.01                                   | 2.81                                       | 0.553                                  | 0.249                                  | ECET2WP331EA             |
| 470                            | 35 x 50            | 2.53                                   | 3.54                                       | 0.423                                  | 0.233                                  | ECET2WP471EA             |
| 560                            | 35 x 63            | 2.90                                   | 4.06                                       | 0.355                                  | 0.195                                  | ECET2WP561EA             |
| 820                            | 35 x 80            | 3.78                                   | 5.29                                       | 0.243                                  | 0.133                                  | ECET2WP821EA             |
| 1200                           | 35 x 105           | 4.80                                   | 6.72                                       | 0.166                                  | 0.091                                  | ECET2WP122EA             |
| 470                            | 40 x 40            | 2.53                                   | 3.54                                       | 0.423                                  | 0.233                                  | ECET2WP471FA             |
| 680                            | 40 x 50            | 3.15                                   | 4.41                                       | 0.293                                  | 0.161                                  | ECET2WP681FA             |
| 820                            | 40 x 63            | 3.70                                   | 5.18                                       | 0.243                                  | 0.133                                  | ECET2WP821FA             |
| 1200                           | 40 x 80            | 4.84                                   | 6.78                                       | 0.166                                  | 0.091                                  | ECET2WP122FA             |
| 1500                           | 40 x 105           | 5.81                                   | 8.13                                       | 0.133                                  | 0.073                                  | ECET2WP152FA             |
| 820                            | 50 x 50            | 4.31                                   | 4.96                                       | 0.263                                  | 0.145                                  | ECEP2WP821HA             |
| 1000                           | 50 x 63            | 4.96                                   | 6.94                                       | 0.216                                  | 0.119                                  | ECEP2WP102HA             |
| 1200                           | 50 x 80            | 5.71                                   | 7.99                                       | 0.180                                  | 0.099                                  | ECEP2WP122HA             |
| 1500                           | 50 x 92            | 6.55                                   | 9.17                                       | 0.144                                  | 0.079                                  | ECEP2WP152HA             |
| 1800                           | 50 x 105           | 7.36                                   | 10.30                                      | 0.120                                  | 0.066                                  | ECEP2WP182HA             |

**T-UP Standard Ratings (continued)**

| Cap.<br>( $\mu\text{F}$ )             | Size (mm)<br>D x L | Max. 85°C R.C. ( $A_{\text{rms}}$ )<br>120 Hz | Max. 20°C E.S.R. ( $\Omega$ )<br>10k-50kHz | Max. 20°C E.S.R. ( $\Omega$ )<br>120Hz | Max. 20°C E.S.R. ( $\Omega$ )<br>20kHz | Panasonic<br>Part Number |
|---------------------------------------|--------------------|-----------------------------------------------|--------------------------------------------|----------------------------------------|----------------------------------------|--------------------------|
| <b>500 VDC Working, 550 VDC Surge</b> |                    |                                               |                                            |                                        |                                        |                          |
| 270                                   | 35 x 40            | 1.76                                          | 2.46                                       | 0.614                                  | 0.276                                  | ECET2HP271EA             |
| 390                                   | 35 x 50            | 2.22                                          | 3.11                                       | 0.425                                  | 0.234                                  | ECET2HP391EA             |
| 470                                   | 35 x 63            | 2.58                                          | 3.61                                       | 0.353                                  | 0.194                                  | ECET2HP471EA             |
| 680                                   | 35 x 80            | 3.21                                          | 4.49                                       | 0.244                                  | 0.134                                  | ECET2HP681EA             |
| 820                                   | 35 x 105           | 3.97                                          | 5.56                                       | 0.202                                  | 0.111                                  | ECET2HP821EA             |
| 330                                   | 40 x 40            | 2.16                                          | 3.02                                       | 0.502                                  | 0.276                                  | ECET2HP331FA             |
| 470                                   | 40 x 50            | 2.70                                          | 3.78                                       | 0.353                                  | 0.194                                  | ECET2HP471FA             |
| 560                                   | 40 x 63            | 3.11                                          | 4.35                                       | 0.326                                  | 0.179                                  | ECET2HP561FA             |
| 820                                   | 40 x 80            | 3.88                                          | 5.43                                       | 0.222                                  | 0.122                                  | ECET2HP821FA             |
| 1200                                  | 40 x 105           | 5.90                                          | 8.26                                       | 0.152                                  | 0.084                                  | ECET2HP122FA             |
| 560                                   | 50 x 50            | 3.52                                          | 4.05                                       | 0.355                                  | 0.195                                  | ECEP2HP561HA             |
| 680                                   | 50 x 63            | 4.07                                          | 5.70                                       | 0.293                                  | 0.161                                  | ECEP2HP681HA             |
| 1000                                  | 50 x 80            | 5.05                                          | 7.07                                       | 0.199                                  | 0.109                                  | ECEP2HP102HA             |
| 1200                                  | 50 x 92            | 5.74                                          | 8.04                                       | 0.166                                  | 0.091                                  | ECEP2HP122HA             |
| 1500                                  | 50 x 105           | 6.65                                          | 9.31                                       | 0.144                                  | 0.079                                  | ECEP2HP152HA             |

**T-HA Series** multi terminal snap-in

- **NEW** 50mm Diameter Sizes with Five P. C. Mount Terminals
- **NEW** lengths up to 105mm
- Endurance rating of 3000 hours at 105°C
- 4 or 5 terminal mounting provides stability and keyed polarity
- Can vent construction



|                        |                                                                         |                               |
|------------------------|-------------------------------------------------------------------------|-------------------------------|
| Rated Working Voltage: | 16 ~ 250 VDC                                                            | 350 ~ 450 VDC                 |
| Operating Temperature: | -40 ~ +105°C                                                            | -25 ~ +105°C                  |
| Nominal Capacitance:   | 1000~ 250000μF (±20% tolerance)                                         | 330 ~ 2200μF (±20% tolerance) |
| Endurance:             | 3000 hours at +105°C with maximum specified ripple current (see page 4) |                               |

**Part Number System**

|                                                                 |                                  |                                      |               |                                                  |                      |                                                            |
|-----------------------------------------------------------------|----------------------------------|--------------------------------------|---------------|--------------------------------------------------|----------------------|------------------------------------------------------------|
| <div> <div>E</div> <div>C</div> <div>E</div> <div></div> </div> |                                  | <div> <div></div> <div></div> </div> | <div>A</div>  | <div> <div></div> <div></div> <div></div> </div> | <div></div>          | <div>A</div>                                               |
| <b>T Type Common Code / Number of Terminals</b>                 |                                  | <b>Voltage Code</b>                  | <b>Series</b> | <b>Capacitance Code</b>                          | <b>Diameter Code</b> | <b>Terminal Shape (see pg.23)</b>                          |
| ECET                                                            | 4 terminal<br>(φ 35 & 40mm dia.) |                                      |               |                                                  |                      | A Snap-in (Standard)                                       |
| ECEP                                                            | 5 terminal<br>(φ 50mm dia.)      |                                      |               |                                                  |                      | E Straight pin with standoff<br>(available on φ 50mm dia.) |

**T-HA Standard Ratings**

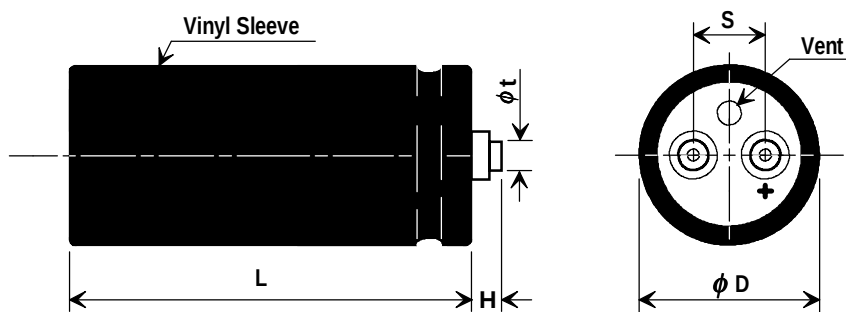
| Part 1: Standard A Ratings   |                    |                                                           |       |                                    |       |                          | Part 2: Standard B Ratings   |                    |                                                          |       |                                    |       |                          |
|------------------------------|--------------------|-----------------------------------------------------------|-------|------------------------------------|-------|--------------------------|------------------------------|--------------------|----------------------------------------------------------|-------|------------------------------------|-------|--------------------------|
| Cap.<br>(μF)                 | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> )<br>120 Hz    10k-50kHz |       | Max 20°C ESR (Ω)<br>120Hz    20kHz |       | Panasonic<br>Part Number | Cap.<br>(μF)                 | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> )<br>120Hz    10k-50kHz |       | Max 20°C ESR (Ω)<br>120Hz    20kHz |       | Panasonic<br>Part Number |
| 16 VDC Working, 20 VDC Surge |                    |                                                           |       |                                    |       |                          | 25 VDC Working, 32 VDC Surge |                    |                                                          |       |                                    |       |                          |
| 39000                        | 35 x 40            | 5.10                                                      | 5.87  | 0.022                              | 0.020 | ECET1CA393EA             | 27000                        | 35 x 40            | 4.80                                                     | 5.52  | 0.018                              | 0.017 | ECET1EA273EA             |
| 56000                        | 35 x 50            | 6.00                                                      | 6.90  | 0.019                              | 0.017 | ECET1CA563EA             | 33000                        | 35 x 50            | 5.50                                                     | 6.33  | 0.018                              | 0.016 | ECET1EA333EA             |
| 68000                        | 35 x 63            | 6.62                                                      | 7.61  | 0.017                              | 0.015 | ECET1CA683EA             | 47000                        | 35 x 63            | 6.56                                                     | 7.54  | 0.017                              | 0.015 | ECET1EA473EA             |
| 100000                       | 35 x 80            | 8.03                                                      | 9.23  | 0.015                              | 0.013 | ECET1CA104EA             | 56000                        | 35 x 80            | 7.25                                                     | 8.34  | 0.015                              | 0.013 | ECET1EA563EA             |
| 120000                       | 35 x 105           | 8.71                                                      | 10.02 | 0.014                              | 0.012 | ECET1CA124EA             | 82000                        | 35 x 105           | 8.58                                                     | 9.87  | 0.013                              | 0.012 | ECET1EA823EA             |
| 47000                        | 40 x 40            | 5.50                                                      | 6.33  | 0.020                              | 0.018 | ECET1CA473FA             | 33000                        | 40 x 40            | 5.50                                                     | 6.33  | 0.018                              | 0.016 | ECET1EA333FA             |
| 68000                        | 40 x 50            | 7.29                                                      | 8.38  | 0.015                              | 0.014 | ECET1CA683FA             | 47000                        | 40 x 50            | 6.47                                                     | 7.44  | 0.015                              | 0.014 | ECET1EA473FA             |
| 82000                        | 40 x 63            | 7.66                                                      | 8.81  | 0.017                              | 0.015 | ECET1CA823FA             | 56000                        | 40 x 63            | 7.17                                                     | 8.25  | 0.014                              | 0.013 | ECET1EA563FA             |
| 120000                       | 40 x 80            | 8.79                                                      | 10.11 | 0.014                              | 0.012 | ECET1CA124FA             | 82000                        | 40 x 80            | 8.68                                                     | 9.98  | 0.013                              | 0.012 | ECET1EA823FA             |
| 150000                       | 40 x 105           | 9.88                                                      | 11.36 | 0.013                              | 0.012 | ECET1CA154FA             | 100000                       | 40 x 105           | 9.76                                                     | 11.22 | 0.012                              | 0.010 | ECET1EA104FA             |
| 120000                       | 50 x 50            | 9.02                                                      | 10.37 | 0.015                              | 0.014 | ECEP1CA124HA             | 82000                        | 50 x 50            | 9.20                                                     | 10.58 | 0.016                              | 0.015 | ECEP1EA823HA             |
| 150000                       | 50 x 63            | 10.15                                                     | 11.67 | 0.014                              | 0.013 | ECEP1CA154HA             | 100000                       | 50 x 63            | 10.02                                                    | 11.52 | 0.015                              | 0.013 | ECEP1EA104HA             |
| 180000                       | 50 x 80            | 11.02                                                     | 12.67 | 0.013                              | 0.012 | ECEP1CA184HA             | 120000                       | 50 x 80            | 10.93                                                    | 12.57 | 0.013                              | 0.012 | ECEP1EA124HA             |
| 220000                       | 50 x 92            | 11.71                                                     | 13.47 | 0.012                              | 0.011 | ECEP1CA224HA             | 150000                       | 50 x 92            | 11.70                                                    | 13.46 | 0.012                              | 0.011 | ECEP1EA154HA             |
| 250000                       | 50 x 105           | 12.31                                                     | 14.16 | 0.011                              | 0.010 | ECEP1CA254HA             | 180000                       | 50 x 105           | 12.42                                                    | 14.28 | 0.010                              | 0.009 | ECEP1EA184HA             |
| 35 VDC Working, 44 VDC Surge |                    |                                                           |       |                                    |       |                          | 50 VDC Working, 63 VDC Surge |                    |                                                          |       |                                    |       |                          |
| 18000                        | 35 x 40            | 4.30                                                      | 4.95  | 0.028                              | 0.021 | ECET1VA183EA             | 10000                        | 35 x 40            | 4.00                                                     | 4.60  | 0.033                              | 0.025 | ECET1HA103EA             |
| 22000                        | 35 x 50            | 5.00                                                      | 5.75  | 0.023                              | 0.017 | ECET1VA223EA             | 15000                        | 35 x 50            | 4.80                                                     | 5.52  | 0.022                              | 0.018 | ECET1HA153EA             |
| 27000                        | 35 x 63            | 5.53                                                      | 6.36  | 0.025                              | 0.018 | ECET1VA273EA             | 18000                        | 35 x 63            | 5.27                                                     | 6.06  | 0.020                              | 0.016 | ECET1HA183EA             |
| 39000                        | 35 x 80            | 6.52                                                      | 7.50  | 0.019                              | 0.014 | ECET1VA393EA             | 27000                        | 35 x 80            | 6.16                                                     | 7.08  | 0.015                              | 0.012 | ECET1HA273EA             |
| 47000                        | 35 x 105           | 8.07                                                      | 9.28  | 0.017                              | 0.013 | ECET1VA473EA             | 33000                        | 35 x 105           | 7.23                                                     | 8.31  | 0.013                              | 0.010 | ECET1HA333EA             |
| 22000                        | 40 x 40            | 5.00                                                      | 5.75  | 0.023                              | 0.017 | ECET1VA223FA             | 15000                        | 40 x 40            | 4.80                                                     | 5.52  | 0.022                              | 0.018 | ECET1HA153FA             |
| 27000                        | 40 x 50            | 5.44                                                      | 6.26  | 0.020                              | 0.015 | ECET1VA273FA             | 22000                        | 40 x 50            | 5.15                                                     | 5.92  | 0.016                              | 0.013 | ECET1HA223FA             |
| 33000                        | 40 x 63            | 6.61                                                      | 7.60  | 0.019                              | 0.014 | ECET1VA333FA             | 27000                        | 40 x 63            | 6.05                                                     | 6.96  | 0.015                              | 0.012 | ECET1HA273FA             |
| 47000                        | 40 x 80            | 7.79                                                      | 8.96  | 0.018                              | 0.013 | ECET1VA473FA             | 39000                        | 40 x 80            | 7.55                                                     | 8.68  | 0.014                              | 0.011 | ECET1HA393FA             |
| 68000                        | 40 x 105           | 9.27                                                      | 10.66 | 0.016                              | 0.012 | ECET1VA683FA             | 47000                        | 40 x 105           | 8.18                                                     | 9.41  | 0.012                              | 0.010 | ECET1HA473FA             |
| 47000                        | 50 x 50            | 8.25                                                      | 9.49  | 0.021                              | 0.016 | ECEP1VA473HA             | 33000                        | 50 x 50            | 7.75                                                     | 8.91  | 0.018                              | 0.014 | ECEP1HA333HA             |
| 56000                        | 50 x 63            | 9.07                                                      | 10.43 | 0.019                              | 0.014 | ECEP1VA563HA             | 39000                        | 50 x 63            | 8.40                                                     | 9.66  | 0.016                              | 0.013 | ECEP1HA393HA             |
| 68000                        | 50 x 80            | 10.07                                                     | 11.58 | 0.017                              | 0.013 | ECEP1VA683HA             | 47000                        | 50 x 80            | 9.19                                                     | 10.57 | 0.014                              | 0.011 | ECEP1HA473HA             |
| 82000                        | 50 x 92            | 10.89                                                     | 12.52 | 0.015                              | 0.011 | ECEP1VA823HA             | 56000                        | 50 x 92            | 9.79                                                     | 11.26 | 0.012                              | 0.009 | ECEP1HA563HA             |
| 100000                       | 50 x 105           | 11.75                                                     | 13.51 | 0.013                              | 0.010 | ECEP1VA104HA             | 68000                        | 50 x 105           | 10.42                                                    | 11.98 | 0.011                              | 0.009 | ECEP1HA683HA             |

## T-HA Standard Ratings (continued)

| Cap.<br>( $\mu$ F)                    | Size (mm)<br>D x L | Max 105°C R.C. ( $A_{rms}$ )<br>120 Hz | Max 105°C R.C. ( $A_{rms}$ )<br>10k-50kHz | Max 20°C ESR ( $\Omega$ )<br>120Hz | Max 20°C ESR ( $\Omega$ )<br>20kHz | Panasonic<br>Part Number |
|---------------------------------------|--------------------|----------------------------------------|-------------------------------------------|------------------------------------|------------------------------------|--------------------------|
| <b>63 VDC Working, 79 VDC Surge</b>   |                    |                                        |                                           |                                    |                                    |                          |
| 6800                                  | 35 x 40            | 3.60                                   | 4.14                                      | 0.049                              | 0.037                              | ECET1JA682EA             |
| 12000                                 | 35 x 50            | 4.40                                   | 5.06                                      | 0.028                              | 0.023                              | ECET1JA123EA             |
| 15000                                 | 35 x 63            | 4.92                                   | 5.66                                      | 0.024                              | 0.021                              | ECET1JA153EA             |
| 18000                                 | 35 x 80            | 5.79                                   | 6.66                                      | 0.022                              | 0.019                              | ECET1JA183EA             |
| 27000                                 | 35 x 105           | 6.53                                   | 7.51                                      | 0.017                              | 0.014                              | ECET1JA273EA             |
| 12000                                 | 40 x 40            | 4.52                                   | 5.20                                      | 0.030                              | 0.026                              | ECET1JA123FA             |
| 15000                                 | 40 x 50            | 4.80                                   | 5.52                                      | 0.027                              | 0.023                              | ECET1JA153FA             |
| 18000                                 | 40 x 63            | 5.39                                   | 6.20                                      | 0.023                              | 0.020                              | ECET1JA183FA             |
| 27000                                 | 40 x 80            | 6.59                                   | 7.58                                      | 0.017                              | 0.014                              | ECET1JA273FA             |
| 39000                                 | 40 x 105           | 7.53                                   | 8.66                                      | 0.014                              | 0.012                              | ECET1JA333FA             |
| 22000                                 | 50 x 50            | 6.76                                   | 7.77                                      | 0.019                              | 0.016                              | ECEP1JA223HA             |
| 27000                                 | 50 x 63            | 7.34                                   | 8.44                                      | 0.017                              | 0.014                              | ECEP1JA273HA             |
| 33000                                 | 50 x 80            | 8.00                                   | 9.20                                      | 0.015                              | 0.013                              | ECEP1JA333HA             |
| 39000                                 | 50 x 92            | 8.48                                   | 9.75                                      | 0.014                              | 0.012                              | ECEP1JA393HA             |
| 47000                                 | 50 x 105           | 8.99                                   | 10.34                                     | 0.012                              | 0.010                              | ECEP1JA473HA             |
| <b>80 VDC Working, 100 VDC Surge</b>  |                    |                                        |                                           |                                    |                                    |                          |
| 4700                                  | 35 x 40            | 3.30                                   | 3.80                                      | 0.049                              | 0.037                              | ECET1KA472EA             |
| 6800                                  | 35 x 50            | 3.90                                   | 4.49                                      | 0.041                              | 0.031                              | ECET1KA682EA             |
| 8200                                  | 35 x 63            | 4.39                                   | 5.05                                      | 0.036                              | 0.027                              | ECET1KA822EA             |
| 10000                                 | 35 x 80            | 4.88                                   | 5.61                                      | 0.031                              | 0.024                              | ECET1KA103EA             |
| 15000                                 | 35 x 105           | 6.13                                   | 7.05                                      | 0.024                              | 0.018                              | ECET1KA153EA             |
| 6800                                  | 40 x 40            | 3.90                                   | 4.49                                      | 0.041                              | 0.031                              | ECET1KA682FA             |
| 8200                                  | 40 x 50            | 4.29                                   | 4.93                                      | 0.036                              | 0.027                              | ECEP1KA822FA             |
| 10000                                 | 40 x 63            | 4.73                                   | 5.44                                      | 0.033                              | 0.025                              | ECET1KA103FA             |
| 15000                                 | 40 x 80            | 5.97                                   | 6.87                                      | 0.025                              | 0.019                              | ECET1KA153FA             |
| 22000                                 | 40 x 105           | 6.95                                   | 7.99                                      | 0.019                              | 0.014                              | ECET1KA223FA             |
| 12000                                 | 50 x 50            | 6.03                                   | 6.93                                      | 0.035                              | 0.026                              | ECEP1KA223HA             |
| 15000                                 | 50 x 63            | 6.65                                   | 7.65                                      | 0.028                              | 0.021                              | ECEP1KA153HA             |
| 18000                                 | 50 x 80            | 7.29                                   | 8.38                                      | 0.026                              | 0.019                              | ECEP1KA183HA             |
| 22000                                 | 50 x 92            | 7.83                                   | 9.00                                      | 0.022                              | 0.016                              | ECEP1KA223HA             |
| 27000                                 | 50 x 105           | 8.38                                   | 9.64                                      | 0.018                              | 0.014                              | ECEP1KA273HA             |
| <b>100 VDC Working, 125 VDC Surge</b> |                    |                                        |                                           |                                    |                                    |                          |
| 3300                                  | 35 x 40            | 3.20                                   | 3.68                                      | 0.075                              | 0.053                              | ECET2AA332EA             |
| 4700                                  | 35 x 50            | 3.80                                   | 4.37                                      | 0.053                              | 0.040                              | ECET2AA472EA             |
| 5600                                  | 35 x 63            | 4.06                                   | 4.67                                      | 0.044                              | 0.033                              | ECET2AA562EA             |
| 8200                                  | 35 x 80            | 5.15                                   | 5.92                                      | 0.030                              | 0.023                              | ECET2AA822EA             |
| 10000                                 | 35 x 105           | 6.38                                   | 7.34                                      | 0.025                              | 0.019                              | ECET2AA103EA             |
| 4700                                  | 40 x 40            | 3.80                                   | 4.37                                      | 0.053                              | 0.040                              | ECET2AA472FA             |
| 6800                                  | 40 x 50            | 4.57                                   | 5.26                                      | 0.037                              | 0.027                              | ECET2AA682FA             |
| 8200                                  | 40 x 63            | 5.02                                   | 5.77                                      | 0.030                              | 0.023                              | ECET2AA822FA             |
| 12000                                 | 40 x 80            | 6.44                                   | 7.41                                      | 0.021                              | 0.016                              | ECET2AA123FA             |
| 15000                                 | 40 x 105           | 7.37                                   | 8.48                                      | 0.017                              | 0.012                              | ECET2AA153FA             |
| 8200                                  | 50 x 50            | 6.14                                   | 7.06                                      | 0.030                              | 0.023                              | ECEP2AA822HA             |
| 12000                                 | 50 x 63            | 7.17                                   | 8.25                                      | 0.022                              | 0.017                              | ECEP2AA123HA             |
| 15000                                 | 50 x 80            | 8.01                                   | 9.21                                      | 0.019                              | 0.014                              | ECEP2AA153HA             |
| 18000                                 | 50 x 92            | 8.64                                   | 9.94                                      | 0.017                              | 0.012                              | ECEP2AA183HA             |
| 22000                                 | 50 x 105           | 9.32                                   | 10.72                                     | 0.015                              | 0.011                              | ECEP2AA223HA             |
| <b>200 VDC Working, 250 VDC Surge</b> |                    |                                        |                                           |                                    |                                    |                          |
| 1500                                  | 35 x 40            | 2.50                                   | 3.50                                      | 0.133                              | 0.066                              | ECET2DA152EA             |
| 2200                                  | 35 x 50            | 2.90                                   | 4.06                                      | 0.098                              | 0.059                              | ECET2DA222EA             |
| 2700                                  | 35 x 63            | 3.65                                   | 5.11                                      | 0.080                              | 0.048                              | ECET2DA272EA             |
| 3300                                  | 35 x 80            | 4.52                                   | 6.33                                      | 0.065                              | 0.039                              | ECET2DA332EA             |
| 4700                                  | 35 x 105           | 5.70                                   | 7.98                                      | 0.046                              | 0.028                              | ECET2DA472EA             |
| 1800                                  | 40 x 40            | 2.70                                   | 3.78                                      | 0.129                              | 0.077                              | ECET2DA182FA             |
| 2700                                  | 40 x 50            | 3.55                                   | 4.97                                      | 0.086                              | 0.052                              | ECET2DA272FA             |
| 3300                                  | 40 x 63            | 4.40                                   | 6.16                                      | 0.070                              | 0.042                              | ECET2DA332FA             |
| 4700                                  | 40 x 80            | 5.76                                   | 8.06                                      | 0.049                              | 0.030                              | ECET2DA472FA             |
| 5600                                  | 40 x 105           | 6.76                                   | 9.46                                      | 0.041                              | 0.025                              | ECET2DA562FA             |
| 3300                                  | 50 x 50            | 5.20                                   | 7.28                                      | 0.075                              | 0.045                              | ECEP2DA222HA             |
| 3900                                  | 50 x 63            | 5.90                                   | 8.26                                      | 0.064                              | 0.038                              | ECEP2DA332HA             |
| 4700                                  | 50 x 80            | 6.82                                   | 9.55                                      | 0.053                              | 0.032                              | ECEP2DA472HA             |
| 5600                                  | 50 x 92            | 7.68                                   | 10.75                                     | 0.044                              | 0.027                              | ECEP2DA512HA             |
| 6800                                  | 50 x 105           | 8.71                                   | 12.19                                     | 0.034                              | 0.020                              | ECEP2DA562HA             |
| <b>250 VDC Working, 300 VDC Surge</b> |                    |                                        |                                           |                                    |                                    |                          |
| 1000                                  | 35 x 40            | 2.20                                   | 3.08                                      | 0.199                              | 0.109                              | ECET2EA102EA             |
| 1200                                  | 35 x 50            | 2.30                                   | 3.22                                      | 0.180                              | 0.117                              | ECET2EA122EA             |
| 1500                                  | 35 x 63            | 2.57                                   | 3.60                                      | 0.144                              | 0.093                              | ECET2EA152EA             |
| 2200                                  | 35 x 80            | 3.75                                   | 5.25                                      | 0.098                              | 0.064                              | ECET2EA222EA             |
| 2700                                  | 35 x 105           | 4.80                                   | 6.72                                      | 0.080                              | 0.052                              | ECET2EA272EA             |
| 1200                                  | 40 x 40            | 2.66                                   | 3.72                                      | 0.180                              | 0.117                              | ECET2EA122FA             |
| 1800                                  | 40 x 50            | 3.15                                   | 4.41                                      | 0.120                              | 0.078                              | ECET2EA182FA             |
| 2200                                  | 40 x 63            | 3.68                                   | 5.15                                      | 0.098                              | 0.064                              | ECET2EA222FA             |
| 3300                                  | 40 x 80            | 4.86                                   | 6.80                                      | 0.065                              | 0.042                              | ECET2EA332FA             |
| 3900                                  | 40 x 105           | 5.61                                   | 7.85                                      | 0.055                              | 0.036                              | ECET2EA392FA             |
| 2200                                  | 50 x 50            | 4.35                                   | 6.09                                      | 0.098                              | 0.064                              | ECEP2EA222HA             |
| 2700                                  | 50 x 63            | 4.98                                   | 6.97                                      | 0.080                              | 0.052                              | ECEP2EA272HA             |
| 3900                                  | 50 x 80            | 6.10                                   | 8.54                                      | 0.055                              | 0.036                              | ECEP2EA392HA             |
| 4300                                  | 50 x 92            | 6.67                                   | 9.34                                      | 0.050                              | 0.033                              | ECEP2EA452HA             |
| 4700                                  | 50 x 105           | 7.03                                   | 9.84                                      | 0.046                              | 0.030                              | ECEP2EA472HA             |
| <b>350 VDC Working, 400 VDC Surge</b> |                    |                                        |                                           |                                    |                                    |                          |
| 470                                   | 35 x 40            | 2.00                                   | 2.80                                      | 0.459                              | 0.183                              | ECET2VA471EA             |
| 680                                   | 35 x 50            | 2.15                                   | 3.01                                      | 0.317                              | 0.127                              | ECET2VA681EA             |
| 820                                   | 35 x 63            | 2.65                                   | 3.71                                      | 0.263                              | 0.105                              | ECET2VA821EA             |
| 1200                                  | 35 x 80            | 3.22                                   | 4.51                                      | 0.180                              | 0.072                              | ECET2VA122EA             |
| 1500                                  | 35 x 105           | 4.78                                   | 6.69                                      | 0.144                              | 0.057                              | ECET2VA152EA             |
| 680                                   | 40 x 40            | 2.30                                   | 3.22                                      | 0.317                              | 0.127                              | ECET2VA681FA             |
| 820                                   | 40 x 50            | 2.65                                   | 3.71                                      | 0.263                              | 0.105                              | ECET2VA821FA             |
| 1200                                  | 40 x 63            | 3.22                                   | 4.51                                      | 0.180                              | 0.072                              | ECET2VA122FA             |
| 1500                                  | 40 x 80            | 3.75                                   | 5.25                                      | 0.144                              | 0.057                              | ECET2VA152FA             |
| 1800                                  | 40 x 105           | 5.23                                   | 7.32                                      | 0.120                              | 0.048                              | ECET2VA182FA             |
| 1000                                  | 50 x 50            | 3.56                                   | 4.98                                      | 0.216                              | 0.086                              | ECEP2VA102HA             |
| 1500                                  | 50 x 63            | 4.16                                   | 5.82                                      | 0.144                              | 0.057                              | ECEP2VA152HA             |
| 1800                                  | 50 x 80            | 5.69                                   | 7.97                                      | 0.120                              | 0.048                              | ECEP2VA182HA             |
| 2000                                  | 50 x 92            | 6.34                                   | 8.88                                      | 0.108                              | 0.043                              | ECEP2VA202HA             |
| 2200                                  | 50 x 105           | 7.03                                   | 9.84                                      | #REF!                              | #REF!                              | ECEP2VA222HA             |
| <b>400 VDC Working, 450 VDC Surge</b> |                    |                                        |                                           |                                    |                                    |                          |
| 390                                   | 35 x 40            | 1.55                                   | 2.17                                      | 0.425                              | 0.170                              | ECET2GA391EA             |
| 560                                   | 35 x 50            | 1.80                                   | 2.52                                      | 0.296                              | 0.118                              | ECET2GA561EA             |
| 820                                   | 35 x 63            | 2.44                                   | 3.42                                      | 0.202                              | 0.081                              | ECET2GA821EA             |
| 1000                                  | 35 x 80            | 3.00                                   | 4.20                                      | 0.166                              | 0.066                              | ECET2GA102EA             |
| 1200                                  | 35 x 105           | 3.26                                   | 4.56                                      | 0.138                              | 0.055                              | ECET2GA122EA             |
| 470                                   | 40 x 40            | 1.75                                   | 2.45                                      | 0.353                              | 0.141                              | ECET2GA471FA             |
| 680                                   | 40 x 50            | 2.17                                   | 3.04                                      | 0.244                              | 0.098                              | ECET2GA681FA             |
| 1000                                  | 40 x 63            | 3.00                                   | 4.20                                      | 0.166                              | 0.066                              | ECET2GA102FA             |
| 1200                                  | 40 x 80            | 3.30                                   | 4.62                                      | 0.138                              | 0.055                              | ECET2GA122FA             |
| 1500                                  | 40 x 105           | 3.96                                   | 5.54                                      | 0.111                              | 0.044                              | ECET2GA152FA             |
| 820                                   | 50 x 50            | 2.92                                   | 4.09                                      | 0.202                              | 0.081                              | ECEP2GA821HA             |
| 1200                                  | 50 x 63            | 3.67                                   | 5.14                                      | 0.152                              | 0.061                              | ECEP2GA122HA             |
| 1500                                  | 50 x 80            | 4.31                                   | 6.03                                      | 0.122                              | 0.049                              | ECEP2GA152HA             |
| 1600                                  | 50 x 92            | 4.60                                   | 6.44                                      | 0.114                              | 0.046                              | ECEP2GA162HA             |
| 1800                                  | 50 x 105           | 5.04                                   | 7.06                                      | 0.101                              | 0.041                              | ECEP2GA182HA             |
| <b>450 VDC Working, 500 VDC Surge</b> |                    |                                        |                                           |                                    |                                    |                          |
| 330                                   | 35 x 40            | 1.37                                   | 1.92                                      | 0.502                              | 0.176                              | ECET2WA331EA             |
| 470                                   | 35 x 50            | 1.74                                   | 2.44                                      | 0.353                              | 0.123                              | ECET2WA471EA             |
| 560                                   | 35 x 63            | 2.15                                   | 3.01                                      | 0.296                              | 0.104                              | ECET2WA561EA             |
| 820                                   | 35 x 80            | 2.70                                   | 3.78                                      | 0.202                              | 0.071                              | ECET2WA821EA             |
| 1000                                  | 35 x 105           | 3.47                                   | 4.86                                      | 0.166                              | 0.058                              | ECET2WA102EA             |
| 390                                   | 40 x 40            | 1.68                                   | 2.35                                      | 0.425                              | 0.149                              | ECET2WA391FA             |
| 560                                   | 40 x 50            | 2.10                                   | 2.94                                      | 0.296                              | 0.104                              | ECET2WA561FA             |
| 680                                   | 40 x 63            | 2.50                                   | 3.50                                      | 0.244                              | 0.085                              | ECET2WA681FA             |
| 1000                                  | 40 x 80            | 3.50                                   | 4.90                                      | 0.166                              | 0.058                              | ECET2WA102FA             |
| 1200                                  | 40 x 105           | 4.33                                   | 6.06                                      | 0.138                              | 0.048                              | ECET2WA122FA             |
| 680                                   | 50 x 50            | 2.90                                   | 4.06                                      | 0.244                              | 0.085                              | ECEP2WA681HA             |
| 820                                   | 50 x 63            | 3.42                                   | 4.79                                      | 0.222                              | 0.078                              | ECEP2WA821HA             |
| 1200                                  | 50 x 80            | 4.70                                   | 6.58                                      | 0.152                              | 0.053                              | ECEP2WA122HA             |
| 1300                                  | 50 x 92            | 5.18                                   | 7.25                                      | 0.140                              | 0.049                              | ECEP2WA132HA             |
| 1500                                  | 50 x 105           | 6.03                                   | 8.44                                      | 0.122                              | 0.043                              | ECEP2WA152HA             |

## G Type General Information

### Dimensions (mm)



| Case Code | Nominal Size<br>D x L | Sleeved Case Dimensions |              |              | Terminal Specifications |              |              |              |                   |
|-----------|-----------------------|-------------------------|--------------|--------------|-------------------------|--------------|--------------|--------------|-------------------|
|           |                       | $\phi D \pm 0.79$       | $L \pm 1.58$ | $S \pm 0.41$ | Terminal Code           | Thread       | Thread Depth | $H \pm 0.79$ | $\phi t \pm 0.25$ |
| CA        | 35 x 41               | 35.4                    | 42.1         | 12.7         | E                       | 10-32 NF-2B  | 9.5          | 6.4          | 8.0               |
| CC        | 35 x 54               |                         | 54.8         |              | L                       | 10-32 NF-2B  | 5.5          | 1.6          | 8.0               |
| CE        | 35 x 67               |                         | 67.5         |              | M                       | M5           | 9.5          | 6.4          | 8.0               |
| CG        | 35 x 79               |                         | 80.2         |              | H                       | 1/4-28 NF-2B | 11.9         | 6.4          | 17.4              |
| CH        | 35 x 92               |                         | 92.9         |              | J                       | 1/4-28 NF-2B | 8.7          | 2.8          | 17.4              |
| CK        | 35 x 105              |                         | 105.6        |              | X                       | M6           | 11.9         | 6.4          | 17.4              |
| CL        | 35 x 117              |                         | 118.3        |              | Y                       | M6           | 8.7          | 2.8          | 17.4              |
| CN        | 35 x 130              |                         | 131.0        |              |                         |              |              |              |                   |
| CP        | 35 x 143              |                         | 143.7        |              |                         |              |              |              |                   |
| FB        | 51 x 48               | 51.3                    | 48.4         | 21.9         |                         |              |              |              |                   |
| FC        | 51 x 54               |                         | 54.8         |              |                         |              |              |              |                   |
| FE        | 51 x 67               |                         | 67.5         |              |                         |              |              |              |                   |
| FG        | 51 x 79               |                         | 80.2         |              |                         |              |              |              |                   |
| FH        | 51 x 92               |                         | 92.9         |              |                         |              |              |              |                   |
| FK        | 51 x 105              |                         | 105.6        |              |                         |              |              |              |                   |
| FL        | 51 x 117              |                         | 118.3        |              |                         |              |              |              |                   |
| FN        | 51 x 130              |                         | 131.0        |              |                         |              |              |              |                   |
| FP        | 51 x 143              |                         | 143.7        |              |                         |              |              |              |                   |
| GG        | 64 x 79               | 64.0                    | 80.2         | 28.6         |                         |              |              |              |                   |
| GH        | 64 x 92               |                         | 92.9         |              |                         |              |              |              |                   |
| GK        | 64 x 105              |                         | 105.6        |              |                         |              |              |              |                   |
| GL        | 64 x 130              |                         | 118.3        |              |                         |              |              |              |                   |
| GN        | 64 x 130              |                         | 131.0        |              |                         |              |              |              |                   |
| GP        | 64 x 143              |                         | 143.7        |              |                         |              |              |              |                   |
| HG        | 76 x 79               | 76.7                    | 80.2         | 31.8         |                         |              |              |              |                   |
| HH        | 76 x 92               |                         | 92.9         |              |                         |              |              |              |                   |
| HK        | 76 x 105              |                         | 105.6        |              |                         |              |              |              |                   |
| HL        | 76 x 117              |                         | 118.3        |              |                         |              |              |              |                   |
| HN        | 76 x 130              |                         | 131.0        |              |                         |              |              |              |                   |
| HP        | 76 x 143              |                         | 143.7        |              |                         |              |              |              |                   |
| HW        | 76 x 219              |                         | 219.9        |              |                         |              |              |              |                   |

| Terminal Code | Nominal Diameter |      |      |      | Max. ripple current (A) |
|---------------|------------------|------|------|------|-------------------------|
|               | 35mm             | 51mm | 64mm | 76mm |                         |
| E             | S                | S    | S    | S    | 30                      |
| L             | O                | O    | O    | O    |                         |
| M             | O                | O    | O    | O    |                         |
| H             | N.A.             | N.A. | O    | O    | 50                      |
| J             | N.A.             | N.A. | O    | O    |                         |
| X             | N.A.             | N.A. | O    | O    |                         |
| Y             | N.A.             | N.A. | O    | O    |                         |

S: standard    O: optional    N.A.: not available

### Ripple Current Multipliers

| Ripple Current Frequency Correction Factors |      |      |         |         |      |         |
|---------------------------------------------|------|------|---------|---------|------|---------|
| Frequency (Hz):                             | 50   | 60   | 100~120 | 300~360 | 1k   | 10k~50k |
| 16~100 WV:                                  | 0.9  | 0.95 | 1.0     | 1.05    | 1.08 | 1.15    |
| 160~500 WV:                                 | 0.75 | 0.8  | 1.0     | 1.2     | 1.25 | 1.4     |

| Ripple Current Temperature Correction Factors |       |      |      |      |       |
|-----------------------------------------------|-------|------|------|------|-------|
| Max. Temperature                              | 105°C | 85°C | 70°C | 60°C | ≤45°C |
| G-AA                                          | ---   | 1.0  | 1.6  | 2.0  | 2.2   |
| G-BA                                          | 1.0   | 1.75 | 2.0  | 2.2  | 2.35  |

Note: Use of temperature correction factors can limit load life to the hours specified for the maximum operating temperature of the series.

- |                        |                                                                        |
|------------------------|------------------------------------------------------------------------|
| Rated Working Voltage: | 16 ~ 500 VDC                                                           |
| Operating Temperature: | -40 ~ +85°C                                                            |
| Nominal Capacitance:   | 150 ~ 1200000μF                                                        |
| Capacitance Tolerance: | ± 20%                                                                  |
| Endurance:             | 3000 hours at +85°C with maximum specified ripple current (see page 4) |

Common Code      Series Code      Voltage Code      Capacitance Code      Case Size Code      Terminal Code  
(see pg.29)

| 16 VDC Typical Ratings              |                            |                             |           |                             |        |                          | 20 VDC Typical Ratings              |                            |                             |           |                             |        |                          |
|-------------------------------------|----------------------------|-----------------------------|-----------|-----------------------------|--------|--------------------------|-------------------------------------|----------------------------|-----------------------------|-----------|-----------------------------|--------|--------------------------|
| Cap.<br>( $\mu$ F)                  | Nominal Size<br>D x L (mm) | Max 85°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |        | Panasonic<br>Part Number | Cap.<br>( $\mu$ F)                  | Nominal Size<br>D x L (mm) | Max 85°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |        | Panasonic<br>Part Number |
|                                     |                            | 120Hz                       | 10k-50kHz | 120Hz                       | 20kHz  |                          |                                     |                            | 120Hz                       | 10k-50kHz | 120Hz                       | 20kHz  |                          |
| <b>16 VDC Working, 20 VDC Surge</b> |                            |                             |           |                             |        |                          | <b>20 VDC Working, 24 VDC Surge</b> |                            |                             |           |                             |        |                          |
| 33000                               | 35 x 41                    | 5.16                        | 5.93      | 0.0313                      | 0.0281 | EEGAA1C333CA□            | 27000                               | 35 x 41                    | 4.95                        | 5.69      | 0.0327                      | 0.0295 | EEGAA1D273CA□            |
| 39000                               | 35 x 54                    | 5.86                        | 6.74      | 0.0269                      | 0.0242 | EEGAA1C393CC□            | 33000                               | 35 x 54                    | 5.72                        | 6.58      | 0.0274                      | 0.0246 | EEGAA1D333CC□            |
| 56000                               | 35 x 67                    | 7.30                        | 8.40      | 0.0196                      | 0.0177 | EEGAA1C563CE□            | 47000                               | 35 x 67                    | 7.12                        | 8.19      | 0.0202                      | 0.0181 | EEGAA1D473CE□            |
| 68000                               | 35 x 79                    | 8.31                        | 9.56      | 0.0167                      | 0.0150 | EEGAA1C683CG□            | 56000                               | 35 x 79                    | 8.05                        | 9.26      | 0.0174                      | 0.0157 | EEGAA1D563CG□            |
| 82000                               | 35 x 92                    | 9.37                        | 10.78     | 0.0143                      | 0.0129 | EEGAA1C823CH□            | 68000                               | 35 x 92                    | 9.12                        | 10.49     | 0.0149                      | 0.0134 | EEGAA1D683CH□            |
| 100000                              | 35 x 105                   | 10.51                       | 12.09     | 0.0123                      | 0.0110 | EEGAA1C104CK□            | 82000                               | 35 x 105                   | 10.21                       | 11.74     | 0.0129                      | 0.0116 | EEGAA1D823CK□            |
| 120000                              | 35 x 117                   | 11.67                       | 13.42     | 0.0107                      | 0.0096 | EEGAA1C124CL□            | 100000                              | 35 x 117                   | 11.45                       | 13.17     | 0.0112                      | 0.0100 | EEGAA1D104CL□            |
| 130000                              | 35 x 130                   | 12.41                       | 14.27     | 0.0101                      | 0.0091 | EEGAA1C134CN□            | 110000                              | 35 x 130                   | 12.25                       | 14.09     | 0.0104                      | 0.0094 | EEGAA1D1134CN□           |
| 150000                              | 35 x 143                   | 13.44                       | 15.46     | 0.0091                      | 0.0082 | EEGAA1C154CP□            | 120000                              | 35 x 143                   | 13.04                       | 15.00     | 0.0098                      | 0.0088 | EEGAA1D124CP□            |
| 82000                               | 51 x 48                    | 10.01                       | 11.51     | 0.0143                      | 0.0129 | EEGAA1C823FB□            | 68000                               | 51 x 48                    | 9.75                        | 11.21     | 0.0149                      | 0.0134 | EEGAA1D683FB□            |
| 100000                              | 51 x 54                    | 11.01                       | 12.66     | 0.0123                      | 0.0110 | EEGAA1C104FC□            | 82000                               | 51 x 54                    | 10.70                       | 12.31     | 0.0129                      | 0.0116 | EEGAA1D823FC□            |
| 120000                              | 51 x 67                    | 12.41                       | 14.27     | 0.0107                      | 0.0096 | EEGAA1C124FE□            | 100000                              | 51 x 67                    | 12.17                       | 14.00     | 0.0112                      | 0.0100 | EEGAA1D104FE□            |
| 150000                              | 51 x 79                    | 13.98                       | 16.08     | 0.0091                      | 0.0082 | EEGAA1C154FG□            | 120000                              | 51 x 79                    | 13.57                       | 15.61     | 0.0098                      | 0.0088 | EEGAA1D124FG□            |
| 180000                              | 51 x 92                    | 15.42                       | 17.73     | 0.0081                      | 0.0073 | EEGAA1C184FH□            | 150000                              | 51 x 92                    | 15.22                       | 17.50     | 0.0085                      | 0.0077 | EEGAA1D154FH□            |
| 220000                              | 51 x 105                   | 16.93                       | 19.47     | 0.0072                      | 0.0064 | EEGAA1C224FK□            | 180000                              | 51 x 105                   | 16.68                       | 19.18     | 0.0076                      | 0.0069 | EEGAA1D184FK□            |
| 270000                              | 51 x 130                   | 19.08                       | 21.94     | 0.0052                      | 0.0047 | EEGAA1C274FN□            | 220000                              | 51 x 130                   | 18.86                       | 21.69     | 0.0068                      | 0.0061 | EEGAA1D224FN□            |
| 330000                              | 51 x 143                   | 20.63                       | 23.72     | 0.0070                      | 0.0063 | EEGAA1C334FP□            | 270000                              | 51 x 143                   | 20.50                       | 23.58     | 0.0061                      | 0.0055 | EEGAA1D274FP□            |
| 270000                              | 64 x 79                    | 19.31                       | 22.21     | 0.0064                      | 0.0057 | EEGAA1C274GG□            | 220000                              | 64 x 79                    | 19.08                       | 21.94     | 0.0068                      | 0.0061 | EEGAA1D224GG□            |
| 330000                              | 64 x 92                    | 21.02                       | 24.17     | 0.0057                      | 0.0052 | EEGAA1C334GH□            | 270000                              | 64 x 92                    | 20.89                       | 24.02     | 0.0061                      | 0.0055 | EEGAA1D274GH□            |
| 390000                              | 64 x 105                   | 22.50                       | 25.88     | 0.0053                      | 0.0048 | EEGAA1C394GK□            | 330000                              | 64 x 105                   | 22.62                       | 26.01     | 0.0056                      | 0.0050 | EEGAA1D334GK□            |
| 470000                              | 64 x 117                   | 24.11                       | 27.73     | 0.0049                      | 0.0044 | EEGAA1C474GL□            | 390000                              |                            |                             |           |                             |        |                          |

## G-AA Typical Ratings (continued)

| Cap.<br>( $\mu$ F)           | Nominal Size<br>D x L (mm) | Max 85°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |        | Panasonic<br>Part Number | Cap.<br>( $\mu$ F)           | Nominal Size<br>D x L (mm) | Max 85°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |        | Panasonic<br>Part Number |
|------------------------------|----------------------------|-----------------------------|-----------|-----------------------------|--------|--------------------------|------------------------------|----------------------------|-----------------------------|-----------|-----------------------------|--------|--------------------------|
|                              |                            | 120Hz                       | 10k-50kHz | 120Hz                       | 20kHz  |                          |                              |                            | 120Hz                       | 10k-50kHz | 120Hz                       | 20kHz  |                          |
| 25 VDC Working, 32 VDC Surge |                            |                             |           |                             |        |                          | 35 VDC Working, 44 VDC Surge |                            |                             |           |                             |        |                          |
| 22000                        | 35 x 41                    | 4.93                        | 5.67      | 0.0234                      | 0.0199 | EEGAA1E223CA□            | 15000                        | 35 x 41                    | 4.12                        | 4.74      | 0.0344                      | 0.0292 | EEGAA1V153CA□            |
| 27000                        | 35 x 54                    | 5.70                        | 6.56      | 0.0196                      | 0.0167 | EEGAA1E273CC□            | 18000                        | 35 x 54                    | 4.73                        | 5.44      | 0.0289                      | 0.0246 | EEGAA1V183CC□            |
| 39000                        | 35 x 67                    | 7.16                        | 8.23      | 0.0144                      | 0.0123 | EEGAA1E393CE□            | 22000                        | 35 x 67                    | 5.53                        | 6.36      | 0.0239                      | 0.0203 | EEGAA1V223CE□            |
| 47000                        | 35 x 79                    | 8.15                        | 9.37      | 0.0124                      | 0.0106 | EEGAA1E473CG□            | 33000                        | 35 x 79                    | 6.99                        | 8.04      | 0.0164                      | 0.0140 | EEGAA1V333CG□            |
| 56000                        | 35 x 92                    | 9.17                        | 10.55     | 0.0109                      | 0.0092 | EEGAA1E563CH□            | 39000                        | 35 x 92                    | 7.87                        | 9.05      | 0.0141                      | 0.0120 | EEGAA1V393CH□            |
| 68000                        | 35 x 105                   | 10.31                       | 11.86     | 0.0094                      | 0.0080 | EEGAA1E683CK□            | 47000                        | 35 x 105                   | 8.86                        | 10.19     | 0.0120                      | 0.0102 | EEGAA1V473CK□            |
| 82000                        | 35 x 117                   | 11.53                       | 13.26     | 0.0083                      | 0.0070 | EEGAA1E823CL□            | 56000                        | 35 x 117                   | 9.91                        | 11.40     | 0.0103                      | 0.0088 | EEGAA1V563CL□            |
| 91000                        | 35 x 130                   | 12.39                       | 14.25     | 0.0077                      | 0.0066 | EEGAA1E913CN□            | 62000                        | 35 x 130                   | 10.68                       | 12.28     | 0.0094                      | 0.0080 | EEGAA1V623CN□            |
| 100000                       | 35 x 143                   | 13.23                       | 15.21     | 0.0073                      | 0.0062 | EEGAA1E104CP□            | 68000                        | 35 x 143                   | 11.43                       | 13.14     | 0.0087                      | 0.0074 | EEGAA1V683CP□            |
| 56000                        | 51 x 48                    | 9.78                        | 11.25     | 0.0109                      | 0.0092 | EEGAA1E563FB□            | 33000                        | 51 x 48                    | 7.70                        | 8.86      | 0.0164                      | 0.0140 | EEGAA1V333FB□            |
| 68000                        | 51 x 54                    | 10.79                       | 12.41     | 0.0094                      | 0.0080 | EEGAA1E683FC□            | 47000                        | 51 x 54                    | 9.16                        | 10.53     | 0.0120                      | 0.0102 | EEGAA1V473FC□            |
| 82000                        | 51 x 67                    | 12.24                       | 14.08     | 0.0083                      | 0.0070 | EEGAA1E823FE□            | 56000                        | 51 x 67                    | 10.39                       | 11.95     | 0.0103                      | 0.0088 | EEGAA1V563FE□            |
| 100000                       | 51 x 79                    | 13.75                       | 15.81     | 0.0073                      | 0.0062 | EEGAA1E104FG□            | 68000                        | 51 x 79                    | 11.73                       | 13.49     | 0.0087                      | 0.0074 | EEGAA1V683FG□            |
| 120000                       | 51 x 92                    | 15.24                       | 17.53     | 0.0065                      | 0.0056 | EEGAA1E124GH□            | 82000                        | 51 x 92                    | 13.12                       | 15.09     | 0.0075                      | 0.0064 | EEGAA1V823GH□            |
| 150000                       | 51 x 105                   | 16.98                       | 19.53     | 0.0058                      | 0.0049 | EEGAA1E154FK□            | 100000                       | 51 x 105                   | 14.61                       | 16.80     | 0.0064                      | 0.0055 | EEGAA1V104FK□            |
| 180000                       | 51 x 130                   | 19.13                       | 22.00     | 0.0053                      | 0.0045 | EEGAA1E184FN□            | 120000                       | 51 x 130                   | 16.60                       | 19.09     | 0.0056                      | 0.0048 | EEGAA1V124FN□            |
| 220000                       | 51 x 143                   | 20.84                       | 23.97     | 0.0048                      | 0.0041 | EEGAA1E224FP□            | 150000                       | 51 x 143                   | 18.40                       | 21.16     | 0.0048                      | 0.0041 | EEGAA1V154FP□            |
| 180000                       | 64 x 79                    | 19.33                       | 22.23     | 0.0053                      | 0.0045 | EEGAA1E184GG□            | 120000                       | 64 x 79                    | 16.78                       | 19.30     | 0.0056                      | 0.0048 | EEGAA1V124GG□            |
| 220000                       | 64 x 92                    | 21.20                       | 24.38     | 0.0048                      | 0.0041 | EEGAA1E224GH□            | 150000                       | 64 x 92                    | 18.72                       | 21.53     | 0.0048                      | 0.0041 | EEGAA1V154GH□            |
| 270000                       | 64 x 105                   | 23.05                       | 26.51     | 0.0044                      | 0.0038 | EEGAA1E274GK□            | 180000                       | 64 x 105                   | 20.42                       | 23.48     | 0.0042                      | 0.0036 | EEGAA1V184GK□            |
| 310000                       | 64 x 117                   | 24.57                       | 28.26     | 0.0042                      | 0.0036 | EEGAA1E314GL□            | 200000                       | 64 x 117                   | 21.71                       | 24.97     | 0.0040                      | 0.0034 | EEGAA1V204GL□            |
| 330000                       | 64 x 130                   | 25.60                       | 29.44     | 0.0041                      | 0.0035 | EEGAA1E334GN□            | 220000                       | 64 x 130                   | 22.91                       | 26.35     | 0.0037                      | 0.0032 | EEGAA1V224GN□            |
| 390000                       | 64 x 143                   | 27.21                       | 31.29     | 0.0039                      | 0.0033 | EEGAA1E394GP□            | 270000                       | 64 x 143                   | 24.81                       | 28.53     | 0.0033                      | 0.0028 | EEGAA1V274GP□            |
| 270000                       | 76 x 79                    | 24.34                       | 27.99     | 0.0044                      | 0.0038 | EEGAA1E274HG□            | 180000                       | 76 x 79                    | 21.56                       | 24.79     | 0.0042                      | 0.0036 | EEGAA1V184HG□            |
| 330000                       | 76 x 92                    | 26.34                       | 30.29     | 0.0041                      | 0.0035 | EEGAA1E334HH□            | 220000                       | 76 x 92                    | 23.57                       | 27.11     | 0.0037                      | 0.0032 | EEGAA1V224HH□            |
| 390000                       | 76 x 105                   | 28.06                       | 32.27     | 0.0039                      | 0.0033 | EEGAA1E394HK□            | 250000                       | 76 x 105                   | 25.07                       | 28.83     | 0.0035                      | 0.0029 | EEGAA1V254HK□            |
| 470000                       | 76 x 117                   | 29.91                       | 34.40     | 0.0037                      | 0.0032 | EEGAA1E474HL□            | 270000                       | 76 x 117                   | 26.29                       | 30.23     | 0.0033                      | 0.0028 | EEGAA1V274HL□            |
| 520000                       | 76 x 130                   | 31.20                       | 35.88     | 0.0036                      | 0.0031 | EEGAA1E524HN□            | 330000                       | 76 x 130                   | 28.27                       | 32.51     | 0.0030                      | 0.0025 | EEGAA1V334HN□            |
| 560000                       | 76 x 143                   | 32.33                       | 37.18     | 0.0036                      | 0.0030 | EEGAA1E564HP□            | 360000                       | 76 x 143                   | 29.50                       | 33.93     | 0.0029                      | 0.0024 | EEGAA1V364HP□            |
| 910000                       | 76 x 219                   | 39.28                       | 45.17     | 0.0032                      | 0.0028 | EEGAA1E914HW□            | 560000                       | 76 x 219                   | 36.46                       | 41.93     | 0.0024                      | 0.0020 | EEGAA1V564HW□            |
| 50 VDC Working, 63 VDC Surge |                            |                             |           |                             |        |                          | 63 VDC Working, 79 VDC Surge |                            |                             |           |                             |        |                          |
| 8200                         | 35 x 41                    | 3.36                        | 3.86      | 0.0539                      | 0.0458 | EEGAA1H822CA□            | 6800                         | 35 x 41                    | 3.35                        | 3.85      | 0.0542                      | 0.0461 | EEGAA1J682CA□            |
| 10000                        | 35 x 54                    | 3.86                        | 4.44      | 0.0442                      | 0.0376 | EEGAA1H103CC□            | 8200                         | 35 x 54                    | 3.85                        | 4.43      | 0.0449                      | 0.0382 | EEGAA1J822CC□            |
| 15000                        | 35 x 67                    | 4.97                        | 5.72      | 0.0295                      | 0.0251 | EEGAA1H153CE□            | 12000                        | 35 x 67                    | 4.90                        | 5.64      | 0.0307                      | 0.0261 | EEGAA1J123CE□            |
| 18000                        | 35 x 79                    | 5.68                        | 6.53      | 0.0246                      | 0.0209 | EEGAA1H183CG□            | 15000                        | 35 x 79                    | 5.70                        | 6.56      | 0.0246                      | 0.0209 | EEGAA1J153CG□            |
| 22000                        | 35 x 92                    | 6.50                        | 7.48      | 0.0201                      | 0.0171 | EEGAA1H223CH□            | 18000                        | 35 x 92                    | 6.47                        | 7.44      | 0.0205                      | 0.0174 | EEGAA1J183CH□            |
| 27000                        | 35 x 105                   | 7.38                        | 8.49      | 0.0164                      | 0.0139 | EEGAA1H273CK□            | 22000                        | 35 x 105                   | 7.33                        | 8.43      | 0.0167                      | 0.0142 | EEGAA1J223CK□            |
| 33000                        | 35 x 117                   | 8.36                        | 9.61      | 0.0134                      | 0.0114 | EEGAA1H333CL□            | 24000                        | 35 x 117                   | 7.91                        | 9.10      | 0.0154                      | 0.0130 | EEGAA1J243CL□            |
| 36000                        | 35 x 130                   | 8.96                        | 10.30     | 0.0125                      | 0.0106 | EEGAA1H363CN□            | 27000                        | 35 x 130                   | 8.59                        | 9.88      | 0.0164                      | 0.0139 | EEGAA1J273CN□            |
| 39000                        | 35 x 143                   | 9.55                        | 10.98     | 0.0117                      | 0.0099 | EEGAA1H393CP□            | 33000                        | 35 x 143                   | 9.62                        | 11.06     | 0.0134                      | 0.0114 | EEGAA1J333CP□            |
| 22000                        | 51 x 48                    | 6.96                        | 8.00      | 0.0201                      | 0.0171 | EEGAA1H223FB□            | 15000                        | 51 x 48                    | 6.34                        | 7.29      | 0.0295                      | 0.0251 | EEGAA1J153FB□            |
| 27000                        | 51 x 54                    | 7.76                        | 8.92      | 0.0164                      | 0.0139 | EEGAA1H273FC□            | 18000                        | 51 x 54                    | 7.01                        | 8.06      | 0.0246                      | 0.0209 | EEGAA1J183FC□            |
| 33000                        | 51 x 67                    | 8.92                        | 10.26     | 0.0134                      | 0.0114 | EEGAA1H333FE□            | 22000                        | 51 x 67                    | 8.07                        | 9.28      | 0.0201                      | 0.0171 | EEGAA1J223FE□            |
| 39000                        | 51 x 79                    | 9.97                        | 11.47     | 0.0117                      | 0.0099 | EEGAA1H393FG□            | 33000                        | 51 x 79                    | 9.97                        | 11.47     | 0.0134                      | 0.0114 | EEGAA1J333FG□            |
| 47000                        | 51 x 92                    | 11.17                       | 12.85     | 0.0101                      | 0.0086 | EEGAA1H473FH□            | 39000                        | 51 x 92                    | 11.07                       | 12.73     | 0.0116                      | 0.0099 | EEGAA1J393FH□            |
| 56000                        | 51 x 105                   | 12.36                       | 14.21     | 0.0088                      | 0.0075 | EEGAA1H563FK□            | 47000                        | 51 x 105                   | 12.29                       | 14.13     | 0.0100                      | 0.0085 | EEGAA1J473FK□            |
| 68000                        | 51 x 130                   | 14.15                       | 16.27     | 0.0077                      | 0.0065 | EEGAA1H683FN□            | 56000                        | 51 x 130                   | 13.94                       | 16.03     | 0.0087                      | 0.0074 | EEGAA1J563FN□            |
| 82000                        | 51 x 143                   | 15.54                       | 17.87     | 0.0067                      | 0.0057 | EEGAA1H823FP□            | 68000                        | 51 x 143                   | 15.33                       | 17.63     | 0.0075                      | 0.0063 | EEGAA1J683FP□            |
| 68000                        | 64 x 79                    | 14.27                       | 16.41     | 0.0077                      | 0.0065 | EEGAA1H683GG□            | 56000                        | 64 x 79                    | 14.06                       | 16.17     | 0.0087                      | 0.0074 | EEGAA1J563GG□            |
| 82000                        | 64 x 92                    | 15.78                       | 18.15     | 0.0067                      | 0.0057 | EEGAA1H823GH□            | 68000                        | 64 x 92                    | 15.57                       | 17.91     | 0.0075                      | 0.0063 | EEGAA1J683GH□            |
| 100000                       | 64 x 105                   | 17.37                       | 19.98     | 0.0059                      | 0.0051 | EEGAA1H104GK□            | 82000                        | 64 x 105                   | 17.04                       | 19.60     | 0.0065                      | 0.0055 | EEGAA1J823GK□            |
| 120000                       | 64 x 117                   | 18.96                       | 21.80     | 0.0053                      | 0.0045 | EEGAA1H124GL□            | 100000                       | 64 x 117                   | 18.65                       | 21.45     | 0.0057                      | 0.0048 | EEGAA1J104GL□            |
| 140000                       | 64 x 130                   | 20.36                       | 23.41     | 0.0049                      | 0.0042 | EEGAA1H144GN□            | 110000                       | 64 x 130                   | 19.68                       | 22.63     | 0.0053                      | 0.0045 | EEGAA1J114GN□            |
| 150000                       | 64 x 143                   | 21.28                       | 24.47     | 0.0047                      | 0.0040 | EEGAA1H154GP□            | 120000                       | 64 x 143                   | 20.67                       | 23.77     | 0.0050                      | 0.0043 | EEGAA1J124GP□            |
| 100000                       | 76 x 79                    | 18.31                       | 21.06     | 0.0059                      | 0.0051 | EEGAA1H104HG□            | 82000                        | 76 x 79                    | 17.96                       | 20.65     | 0.0065                      | 0.0055 | EEGAA1J823HG□            |
| 120000                       | 76 x 92                    | 20.00                       | 23.00     | 0.0053                      | 0.0045 | EEGAA1H124HH□            | 100000                       | 76 x 92                    | 19.68                       | 22.63     | 0.0057                      | 0.0048 | EEGAA1J104HH□            |
| 150000                       | 76 x 105                   | 21.91                       | 25.20     | 0.0047                      | 0.0040 | EEGAA1H154HK□            | 120000                       | 76 x 105                   | 21.27                       | 24.46     | 0.0050                      | 0.0043 | EEGAA1J124HK□            |
| 180000                       | 76 x 117                   | 23.63                       | 27.17     | 0.0043                      | 0.0037 | EEGAA1H184HL□            | 130000                       | 76 x 117                   | 22.33                       | 25.68     | 0.0048                      | 0.0041 | EEGAA1J134HL□            |
| 200000                       | 76 x 130                   | 24.84                       | 28.57     | 0.0041                      | 0.0035 | EEGAA1H204HN□            | 150000                       | 76 x 130                   | 23.71                       | 27.27     | 0.0044                      | 0.0037 | EEGAA1J154HN□            |
| 220000                       | 76 x 143                   | 25.99                       | 29.89     | 0.0039                      | 0.0033 | EEGAA1H224HP□            | 180000                       | 76 x 143                   | 25.31                       | 29.11     | 0.0040                      | 0.0034 | EEGAA1J184HP□            |
| 390000                       | 76 x 219                   | 32.95                       | 37.89     | 0.0032                      | 0.0027 | EEGAA1H394HW□            | 270000                       | 76 x 219                   | 31.09                       | 35.75     | 0.0033                      | 0.0028 | EEGAA1J274HW□            |

## G-AA Typical Ratings (continued)

| Cap.<br>( $\mu$ F)             | Nominal Size<br>D x L (mm) | Max 85°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |        | Panasonic<br>Part Number | Cap.<br>( $\mu$ F)             | Nominal Size<br>D x L (mm) | Max 85°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |        | Panasonic<br>Part Number |
|--------------------------------|----------------------------|-----------------------------|-----------|-----------------------------|--------|--------------------------|--------------------------------|----------------------------|-----------------------------|-----------|-----------------------------|--------|--------------------------|
|                                |                            | 120Hz                       | 10k-50kHz | 120Hz                       | 20kHz  |                          |                                |                            | 120Hz                       | 10k-50kHz | 120Hz                       | 20kHz  |                          |
| 80 VDC Working, 100 VDC Surge  |                            |                             |           |                             |        |                          | 100 VDC Working, 125 VDC Surge |                            |                             |           |                             |        |                          |
| 3900                           | 35 x 41                    | 2.83                        | 3.25      | 0.0945                      | 0.0756 | EEGAA1K392CA□            | 2700                           | 35 x 41                    | 2.22                        | 2.55      | 0.1092                      | 0.0873 | EEGAA2A272CA□            |
| 5600                           | 35 x 54                    | 3.56                        | 4.09      | 0.0658                      | 0.0526 | EEGAA1K562CC□            | 3300                           | 35 x 54                    | 2.58                        | 2.97      | 0.0893                      | 0.0714 | EEGAA2A332CC□            |
| 6800                           | 35 x 67                    | 4.17                        | 4.80      | 0.0542                      | 0.0433 | EEGAA1K682CE□            | 4700                           | 35 x 67                    | 3.27                        | 3.76      | 0.0627                      | 0.0502 | EEGAA2A472CE□            |
| 10000                          | 35 x 79                    | 5.26                        | 6.05      | 0.0368                      | 0.0295 | EEGAA1K103CG□            | 5600                           | 35 x 79                    | 3.74                        | 4.30      | 0.0526                      | 0.0421 | EEGAA2A562CG□            |
| 12000                          | 35 x 92                    | 5.99                        | 6.89      | 0.0307                      | 0.0246 | EEGAA1K123CH□            | 6800                           | 35 x 92                    | 4.29                        | 4.93      | 0.0433                      | 0.0347 | EEGAA2A682CH□            |
| 13000                          | 35 x 105                   | 6.46                        | 7.43      | 0.0283                      | 0.0227 | EEGAA1K133CK□            | 8200                           | 35 x 105                   | 4.88                        | 5.61      | 0.0359                      | 0.0288 | EEGAA2A822CK□            |
| 15000                          | 35 x 117                   | 7.17                        | 8.25      | 0.0246                      | 0.0196 | EEGAA1K153CL□            | 10000                          | 35 x 117                   | 5.58                        | 6.42      | 0.0295                      | 0.0236 | EEGAA2A103CL□            |
| 18000                          | 35 x 130                   | 8.05                        | 9.26      | 0.0205                      | 0.0164 | EEGAA1K183CN□            | 12000                          | 35 x 130                   | 6.29                        | 7.23      | 0.0246                      | 0.0196 | EEGAA2A123CN□            |
| 22000                          | 35 x 143                   | 9.08                        | 10.44     | 0.0167                      | 0.0134 | EEGAA1K223CP□            | 13000                          | 35 x 143                   | 6.74                        | 7.75      | 0.0227                      | 0.0181 | EEGAA2A133CP□            |
| 10000                          | 51 x 48                    | 6.04                        | 6.95      | 0.0368                      | 0.0295 | EEGAA1K103FB□            | 6800                           | 51 x 48                    | 4.72                        | 5.43      | 0.0433                      | 0.0347 | EEGAA2A682FB□            |
| 12000                          | 51 x 54                    | 6.71                        | 7.72      | 0.0307                      | 0.0246 | EEGAA1K123FC□            | 8200                           | 51 x 54                    | 5.27                        | 6.06      | 0.0359                      | 0.0288 | EEGAA2A822FC□            |
| 15000                          | 51 x 67                    | 7.84                        | 9.02      | 0.0246                      | 0.0196 | EEGAA1K153FE□            | 10000                          | 51 x 67                    | 6.11                        | 7.03      | 0.0295                      | 0.0236 | EEGAA2A103FE□            |
| 22000                          | 51 x 79                    | 9.72                        | 11.18     | 0.0167                      | 0.0134 | EEGAA1K223FG□            | 15000                          | 51 x 79                    | 7.72                        | 8.88      | 0.0196                      | 0.0157 | EEGAA2A153FG□            |
| 27000                          | 51 x 92                    | 11.05                       | 12.71     | 0.0136                      | 0.0109 | EEGAA1K273FH□            | 18000                          | 51 x 92                    | 8.73                        | 10.04     | 0.0164                      | 0.0131 | EEGAA2A4823FH□           |
| 33000                          | 51 x 105                   | 12.44                       | 14.31     | 0.0112                      | 0.0089 | EEGAA1K333FK□            | 22000                          | 51 x 105                   | 9.90                        | 11.39     | 0.0134                      | 0.0107 | EEGAA2A223FK□            |
| 39000                          | 51 x 130                   | 14.18                       | 16.31     | 0.0102                      | 0.0082 | EEGAA1K393FN□            | 27000                          | 51 x 130                   | 11.56                       | 13.29     | 0.0109                      | 0.0087 | EEGAA2A273FN□            |
| 47000                          | 51 x 143                   | 15.71                       | 18.07     | 0.0091                      | 0.0073 | EEGAA1K473FP□            | 33000                          | 51 x 143                   | 12.98                       | 14.93     | 0.0098                      | 0.0079 | EEGAA2A333FP□            |
| 39000                          | 64 x 79                    | 13.65                       | 15.70     | 0.0132                      | 0.0106 | EEGAA1K393GG□            | 22000                          | 64 x 79                    | 10.95                       | 12.59     | 0.0167                      | 0.0134 | EEGAA2A223GG□            |
| 47000                          | 64 x 92                    | 15.22                       | 17.50     | 0.0110                      | 0.0088 | EEGAA1K473GH□            | 27000                          | 64 x 92                    | 12.43                       | 14.29     | 0.0136                      | 0.0109 | EEGAA2A273GH□            |
| 51000                          | 64 x 105                   | 16.19                       | 18.62     | 0.0101                      | 0.0081 | EEGAA1K513GK□            | 33000                          | 64 x 105                   | 14.00                       | 16.10     | 0.0112                      | 0.0089 | EEGAA2A333GK□            |
| 56000                          | 64 x 117                   | 17.29                       | 19.88     | 0.0092                      | 0.0074 | EEGAA1K563GL□            | 39000                          | 64 x 117                   | 15.51                       | 17.84     | 0.0094                      | 0.0076 | EEGAA2A393GL□            |
| 68000                          | 64 x 130                   | 19.07                       | 21.93     | 0.0080                      | 0.0064 | EEGAA1K683GN□            | 44000                          | 64 x 130                   | 16.76                       | 19.27     | 0.0084                      | 0.0067 | EEGAA2A443GN□            |
| 82000                          | 64 x 143                   | 20.87                       | 24.00     | 0.0066                      | 0.0053 | EEGAA1K823GP□            | 47000                          | 64 x 143                   | 17.66                       | 20.31     | 0.0078                      | 0.0063 | EEGAA2A473GP□            |
| 56000                          | 76 x 79                    | 17.58                       | 20.22     | 0.0105                      | 0.0084 | EEGAA1K563HG□            | 33000                          | 76 x 79                    | 15.18                       | 17.46     | 0.0156                      | 0.0125 | EEGAA2A333HG□            |
| 68000                          | 76 x 92                    | 19.48                       | 22.40     | 0.0087                      | 0.0069 | EEGAA1K683HH□            | 39000                          | 76 x 92                    | 16.83                       | 19.35     | 0.0132                      | 0.0106 | EEGAA2A393HH□            |
| 75000                          | 76 x 105                   | 20.71                       | 23.82     | 0.0079                      | 0.0063 | EEGAA1K753HK□            | 47000                          | 76 x 105                   | 18.71                       | 21.52     | 0.0110                      | 0.0088 | EEGAA2A473HK□            |
| 82000                          | 76 x 117                   | 21.95                       | 25.24     | 0.0072                      | 0.0058 | EEGAA1K823HL□            | 56000                          | 76 x 117                   | 20.66                       | 23.76     | 0.0092                      | 0.0074 | EEGAA2A563HL□            |
| 100000                         | 76 x 130                   | 24.00                       | 27.60     | 0.0059                      | 0.0047 | EEGAA1K104HN□            | 62000                          | 76 x 130                   | 22.05                       | 25.36     | 0.0083                      | 0.0067 | EEGAA2A623HN□            |
| 110000                         | 76 x 143                   | 25.30                       | 29.10     | 0.0060                      | 0.0048 | EEGAA1K114HP□            | 72000                          | 76 x 143                   | 23.91                       | 27.50     | 0.0072                      | 0.0057 | EEGAA2A723HP□            |
| 180000                         | 76 x 219                   | 32.90                       | 37.84     | 0.0041                      | 0.0033 | EEGAA1K184HW□            | 120000                         | 76 x 219                   | 32.58                       | 37.47     | 0.0049                      | 0.0039 | EEGAA2A124HW□            |
| 200 VDC Working, 250 VDC Surge |                            |                             |           |                             |        |                          | 250 VDC Working, 300 VDC Surge |                            |                             |           |                             |        |                          |
| 820                            | 35 x 41                    | 2.69                        | 3.77      | 0.270                       | 0.202  | EEGAA2D821CA□            | 560                            | 35 x 41                    | 2.40                        | 3.36      | 0.395                       | 0.296  | EEGAA2E561CA□            |
| 1200                           | 35 x 54                    | 3.41                        | 4.77      | 0.184                       | 0.138  | EEGAA2D122CC□            | 820                            | 35 x 54                    | 3.05                        | 4.27      | 0.270                       | 0.202  | EEGAA2E821CC□            |
| 1500                           | 35 x 67                    | 4.05                        | 5.67      | 0.147                       | 0.111  | EEGAA2D152CE□            | 1200                           | 35 x 67                    | 3.92                        | 5.49      | 0.184                       | 0.138  | EEGAA2E122CE□            |
| 1800                           | 35 x 79                    | 4.65                        | 6.51      | 0.123                       | 0.092  | EEGAA2D182CG□            | 1500                           | 35 x 79                    | 4.58                        | 6.41      | 0.147                       | 0.111  | EEGAA2E152CG□            |
| 2200                           | 35 x 92                    | 5.35                        | 7.49      | 0.100                       | 0.075  | EEGAA2D222CH□            | 1800                           | 35 x 92                    | 5.23                        | 7.32      | 0.123                       | 0.092  | EEGAA2E182CH□            |
| 2700                           | 35 x 105                   | 6.12                        | 8.57      | 0.082                       | 0.061  | EEGAA2D272CK□            | 2200                           | 35 x 105                   | 5.98                        | 8.37      | 0.100                       | 0.075  | EEGAA2E222CK□            |
| 3300                           | 35 x 117                   | 6.98                        | 9.77      | 0.067                       | 0.050  | EEGAA2D332CL□            | 2500                           | 35 x 117                   | 6.60                        | 9.24      | 0.088                       | 0.066  | EEGAA2E252CL□            |
| 3900                           | 35 x 130                   | 7.80                        | 10.92     | 0.057                       | 0.043  | EEGAA2D392CN□            | 2700                           | 35 x 130                   | 7.07                        | 9.90      | 0.082                       | 0.061  | EEGAA2E272CN□            |
| 4700                           | 35 x 143                   | 8.75                        | 12.25     | 0.047                       | 0.035  | EEGAA2D472CP□            | 3300                           | 35 x 143                   | 8.01                        | 11.21     | 0.067                       | 0.050  | EEGAA2E332CP□            |
| 1800                           | 51 x 48                    | 5.16                        | 7.22      | 0.123                       | 0.092  | EEGAA2D182FB□            | 1500                           | 51 x 48                    | 5.06                        | 7.08      | 0.147                       | 0.111  | EEGAA2E152FB□            |
| 2700                           | 51 x 54                    | 6.38                        | 8.93      | 0.082                       | 0.061  | EEGAA2D272FC□            | 1800                           | 51 x 54                    | 5.63                        | 7.88      | 0.123                       | 0.092  | EEGAA2E182FC□            |
| 3300                           | 51 x 67                    | 7.38                        | 10.33     | 0.067                       | 0.050  | EEGAA2D332FE□            | 2200                           | 51 x 67                    | 6.53                        | 9.14      | 0.100                       | 0.075  | EEGAA2E222FE□            |
| 3900                           | 51 x 79                    | 8.32                        | 11.65     | 0.057                       | 0.043  | EEGAA2D392FG□            | 3300                           | 51 x 79                    | 8.24                        | 11.54     | 0.067                       | 0.050  | EEGAA2E332FG□            |
| 5600                           | 51 x 92                    | 10.18                       | 14.25     | 0.039                       | 0.030  | EEGAA2D562FH□            | 3900                           | 51 x 92                    | 9.25                        | 12.95     | 0.057                       | 0.043  | EEGAA2E392FH□            |
| 6200                           | 51 x 105                   | 11.00                       | 15.40     | 0.036                       | 0.027  | EEGAA2D622FK□            | 4700                           | 51 x 105                   | 10.41                       | 14.57     | 0.047                       | 0.035  | EEGAA2E472FK□            |
| 8200                           | 51 x 130                   | 13.21                       | 18.49     | 0.027                       | 0.020  | EEGAA2D822FN□            | 6800                           | 51 x 130                   | 13.04                       | 18.26     | 0.033                       | 0.024  | EEGAA2E682FN□            |
| 10000                          | 51 x 143                   | 14.74                       | 20.64     | 0.022                       | 0.017  | EEGAA2D103FP□            | 8200                           | 51 x 143                   | 14.52                       | 20.33     | 0.027                       | 0.020  | EEGAA2E822FP□            |
| 5600                           | 64 x 79                    | 11.64                       | 16.30     | 0.039                       | 0.030  | EEGAA2D562GG□            | 5600                           | 64 x 79                    | 12.00                       | 16.80     | 0.039                       | 0.030  | EEGAA2E562GG□            |
| 8200                           | 64 x 92                    | 14.21                       | 19.89     | 0.027                       | 0.020  | EEGAA2D822GH□            | 6800                           | 64 x 92                    | 13.52                       | 18.93     | 0.033                       | 0.024  | EEGAA2E682GH□            |
| 10000                          | 64 x 105                   | 15.89                       | 22.25     | 0.022                       | 0.017  | EEGAA2D103GK□            | 8200                           | 64 x 105                   | 15.08                       | 21.11     | 0.027                       | 0.020  | EEGAA2E822GK□            |
| 12000                          | 64 x 117                   | 17.62                       | 24.67     | 0.018                       | 0.014  | EEGAA2D123GL□            | 10000                          | 64 x 117                   | 16.88                       | 23.63     | 0.022                       | 0.017  | EEGAA2E103GL□            |
| 15000                          | 64 x 130                   | 19.71                       | 27.59     | 0.015                       | 0.011  | EEGAA2D153GN□            | 12000                          | 64 x 130                   | 18.64                       | 26.10     | 0.018                       | 0.014  | EEGAA2E123GN□            |
| 17000                          | 64 x 143                   | 21.17                       | 29.64     | 0.013                       | 0.010  | EEGAA2D173GP□            | 13000                          | 64 x 143                   | 19.71                       | 27.59     | 0.017                       | 0.013  | EEGAA2E133GP□            |
| 10000                          | 76 x 79                    | 16.69                       | 23.37     | 0.022                       | 0.017  | EEGAA2D103HG□            | 8200                           | 76 x 79                    | 15.81                       | 22.13     | 0.027                       | 0.020  | EEGAA2E822HG□            |
| 12000                          | 76 x 92                    | 18.52                       | 25.93     | 0.018                       | 0.014  | EEGAA2D123HH□            | 10000                          | 76 x 92                    | 17.70                       | 24.78     | 0.022                       | 0.017  | EEGAA2E103HH□            |
| 15000                          | 76 x 105                   | 20.73                       | 29.02     | 0.015                       | 0.011  | EEGAA2D153HK□            | 12000                          | 76 x 105                   | 19.56                       | 27.38     | 0.018                       | 0.014  | EEGAA2E123HK□            |
| 18000                          | 76 x 117                   | 22.78                       | 31.89     | 0.012                       | 0.009  | EEGAA2D183HL□            | 15000                          | 76 x 117                   | 21.89                       | 30.65     | 0.015                       | 0.011  | EEGAA2E153HL□            |
| 21000                          | 76 x 130                   | 24.62                       | 34.47     | 0.011                       | 0.008  | EEGAA2D213HN□            | 17000                          | 76 x 130                   | 23.48                       | 32.87     | 0.013                       | 0.010  | EEGAA2E173HN□            |
| 22000                          | 76 x 143                   | 25.59                       | 35.83     | 0.010                       | 0.008  | EEGAA2D223HP□            | 18000                          | 76 x 143                   | 24.52                       | 34.33     | 0.012                       | 0.009  | EEGAA2E183HP□            |
| 37000                          | 76 x 219                   | 34.04                       | 47.66     | 0.008                       | 0.006  | EEGAA2D373HW□            | 27000                          | 76 x 219                   | 31.85                       | 44.59     | 0.010                       | 0.007  | EEGAA2E273HW□            |

## G-AA Typical Ratings (continued)

| Cap.<br>( $\mu$ F)             | Nominal Size<br>D x L (mm) | Max 85°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |       | Panasonic<br>Part Number | Cap.<br>( $\mu$ F)             | Nominal Size<br>D x L (mm) | Max 85°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |       | Panasonic<br>Part Number |
|--------------------------------|----------------------------|-----------------------------|-----------|-----------------------------|-------|--------------------------|--------------------------------|----------------------------|-----------------------------|-----------|-----------------------------|-------|--------------------------|
|                                |                            | 120Hz                       | 10k-50kHz | 120Hz                       | 20kHz |                          |                                |                            | 120Hz                       | 10k-50kHz | 120Hz                       | 20kHz |                          |
| 350 VDC Working, 400 VDC Surge |                            |                             |           |                             |       |                          | 400 VDC Working, 450 VDC Surge |                            |                             |           |                             |       |                          |
| 330                            | 35 x 41                    | 1.71                        | 2.39      | 0.536                       | 0.402 | EEGAA2V331CA□            | 270                            | 35 x 41                    | 1.74                        | 2.44      | 0.655                       | 0.458 | EEGAA2G271CA□            |
| 470                            | 35 x 54                    | 2.15                        | 3.01      | 0.376                       | 0.282 | EEGAA2V471CC□            | 390                            | 35 x 54                    | 2.21                        | 3.09      | 0.453                       | 0.317 | EEGAA2G391CC□            |
| 560                            | 35 x 67                    | 2.49                        | 3.49      | 0.316                       | 0.237 | EEGAA2V561CE□            | 470                            | 35 x 67                    | 2.58                        | 3.61      | 0.376                       | 0.263 | EEGAA2G471CE□            |
| 680                            | 35 x 79                    | 2.89                        | 4.05      | 0.260                       | 0.195 | EEGAA2V681CG□            | 560                            | 35 x 79                    | 2.96                        | 4.14      | 0.316                       | 0.221 | EEGAA2G561CG□            |
| 820                            | 35 x 92                    | 3.31                        | 4.63      | 0.216                       | 0.162 | EEGAA2V821CH□            | 680                            | 35 x 92                    | 3.41                        | 4.77      | 0.260                       | 0.182 | EEGAA2G681CH□            |
| 1000                           | 35 x 105                   | 3.80                        | 5.32      | 0.177                       | 0.133 | EEGAA2V102CK□            | 820                            | 35 x 105                   | 3.88                        | 5.43      | 0.216                       | 0.151 | EEGAA2G821CK□            |
| 1200                           | 35 x 117                   | 4.33                        | 6.06      | 0.147                       | 0.111 | EEGAA2V122CL□            | 1000                           | 35 x 117                   | 4.46                        | 6.24      | 0.177                       | 0.124 | EEGAA2G102CL□            |
| 1500                           | 35 x 130                   | 5.00                        | 7.00      | 0.118                       | 0.088 | EEGAA2V152CN□            | 1200                           | 35 x 130                   | 5.04                        | 7.06      | 0.147                       | 0.103 | EEGAA2G122CN□            |
| 1800                           | 35 x 143                   | 5.64                        | 7.90      | 0.098                       | 0.074 | EEGAA2V182CP□            | 1300                           | 35 x 143                   | 5.41                        | 7.57      | 0.136                       | 0.095 | EEGAA2G132CP□            |
| 820                            | 51 x 48                    | 3.64                        | 5.10      | 0.216                       | 0.162 | EEGAA2V821FB□            | 680                            | 51 x 48                    | 3.58                        | 5.01      | 0.260                       | 0.182 | EEGAA2G681FB□            |
| 1000                           | 51 x 54                    | 4.10                        | 5.74      | 0.177                       | 0.133 | EEGAA2V102FC□            | 820                            | 51 x 54                    | 4.01                        | 5.61      | 0.216                       | 0.151 | EEGAA2G821FC□            |
| 1200                           | 51 x 67                    | 4.73                        | 6.62      | 0.147                       | 0.111 | EEGAA2V122FE□            | 1000                           | 51 x 67                    | 4.67                        | 6.54      | 0.177                       | 0.124 | EEGAA2G102FE□            |
| 1800                           | 51 x 79                    | 6.04                        | 8.46      | 0.098                       | 0.074 | EEGAA2V182FG□            | 1500                           | 51 x 79                    | 5.96                        | 8.34      | 0.118                       | 0.083 | EEGAA2G152FG□            |
| 2200                           | 51 x 92                    | 6.94                        | 9.72      | 0.080                       | 0.060 | EEGAA2V222FH□            | 1800                           | 51 x 92                    | 6.78                        | 9.49      | 0.098                       | 0.069 | EEGAA2G182FH□            |
| 2700                           | 51 x 105                   | 7.95                        | 11.13     | 0.065                       | 0.049 | EEGAA2V272FK□            | 2200                           | 51 x 105                   | 7.75                        | 10.85     | 0.080                       | 0.056 | EEGAA2G222FK□            |
| 3300                           | 51 x 130                   | 9.35                        | 13.09     | 0.054                       | 0.040 | EEGAA2V332FN□            | 2700                           | 51 x 130                   | 9.14                        | 12.80     | 0.065                       | 0.046 | EEGAA2G272FN□            |
| 3900                           | 51 x 143                   | 10.45                       | 14.63     | 0.045                       | 0.034 | EEGAA2V392FP□            | 3300                           | 51 x 143                   | 10.38                       | 14.53     | 0.054                       | 0.038 | EEGAA2G332FP□            |
| 2700                           | 64 x 79                    | 8.50                        | 11.90     | 0.065                       | 0.049 | EEGAA2V272GG□            | 2200                           | 64 x 79                    | 8.24                        | 11.54     | 0.080                       | 0.056 | EEGAA2G222GG□            |
| 3300                           | 64 x 92                    | 9.72                        | 13.61     | 0.054                       | 0.040 | EEGAA2V332GH□            | 2700                           | 64 x 92                    | 9.45                        | 13.23     | 0.065                       | 0.046 | EEGAA2G272GH□            |
| 3900                           | 64 x 105                   | 10.89                       | 15.25     | 0.045                       | 0.034 | EEGAA2V392GK□            | 3300                           | 64 x 105                   | 10.76                       | 15.06     | 0.054                       | 0.038 | EEGAA2G332GK□            |
| 4700                           | 64 x 117                   | 12.32                       | 17.25     | 0.038                       | 0.028 | EEGAA2V472GL□            | 3900                           | 64 x 117                   | 12.05                       | 16.87     | 0.045                       | 0.032 | EEGAA2G392GL□            |
| 5600                           | 64 x 130                   | 13.81                       | 19.33     | 0.032                       | 0.024 | EEGAA2V562GN□            | 4700                           | 64 x 130                   | 13.59                       | 19.03     | 0.038                       | 0.026 | EEGAA2G472GN□            |
| 6200                           | 64 x 143                   | 14.89                       | 20.85     | 0.029                       | 0.021 | EEGAA2V622GP□            | 5100                           | 64 x 143                   | 14.51                       | 20.31     | 0.035                       | 0.024 | EEGAA2G512GP□            |
| 4700                           | 76 x 79                    | 12.96                       | 18.14     | 0.038                       | 0.028 | EEGAA2V472HG□            | 3900                           | 76 x 79                    | 12.22                       | 17.11     | 0.045                       | 0.032 | EEGAA2G392HG□            |
| 5600                           | 76 x 92                    | 14.60                       | 20.44     | 0.032                       | 0.024 | EEGAA2V562HH□            | 4300                           | 76 x 92                    | 13.24                       | 18.54     | 0.041                       | 0.029 | EEGAA2G432HH□            |
| 6200                           | 76 x 105                   | 15.78                       | 22.09     | 0.029                       | 0.021 | EEGAA2V622HK□            | 4700                           | 76 x 105                   | 14.22                       | 19.91     | 0.038                       | 0.026 | EEGAA2G472HK□            |
| 6800                           | 76 x 117                   | 16.98                       | 23.77     | 0.026                       | 0.020 | EEGAA2V682HL□            | 5600                           | 76 x 117                   | 15.95                       | 22.33     | 0.032                       | 0.022 | EEGAA2G562HL□            |
| 8200                           | 76 x 130                   | 19.11                       | 26.75     | 0.022                       | 0.016 | EEGAA2V822HN□            | 6800                           | 76 x 130                   | 18.01                       | 25.21     | 0.026                       | 0.018 | EEGAA2G682HN□            |
| 9100                           | 76 x 143                   | 20.60                       | 28.84     | 0.019                       | 0.015 | EEGAA2V912HP□            | 7500                           | 76 x 143                   | 19.36                       | 27.10     | 0.024                       | 0.017 | EEGAA2G752HP□            |
| 15000                          | 76 x 219                   | 30.03                       | 42.04     | 0.012                       | 0.009 | EEGAA2V153HW□            | 12000                          | 76 x 219                   | 27.80                       | 38.92     | 0.015                       | 0.010 | EEGAA2G123HW□            |
| 450 VDC Working, 500 VDC Surge |                            |                             |           |                             |       |                          | 500 VDC Working, 550 VDC Surge |                            |                             |           |                             |       |                          |
| 220                            | 35 x 41                    | 1.57                        | 2.20      | 0.804                       | 0.522 | EEGAA2W221CA□            | 150                            | 35 x 41                    | 1.24                        | 1.74      | 1.375                       | 0.963 | EEGAA2H151CA□            |
| 270                            | 35 x 54                    | 1.83                        | 2.56      | 0.655                       | 0.426 | EEGAA2W271CC□            | 180                            | 35 x 54                    | 1.43                        | 2.00      | 1.146                       | 0.802 | EEGAA2H181CC□            |
| 390                            | 35 x 67                    | 2.35                        | 3.29      | 0.453                       | 0.295 | EEGAA2W391CE□            | 220                            | 35 x 67                    | 1.69                        | 2.37      | 0.938                       | 0.656 | EEGAA2H221CE□            |
| 470                            | 35 x 79                    | 2.71                        | 3.79      | 0.376                       | 0.245 | EEGAA2W471CG□            | 330                            | 35 x 79                    | 2.17                        | 3.04      | 0.625                       | 0.438 | EEGAA2H331CG□            |
| 560                            | 35 x 92                    | 3.09                        | 4.33      | 0.316                       | 0.205 | EEGAA2W561CH□            | 390                            | 35 x 92                    | 2.47                        | 3.46      | 0.529                       | 0.370 | EEGAA2H391CH□            |
| 680                            | 35 x 105                   | 3.54                        | 4.96      | 0.260                       | 0.169 | EEGAA2W681CK□            | 470                            | 35 x 105                   | 2.81                        | 3.93      | 0.439                       | 0.307 | EEGAA2H471CK□            |
| 820                            | 35 x 117                   | 4.03                        | 5.64      | 0.216                       | 0.140 | EEGAA2W821CL□            | 560                            | 35 x 117                   | 3.18                        | 4.45      | 0.368                       | 0.258 | EEGAA2H561CL□            |
| 1000                           | 35 x 130                   | 4.60                        | 6.44      | 0.177                       | 0.115 | EEGAA2W102CN□            | 680                            | 35 x 130                   | 3.62                        | 5.07      | 0.303                       | 0.212 | EEGAA2H681CN□            |
| 1100                           | 35 x 143                   | 4.98                        | 6.97      | 0.161                       | 0.104 | EEGAA2W112CP□            | 750                            | 35 x 143                   | 3.92                        | 5.49      | 0.275                       | 0.193 | EEGAA2H751CP□            |
| 560                            | 51 x 48                    | 3.25                        | 4.55      | 0.316                       | 0.205 | EEGAA2W561FB□            | 390                            | 51 x 48                    | 2.71                        | 3.79      | 0.529                       | 0.370 | EEGAA2H391FB□            |
| 680                            | 51 x 54                    | 3.65                        | 5.11      | 0.260                       | 0.169 | EEGAA2W681FC□            | 470                            | 51 x 54                    | 3.03                        | 4.24      | 0.439                       | 0.307 | EEGAA2H471FC□            |
| 820                            | 51 x 67                    | 4.23                        | 5.92      | 0.216                       | 0.140 | EEGAA2W821FE□            | 560                            | 51 x 67                    | 3.48                        | 4.87      | 0.368                       | 0.258 | EEGAA2H561FE□            |
| 1000                           | 51 x 79                    | 4.87                        | 6.82      | 0.177                       | 0.115 | EEGAA2W102FG□            | 820                            | 51 x 79                    | 4.39                        | 6.15      | 0.252                       | 0.176 | EEGAA2H821FG□            |
| 1200                           | 51 x 92                    | 5.54                        | 7.76      | 0.147                       | 0.096 | EEGAA2W122FH□            | 1000                           | 51 x 92                    | 5.03                        | 7.04      | 0.206                       | 0.144 | EEGAA2H102FH□            |
| 1500                           | 51 x 105                   | 6.40                        | 8.96      | 0.118                       | 0.077 | EEGAA2W152FK□            | 1200                           | 51 x 105                   | 6.35                        | 8.89      | 0.172                       | 0.120 | EEGAA2H122FK□            |
| 2200                           | 51 x 130                   | 8.25                        | 11.55     | 0.080                       | 0.052 | EEGAA2W222FN□            | 1500                           | 51 x 130                   | 6.76                        | 9.46      | 0.138                       | 0.096 | EEGAA2H152FN□            |
| 2700                           | 51 x 143                   | 9.39                        | 13.15     | 0.065                       | 0.043 | EEGAA2W272FP□            | 1800                           | 51 x 143                   | 7.59                        | 10.63     | 0.115                       | 0.080 | EEGAA2H182FP□            |
| 1800                           | 64 x 79                    | 7.45                        | 10.43     | 0.098                       | 0.064 | EEGAA2W182GG□            | 1200                           | 64 x 79                    | 6.29                        | 8.81      | 0.172                       | 0.120 | EEGAA2H122GG□            |
| 2200                           | 64 x 92                    | 8.53                        | 11.94     | 0.080                       | 0.052 | EEGAA2W222GH□            | 1500                           | 64 x 92                    | 7.27                        | 10.18     | 0.138                       | 0.096 | EEGAA2H152GH□            |
| 2700                           | 64 x 105                   | 9.73                        | 13.62     | 0.065                       | 0.043 | EEGAA2W272GK□            | 1800                           | 64 x 105                   | 8.18                        | 11.45     | 0.115                       | 0.080 | EEGAA2H182GK□            |
| 3300                           | 64 x 117                   | 11.09                       | 15.53     | 0.054                       | 0.035 | EEGAA2W332GL□            | 2200                           | 64 x 117                   | 9.30                        | 13.02     | 0.094                       | 0.066 | EEGAA2H222GL□            |
| 3600                           | 64 x 130                   | 11.89                       | 16.65     | 0.049                       | 0.032 | EEGAA2W362GN□            | 2400                           | 64 x 130                   | 9.96                        | 13.94     | 0.086                       | 0.060 | EEGAA2H242GN□            |
| 3900                           | 64 x 143                   | 12.69                       | 17.77     | 0.045                       | 0.029 | EEGAA2W392GP□            | 2700                           | 64 x 143                   | 10.82                       | 15.15     | 0.076                       | 0.053 | EEGAA2H272GP□            |
| 2700                           | 76 x 79                    | 10.17                       | 14.24     | 0.065                       | 0.043 | EEGAA2W272HG□            | 2000                           | 76 x 79                    | 8.91                        | 12.47     | 0.103                       | 0.072 | EEGAA2H202HG□            |
| 3300                           | 76 x 92                    | 11.60                       | 16.24     | 0.054                       | 0.035 | EEGAA2W332HH□            | 2400                           | 76 x 92                    | 10.04                       | 14.06     | 0.086                       | 0.060 | EEGAA2H242HH□            |
| 3900                           | 76 x 105                   | 12.95                       | 18.13     | 0.045                       | 0.029 | EEGAA2W392HK□            | 2700                           | 76 x 105                   | 10.92                       | 15.29     | 0.076                       | 0.053 | EEGAA2H272HK□            |
| 4700                           | 76 x 117                   | 14.62                       | 20.47     | 0.038                       | 0.024 | EEGAA2W472HL□            | 3300                           | 76 x 117                   | 12.37                       | 17.32     | 0.063                       | 0.044 | EEGAA2H332HL□            |
| 5600                           | 76 x 130                   | 16.34                       | 22.88     | 0.032                       | 0.021 | EEGAA2W562HN□            | 3600                           | 76 x 130                   | 13.21                       | 18.49     | 0.057                       | 0.040 | EEGAA2H362HN□            |
| 6200                           | 76 x 143                   | 17.60                       | 24.64     | 0.029                       | 0.019 | EEGAA2W622HP□            | 3900                           | 76 x 143                   | 14.05                       | 19.67     | 0.053                       | 0.037 | EEGAA2H392HP□            |
| 10000                          | 76 x 219                   | 25.38                       | 35.53     | 0.018                       | 0.011 | EEGAA2W103HW□            | 6800                           | 76 x 219                   | 20.71                       | 28.99     | 0.030                       | 0.021 | EEGAA2H682HW□            |

**G-BA Series** screw terminal style

- Long life for industrial applications
- 2000 hour life @ 105°C with ripple current applied
- High CV design
- Customized designs available



|                        |                                                                         |
|------------------------|-------------------------------------------------------------------------|
| Rated Working Voltage: | 10 ~ 450 VDC                                                            |
| Operating Temperature: | -40 ~ +105°C                                                            |
| Nominal Capacitance:   | 220 ~ 1200000μF                                                         |
| Capacitance Tolerance: | ± 20%                                                                   |
| Endurance:             | 2000 hours at +105°C with maximum specified ripple current (see page 4) |

**Part Number System**Common Code/  
Terminal StyleSeries  
CodeVoltage  
CodeCapacitance  
CodeCase Size  
CodeTerminal  
Code  
(see pg. 29)**G-BA Typical Ratings**

| Cap.<br>(μF)                        | Nominal Size<br>D x L (mm) | Max 105°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |        | Panasonic<br>Part Number | Cap.<br>(μF)                        | Nominal Size<br>D x L (mm) | Max 105°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |        | Panasonic<br>Part Number |
|-------------------------------------|----------------------------|------------------------------|-----------|-----------------------------|--------|--------------------------|-------------------------------------|----------------------------|------------------------------|-----------|-----------------------------|--------|--------------------------|
|                                     |                            | 120Hz                        | 10k-50kHz | 120Hz                       | 20kHz  |                          |                                     |                            | 120Hz                        | 10k-50kHz | 120Hz                       | 20kHz  |                          |
| <b>10 VDC Working, 13 VDC Surge</b> |                            |                              |           |                             |        |                          | <b>16 VDC Working, 20 VDC Surge</b> |                            |                              |           |                             |        |                          |
| 33000                               | 35 x 41                    | 4.67                         | 5.37      | 0.0402                      | 0.0362 | EEGBA1A333CA□            | 22000                               | 35 x 41                    | 4.47                         | 5.14      | 0.0435                      | 0.0392 | EEGBA1C223CA□            |
| 39000                               | 35 x 54                    | 5.31                         | 6.11      | 0.0345                      | 0.0310 | EEGBA1A393CC□            | 33000                               | 35 x 54                    | 5.65                         | 6.50      | 0.0301                      | 0.0271 | EEGBA1C333CC□            |
| 56000                               | 35 x 67                    | 6.62                         | 7.61      | 0.0249                      | 0.0224 | EEGBA1A563CE□            | 47000                               | 35 x 67                    | 6.99                         | 8.04      | 0.0221                      | 0.0199 | EEGBA1C473CE□            |
| 75000                               | 35 x 79                    | 7.86                         | 9.04      | 0.0194                      | 0.0174 | EEGBA1A753CG□            | 56000                               | 35 x 79                    | 7.89                         | 9.07      | 0.0191                      | 0.0172 | EEGBA1C563CG□            |
| 82000                               | 35 x 92                    | 8.52                         | 9.80      | 0.0180                      | 0.0162 | EEGBA1A823CH□            | 68000                               | 35 x 92                    | 8.91                         | 10.25     | 0.0163                      | 0.0146 | EEGBA1C683CH□            |
| 100000                              | 35 x 105                   | 9.56                         | 10.99     | 0.0153                      | 0.0138 | EEGBA1A104CK□            | 82000                               | 35 x 105                   | 9.93                         | 11.42     | 0.0141                      | 0.0126 | EEGBA1C823CK□            |
| 120000                              | 35 x 117                   | 10.64                        | 12.24     | 0.0132                      | 0.0119 | EEGBA1A124CL□            | 91000                               | 35 x 117                   | 10.71                        | 12.32     | 0.0130                      | 0.0117 | EEGBA1C913CL□            |
| 130000                              | 35 x 130                   | 11.32                        | 13.02     | 0.0125                      | 0.0112 | EEGBA1A134CN□            | 100000                              | 35 x 130                   | 11.44                        | 13.16     | 0.0121                      | 0.0109 | EEGBA1C104CN□            |
| 150000                              | 35 x 143                   | 12.28                        | 14.12     | 0.0112                      | 0.0101 | EEGBA1A154CP□            | 120000                              | 35 x 143                   | 12.55                        | 14.43     | 0.0106                      | 0.0096 | EEGBA1C124CP□            |
| 82000                               | 51 x 48                    | 9.10                         | 10.47     | 0.0180                      | 0.0162 | EEGBA1A823FB□            | 56000                               | 51 x 48                    | 8.81                         | 10.13     | 0.0191                      | 0.0172 | EEGBA1C563FB□            |
| 100000                              | 51 x 54                    | 10.03                        | 11.53     | 0.0153                      | 0.0138 | EEGBA1A104FC□            | 75000                               | 51 x 54                    | 10.07                        | 11.58     | 0.0151                      | 0.0136 | EEGBA1C753FC□            |
| 120000                              | 51 x 67                    | 11.32                        | 13.02     | 0.0132                      | 0.0119 | EEGBA1A124FE□            | 100000                              | 51 x 67                    | 11.78                        | 13.55     | 0.0121                      | 0.0109 | EEGBA1C104FE□            |
| 150000                              | 51 x 79                    | 12.77                        | 14.69     | 0.0112                      | 0.0101 | EEGBA1A154FG□            | 120000                              | 51 x 79                    | 13.06                        | 15.02     | 0.0106                      | 0.0096 | EEGBA1C124FG□            |
| 180000                              | 51 x 92                    | 14.11                        | 16.23     | 0.0098                      | 0.0089 | EEGBA1A184FH□            | 150000                              | 51 x 92                    | 14.56                        | 16.74     | 0.0092                      | 0.0082 | EEGBA1C154FH□            |
| 220000                              | 51 x 105                   | 15.53                        | 17.86     | 0.0086                      | 0.0077 | EEGBA1A224FK□            | 180000                              | 51 x 105                   | 15.87                        | 18.25     | 0.0082                      | 0.0073 | EEGBA1C184FK□            |
| 270000                              | 51 x 130                   | 17.54                        | 20.17     | 0.0076                      | 0.0068 | EEGBA1A274FN□            | 220000                              | 51 x 130                   | 17.83                        | 20.50     | 0.0073                      | 0.0065 | EEGBA1C224FN□            |
| 330000                              | 51 x 143                   | 19.00                        | 21.85     | 0.0067                      | 0.0061 | EEGBA1A334FP□            | 270000                              | 51 x 143                   | 19.26                        | 22.15     | 0.0065                      | 0.0059 | EEGBA1C274FP□            |
| 270000                              | 64 x 79                    | 17.74                        | 20.40     | 0.0076                      | 0.0068 | EEGBA1A274GG□            | 180000                              | 64 x 79                    | 17.09                        | 19.65     | 0.0082                      | 0.0073 | EEGBA1C184GG□            |
| 330000                              | 64 x 92                    | 19.36                        | 22.26     | 0.0067                      | 0.0061 | EEGBA1A334GH□            | 220000                              | 64 x 92                    | 18.67                        | 21.47     | 0.0073                      | 0.0065 | EEGBA1C224GH□            |
| 390000                              | 64 x 105                   | 20.76                        | 23.87     | 0.0062                      | 0.0056 | EEGBA1A394GK□            | 270000                              | 64 x 105                   | 20.21                        | 23.24     | 0.0065                      | 0.0059 | EEGBA1C274GK□            |
| 470000                              | 64 x 117                   | 22.29                        | 25.63     | 0.0056                      | 0.0051 | EEGBA1A474GL□            | 330000                              | 64 x 117                   | 21.76                        | 25.02     | 0.0059                      | 0.0053 | EEGBA1C334GL□            |
| 510000                              | 64 x 130                   | 23.27                        | 26.76     | 0.0054                      | 0.0049 | EEGBA1A514GN□            | 390000                              | 64 x 130                   | 23.08                        | 26.54     | 0.0055                      | 0.0050 | EEGBA1C394GN□            |
| 560000                              | 64 x 143                   | 24.29                        | 27.93     | 0.0052                      | 0.0047 | EEGBA1A564GP□            | 470000                              | 64 x 143                   | 24.46                        | 28.13     | 0.0051                      | 0.0046 | EEGBA1C474GP□            |
| 390000                              | 76 x 79                    | 21.95                        | 25.24     | 0.0062                      | 0.0056 | EEGBA1A394HG□            | 330000                              | 76 x 79                    | 22.32                        | 25.67     | 0.0059                      | 0.0053 | EEGBA1C334HG□            |
| 470000                              | 76 x 92                    | 23.58                        | 27.12     | 0.0056                      | 0.0051 | EEGBA1A474HH□            | 390000                              | 76 x 92                    | 23.79                        | 27.36     | 0.0055                      | 0.0050 | EEGBA1C394HH□            |
| 560000                              | 76 x 105                   | 25.08                        | 28.84     | 0.0052                      | 0.0047 | EEGBA1A564HK□            | 470000                              | 76 x 105                   | 25.25                        | 29.04     | 0.0051                      | 0.0046 | EEGBA1C474HK□            |
| 680000                              | 76 x 117                   | 26.68                        | 30.68     | 0.0048                      | 0.0044 | EEGBA1A684HL□            | 510000                              | 76 x 117                   | 26.29                        | 30.23     | 0.0050                      | 0.0045 | EEGBA1C514HL□            |
| 750000                              | 76 x 130                   | 27.76                        | 31.92     | 0.0047                      | 0.0042 | EEGBA1A754HN□            | 560000                              | 76 x 130                   | 27.32                        | 31.42     | 0.0048                      | 0.0043 | EEGBA1C564HN□            |
| 820000                              | 76 x 143                   | 28.79                        | 33.11     | 0.0045                      | 0.0041 | EEGBA1A824HP□            | 620000                              | 76 x 143                   | 28.36                        | 32.61     | 0.0047                      | 0.0042 | EEGBA1C624HP□            |
| 1200000                             | 76 x 219                   | 34.30                        | 39.45     | 0.0041                      | 0.0036 | EEGBA1A125HW□            | 1000000                             | 76 x 219                   | 34.01                        | 39.11     | 0.0041                      | 0.0037 | EEGBA1C105HW□            |

## G-BA Typical Ratings (continued)

| Cap.<br>( $\mu$ F)           | Nominal Size<br>D x L (mm) | Max 105°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |        | Panasonic<br>Part Number | Cap.<br>( $\mu$ F)           | Nominal Size<br>D x L (mm) | Max 105°C R.C. ( $A_{rms}$ ) |           | 20°C ESR ( $\Omega$ , max.) |        | Panasonic<br>Part Number |
|------------------------------|----------------------------|------------------------------|-----------|-----------------------------|--------|--------------------------|------------------------------|----------------------------|------------------------------|-----------|-----------------------------|--------|--------------------------|
|                              |                            | 120Hz                        | 10k-50kHz | 120Hz                       | 20kHz  |                          |                              |                            | 120Hz                        | 10k-50kHz | 120Hz                       | 20kHz  |                          |
| 25 VDC Working, 32 VDC Surge |                            |                              |           |                             |        |                          | 35 VDC Working, 44 VDC Surge |                            |                              |           |                             |        |                          |
| 18000                        | 35 x 41                    | 4.52                         | 5.20      | 0.0368                      | 0.0313 | EEGBA1E183CA□            | 12000                        | 35 x 41                    | 4.36                         | 5.01      | 0.0491                      | 0.0418 | EEGBA1V123CA□            |
| 22000                        | 35 x 54                    | 5.21                         | 5.99      | 0.0309                      | 0.0263 | EEGBA1E223CC□            | 18000                        | 35 x 54                    | 5.51                         | 6.34      | 0.0337                      | 0.0287 | EEGBA1V183CC□            |
| 33000                        | 35 x 67                    | 6.62                         | 7.61      | 0.0220                      | 0.0187 | EEGBA1E333CE□            | 22000                        | 35 x 67                    | 6.41                         | 7.37      | 0.0281                      | 0.0239 | EEGBA1V223CE□            |
| 39000                        | 35 x 79                    | 7.46                         | 8.58      | 0.0192                      | 0.0163 | EEGBA1E393CG□            | 27000                        | 35 x 79                    | 7.33                         | 8.43      | 0.0235                      | 0.0200 | EEGBA1V273CG□            |
| 47000                        | 35 x 92                    | 8.41                         | 9.67      | 0.0167                      | 0.0142 | EEGBA1E473CH□            | 33000                        | 35 x 92                    | 8.32                         | 9.57      | 0.0197                      | 0.0168 | EEGBA1V333CH□            |
| 56000                        | 35 x 105                   | 9.35                         | 10.75     | 0.0146                      | 0.0124 | EEGBA1E563CK□            | 39000                        | 35 x 105                   | 9.23                         | 10.61     | 0.0172                      | 0.0146 | EEGBA1V393CK□            |
| 68000                        | 35 x 117                   | 10.43                        | 11.99     | 0.0128                      | 0.0109 | EEGBA1E683CL□            | 47000                        | 35 x 117                   | 10.29                        | 11.83     | 0.0147                      | 0.0125 | EEGBA1V473CL□            |
| 75000                        | 35 x 130                   | 11.17                        | 12.85     | 0.0120                      | 0.0102 | EEGBA1E753CN□            | 51000                        | 35 x 130                   | 10.95                        | 12.59     | 0.0138                      | 0.0117 | EEGBA1V513CN□            |
| 82000                        | 35 x 143                   | 11.88                        | 13.66     | 0.0113                      | 0.0096 | EEGBA1E823CP□            | 56000                        | 35 x 143                   | 11.68                        | 13.43     | 0.0129                      | 0.0109 | EEGBA1V563CP□            |
| 47000                        | 51 x 48                    | 8.96                         | 10.30     | 0.0167                      | 0.0142 | EEGBA1E473FB□            | 33000                        | 51 x 48                    | 8.76                         | 10.07     | 0.0197                      | 0.0168 | EEGBA1V333FB□            |
| 56000                        | 51 x 54                    | 9.78                         | 11.25     | 0.0146                      | 0.0124 | EEGBA1E563FC□            | 39000                        | 51 x 54                    | 9.54                         | 10.97     | 0.0172                      | 0.0146 | EEGBA1V393FC□            |
| 68000                        | 51 x 67                    | 11.08                        | 12.74     | 0.0128                      | 0.0109 | EEGBA1E683FE□            | 47000                        | 51 x 67                    | 10.79                        | 12.41     | 0.0147                      | 0.0125 | EEGBA1V473FE□            |
| 100000                       | 51 x 79                    | 13.18                        | 15.16     | 0.0100                      | 0.0085 | EEGBA1E104FG□            | 68000                        | 51 x 79                    | 12.80                        | 14.72     | 0.0111                      | 0.0094 | EEGBA1V683FG□            |
| 120000                       | 51 x 92                    | 14.49                        | 16.66     | 0.0090                      | 0.0077 | EEGBA1E124FH□            | 82000                        | 51 x 92                    | 14.12                        | 16.24     | 0.0097                      | 0.0083 | EEGBA1V823FH□            |
| 130000                       | 51 x 105                   | 15.33                        | 17.63     | 0.0087                      | 0.0074 | EEGBA1E134FK□            | 100000                       | 51 x 105                   | 15.47                        | 17.79     | 0.0085                      | 0.0072 | EEGBA1V104FK□            |
| 150000                       | 51 x 130                   | 16.99                        | 19.54     | 0.0081                      | 0.0068 | EEGBA1E154FN□            | 120000                       | 51 x 130                   | 17.31                        | 19.91     | 0.0076                      | 0.0064 | EEGBA1V124FN□            |
| 180000                       | 51 x 143                   | 18.32                        | 21.07     | 0.0074                      | 0.0063 | EEGBA1E184FP□            | 150000                       | 51 x 143                   | 18.80                        | 21.62     | 0.0067                      | 0.0057 | EEGBA1V154FP□            |
| 120000                       | 64 x 79                    | 16.11                        | 18.53     | 0.0090                      | 0.0077 | EEGBA1E124GG□            | 100000                       | 64 x 79                    | 16.64                        | 19.14     | 0.0085                      | 0.0072 | EEGBA1V104GG□            |
| 150000                       | 64 x 92                    | 17.76                        | 20.42     | 0.0081                      | 0.0068 | EEGBA1E154GH□            | 120000                       | 64 x 92                    | 18.10                        | 20.82     | 0.0076                      | 0.0064 | EEGBA1V124GH□            |
| 180000                       | 64 x 105                   | 19.19                        | 22.07     | 0.0074                      | 0.0063 | EEGBA1E184GK□            | 150000                       | 64 x 105                   | 19.70                        | 22.66     | 0.0067                      | 0.0057 | EEGBA1V154GK□            |
| 220000                       | 64 x 117                   | 20.74                        | 23.85     | 0.0068                      | 0.0058 | EEGBA1E224GL□            | 180000                       | 64 x 117                   | 21.15                        | 24.32     | 0.0060                      | 0.0051 | EEGBA1V184GL□            |
| 270000                       | 64 x 130                   | 22.24                        | 25.58     | 0.0063                      | 0.0054 | EEGBA1E274GN□            | 220000                       | 64 x 130                   | 22.60                        | 25.99     | 0.0055                      | 0.0047 | EEGBA1V224GN□            |
| 330000                       | 64 x 143                   | 23.68                        | 27.23     | 0.0059                      | 0.0050 | EEGBA1E334GP□            | 270000                       | 64 x 143                   | 24.03                        | 27.63     | 0.0050                      | 0.0043 | EEGBA1V274GP□            |
| 220000                       | 76 x 79                    | 21.25                        | 24.44     | 0.0068                      | 0.0058 | EEGBA1E224HG□            | 150000                       | 76 x 79                    | 20.80                        | 23.92     | 0.0067                      | 0.0057 | EEGBA1V154HG□            |
| 270000                       | 76 x 92                    | 22.89                        | 26.32     | 0.0063                      | 0.0054 | EEGBA1E274HH□            | 180000                       | 76 x 92                    | 22.35                        | 25.70     | 0.0060                      | 0.0051 | EEGBA1V184HH□            |
| 330000                       | 76 x 105                   | 24.42                        | 28.08     | 0.0059                      | 0.0050 | EEGBA1E334HK□            | 220000                       | 76 x 105                   | 23.89                        | 27.47     | 0.0055                      | 0.0047 | EEGBA1V224HK□            |
| 390000                       | 76 x 117                   | 25.81                        | 29.68     | 0.0056                      | 0.0048 | EEGBA1E394HL□            | 270000                       | 76 x 117                   | 25.46                        | 29.28     | 0.0050                      | 0.0043 | EEGBA1V274HL□            |
| 430000                       | 76 x 130                   | 26.84                        | 30.87     | 0.0055                      | 0.0047 | EEGBA1E434HN□            | 300000                       | 76 x 130                   | 26.53                        | 30.51     | 0.0048                      | 0.0041 | EEGBA1V304HN□            |
| 470000                       | 76 x 143                   | 27.82                        | 31.99     | 0.0054                      | 0.0046 | EEGBA1E474HP□            | 330000                       | 76 x 143                   | 27.53                        | 31.66     | 0.0046                      | 0.0039 | EEGBA1V334HP□            |
| 750000                       | 76 x 219                   | 33.26                        | 38.25     | 0.0049                      | 0.0042 | EEGBA1E754HW□            | 560000                       | 76 x 219                   | 33.28                        | 38.27     | 0.0039                      | 0.0034 | EEGBA1V564HW□            |
| 50 VDC Working, 63 VDC Surge |                            |                              |           |                             |        |                          | 63 VDC Working, 79 VDC Surge |                            |                              |           |                             |        |                          |
| 8200                         | 35 x 41                    | 4.11                         | 4.73      | 0.0539                      | 0.0458 | EEGBA1H822CA□            | 5600                         | 35 x 41                    | 3.80                         | 4.37      | 0.0658                      | 0.0559 | EEGBA1J562CA□            |
| 12000                        | 35 x 54                    | 5.11                         | 5.88      | 0.0368                      | 0.0313 | EEGBA1H123CC□            | 8200                         | 35 x 54                    | 4.76                         | 5.47      | 0.0449                      | 0.0382 | EEGBA1J822CC□            |
| 15000                        | 35 x 67                    | 5.99                         | 6.89      | 0.0295                      | 0.0251 | EEGBA1H153CE□            | 10000                        | 35 x 67                    | 5.54                         | 6.37      | 0.0368                      | 0.0313 | EEGBA1J103CE□            |
| 18000                        | 35 x 79                    | 6.80                         | 7.82      | 0.0246                      | 0.0209 | EEGBA1H183CG□            | 12000                        | 35 x 79                    | 6.29                         | 7.23      | 0.0307                      | 0.0261 | EEGBA1J123CG□            |
| 22000                        | 35 x 92                    | 7.72                         | 8.88      | 0.0201                      | 0.0171 | EEGBA1H223CH□            | 15000                        | 35 x 92                    | 7.22                         | 8.30      | 0.0246                      | 0.0209 | EEGBA1J153CH□            |
| 27000                        | 35 x 105                   | 8.69                         | 9.99      | 0.0164                      | 0.0139 | EEGBA1H273CK□            | 18000                        | 35 x 105                   | 8.08                         | 9.29      | 0.0205                      | 0.0174 | EEGBA1J183CK□            |
| 33000                        | 35 x 117                   | 9.73                         | 11.19     | 0.0134                      | 0.0114 | EEGBA1H333CL□            | 22000                        | 35 x 117                   | 9.07                         | 10.43     | 0.0167                      | 0.0142 | EEGBA1J223CL□            |
| 36000                        | 35 x 130                   | 10.38                        | 11.94     | 0.0125                      | 0.0106 | EEGBA1H363CN□            | 27000                        | 35 x 130                   | 10.12                        | 11.64     | 0.0164                      | 0.0139 | EEGBA1J273CN□            |
| 39000                        | 35 x 143                   | 11.01                        | 12.66     | 0.0118                      | 0.0100 | EEGBA1H393CP□            | 30000                        | 35 x 143                   | 10.83                        | 12.45     | 0.0147                      | 0.0125 | EEGBA1J303CP□            |
| 22000                        | 51 x 48                    | 8.27                         | 9.51      | 0.0201                      | 0.0171 | EEGBA1H223FB□            | 15000                        | 51 x 48                    | 7.69                         | 8.84      | 0.0295                      | 0.0251 | EEGBA1J153FB□            |
| 27000                        | 51 x 54                    | 9.13                         | 10.50     | 0.0164                      | 0.0139 | EEGBA1H273FC□            | 18000                        | 51 x 54                    | 8.44                         | 9.71      | 0.0246                      | 0.0209 | EEGBA1J183FC□            |
| 33000                        | 51 x 67                    | 10.38                        | 11.94     | 0.0134                      | 0.0114 | EEGBA1H333FE□            | 22000                        | 51 x 67                    | 9.62                         | 11.06     | 0.0201                      | 0.0171 | EEGBA1J223FE□            |
| 39000                        | 51 x 79                    | 11.49                        | 13.21     | 0.0118                      | 0.0100 | EEGBA1H393FG□            | 33000                        | 51 x 79                    | 11.61                        | 13.35     | 0.0134                      | 0.0114 | EEGBA1J333FG□            |
| 47000                        | 51 x 92                    | 12.72                        | 14.63     | 0.0103                      | 0.0087 | EEGBA1H473FH□            | 39000                        | 51 x 92                    | 12.75                        | 14.66     | 0.0117                      | 0.0099 | EEGBA1J393FH□            |
| 56000                        | 51 x 105                   | 13.91                        | 16.00     | 0.0091                      | 0.0077 | EEGBA1H563FK□            | 47000                        | 51 x 105                   | 13.96                        | 16.05     | 0.0101                      | 0.0086 | EEGBA1J473FK□            |
| 82000                        | 51 x 130                   | 16.51                        | 18.99     | 0.0072                      | 0.0061 | EEGBA1H823FN□            | 56000                        | 51 x 130                   | 15.63                        | 17.97     | 0.0089                      | 0.0075 | EEGBA1J563FN□            |
| 91000                        | 51 x 143                   | 17.43                        | 20.04     | 0.0068                      | 0.0057 | EEGBA1H913FP□            | 68000                        | 51 x 143                   | 16.92                        | 19.46     | 0.0077                      | 0.0066 | EEGBA1J683FP□            |
| 75000                        | 64 x 79                    | 16.26                        | 18.70     | 0.0076                      | 0.0064 | EEGBA1H753GG□            | 47000                        | 64 x 79                    | 14.99                        | 17.24     | 0.0101                      | 0.0086 | EEGBA1J473GG□            |
| 82000                        | 64 x 92                    | 17.23                        | 19.81     | 0.0072                      | 0.0061 | EEGBA1H823GH□            | 56000                        | 64 x 92                    | 16.32                        | 18.77     | 0.0089                      | 0.0075 | EEGBA1J563GH□            |
| 100000                       | 64 x 105                   | 18.65                        | 21.45     | 0.0064                      | 0.0055 | EEGBA1H104GK□            | 68000                        | 64 x 105                   | 17.70                        | 20.36     | 0.0077                      | 0.0066 | EEGBA1J683GK□            |
| 120000                       | 64 x 117                   | 20.03                        | 23.03     | 0.0058                      | 0.0050 | EEGBA1H124GL□            | 82000                        | 64 x 117                   | 19.09                        | 21.95     | 0.0068                      | 0.0058 | EEGBA1J823GL□            |
| 130000                       | 64 x 130                   | 20.92                        | 24.06     | 0.0056                      | 0.0048 | EEGBA1H134GN□            | 100000                       | 64 x 130                   | 20.48                        | 23.55     | 0.0060                      | 0.0051 | EEGBA1J104GN□            |
| 150000                       | 64 x 143                   | 22.06                        | 25.37     | 0.0053                      | 0.0045 | EEGBA1H154GP□            | 110000                       | 64 x 143                   | 21.40                        | 24.61     | 0.0057                      | 0.0048 | EEGBA1J114GP□            |
| 100000                       | 76 x 79                    | 19.66                        | 22.61     | 0.0064                      | 0.0055 | EEGBA1H104HG□            | 82000                        | 76 x 79                    | 19.53                        | 22.46     | 0.0068                      | 0.0058 | EEGBA1J823HG□            |
| 120000                       | 76 x 92                    | 21.13                        | 24.30     | 0.0058                      | 0.0050 | EEGBA1H124HH□            | 91000                        | 76 x 92                    | 20.62                        | 23.71     | 0.0064                      | 0.0054 | EEGBA1J913HH□            |
| 150000                       | 76 x 105                   | 22.71                        | 26.12     | 0.0053                      | 0.0045 | EEGBA1H154HK□            | 100000                       | 76 x 105                   | 21.61                        | 24.85     | 0.0060                      | 0.0051 | EEGBA1J104HK□            |
| 160000                       | 76 x 117                   | 23.63                        | 27.17     | 0.0051                      | 0.0044 | EEGBA1H164HL□            | 120000                       | 76 x 117                   | 23.02                        | 26.47     | 0.0054                      | 0.0046 | EEGBA1J124HL□            |
| 180000                       | 76 x 130                   | 24.71                        | 28.42     | 0.0049                      | 0.0042 | EEGBA1H184HN□            | 130000                       | 76 x 130                   | 23.93                        | 27.52     | 0.0052                      | 0.0044 | EEGBA1J134HN□            |
| 200000                       | 76 x 143                   | 25.72                        | 29.58     | 0.0047                      | 0.0040 | EEGBA1H204HP□            | 150000                       | 76 x 143                   | 25.09                        | 28.85     | 0.0048                      | 0.0041 | EEGBA1J154HP□            |
| 330000                       | 76 x 219                   | 31.19                        | 35.87     | 0.0040                      | 0.0034 | EEGBA1H334HW□            | 220000                       | 76 x 219                   | 30.06                        | 34.57     | 0.0040                      | 0.0034 | EEGBA1J224HW□            |

Aluminum Electrolytic Capacitors

**G-BA Typical Ratings (continued)**

| Cap.<br>(μF)                          | Nominal Size<br>D x L (mm) | Max 105°C R.C. (A <sub>rms</sub> ) |           | 20°C ESR (Ω, max.) |        | Panasonic<br>Part Number | Cap.<br>(μF)                          | Nominal Size<br>D x L (mm) | Max 105°C R.C. (A <sub>rms</sub> ) |           | 20°C ESR (Ω, max.) |        | Panasonic<br>Part Number |
|---------------------------------------|----------------------------|------------------------------------|-----------|--------------------|--------|--------------------------|---------------------------------------|----------------------------|------------------------------------|-----------|--------------------|--------|--------------------------|
|                                       |                            | 120Hz                              | 10k-50kHz | 120Hz              | 20kHz  |                          |                                       |                            | 120Hz                              | 10k-50kHz | 120Hz              | 20kHz  |                          |
| <b>80 VDC Working, 100 VDC Surge</b>  |                            |                                    |           |                    |        |                          | <b>100 VDC Working, 125 VDC Surge</b> |                            |                                    |           |                    |        |                          |
| 3300                                  | 35 x 41                    | 3.37                               | 3.88      | 0.1116             | 0.0893 | EEGBA1K332CA□            | 2200                                  | 35 x 41                    | 2.48                               | 2.85      | 0.1340             | 0.1072 | EEGBA2A222CA□            |
| 3900                                  | 35 x 54                    | 3.84                               | 4.42      | 0.0945             | 0.0756 | EEGBA1K392CC□            | 3300                                  | 35 x 54                    | 3.18                               | 3.66      | 0.0893             | 0.0714 | EEGBA2A332CC□            |
| 4700                                  | 35 x 67                    | 4.46                               | 5.13      | 0.0784             | 0.0627 | EEGBA1K472CE□            | 4700                                  | 35 x 67                    | 4.00                               | 4.60      | 0.0627             | 0.0502 | EEGBA2A472CE□            |
| 6800                                  | 35 x 79                    | 5.54                               | 6.37      | 0.0542             | 0.0433 | EEGBA1K682CG□            | 5600                                  | 35 x 79                    | 4.56                               | 5.24      | 0.0526             | 0.0421 | EEGBA2A562CG□            |
| 8200                                  | 35 x 92                    | 6.30                               | 7.25      | 0.0449             | 0.0359 | EEGBA1K822CH□            | 6800                                  | 35 x 92                    | 5.21                               | 5.99      | 0.0433             | 0.0347 | EEGBA2A682CH□            |
| 10000                                 | 35 x 105                   | 7.13                               | 8.20      | 0.0368             | 0.0295 | EEGBA1K103CK□            | 8200                                  | 35 x 105                   | 5.89                               | 6.77      | 0.0359             | 0.0288 | EEGBA2A822CK□            |
| 12000                                 | 35 x 117                   | 8.00                               | 9.20      | 0.0307             | 0.0246 | EEGBA1K123CL□            | 9100                                  | 35 x 117                   | 6.41                               | 7.37      | 0.0324             | 0.0259 | EEGBA2A912CL□            |
| 15000                                 | 35 x 130                   | 9.05                               | 10.41     | 0.0246             | 0.0196 | EEGBA1K153CN□            | 10000                                 | 35 x 130                   | 6.91                               | 7.95      | 0.0295             | 0.0236 | EEGBA2A103CN□            |
| 18000                                 | 35 x 143                   | 10.02                              | 11.52     | 0.0205             | 0.0164 | EEGBA1K183CP□            | 12000                                 | 35 x 143                   | 7.71                               | 8.87      | 0.0246             | 0.0196 | EEGBA2A123CP□            |
| 8200                                  | 51 x 48                    | 6.92                               | 7.96      | 0.0449             | 0.0359 | EEGBA1K822FB□            | 5600                                  | 51 x 48                    | 5.24                               | 6.03      | 0.0526             | 0.0421 | EEGBA2A562FB□            |
| 12000                                 | 51 x 54                    | 8.30                               | 9.55      | 0.0307             | 0.0246 | EEGBA1K123FC□            | 7500                                  | 51 x 54                    | 6.11                               | 7.03      | 0.0393             | 0.0314 | EEGBA2A752FC□            |
| 15000                                 | 51 x 67                    | 9.58                               | 11.02     | 0.0246             | 0.0196 | EEGBA1K153FE□            | 10000                                 | 51 x 67                    | 7.32                               | 8.42      | 0.0295             | 0.0236 | EEGBA2A103FE□            |
| 18000                                 | 51 x 79                    | 10.73                              | 12.34     | 0.0205             | 0.0164 | EEGBA1K183FG□            | 12000                                 | 51 x 79                    | 8.26                               | 9.50      | 0.0246             | 0.0196 | EEGBA2A123FG□            |
| 22000                                 | 51 x 92                    | 12.02                              | 13.82     | 0.0167             | 0.0134 | EEGBA1K223FH□            | 15000                                 | 51 x 92                    | 9.43                               | 10.84     | 0.0196             | 0.0157 | EEGBA2A153FH□            |
| 27000                                 | 51 x 105                   | 13.36                              | 15.36     | 0.0136             | 0.0109 | EEGBA1K273FK□            | 18000                                 | 51 x 105                   | 10.50                              | 12.08     | 0.0164             | 0.0131 | EEGBA2A183FK□            |
| 33000                                 | 51 x 130                   | 15.20                              | 17.48     | 0.0121             | 0.0096 | EEGBA1K333FN□            | 22000                                 | 51 x 130                   | 12.09                              | 13.90     | 0.0134             | 0.0107 | EEGBA2A223FN□            |
| 39000                                 | 51 x 143                   | 16.46                              | 18.93     | 0.0110             | 0.0088 | EEGBA1K393FP□            | 27000                                 | 51 x 143                   | 13.41                              | 15.42     | 0.0120             | 0.0096 | EEGBA2A273FP□            |
| 27000                                 | 64 x 79                    | 13.69                              | 15.74     | 0.0191             | 0.0153 | EEGBA1K273GG□            | 18000                                 | 64 x 79                    | 11.61                              | 13.35     | 0.0205             | 0.0164 | EEGBA2A183GG□            |
| 33000                                 | 64 x 92                    | 15.14                              | 17.41     | 0.0156             | 0.0125 | EEGBA1K333GH□            | 22000                                 | 64 x 92                    | 13.00                              | 14.95     | 0.0167             | 0.0134 | EEGBA2A223GH□            |
| 39000                                 | 64 x 105                   | 16.43                              | 18.89     | 0.0132             | 0.0106 | EEGBA1K393GK□            | 27000                                 | 64 x 105                   | 14.46                              | 16.63     | 0.0136             | 0.0109 | EEGBA2A273GK□            |
| 43000                                 | 64 x 117                   | 17.43                              | 20.04     | 0.0120             | 0.0096 | EEGBA1K433GL□            | 33000                                 | 64 x 117                   | 16.00                              | 18.40     | 0.0112             | 0.0089 | EEGBA2A333GL□            |
| 47000                                 | 64 x 130                   | 18.36                              | 21.11     | 0.0116             | 0.0093 | EEGBA1K473GN□            | 39000                                 | 64 x 130                   | 17.38                              | 19.99     | 0.0094             | 0.0076 | EEGBA2A393GN□            |
| 56000                                 | 64 x 143                   | 19.73                              | 22.69     | 0.0097             | 0.0078 | EEGBA1K563GP□            | 47000                                 | 64 x 143                   | 18.89                              | 21.72     | 0.0078             | 0.0063 | EEGBA2A473GP□            |
| 47000                                 | 76 x 79                    | 18.18                              | 20.91     | 0.0125             | 0.0100 | EEGBA1K473HG□            | 33000                                 | 76 x 79                    | 16.84                              | 19.37     | 0.0156             | 0.0125 | EEGBA2A333HG□            |
| 56000                                 | 76 x 92                    | 19.65                              | 22.60     | 0.0105             | 0.0084 | EEGBA1K563HH□            | 39000                                 | 76 x 92                    | 18.37                              | 21.13     | 0.0132             | 0.0106 | EEGBA2A393HH□            |
| 68000                                 | 76 x 105                   | 21.18                              | 24.36     | 0.0087             | 0.0069 | EEGBA1K683HK□            | 47000                                 | 76 x 105                   | 20.01                              | 23.01     | 0.0110             | 0.0088 | EEGBA2A473HK□            |
| 75000                                 | 76 x 117                   | 22.26                              | 25.60     | 0.0079             | 0.0063 | EEGBA1K753HL□            | 52000                                 | 76 x 117                   | 21.20                              | 24.38     | 0.0099             | 0.0079 | EEGBA2A523HL□            |
| 82000                                 | 76 x 130                   | 23.25                              | 26.74     | 0.0072             | 0.0058 | EEGBA1K823HN□            | 56000                                 | 76 x 130                   | 22.18                              | 25.51     | 0.0092             | 0.0074 | EEGBA2A563HN□            |
| 91000                                 | 76 x 143                   | 24.30                              | 27.95     | 0.0073             | 0.0058 | EEGBA1K913HP□            | 68000                                 | 76 x 143                   | 23.93                              | 27.52     | 0.0076             | 0.0061 | EEGBA2A683HP□            |
| 150000                                | 76 x 219                   | 30.30                              | 34.85     | 0.0041             | 0.0033 | EEGBA1K154HW□            | 100000                                | 76 x 219                   | 29.74                              | 34.20     | 0.0041             | 0.0033 | EEGBA2A104HW□            |
| <b>200 VDC Working, 250 VDC Surge</b> |                            |                                    |           |                    |        |                          | <b>250 VDC Working, 300 VDC Surge</b> |                            |                                    |           |                    |        |                          |
| 820                                   | 35 x 41                    | 1.55                               | 2.17      | 0.180              | 0.135  | EEGBA2D821CA□            | 560                                   | 35 x 41                    | 1.39                               | 1.95      | 0.263              | 0.197  | EEGBA2E561CA□            |
| 1000                                  | 35 x 54                    | 1.81                               | 2.53      | 0.147              | 0.111  | EEGBA2D102CC□            | 820                                   | 35 x 54                    | 1.77                               | 2.48      | 0.180              | 0.135  | EEGBA2E821CC□            |
| 1500                                  | 35 x 67                    | 2.36                               | 3.30      | 0.098              | 0.074  | EEGBA2D152CE□            | 1000                                  | 35 x 67                    | 2.08                               | 2.91      | 0.147              | 0.111  | EEGBA2E102CE□            |
| 1800                                  | 35 x 79                    | 2.71                               | 3.79      | 0.082              | 0.061  | EEGBA2D182CG□            | 1200                                  | 35 x 79                    | 2.39                               | 3.35      | 0.123              | 0.092  | EEGBA2E122CG□            |
| 2200                                  | 35 x 92                    | 3.13                               | 4.38      | 0.067              | 0.050  | EEGBA2D222CH□            | 1500                                  | 35 x 92                    | 2.80                               | 3.92      | 0.098              | 0.074  | EEGBA2E152CH□            |
| 2700                                  | 35 x 105                   | 3.61                               | 5.05      | 0.055              | 0.041  | EEGBA2D272CK□            | 1800                                  | 35 x 105                   | 3.18                               | 4.45      | 0.082              | 0.061  | EEGBA2E182CK□            |
| 3000                                  | 35 x 117                   | 3.95                               | 5.53      | 0.049              | 0.037  | EEGBA2D302CL□            | 2200                                  | 35 x 117                   | 3.65                               | 5.11      | 0.067              | 0.050  | EEGBA2E222CL□            |
| 3300                                  | 35 x 130                   | 4.28                               | 5.99      | 0.045              | 0.033  | EEGBA2D332CN□            | 2400                                  | 35 x 130                   | 3.94                               | 5.52      | 0.061              | 0.046  | EEGBA2E242CN□            |
| 3900                                  | 35 x 143                   | 4.80                               | 6.72      | 0.038              | 0.028  | EEGBA2D392CP□            | 2700                                  | 35 x 143                   | 4.31                               | 6.03      | 0.055              | 0.041  | EEGBA2E272CP□            |
| 2200                                  | 51 x 48                    | 3.33                               | 4.66      | 0.067              | 0.050  | EEGBA2D222FB□            | 1500                                  | 51 x 48                    | 2.95                               | 4.13      | 0.098              | 0.074  | EEGBA2E152FB□            |
| 2700                                  | 51 x 54                    | 3.76                               | 5.26      | 0.055              | 0.041  | EEGBA2D272FC□            | 1800                                  | 51 x 54                    | 3.30                               | 4.62      | 0.082              | 0.061  | EEGBA2E182FC□            |
| 3300                                  | 51 x 67                    | 4.38                               | 6.13      | 0.045              | 0.033  | EEGBA2D332FE□            | 2200                                  | 51 x 67                    | 3.84                               | 5.38      | 0.067              | 0.050  | EEGBA2E222FE□            |
| 4700                                  | 51 x 79                    | 5.45                               | 7.63      | 0.031              | 0.024  | EEGBA2D472FG□            | 2700                                  | 51 x 79                    | 4.44                               | 6.22      | 0.055              | 0.041  | EEGBA2E272FG□            |
| 5100                                  | 51 x 92                    | 5.90                               | 8.26      | 0.029              | 0.022  | EEGBA2D512FH□            | 3300                                  | 51 x 92                    | 5.09                               | 7.13      | 0.045              | 0.033  | EEGBA2E332FH□            |
| 5600                                  | 51 x 105                   | 6.39                               | 8.95      | 0.026              | 0.020  | EEGBA2D562FK□            | 3900                                  | 51 x 105                   | 5.72                               | 8.01      | 0.038              | 0.028  | EEGBA2E392FK□            |
| 6800                                  | 51 x 130                   | 7.49                               | 10.49     | 0.022              | 0.016  | EEGBA2D682FN□            | 4700                                  | 51 x 130                   | 6.69                               | 9.37      | 0.031              | 0.024  | EEGBA2E472FN□            |
| 8200                                  | 51 x 143                   | 8.45                               | 11.83     | 0.018              | 0.013  | EEGBA2D822FP□            | 5600                                  | 51 x 143                   | 7.50                               | 10.50     | 0.026              | 0.020  | EEGBA2E562FP□            |
| 6800                                  | 64 x 79                    | 7.79                               | 10.91     | 0.022              | 0.016  | EEGBA2D682GG□            | 4700                                  | 64 x 79                    | 6.70                               | 9.38      | 0.031              | 0.024  | EEGBA2E472GG□            |
| 8200                                  | 64 x 92                    | 8.85                               | 12.39     | 0.018              | 0.013  | EEGBA2D822GH□            | 5600                                  | 64 x 92                    | 7.57                               | 10.60     | 0.026              | 0.020  | EEGBA2E562GH□            |
| 10000                                 | 64 x 105                   | 10.06                              | 14.08     | 0.015              | 0.011  | EEGBA2D103GK□            | 6800                                  | 64 x 105                   | 8.59                               | 12.03     | 0.022              | 0.016  | EEGBA2E682GK□            |
| 12000                                 | 64 x 117                   | 11.36                              | 15.90     | 0.012              | 0.009  | EEGBA2D123GL□            | 8200                                  | 64 x 117                   | 9.72                               | 13.61     | 0.018              | 0.013  | EEGBA2E822GL□            |
| 13000                                 | 64 x 130                   | 12.14                              | 17.00     | 0.011              | 0.009  | EEGBA2D133GN□            | 9100                                  | 64 x 130                   | 10.52                              | 14.73     | 0.016              | 0.012  | EEGBA2E912GN□            |
| 15000                                 | 64 x 143                   | 13.38                              | 18.73     | 0.010              | 0.007  | EEGBA2D153GP□            | 10000                                 | 64 x 143                   | 11.30                              | 15.82     | 0.015              | 0.011  | EEGBA2E103GP□            |
| 10000                                 | 76 x 79                    | 10.57                              | 14.80     | 0.016              | 0.012  | EEGBA2D103HG□            | 7500                                  | 76 x 79                    | 9.46                               | 13.24     | 0.022              | 0.016  | EEGBA2E752HG□            |
| 12000                                 | 76 x 92                    | 11.94                              | 16.72     | 0.014              | 0.010  | EEGBA2D123HH□            | 8200                                  | 76 x 92                    | 10.20                              | 14.28     | 0.020              | 0.015  | EEGBA2E822HH□            |
| 15000                                 | 76 x 105                   | 13.72                              | 19.21     | 0.011              | 0.008  | EEGBA2D153HK□            | 10000                                 | 76 x 105                   | 11.57                              | 16.20     | 0.016              | 0.012  | EEGBA2E103HK□            |
| 18000                                 | 76 x 117                   | 15.45                              | 21.63     | 0.009              | 0.007  | EEGBA2D183HL□            | 12000                                 | 76 x 117                   | 13.03                              | 18.24     | 0.014              | 0.010  | EEGBA2E123HL□            |
| 20000                                 | 76 x 130                   | 16.68                              | 23.35     | 0.008              | 0.006  | EEGBA2D203HN□            | 13000                                 | 76 x 130                   | 13.89                              | 19.45     | 0.012              | 0.009  | EEGBA2E133HN□            |
| 22000                                 | 76 x 143                   | 17.90                              | 25.06     | 0.007              | 0.006  | EEGBA2D223HP□            | 15000                                 | 76 x 143                   | 15.27                              | 21.38     | 0.011              | 0.008  | EEGBA2E153HP□            |
| 33000                                 | 76 x 219                   | 24.90                              | 34.86     | 0.005              | 0.004  | EEGBA2D333HW□            | 22000                                 | 76 x 219                   | 21.00                              | 29.40     | 0.008              | 0.006  | EEGBA2E223HW□            |

Aluminum Electrolytic Capacitors

**G-BA Typical Ratings (continued)**

| Cap.<br>(μF)                          | Nominal Size<br>D x L (mm) | Max 105°C R.C. (A <sub>rms</sub> ) |           | 20°C ESR (Ω, max.) |       | Panasonic<br>Part Number | Cap.<br>(μF)                          | Nominal Size<br>D x L (mm) | Max 105°C R.C. (A <sub>rms</sub> ) |           | 20°C ESR (Ω, max.) |       | Panasonic<br>Part Number |
|---------------------------------------|----------------------------|------------------------------------|-----------|--------------------|-------|--------------------------|---------------------------------------|----------------------------|------------------------------------|-----------|--------------------|-------|--------------------------|
|                                       |                            | 120Hz                              | 10k-50kHz | 120Hz              | 20kHz |                          |                                       |                            | 120Hz                              | 10k-50kHz | 120Hz              | 20kHz |                          |
| <b>300 VDC Working, 350 VDC Surge</b> |                            |                                    |           |                    |       |                          | <b>350 VDC Working, 400 VDC Surge</b> |                            |                                    |           |                    |       |                          |
| 390                                   | 35 x 41                    | 1.11                               | 1.55      | 0.378              | 0.283 | EEGBA2U391CA□            | 330                                   | 35 x 41                    | 0.99                               | 1.39      | 0.447              | 0.313 | EEGBA2V331CA□            |
| 470                                   | 35 x 54                    | 1.29                               | 1.81      | 0.314              | 0.235 | EEGBA2U471CC□            | 390                                   | 35 x 54                    | 1.13                               | 1.58      | 0.378              | 0.264 | EEGBA2V391CC□            |
| 680                                   | 35 x 67                    | 1.65                               | 2.31      | 0.217              | 0.163 | EEGBA2U681CE□            | 560                                   | 35 x 67                    | 1.44                               | 2.02      | 0.263              | 0.184 | EEGBA2V561CE□            |
| 820                                   | 35 x 79                    | 1.90                               | 2.66      | 0.180              | 0.135 | EEGBA2U821CG□            | 680                                   | 35 x 79                    | 1.67                               | 2.34      | 0.217              | 0.152 | EEGBA2V681CG□            |
| 1000                                  | 35 x 92                    | 2.19                               | 3.07      | 0.147              | 0.111 | EEGBA2U102CH□            | 820                                   | 35 x 92                    | 1.91                               | 2.67      | 0.180              | 0.126 | EEGBA2V821CH□            |
| 1200                                  | 35 x 105                   | 2.50                               | 3.50      | 0.123              | 0.092 | EEGBA2U122CK□            | 1000                                  | 35 x 105                   | 2.19                               | 3.07      | 0.147              | 0.103 | EEGBA2V102CK□            |
| 1500                                  | 35 x 117                   | 2.90                               | 4.06      | 0.098              | 0.074 | EEGBA2U152CL□            | 1200                                  | 35 x 117                   | 2.50                               | 3.50      | 0.123              | 0.086 | EEGBA2V122CL□            |
| 1600                                  | 35 x 130                   | 3.09                               | 4.33      | 0.092              | 0.069 | EEGBA2U162CN□            | 1300                                  | 35 x 130                   | 2.69                               | 3.77      | 0.113              | 0.079 | EEGBA2V132CN□            |
| 1800                                  | 35 x 143                   | 3.38                               | 4.73      | 0.082              | 0.061 | EEGBA2U182CP□            | 1500                                  | 35 x 143                   | 2.98                               | 4.17      | 0.098              | 0.069 | EEGBA2V152CP□            |
| 1000                                  | 51 x 48                    | 2.32                               | 3.25      | 0.147              | 0.111 | EEGBA2U102FB□            | 820                                   | 51 x 48                    | 2.10                               | 2.94      | 0.180              | 0.126 | EEGBA2V821FB□            |
| 1200                                  | 51 x 54                    | 2.59                               | 3.63      | 0.123              | 0.092 | EEGBA2U122FC□            | 1000                                  | 51 x 54                    | 2.37                               | 3.32      | 0.147              | 0.103 | EEGBA2V102FC□            |
| 1500                                  | 51 x 67                    | 3.06                               | 4.28      | 0.098              | 0.074 | EEGBA2U152FE□            | 1200                                  | 51 x 67                    | 2.73                               | 3.82      | 0.123              | 0.086 | EEGBA2V122FE□            |
| 2200                                  | 51 x 79                    | 3.86                               | 5.40      | 0.067              | 0.050 | EEGBA2U222FG□            | 1500                                  | 51 x 79                    | 3.19                               | 4.47      | 0.098              | 0.069 | EEGBA2V152FG□            |
| 2700                                  | 51 x 92                    | 4.44                               | 6.22      | 0.055              | 0.041 | EEGBA2U272FH□            | 1800                                  | 51 x 92                    | 3.63                               | 5.08      | 0.082              | 0.057 | EEGBA2V182FH□            |
| 3300                                  | 51 x 105                   | 5.07                               | 7.10      | 0.045              | 0.033 | EEGBA2U332FK□            | 2200                                  | 51 x 105                   | 4.14                               | 5.80      | 0.067              | 0.047 | EEGBA2V222FK□            |
| 3900                                  | 51 x 130                   | 5.87                               | 8.22      | 0.038              | 0.028 | EEGBA2U392FN□            | 2700                                  | 51 x 130                   | 4.89                               | 6.85      | 0.055              | 0.038 | EEGBA2V272FN□            |
| 4700                                  | 51 x 143                   | 6.62                               | 9.27      | 0.031              | 0.024 | EEGBA2U472FP□            | 3300                                  | 51 x 143                   | 5.55                               | 7.77      | 0.045              | 0.031 | EEGBA2V332FP□            |
| 3300                                  | 64 x 79                    | 5.61                               | 7.85      | 0.045              | 0.033 | EEGBA2U332GG□            | 2700                                  | 64 x 79                    | 4.91                               | 6.87      | 0.055              | 0.038 | EEGBA2V272GG□            |
| 3900                                  | 64 x 92                    | 6.32                               | 8.85      | 0.038              | 0.028 | EEGBA2U392GH□            | 3300                                  | 64 x 92                    | 5.61                               | 7.85      | 0.045              | 0.031 | EEGBA2V332GH□            |
| 4700                                  | 64 x 105                   | 7.14                               | 10.00     | 0.031              | 0.024 | EEGBA2U472GK□            | 3900                                  | 64 x 105                   | 6.29                               | 8.81      | 0.038              | 0.026 | EEGBA2V392GK□            |
| 5600                                  | 64 x 117                   | 8.04                               | 11.26     | 0.026              | 0.020 | EEGBA2U562GL□            | 4700                                  | 64 x 117                   | 7.11                               | 9.95      | 0.031              | 0.022 | EEGBA2V472GL□            |
| 6200                                  | 64 x 130                   | 8.68                               | 12.15     | 0.024              | 0.018 | EEGBA2U622GN□            | 5100                                  | 64 x 130                   | 7.61                               | 10.65     | 0.029              | 0.020 | EEGBA2V512GN□            |
| 6800                                  | 64 x 143                   | 9.32                               | 13.05     | 0.022              | 0.016 | EEGBA2U682GP□            | 5600                                  | 64 x 143                   | 8.17                               | 11.44     | 0.026              | 0.018 | EEGBA2V562GP□            |
| 5100                                  | 76 x 79                    | 7.80                               | 10.92     | 0.032              | 0.024 | EEGBA2U512HG□            | 3900                                  | 76 x 79                    | 6.82                               | 9.55      | 0.042              | 0.029 | EEGBA2V392HG□            |
| 6200                                  | 76 x 92                    | 8.87                               | 12.42     | 0.026              | 0.020 | EEGBA2U622HH□            | 4700                                  | 76 x 92                    | 7.72                               | 10.81     | 0.034              | 0.024 | EEGBA2V472HH□            |
| 6800                                  | 76 x 105                   | 9.54                               | 13.36     | 0.024              | 0.018 | EEGBA2U682HK□            | 5600                                  | 76 x 105                   | 8.66                               | 12.12     | 0.029              | 0.020 | EEGBA2V562HK□            |
| 8200                                  | 76 x 117                   | 10.77                              | 15.08     | 0.020              | 0.015 | EEGBA2U822HL□            | 6800                                  | 76 x 117                   | 9.81                               | 13.73     | 0.024              | 0.017 | EEGBA2V682HL□            |
| 9100                                  | 76 x 130                   | 11.62                              | 16.27     | 0.018              | 0.013 | EEGBA2U912HN□            | 7500                                  | 76 x 130                   | 10.55                              | 14.77     | 0.022              | 0.015 | EEGBA2V752HN□            |
| 10000                                 | 76 x 143                   | 12.47                              | 17.46     | 0.016              | 0.012 | EEGBA2U103HP□            | 8200                                  | 76 x 143                   | 11.29                              | 15.81     | 0.020              | 0.014 | EEGBA2V822HP□            |
| 18000                                 | 76 x 219                   | 18.99                              | 26.59     | 0.010              | 0.007 | EEGBA2U183HW□            | 12000                                 | 76 x 219                   | 15.51                              | 21.71     | 0.015              | 0.010 | EEGBA2V123HW□            |
| <b>400 VDC Working, 450 VDC Surge</b> |                            |                                    |           |                    |       |                          | <b>450 VDC Working, 500 VDC Surge</b> |                            |                                    |           |                    |       |                          |
| 270                                   | 35 x 41                    | 0.97                               | 1.36      | 0.546              | 0.355 | EEGBA2G271CA□            | 220                                   | 35 x 41                    | 0.88                               | 1.23      | 0.670              | 0.435 | EEGBA2W221CA□            |
| 330                                   | 35 x 54                    | 1.13                               | 1.58      | 0.447              | 0.290 | EEGBA2G331CC□            | 270                                   | 35 x 54                    | 1.03                               | 1.44      | 0.546              | 0.355 | EEGBA2W271CC□            |
| 390                                   | 35 x 67                    | 1.31                               | 1.83      | 0.378              | 0.246 | EEGBA2G391CE□            | 330                                   | 35 x 67                    | 1.21                               | 1.69      | 0.447              | 0.290 | EEGBA2W331CE□            |
| 560                                   | 35 x 79                    | 1.65                               | 2.31      | 0.263              | 0.171 | EEGBA2G561CG□            | 470                                   | 35 x 79                    | 1.51                               | 2.11      | 0.314              | 0.204 | EEGBA2W471CG□            |
| 680                                   | 35 x 92                    | 1.90                               | 2.66      | 0.217              | 0.141 | EEGBA2G681CH□            | 560                                   | 35 x 92                    | 1.73                               | 2.42      | 0.263              | 0.171 | EEGBA2W561CH□            |
| 820                                   | 35 x 105                   | 2.17                               | 3.04      | 0.180              | 0.117 | EEGBA2G821CK□            | 680                                   | 35 x 105                   | 1.98                               | 2.77      | 0.217              | 0.141 | EEGBA2W681CK□            |
| 910                                   | 35 x 117                   | 2.38                               | 3.33      | 0.162              | 0.105 | EEGBA2G911CL□            | 750                                   | 35 x 117                   | 2.16                               | 3.02      | 0.196              | 0.128 | EEGBA2W751CL□            |
| 1000                                  | 35 x 130                   | 2.57                               | 3.60      | 0.147              | 0.096 | EEGBA2G102CN□            | 820                                   | 35 x 130                   | 2.33                               | 3.26      | 0.180              | 0.117 | EEGBA2W821CN□            |
| 1200                                  | 35 x 143                   | 2.91                               | 4.07      | 0.123              | 0.080 | EEGBA2G122CP□            | 1000                                  | 35 x 143                   | 2.65                               | 3.71      | 0.147              | 0.096 | EEGBA2W102CP□            |
| 560                                   | 51 x 48                    | 1.82                               | 2.55      | 0.263              | 0.171 | EEGBA2G561FB□            | 470                                   | 51 x 48                    | 1.67                               | 2.34      | 0.314              | 0.204 | EEGBA2W471FB□            |
| 680                                   | 51 x 54                    | 2.04                               | 2.86      | 0.217              | 0.141 | EEGBA2G681FC□            | 560                                   | 51 x 54                    | 1.85                               | 2.59      | 0.263              | 0.171 | EEGBA2W561FC□            |
| 1000                                  | 51 x 67                    | 2.61                               | 3.65      | 0.147              | 0.096 | EEGBA2G102FE□            | 820                                   | 51 x 67                    | 2.36                               | 3.30      | 0.180              | 0.117 | EEGBA2W821FE□            |
| 1200                                  | 51 x 79                    | 2.98                               | 4.17      | 0.123              | 0.080 | EEGBA2G122FG□            | 1000                                  | 51 x 79                    | 2.72                               | 3.81      | 0.147              | 0.096 | EEGBA2W102FG□            |
| 1500                                  | 51 x 92                    | 3.46                               | 4.84      | 0.098              | 0.064 | EEGBA2G152FH□            | 1200                                  | 51 x 92                    | 3.10                               | 4.34      | 0.123              | 0.080 | EEGBA2W122FH□            |
| 1800                                  | 51 x 105                   | 3.92                               | 5.49      | 0.082              | 0.053 | EEGBA2G182FK□            | 1500                                  | 51 x 105                   | 3.58                               | 5.01      | 0.098              | 0.064 | EEGBA2W152FK□            |
| 2200                                  | 51 x 130                   | 4.61                               | 6.45      | 0.067              | 0.044 | EEGBA2G222FN□            | 1800                                  | 51 x 130                   | 4.17                               | 5.84      | 0.082              | 0.053 | EEGBA2W182FN□            |
| 2700                                  | 51 x 143                   | 5.25                               | 7.35      | 0.055              | 0.035 | EEGBA2G272FP□            | 2200                                  | 51 x 143                   | 4.74                               | 6.64      | 0.067              | 0.044 | EEGBA2W222FP□            |
| 2200                                  | 64 x 79                    | 4.61                               | 6.45      | 0.067              | 0.044 | EEGBA2G222GG□            | 1500                                  | 64 x 79                    | 3.80                               | 5.32      | 0.098              | 0.064 | EEGBA2W152GG□            |
| 2700                                  | 64 x 92                    | 5.28                               | 7.39      | 0.055              | 0.035 | EEGBA2G272GH□            | 1800                                  | 64 x 92                    | 4.31                               | 6.03      | 0.082              | 0.053 | EEGBA2W182GH□            |
| 3300                                  | 64 x 105                   | 6.01                               | 8.41      | 0.045              | 0.029 | EEGBA2G332GK□            | 2200                                  | 64 x 105                   | 4.91                               | 6.87      | 0.067              | 0.044 | EEGBA2W222GK□            |
| 3600                                  | 64 x 117                   | 6.47                               | 9.06      | 0.041              | 0.027 | EEGBA2G362GL□            | 2700                                  | 64 x 117                   | 5.61                               | 7.85      | 0.055              | 0.035 | EEGBA2W272GL□            |
| 3900                                  | 64 x 130                   | 6.92                               | 9.69      | 0.038              | 0.025 | EEGBA2G392GN□            | 3300                                  | 64 x 130                   | 6.36                               | 8.90      | 0.045              | 0.029 | EEGBA2W332GN□            |
| 4700                                  | 64 x 143                   | 7.79                               | 10.91     | 0.031              | 0.020 | EEGBA2G472GP□            | 3900                                  | 64 x 143                   | 7.09                               | 9.93      | 0.038              | 0.025 | EEGBA2W392GP□            |
| 3300                                  | 76 x 79                    | 6.29                               | 8.81      | 0.049              | 0.032 | EEGBA2G332HG□            | 2700                                  | 76 x 79                    | 5.69                               | 7.97      | 0.060              | 0.039 | EEGBA2W272HG□            |
| 3900                                  | 76 x 92                    | 7.05                               | 9.87      | 0.042              | 0.027 | EEGBA2G392HH□            | 3300                                  | 76 x 92                    | 6.48                               | 9.07      | 0.049              | 0.032 | EEGBA2W332HH□            |
| 4700                                  | 76 x 105                   | 7.95                               | 11.13     | 0.034              | 0.022 | EEGBA2G472HK□            | 3900                                  | 76 x 105                   | 7.24                               | 10.14     | 0.042              | 0.027 | EEGBA2W392HK□            |
| 5200                                  | 76 x 117                   | 8.59                               | 12.03     | 0.031              | 0.020 | EEGBA2G522HL□            | 4300                                  | 76 x 117                   | 7.82                               | 10.95     | 0.038              | 0.025 | EEGBA2W432HL□            |
| 5600                                  | 76 x 130                   | 9.14                               | 12.80     | 0.029              | 0.019 | EEGBA2G562HN□            | 4700                                  | 76 x 130                   | 8.37                               | 11.72     | 0.034              | 0.022 | EEGBA2W472HN□            |
| 6800                                  | 76 x 143                   | 10.30                              | 14.42     | 0.024              | 0.015 | EEGBA2G682HP□            | 5600                                  | 76 x 143                   | 9.35                               | 13.09     | 0.029              | 0.019 | EEGBA2W562HP□            |
| 10000                                 | 76 x 219                   | 14.19                              | 19.87     | 0.018              | 0.011 | EEGBA2G103HW□            | 9100                                  | 76 x 219                   | 13.54                              | 18.96     | 0.019              | 0.013 | EEGBA2W912HW□            |