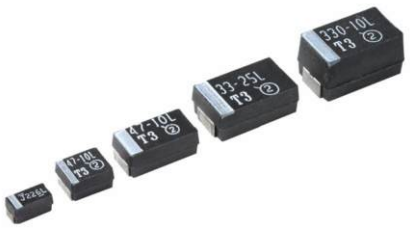
# Solid Tantalum Surface Mount Capacitors
# TANTAMOUNT® Molded Case, Standard Industrial Grade



## FEATURES

- Terminations: 100 % matte tin, standard, tin/lead available
- Compliant terminations
- Molded case available in six case codes
- Compatible with “High Volume” automatic pick and place equipment
- Optical character recognition qualified
- Meets IEC specification QC300801/US0001 and EIA535BAAC mechanical and performance requirements
- Compliant to RoHS directive 2002/95/EC

Pb-free Available

RoHS* COMPLIANT

## PERFORMANCE/ELECTRICAL CHARACTERISTICS

**Operating Temperature:** - 55 °C to + 85 °C
(to + 125 °C with voltage derating)

**Note:** Refer to Doc. 40088

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

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

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

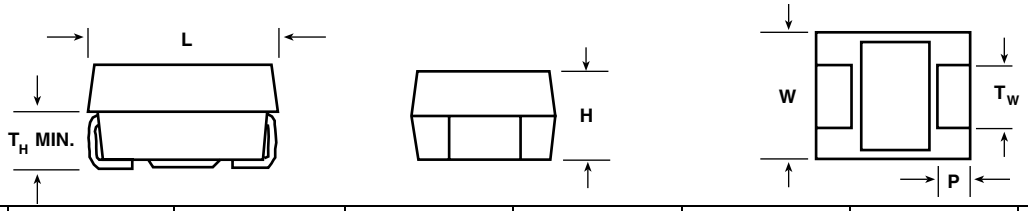
**Voltage Rating:** 4 VDC to 63 VDC

## 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 % | 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<br>2WE3: Matte tin, 13" (330 mm) reel<br>8T: Tin/lead, 7" (178 mm) reel<br>8W: Tin/lead, 13" (330 mm) reel |

**Note**
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.
Effective July 15, 2008, part numbers with solderable termination codes “2T” and “2W” may have either matte tin or tin/lead terminations. Codes 2TE3 and 2WE3 specify only matte tin terminations. Codes 8T and 8W specify only tin/lead terminations.

## 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] | 0.170 ± 0.012 [4.3 ± 0.30] | 0.110 ± 0.012 [2.8 ± 0.30] | 0.051 ± 0.012 [1.3 ± 0.30] | 0.095 ± 0.004 [2.4 ± 0.10] | 0.039 [1.0] |
| E | 7343-43 | 0.287 ± 0.012 [7.3 ± 0.30] | 0.170 ± 0.012 [4.3 ± 0.30] | 0.158 ± 0.012 [4.0 ± 0.30] | 0.051 ± 0.012 [1.3 ± 0.30] | 0.095 ± 0.004 [2.4 ± 0.10] | 0.039 [1.0] |
| V | 7343-20 | 0.287 ± 0.012 [7.3 ± 0.30] | 0.170 ± 0.012 [4.3 ± 0.30] | 0.079 max. [2.0 max.] | 0.051 ± 0.012 [1.3 ± 0.30] | 0.095 ± 0.004 [2.4 ± 0.10] | 0.039 [1.0] |

* Pb containing terminations are not RoHS compliant, exemptions may apply



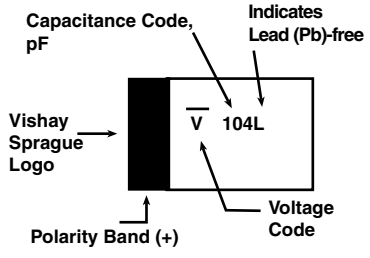
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## RATINGS AND CASE CODES

| µF | 4 V | 6.3 V | 10 V | 16 V | 20 V | 25 V | 35 V | 50 V | 63 V |
|---|---|---|---|---|---|---|---|---|---|
| 0.10 | | | | | | | A | A | |
| 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/B | A/B | A/B | A/B | B/C | |
| 1.5 | | A | A | A | 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/BC | A/B/C | A/B/C | 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 | | | | |
| 100 | A/B/C/D | B/C/D/E | B/C/D/E/V | D/E | D/E | | | | |
| 120 | D | D | E | | | | | | |
| 150 | B/C/D | C/D/E | 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 | E | E | | | | | | | |
| 1000 | E | | | | | | | | |

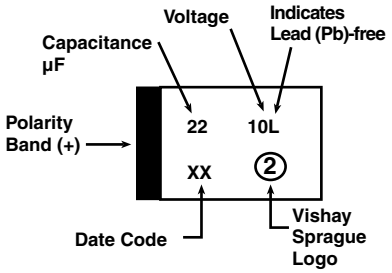
**Note**
• Preliminary values, contact factory for availability.

## MARKING




**"A" Case Size**

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




**"B, C, D, E, V" Case Sizes**

**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 might bear a slightly different marking than the one shown above. For example, rating 22 µF 10 V could be marked either as 22-10L or 22R10.
Call the factory for further explanation.



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## RATINGS AND PART NUMBER REFERENCE

| 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) |
|---|---|---|---|---|---|---|
| **4 VDC AT + 85 °C, 2.7 VDC AT + 125 °C** | | | | | | |
| 2.2 | A | 293D225(1)004A(2) | 0.5 | 6 | 7.6 | 0.10 |
| 3.3 | A | 293D475(1)004A(2) | 0.5 | 6 | 7.6 | 0.10 |
| 4.7 | A | 293D475(1)004A(2) | 0.5 | 6 | 6.3 | 0.11 |
| 4.7 | B | 293D475(1)004B(2) | 0.5 | 6 | 7.0 | 0.11 |
| 6.8 | A | 293D685(1)004A(2) | 0.5 | 6 | 5.5 | 0.12 |
| 6.8 | B | 293D685(1)004B(2) | 0.5 | 6 | 3.4 | 0.16 |
| 10 | A | 293D106(1)004A(2) | 0.5 | 6 | 5.1 | 0.12 |
| 10 | B | 293D106(1)004B(2) | 0.5 | 6 | 3.5 | 0.16 |
| 15 | A | 293D156(1)004A(2) | 0.6 | 6 | 3.4 | 0.15 |
| 15 | B | 293D156(1)004B(2) | 0.6 | 6 | 2.9 | 0.17 |
| 15 | C | 293D156(1)004C(2) | 0.6 | 6 | 2.8 | 0.20 |
| 22 | A | 293D226(1)004A(2) | 0.9 | 6 | 2.9 | 0.16 |
| 22 | B | 293D226(1)004B(2) | 0.9 | 6 | 2.5 | 0.18 |
| 22 | C | 293D226(1)004C(2) | 0.9 | 6 | 1.8 | 0.25 |
| 33 | A | 293D336(1)004A(2) | 1.3 | 6 | 2.9 | 0.16 |
| 33 | B | 293D336(1)004B(2) | 1.3 | 6 | 2.0 | 0.21 |
| 33 | C | 293D336(1)004C(2) | 1.3 | 6 | 1.8 | 0.25 |
| 47 | A | 293D476(1)004A(2) | 1.9 | 14 | 2.5 | 0.17 |
| 47 | B | 293D476(1)004B(2) | 1.9 | 6 | 1.9 | 0.21 |
| 47 | C | 293D476(1)004C(2) | 1.9 | 6 | 1.8 | 0.25 |
| 68 | B | 293D686(1)004B(2) | 2.7 | 6 | 1.9 | 0.21 |
| 68 | C | 293D686(1)004C(2) | 2.7 | 6 | 1.4 | 0.28 |
| 68 | D | 293D686(1)004D(2) | 2.7 | 6 | 0.8 | 0.43 |
| 100 | A | 293D107(1)004A(2) | 10.0 | 30 | 2.5 | 0.22 |
| 100 | B | 293D107(1)004B(2) | 4.0 | 8 | 1.8 | 0.22 |
| 100 | C | 293D107(1)004C(2) | 4.0 | 6 | 0.8 | 0.37 |
| 100 | D | 293D107(1)004D(2) | 4.0 | 6 | 0.7 | 0.46 |
| 120 | D | 293D127(1)004D(2) | 4.8 | 6 | 0.6 | 0.51 |
| 150 | B | 293D157(1)004B(2) | 6.0 | 14 | 1.6 | 0.23 |
| 150 | C | 293D157(1)004C(2) | 6.0 | 12 | 0.7 | 0.40 |
| 150 | D | 293D157(1)004D(2) | 6.0 | 8 | 0.6 | 0.50 |
| 220 | B | 293D227X0004B(2) | 8.8 | 18 | 1.5 | 0.24 |
| 220 | C | 293D227(1)004C(2) | 8.8 | 8 | 0.7 | 0.40 |
| 220 | D | 293D227(1)004D(2) | 8.8 | 8 | 0.6 | 0.50 |
| 220 | E | 293D227(1)004E(2) | 8.8 | 8 | 0.5 | 0.57 |
| 330 | D | 293D337(1)004D(2) | 13.2 | 8 | 0.6 | 0.50 |
| 330 | E | 293D337(1)004E(2) | 13.2 | 8 | 0.5 | 0.57 |
| 470 | D | 293D477(1)004D(2) | 18.8 | 10 | 0.6 | 0.50 |
| 470 | E | 293D477(1)004E(2) | 18.8 | 10 | 0.5 | 0.57 |
| 680 | E | 293D687(1)004E(2) | 27.2 | 12 | 0.5 | 0.57 |
| 1000 | E | 293D108X0004E(2) | 40.0 | 20 | 0.5 | 0.57 |
| **6.3 VDC AT + 85 °C, 4 VDC AT + 125 °C** | | | | | | |
| 1.5 | A | 293D155(1)6R3A(2) | 0.5 | 6 | 2.9 | 0.16 |
| 2.2 | A | 293D225(1)6R3A(2) | 0.5 | 6 | 7.6 | 0.10 |
| 3.3 | A | 293D335(1)6R3A(2) | 0.5 | 6 | 6.3 | 0.11 |
| 3.3 | B | 293D335(1)6R3B(2) | 0.5 | 6 | 5.5 | 0.12 |
| 4.7 | A | 293D475(1)6R3A(2) | 0.5 | 6 | 5.5 | 0.12 |
| 4.7 | B | 293D475(1)6R3B(2) | 0.5 | 6 | 4.4 | 0.14 |
| 6.8 | A | 293D685(1)6R3A(2) | 0.5 | 6 | 5.0 | 0.12 |
| 6.8 | B | 293D685(1)6R3B(2) | 0.5 | 6 | 3.4 | 0.16 |

**Notes**
- (1) Tolerance: X0, X9, X5
- (2) Terminations and packaging: 2TE3, 2WE3, 8T, 8W
- (3) Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



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## RATINGS AND PART NUMBER REFERENCE

| 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) |
|---|---|---|---|---|---|---|
| **6.3 VDC AT + 85 °C, 4 VDC AT + 125 °C** | | | | | | |
| 10 | A | 293D106(1)6R3A(2) | 0.6 | 6 | 3.4 | 0.15 |
| 10 | B | 293D106(1)6R3B(2) | 0.6 | 6 | 2.9 | 0.17 |
| 10 | C | 293D106(1)6R3C(2) | 0.6 | 6 | 3.0 | 0.19 |
| 15 | A | 293D156(1)6R3A(2) | 0.9 | 6 | 2.9 | 0.16 |
| 15 | B | 293D156(1)6R3B(2) | 0.9 | 6 | 2.5 | 0.18 |
| 15 | C | 293D156(1)6R3C(2) | 0.9 | 6 | 1.8 | 0.25 |
| 22 | A | 293D226(1)6R3A(2) | 1.3 | 6 | 2.9 | 0.16 |
| 22 | B | 293D226(1)6R3B(2) | 1.3 | 6 | 2.0 | 0.21 |
| 22 | C | 293D226(1)6R3C(2) | 1.3 | 6 | 1.8 | 0.25 |
| 33 | A | 293D336(1)6R3A(2) | 2.0 | 14 | 2.5 | 0.17 |
| 33 | B | 293D336(1)6R3B(2) | 2.0 | 6 | 1.9 | 0.21 |
| 33 | C | 293D336(1)6R3C(2) | 2.0 | 6 | 1.5 | 0.27 |
| 47 | A | 293D476(1)6R3A(2) | 2.8 | 12 | 1.6 | 0.22 |
| 47 | B | 293D476(1)6R3B(2) | 2.8 | 6 | 1.9 | 0.21 |
| 47 | C | 293D476(1)6R3C(2) | 2.8 | 6 | 1.4 | 0.28 |
| 47 | D | 293D476(1)6R3D(2) | 2.8 | 6 | 0.8 | 0.43 |
| 68 | B | 293D686(1)6R3B(2) | 4.1 | 6 | 1.8 | 0.22 |
| 68 | C | 293D686(1)6R3C(2) | 4.1 | 6 | 0.8 | 0.37 |
| 68 | D | 293D686(1)6R3D(2) | 4.1 | 6 | 0.7 | 0.46 |
| 100 | B | 293D107(1)6R3B(2) | 6.0 | 15 | 1.7 | 0.22 |
| 100 | C | 293D107(1)6R3C(2) | 6.0 | 6 | 0.8 | 0.37 |
| 100 | D | 293D107(1)6R3D(2) | 6.0 | 6 | 0.7 | 0.46 |
| 100 | V | 293D107(1)6R3V(3) | 6.0 | 8 | 0.7 | 0.42 |
| 100 | E | 293D107(1)6R3E(2) | 6.0 | 8 | 0.7 | 0.49 |
| 120 | D | 293D127(1)6R3D(2) | 6.3 | 8 | 0.7 | 0.46 |
| 150 | C | 293D157(1)6R3C(2) | 9.0 | 8 | 0.7 | 0.40 |
| 150 | D | 293D157(1)6R3D(2) | 9.0 | 8 | 0.6 | 0.50 |
| 150 | E | 293D157(1)6R3E(2) | 9.0 | 8 | 0.5 | 0.57 |
| 220 | C | 293D227(1)6R3C(2) | 13.9 | 14 | 0.7 | 0.39 |
| 220 | D | 293D227(1)6R3D(2) | 13.2 | 8 | 0.6 | 0.50 |
| 220 | E | 293D227(1)6R3E(2) | 13.2 | 8 | 0.5 | 0.57 |
| 330 | D | 293D337(1)6R3D(2) | 19.8 | 8 | 0.6 | 0.50 |
| 330 | E | 293D337(1)6R3E(2) | 19.8 | 8 | 0.5 | 0.57 |
| 470 | D | 293D477(1)6R3D(2) | 28.2 | 14 | 0.5 | 0.55 |
| 470 | E | 293E477(1)6R3E(2) | 28.2 | 10 | 1.5 | 0.57 |
| 680 | E | 293D687X06R3E(2) | 42.8 | 20 | 0.5 | 0.57 |
| **10 VDC AT + 85 °C, 7 VDC AT + 125 °C** | | | | | | |
| 0.47 | A | 293D474(1)010A(2) | 0.5 | 4 | 14.0 | 0.07 |
| 1.0 | A | 293D105(1)010A(2) | 0.5 | 4 | 9.6 | 0.09 |
| 1.5 | A | 293D155(1)010A(2) | 0.5 | 6 | 8.0 | 0.10 |
| 2.2 | A | 293D225(1)010A(2) | 0.5 | 6 | 6.3 | 0.11 |
| 2.2 | B | 293D225(1)010B(2) | 0.5 | 6 | 4.6 | 0.14 |
| 3.3 | A | 293D335(1)010A(2) | 0.5 | 6 | 5.5 | 0.12 |
| 3.3 | B | 293D335(1)010B(2) | 0.5 | 6 | 5.5 | 0.12 |
| 4.7 | A | 293D475(1)010A(2) | 0.5 | 6 | 5.0 | 0.12 |
| 4.7 | B | 293D475(1)010B(2) | 0.5 | 6 | 3.4 | 0.16 |
| 4.7 | C | 293D475(1)010C(2) | 0.5 | 6 | 2.3 | 0.22 |
| 6.8 | A | 293D685(1)010A(2) | 0.7 | 6 | 4.2 | 0.13 |
| 6.8 | B | 293D685(1)010B(2) | 0.7 | 6 | 2.9 | 0.17 |
| 6.8 | C | 293D685(1)010C(2) | 0.7 | 6 | 1.9 | 0.24 |

**Notes**
- (1) Tolerance: X0, X9, X5
- (2) Terminations and packaging: 2TE3, 2WE3, 8T, 8W
- (3) Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



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## RATINGS AND PART NUMBER REFERENCE

| 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) |
|---|---|---|---|---|---|---|
| **10 VDC AT + 85 °C, 7 VDC AT + 125 °C** | | | | | | |
| 10 | A | 293D106(1)010A(2) | 1.0 | 6 | 3.4 | 0.15 |
| 10 | B | 293D106(1)010B(2) | 1.0 | 6 | 2.5 | 0.18 |
| 10 | C | 293D106(1)010C(2) | 1.0 | 6 | 1.8 | 0.25 |
| 15 | A | 293D156(1)010A(2) | 1.5 | 6 | 2.9 | 0.16 |
| 15 | B | 293D156(1)010B(2) | 1.5 | 6 | 2.0 | 0.21 |
| 15 | C | 293D156(1)010C(2) | 1.5 | 6 | 1.8 | 0.25 |
| 22 | A | 293D226(1)010A(2) | 2.2 | 8 | 2.5 | 0.17 |
| 22 | B | 293D226(1)010B(2) | 2.2 | 6 | 1.9 | 0.21 |
| 22 | C | 293D226(1)010C(2) | 2.2 | 6 | 1.5 | 0.27 |
| 33 | B | 293D336(1)010B(2) | 3.3 | 6 | 1.9 | 0.21 |
| 33 | C | 293D336(1)010C(2) | 3.3 | 6 | 1.4 | 0.28 |
| 33 | D | 293D336(1)010D(2) | 3.3 | 6 | 0.8 | 0.43 |
| 47 | B | 293D476(1)010B(2) | 4.7 | 6 | 1.8 | 0.22 |
| 47 | C | 293D476(1)010C(2) | 4.7 | 6 | 1.1 | 0.32 |
| 47 | D | 293D476(1)010D(2) | 4.7 | 6 | 0.7 | 0.46 |
| 68 | B | 293D686(1)010B(2) | 6.8 | 14 | 1.8 | 0.22 |
| 68 | C | 293D686(1)010C(2) | 6.8 | 6 | 1.0 | 0.33 |
| 68 | D | 293D686(1)010D(2) | 6.8 | 6 | 0.7 | 0.46 |
| 68 | E | 293D686(1)010E(2) | 6.8 | 6 | 0.8 | 0.45 |
| 68 | V | 293D686(1)010V(3) | 6.8 | 6 | 0.7 | 0.42 |
| 100 | B | 293D107X0010B(2) | 10 | 25 | 2.5 | 0.18 |
| 100 | C | 293D107(1)010C(2) | 10 | 8 | 0.9 | 0.35 |
| 100 | D | 293D107(1)010D(2) | 10 | 8 | 0.6 | 0.50 |
| 100 | E | 293D107(1)010E(2) | 10.0 | 8 | 0.7 | 0.49 |
| 100 | V | 293D107(1)010V(3) | 10 | 8 | 0.7 | 0.42 |
| 120 | E | 293D127(1)010E(2) | 12.0 | 6 | 1.0 | 0.41 |
| 150 | D | 293D157(1)010D(2) | 15 | 8 | 0.6 | 0.50 |
| 150 | E | 293D157(1)010E(2) | 15 | 8 | 0.5 | 0.57 |
| 220 | D | 293D227(1)010D(2) | 22 | 8 | 0.6 | 0.50 |
| 220 | E | 293D227(1)010E(2) | 22 | 8 | 0.5 | 0.57 |
| 330 | D | 293D337X0010D(2) | 33 | 15 | 0.5 | 0.57 |
| 330 | E | 293D337(1)010E(2) | 33 | 10 | 0.5 | 0.57 |
| 470 | E | 293D477X0010E(2) | 47 | 15 | 0.5 | 0.57 |
| **16 VDC AT + 85 °C, 10 VDC AT + 125 °C** | | | | | | |
| 0.68 | A | 293D684(1)016A(2) | 0.5 | 4 | 10.4 | 0.08 |
| 1.0 | A | 293D105(1)016A(2) | 0.5 | 4 | 9.3 | 0.09 |
| 1.5 | A | 293D155(1)016A(2) | 0.5 | 6 | 6.7 | 0.11 |
| 1.5 | B | 293D155(1)016B(2) | 0.5 | 6 | 6.4 | 0.12 |
| 2.2 | A | 293D225(1)016A(2) | 0.5 | 6 | 5.9 | 0.11 |
| 2.2 | B | 293D225(1)016B(2) | 0.5 | 6 | 4.6 | 0.14 |
| 3.3 | A | 293D335(1)016A(2) | 0.5 | 6 | 5.0 | 0.12 |
| 3.3 | B | 293D335(1)016B(2) | 0.5 | 6 | 3.5 | 0.16 |
| 4.7 | A | 293D475(1)016A(2) | 0.8 | 6 | 5.0 | 0.12 |
| 4.7 | B | 293D475(1)016B(2) | 0.8 | 6 | 2.9 | 0.17 |
| 4.7 | C | 293D475(1)016C(2) | 0.8 | 6 | 2.9 | 0.19 |
| 6.8 | A | 293D685(1)016A(2) | 1.1 | 6 | 4.2 | 0.13 |
| 6.8 | B | 293D685(1)016B(2) | 1.1 | 6 | 2.5 | 0.18 |
| 6.8 | C | 293D685(1)016C(2) | 1.1 | 6 | 1.9 | 0.24 |
| 10 | A | 293D106(1)016A(2) | 1.6 | 6 | 3.0 | 0.16 |
| 10 | B | 293D106(1)016B(2) | 1.6 | 6 | 2.0 | 0.21 |
| 10 | C | 293D106(1)016C(2) | 1.6 | 6 | 1.8 | 0.25 |
| 10 | D | 293D106(1)016D(2) | 2.5 | 6 | 1.2 | 0.35 |

**Notes**
- (1) Tolerance: X0, X9, X5
- (2) Terminations and packaging: 2TE3, 2WE3, 8T, 8W
- (3) Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



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## RATINGS AND PART NUMBER REFERENCE

| 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) |
|---|---|---|---|---|---|---|
| **16 VDC AT + 85 °C, 10 VDC AT + 125 °C** | | | | | | |
| 15 | B | 293D156(1)016B(2) | 2.4 | 6 | 2.0 | 0.21 |
| 15 | C | 293D156(1)016C(2) | 2.4 | 6 | 1.5 | 0.27 |
| 22 | B | 293D226X0016B(2) | 3.5 | 6 | 1.9 | 0.21 |
| 22 | C | 293D226(1)016C(2) | 3.5 | 6 | 1.4 | 0.28 |
| 22 | D | 293D226(1)016D(2) | 3.5 | 6 | 0.8 | 0.43 |
| 33 | B | 293D336(1)016B(2) | 5.3 | 6 | 1.8 | 0.22 |
| 33 | C | 293D336(1)016C(2) | 5.3 | 6 | 1.1 | 0.32 |
| 33 | D | 293D336(1)016D(2) | 5.3 | 6 | 0.7 | 0.46 |
| 47 | C | 293D476(1)016C(2) | 7.5 | 6 | 1.0 | 0.33 |
| 47 | D | 293D476(1)016D(2) | 7.5 | 6 | 0.7 | 0.46 |
| 47 | E | 293D476(1)016E(2) | 7.5 | 6 | 0.8 | 0.45 |
| 68 | D | 293D686(1)016D(2) | 10.9 | 6 | 0.6 | 0.50 |
| 68 | E | 293D686(1)016E(2) | 10.9 | 6 | 0.8 | 0.45 |
| 100 | D | 293D107(1)016D(2) | 16 | 8 | 0.6 | 0.50 |
| 100 | E | 293D107(1)016E(2) | 16 | 8 | 0.6 | 0.52 |
| 150 | D | 293D157(1)016D(2) | 24 | 8 | 0.6 | 0.50 |
| 150 | E | 293D157(1)016E(2) | 24 | 8 | 0.5 | 0.57 |
| 220 | E | 293D227(1)016E(2) | 35.2 | 14 | 0.5 | 0.57 |
| **20 VDC AT + 85 °C, 13 VDC AT + 125 °C** | | | | | | |
| 0.47 | A | 293D474(1)020A(2) | 0.5 | 4 | 14.0 | 0.07 |
| 0.68 | A | 293D684(1)020A(2) | 0.5 | 4 | 10.0 | 0.09 |
| 1.0 | A | 293D105(1)020A(2) | 0.5 | 4 | 8.4 | 0.09 |
| 1 | B | 293D105(1)020B(2) | 0.5 | 4 | 9.0 | 0.10 |
| 1.5 | A | 293D155(1)020A(2) | 0.5 | 6 | 6.3 | 0.11 |
| 1.5 | B | 293D155(1)020B(2) | 0.5 | 4.8 | 5.6 | 0.12 |
| 2.2 | A | 293D225(1)020A(2) | 0.5 | 6 | 5.9 | 0.11 |
| 2.2 | B | 293D225(1)020B(2) | 0.5 | 6 | 3.5 | 0.16 |
| 3.3 | A | 293D335(1)020A(2) | 0.7 | 6 | 5.9 | 0.11 |
| 3.3 | B | 293D335(1)020B(2) | 0.7 | 6 | 3.0 | 0.17 |
| 3.3 | C | 293D335(1)020C(2) | 0.8 | 6 | 2.3 | 0.22 |
| 4.7 | A | 293D475(1)020A(2) | 0.9 | 6 | 5.0 | 0.12 |
| 4.7 | B | 293D475(1)020B(2) | 0.9 | 6 | 2.9 | 0.17 |
| 4.7 | C | 293D475(1)020C(2) | 0.9 | 6 | 2.3 | 0.22 |
| 6.8 | A | 293D685(1)020A(2) | 1.4 | 6 | 4.5 | 0.13 |
| 6.8 | B | 293D685(1)020B(2) | 1.4 | 6 | 2.5 | 0.18 |
| 6.8 | C | 293D685(1)020C(2) | 1.4 | 6 | 1.9 | 0.24 |
| 10 | B | 293D106(1)020B(2) | 2.0 | 6 | 2.1 | 0.20 |
| 10 | C | 293D106(1)020C(2) | 2.0 | 6 | 1.7 | 0.25 |
| 10 | D | 293D106(1)020D(2) | 2.0 | 6 | 1.0 | 0.38 |
| 15 | B | 293D156(1)020B(2) | 3.0 | 6 | 2.3 | 0.19 |
| 15 | C | 293D156(1)020C(2) | 3.0 | 6 | 1.5 | 0.27 |
| 15 | D | 293D156(1)020D(2) | 3.0 | 6 | 0.9 | 0.41 |
| 22 | B | 293D226(1)020B(2) | 4.4 | 6 | 2.1 | 0.20 |
| 22 | C | 293D226(1)020C(2) | 4.4 | 6 | 1.1 | 0.32 |
| 22 | D | 293D226(1)020D(2) | 4.4 | 6 | 0.7 | 0.46 |
| 33 | C | 293D336(1)020C(2) | 6.6 | 6 | 1.0 | 0.33 |
| 33 | D | 293D336(1)020D(2) | 6.6 | 6 | 0.7 | 0.46 |
| 47 | D | 293D476(1)020D(2) | 9.4 | 6 | 0.7 | 0.46 |
| 47 | E | 293D476(1)020E(2) | 9.4 | 6 | 0.6 | 0.52 |
| 68 | D | 293D686(1)020D(2) | 13.6 | 6 | 0.7 | 0.46 |
| 68 | E | 293D686(1)020E(2) | 13.6 | 6 | 0.6 | 0.52 |
| 100 | D | 293D107(1)020D(2) | 20.0 | 8 | 0.6 | 0.50 |
| 100 | E | 293D107(1)020E(2) | 20.0 | 8 | 0.5 | 0.57 |

**Notes**
- (1) Tolerance: X0, X9, X5
- (2) Terminations and packaging: 2TE3, 2WE3, 8T, 8W
- (3) Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



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## RATINGS AND PART NUMBER REFERENCE

| 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 VDC AT + 85 °C, 17 VDC AT + 125 °C** | | | | | | |
| 0.33 | A | 293D334(1)025A(2) | 0.5 | 4 | 13.0 | 0.08 |
| 0.47 | A | 293D474(1)025A(2) | 0.5 | 4 | 12.0 | 0.08 |
| 0.68 | A | 293D684(1)025A(2) | 0.5 | 4 | 8.4 | 0.09 |
| 1.0 | A | 293D105(1)025A(2) | 0.5 | 4 | 7.6 | 0.10 |
| 1.0 | B | 293D105(1)025B(2) | 0.5 | 4 | 5.0 | 0.13 |
| 1.5 | A | 293D155(1)025A(2) | 0.5 | 6 | 6.7 | 0.11 |
| 1.5 | B | 293D155(1)025B(2) | 0.5 | 6 | 4.6 | 0.14 |
| 2.2 | A | 293D225(1)025A(2) | 0.6 | 6 | 6.3 | 0.11 |
| 2.2 | B | 293D225(1)025B(2) | 0.6 | 6 | 3.8 | 0.15 |
| 2.2 | C | 293D225(1)025C(2) | 0.6 | 6 | 3.2 | 0.19 |
| 3.3 | A | 293D335(1)025A(2) | 0.8 | 6 | 4.0 | 0.14 |
| 3.3 | B | 293D335(1)025B(2) | 0.8 | 6 | 3.1 | 0.17 |
| 3.3 | C | 293D335(1)025C(2) | 0.8 | 6 | 2.3 | 0.22 |
| 4.7 | A | 293D475(1)025A(2) | 1.2 | 6 | 5.5 | 0.12 |
| 4.7 | B | 293D475(1)025B(2) | 1.2 | 6 | 2.8 | 0.17 |
| 4.7 | C | 293D475(1)025C(2) | 1.2 | 6 | 2.0 | 0.24 |
| 4.7 | D | 293D475(1)025D(2) | 1.2 | 6 | 1.3 | 0.34 |
| 6.8 | B | 293D685(1)025B(2) | 1.7 | 6 | 2.4 | 0.19 |
| 6.8 | C | 293D685(1)025C(2) | 1.7 | 6 | 1.7 | 0.25 |
| 6.8 | D | 293D685(1)025D(2) | 1.7 | 6 | 1.1 | 0.37 |
| 10 | B | 293D106(1)025B(2) | 2.5 | 6 | 2.3 | 0.19 |
| 10 | C | 293D106(1)025C(2) | 2.5 | 6 | 1.5 | 0.27 |
| 10 | D | 293D106(1)025D(2) | 2.5 | 6 | 1.0 | 0.39 |
| 15 | B | 293D156(1)025B(2) | 3.8 | 6 | 2.2 | 0.20 |
| 15 | C | 293D156(1)025C(2) | 3.8 | 6 | 1.2 | 0.30 |
| 15 | D | 293D156(1)025D(2) | 3.8 | 6 | 0.8 | 0.43 |
| 22 | C | 293D226(1)025C(2) | 5.5 | 6 | 1.2 | 0.30 |
| 22 | D | 293D226(1)025D(2) | 5.5 | 6 | 0.7 | 0.46 |
| 22 | E | 293D226(1)025E(2) | 5.5 | 6 | 0.8 | 0.45 |
| 22 | V | 293D226(1)025V(3) | 5.5 | 6 | 0.7 | 0.42 |
| 33 | D | 293D336(1)025D(2) | 8.3 | 6 | 0.7 | 0.46 |
| 33 | E | 293D336(1)025E(2) | 8.3 | 6 | 0.6 | 0.52 |
| 47 | D | 293D476(1)025D(2) | 11.8 | 8 | 0.7 | 0.46 |
| 47 | E | 293D476(1)025E(2) | 11.8 | 6 | 0.6 | 0.52 |
| **35 VDC AT + 85 °C, 23 VDC AT + 125 °C** | | | | | | |
| 0.10 | A | 293D104(1)035A(2) | 0.5 | 4 | 20.0 | 0.06 |
| 0.15 | A | 293D154(1)035A(2) | 0.5 | 4 | 18.0 | 0.07 |
| 0.22 | A | 293D224(1)035A(2) | 0.5 | 4 | 15.0 | 0.07 |
| 0.33 | A | 293D334(1)035A(2) | 0.5 | 4 | 13.0 | 0.08 |
| 3.3 | D | 293D335(1)035D(2) | 1.2 | 6 | 1.7 | 0.30 |
| 0.47 | A | 293D474(1)035A(2) | 0.5 | 4 | 10.0 | 0.09 |
| 0.47 | B | 293D474(1)035B(2) | 0.5 | 4 | 8.0 | 0.10 |
| 0.68 | A | 293D684(1)035A(2) | 0.5 | 4 | 7.6 | 0.10 |
| 0.68 | B | 293D684(1)035B(2) | 0.5 | 4 | 6.5 | 0.11 |
| 1.0 | A | 293D105(1)035A(2) | 0.5 | 4 | 7.5 | 0.10 |
| 1.0 | B | 293D105(1)035B(2) | 0.5 | 4 | 5.0 | 0.13 |
| 1.5 | B | 293D155(1)035B(2) | 0.5 | 6 | 4.2 | 0.14 |
| 1.5 | C | 293D155(1)035C(2) | 0.5 | 6 | 3.8 | 0.17 |
| 1.5 | D | 293D155(1)050D(2) | 0.8 | 6 | 2.9 | 0.23 |

**Notes**
- (1) Tolerance: X0, X9, X5
- (2) Terminations and packaging: 2TE3, 2WE3, 8T, 8W
- (3) Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3



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## RATINGS AND PART NUMBER REFERENCE

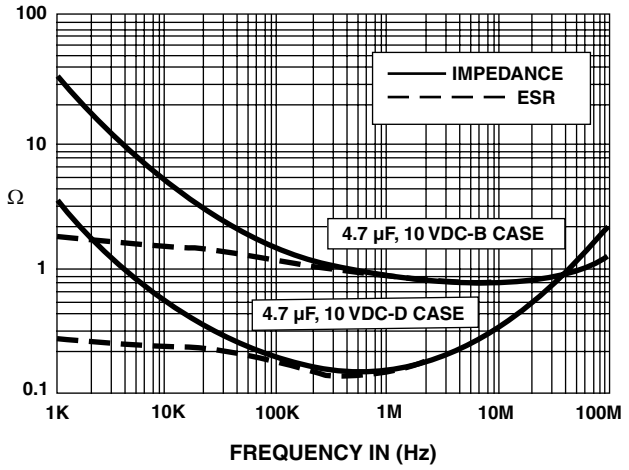
| CAPACITANCE (µF) | CASE CODE | PART NUMBER | MAX. DC LEAKAGE AT + 25 °C (µA) | MAX. DF AT + 25 °C 120 Hz (%) | MAX. ESR AT + 25 °C 100 kHz (Ω) | MAX. RIPPLE 100 kHz $I_{rms}$ (A) |
|---|---|---|---|---|---|---|
| **35 VDC AT + 85 °C, 23 VDC AT + 125 °C** | | | | | | |
| 2.2 | B | 293D225(1)035B(2) | 0.8 | 6 | 3.8 | 0.15 |
| 2.2 | C | 293D225(1)035C(2) | 0.8 | 6 | 2.9 | 0.20 |
| 3.3 | B | 293D335(1)035B(2) | 1.2 | 6 | 3.5 | 0.16 |
| 3.3 | C | 293D335(1)035C(2) | 1.2 | 6 | 2.1 | 0.23 |
| 4.7 | B | 293D475(1)035B(2) | 1.7 | 6 | 3.1 | 0.17 |
| 4.7 | C | 293D475(1)035C(2) | 1.6 | 6 | 1.9 | 0.24 |
| 4.7 | D | 293D475(1)035D(2) | 1.6 | 6 | 1.3 | 0.34 |
| 6.8 | C | 293D685(1)035C(2) | 2.4 | 6 | 1.8 | 0.25 |
| 6.8 | D | 293D685(1)035D(2) | 2.4 | 6 | 1.1 | 0.37 |
| 10 | C | 293D106(1)035C(2) | 3.5 | 6 | 1.6 | 0.26 |
| 10 | D | 293D106(1)035D(2) | 3.5 | 6 | 0.8 | 0.43 |
| 15 | D | 293D156(1)035D(2) | 5.3 | 6 | 0.7 | 0.46 |
| 15 | E | 293D156(1)035E(2) | 5.3 | 6 | 0.7 | 0.49 |
| 22 | D | 293D226(1)035D(2) | 7.7 | 6 | 0.6 | 0.52 |
| 22 | E | 293D226(1)035E(2) | 7.7 | 6 | 0.6 | 0.52 |
| **50 VDC AT + 85 °C, 33 VDC AT + 125 °C** | | | | | | |
| 0.10 | A | 293D104(1)050A(2) | 0.5 | 4 | 19.0 | 0.06 |
| 0.15 | A | 293D154(1)050A(2) | 0.5 | 4 | 17.0 | 0.07 |
| 0.15 | B | 293D154(1)050B(2) | 0.5 | 4 | 14.0 | 0.08 |
| 0.22 | A | 293D224(1)050A(2) | 0.5 | 4 | 15.0 | 0.07 |
| 0.22 | B | 293D224(1)050B(2) | 0.5 | 4 | 12.0 | 0.08 |
| 0.33 | A | 293D334(1)050A(2) | 0.5 | 4 | 14.0 | 0.07 |
| 0.33 | B | 293D334(1)050B(2) | 0.5 | 4 | 10.0 | 0.09 |
| 0.47 | A | 293D474(1)050A(2) | 0.5 | 4 | 12.0 | 0.08 |
| 0.47 | B | 293D474(1)050B(2) | 0.5 | 4 | 8.4 | 0.10 |
| 0.47 | C | 293D474(1)050C(2) | 0.5 | 4 | 6.7 | 0.13 |
| 0.68 | B | 293D684(1)050B(2) | 0.5 | 4 | 7.6 | 0.11 |
| 0.68 | C | 293D684(1)050C(2) | 0.5 | 4 | 5.9 | 0.14 |
| 1.0 | B | 293D105(1)050B(2) | 0.5 | 4 | 6.7 | 0.11 |
| 1.0 | C | 293D105(1)050C(2) | 0.5 | 4 | 4.6 | 0.16 |
| 1.5 | B | 293D155(1)050B(2) | 0.8 | 6 | 6.0 | 0.12 |
| 1.5 | C | 293D155(1)050C(2) | 0.8 | 6 | 3.4 | 0.18 |
| 2.2 | B | 293D225(1)050B(2) | 1.1 | 6 | 3.5 | 0.16 |
| 2.2 | C | 293D225(1)050C(2) | 1.1 | 6 | 2.9 | 0.20 |
| 2.2 | D | 293D225(1)050D(2) | 1.1 | 6 | 2.1 | 0.27 |
| 3.3 | C | 293D335(1)050C(2) | 1.7 | 6 | 2.5 | 0.21 |
| 3.3 | D | 293D335(1)050D(2) | 1.7 | 6 | 1.7 | 0.30 |
| 4.7 | C | 293D457(1)050C(2) | 2.4 | 6 | 1.5 | 0.27 |
| 4.7 | D | 293D475(1)050D(2) | 2.4 | 6 | 1.2 | 0.37 |
| 4.7 | E | 293D475(1)050E(2) | 2.4 | 6 | 1.4 | 0.34 |
| 6.8 | D | 293D685(1)050D(2) | 3.4 | 6 | 0.9 | 0.41 |
| 6.8 | E | 293D685(1)050E(2) | 3.4 | 6 | 0.9 | 0.43 |
| 10 | D | 293D106(1)050D(2) | 5.0 | 6 | 0.8 | 0.43 |
| 10 | E | 293D106(1)050E(2) | 5.0 | 6 | 0.8 | 0.45 |
| 15 | E | 293D156(1)050E(2) | 7.5 | 6 | 0.8 | 0.45 |
| **63 VDC AT + 85 °C, 40 VDC AT + 125 °C** | | | | | | |
| 4.7 | D | 293D475(1)063D(2) | 3.0 | 6 | 1.1 | 0.37 |
| 10 | E | 293D106(1)063E(2) | 6.3 | 6 | 1.0 | 0.41 |

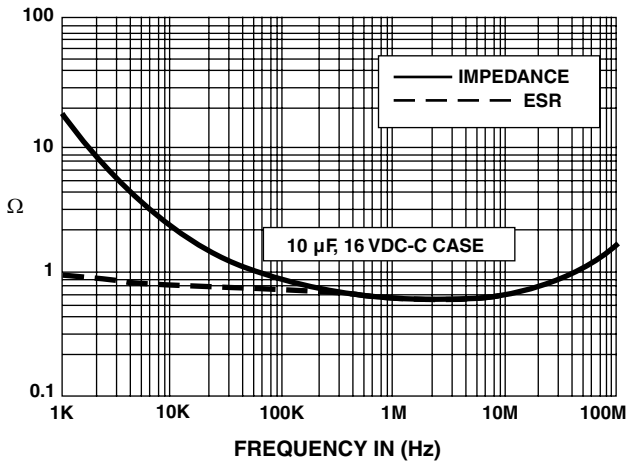
**Notes**
- (1) Tolerance: X0, X9, X5
- (2) Terminations and packaging: 2TE3, 2WE3, 8T, 8W
- (3) Lead (Pb)-free terminations and packaging codes: 2TE3, 2WE3

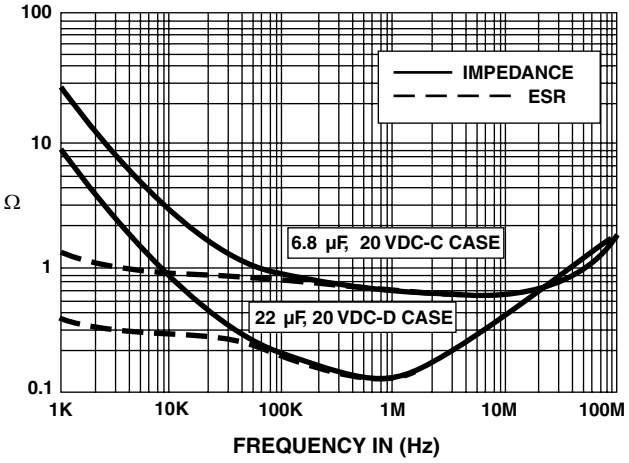


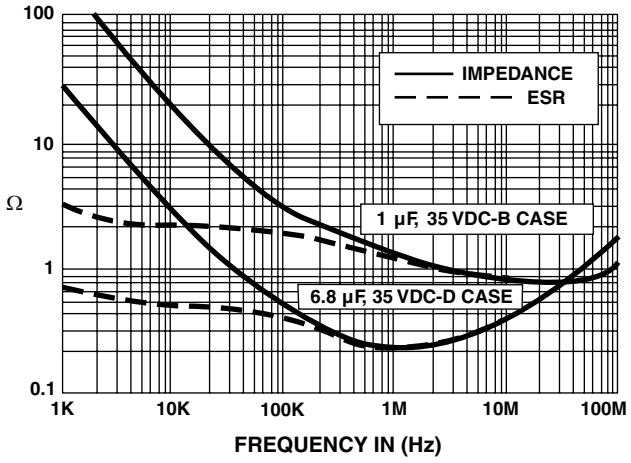
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## TYPICAL CURVES AT + 25 °C, IMPEDANCE AND ESR VS. FREQUENCY






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