



## Solid Tantalum Surface Mount Chip Capacitors TANTAMOUNT™, Molded Case, Standard Industrial Grade



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Application Notes



Technical Notes



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### PERFORMANCE / ELECTRICAL CHARACTERISTICS

[www.vishay.com/doc?40192](http://www.vishay.com/doc?40192)

**Operating Temperature:** -55 °C to +125 °C  
(above 85 °C, voltage derating is required)

**Capacitance Range:** 0.10 µF to 1000 µF

**Capacitance Tolerance:** ± 5 %, ± 10 %, ± 20 %

**100 % Surge Current Tested (D and E Case Codes)**

**Voltage Rating:** 4 V<sub>DC</sub> to 75 V<sub>DC</sub>

#### Note

- For recommended voltage derating guidelines see "Typical Performance Characteristics"

### FEATURES

- Molded case available in five case codes
- Terminations: 100 % matte tin standard, tin / lead available
- Compatible with "high volume" automatic pick and place equipment
- Standard EIA-535-BAAC case sizes (A through E)
- Qualified to EIA-717
- Moisture sensitivity level 1
- Optical character recognition qualified
- Compliant terminations
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

#### Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

### APPLICATIONS

- Industrial
- Telecom infrastructure
- General purpose



**RoHS\***  
Available

**HALOGEN  
FREE  
GREEN  
(5-2008)  
Available**

### ORDERING INFORMATION

| 293D | 107                                                                                                                            | X9                                                       | 010                                                                                                                                                | D                                | 2WE3                                                                                                                                                                                                                                                                                                                       |
|------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TYPE | CAPACITANCE                                                                                                                    | CAPACITANCE TOLERANCE                                    | DC VOLTAGE RATING AT +85 °C                                                                                                                        | CASE CODE                        | TERMINATION AND PACKAGING                                                                                                                                                                                                                                                                                                  |
|      | This is expressed in picofarads. The first two digits are the significant figures. The third is the number of zeros to follow. | X0 = ± 20 %<br>X9 = ± 10 %<br>X5 = ± 5 % (special order) | This is expressed in V. To complete the three-digit block, zeros precede the voltage rating. A decimal point is indicated by an "R" (6R3 = 6.3 V). | See Ratings and Case Codes table | <p><b>Matte tin</b></p> <p>2TE3 = 7" (178 mm) reel<br/>2WE3 = 13" (330 mm) reel<br/>2DE3 = 7" (178 mm) reel, dry pack<br/>2RE3 = 13" (330 mm) reel, dry pack</p> <p><b>Tin / lead</b></p> <p>8T = 7" (178 mm) reel<br/>8W = 13" (330 mm) reel<br/>8D = 7" (178 mm) reel, dry pack<br/>8R = 13" (330 mm) reel, dry pack</p> |

#### Notes

- We reserve the right to supply higher voltage ratings and tighter capacitance tolerance capacitors in the same case size. Voltage substitutions will be marked with the higher voltage rating
- We reserve the right to supply better series with more extensive screening
- Dry pack as specified in J-STD-033

**DIMENSIONS** in inches [millimeters]

| CASE CODE | EIA SIZE | L                             | W                             | H                             | P                              | T <sub>W</sub>                | T <sub>H</sub> (MIN.) |
|-----------|----------|-------------------------------|-------------------------------|-------------------------------|--------------------------------|-------------------------------|-----------------------|
| A         | 3216-18  | 0.126 ± 0.008<br>[3.2 ± 0.20] | 0.063 ± 0.008<br>[1.6 ± 0.20] | 0.063 ± 0.008<br>[1.6 ± 0.20] | 0.031 ± 0.012<br>[0.80 ± 0.30] | 0.047 ± 0.004<br>[1.2 ± 0.10] | 0.028<br>[0.70]       |
| B         | 3528-21  | 0.138 ± 0.008<br>[3.5 ± 0.20] | 0.110 ± 0.008<br>[2.8 ± 0.20] | 0.075 ± 0.008<br>[1.9 ± 0.20] | 0.031 ± 0.012<br>[0.80 ± 0.30] | 0.087 ± 0.004<br>[2.2 ± 0.10] | 0.028<br>[0.70]       |
| C         | 6032-28  | 0.236 ± 0.012<br>[6.0 ± 0.30] | 0.126 ± 0.012<br>[3.2 ± 0.30] | 0.098 ± 0.012<br>[2.5 ± 0.30] | 0.051 ± 0.012<br>[1.3 ± 0.30]  | 0.087 ± 0.004<br>[2.2 ± 0.10] | 0.039<br>[1.0]        |
| D         | 7343-31  | 0.287 ± 0.012<br>[7.3 ± 0.30] | 0.169 ± 0.012<br>[4.3 ± 0.30] | 0.110 ± 0.012<br>[2.8 ± 0.30] | 0.051 ± 0.012<br>[1.3 ± 0.30]  | 0.094 ± 0.004<br>[2.4 ± 0.10] | 0.039<br>[1.0]        |
| E         | 7343-43  | 0.287 ± 0.012<br>[7.3 ± 0.30] | 0.169 ± 0.012<br>[4.3 ± 0.30] | 0.157 ± 0.012<br>[4.0 ± 0.30] | 0.051 ± 0.012<br>[1.3 ± 0.30]  | 0.094 ± 0.004<br>[2.4 ± 0.10] | 0.039<br>[1.0]        |

**Notes**

- Glue pad (non-conductive, part of molded case) is dedicated for glue attachment (as user option)
- Mechanical variations in anode and/or cathode terminations on tantalum capacitors manufactured by various Vishay plants are normal and will not impact the capacitor's form, fit, and function. Examples of termination shapes:

**RATINGS AND CASE CODES**

| μF   | 4 V           | 6.3 V         | 10 V          | 16 V          | 20 V      | 25 V          | 35 V             | 50 V      | 63 V | 75 V      |
|------|---------------|---------------|---------------|---------------|-----------|---------------|------------------|-----------|------|-----------|
| 0.10 |               |               |               |               |           | A             | A                | A         |      | A         |
| 0.15 |               |               |               |               |           |               | A                | A / B     |      | B         |
| 0.22 |               |               |               |               |           |               | A                | A / B     |      | B         |
| 0.33 |               |               |               |               |           | A             | A                | A / B     |      | B         |
| 0.47 |               |               | A             |               | A         | A             | A / B            | A / B / C |      | B         |
| 0.68 |               |               |               | A             | A         | A / B         | A / B            | B / C     |      | B / C     |
| 1.0  |               |               | A             | A             | A / B     | A / B         | A / B            | B / C     |      | D         |
| 1.5  |               | A             | A             | A / B         | A / B     | A / B         | B / C            | B / C / D |      | B / C / D |
| 2.2  | A             | A             | A / B         | A / B         | A / B     | A / B / C     | B / C            | B / C / D |      | D         |
| 3.3  | A             | A / B         | A / B         | A / B         | A / B / C | A / B / C     | B / C / D        | C / D     | D    | D         |
| 4.7  | A / B         | A / B         | A / B / C     | A / B / C     | A / B / C | A / B / C / D | B / C / D        | C / D / E | D    | E         |
| 6.8  | A / B         | A / B         | A / B / C     | A / B / C     | A / B / C | B / C / D     | C / D            | D / E     |      |           |
| 10   | A / B         | A / B / C     | A / B / C     | A / B / C / D | B / C / D | B / C / D     | C / D            | D / E     | E    |           |
| 15   | A / B / C     | A / B / C     | A / B / C     | B / C         | B / C / D | B / C / D     | C / D / E        | E         |      |           |
| 22   | A / B / C     | A / B / C     | A / B / C / D | B / C / D     | B / C / D | C / D / E     | D / E            |           |      |           |
| 33   | A / B / C     | A / B / C     | B / C / D     | B / C / D     | C / D     | D / E         | D / E            |           |      |           |
| 47   | A / B / C     | A / B / C / D | B / C / D     | C / D / E     | D / E     | D / E         | E <sup>(1)</sup> |           |      |           |
| 68   | B / C / D     | B / C / D     | B / C / D / E | D / E         | D / E     | E             |                  |           |      |           |
| 100  | A / B / C / D | B / C / D / E | B / C / D / E | D / E         | D / E     | E             |                  |           |      |           |
| 120  | D             | D             | E             |               |           |               |                  |           |      |           |
| 150  | B / C / D     | C / D / E     | C / D / E     | D / E         |           |               |                  |           |      |           |
| 220  | B / C / D / E | C / D / E     | D / E         | E             |           |               |                  |           |      |           |
| 330  | D / E         | D / E         | D / E         |               |           |               |                  |           |      |           |
| 470  | D / E         | D / E         | E             |               |           |               |                  |           |      |           |
| 680  | D / E         | E             |               |               |           |               |                  |           |      |           |
| 1000 | E             | E             |               |               |           |               |                  |           |      |           |

**Note**

<sup>(1)</sup> 125 °C life test post test limits per AEC-Q200

**MARKING**

| "A" CASE VOLTAGE CODE |      |  |  |
|-----------------------|------|--|--|
| VOLTS                 | CODE |  |  |
| 4.0                   | G    |  |  |
| 6.3                   | J    |  |  |
| 10                    | A    |  |  |
| 16                    | C    |  |  |
| 20                    | D    |  |  |
| 25                    | E    |  |  |
| 35                    | V    |  |  |
| 50                    | T    |  |  |
| 75                    | S    |  |  |

**Marking**

Capacitor marking includes an anode (+) polarity band, capacitance in microfarads and the voltage rating. "A" case capacitors use a letter code for the voltage and EIA capacitance code.

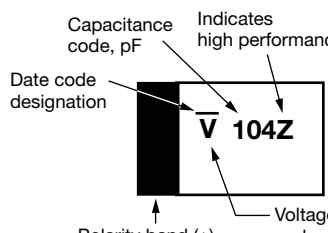
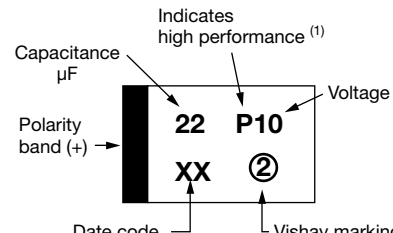
The Vishay identification marking is included if space permits. Vishay marking ("circled 2") may show additives in the form of short lines, depicting actual manufacturing facility. For A case capacitors discontinuation in polarity bar maybe used as actual manufacturing facility designation. Capacitors rated at 6.3 V are marked 6 V.

A manufacturing date code is marked on all capacitors, for details see FAQ: [www.vishay.com/doc?40110](http://www.vishay.com/doc?40110).

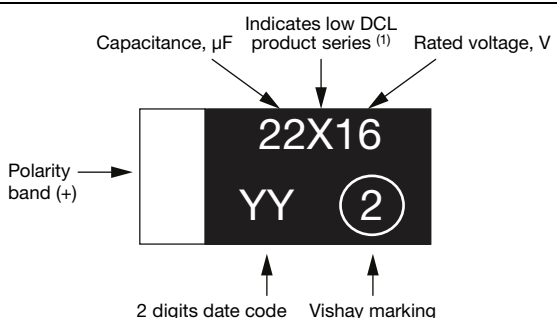
Capacitors may bear different marking scheme if parts are substituted with high performance Vishay Automotive Grade TP3 family or low DCL TX3 family products. Marking examples are shown below.

Call the factory for further explanation.

**ADDITIONAL MARKING EXAMPLES****TP3 MARKING**

|                                                                                                         |                                                                                                                    |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
|  <p><b>A Case</b></p> |  <p><b>B, C, D, E Cases</b></p> |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|

**TX3 MARKING**

|                                                                                                               |
|---------------------------------------------------------------------------------------------------------------|
|  <p><b>B, C Cases</b></p> |
|---------------------------------------------------------------------------------------------------------------|

**Note**

(1) Capital letter indicates lead (Pb)-free



| STANDARD RATINGS                                            |           |                   |                                     |                                       |                                                  |                                            |
|-------------------------------------------------------------|-----------|-------------------|-------------------------------------|---------------------------------------|--------------------------------------------------|--------------------------------------------|
| CAPACITANCE<br>( $\mu$ F)                                   | CASE CODE | PART NUMBER       | MAX. DCL<br>AT +25 °C<br>( $\mu$ A) | MAX. DF<br>AT +25 °C<br>120 Hz<br>(%) | MAX. ESR<br>AT +25 °C<br>100 kHz<br>( $\Omega$ ) | MAX. RIPPLE<br>100 kHz<br>$I_{RMS}$<br>(A) |
| 4 V <sub>DC</sub> AT +85 °C; 2.7 V <sub>DC</sub> AT +125 °C |           |                   |                                     |                                       |                                                  |                                            |
| 2.2                                                         | A         | 293D225(1)004A(2) | 0.5                                 | 6                                     | 7.60                                             | 0.10                                       |
| 3.3                                                         | A         | 293D335(1)004A(2) | 0.5                                 | 6                                     | 7.60                                             | 0.10                                       |
| 4.7                                                         | A         | 293D475(1)004A(2) | 0.5                                 | 6                                     | 6.30                                             | 0.11                                       |
| 4.7                                                         | B         | 293D475(1)004B(2) | 0.5                                 | 6                                     | 7.00                                             | 0.11                                       |
| 6.8                                                         | A         | 293D685(1)004A(2) | 0.5                                 | 6                                     | 5.50                                             | 0.12                                       |
| 6.8                                                         | B         | 293D685(1)004B(2) | 0.5                                 | 6                                     | 3.40                                             | 0.16                                       |
| 10                                                          | A         | 293D106(1)004A(2) | 0.5                                 | 6                                     | 5.10                                             | 0.12                                       |
| 10                                                          | B         | 293D106(1)004B(2) | 0.5                                 | 6                                     | 3.50                                             | 0.16                                       |
| 15                                                          | A         | 293D156(1)004A(2) | 0.6                                 | 6                                     | 3.40                                             | 0.15                                       |
| 15                                                          | B         | 293D156(1)004B(2) | 0.6                                 | 6                                     | 2.90                                             | 0.17                                       |
| 15                                                          | C         | 293D156(1)004C(2) | 0.6                                 | 6                                     | 2.80                                             | 0.20                                       |
| 22                                                          | A         | 293D226(1)004A(2) | 0.9                                 | 6                                     | 2.90                                             | 0.16                                       |
| 22                                                          | B         | 293D226(1)004B(2) | 0.9                                 | 6                                     | 2.50                                             | 0.18                                       |
| 22                                                          | C         | 293D226(1)004C(2) | 0.9                                 | 6                                     | 1.80                                             | 0.25                                       |
| 33                                                          | A         | 293D336(1)004A(2) | 1.3                                 | 6                                     | 2.90                                             | 0.16                                       |
| 33                                                          | B         | 293D336(1)004B(2) | 1.3                                 | 6                                     | 2.00                                             | 0.21                                       |
| 33                                                          | C         | 293D336(1)004C(2) | 1.3                                 | 6                                     | 1.80                                             | 0.25                                       |
| 47                                                          | A         | 293D476(1)004A(2) | 1.9                                 | 14                                    | 2.50                                             | 0.17                                       |
| 47                                                          | B         | 293D476(1)004B(2) | 1.9                                 | 6                                     | 1.90                                             | 0.21                                       |
| 47                                                          | C         | 293D476(1)004C(2) | 1.9                                 | 6                                     | 1.80                                             | 0.25                                       |
| 68                                                          | B         | 293D686(1)004B(2) | 2.7                                 | 6                                     | 1.90                                             | 0.21                                       |
| 68                                                          | C         | 293D686(1)004C(2) | 2.7                                 | 6                                     | 1.40                                             | 0.28                                       |
| 68                                                          | D         | 293D686(1)004D(2) | 2.7                                 | 6                                     | 0.80                                             | 0.43                                       |
| 100                                                         | A         | 293D107X0004A(2)  | 10.0                                | 30                                    | 2.50                                             | 0.22                                       |
| 100                                                         | B         | 293D107(1)004B(2) | 4.0                                 | 8                                     | 1.80                                             | 0.22                                       |
| 100                                                         | C         | 293D107(1)004C(2) | 4.0                                 | 6                                     | 0.80                                             | 0.37                                       |
| 100                                                         | D         | 293D107(1)004D(2) | 4.0                                 | 6                                     | 0.70                                             | 0.46                                       |
| 120                                                         | D         | 293D127(1)004D(2) | 4.8                                 | 6                                     | 0.60                                             | 0.51                                       |
| 150                                                         | B         | 293D157(1)004B(2) | 6.0                                 | 14                                    | 1.60                                             | 0.23                                       |
| 150                                                         | C         | 293D157(1)004C(2) | 6.0                                 | 12                                    | 0.70                                             | 0.40                                       |
| 150                                                         | D         | 293D157(1)004D(2) | 6.0                                 | 8                                     | 0.60                                             | 0.50                                       |
| 220                                                         | B         | 293D227X0004B(2)  | 8.8                                 | 18                                    | 1.50                                             | 0.24                                       |
| 220                                                         | C         | 293D227(1)004C(2) | 8.8                                 | 8                                     | 0.70                                             | 0.40                                       |
| 220                                                         | D         | 293D227(1)004D(2) | 8.8                                 | 8                                     | 0.60                                             | 0.50                                       |
| 220                                                         | E         | 293D227(1)004E(2) | 8.8                                 | 8                                     | 0.50                                             | 0.57                                       |
| 330                                                         | D         | 293D337(1)004D(2) | 13.2                                | 8                                     | 0.60                                             | 0.50                                       |
| 330                                                         | E         | 293D337(1)004E(2) | 13.2                                | 8                                     | 0.50                                             | 0.57                                       |
| 470                                                         | D         | 293D477(1)004D(2) | 18.8                                | 10                                    | 0.60                                             | 0.50                                       |
| 470                                                         | E         | 293D477(1)004E(2) | 18.8                                | 10                                    | 0.50                                             | 0.57                                       |
| 680                                                         | D         | 293D687X0004D(2)  | 27.2                                | 25                                    | 0.20                                             | 0.87                                       |
| 680                                                         | E         | 293D687(1)004E(2) | 27.2                                | 12                                    | 0.50                                             | 0.57                                       |
| 1000                                                        | E         | 293D108X0004E(2)  | 40.0                                | 20                                    | 0.50                                             | 0.57                                       |

**Note**

- Part number definitions:
  - Tolerance: X0, X9. For  $\pm 5\%$  tolerance (code X5) contact factory
  - Terminations and packaging: 2TE3, 2WE3, 8T, 8W, 2DE3, 2RE3, 8D, 8R



| STANDARD RATINGS                                            |           |                   |                                     |                                       |                                                  |                                            |
|-------------------------------------------------------------|-----------|-------------------|-------------------------------------|---------------------------------------|--------------------------------------------------|--------------------------------------------|
| CAPACITANCE<br>( $\mu$ F)                                   | CASE CODE | PART NUMBER       | MAX. DCL<br>AT +25 °C<br>( $\mu$ A) | MAX. DF<br>AT +25 °C<br>120 Hz<br>(%) | MAX. ESR<br>AT +25 °C<br>100 kHz<br>( $\Omega$ ) | MAX. RIPPLE<br>100 kHz<br>$I_{RMS}$<br>(A) |
| 6.3 V <sub>DC</sub> AT +85 °C; 4 V <sub>DC</sub> AT +125 °C |           |                   |                                     |                                       |                                                  |                                            |
| 1.5                                                         | A         | 293D155(1)6R3A(2) | 0.5                                 | 6                                     | 8.00                                             | 0.16                                       |
| 2.2                                                         | A         | 293D225(1)6R3A(2) | 0.5                                 | 6                                     | 7.60                                             | 0.10                                       |
| 3.3                                                         | A         | 293D335(1)6R3A(2) | 0.5                                 | 6                                     | 6.30                                             | 0.11                                       |
| 3.3                                                         | B         | 293D335(1)6R3B(2) | 0.5                                 | 6                                     | 5.50                                             | 0.12                                       |
| 4.7                                                         | A         | 293D475(1)6R3A(2) | 0.5                                 | 6                                     | 5.50                                             | 0.12                                       |
| 4.7                                                         | B         | 293D475(1)6R3B(2) | 0.5                                 | 6                                     | 4.40                                             | 0.14                                       |
| 6.8                                                         | A         | 293D685(1)6R3A(2) | 0.5                                 | 6                                     | 5.00                                             | 0.12                                       |
| 6.8                                                         | B         | 293D685(1)6R3B(2) | 0.5                                 | 6                                     | 3.40                                             | 0.16                                       |
| 10                                                          | A         | 293D106(1)6R3A(2) | 0.6                                 | 6                                     | 3.40                                             | 0.15                                       |
| 10                                                          | B         | 293D106(1)6R3B(2) | 0.6                                 | 6                                     | 2.90                                             | 0.17                                       |
| 10                                                          | C         | 293D106(1)6R3C(2) | 0.6                                 | 6                                     | 3.00                                             | 0.19                                       |
| 15                                                          | A         | 293D156(1)6R3A(2) | 0.9                                 | 6                                     | 2.90                                             | 0.16                                       |
| 15                                                          | B         | 293D156(1)6R3B(2) | 0.9                                 | 6                                     | 2.50                                             | 0.18                                       |
| 15                                                          | C         | 293D156(1)6R3C(2) | 0.9                                 | 6                                     | 1.80                                             | 0.25                                       |
| 22                                                          | A         | 293D226(1)6R3A(2) | 1.3                                 | 6                                     | 2.90                                             | 0.16                                       |
| 22                                                          | B         | 293D226(1)6R3B(2) | 1.3                                 | 6                                     | 2.00                                             | 0.21                                       |
| 22                                                          | C         | 293D226(1)6R3C(2) | 1.3                                 | 6                                     | 1.80                                             | 0.25                                       |
| 33                                                          | A         | 293D336(1)6R3A(2) | 2.0                                 | 14                                    | 2.50                                             | 0.17                                       |
| 33                                                          | B         | 293D336(1)6R3B(2) | 2.0                                 | 6                                     | 1.90                                             | 0.21                                       |
| 33                                                          | C         | 293D336(1)6R3C(2) | 2.0                                 | 6                                     | 1.50                                             | 0.27                                       |
| 47                                                          | A         | 293D476(1)6R3A(2) | 2.8                                 | 12                                    | 1.60                                             | 0.22                                       |
| 47                                                          | B         | 293D476(1)6R3B(2) | 2.8                                 | 6                                     | 1.90                                             | 0.21                                       |
| 47                                                          | C         | 293D476(1)6R3C(2) | 2.8                                 | 6                                     | 1.40                                             | 0.28                                       |
| 47                                                          | D         | 293D476(1)6R3D(2) | 2.8                                 | 6                                     | 0.80                                             | 0.43                                       |
| 68                                                          | B         | 293D686(1)6R3B(2) | 4.1                                 | 6                                     | 1.80                                             | 0.22                                       |
| 68                                                          | C         | 293D686(1)6R3C(2) | 4.1                                 | 6                                     | 0.80                                             | 0.37                                       |
| 68                                                          | D         | 293D686(1)6R3D(2) | 4.1                                 | 6                                     | 0.70                                             | 0.46                                       |
| 100                                                         | B         | 293D107(1)6R3B(2) | 6.0                                 | 15                                    | 1.70                                             | 0.22                                       |
| 100                                                         | C         | 293D107(1)6R3C(2) | 6.0                                 | 6                                     | 0.80                                             | 0.37                                       |
| 100                                                         | D         | 293D107(1)6R3D(2) | 6.0                                 | 6                                     | 0.70                                             | 0.46                                       |
| 100                                                         | E         | 293D107(1)6R3E(2) | 6.0                                 | 8                                     | 0.70                                             | 0.49                                       |
| 120                                                         | D         | 293D127(1)6R3D(2) | 6.3                                 | 8                                     | 0.70                                             | 0.46                                       |
| 150                                                         | C         | 293D157(1)6R3C(2) | 9.0                                 | 8                                     | 0.70                                             | 0.40                                       |
| 150                                                         | D         | 293D157(1)6R3D(2) | 9.0                                 | 8                                     | 0.60                                             | 0.50                                       |
| 150                                                         | E         | 293D157(1)6R3E(2) | 9.0                                 | 8                                     | 0.50                                             | 0.57                                       |
| 220                                                         | C         | 293D227(1)6R3C(2) | 13.9                                | 14                                    | 0.70                                             | 0.39                                       |
| 220                                                         | D         | 293D227(1)6R3D(2) | 13.2                                | 8                                     | 0.60                                             | 0.50                                       |
| 220                                                         | E         | 293D227(1)6R3E(2) | 13.2                                | 8                                     | 0.50                                             | 0.57                                       |
| 330                                                         | D         | 293D337(1)6R3D(2) | 19.8                                | 8                                     | 0.60                                             | 0.50                                       |
| 330                                                         | E         | 293D337(1)6R3E(2) | 19.8                                | 8                                     | 0.50                                             | 0.57                                       |
| 470                                                         | D         | 293D477(1)6R3D(2) | 28.2                                | 14                                    | 0.50                                             | 0.55                                       |
| 470                                                         | E         | 293D477(1)6R3E(2) | 28.2                                | 10                                    | 0.50                                             | 0.57                                       |
| 680                                                         | E         | 293D687(1)6R3E(2) | 42.8                                | 20                                    | 0.50                                             | 0.57                                       |
| 1000                                                        | E         | 293D108X06R3E(2)  | 63.0                                | 30                                    | 0.40                                             | 0.64                                       |

**Note**

- Part number definitions:
  - Tolerance: X0, X9. For  $\pm 5\%$  tolerance (code X5) contact factory
  - Terminations and packaging: 2TE3, 2WE3, 8T, 8W, 2DE3, 2RE3, 8D, 8R



| STANDARD RATINGS                                           |           |                   |                                     |                                       |                                                  |                                            |
|------------------------------------------------------------|-----------|-------------------|-------------------------------------|---------------------------------------|--------------------------------------------------|--------------------------------------------|
| CAPACITANCE<br>( $\mu$ F)                                  | CASE CODE | PART NUMBER       | MAX. DCL<br>AT +25 °C<br>( $\mu$ A) | MAX. DF<br>AT +25 °C<br>120 Hz<br>(%) | MAX. ESR<br>AT +25 °C<br>100 kHz<br>( $\Omega$ ) | MAX. RIPPLE<br>100 kHz<br>$I_{RMS}$<br>(A) |
| 10 V <sub>DC</sub> AT +85 °C; 7 V <sub>DC</sub> AT +125 °C |           |                   |                                     |                                       |                                                  |                                            |
| 0.47                                                       | A         | 293D474(1)010A(2) | 0.5                                 | 4                                     | 14.00                                            | 0.07                                       |
| 1.0                                                        | A         | 293D105(1)010A(2) | 0.5                                 | 4                                     | 9.60                                             | 0.09                                       |
| 1.5                                                        | A         | 293D155(1)010A(2) | 0.5                                 | 6                                     | 8.00                                             | 0.10                                       |
| 2.2                                                        | A         | 293D225(1)010A(2) | 0.5                                 | 6                                     | 6.30                                             | 0.11                                       |
| 2.2                                                        | B         | 293D225(1)010B(2) | 0.5                                 | 6                                     | 4.60                                             | 0.14                                       |
| 3.3                                                        | A         | 293D335(1)010A(2) | 0.5                                 | 6                                     | 5.50                                             | 0.12                                       |
| 3.3                                                        | B         | 293D335(1)010B(2) | 0.5                                 | 6                                     | 5.50                                             | 0.12                                       |
| 4.7                                                        | A         | 293D475(1)010A(2) | 0.5                                 | 6                                     | 5.00                                             | 0.12                                       |
| 4.7                                                        | B         | 293D475(1)010B(2) | 0.5                                 | 6                                     | 3.40                                             | 0.16                                       |
| 4.7                                                        | C         | 293D475(1)010C(2) | 0.5                                 | 6                                     | 2.30                                             | 0.22                                       |
| 6.8                                                        | A         | 293D685(1)010A(2) | 0.7                                 | 6                                     | 4.20                                             | 0.13                                       |
| 6.8                                                        | B         | 293D685(1)010B(2) | 0.7                                 | 6                                     | 2.90                                             | 0.17                                       |
| 6.8                                                        | C         | 293D685(1)010C(2) | 0.7                                 | 6                                     | 1.90                                             | 0.24                                       |
| 10                                                         | A         | 293D106(1)010A(2) | 1.0                                 | 6                                     | 3.40                                             | 0.15                                       |
| 10                                                         | B         | 293D106(1)010B(2) | 1.0                                 | 6                                     | 2.50                                             | 0.18                                       |
| 10                                                         | C         | 293D106(1)010C(2) | 1.0                                 | 6                                     | 1.80                                             | 0.25                                       |
| 15                                                         | A         | 293D156(1)010A(2) | 1.5                                 | 6                                     | 2.90                                             | 0.16                                       |
| 15                                                         | B         | 293D156(1)010B(2) | 1.5                                 | 6                                     | 2.00                                             | 0.21                                       |
| 15                                                         | C         | 293D156(1)010C(2) | 1.5                                 | 6                                     | 1.80                                             | 0.25                                       |
| 22                                                         | A         | 293D226(1)010A(2) | 2.2                                 | 8                                     | 2.50                                             | 0.17                                       |
| 22                                                         | B         | 293D226(1)010B(2) | 2.2                                 | 6                                     | 1.90                                             | 0.21                                       |
| 22                                                         | C         | 293D226(1)010C(2) | 2.2                                 | 6                                     | 1.50                                             | 0.27                                       |
| 22                                                         | D         | 293D226(1)010D(2) | 2.2                                 | 6                                     | 1.50                                             | 0.32                                       |
| 33                                                         | B         | 293D336(1)010B(2) | 3.3                                 | 6                                     | 1.90                                             | 0.21                                       |
| 33                                                         | C         | 293D336(1)010C(2) | 3.3                                 | 6                                     | 1.40                                             | 0.28                                       |
| 33                                                         | D         | 293D336(1)010D(2) | 3.3                                 | 6                                     | 0.80                                             | 0.43                                       |
| 47                                                         | B         | 293D476(1)010B(2) | 4.7                                 | 6                                     | 1.80                                             | 0.22                                       |
| 47                                                         | C         | 293D476(1)010C(2) | 4.7                                 | 6                                     | 1.10                                             | 0.32                                       |
| 47                                                         | D         | 293D476(1)010D(2) | 4.7                                 | 6                                     | 0.70                                             | 0.46                                       |
| 68                                                         | B         | 293D686(1)010B(2) | 6.8                                 | 14                                    | 1.80                                             | 0.22                                       |
| 68                                                         | C         | 293D686(1)010C(2) | 6.8                                 | 6                                     | 1.00                                             | 0.33                                       |
| 68                                                         | D         | 293D686(1)010D(2) | 6.8                                 | 6                                     | 0.70                                             | 0.46                                       |
| 68                                                         | E         | 293D686(1)010E(2) | 6.8                                 | 6                                     | 0.80                                             | 0.45                                       |
| 100                                                        | B         | 293D107(1)010B(2) | 10.0                                | 25                                    | 2.50                                             | 0.18                                       |
| 100                                                        | C         | 293D107(1)010C(2) | 10.0                                | 8                                     | 0.90                                             | 0.35                                       |
| 100                                                        | D         | 293D107(1)010D(2) | 10.0                                | 8                                     | 0.60                                             | 0.50                                       |
| 100                                                        | E         | 293D107(1)010E(2) | 10.0                                | 8                                     | 0.70                                             | 0.49                                       |
| 120                                                        | E         | 293D127(1)010E(2) | 12.0                                | 6                                     | 1.00                                             | 0.41                                       |
| 150                                                        | C         | 293D157(1)010C(2) | 15.0                                | 20                                    | 0.90                                             | 0.35                                       |
| 150                                                        | D         | 293D157(1)010D(2) | 15.0                                | 8                                     | 0.60                                             | 0.50                                       |
| 150                                                        | E         | 293D157(1)010E(2) | 15.0                                | 8                                     | 0.50                                             | 0.57                                       |
| 220                                                        | D         | 293D227(1)010D(2) | 22.0                                | 8                                     | 0.60                                             | 0.50                                       |
| 220                                                        | E         | 293D227(1)010E(2) | 22.0                                | 8                                     | 0.50                                             | 0.57                                       |
| 330                                                        | D         | 293D337(1)010D(2) | 33.0                                | 15                                    | 0.50                                             | 0.57                                       |
| 330                                                        | E         | 293D337(1)010E(2) | 33.0                                | 10                                    | 0.50                                             | 0.57                                       |
| 470                                                        | E         | 293D477(1)010E(2) | 47.0                                | 15                                    | 0.50                                             | 0.57                                       |

**Note**

- Part number definitions:
  - (1) Tolerance: X0, X9. For  $\pm 5\%$  tolerance (code X5) contact factory
  - (2) Terminations and packaging: 2TE3, 2WE3, 8T, 8W, 2DE3, 2RE3, 8D, 8R



| STANDARD RATINGS                                            |           |                   |                                     |                                       |                                                  |                                            |
|-------------------------------------------------------------|-----------|-------------------|-------------------------------------|---------------------------------------|--------------------------------------------------|--------------------------------------------|
| CAPACITANCE<br>( $\mu$ F)                                   | CASE CODE | PART NUMBER       | MAX. DCL<br>AT +25 °C<br>( $\mu$ A) | MAX. DF<br>AT +25 °C<br>120 Hz<br>(%) | MAX. ESR<br>AT +25 °C<br>100 kHz<br>( $\Omega$ ) | MAX. RIPPLE<br>100 kHz<br>$I_{RMS}$<br>(A) |
| 16 V <sub>DC</sub> AT +85 °C; 10 V <sub>DC</sub> AT +125 °C |           |                   |                                     |                                       |                                                  |                                            |
| 0.68                                                        | A         | 293D684(1)016A(2) | 0.5                                 | 4                                     | 10.40                                            | 0.08                                       |
| 1.0                                                         | A         | 293D105(1)016A(2) | 0.5                                 | 4                                     | 9.30                                             | 0.09                                       |
| 1.5                                                         | A         | 293D155(1)016A(2) | 0.5                                 | 6                                     | 6.70                                             | 0.11                                       |
| 1.5                                                         | B         | 293D155(1)016B(2) | 0.5                                 | 6                                     | 6.40                                             | 0.12                                       |
| 2.2                                                         | A         | 293D225(1)016A(2) | 0.5                                 | 6                                     | 5.90                                             | 0.11                                       |
| 2.2                                                         | B         | 293D225(1)016B(2) | 0.5                                 | 6                                     | 4.60                                             | 0.14                                       |
| 3.3                                                         | A         | 293D335(1)016A(2) | 0.5                                 | 6                                     | 5.00                                             | 0.12                                       |
| 3.3                                                         | B         | 293D335(1)016B(2) | 0.5                                 | 6                                     | 3.50                                             | 0.16                                       |
| 4.7                                                         | A         | 293D475(1)016A(2) | 0.8                                 | 6                                     | 5.00                                             | 0.12                                       |
| 4.7                                                         | B         | 293D475(1)016B(2) | 0.8                                 | 6                                     | 2.90                                             | 0.17                                       |
| 4.7                                                         | C         | 293D475(1)016C(2) | 0.8                                 | 6                                     | 2.90                                             | 0.19                                       |
| 6.8                                                         | A         | 293D685(1)016A(2) | 1.1                                 | 6                                     | 4.20                                             | 0.13                                       |
| 6.8                                                         | B         | 293D685(1)016B(2) | 1.1                                 | 6                                     | 2.50                                             | 0.18                                       |
| 6.8                                                         | C         | 293D685(1)016C(2) | 1.1                                 | 6                                     | 1.90                                             | 0.24                                       |
| 10                                                          | A         | 293D106(1)016A(2) | 1.6                                 | 6                                     | 3.00                                             | 0.16                                       |
| 10                                                          | B         | 293D106(1)016B(2) | 1.6                                 | 6                                     | 2.00                                             | 0.21                                       |
| 10                                                          | C         | 293D106(1)016C(2) | 1.6                                 | 6                                     | 1.80                                             | 0.25                                       |
| 10                                                          | D         | 293D106(1)016D(2) | 2.5                                 | 6                                     | 1.20                                             | 0.35                                       |
| 15                                                          | B         | 293D156(1)016B(2) | 2.4                                 | 6                                     | 2.00                                             | 0.21                                       |
| 15                                                          | C         | 293D156(1)016C(2) | 2.4                                 | 6                                     | 1.50                                             | 0.27                                       |
| 22                                                          | B         | 293D226(1)016B(2) | 3.5                                 | 6                                     | 1.90                                             | 0.21                                       |
| 22                                                          | C         | 293D226(1)016C(2) | 3.5                                 | 6                                     | 1.40                                             | 0.28                                       |
| 22                                                          | D         | 293D226(1)016D(2) | 3.5                                 | 6                                     | 0.80                                             | 0.43                                       |
| 33                                                          | B         | 293D336(1)016B(2) | 5.3                                 | 6                                     | 1.80                                             | 0.22                                       |
| 33                                                          | C         | 293D336(1)016C(2) | 5.3                                 | 6                                     | 1.10                                             | 0.32                                       |
| 33                                                          | D         | 293D336(1)016D(2) | 5.3                                 | 6                                     | 0.70                                             | 0.46                                       |
| 47                                                          | C         | 293D476(1)016C(2) | 7.5                                 | 6                                     | 1.00                                             | 0.33                                       |
| 47                                                          | D         | 293D476(1)016D(2) | 7.5                                 | 6                                     | 0.70                                             | 0.46                                       |
| 47                                                          | E         | 293D476(1)016E(2) | 7.5                                 | 6                                     | 0.80                                             | 0.45                                       |
| 68                                                          | D         | 293D686(1)016D(2) | 10.9                                | 6                                     | 0.60                                             | 0.50                                       |
| 68                                                          | E         | 293D686(1)016E(2) | 10.9                                | 6                                     | 0.80                                             | 0.45                                       |
| 100                                                         | D         | 293D107(1)016D(2) | 16.0                                | 8                                     | 0.60                                             | 0.50                                       |
| 100                                                         | E         | 293D107(1)016E(2) | 16.0                                | 8                                     | 0.60                                             | 0.52                                       |
| 150                                                         | D         | 293D157(1)016D(2) | 24.0                                | 8                                     | 0.60                                             | 0.50                                       |
| 150                                                         | E         | 293D157(1)016E(2) | 24.0                                | 8                                     | 0.50                                             | 0.57                                       |
| 220                                                         | E         | 293D227(1)016E(2) | 35.2                                | 14                                    | 0.50                                             | 0.57                                       |

**Note**

- Part number definitions:
  - (1) Tolerance: X0, X9. For  $\pm 5$  % tolerance (code X5) contact factory
  - (2) Terminations and packaging: 2TE3, 2WE3, 8T, 8W, 2DE3, 2RE3, 8D, 8R



| STANDARD RATINGS                                            |           |                   |                                     |                                       |                                                  |                                            |
|-------------------------------------------------------------|-----------|-------------------|-------------------------------------|---------------------------------------|--------------------------------------------------|--------------------------------------------|
| CAPACITANCE<br>( $\mu$ F)                                   | CASE CODE | PART NUMBER       | MAX. DCL<br>AT +25 °C<br>( $\mu$ A) | MAX. DF<br>AT +25 °C<br>120 Hz<br>(%) | MAX. ESR<br>AT +25 °C<br>100 kHz<br>( $\Omega$ ) | MAX. RIPPLE<br>100 kHz<br>$I_{RMS}$<br>(A) |
| 20 V <sub>DC</sub> AT +85 °C; 13 V <sub>DC</sub> AT +125 °C |           |                   |                                     |                                       |                                                  |                                            |
| 0.47                                                        | A         | 293D474(1)020A(2) | 0.5                                 | 4                                     | 14.00                                            | 0.07                                       |
| 0.68                                                        | A         | 293D684(1)020A(2) | 0.5                                 | 4                                     | 10.00                                            | 0.09                                       |
| 1.0                                                         | A         | 293D105(1)020A(2) | 0.5                                 | 4                                     | 8.40                                             | 0.09                                       |
| 1.0                                                         | B         | 293D105(1)020B(2) | 0.5                                 | 4                                     | 9.00                                             | 0.10                                       |
| 1.5                                                         | A         | 293D155(1)020A(2) | 0.5                                 | 6                                     | 6.30                                             | 0.11                                       |
| 1.5                                                         | B         | 293D155(1)020B(2) | 0.5                                 | 4.8                                   | 5.60                                             | 0.12                                       |
| 2.2                                                         | A         | 293D225(1)020A(2) | 0.5                                 | 6                                     | 5.90                                             | 0.11                                       |
| 2.2                                                         | B         | 293D225(1)020B(2) | 0.5                                 | 6                                     | 3.50                                             | 0.16                                       |
| 3.3                                                         | A         | 293D335(1)020A(2) | 0.7                                 | 6                                     | 5.90                                             | 0.11                                       |
| 3.3                                                         | B         | 293D335(1)020B(2) | 0.7                                 | 6                                     | 3.00                                             | 0.17                                       |
| 3.3                                                         | C         | 293D335(1)020C(2) | 0.8                                 | 6                                     | 2.30                                             | 0.22                                       |
| 4.7                                                         | A         | 293D475(1)020A(2) | 0.9                                 | 6                                     | 5.00                                             | 0.12                                       |
| 4.7                                                         | B         | 293D475(1)020B(2) | 0.9                                 | 6                                     | 2.90                                             | 0.17                                       |
| 4.7                                                         | C         | 293D475(1)020C(2) | 0.9                                 | 6                                     | 2.30                                             | 0.22                                       |
| 6.8                                                         | A         | 293D685(1)020A(2) | 1.4                                 | 6                                     | 4.50                                             | 0.13                                       |
| 6.8                                                         | B         | 293D685(1)020B(2) | 1.4                                 | 6                                     | 2.50                                             | 0.18                                       |
| 6.8                                                         | C         | 293D685(1)020C(2) | 1.4                                 | 6                                     | 1.90                                             | 0.24                                       |
| 10                                                          | B         | 293D106(1)020B(2) | 2.0                                 | 6                                     | 2.10                                             | 0.20                                       |
| 10                                                          | C         | 293D106(1)020C(2) | 2.0                                 | 6                                     | 1.70                                             | 0.25                                       |
| 10                                                          | D         | 293D106(1)020D(2) | 2.0                                 | 6                                     | 1.00                                             | 0.38                                       |
| 15                                                          | B         | 293D156(1)020B(2) | 3.0                                 | 6                                     | 2.30                                             | 0.19                                       |
| 15                                                          | C         | 293D156(1)020C(2) | 3.0                                 | 6                                     | 1.50                                             | 0.27                                       |
| 15                                                          | D         | 293D156(1)020D(2) | 3.0                                 | 6                                     | 0.90                                             | 0.41                                       |
| 22                                                          | B         | 293D226(1)020B(2) | 4.4                                 | 6                                     | 2.10                                             | 0.20                                       |
| 22                                                          | C         | 293D226(1)020C(2) | 4.4                                 | 6                                     | 1.10                                             | 0.32                                       |
| 22                                                          | D         | 293D226(1)020D(2) | 4.4                                 | 6                                     | 0.70                                             | 0.46                                       |
| 33                                                          | C         | 293D336(1)020C(2) | 6.6                                 | 6                                     | 1.00                                             | 0.33                                       |
| 33                                                          | D         | 293D336(1)020D(2) | 6.6                                 | 6                                     | 0.70                                             | 0.46                                       |
| 47                                                          | D         | 293D476(1)020D(2) | 9.4                                 | 6                                     | 0.70                                             | 0.46                                       |
| 47                                                          | E         | 293D476(1)020E(2) | 9.4                                 | 6                                     | 0.60                                             | 0.52                                       |
| 68                                                          | D         | 293D686(1)020D(2) | 13.6                                | 6                                     | 0.70                                             | 0.46                                       |
| 68                                                          | E         | 293D686(1)020E(2) | 13.6                                | 6                                     | 0.60                                             | 0.52                                       |
| 100                                                         | D         | 293D107(1)020D(2) | 20.0                                | 8                                     | 0.60                                             | 0.50                                       |
| 100                                                         | E         | 293D107(1)020E(2) | 20.0                                | 8                                     | 0.50                                             | 0.57                                       |

**Note**

- Part number definitions:
  - Tolerance: X0, X9. For  $\pm 5$  % tolerance (code X5) contact factory
  - Terminations and packaging: 2TE3, 2WE3, 8T, 8W, 2DE3, 2RE3, 8D, 8R



| STANDARD RATINGS                                            |           |                   |                                     |                                       |                                                  |                                            |
|-------------------------------------------------------------|-----------|-------------------|-------------------------------------|---------------------------------------|--------------------------------------------------|--------------------------------------------|
| CAPACITANCE<br>( $\mu$ F)                                   | CASE CODE | PART NUMBER       | MAX. DCL<br>AT +25 °C<br>( $\mu$ A) | MAX. DF<br>AT +25 °C<br>120 Hz<br>(%) | MAX. ESR<br>AT +25 °C<br>100 kHz<br>( $\Omega$ ) | MAX. RIPPLE<br>100 kHz<br>$I_{RMS}$<br>(A) |
| 25 V <sub>DC</sub> AT +85 °C; 17 V <sub>DC</sub> AT +125 °C |           |                   |                                     |                                       |                                                  |                                            |
| 0.10                                                        | A         | 293D104(1)025A(2) | 0.5                                 | 4                                     | 20.00                                            | 0.06                                       |
| 0.33                                                        | A         | 293D334(1)025A(2) | 0.5                                 | 4                                     | 13.00                                            | 0.08                                       |
| 0.47                                                        | A         | 293D474(1)025A(2) | 0.5                                 | 4                                     | 12.00                                            | 0.08                                       |
| 0.68                                                        | A         | 293D684(1)025A(2) | 0.5                                 | 4                                     | 8.40                                             | 0.09                                       |
| 0.68                                                        | B         | 293D684(1)025B(2) | 0.5                                 | 4                                     | 6.50                                             | 0.11                                       |
| 1.0                                                         | A         | 293D105(1)025A(2) | 0.5                                 | 4                                     | 7.60                                             | 0.10                                       |
| 1.0                                                         | B         | 293D105(1)025B(2) | 0.5                                 | 4                                     | 5.00                                             | 0.13                                       |
| 1.5                                                         | A         | 293D155(1)025A(2) | 0.5                                 | 6                                     | 6.70                                             | 0.11                                       |
| 1.5                                                         | B         | 293D155(1)025B(2) | 0.5                                 | 6                                     | 4.60                                             | 0.14                                       |
| 2.2                                                         | A         | 293D225(1)025A(2) | 0.6                                 | 6                                     | 6.30                                             | 0.11                                       |
| 2.2                                                         | B         | 293D225(1)025B(2) | 0.6                                 | 6                                     | 3.80                                             | 0.15                                       |
| 2.2                                                         | C         | 293D225(1)025C(2) | 0.6                                 | 6                                     | 3.20                                             | 0.19                                       |
| 3.3                                                         | A         | 293D335(1)025A(2) | 0.8                                 | 6                                     | 6.00                                             | 0.14                                       |
| 3.3                                                         | B         | 293D335(1)025B(2) | 0.8                                 | 6                                     | 3.10                                             | 0.17                                       |
| 3.3                                                         | C         | 293D335(1)025C(2) | 0.8                                 | 6                                     | 2.30                                             | 0.22                                       |
| 4.7                                                         | A         | 293D475(1)025A(2) | 1.2                                 | 6                                     | 5.50                                             | 0.12                                       |
| 4.7                                                         | B         | 293D475(1)025B(2) | 1.2                                 | 6                                     | 2.80                                             | 0.17                                       |
| 4.7                                                         | C         | 293D475(1)025C(2) | 1.2                                 | 6                                     | 2.00                                             | 0.24                                       |
| 4.7                                                         | D         | 293D475(1)025D(2) | 1.2                                 | 6                                     | 1.30                                             | 0.34                                       |
| 6.8                                                         | B         | 293D685(1)025B(2) | 1.7                                 | 6                                     | 2.40                                             | 0.19                                       |
| 6.8                                                         | C         | 293D685(1)025C(2) | 1.7                                 | 6                                     | 1.70                                             | 0.25                                       |
| 6.8                                                         | D         | 293D685(1)025D(2) | 1.7                                 | 6                                     | 1.10                                             | 0.37                                       |
| 10                                                          | B         | 293D106(1)025B(2) | 2.5                                 | 6                                     | 2.30                                             | 0.19                                       |
| 10                                                          | C         | 293D106(1)025C(2) | 2.5                                 | 6                                     | 1.50                                             | 0.27                                       |
| 10                                                          | D         | 293D106(1)025D(2) | 2.5                                 | 6                                     | 1.00                                             | 0.39                                       |
| 15                                                          | B         | 293D156(1)025B(2) | 3.8                                 | 6                                     | 2.20                                             | 0.20                                       |
| 15                                                          | C         | 293D156(1)025C(2) | 3.8                                 | 6                                     | 1.20                                             | 0.30                                       |
| 15                                                          | D         | 293D156(1)025D(2) | 3.8                                 | 6                                     | 0.80                                             | 0.43                                       |
| 22                                                          | C         | 293D226(1)025C(2) | 5.5                                 | 6                                     | 1.20                                             | 0.30                                       |
| 22                                                          | D         | 293D226(1)025D(2) | 5.5                                 | 6                                     | 0.70                                             | 0.46                                       |
| 22                                                          | E         | 293D226(1)025E(2) | 5.5                                 | 6                                     | 0.80                                             | 0.45                                       |
| 33                                                          | D         | 293D336(1)025D(2) | 8.3                                 | 6                                     | 0.70                                             | 0.46                                       |
| 33                                                          | E         | 293D336(1)025E(2) | 8.3                                 | 6                                     | 0.60                                             | 0.52                                       |
| 47                                                          | D         | 293D476(1)025D(2) | 11.8                                | 8                                     | 0.70                                             | 0.46                                       |
| 47                                                          | E         | 293D476(1)025E(2) | 11.8                                | 6                                     | 0.60                                             | 0.52                                       |
| 68                                                          | E         | 293D686(1)025E(2) | 17.0                                | 8                                     | 0.60                                             | 0.52                                       |
| 100                                                         | E         | 293D107(1)025E(2) | 35.0                                | 10                                    | 0.50                                             | 0.57                                       |

**Note**

- Part number definitions:
  - (1) Tolerance: X0, X9. For  $\pm 5\%$  tolerance (code X5) contact factory
  - (2) Terminations and packaging: 2TE3, 2WE3, 8T, 8W, 2DE3, 2RE3, 8D, 8R



| STANDARD RATINGS                                            |           |                   |                                     |                                       |                                                  |                                            |
|-------------------------------------------------------------|-----------|-------------------|-------------------------------------|---------------------------------------|--------------------------------------------------|--------------------------------------------|
| CAPACITANCE<br>( $\mu$ F)                                   | CASE CODE | PART NUMBER       | MAX. DCL<br>AT +25 °C<br>( $\mu$ A) | MAX. DF<br>AT +25 °C<br>120 Hz<br>(%) | MAX. ESR<br>AT +25 °C<br>100 kHz<br>( $\Omega$ ) | MAX. RIPPLE<br>100 kHz<br>$I_{RMS}$<br>(A) |
| 35 V <sub>DC</sub> AT +85 °C; 23 V <sub>DC</sub> AT +125 °C |           |                   |                                     |                                       |                                                  |                                            |
| 0.10                                                        | A         | 293D104(1)035A(2) | 0.5                                 | 4                                     | 20.00                                            | 0.06                                       |
| 0.15                                                        | A         | 293D154(1)035A(2) | 0.5                                 | 4                                     | 18.00                                            | 0.07                                       |
| 0.22                                                        | A         | 293D224(1)035A(2) | 0.5                                 | 4                                     | 15.00                                            | 0.07                                       |
| 0.33                                                        | A         | 293D334(1)035A(2) | 0.5                                 | 4                                     | 13.00                                            | 0.08                                       |
| 0.47                                                        | A         | 293D474(1)035A(2) | 0.5                                 | 4                                     | 10.00                                            | 0.09                                       |
| 0.47                                                        | B         | 293D474(1)035B(2) | 0.5                                 | 4                                     | 8.00                                             | 0.10                                       |
| 0.68                                                        | A         | 293D684(1)035A(2) | 0.5                                 | 4                                     | 7.60                                             | 0.10                                       |
| 0.68                                                        | B         | 293D684(1)035B(2) | 0.5                                 | 4                                     | 6.50                                             | 0.11                                       |
| 1.0                                                         | A         | 293D105(1)035A(2) | 0.5                                 | 4                                     | 7.50                                             | 0.10                                       |
| 1.0                                                         | B         | 293D105(1)035B(2) | 0.5                                 | 4                                     | 5.00                                             | 0.13                                       |
| 1.5                                                         | B         | 293D155(1)035B(2) | 0.5                                 | 6                                     | 4.20                                             | 0.14                                       |
| 1.5                                                         | C         | 293D155(1)035C(2) | 0.5                                 | 6                                     | 3.80                                             | 0.17                                       |
| 2.2                                                         | B         | 293D225(1)035B(2) | 0.8                                 | 6                                     | 3.80                                             | 0.15                                       |
| 2.2                                                         | C         | 293D225(1)035C(2) | 0.8                                 | 6                                     | 2.90                                             | 0.20                                       |
| 3.3                                                         | B         | 293D335(1)035B(2) | 1.2                                 | 6                                     | 3.50                                             | 0.16                                       |
| 3.3                                                         | C         | 293D335(1)035C(2) | 1.2                                 | 6                                     | 2.10                                             | 0.23                                       |
| 3.3                                                         | D         | 293D335(1)035D(2) | 1.2                                 | 6                                     | 1.70                                             | 0.30                                       |
| 4.7                                                         | B         | 293D475(1)035B(2) | 1.7                                 | 6                                     | 3.10                                             | 0.17                                       |
| 4.7                                                         | C         | 293D475(1)035C(2) | 1.6                                 | 6                                     | 1.90                                             | 0.24                                       |
| 4.7                                                         | D         | 293D475(1)035D(2) | 1.6                                 | 6                                     | 1.30                                             | 0.34                                       |
| 6.8                                                         | C         | 293D685(1)035C(2) | 2.4                                 | 6                                     | 1.80                                             | 0.25                                       |
| 6.8                                                         | D         | 293D685(1)035D(2) | 2.4                                 | 6                                     | 1.10                                             | 0.37                                       |
| 10                                                          | C         | 293D106(1)035C(2) | 3.5                                 | 6                                     | 1.60                                             | 0.26                                       |
| 10                                                          | D         | 293D106(1)035D(2) | 3.5                                 | 6                                     | 0.80                                             | 0.43                                       |
| 15                                                          | C         | 293D156(1)035C(2) | 5.3                                 | 6                                     | 0.90                                             | 0.35                                       |
| 15                                                          | D         | 293D156(1)035D(2) | 5.3                                 | 6                                     | 0.70                                             | 0.46                                       |
| 15                                                          | E         | 293D156(1)035E(2) | 5.3                                 | 6                                     | 0.70                                             | 0.49                                       |
| 22                                                          | D         | 293D226(1)035D(2) | 7.7                                 | 6                                     | 0.60                                             | 0.50                                       |
| 22                                                          | E         | 293D226(1)035E(2) | 7.7                                 | 6                                     | 0.60                                             | 0.57                                       |
| 33                                                          | D         | 293D336(1)035D(2) | 11.6                                | 6                                     | 0.70                                             | 0.46                                       |
| 33                                                          | E         | 293D336(1)035E(2) | 11.6                                | 6                                     | 0.70                                             | 0.49                                       |
| 47                                                          | E         | 293D476(1)035E(2) | 20.0                                | 10                                    | 0.60                                             | 0.52                                       |
| 50 V <sub>DC</sub> AT +85 °C; 33 V <sub>DC</sub> AT +125 °C |           |                   |                                     |                                       |                                                  |                                            |
| 0.10                                                        | A         | 293D104(1)050A(2) | 0.5                                 | 4                                     | 19.00                                            | 0.06                                       |
| 0.15                                                        | A         | 293D154(1)050A(2) | 0.5                                 | 4                                     | 17.00                                            | 0.07                                       |
| 0.15                                                        | B         | 293D154(1)050B(2) | 0.5                                 | 4                                     | 14.00                                            | 0.08                                       |
| 0.22                                                        | A         | 293D224(1)050A(2) | 0.5                                 | 4                                     | 15.00                                            | 0.07                                       |
| 0.22                                                        | B         | 293D224(1)050B(2) | 0.5                                 | 4                                     | 12.00                                            | 0.08                                       |
| 0.33                                                        | A         | 293D334(1)050A(2) | 0.5                                 | 4                                     | 14.00                                            | 0.07                                       |
| 0.33                                                        | B         | 293D334(1)050B(2) | 0.5                                 | 4                                     | 10.00                                            | 0.09                                       |
| 0.47                                                        | A         | 293D474(1)050A(2) | 0.5                                 | 4                                     | 12.00                                            | 0.08                                       |
| 0.47                                                        | B         | 293D474(1)050B(2) | 0.5                                 | 4                                     | 8.40                                             | 0.10                                       |
| 0.47                                                        | C         | 293D474(1)050C(2) | 0.5                                 | 4                                     | 6.70                                             | 0.13                                       |

**Note**

- Part number definitions:
  - Tolerance: X0, X9. For  $\pm 5\%$  tolerance (code X5) contact factory
  - Terminations and packaging: 2TE3, 2WE3, 8T, 8W, 2DE3, 2RE3, 8D, 8R



| STANDARD RATINGS                                            |           |                   |                                     |                                       |                                                  |                                            |
|-------------------------------------------------------------|-----------|-------------------|-------------------------------------|---------------------------------------|--------------------------------------------------|--------------------------------------------|
| CAPACITANCE<br>( $\mu$ F)                                   | CASE CODE | PART NUMBER       | MAX. DCL<br>AT +25 °C<br>( $\mu$ A) | MAX. DF<br>AT +25 °C<br>120 Hz<br>(%) | MAX. ESR<br>AT +25 °C<br>100 kHz<br>( $\Omega$ ) | MAX. RIPPLE<br>100 kHz<br>$I_{RMS}$<br>(A) |
| 50 V <sub>DC</sub> AT +85 °C; 33 V <sub>DC</sub> AT +125 °C |           |                   |                                     |                                       |                                                  |                                            |
| 0.68                                                        | B         | 293D684(1)050B(2) | 0.5                                 | 4                                     | 7.60                                             | 0.11                                       |
| 0.68                                                        | C         | 293D684(1)050C(2) | 0.5                                 | 4                                     | 5.90                                             | 0.14                                       |
| 1.0                                                         | B         | 293D105(1)050B(2) | 0.5                                 | 4                                     | 6.70                                             | 0.11                                       |
| 1.0                                                         | C         | 293D105(1)050C(2) | 0.5                                 | 4                                     | 4.60                                             | 0.16                                       |
| 1.5                                                         | B         | 293D155(1)050B(2) | 0.8                                 | 6                                     | 6.00                                             | 0.12                                       |
| 1.5                                                         | C         | 293D155(1)050C(2) | 0.8                                 | 6                                     | 3.40                                             | 0.18                                       |
| 1.5                                                         | D         | 293D155(1)050D(2) | 0.8                                 | 6                                     | 2.90                                             | 0.23                                       |
| 2.2                                                         | B         | 293D225(1)050B(2) | 1.1                                 | 6                                     | 3.50                                             | 0.16                                       |
| 2.2                                                         | C         | 293D225(1)050C(2) | 1.1                                 | 6                                     | 2.90                                             | 0.20                                       |
| 2.2                                                         | D         | 293D225(1)050D(2) | 1.1                                 | 6                                     | 2.10                                             | 0.27                                       |
| 3.3                                                         | C         | 293D335(1)050C(2) | 1.7                                 | 6                                     | 2.50                                             | 0.21                                       |
| 3.3                                                         | D         | 293D335(1)050D(2) | 1.7                                 | 6                                     | 1.70                                             | 0.30                                       |
| 4.7                                                         | C         | 293D475(1)050C(2) | 2.4                                 | 6                                     | 1.50                                             | 0.27                                       |
| 4.7                                                         | D         | 293D475(1)050D(2) | 2.4                                 | 6                                     | 1.20                                             | 0.37                                       |
| 4.7                                                         | E         | 293D475(1)050E(2) | 2.4                                 | 6                                     | 1.10                                             | 0.34                                       |
| 6.8                                                         | D         | 293D685(1)050D(2) | 3.4                                 | 6                                     | 0.90                                             | 0.41                                       |
| 6.8                                                         | E         | 293D685(1)050E(2) | 3.4                                 | 6                                     | 0.90                                             | 0.43                                       |
| 10                                                          | D         | 293D106(1)050D(2) | 5.0                                 | 6                                     | 0.80                                             | 0.43                                       |
| 10                                                          | E         | 293D106(1)050E(2) | 5.0                                 | 6                                     | 0.80                                             | 0.45                                       |
| 15                                                          | E         | 293D156(1)050E(2) | 7.5                                 | 6                                     | 0.80                                             | 0.45                                       |
| 63 V <sub>DC</sub> AT +85 °C; 40 V <sub>DC</sub> AT +125 °C |           |                   |                                     |                                       |                                                  |                                            |
| 3.3                                                         | D         | 293D335(1)063D(2) | 2.1                                 | 6                                     | 1.50                                             | 0.32                                       |
| 4.7                                                         | D         | 293D475(1)063D(2) | 3.0                                 | 6                                     | 1.10                                             | 0.37                                       |
| 10                                                          | E         | 293D106(1)063E(2) | 6.3                                 | 6                                     | 1.00                                             | 0.41                                       |
| 75 V <sub>DC</sub> AT +85 °C; 50 V <sub>DC</sub> AT +125 °C |           |                   |                                     |                                       |                                                  |                                            |
| 0.10                                                        | A         | 293D104(1)075A(2) | 0.5                                 | 4                                     | 30.00                                            | 0.05                                       |
| 0.15                                                        | B         | 293D154(1)075B(2) | 0.5                                 | 4                                     | 25.00                                            | 0.06                                       |
| 0.22                                                        | B         | 293D224(1)075B(2) | 0.5                                 | 4                                     | 20.00                                            | 0.07                                       |
| 0.33                                                        | B         | 293D334(1)075B(2) | 0.5                                 | 4                                     | 15.00                                            | 0.08                                       |
| 0.47                                                        | B         | 293D474(1)075B(2) | 0.5                                 | 4                                     | 12.00                                            | 0.08                                       |
| 0.68                                                        | B         | 293D684(1)075B(2) | 0.6                                 | 4                                     | 10.00                                            | 0.09                                       |
| 0.68                                                        | C         | 293D684(1)075C(2) | 0.6                                 | 4                                     | 10.00                                            | 0.11                                       |
| 1.0                                                         | D         | 293D105(1)075D(2) | 0.8                                 | 6                                     | 6.00                                             | 0.16                                       |
| 1.5                                                         | B         | 293D155(1)075B(2) | 1.1                                 | 6                                     | 4.00                                             | 0.15                                       |
| 1.5                                                         | C         | 293D155(1)075C(2) | 1.1                                 | 6                                     | 4.00                                             | 0.17                                       |
| 1.5                                                         | D         | 293D155(1)075D(2) | 1.1                                 | 6                                     | 4.00                                             | 0.19                                       |
| 2.2                                                         | D         | 293D225(1)075D(2) | 1.7                                 | 6                                     | 3.00                                             | 0.22                                       |
| 3.3                                                         | D         | 293D335(1)075D(2) | 2.5                                 | 6                                     | 2.50                                             | 0.24                                       |
| 4.7                                                         | E         | 293D475(1)075E(2) | 3.5                                 | 10                                    | 2.50                                             | 0.26                                       |

**Note**

- Part number definitions:
  - (1) Tolerance: X0, X9. For  $\pm 5\%$  tolerance (code X5) contact factory
  - (2) Terminations and packaging: 2TE3, 2WE3, 8T, 8W, 2DE3, 2RE3, 8D, 8R


**TYPICAL CURVES AT +25 °C, IMPEDANCE AND ESR VS. FREQUENCY**

**POWER DISSIPATION**

| CASE CODE | MAXIMUM PERMISSIBLE POWER DISSIPATION AT +25 °C (W) IN FREE AIR |
|-----------|-----------------------------------------------------------------|
| A         | 0.075                                                           |
| B         | 0.085                                                           |
| C         | 0.110                                                           |
| D         | 0.150                                                           |
| E         | 0.165                                                           |

**STANDARD PACKAGING QUANTITY**

| CASE CODE | UNITS PER REEL |          |
|-----------|----------------|----------|
|           | 7" REEL        | 13" REEL |
| A         | 2000           | 9000     |
| B         | 2000           | 8000     |
| C         | 500            | 3000     |
| D         | 500            | 2500     |
| E         | 400            | 1500     |

**PRODUCT INFORMATION**

|                                      |                                                                        |
|--------------------------------------|------------------------------------------------------------------------|
| Guide for Molded Tantalum Capacitors | <a href="http://www.vishay.com/doc?40074">www.vishay.com/doc?40074</a> |
| Pad Dimensions                       |                                                                        |
| Packaging Dimensions                 |                                                                        |
| Moisture Sensitivity (MSL)           | <a href="http://www.vishay.com/doc?40135">www.vishay.com/doc?40135</a> |
| <b>SELECTOR GUIDES</b>               |                                                                        |
| Solid Tantalum Selector Guide        | <a href="http://www.vishay.com/doc?49053">www.vishay.com/doc?49053</a> |
| Solid Tantalum Chip Capacitors       | <a href="http://www.vishay.com/doc?40091">www.vishay.com/doc?40091</a> |
| <b>FAQ</b>                           |                                                                        |
| Frequently Asked Questions           | <a href="http://www.vishay.com/doc?40110">www.vishay.com/doc?40110</a> |