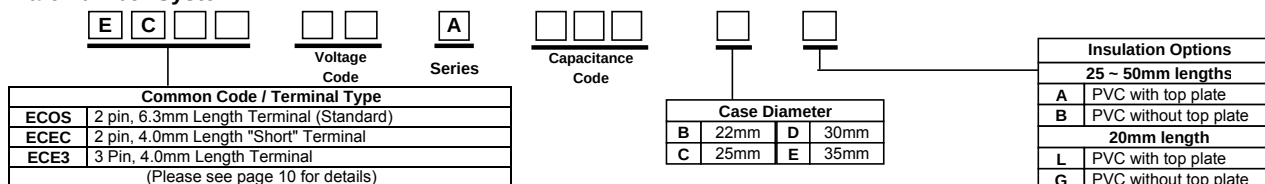


- *High ripple current capability*
- *20mm lengths for low profile applications*
- *2 and 3 pin versions available*



|                                        |                                                                                                                                                    |      |      |         |      |      |                             |                                              |       |           |      |      |       |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------|------|---------|------|------|-----------------------------|----------------------------------------------|-------|-----------|------|------|-------|
| Rated Working Voltage:                 | 10 ~ 250 VDC                                                                                                                                       |      |      |         |      |      | 385 ~ 450 VDC               |                                              |       |           |      |      |       |
| Operating Temperature:                 | -40 ~ +105°C                                                                                                                                       |      |      |         |      |      | -25 ~ +105°C                |                                              |       |           |      |      |       |
| Nominal Capacitance:                   | 68 ~ 82000µF (±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: <span style="border: 1px solid black; padding: 2px;">(rated cap. [µF] - 33000)<br/>1000</span> |      |      |         |      |      |                             |                                              |       |           |      |      |       |
| Leakage Current:                       | 3√CV (µA) max. after 5 minutes; C = Capacitance in µF, V = WV                                                                                      |      |      |         |      |      |                             |                                              |       |           |      |      |       |
| Ripple Current Multipliers:            | Frequency(Hz):                                                                                                                                     | 50   | 60   | 100~120 | 500  | 1k   | 10k~                        | Ripple Current Ambient Temperature Factors** |       |           |      |      |       |
|                                        | 10~100WV:                                                                                                                                          | 0.93 | 0.95 | 1.0     | 1.05 | 1.08 | 1.15                        | Ambient Temperature:                         | 105°C | 85°C      | 70°C | 60°C | ≤45°C |
|                                        | 160~450WV:                                                                                                                                         | 0.75 | 0.8  | 1.0     | 1.2  | 1.25 | 1.4                         | Multiplier:                                  | 1.0   | 1.7       | 2.0  | 2.2  | 2.35  |
| Endurance:                             | 3000 hours at +105°C with maximum specified ripple current (see page 6)<br>*2000 hours for 20mm length sizes                                       |      |      |         |      |      |                             |                                              |       |           |      |      |       |

## Part Number System



**TS-HA Standard Ratings** (part numbers shown with 2 pins, 6.3mm length terminal, and top vinyl plate)

| Cap.<br>(μF)                 | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> ) |        | 20°C ESR (Ω, max.) |       | Panasonic<br>Part Number | Cap.<br>(μF)                             | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> ) |        | 20°C ESR (Ω, max.) |       | Panasonic<br>Part Number |
|------------------------------|--------------------|------------------------------------|--------|--------------------|-------|--------------------------|------------------------------------------|--------------------|------------------------------------|--------|--------------------|-------|--------------------------|
|                              |                    | 120Hz                              | 10kHz~ | 120Hz              | 20kHz |                          |                                          |                    | 120Hz                              | 10kHz~ | 120Hz              | 20kHz |                          |
| 10 VDC Working, 13 VDC Surge |                    |                                    |        |                    |       |                          | 16 VDC Working, 20 VDC Surge (continued) |                    |                                    |        |                    |       |                          |
| 4700                         | 22 x 25            | 0.85                               | 0.98   | 0.159              | 0.135 | ECOS1AA472BA             | 10000                                    | 35 x 20            | 2.40                               | 2.76   | 0.071              | 0.057 | ECOS1CA103EL             |
| 6800                         | 22 x 25            | 1.30                               | 1.50   | 0.110              | 0.093 | ECOS1AA682BA             | 12000                                    | 22 x 35            | 2.90                               | 3.34   | 0.055              | 0.044 | ECOS1CA123BA             |
| 10000                        | 22 x 25            | 1.80                               | 2.07   | 0.075              | 0.063 | ECOS1AA103BA             |                                          | 25 x 30            | 2.90                               | 3.34   | 0.055              | 0.044 | ECOS1CA123CA             |
| 12000                        | 22 x 30            | 2.20                               | 2.53   | 0.062              | 0.053 | ECOS1AA123BA             |                                          | 30 x 25            | 2.90                               | 3.34   | 0.055              | 0.044 | ECOS1CA123DA             |
| 15000                        | 22 x 35            | 2.30                               | 2.65   | 0.053              | 0.045 | ECOS1AA153BA             | 15000                                    | 22 x 40            | 3.20                               | 3.68   | 0.046              | 0.037 | ECOS1CA153BA             |
|                              | 25 x 25            | 2.30                               | 2.65   | 0.053              | 0.045 | ECOS1AA153CA             |                                          | 25 x 35            | 3.20                               | 3.68   | 0.046              | 0.037 | ECOS1CA153CA             |
| 18000                        | 22 x 40            | 2.40                               | 2.76   | 0.044              | 0.038 | ECOS1AA183BA             |                                          | 30 x 30            | 3.20                               | 3.68   | 0.046              | 0.037 | ECOS1CA153DA             |
|                              | 25 x 30            | 2.40                               | 2.76   | 0.044              | 0.038 | ECOS1AA183CA             | 18000                                    | 22 x 45            | 3.50                               | 4.03   | 0.040              | 0.034 | ECOS1CA183BA             |
| 22000                        | 22 x 45            | 2.60                               | 2.99   | 0.038              | 0.032 | ECOS1AA223BA             |                                          | 25 x 40            | 3.50                               | 4.03   | 0.040              | 0.034 | ECOS1CA183CA             |
|                              | 25 x 35            | 2.60                               | 2.99   | 0.038              | 0.032 | ECOS1AA223CA             |                                          | 30 x 30            | 3.50                               | 4.03   | 0.040              | 0.034 | ECOS1CA183DA             |
|                              | 30 x 25            | 2.60                               | 2.99   | 0.038              | 0.032 | ECOS1AA223DA             |                                          | 35 x 25            | 3.50                               | 4.03   | 0.040              | 0.034 | ECOS1CA183EA             |
| 27000                        | 22 x 50            | 3.10                               | 3.57   | 0.033              | 0.028 | ECOS1AA273BA             | 22000                                    | 25 x 45            | 3.80                               | 4.37   | 0.033              | 0.028 | ECOS1CA223CA             |
|                              | 25 x 40            | 3.10                               | 3.57   | 0.033              | 0.028 | ECOS1AA273CA             |                                          | 30 x 35            | 3.80                               | 4.37   | 0.033              | 0.028 | ECOS1CA223DA             |
|                              | 30 x 30            | 3.10                               | 3.57   | 0.033              | 0.028 | ECOS1AA273DA             |                                          | 35 x 30            | 3.80                               | 4.37   | 0.033              | 0.028 | ECOS1CA223EA             |
|                              | 35 x 25            | 3.10                               | 3.57   | 0.033              | 0.028 | ECOS1AA273EA             | 27000                                    | 25 x 50            | 4.20                               | 4.83   | 0.028              | 0.025 | ECOS1CA273CA             |
| 33000                        | 25 x 45            | 3.40                               | 3.91   | 0.027              | 0.023 | ECOS1AA333CA             |                                          | 30 x 40            | 4.20                               | 4.83   | 0.028              | 0.025 | ECOS1CA273DA             |
|                              | 30 x 35            | 3.40                               | 3.91   | 0.027              | 0.023 | ECOS1AA333DA             |                                          | 35 x 30            | 4.20                               | 4.83   | 0.028              | 0.025 | ECOS1CA273EA             |
|                              | 35 x 30            | 3.40                               | 3.91   | 0.027              | 0.023 | ECOS1AA333EA             | 33000                                    | 30 x 45            | 4.70                               | 5.41   | 0.023              | 0.020 | ECOS1CA333DA             |
| 39000                        | 25 x 50            | 3.70                               | 4.26   | 0.025              | 0.021 | ECOS1AA393CA             |                                          | 35 x 35            | 4.70                               | 5.41   | 0.023              | 0.020 | ECOS1CA333EA             |
|                              | 30 x 40            | 3.70                               | 4.26   | 0.025              | 0.021 | ECOS1AA393DA             | 39000                                    | 30 x 50            | 5.10                               | 5.87   | 0.022              | 0.020 | ECOS1CA393DA             |
|                              | 35 x 30            | 3.70                               | 4.26   | 0.025              | 0.021 | ECOS1AA393EA             |                                          | 35 x 40            | 5.10                               | 5.87   | 0.022              | 0.020 | ECOS1CA393EA             |
| 47000                        | 30 x 45            | 4.20                               | 4.83   | 0.023              | 0.020 | ECOS1AA473DA             | 47000                                    | 35 x 45            | 5.50                               | 6.33   | 0.020              | 0.018 | ECOS1CA473EA             |
|                              | 35 x 35            | 4.20                               | 4.83   | 0.023              | 0.020 | ECOS1AA473EA             | 56000                                    | 35 x 50            | 6.00                               | 6.90   | 0.019              | 0.017 | ECOS1CA563EA             |
| 56000                        | 30 x 50            | 5.00                               | 5.75   | 0.022              | 0.019 | ECOS1AA563DA             | 25 VDC Working, 32 VDC Surge             |                    |                                    |        |                    |       |                          |
|                              | 35 x 40            | 5.00                               | 5.75   | 0.022              | 0.021 | ECOS1AA563EA             | 2200                                     | 22 x 20            | 1.30                               | 1.50   | 0.241              | 0.181 | ECOS1EA222BL             |
| 68000                        | 35 x 50            | 5.50                               | 6.33   | 0.021              | 0.020 | ECOS1AA683EA             |                                          | 22 x 25            | 1.30                               | 1.50   | 0.241              | 0.181 | ECOS1EA222BA             |
| 16 VDC Working, 20 VDC Surge |                    |                                    |        |                    |       |                          | 3300                                     | 22 x 25            | 1.62                               | 1.86   | 0.161              | 0.121 | ECOS1EA332BA             |
| 3300                         | 22 x 20            | 1.30                               | 1.50   | 0.216              | 0.173 | ECOS1CA332BL             |                                          | 25 x 20            | 1.60                               | 1.84   | 0.161              | 0.121 | ECOS1EA332CL             |
|                              | 22 x 25            | 1.30                               | 1.50   | 0.176              | 0.141 | ECOS1CA332BA             | 4700                                     | 22 x 25            | 2.00                               | 2.30   | 0.106              | 0.079 | ECOS1EA472BA             |
| 4700                         | 22 x 25            | 1.52                               | 1.75   | 0.123              | 0.099 | ECOS1CA472BA             |                                          | 30 x 20            | 1.80                               | 2.07   | 0.113              | 0.085 | ECOS1EA472DL             |
|                              | 25 x 20            | 1.60                               | 1.84   | 0.152              | 0.121 | ECOS1CA472CL             | 5600                                     | 22 x 30            | 2.20                               | 2.53   | 0.089              | 0.067 | ECOS1EA562BA             |
| 6800                         | 22 x 25            | 2.20                               | 2.53   | 0.085              | 0.068 | ECOS1CA682BA             | 6800                                     | 22 x 30            | 2.40                               | 2.76   | 0.073              | 0.055 | ECOS1EA682BA             |
|                              | 30 x 20            | 1.80                               | 2.07   | 0.105              | 0.084 | ECOS1CA682DL             |                                          | 25 x 25            | 2.40                               | 2.76   | 0.073              | 0.055 | ECOS1EA682CA             |
| 8200                         | 22 x 30            | 2.40                               | 2.76   | 0.071              | 0.057 | ECOS1CA822BA             |                                          | 35 x 20            | 2.30                               | 2.65   | 0.080              | 0.060 | ECOS1EA682EL             |
| 10000                        | 22 x 30            | 2.60                               | 2.99   | 0.066              | 0.053 | ECOS1CA103BA             | 8200                                     | 22 x 35            | 2.70                               | 3.11   | 0.061              | 0.045 | ECOS1EA822BA             |
|                              | 25 x 25            | 2.60                               | 2.99   | 0.066              | 0.053 | ECOS1CA103CA             |                                          | 25 x 30            | 2.70                               | 3.11   | 0.061              | 0.045 | ECOS1EA822CA             |

## TS-HA Standard Ratings (continued)

| Cap.<br>(μF)                             | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> ) |        | 20°C ESR (Ω, max.) |       | Panasonic<br>Part Number |
|------------------------------------------|--------------------|------------------------------------|--------|--------------------|-------|--------------------------|
|                                          |                    | 120Hz                              | 10kHz~ | 120Hz              | 20kHz |                          |
| 25 VDC Working, 32 VDC Surge (continued) |                    |                                    |        |                    |       |                          |
| 8200                                     | 30 x 25            | 2.70                               | 3.11   | 0.061              | 0.045 | ECOS1EA822DA             |
| 10000                                    | 22 x 40            | 3.00                               | 3.45   | 0.051              | 0.039 | ECOS1EA103BA             |
|                                          | 25 x 35            | 3.00                               | 3.45   | 0.051              | 0.039 | ECOS1EA103CA             |
|                                          | 30 x 30            | 3.00                               | 3.45   | 0.051              | 0.039 | ECOS1EA103DA             |
| 12000                                    | 22 x 45            | 3.20                               | 3.68   | 0.044              | 0.033 | ECOS1EA123BA             |
|                                          | 25 x 40            | 3.20                               | 3.68   | 0.044              | 0.035 | ECOS1EA123CA             |
|                                          | 30 x 30            | 3.20                               | 3.68   | 0.044              | 0.035 | ECOS1EA123DA             |
|                                          | 35 x 25            | 3.20                               | 3.68   | 0.044              | 0.035 | ECOS1EA123EA             |
| 15000                                    | 25 x 45            | 3.60                               | 4.14   | 0.036              | 0.031 | ECOS1EA153CA             |
|                                          | 30 x 35            | 3.60                               | 4.14   | 0.036              | 0.031 | ECOS1EA153DA             |
|                                          | 35 x 30            | 3.60                               | 4.14   | 0.036              | 0.031 | ECOS1EA153EA             |
| 18000                                    | 25 x 50            | 3.90                               | 4.49   | 0.030              | 0.027 | ECOS1EA183CA             |
|                                          | 30 x 40            | 3.90                               | 4.49   | 0.030              | 0.027 | ECOS1EA183DA             |
|                                          | 35 x 35            | 3.90                               | 4.49   | 0.030              | 0.027 | ECOS1EA183EA             |
| 22000                                    | 30 x 45            | 4.30                               | 4.95   | 0.025              | 0.022 | ECOS1EA223DA             |
|                                          | 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             |
| 35 VDC Working, 44 VDC Surge             |                    |                                    |        |                    |       |                          |
| 1500                                     | 22 x 20            | 1.10                               | 1.27   | 0.287              | 0.216 | ECOS1VA152BL             |
|                                          | 22 x 25            | 1.10                               | 1.27   | 0.287              | 0.216 | ECOS1VA152BA             |
| 2200                                     | 22 x 25            | 1.48                               | 1.70   | 0.196              | 0.147 | ECOS1VA222BA             |
|                                          | 25 x 20            | 1.40                               | 1.61   | 0.196              | 0.147 | ECOS1VA222CL             |
| 3300                                     | 22 x 25            | 1.90                               | 2.19   | 0.121              | 0.090 | ECOS1VA332BA             |
|                                          | 30 x 20            | 1.70                               | 1.96   | 0.131              | 0.098 | ECOS1VA332DL             |
| 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             |
|                                          | 25 x 25            | 2.20                               | 2.53   | 0.088              | 0.066 | ECOS1VA472CA             |
|                                          | 35 x 20            | 2.00                               | 2.30   | 0.095              | 0.071 | ECOS1VA472EL             |
| 5600                                     | 22 x 35            | 2.40                               | 2.76   | 0.074              | 0.056 | ECOS1VA562BA             |
|                                          | 25 x 30            | 2.40                               | 2.76   | 0.074              | 0.056 | ECOS1VA562CA             |
|                                          | 30 x 25            | 2.40                               | 2.76   | 0.074              | 0.056 | ECOS1VA562DA             |
| 6800                                     | 22 x 40            | 2.60                               | 2.99   | 0.061              | 0.046 | ECOS1VA682BA             |
|                                          | 25 x 35            | 2.60                               | 2.99   | 0.061              | 0.046 | ECOS1VA682CA             |
|                                          | 30 x 30            | 2.60                               | 2.99   | 0.061              | 0.046 | ECOS1VA682DA             |
| 8200                                     | 22 x 50            | 2.90                               | 3.34   | 0.051              | 0.038 | ECOS1VA822BA             |
|                                          | 25 x 40            | 2.90                               | 3.34   | 0.051              | 0.038 | ECOS1VA822CA             |
|                                          | 30 x 30            | 2.90                               | 3.34   | 0.051              | 0.038 | ECOS1VA822DA             |
|                                          | 35 x 25            | 2.90                               | 3.34   | 0.051              | 0.038 | ECOS1VA822EA             |
| 10000                                    | 25 x 45            | 3.20                               | 3.68   | 0.041              | 0.031 | ECOS1VA103CA             |
|                                          | 30 x 35            | 3.20                               | 3.68   | 0.041              | 0.031 | ECOS1VA103DA             |
|                                          | 35 x 30            | 3.20                               | 3.68   | 0.041              | 0.031 | ECOS1VA103EA             |
| 12000                                    | 25 x 50            | 3.50                               | 4.03   | 0.035              | 0.026 | ECOS1VA123CA             |
|                                          | 30 x 40            | 3.50                               | 4.03   | 0.035              | 0.026 | ECOS1VA123DA             |
|                                          | 35 x 30            | 3.50                               | 4.03   | 0.035              | 0.026 | ECOS1VA123EA             |
| 15000                                    | 30 x 45            | 3.90                               | 4.49   | 0.030              | 0.022 | ECOS1VA153DA             |
|                                          | 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             |
| 50 VDC Working, 63 VDC Surge             |                    |                                    |        |                    |       |                          |
| 1000                                     | 22 x 20            | 0.90                               | 1.04   | 0.265              | 0.199 | ECOS1HA102BL             |
|                                          | 22 x 25            | 0.90                               | 1.04   | 0.232              | 0.174 | ECOS1HA102BA             |
| 1500                                     | 22 x 25            | 1.25                               | 1.44   | 0.155              | 0.116 | ECOS1HA152BA             |
|                                          | 25 x 20            | 1.20                               | 1.38   | 0.177              | 0.133 | ECOS1HA152CL             |
| 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             |
|                                          | 30 x 20            | 1.40                               | 1.61   | 0.121              | 0.090 | ECOS1HA222DL             |
| 2700                                     | 22 x 30            | 1.80                               | 2.07   | 0.086              | 0.064 | ECOS1HA272BA             |
|                                          | 25 x 25            | 1.80                               | 2.07   | 0.086              | 0.064 | ECOS1HA272CA             |
| 3300                                     | 22 x 35            | 2.00                               | 2.30   | 0.070              | 0.053 | ECOS1HA332BA             |
|                                          | 25 x 30            | 2.00                               | 2.30   | 0.070              | 0.053 | ECOS1HA332CA             |
|                                          | 35 x 20            | 1.70                               | 1.96   | 0.085              | 0.064 | ECOS1HA332EL             |
| 3900                                     | 22 x 40            | 2.20                               | 2.53   | 0.064              | 0.048 | ECOS1HA392BA             |
|                                          | 25 x 35            | 2.20                               | 2.53   | 0.064              | 0.048 | ECOS1HA392CA             |
|                                          | 30 x 25            | 2.20                               | 2.53   | 0.064              | 0.048 | ECOS1HA392DA             |
| 4700                                     | 22 x 45            | 2.50                               | 2.88   | 0.053              | 0.040 | ECOS1HA472BA             |
|                                          | 25 x 40            | 2.50                               | 2.88   | 0.053              | 0.040 | ECOS1HA472CA             |
|                                          | 30 x 30            | 2.50                               | 2.88   | 0.053              | 0.040 | ECOS1HA472DA             |
|                                          | 35 x 25            | 2.50                               | 2.88   | 0.053              | 0.040 | ECOS1HA472EA             |
| 5600                                     | 22 x 50            | 2.80                               | 3.22   | 0.050              | 0.038 | ECOS1HA562BA             |
|                                          | 25 x 40            | 2.80                               | 3.22   | 0.050              | 0.038 | ECOS1HA562CA             |
|                                          | 30 x 35            | 2.80                               | 3.22   | 0.050              | 0.038 | ECOS1HA562DA             |
|                                          | 35 x 30            | 2.80                               | 3.22   | 0.050              | 0.038 | ECOS1HA562EA             |
| 6800                                     | 25 x 50            | 3.30                               | 3.80   | 0.046              | 0.035 | ECOS1HA682CA             |
|                                          | 30 x 40            | 3.30                               | 3.80   | 0.046              | 0.035 | ECOS1HA682DA             |
| 50 VDC Working, 63 VDC Surge (continued) |                    |                                    |        |                    |       |                          |
| 6800                                     | 35 x 30            | 3.30                               | 3.80   | 0.046              | 0.035 | ECOS1HA682EA             |
| 8200                                     | 30 x 45            | 3.60                               | 4.14   | 0.038              | 0.029 | ECOS1HA822DA             |
|                                          | 35 x 35            | 3.60                               | 4.14   | 0.038              | 0.029 | ECOS1HA822EA             |
| 10000                                    | 30 x 50            | 4.00                               | 4.60   | 0.033              | 0.025 | ECOS1HA103DA             |
|                                          | 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             |
| 63 VDC Working, 79 VDC Surge             |                    |                                    |        |                    |       |                          |
| 680                                      | 22 x 20            | 0.90                               | 1.04   | 0.463              | 0.347 | ECOS1JA681BL             |
|                                          | 22 x 25            | 0.90                               | 1.04   | 0.414              | 0.311 | ECOS1JA681BA             |
| 1000                                     | 22 x 25            | 1.17                               | 1.35   | 0.282              | 0.211 | ECOS1JA102BA             |
|                                          | 25 x 20            | 1.20                               | 1.38   | 0.315              | 0.236 | ECOS1JA102CL             |
| 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             |
|                                          | 30 x 20            | 1.30                               | 1.50   | 0.210              | 0.157 | ECOS1JA152DL             |
| 1800                                     | 22 x 30            | 1.70                               | 1.96   | 0.157              | 0.117 | ECOS1JA182BA             |
|                                          | 25 x 25            | 1.70                               | 1.96   | 0.157              | 0.117 | ECOS1JA182CA             |
| 2200                                     | 22 x 35            | 2.00                               | 2.30   | 0.128              | 0.096 | ECOS1JA222BA             |
|                                          | 25 x 30            | 2.00                               | 2.30   | 0.128              | 0.096 | ECOS1JA222CA             |
|                                          | 35 x 20            | 1.50                               | 1.73   | 0.143              | 0.107 | ECOS1JA222EL             |
| 2700                                     | 22 x 40            | 2.20                               | 2.53   | 0.104              | 0.078 | ECOS1JA272BA             |
|                                          | 25 x 35            | 2.20                               | 2.53   | 0.104              | 0.078 | ECOS1JA272CA             |
|                                          | 30 x 25            | 2.20                               | 2.53   | 0.104              | 0.078 | ECOS1JA272DA             |
| 3300                                     | 22 x 50            | 2.50                               | 2.88   | 0.090              | 0.068 | ECOS1JA332BA             |
|                                          | 25 x 40            | 2.50                               | 2.88   | 0.090              | 0.068 | ECOS1JA332CA             |
|                                          | 30 x 30            | 2.50                               | 2.88   | 0.090              | 0.068 | ECOS1JA332DA             |
|                                          | 35 x 25            | 2.50                               | 2.88   | 0.090              | 0.068 | ECOS1JA332EA             |
| 3900                                     | 25 x 45            | 2.70                               | 3.11   | 0.077              | 0.057 | ECOS1JA392CA             |
|                                          | 30 x 35            | 2.70                               | 3.11   | 0.077              | 0.057 | ECOS1JA392DA             |
|                                          | 35 x 30            | 2.70                               | 3.11   | 0.077              | 0.057 | ECOS1JA392EA             |
| 4700                                     | 25 x 50            | 3.00                               | 3.45   | 0.063              | 0.048 | ECOS1JA472CA             |
|                                          | 30 x 40            | 3.00                               | 3.45   | 0.063              | 0.048 | ECOS1JA472DA             |
|                                          | 35 x 30            | 3.00                               | 3.45   | 0.063              | 0.048 | ECOS1JA472EA             |
| 5600                                     | 30 x 45            | 3.30                               | 3.80   | 0.053              | 0.040 | ECOS1JA562DA             |
|                                          | 35 x 35            | 3.30                               | 3.80   | 0.053              | 0.040 | ECOS1JA562EA             |
| 6800                                     | 30 x 50            | 3.60                               | 4.14   | 0.049              | 0.037 | ECOS1JA682DA             |
| 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             |
| 80 VDC Working, 100 VDC Surge            |                    |                                    |        |                    |       |                          |
| 470                                      | 22 x 20            | 0.80                               | 0.92   | 0.459              | 0.298 | ECOS1KA471BL             |
|                                          | 22 x 25            | 0.80                               | 0.92   | 0.388              | 0.272 | ECOS1KA471BA             |
| 680                                      | 22 x 25            | 1.00                               | 1.15   | 0.268              | 0.188 | ECOS1KA681BA             |
|                                          | 25 x 20            | 1.00                               | 1.15   | 0.317              | 0.206 | ECOS1KA681CL             |
| 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             |
|                                          | 25 x 25            | 1.30                               | 1.50   | 0.182              | 0.119 | ECOS1KA102CA             |
|                                          | 30 x 20            | 1.20                               | 1.38   | 0.216              | 0.140 | ECOS1KA102DL             |
| 1200                                     | 22 x 30            | 1.50                               | 1.73   | 0.166              | 0.116 | ECOS1KA122BA             |
|                                          | 25 x 25            | 1.50                               | 1.73   | 0.166              | 0.116 | ECOS1KA122CA             |
| 1500                                     | 22 x 35            | 1.70                               | 1.96   | 0.133              | 0.093 | ECOS1KA152BA             |
|                                          | 25 x 30            | 1.70                               | 1.96   | 0.133              | 0.093 | ECOS1KA152CA             |
|                                          | 35 x 20            | 1.40                               | 1.61   | 0.155              | 0.108 | ECOS1KA152EL             |
| 1800                                     | 22 x 40            | 1.80                               | 2.07   | 0.111              | 0.077 | ECOS1KA182BA             |
|                                          | 25 x 35            | 1.80                               | 2.07   | 0.111              | 0.077 | ECOS1KA182CA             |
|                                          | 30 x 25            | 1.80                               | 2.07   | 0.111              | 0.077 | ECOS1KA182DA             |
| 2200                                     | 22 x 45            | 2.10                               | 2.42   | 0.090              | 0.063 | ECOS1KA222BA             |
|                                          | 25 x 35            | 2.10                               | 2.42   | 0.090              | 0.063 | ECOS1KA222CA             |
|                                          | 30 x 30            | 2.10                               | 2.42   | 0.090              | 0.063 | ECOS1KA222DA             |
|                                          | 35 x 25            | 2.10                               | 2.42   | 0.090              | 0.063 | ECOS1KA222EA             |
| 2700                                     | 25 x 45            | 2.40                               | 2.76   | 0.074              | 0.055 | ECOS1KA272CA             |
|                                          | 30 x 35            | 2.40                               | 2.76   | 0.074              | 0.055 | ECOS1KA272DA             |
|                                          | 35 x 30            | 2.40                               | 2.76   | 0.074              | 0.055 | ECOS1KA272EA             |
|                                          | 35 x 30            | 2.40                               | 2.76   | 0.074              | 0.055 | ECOS1KA272EA             |
| 3300                                     | 25 x 50            | 2.60                               | 2.99   | 0.065              | 0.049 | ECOS1KA332CA             |
|                                          | 30 x 40            | 2.60                               | 2.99   | 0.065              | 0.049 | ECOS1KA332DA             |
|                                          | 35 x 30            | 2.60                               | 2.99   | 0.065              | 0.049 | ECOS1KA332EA             |
| 3900                                     | 30 x 45            | 3.00                               | 3.45   | 0.060              | 0.045 | ECOS1KA392DA             |
|                                          | 35 x 35            | 3.00                               | 3.45   | 0.060              | 0.045 | ECOS1KA392EA             |
|                                          | 30 x 50            | 3.30                               | 3.80   | 0.049              | 0.037 | ECOS1KA472DA             |
| 4700                                     | 35 x 40            | 3.30                               | 3.80   | 0.049              | 0.037 | ECOS1KA472EA             |
|                                          | 35 x 45            | 3.70                               | 4.26   | 0.050              | 0.038 | ECOS1KA562EA             |
| 5600                                     | 35 x 50            | 3.90                               | 4.49   | 0.041              | 0.031 | ECOS1KA682EA             |
| 100 VDC Working, 125 VDC Surge           |                    |                                    |        |                    |       |                          |
| 330                                      | 22 x 20            | 0.80                               | 1.20   | 0.653              | 0.392 | ECOS2AA331BL             |
|                                          | 22 x 25            | 0.80                               | 1.20   | 0.553              | 0.332 | ECOS2AA331BA             |

## TS-HA Standard Ratings (continued)

| Cap.<br>(μF)                               | Size (mm)<br>D x L | Max 105°C R.C. (A <sub>rms</sub> ) |        | 20°C ESR (Ω, max.) |       | Panasonic<br>Part Number |
|--------------------------------------------|--------------------|------------------------------------|--------|--------------------|-------|--------------------------|
|                                            |                    | 120Hz                              | 10kHz~ | 120Hz              | 20kHz |                          |
| 100 VDC Working, 125 VDC Surge (continued) |                    |                                    |        |                    |       |                          |
| 470                                        | 22 x 25            | 0.92                               | 1.38   | 0.388              | 0.233 | ECOS2AA471BA             |
|                                            | 25 x 20            | 1.00                               | 1.50   | 0.459              | 0.275 | ECOS2AA471CL             |
| 560                                        | 22 x 25            | 1.10                               | 1.65   | 0.296              | 0.178 | ECOS2AA561BA             |
| 680                                        | 30 x 20            | 1.10                               | 1.65   | 0.317              | 0.190 | ECOS2AA681DL             |
| 820                                        | 22 x 30            | 1.40                               | 2.10   | 0.202              | 0.121 | ECOS2AA821BA             |
|                                            | 25 x 25            | 1.40                               | 2.10   | 0.202              | 0.121 | ECOS2AA821CA             |
| 1000                                       | 22 x 35            | 1.70                               | 2.55   | 0.182              | 0.109 | ECOS2AA102BA             |
|                                            | 25 x 30            | 1.70                               | 2.55   | 0.182              | 0.109 | ECOS2AA102CA             |
|                                            | 35 x 20            | 1.20                               | 1.80   | 0.216              | 0.129 | ECOS2AA102EL             |
| 1200                                       | 22 x 40            | 1.80                               | 2.70   | 0.152              | 0.091 | ECOS2AA122BA             |
|                                            | 25 x 35            | 1.80                               | 2.70   | 0.152              | 0.091 | ECOS2AA122CA             |
|                                            | 30 x 25            | 1.80                               | 2.70   | 0.152              | 0.091 | ECOS2AA122DA             |
| 1500                                       | 22 x 45            | 2.10                               | 3.15   | 0.122              | 0.073 | ECOS2AA152BA             |
|                                            | 25 x 40            | 2.10                               | 3.15   | 0.122              | 0.079 | ECOS2AA152CA             |
|                                            | 30 x 30            | 2.10                               | 3.15   | 0.122              | 0.079 | ECOS2AA152DA             |
|                                            | 35 x 25            | 2.10                               | 3.15   | 0.122              | 0.079 | ECOS2AA152EA             |
| 1800                                       | 25 x 45            | 2.30                               | 3.45   | 0.111              | 0.072 | ECOS2AA182CA             |
|                                            | 30 x 35            | 2.30                               | 3.45   | 0.111              | 0.072 | ECOS2AA182DA             |
|                                            | 35 x 30            | 2.30                               | 3.45   | 0.111              | 0.072 | ECOS2AA182EA             |
| 2200                                       | 25 x 50            | 2.60                               | 3.90   | 0.090              | 0.059 | ECOS2AA222CA             |
|                                            | 30 x 40            | 2.60                               | 3.90   | 0.090              | 0.059 | ECOS2AA222DA             |
|                                            | 35 x 30            | 2.60                               | 3.90   | 0.090              | 0.059 | ECOS2AA222EA             |
| 2700                                       | 30 x 45            | 2.90                               | 4.35   | 0.080              | 0.052 | ECOS2AA272DA             |
|                                            | 35 x 35            | 2.90                               | 4.35   | 0.080              | 0.052 | ECOS2AA272EA             |
| 3300                                       | 30 x 50            | 3.20                               | 4.80   | 0.075              | 0.053 | ECOS2AA332DA             |
|                                            | 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             |
| 160 VDC Working, 200 VDC Surge             |                    |                                    |        |                    |       |                          |
| 150                                        | 22 x 20            | 0.55                               | 0.77   | 1.437              | 0.647 | ECOS2CA151BL             |
|                                            | 22 x 25            | 0.61                               | 0.85   | 1.216              | 0.547 | ECOS2CA151BA             |
| 220                                        | 22 x 25            | 0.90                               | 1.26   | 0.829              | 0.373 | ECOS2CA221BA             |
|                                            | 25 x 20            | 0.75                               | 1.05   | 0.980              | 0.441 | ECOS2CA221CL             |
| 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             |
|                                            | 30 x 20            | 1.00                               | 1.40   | 0.553              | 0.249 | ECOS2CA331DL             |
| 390                                        | 22 x 30            | 1.30                               | 1.82   | 0.553              | 0.249 | ECOS2CA391BA             |
|                                            | 25 x 25            | 1.30                               | 1.82   | 0.553              | 0.249 | ECOS2CA391CA             |
| 470                                        | 22 x 35            | 1.40                               | 1.96   | 0.529              | 0.238 | ECOS2CA471BA             |
|                                            | 25 x 30            | 1.40                               | 1.96   | 0.459              | 0.206 | ECOS2CA471CA             |
|                                            | 35 x 20            | 1.15                               | 1.61   | 0.459              | 0.206 | ECOS2CA471EL             |
| 560                                        | 22 x 40            | 1.50                               | 2.10   | 0.385              | 0.173 | ECOS2CA561BA             |
|                                            | 25 x 30            | 1.50                               | 2.10   | 0.385              | 0.173 | ECOS2CA561CA             |
|                                            | 30 x 25            | 1.50                               | 2.10   | 0.385              | 0.173 | ECOS2CA561DA             |
| 680                                        | 22 x 45            | 1.70                               | 2.38   | 0.317              | 0.143 | ECOS2CA681BA             |
|                                            | 25 x 35            | 1.70                               | 2.38   | 0.317              | 0.143 | ECOS2CA681CA             |
|                                            | 30 x 30            | 1.70                               | 2.38   | 0.317              | 0.143 | ECOS2CA681DA             |
| 820                                        | 25 x 40            | 2.00                               | 2.80   | 0.263              | 0.118 | ECOS2CA821CA             |
|                                            | 30 x 30            | 2.00                               | 2.80   | 0.263              | 0.118 | ECOS2CA821DA             |
| 1000                                       | 25 x 45            | 2.20                               | 3.08   | 0.216              | 0.108 | ECOS2CA102CA             |
|                                            | 30 x 35            | 2.20                               | 3.08   | 0.216              | 0.108 | ECOS2CA102DA             |
| 1200                                       | 25 x 50            | 2.30                               | 3.22   | 0.180              | 0.090 | ECOS2CA122CA             |
|                                            | 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             |
|                                            | 35 x 35            | 2.50                               | 3.50   | 0.166              | 0.083 | ECOS2CA152EA             |
| 1800                                       | 30 x 50            | 2.70                               | 3.78   | 0.138              | 0.083 | ECOS2CA182DA             |
|                                            | 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             |                    |                                    |        |                    |       |                          |
| 100                                        | 22 x 20            | 0.50                               | 0.70   | 1.989              | 0.895 | ECOS2DA101BL             |
|                                            | 22 x 25            | 0.50                               | 0.70   | 1.658              | 0.746 | ECOS2DA101BA             |
| 150                                        | 22 x 25            | 0.68                               | 0.95   | 1.105              | 0.497 | ECOS2DA151BA             |
|                                            | 25 x 20            | 0.65                               | 0.91   | 1.326              | 0.597 | ECOS2DA151CL             |
| 220                                        | 22 x 25            | 1.00                               | 1.40   | 0.754              | 0.339 | ECOS2DA221BA             |
|                                            | 30 x 20            | 0.87                               | 1.22   | 0.904              | 0.407 | ECOS2DA221DL             |
| 270                                        | 22 x 30            | 1.10                               | 1.54   | 0.614              | 0.276 | ECOS2DA271BA             |
|                                            | 25 x 25            | 1.10                               | 1.54   | 0.614              | 0.276 | ECOS2DA271CA             |
| 330                                        | 22 x 30            | 1.20                               | 1.68   | 0.502              | 0.226 | ECOS2DA331BA             |
|                                            | 25 x 25            | 1.20                               | 1.68   | 0.502              | 0.226 | ECOS2DA331CA             |
|                                            | 35 x 20            | 1.10                               | 1.54   | 0.603              | 0.271 | ECOS2DA331EL             |
| 390                                        | 22 x 35            | 1.30                               | 1.82   | 0.425              | 0.191 | ECOS2DA391BA             |
|                                            | 25 x 30            | 1.30                               | 1.82   | 0.425              | 0.191 | ECOS2DA391CA             |
|                                            | 30 x 25            | 1.30                               | 1.82   | 0.425              | 0.191 | ECOS2DA391DA             |
| 470                                        | 22 x 40            | 1.40                               | 1.96   | 0.353              | 0.159 | ECOS2DA471BA             |
|                                            | 25 x 35            | 1.40                               | 1.96   | 0.353              | 0.159 | ECOS2DA471CA             |
|                                            | 30 x 25            | 1.40                               | 1.96   | 0.353              | 0.159 | ECOS2DA471DA             |
| 200 VDC Working, 250 VDC Surge (continued) |                    |                                    |        |                    |       |                          |
| 560                                        | 22 x 45            | 1.50                               | 2.10   | 0.296              | 0.133 | ECOS2DA561BA             |
|                                            | 25 x 35            | 1.50                               | 2.10   | 0.296              | 0.133 | ECOS2DA561CA             |
|                                            | 30 x 30            | 1.50                               | 2.10   | 0.296              | 0.133 | ECOS2DA561DA             |
| 680                                        | 25 x 40            | 1.70                               | 2.38   | 0.244              | 0.110 | ECOS2DA681CA             |
|                                            | 30 x 30            | 1.70                               | 2.38   | 0.244              | 0.110 | ECOS2DA681DA             |
| 820                                        | 25 x 50            | 2.00                               | 2.80   | 0.222              | 0.111 | ECOS2DA821CA             |
|                                            | 30 x 35            | 2.00                               | 2.80   | 0.222              | 0.111 | ECOS2DA821DA             |
|                                            | 35 x 30            | 2.00                               | 2.80   | 0.222              | 0.111 | ECOS2DA821EA             |
| 1000                                       | 30 x 45            | 2.20                               | 3.08   | 0.199              | 0.099 | ECOS2DA102DA             |
|                                            | 35 x 35            | 2.20                               | 3.08   | 0.199              | 0.099 | ECOS2DA102EA             |
| 1200                                       | 30 x 50            | 2.30                               | 3.22   | 0.166              | 0.083 | ECOS2DA122DA             |
|                                            | 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             |
| 250 VDC Working, 300 VDC Surge             |                    |                                    |        |                    |       |                          |
| 68                                         | 22 x 20            | 0.40                               | 0.56   | 2.926              | 1.463 | ECOS2EA680BL             |
|                                            | 22 x 25            | 0.40                               | 0.56   | 2.438              | 1.219 | ECOS2EA680BA             |
| 100                                        | 22 x 25            | 0.55                               | 0.77   | 1.658              | 0.829 | ECOS2EA101BA             |
|                                            | 25 x 20            | 0.50                               | 0.70   | 1.989              | 0.995 | ECOS2EA101CL             |
|                                            | 150                | 22 x 25                            | 0.75   | 1.05               | 1.105 | 0.553                    |
| 180                                        | 22 x 30            | 0.90                               | 1.26   | 0.921              | 0.461 | ECOS2EA181BA             |
|                                            | 25 x 25            | 0.90                               | 1.26   | 0.921              | 0.461 | ECOS2EA181CA             |
| 220                                        | 22 x 30            | 1.00                               | 1.40   | 0.754              | 0.377 | ECOS2EA221BA             |
|                                            | 25 x 25            | 1.00                               | 1.40   | 0.754              | 0.377 | ECOS2EA221CA             |
|                                            | 35 x 20            | 0.87                               | 1.22   | 0.904              | 0.452 | ECOS2EA221EL             |
| 270                                        | 22 x 35            | 1.10                               | 1.54   | 0.614              | 0.307 | ECOS2EA271BA             |
|                                            | 25 x 30            | 1.10                               | 1.54   | 0.614              | 0.307 | ECOS2EA271CA             |
|                                            | 30 x 25            | 1.10                               | 1.54   | 0.614              | 0.307 | ECOS2EA271DA             |
| 330                                        | 22 x 40            | 1.20                               | 1.68   | 0.502              | 0.251 | ECOS2EA331BA             |
|                                            | 25 x 35            | 1.20                               | 1.68   | 0.502              | 0.251 | ECOS2EA331CA             |
|                                            | 30 x 25            | 1.20                               | 1.68   | 0.502              | 0.251 | ECOS2EA331DA             |
| 390                                        | 22 x 45            | 1.30                               | 1.82   | 0.425              | 0.213 | ECOS2EA391BA             |
|                                            | 25 x 35            | 1.30                               | 1.82   | 0.425              | 0.213 | ECOS2EA391CA             |
|                                            | 30 x 30            | 1.30                               | 1.82   | 0.425              | 0.213 | ECOS2EA391DA             |
|                                            | 35 x 30            | 1.40                               | 1.96   | 0.353              | 0.176 | ECOS2EA471CA             |
| 470                                        | 25 x 45            | 1.40                               | 1.96   | 0.353              | 0.176 | ECOS2EA471DA             |
|                                            | 30 x 25            | 1.10                               | 1.54   | 0.614              | 0.307 | ECOS2EA271DA             |
|                                            | 330                | 22 x 40                            | 1.20   | 1.68               | 0.502 | 0.251                    |
| 250                                        | 22 x 45            | 1.30                               | 1.82   | 0.425              | 0.213 | ECOS2EA391BA             |
|                                            | 25 x 35            | 1.30                               | 1.82   | 0.425              | 0.213 | ECOS2EA391CA             |
|                                            | 30 x 30            | 1.30                               | 1.82   | 0.425              | 0.213 | ECOS2EA391DA             |
| 560                                        | 25 x 50            | 1.50                               | 2.10   | 0.296              | 0.148 | ECOS2EA561CA             |
|                                            | 30 x 35            | 1.50                               | 2.10   | 0.296              | 0.148 | ECOS2EA561DA             |
|                                            | 35 x 30            | 1.50                               | 2.10   | 0.296              | 0.148 | ECOS2EA561EA             |
| 680                                        | 30 x 45            | 1.70                               | 2.38   | 0.244              | 0.122 | ECOS2EA681DA             |
|                                            | 35 x 35            | 1.70                               | 2.38   | 0.244              | 0.122 | ECOS2EA681EA             |
| 820                                        | 30 x 50            | 2.00                               | 2.80   | 0.202              | 0.101 | ECOS2EA821DA             |
|                                            | 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             |
| 385 VDC Working, 435 VDC Surge             |                    |                                    |        |                    |       |                          |
| 33                                         | 22 x 20            | 0.20                               | 0.28   | 5.024              | 1.758 | ECOS2TA330BL             |
| 47                                         | 25 x 20            | 0.25                               | 0.35   | 3.527              | 1.235 | ECOS2TA470CL             |
| 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             |
|                                            | 25 x 25            | 0.56                               | 0.78   | 1.950              | 0.683 | ECOS2TA680CA             |
| 82                                         | 30 x 20            | 0.35                               | 0.49   | 2.438              | 0.853 | ECOS2TA680DL             |
|                                            | 22 x 35            | 0.64                               | 0.90   | 1.617              | 0.566 | ECOS2TA820BA             |
| 100                                        | 25 x 25            | 0.64                               | 0.90   | 1.617              | 0.566 | ECOS2TA820CA             |
|                                            | 22 x 35            | 0.69                               | 0.97   | 1.326              | 0.464 | ECOS2TA101BA             |
| 120                                        | 25 x 30            | 0.69                               | 0.97   | 1.326              | 0.464 | ECOS2TA101CA             |
|                                            | 35 x 20            | 0.47                               | 0.66   | 1.658              | 0.580 | ECOS2TA101EL             |
| 150                                        | 22 x 35            | 0.75                               | 1.05   | 1.105              | 0.387 | ECOS2TA121BA             |
|                                            | 25 x 30            | 0.75                               | 1.05   | 1.105              | 0.387 | ECOS2TA121CA             |
| 180                                        | 22 x 50            | 0.82                               | 1.15   | 0.884              | 0.309 | ECOS2TA151BA             |
|                                            | 25 x 40            | 0.82                               | 1.15   | 0.884              | 0.309 | ECOS2TA151CA             |
|                                            | 30 x 30            | 0.82                               | 1.15   | 0.884              | 0.309 | ECOS2TA151DA             |
|                                            | 25 x 45            | 0.95                               | 1.33   | 0.737              | 0.258 | ECOS2TA181CA             |
| 220                                        | 30 x 35            | 0.95                               | 1.33   | 0.737              | 0.258 | ECOS2TA181DA             |
|                                            | 35 x 25            | 0.95                               | 1.33   | 0.737              | 0.258 | ECOS2TA181EA             |
|                                            | 25 x 50            | 1.10                               | 1.54   | 0.603              | 0.211 | ECOS2TA221CA             |
| 270                                        | 30 x 40            | 1.10                               | 1.54   | 0.603              | 0.211 | ECOS2TA221DA             |
|                                            | 35 x 30            | 1.10                               | 1.54   | 0.603              | 0.211 | ECOS2TA221EA             |
| 330                                        | 30 x 45            | 1.20                               | 1.68   | 0.491              | 0.172 | ECOS2TA271DA             |
|                                            | 35 x 35            | 1.20                               | 1.68   | 0.491              | 0.172 | ECOS2TA271EA             |
| 390                                        | 30 x 50            | 1.35                               | 1.89   | 0.402              | 0.161 | ECOS2TA331DA             |
|                                            | 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             |

### TS-HA 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                        | 10kHz~ | 120Hz                       | 20kHz |                          |
| 400 VDC Working, 450 VDC Surge |                    |                              |        |                             |       |                          |
| 33                             | 22 x 20            | 0.20                         | 0.28   | 5.024                       | 1.758 | ECOS2GA330BL             |
|                                | 22 x 25            | 0.30                         | 0.42   | 4.521                       | 1.582 | ECOS2GA330BA             |
| 47                             | 22 x 25            | 0.43                         | 0.60   | 2.822                       | 0.988 | ECOS2GA470BA             |
|                                | 25 x 20            | 0.25                         | 0.35   | 3.527                       | 1.235 | ECOS2GA470CL             |
| 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             |
|                                | 25 x 25            | 0.56                         | 0.78   | 1.950                       | 0.683 | ECOS2GA680CA             |
|                                | 30 x 20            | 0.35                         | 0.49   | 2.438                       | 0.853 | ECOS2GA680DL             |
| 82                             | 22 x 35            | 0.64                         | 0.90   | 1.617                       | 0.566 | ECOS2GA820BA             |
|                                | 25 x 25            | 0.64                         | 0.90   | 1.617                       | 0.566 | ECOS2GA820CA             |
| 100                            | 22 x 35            | 0.69                         | 0.97   | 1.326                       | 0.464 | ECOS2GA101BA             |
|                                | 25 x 30            | 0.69                         | 0.97   | 1.326                       | 0.464 | ECOS2GA101CA             |
|                                | 35 x 20            | 0.47                         | 0.66   | 1.658                       | 0.580 | ECOS2GA101EL             |
| 120                            | 22 x 40            | 0.75                         | 1.05   | 1.105                       | 0.387 | ECOS2GA121BA             |
|                                | 25 x 35            | 0.75                         | 1.05   | 1.105                       | 0.387 | ECOS2GA121CA             |
|                                | 30 x 25            | 0.75                         | 1.05   | 1.105                       | 0.387 | ECOS2GA121DA             |
| 150                            | 22 x 50            | 0.82                         | 1.15   | 0.884                       | 0.309 | ECOS2GA151BA             |
|                                | 25 x 40            | 0.82                         | 1.15   | 0.884                       | 0.309 | ECOS2GA151CA             |
|                                | 30 x 30            | 0.82                         | 1.15   | 0.884                       | 0.309 | ECOS2GA151DA             |
| 180                            | 25 x 45            | 0.95                         | 1.33   | 0.737                       | 0.258 | ECOS2GA181CA             |
|                                | 30 x 35            | 0.95                         | 1.33   | 0.737                       | 0.258 | ECOS2GA181DA             |
|                                | 35 x 25            | 0.95                         | 1.33   | 0.737                       | 0.258 | ECOS2GA181EA             |
| 220                            | 25 x 50            | 1.10                         | 1.54   | 0.603                       | 0.211 | ECOS2GA221CA             |
|                                | 30 x 40            | 1.10                         | 1.54   | 0.603                       | 0.211 | ECOS2GA221DA             |
|                                | 35 x 30            | 1.10                         | 1.54   | 0.603                       | 0.211 | ECOS2GA221EA             |
| 270                            | 30 x 45            | 1.20                         | 1.68   | 0.491                       | 0.172 | ECOS2GA271DA             |
|                                | 35 x 35            | 1.20                         | 1.68   | 0.491                       | 0.172 | ECOS2GA271EA             |
| 330                            | 30 x 50            | 1.35                         | 1.89   | 0.402                       | 0.161 | ECOS2GA331DA             |
|                                | 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             |
| 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             |
|                                | 25 x 25            | 0.50                         | 0.70   | 1.950                       | 0.780 | ECOS2WA680CA             |
| 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             |
|                                | 25 x 30            | 0.64                         | 0.90   | 1.326                       | 0.531 | ECOS2WA101CA             |
|                                | 30 x 25            | 0.64                         | 0.90   | 1.326                       | 0.531 | ECOS2WA101DA             |
| 120                            | 22 x 45            | 0.72                         | 1.01   | 1.105                       | 0.442 | ECOS2WA121BA             |
|                                | 25 x 35            | 0.72                         | 1.01   | 1.105                       | 0.442 | ECOS2WA121CA             |
| 150                            | 22 x 50            | 0.79                         | 1.11   | 0.884                       | 0.354 | ECOS2WA151BA             |
|                                | 25 x 40            | 0.79                         | 1.11   | 0.884                       | 0.354 | ECOS2WA151CA             |
|                                | 30 x 30            | 0.79                         | 1.11   | 0.884                       | 0.354 | ECOS2WA151DA             |
|                                | 35 x 25            | 0.79                         | 1.11   | 0.884                       | 0.354 | ECOS2WA151EA             |
| 180                            | 25 x 45            | 0.87                         | 1.22   | 0.737                       | 0.295 | ECOS2WA181CA             |
|                                | 30 x 35            | 0.87                         | 1.22   | 0.737                       | 0.295 | ECOS2WA181DA             |
| 220                            | 25 x 50            | 1.00                         | 1.40   | 0.678                       | 0.271 | ECOS2WA221CA             |
|                                | 30 x 40            | 1.00                         | 1.40   | 0.678                       | 0.271 | ECOS2WA221DA             |
|                                | 35 x 30            | 1.00                         | 1.40   | 0.678                       | 0.271 | ECOS2WA221EA             |
| 270                            | 30 x 45            | 1.17                         | 1.64   | 0.614                       | 0.246 | ECOS2WA271DA             |
|                                | 35 x 35            | 1.17                         | 1.64   | 0.614                       | 0.246 | ECOS2WA271EA             |
| 330                            | 30 x 50            | 1.38                         | 1.93   | 0.502                       | 0.201 | ECOS2WA331DA             |
|                                | 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             |