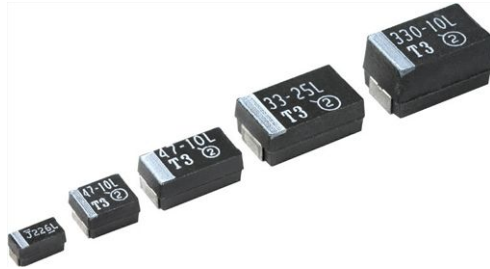


Solid Tantalum Surface Mount Chip Capacitors

TANTAMOUNT[®], Molded Case, Standard Industrial Grade



PERFORMANCE/ELECTRICAL CHARACTERISTICS

www.vishay.com/doc?40088

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_{DC} to 63 V_{DC}

FEATURES

- Molded case available in six case codes
- Terminations: 100 % matte tin, standard, tin/lead available
- Compatible with “High Volume” automatic pick and place equipment
- Meets IEC specification QC300801/US0001 and EIA535BAAC mechanical and performance requirements
- Moisture sensitivity level 1
- Optical character recognition qualified
- Compliant terminations
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912



RoHS*
COMPLIANT

Note

* Lead (Pb)-containing terminations are not RoHS-compliant. Exemptions may apply.

APPLICATIONS

- Industrial
- Telecom infrastructure
- General purpose

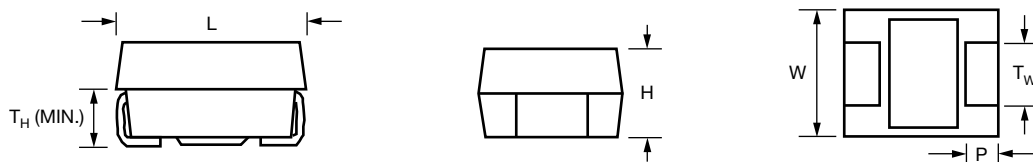
ORDERING INFORMATION

| 293D TYPE | 107 CAPACITANCE | X9 CAPACITANCE TOLERANCE | 010 DC VOLTAGE RATING AT + 85 °C | D CASE CODE | 2WE3 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 % X9 = ± 10 % 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 | 2TE3: Matte tin, 7" (178 mm) reel 2WE3: Matte tin, 13" (330 mm) reel 8T: Tin/lead, 7" (178 mm) reel 8W: Tin/lead, 13" (330 mm) reel |

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 is available per request, contact regional marketing.

DIMENSIONS in inches [millimeters]



| CASE CODE | EIA SIZE | L | W | H | P | T _w | T _H (MIN.) |
|-----------|----------|-------------------------------|-------------------------------|-------------------------------|--------------------------------|-------------------------------|-----------------------|
| A | 3216-18 | 0.126 ± 0.008 [3.2 ± 0.20] | 0.063 ± 0.008 [1.6 ± 0.20] | 0.063 ± 0.008 [1.6 ± 0.20] | 0.031 ± 0.012 [0.80 ± 0.30] | 0.047 ± 0.004 [1.2 ± 0.10] | 0.028 [0.70] |
| B | 3528-21 | 0.138 ± 0.008 [3.5 ± 0.20] | 0.110 ± 0.008 [2.8 ± 0.20] | 0.075 ± 0.008 [1.9 ± 0.20] | 0.031 ± 0.012 [0.80 ± 0.30] | 0.087 ± 0.004 [2.2 ± 0.10] | 0.028 [0.70] |
| C | 6032-28 | 0.236 ± 0.012 [6.0 ± 0.30] | 0.126 ± 0.012 [3.2 ± 0.30] | 0.098 ± 0.012 [2.5 ± 0.30] | 0.051 ± 0.012 [1.3 ± 0.30] | 0.087 ± 0.004 [2.2 ± 0.10] | 0.039 [1.0] |
| D | 7343-31 | 0.287 ± 0.012 [7.3 ± 0.30] | 0.169 ± 0.012 [4.3 ± 0.30] | 0.110 ± 0.012 [2.8 ± 0.30] | 0.051 ± 0.012 [1.3 ± 0.30] | 0.094 ± 0.004 [2.4 ± 0.10] | 0.039 [1.0] |
| E | 7343-43 | 0.287 ± 0.012 [7.3 ± 0.30] | 0.169 ± 0.012 [4.3 ± 0.30] | 0.157 ± 0.012 [4.0 ± 0.30] | 0.051 ± 0.012 [1.3 ± 0.30] | 0.094 ± 0.004 [2.4 ± 0.10] | 0.039 [1.0] |
| V | 7343-20 | 0.287 ± 0.012 [7.3 ± 0.30] | 0.169 ± 0.012 [4.3 ± 0.30] | 0.079 max [2.0 max] | 0.051 ± 0.012 [1.3 ± 0.30] | 0.094 ± 0.004 [2.4 ± 0.10] | 0.039 [1.0] |

| RATINGS AND CASE CODES | | | | | | | | | |
|------------------------|---------|---------|-----------|---------|-------|---------|-------|-------|------|
| μF | 4 V | 6.3 V | 10 V | 16 V | 20 V | 25 V | 35 V | 50 V | 63 V |
| 0.10 | | | | | | A | A | A | |
| 0.15 | | | | | | | A | A/B | |
| 0.22 | | | | | | | A | A/B | |
| 0.33 | | | | | | A | A | A/B | |
| 0.47 | | | A | | A | A | A/B | A/B/C | |
| 0.68 | | | | A | A | A | A/B | B/C | |
| 1.0 | | | A | A | A/B | A/B | A/B | B/C | |
| 1.5 | | A | A | A/B | A/B | A/B | B/C | B/C/D | |
| 2.2 | A | A | A/B | A/B | A/B | A/B/C | B/C | B/C/D | |
| 3.3 | A | A/B | A/B | A/B | A/B/C | A/B/C | B/C/D | C/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 |
| 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 | D/E | E | |
| 22 | A/B/C | A/B/C | A/B/C/D | B/C/D | B/C/D | C/D/E/V | D/E | | |
| 33 | A/B/C | A/B/C | B/C/D | B/C/D | C/D | D/E | | | |
| 47 | A/B/C | A/B/C/D | B/C/D | C/D/E | D/E | D/E | | | |
| 68 | B/C/D | B/C/D | B/C/D/E/V | D/E | D/E | E | | | |
| 100 | A/B/C/D | B/C/D/E | B/C/D/E/V | D/E/V | D/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/V | E | | | | | |
| 330 | D/E | D/E | D/E | | | | | | |
| 470 | D/E | D/E | E | | | | | | |
| 680 | D/E | E | | | | | | | |
| 1000 | E | E | | | | | | | |

| MARKING | | | |
|----------------------|------------------------------|-------------|-----------------------------------|
| <p>A Case</p> | "A" CASE VOLTAGE CODE | | <p>B, C, D, E, V Cases</p> |
| | VOLTS | CODE | |
| | 4.0 | G | |
| | 6.3 | J | |
| | 10 | A | |
| | 16 | C | |
| | 20 | D | |
| 25 | E | | |
| 35 | V | | |
| 50 | T | | |

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 Sprague® trademark is included if space permits. Capacitors rated at 6.3 V are marked 6 V.

A manufacturing date code is marked on all capacitors.

Capacitors may bear a different marking scheme if a part with more extensive screening is substituted. These would include "R" for low ESR series (TR3) or "P" for professional series (TP3).

Call the factory for further explanation.



| STANDARD RATINGS | | | | | | |
|--|-----------|-------------------|--|--|---|--|
| CAPACITANCE (μ F) | CASE CODE | PART NUMBER | MAX. DC LEAKAGE AT + 25 °C (μ A) | MAX. DF AT + 25 °C 120 Hz (%) | MAX. ESR AT + 25 °C 100 kHz (Ω) | MAX. RIPPLE 100 kHz I_{RMS} (A) |
| 4 V_{DC} AT + 85 °C; 2.7 V_{DC} 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
 - Terminations and packaging: 2TE3, 2WE3, 8T, 8W
 - Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



| STANDARD RATINGS | | | | | | |
|--|-----------|-------------------|--|--|---|--|
| CAPACITANCE (μ F) | CASE CODE | PART NUMBER | MAX. DC LEAKAGE AT + 25 °C (μ A) | MAX. DF AT + 25 °C 120 Hz (%) | MAX. ESR AT + 25 °C 100 kHz (Ω) | MAX. RIPPLE 100 kHz I_{RMS} (A) |
| 6.3 V_{DC} AT + 85 °C; 4 V_{DC} AT 125 °C | | | | | | |
| 1.5 | A | 293D155(1)6R3A(2) | 0.5 | 6 | 2.90 | 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 | 293E477(1)6R3E(2) | 28.2 | 10 | 1.50 | 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:
 - (1) Tolerance: X0, X9
 - (2) Terminations and packaging: 2TE3, 2WE3, 8T, 8W
 - (3) Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



| STANDARD RATINGS | | | | | | |
|---|-----------|-------------------|--|--|---|--|
| CAPACITANCE (μ F) | CASE CODE | PART NUMBER | MAX. DC LEAKAGE AT + 25 °C (μ A) | MAX. DF AT + 25 °C 120 Hz (%) | MAX. ESR AT + 25 °C 100 kHz (Ω) | MAX. RIPPLE 100 kHz I_{RMS} (A) |
| 10 V_{DC} AT + 85 °C; 7 V_{DC} 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 |
| 68 | V | 293D686(1)010V(3) | 6.8 | 6 | 0.70 | 0.42 |
| 100 | B | 293D107X0010B(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 |
| 100 | V | 293D107(1)010V(3) | 10.0 | 8 | 0.70 | 0.42 |
| 120 | E | 293D127(1)010E(2) | 12.0 | 6 | 1.00 | 0.41 |
| 150 | C | 293D157X0010C(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 |

Note

- Part number definitions:
 - Tolerance: X0, X9
 - Terminations and packaging: 2TE3, 2WE3, 8T, 8W
 - Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



| STANDARD RATINGS | | | | | | |
|--|-----------|-------------------|--|--|---|--|
| CAPACITANCE (μ F) | CASE CODE | PART NUMBER | MAX. DC LEAKAGE AT + 25 °C (μ A) | MAX. DF AT + 25 °C 120 Hz (%) | MAX. ESR AT + 25 °C 100 kHz (Ω) | MAX. RIPPLE 100 kHz I_{RMS} (A) |
| 10 V_{DC} AT + 85 °C; 7 V_{DC} AT 125 °C | | | | | | |
| 220 | E | 293D227(1)010E(2) | 22.0 | 8 | 0.50 | 0.57 |
| 220 | V | 293D227(1)010V(3) | 30.0 | 12 | 0.50 | 0.50 |
| 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 |
| 16 V_{DC} AT + 85 °C; 10 V_{DC} 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 |
| 100 | V | 293D107X016V(3) | 16.0 | 10 | 0.40 | 0.56 |
| 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:
 - Tolerance: X0, X9
 - Terminations and packaging: 2TE3, 2WE3, 8T, 8W
 - Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



| STANDARD RATINGS | | | | | | |
|--|-----------|-------------------|--|--|---|--|
| CAPACITANCE (μ F) | CASE CODE | PART NUMBER | MAX. DC LEAKAGE AT + 25 °C (μ A) | MAX. DF AT + 25 °C 120 Hz (%) | MAX. ESR AT + 25 °C 100 kHz (Ω) | MAX. RIPPLE 100 kHz I_{RMS} (A) |
| 20 V_{DC} AT + 85 °C; 13 V_{DC} 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 |
| 25 V_{DC} AT + 85 °C; 17 V_{DC} 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 |
| 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 |

Note

- Part number definitions:
 - Tolerance: X0, X9
 - Terminations and packaging: 2TE3, 2WE3, 8T, 8W
 - Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



| STANDARD RATINGS | | | | | | |
|--|-----------|-------------------|---|--|---|---|
| CAPACITANCE (μF) | CASE CODE | PART NUMBER | MAX. DC LEAKAGE AT + 25 °C (μA) | MAX. DF AT + 25 °C 120 Hz (%) | MAX. ESR AT + 25 °C 100 kHz (Ω) | MAX. RIPPLE 100 kHz I_{RMS} (A) |
| 25 V_{DC} AT + 85 °C; 17 V_{DC} AT + 125 °C | | | | | | |
| 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 |
| 22 | V | 293D226(1)025V(3) | 5.5 | 6 | 0.70 | 0.42 |
| 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 |
| 35 V_{DC} AT + 85 °C; 23 V_{DC} 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 |

Note

- Part number definitions:
 - Tolerance: X0, X9
 - Terminations and packaging: 2TE3, 2WE3, 8T, 8W
 - Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



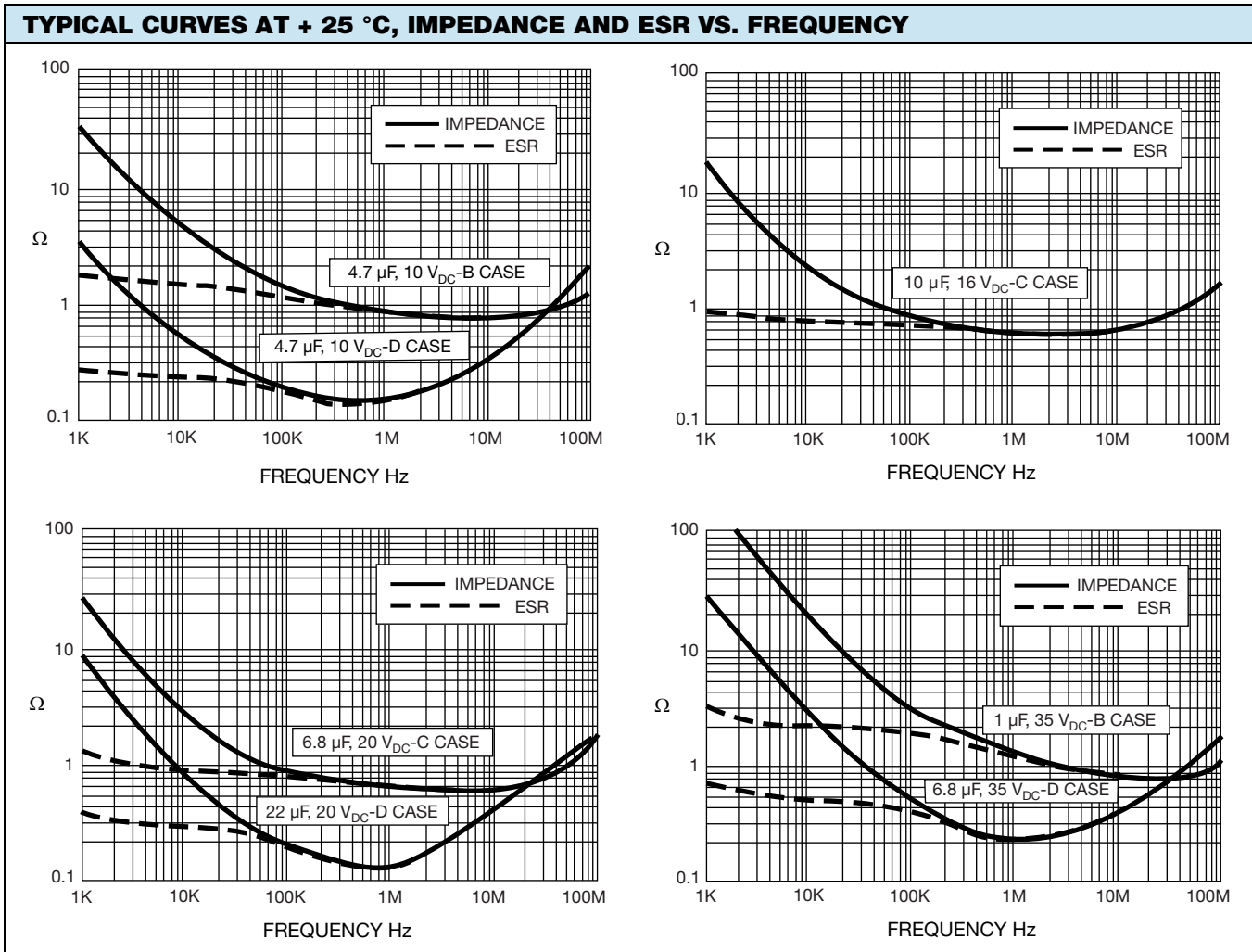
| STANDARD RATINGS | | | | | | |
|--|-----------|-------------------|---|--|---|---|
| CAPACITANCE (μF) | CASE CODE | PART NUMBER | MAX. DC LEAKAGE AT + 25 °C (μA) | MAX. DF AT + 25 °C 120 Hz (%) | MAX. ESR AT + 25 °C 100 kHz (Ω) | MAX. RIPPLE 100 kHz I_{RMS} (A) |
| 35 V_{DC} AT + 85 °C; 23 V_{DC} AT + 125 °C | | | | | | |
| 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 | 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 |
| 50 V_{DC} AT + 85 °C; 33 V_{DC} 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 |
| 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_{DC} AT + 85 °C; 40 V_{DC} AT + 125 °C | | | | | | |
| 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 |

Note

- Part number definitions:
 - Tolerance: X0, X9
 - Terminations and packaging: 2TE3, 2WE3, 8T, 8W
 - Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



| RECOMMENDED VOLTAGE DERATING GUIDELINES (for temperatures below + 85 °C) | |
|---|-------------------|
| STANDARD CONDITIONS. FOR EXAMPLE: OUTPUT FILTERS | |
| Capacitor Voltage Rating | Operating Voltage |
| 4.0 | 2.5 |
| 6.3 | 3.6 |
| 10 | 6.0 |
| 16 | 10 |
| 20 | 12 |
| 25 | 15 |
| 35 | 24 |
| 50 | 28 |
| 63 | 36 |
| SEVERE CONDITIONS. FOR EXAMPLE: INPUT FILTERS | |
| Capacitor Voltage Rating | Operating Voltage |
| 4.0 | 2.5 |
| 6.3 | 3.3 |
| 10 | 5.0 |
| 16 | 8.0 |
| 20 | 10 |
| 25 | 12 |
| 35 | 15 |
| 50 | 24 |
| 63 | 31 |





| 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 |
| V | 0.125 |

| 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 |
| V | 1000 | 5000 |

| PRODUCT INFORMATION | |
|--------------------------------------|--|
| Guide for Molded Tantalum Capacitors | www.vishay.com/doc?40074 |
| Pad Dimensions | |
| Packaging Dimensions | |
| Moisture Sensitivity | www.vishay.com/doc?40135 |
| SELECTOR GUIDES | |
| Solid Tantalum Selector Guide | www.vishay.com/doc?49053 |
| Solid Tantalum Chip Capacitors | www.vishay.com/doc?40091 |
| FAQ | |
| Frequently Asked Questions | www.vishay.com/doc?40110 |



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