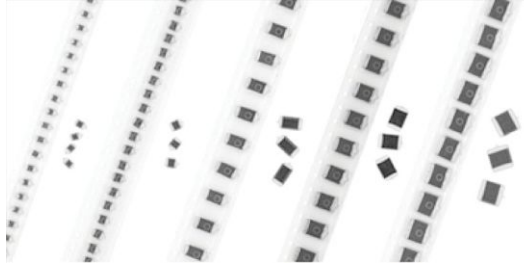


# Solid Tantalum Chip Capacitors TANTAMOUNT<sup>®</sup>, Low Profile, Low ESR, Conformal Coated, Maximum CV



## FEATURES

- New robust ratings for pulsed applications
- New case size offerings
- 1.2 mm to 2 mm height
- Terminations: 100 % matte tin (2) standard, tin/lead available
- Mounting: Surface mount
- Very low ESR
- 8 mm, 12 mm tape and reel packaging available per EIA-481 and reeling per IEC 60286-3  
7" [178 mm] standard  
13" [330 mm] available
- Footprint compatible with EIA 535BAAC and CECC 30801
- See also 592W for additional ratings designs for pulsed applications
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS\***  
COMPLIANT

## Note

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

## PERFORMANCE CHARACTERISTICS

[www.vishay.com/doc?40088](http://www.vishay.com/doc?40088)

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

**Capacitance Range:** 1 µF to 1000 µF

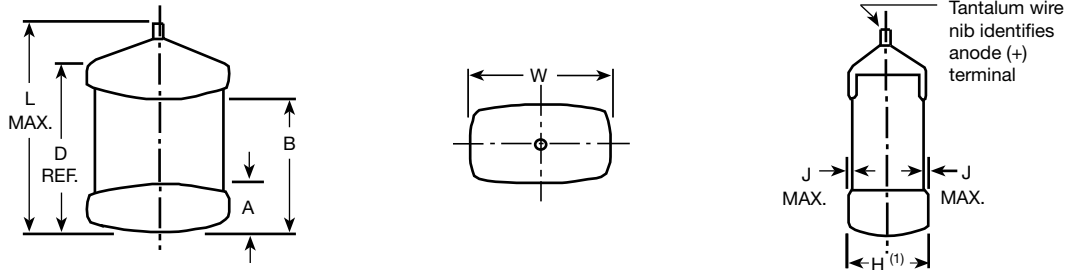
**Capacitance Tolerance:** ± 10 %, ± 20 % standard

**Voltage Rating:** 4 V<sub>DC</sub> to 50 V<sub>DC</sub>

| ORDERING INFORMATION |  |                                   |  |                                  |   |  |  |
|----------------------|--|-----------------------------------|--|----------------------------------|---|--|--|
| 591D                 | 106  | X0                                | 010  | B                                | 2   | T  | 15H  |
| TYPE                 | CAPACITANCE  | CAPACITANCE TOLERANCE             | DC VOLTAGE RATING AT + 85 °C   | CASE CODE                        | TERMINATION   | REEL SIZE AND PACKAGING  | SUFFIX   |
|                      | This is expressed in picofarads. The first two digits are the significant figures. The third is the number of zeros to follow. | <b>X0 = ± 20 %</b><br>X9 = ± 10 % | This is expressed in volts. 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 | <b>2 = 100 % tin</b><br>4 = Gold plated<br>8 = Solder plated 60/40<br>Special order | <b>T = Tape and reel</b><br><b>7" [178 mm] reel</b><br>W = 13" [330 mm] reel | Maximum height (mm) see Standard Ratings table |

## Note

- Preferred tolerance and reel sizes are in bold.  
We reserve the right to supply higher voltage ratings and tighter capacitance tolerance capacitors in the same case size.

**DIMENSIONS** in inches [millimeters]


| CASE CODE | L MAX.      | W  | A                            | B                            | D REF.      | J MAX.      |
|-----------|-------------|--|------------------------------|------------------------------|-------------|-------------|
| A         | 0.146 [3.7] | 0.071 ± 0.012<br>[1.8 ± 0.3]               | 0.031 ± 0.012<br>[0.8 ± 0.3] | 0.087 ± 0.016<br>[2.2 ± 0.4] | 0.114 [2.9] | 0.004 [0.1] |
| B         | 0.157 [4.0] | 0.110 + 0.012/- 0.016<br>[2.8 + 0.3/- 0.4] | 0.031 ± 0.012<br>[0.8 ± 0.3] | 0.098 ± 0.016<br>[2.5 ± 0.4] | 0.138 [3.5] | 0.004 [0.1] |
| C         | 0.28 [7.1]  | 0.126 ± 0.012<br>[3.2 ± 0.3]               | 0.051 ± 0.012<br>[1.3 ± 0.3] | 0.173 ± 0.024<br>[4.4 ± 0.6] | 0.236 [6.0] | 0.004 [0.1] |
| D         | 0.295 [7.5] | 0.169 ± 0.012<br>[4.3 ± 0.3]               | 0.051 ± 0.012<br>[1.3 ± 0.3] | 0.181 ± 0.024<br>[4.6 ± 0.6] | 0.252 [6.4] | 0.004 [0.1] |
| M         | 0.295 [7.5] | 0.248 ± 0.012<br>[6.3 ± 0.3]               | 0.051 ± 0.012<br>[1.3 ± 0.3] | 0.200 ± 0.024<br>[5.1 ± 0.6] | 0.264 [6.7] | 0.004 [0.1] |
| R         | 0.283 [7.2] | 0.236 + 0.012/- 0.024<br>[6.0 + 0.3/- 0.6] | 0.051 ± 0.012<br>[1.3 ± 0.3] | 0.181 ± 0.024<br>[4.6 ± 0.6] | 0.244 [6.2] | 0.004 [0.1] |

**Notes**

- The anode termination (D less B) will be a minimum of 0.012" [0.3 mm]
- (1) For package height, please refer to specific rating in the "Standard Ratings" table

**RATINGS AND CASE CODES**

| μF   | 4 V   | 6.3 V   | 10 V  | 16 V  | 20 V | 25 V  | 35 V | 50 V |
|------|-------|---------|-------|-------|------|-------|------|------|
| 1.0  |       |         |       |       |      |       | A/B  | B    |
| 1.5  |       |         |       |       |      |       | B    |      |
| 2.2  |       |         |       |       | A    | A/B   | B/C  |      |
| 3.3  |       |         | A     | A     | A/B  | C     | B    | C    |
| 4.7  |       |         | A     | A/B   | B/C  | C/D   | D/R  |      |
| 6.8  |       | A       | A/B   | B/C   | B/D  | B/D/R | R    |      |
| 10   |       | A/B     | B     | B/D   | C    | R     |      |      |
| 15   | A/B   | A/B     | A/B/C | C/D   | D/R  |       |      |      |
| 22   | B     | A/B/C   | C/D   | C/D/R | R    | C     |      |      |
| 33   | B/C   | B/C/D   | D/R   | C/R   |      |       |      |      |
| 47   | B/C/D | D/R     | C/D/R | C/D   |      | R     |      |      |
| 68   | D/R   | B/C/D/R | B/C/D | C/D   | R    |       |      |      |
| 100  |       | C       |       |       |      |       |      |      |
| 120  |       |         |       |       |      |       |      |      |
| 150  | C/R   | C/D/R   | C/D   | D/R   |      |       |      |      |
| 220  | C/D   | C/D/R   | D/R   | R     |      |       |      |      |
| 330  | C/D   | C/D/R   | D/R   |       |      |       |      |      |
| 470  | C/D/R | C/D/R   |       |       |      |       |      |      |
| 680  | D/R   | R       |       |       |      |       |      |      |
| 1000 | R     | R       |       |       |      |       |      |      |
| 1500 |       | M/R     |       |       |      |       |      |      |



| STANDARD RATINGS   |              |                         |                        |                                      |  |   |  |
|--|--------------|-------------------------|------------------------|--------------------------------------|--|---|--|
| CAPACITANCE<br>( $\mu$ F)  | CASE<br>CODE | PART NUMBER             | HEIGHT<br>MAX.<br>(mm) | 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) |
| <b>4 V<sub>DC</sub> AT + 85 °C; 2.7 V<sub>DC</sub> AT + 125 °C</b> |              |                         |                        |                                      |  |   |  |
| 22   | A            | 591D226(1)004A(2)(3)15H | 1.5                    | 0.9                                  | 6                                      | 1.200   | 0.22                                       |
| 22   | B            | 591D226(1)004B(2)(3)15H | 1.5                    | 0.9                                  | 6                                      | 0.800   | 0.32                                       |
| 33   | B            | 591D336(1)004B(2)(3)15H | 1.5                    | 1.3                                  | 6                                      | 0.800   | 0.32                                       |
| 47   | B            | 591D476(1)004B(2)(3)15H | 1.5                    | 1.9                                  | 6                                      | 0.800   | 0.32                                       |
| 47   | C            | 591D476(1)004C(2)(3)15H | 1.5                    | 1.9                                  | 6                                      | 0.200   | 0.71                                       |
| 68   | B            | 591D686(1)004B(2)(3)15H | 1.5                    | 2.7                                  | 6                                      | 0.800   | 0.32                                       |
| 68   | C            | 591D686(1)004C(2)(3)15H | 1.5                    | 2.7                                  | 6                                      | 0.180   | 0.75                                       |
| 68   | D            | 591D686(1)004D(2)(3)15H | 1.5                    | 2.7                                  | 6                                      | 0.140   | 0.94                                       |
| 100  | D            | 591D107(1)004D(2)(3)15H | 1.5                    | 4.0                                  | 8                                      | 0.130   | 0.98                                       |
| 100  | R            | 591D107(1)004R(2)(3)15H | 1.5                    | 4.0                                  | 8                                      | 0.110   | 1.17                                       |
| 150  | C            | 591D157(1)004C(2)(3)15H | 1.5                    | 6.0                                  | 8                                      | 0.150   | 0.82                                       |
| 150  | R            | 591D157(1)004R(2)(3)15H | 1.5                    | 6.0                                  | 8                                      | 0.100   | 1.22                                       |
| 220  | C            | 591D227(1)004C(2)(3)20H | 2.0                    | 8.8                                  | 8                                      | 0.075   | 1.21                                       |
| 220  | D            | 591D227(1)004D(2)(3)15H | 1.5                    | 8.8                                  | 8                                      | 0.100   | 1.12                                       |
| 330  | C            | 591D337(1)004C(2)(3)20H | 2.0                    | 13.2                                 | 8                                      | 0.070   | 1.25                                       |
| 330  | D            | 591D337(1)004D(2)(3)20H | 2.0                    | 13.2                                 | 8                                      | 0.060   | 1.53                                       |
| 470  | C            | 591D477(1)004C(2)(3)20H | 2.0                    | 18.8                                 | 8                                      | 0.070   | 1.25                                       |
| 470  | D            | 591D477(1)004D(2)(3)20H | 2.0                    | 18.8                                 | 8                                      | 0.060   | 1.53                                       |
| 470  | R            | 591D477(1)004R(2)(3)20H | 2.0                    | 18.8                                 | 10                                     | 0.045   | 1.97                                       |
| 680  | D            | 591D687(1)004D(2)(3)20H | 2.0                    | 27.2                                 | 12                                     | 0.085   | 1.28                                       |
| 680  | R            | 591D687(1)004R(2)(3)20H | 2.0                    | 27.2                                 | 12                                     | 0.045   | 1.97                                       |
| 1000   | R            | 591D108(1)004R(2)(3)20H | 2.0                    | 40.0                                 | 14                                     | 0.050   | 1.87                                       |
| <b>6.3 V<sub>DC</sub> AT + 85 °C; 4 V<sub>DC</sub> AT + 125 °C</b> |              |                         |                        |                                      |  |   |  |
| 10   | A            | 591D106(1)6R3A(2)(3)15H | 1.5                    | 0.6                                  | 6                                      | 1.900   | 0.18                                       |
| 15   | A            | 591D156(1)6R3A(2)(3)15H | 1.5                    | 0.9                                  | 6                                      | 1.300   | 0.21                                       |
| 15   | B            | 591D156(1)6R3B(2)(3)15H | 1.5                    | 0.9                                  | 6                                      | 0.800   | 0.32                                       |
| 22   | A            | 591D226(1)6R3A(2)(3)13H | 1.3                    | 1.4                                  | 6                                      | 0.800   | 0.26                                       |
| 22   | B            | 591D226(1)6R3B(2)(3)15H | 1.5                    | 1.4                                  | 6                                      | 0.800   | 0.32                                       |
| 33   | A            | 591D336(1)6R3A(2)(3)15H | 1.5                    | 2.1                                  | 6                                      | 1.000   | 0.24                                       |
| 33   | B            | 591D336(1)6R3B(2)(3)15H | 1.5                    | 2.1                                  | 6                                      | 0.800   | 0.32                                       |
| 33   | C            | 591D336(1)6R3C(2)(3)15H | 1.5                    | 2.1                                  | 6                                      | 0.200   | 0.71                                       |
| 47   | B            | 591D476(1)6R3B(2)(3)15H | 1.5                    | 3.0                                  | 8                                      | 0.800   | 0.32                                       |
| 47   | C            | 591D476(1)6R3C(2)(3)15H | 1.5                    | 3.0                                  | 6                                      | 0.200   | 0.71                                       |
| 47   | D            | 591D476(1)6R3D(2)(3)15H | 1.5                    | 3.0                                  | 6                                      | 0.140   | 0.94                                       |
| 68   | D            | 591D686(1)6R3D(2)(3)15H | 1.5                    | 4.3                                  | 6                                      | 0.130   | 0.98                                       |
| 68   | R            | 591D686(1)6R3R(2)(3)15H | 1.5                    | 4.3                                  | 6                                      | 0.110   | 1.17                                       |
| 100  | B            | 591D107(1)6R3B(2)(3)15H | 1.5                    | 6.3                                  | 8                                      | 0.500   | 0.40                                       |
| 100  | C            | 591D107(1)6R3C(2)(3)15H | 1.5                    | 6.3                                  | 8                                      | 0.190   | 0.73                                       |
| 100  | D            | 591D107(1)6R3D(2)(3)15H | 1.5                    | 6.3                                  | 8                                      | 0.150   | 0.91                                       |
| 100  | R            | 591D107(1)6R3R(2)(3)15H | 1.5                    | 6.3                                  | 8                                      | 0.100   | 1.22                                       |
| 120  | C            | 591D127(1)6R3C(2)(3)20H | 2.0                    | 7.2                                  | 8                                      | 0.100   | 1.05                                       |
| 150  | C            | 591D157(1)6R3C(2)(3)20H | 2.0                    | 9.5                                  | 8                                      | 0.080   | 1.17                                       |
| 150  | D            | 591D157(1)6R3D(2)(3)15H | 1.5                    | 9.5                                  | 8                                      | 0.120   | 1.02                                       |
| 150  | R            | 591D157(1)6R3R(2)(3)15H | 1.5                    | 9.5                                  | 8                                      | 0.140   | 1.04                                       |
| 220  | C            | 591D227(1)6R3C(2)(3)20H | 2.0                    | 13.9                                 | 8                                      | 0.075   | 1.21                                       |
| 220  | D            | 591D227(1)6R3D(2)(3)20H | 2.0                    | 13.9                                 | 8                                      | 0.065   | 1.47                                       |
| 220  | R            | 591D227(1)6R3R(2)(3)15H | 1.5                    | 13.9                                 | 8                                      | 0.150   | 1.00                                       |

**Note**

- Part number definitions:
  - Tolerance: For 10 % tolerance, specify "X9"; for 20 % tolerance, change to "X0"
  - Termination: For 100 % tin specify "2", for gold plated specify "4", for solder plated 60/40 specify "8"
  - Packaging code: For 7" reels specify "T", for 13" reels specify "W"



| STANDARD RATINGS   |              |                         |                        |                                      |  |   |  |
|--|--------------|-------------------------|------------------------|--------------------------------------|--|---|--|
| CAPACITANCE<br>( $\mu$ F)  | CASE<br>CODE | PART NUMBER             | HEIGHT<br>MAX.<br>(mm) | 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) |
| <b>6.3 V<sub>DC</sub> AT + 85 °C; 4 V<sub>DC</sub> AT + 125 °C</b> |              |                         |                        |                                      |  |   |  |
| 330  | C            | 591D337(1)6R3C(2)(3)20H | 2.0                    | 20.8                                 | 12                                     | 0.150   | 0.86                                       |
| 330  | D            | 591D337(1)6R3D(2)(3)20H | 2.0                    | 20.8                                 | 8                                      | 0.060   | 1.53                                       |
| 330  | R            | 591D337(1)6R3R(2)(3)20H | 2.0                    | 20.8                                 | 8                                      | 0.045   | 1.97                                       |
| 470  | C            | 591D477X06R3C(2)(3)16H  | 1.6                    | 29.6                                 | 14                                     | 0.080   | 1.12                                       |
| 470  | C            | 591D477(1)6R3C(2)(3)20H | 2.0                    | 29.6                                 | 14                                     | 0.080   | 1.17                                       |
| 470  | D            | 591D477(1)6R3D(2)(3)20H | 2.0                    | 29.6                                 | 10                                     | 0.085   | 1.28                                       |
| 470  | R            | 591D477(1)6R3R(2)(3)20H | 2.0                    | 29.6                                 | 10                                     | 0.045   | 1.97                                       |
| 680  | R            | 591D687(1)6R3R(2)(3)16H | 1.6                    | 42.8                                 | 10                                     | 0.060   | 1.60                                       |
| 680  | R            | 591D687(1)6R3R(2)(3)20H | 2.0                    | 42.8                                 | 10                                     | 0.060   | 1.71                                       |
| 1000   | R            | 591D108(1)6R3R(2)(3)20H | 2.0                    | 63.0                                 | 29                                     | 0.075   | 1.53                                       |
| 1500   | M            | 591D158X06R3M(2)(3)20H  | 2.0                    | 95.0                                 | 50                                     | 0.060   | 1.87                                       |
| 1500   | R            | 591D158X06R3R(2)(3)20H  | 2.0                    | 95.0                                 | 50                                     | 0.060   | 1.71                                       |
| <b>10 V<sub>DC</sub> AT + 85 °C; 7 V<sub>DC</sub> AT + 125 °C</b>  |              |                         |                        |                                      |  |   |  |
| 4.7  | A            | 591D475(1)010A(2)(3)15H | 1.5                    | 0.5                                  | 6                                      | 4.000   | 0.12                                       |
| 6.8  | A            | 591D685(1)010A(2)(3)15H | 1.5                    | 0.7                                  | 6                                      | 4.000   | 0.12                                       |
| 10   | A            | 591D106(1)010A(2)(3)15H | 1.5                    | 1.0                                  | 6                                      | 1.300   | 0.21                                       |
| 10   | B            | 591D106(1)010B(2)(3)15H | 1.5                    | 1.0                                  | 6                                      | 0.850   | 0.31                                       |
| 15   | B            | 591D156(1)010B(2)(3)15H | 1.5                    | 1.5                                  | 6                                      | 0.800   | 0.32                                       |
| 22   | A            | 591D226(1)010A(2)(3)13H | 1.3                    | 2.2                                  | 6                                      | 0.800   | 0.27                                       |
| 22   | A            | 591D226(1)010A(2)(3)15H | 1.5                    | 2.2                                  | 6                                      | 0.900   | 0.26                                       |
| 22   | B            | 591D226(1)010B(2)(3)15H | 1.5                    | 2.2                                  | 6                                      | 0.800   | 0.32                                       |
| 22   | C            | 591D226(1)010C(2)(3)15H | 1.5                    | 2.2                                  | 6                                      | 0.200   | 0.71                                       |
| 33   | C            | 591D336(1)010C(2)(3)15H | 1.5                    | 3.3                                  | 6                                      | 0.200   | 0.71                                       |
| 33   | D            | 591D336(1)010D(2)(3)15H | 1.5                    | 3.3                                  | 6                                      | 0.140   | 0.94                                       |
| 47   | D            | 591D476(1)010D(2)(3)15H | 1.5                    | 4.7                                  | 6                                      | 0.140   | 0.94                                       |
| 47   | R            | 591D476(1)010R(2)(3)15H | 1.5                    | 4.7                                  | 6                                      | 0.120   | 1.12                                       |
| 68   | C            | 591D686(1)010C(2)(3)15H | 1.5                    | 6.8                                  | 6                                      | 0.190   | 0.73                                       |
| 68   | D            | 591D686(1)010D(2)(3)15H | 1.5                    | 6.8                                  | 6                                      | 0.130   | 0.98                                       |
| 68   | R            | 591D686(1)010R(2)(3)15H | 1.5                    | 6.8                                  | 6                                      | 0.110   | 1.17                                       |
| 100  | B            | 591D107(1)010B(2)(3)20H | 2.0                    | 10.0                                 | 14                                     | 0.250   | 0.57                                       |
| 100  | C            | 591D107(1)010C(2)(3)20H | 2.0                    | 10.0                                 | 8                                      | 0.085   | 1.14                                       |
| 100  | D            | 591D107(1)010D(2)(3)15H | 1.5                    | 10.0                                 | 8                                      | 0.130   | 0.98                                       |
| 150  | C            | 591D157(1)010C(2)(3)15H | 1.5                    | 15.0                                 | 8                                      | 0.083   | 1.10                                       |
| 150  | C            | 591D157(1)010C(2)(3)20H | 2.0                    | 15.0                                 | 8                                      | 0.080   | 1.17                                       |
| 150  | D            | 591D157(1)010D(2)(3)15H | 1.5                    | 15.0                                 | 8                                      | 0.120   | 1.02                                       |
| 150  | D            | 591D157(1)010D(2)(3)20H | 2.0                    | 15.0                                 | 8                                      | 0.075   | 1.37                                       |
| 220  | D            | 591D227(1)010D(2)(3)20H | 2.0                    | 22.0                                 | 8                                      | 0.065   | 1.47                                       |
| 220  | R            | 591D227(1)010R(2)(3)20H | 2.0                    | 22.0                                 | 8                                      | 0.055   | 1.78                                       |
| 330  | D            | 591D337(1)010D(2)(3)20H | 2.0                    | 33.0                                 | 8                                      | 0.060   | 1.53                                       |
| 330  | R            | 591D337(1)010R(2)(3)18H | 1.8                    | 33.0                                 | 8                                      | 0.050   | 1.81                                       |
| 330  | R            | 591D337(1)010R(2)(3)20H | 2.0                    | 33.0                                 | 8                                      | 0.050   | 1.87                                       |

**Note**

- Part number definitions:
  - Tolerance: For 10 % tolerance, specify "X9"; for 20 % tolerance, change to "X0"
  - Termination: For 100 % tin specify "2", for gold plated specify "4", for solder plated 60/40 specify "8"
  - Packaging code: For 7" reels specify "T", for 13" reels specify "W"



| STANDARD RATINGS   |              |                         |                        |                                      |  |   |  |
|--|--------------|-------------------------|------------------------|--------------------------------------|--|---|--|
| CAPACITANCE<br>( $\mu$ F)  | CASE<br>CODE | PART NUMBER             | HEIGHT<br>MAX.<br>(mm) | 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) |
| <b>16 V<sub>DC</sub> AT + 85 °C; 10 V<sub>DC</sub> AT + 125 °C</b> |              |                         |                        |                                      |  |   |  |
| 4.7  | A            | 591D475(1)016A(2)(3)15H | 1.5                    | 0.8                                  | 6                                      | 1.750   | 0.19                                       |
| 6.8  | A            | 591D685(1)016A(2)(3)15H | 1.5                    | 1.1                                  | 6                                      | 1.750   | 0.19                                       |
| 6.8  | B            | 591D685(1)016B(2)(3)15H | 1.5                    | 1.1                                  | 6                                      | 0.900   | 0.30                                       |
| 10   | B            | 591D106(1)016B(2)(3)15H | 1.5                    | 1.6                                  | 6                                      | 0.800   | 0.32                                       |
| 10   | C            | 591D106(1)016C(2)(3)15H | 1.5                    | 1.6                                  | 6                                      | 0.500   | 0.45                                       |
| 15   | B            | 591D156(1)016B(2)(3)15H | 1.5                    | 2.4                                  | 6                                      | 0.700   | 0.34                                       |
| 15   | D            | 591D156(1)016D(2)(3)15H | 1.5                    | 2.4                                  | 6                                      | 0.250   | 0.71                                       |
| 22   | C            | 591D226(1)016C(2)(3)15H | 1.5                    | 3.5                                  | 6                                      | 0.240   | 0.65                                       |
| 22   | D            | 591D226(1)016D(2)(3)15H | 1.5                    | 3.5                                  | 6                                      | 0.180   | 0.83                                       |
| 33   | C            | 591D336(1)016C(2)(3)15H | 1.5                    | 5.3                                  | 6                                      | 0.180   | 0.75                                       |
| 33   | D            | 591D336(1)016D(2)(3)15H | 1.5                    | 5.3                                  | 6                                      | 0.170   | 0.86                                       |
| 33   | R            | 591D336(1)016R(2)(3)15H | 1.5                    | 5.3                                  | 6                                      | 0.140   | 1.04                                       |
| 47   | C            | 591D476(1)016C(2)(3)20H | 2.0                    | 7.5                                  | 6                                      | 0.180   | 0.78                                       |
| 47   | R            | 591D476(1)016R(2)(3)15H | 1.5                    | 7.5                                  | 6                                      | 0.130   | 1.07                                       |
| 68   | C            | 591D686(1)016C(2)(3)20H | 2.0                    | 10.9                                 | 6                                      | 0.100   | 1.05                                       |
| 68   | D            | 591D686(1)016D(2)(3)20H | 2.0                    | 10.9                                 | 6                                      | 0.080   | 1.32                                       |
| 100  | C            | 591D107(1)016C(2)(3)20H | 2.0                    | 16.0                                 | 8                                      | 0.100   | 1.05                                       |
| 100  | D            | 591D107(1)016D(2)(3)15H | 1.5                    | 16.0                                 | 8                                      | 0.100   | 1.12                                       |
| 100  | D            | 591D107(1)016D(2)(3)20H | 2.0                    | 16.0                                 | 8                                      | 0.075   | 1.37                                       |
| 150  | D            | 591D157(1)016D(2)(3)20H | 2.0                    | 24.0                                 | 8                                      | 0.080   | 1.32                                       |
| 150  | R            | 591D157(1)016R(2)(3)20H | 2.0                    | 24.0                                 | 8                                      | 0.060   | 1.71                                       |
| 220  | R            | 591D227(1)016R(2)(3)20H | 2.0                    | 35.2                                 | 10                                     | 0.075   | 1.53                                       |
| <b>20 V<sub>DC</sub> AT + 85 °C; 13 V<sub>DC</sub> AT + 125 °C</b> |              |                         |                        |                                      |  |   |  |
| 2.2  | A            | 591D225(1)020A(2)(3)15H | 1.5                    | 0.5                                  | 6                                      | 4.000   | 0.12                                       |
| 4.7  | A            | 591D475(1)020A(2)(3)15H | 1.5                    | 0.9                                  | 6                                      | 1.900   | 0.18                                       |
| 4.7  | B            | 591D475(1)020B(2)(3)15H | 1.5                    | 0.9                                  | 6                                      | 1.600   | 0.22                                       |
| 6.8  | B            | 591D685(1)020B(2)(3)15H | 1.5                    | 1.4                                  | 6                                      | 1.600   | 0.22                                       |
| 6.8  | C            | 591D685(1)020C(2)(3)15H | 1.5                    | 1.4                                  | 6                                      | 0.400   | 0.50                                       |
| 10   | B            | 591D106(1)020B(2)(3)15H | 1.5                    | 2.0                                  | 6                                      | 1.500   | 0.23                                       |
| 10   | D            | 591D106(1)020D(2)(3)15H | 1.5                    | 2.0                                  | 6                                      | 0.270   | 0.68                                       |
| 15   | C            | 591D156(1)020C(2)(3)15H | 1.5                    | 3.0                                  | 6                                      | 0.300   | 0.58                                       |
| 22   | D            | 591D226(1)020D(2)(3)15H | 1.5                    | 4.4                                  | 6                                      | 0.200   | 0.79                                       |
| 22   | R            | 591D226(1)020R(2)(3)15H | 1.5                    | 4.4                                  | 6                                      | 0.140   | 1.04                                       |
| 33   | R            | 591D336(1)020R(2)(3)15H | 1.5                    | 6.6                                  | 6                                      | 0.140   | 1.04                                       |
| 100  | R            | 591D107(1)020R(2)(3)20H | 2.0                    | 20.0                                 | 10                                     | 0.100   | 0.94                                       |
| <b>25 V<sub>DC</sub> AT + 85 °C; 17 V<sub>DC</sub> AT + 125 °C</b> |              |                         |                        |                                      |  |   |  |
| 2.2  | A            | 591D225(1)025A(2)(3)15H | 1.5                    | 0.6                                  | 6                                      | 5.000   | 0.11                                       |
| 2.2  | B            | 591D225(1)025B(2)(3)15H | 1.5                    | 0.6                                  | 6                                      | 3.800   | 0.15                                       |
| 3.3  | B            | 591D335(1)025B(2)(3)15H | 1.5                    | 0.8                                  | 6                                      | 3.700   | 0.15                                       |
| 3.3  | C            | 591D335(1)025C(2)(3)15H | 1.5                    | 0.8                                  | 6                                      | 1.000   | 0.32                                       |
| 4.7  | C            | 591D475(1)025C(2)(3)15H | 1.5                    | 1.2                                  | 6                                      | 0.800   | 0.35                                       |
| 6.8  | C            | 591D685(1)025C(2)(3)15H | 1.5                    | 1.7                                  | 6                                      | 0.750   | 0.37                                       |
| 6.8  | D            | 591D685(1)025D(2)(3)15H | 1.5                    | 1.7                                  | 6                                      | 0.650   | 0.44                                       |
| 10   | B            | 591D106X0025B(2)(3)15H  | 1.5                    | 2.5                                  | 6                                      | 1.000   | 0.28                                       |
| 10   | D            | 591D106(1)025D(2)(3)15H | 1.5                    | 2.5                                  | 6                                      | 0.600   | 0.46                                       |
| 10   | R            | 591D106(1)025R(2)(3)15H | 1.5                    | 2.5                                  | 6                                      | 0.240   | 0.79                                       |
| 15   | R            | 591D156(1)025R(2)(3)15H | 1.5                    | 3.8                                  | 6                                      | 0.200   | 0.87                                       |
| 33   | C            | 591D336(1)025C(2)(3)16H | 1.6                    | 8.3                                  | 6                                      | 0.250   | 0.63                                       |
| 33   | C            | 591D336(1)025C(2)(3)20H | 2.0                    | 8.3                                  | 6                                      | 0.250   | 0.66                                       |
| 68   | R            | 591D686(1)025R(2)(3)20H | 2.0                    | 17.0                                 | 8                                      | 0.175   | 1.00                                       |

Note

- Part number definitions:
  - Tolerance: For 10 % tolerance, specify "X9"; for 20 % tolerance, change to "X0"
  - Termination: For 100 % tin specify "2", for gold plated specify "4", for solder plated 60/40 specify "8"
  - Packaging code: For 7" reels specify "T", for 13" reels specify "W"



| STANDARD RATINGS   |              |                         |                        |                                      |  |   |  |
|--|--------------|-------------------------|------------------------|--------------------------------------|--|---|--|
| CAPACITANCE<br>( $\mu$ F)  | CASE<br>CODE | PART NUMBER             | HEIGHT<br>MAX.<br>(mm) | 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) |
| <b>35 V<sub>DC</sub> AT + 85 °C; 23 V<sub>DC</sub> AT + 125 °C</b> |              |                         |                        |                                      |  |   |  |
| 1.0  | A            | 591D105(1)035A(2)(3)15H | 1.5                    | 0.5                                  | 4                                      | 5.000   | 0.11                                       |
| 1.0  | B            | 591D105(1)035B(2)(3)15H | 1.5                    | 0.5                                  | 4                                      | 4.400   | 0.13                                       |
| 1.5  | B            | 591D155(1)035B(2)(3)15H | 1.5                    | 0.5                                  | 4                                      | 3.800   | 0.15                                       |
| 2.2  | B            | 591D225(1)035B(2)(3)15H | 1.5                    | 0.8                                  | 6                                      | 4.000   | 0.14                                       |
| 2.2  | C            | 591D225(1)035C(2)(3)15H | 1.5                    | 0.8                                  | 6                                      | 2.000   | 0.22                                       |
| 3.3  | B            | 591D335(1)035B(2)(3)15H | 1.5                    | 1.2                                  | 6                                      | 3.500   | 0.15                                       |
| 3.3  | C            | 591D335(1)035C(2)(3)15H | 1.5                    | 1.2                                  | 6                                      | 1.900   | 0.23                                       |
| 3.3  | D            | 591D335(1)035D(2)(3)15H | 1.5                    | 1.2                                  | 6                                      | 1.500   | 0.29                                       |
| 4.7  | B            | 591D475(1)035B(2)(3)15H | 1.5                    | 1.6                                  | 6                                      | 0.800   | 0.32                                       |
| 6.8  | D            | 591D685(1)035D(2)(3)15H | 1.5                    | 2.4                                  | 6                                      | 0.950   | 0.36                                       |
| 6.8  | R            | 591D685(1)035R(2)(3)15H | 1.5                    | 2.4                                  | 6                                      | 0.750   | 0.45                                       |
| 10   | R            | 591D106(1)035R(2)(3)15H | 1.5                    | 3.5                                  | 6                                      | 0.600   | 0.50                                       |
| <b>50 V<sub>DC</sub> AT + 85 °C; 33 V<sub>DC</sub> AT + 125 °C</b> |              |                         |                        |                                      |  |   |  |
| 1.0  | B            | 591D155(1)050B(2)(3)15H | 1.5                    | 0.8                                  | 6                                      | 6.500   | 0.11                                       |
| 4.7  | C            | 591D475(1)050C(2)(3)20H | 2.0                    | 23.5                                 | 6                                      | 6.000   | 0.14                                       |

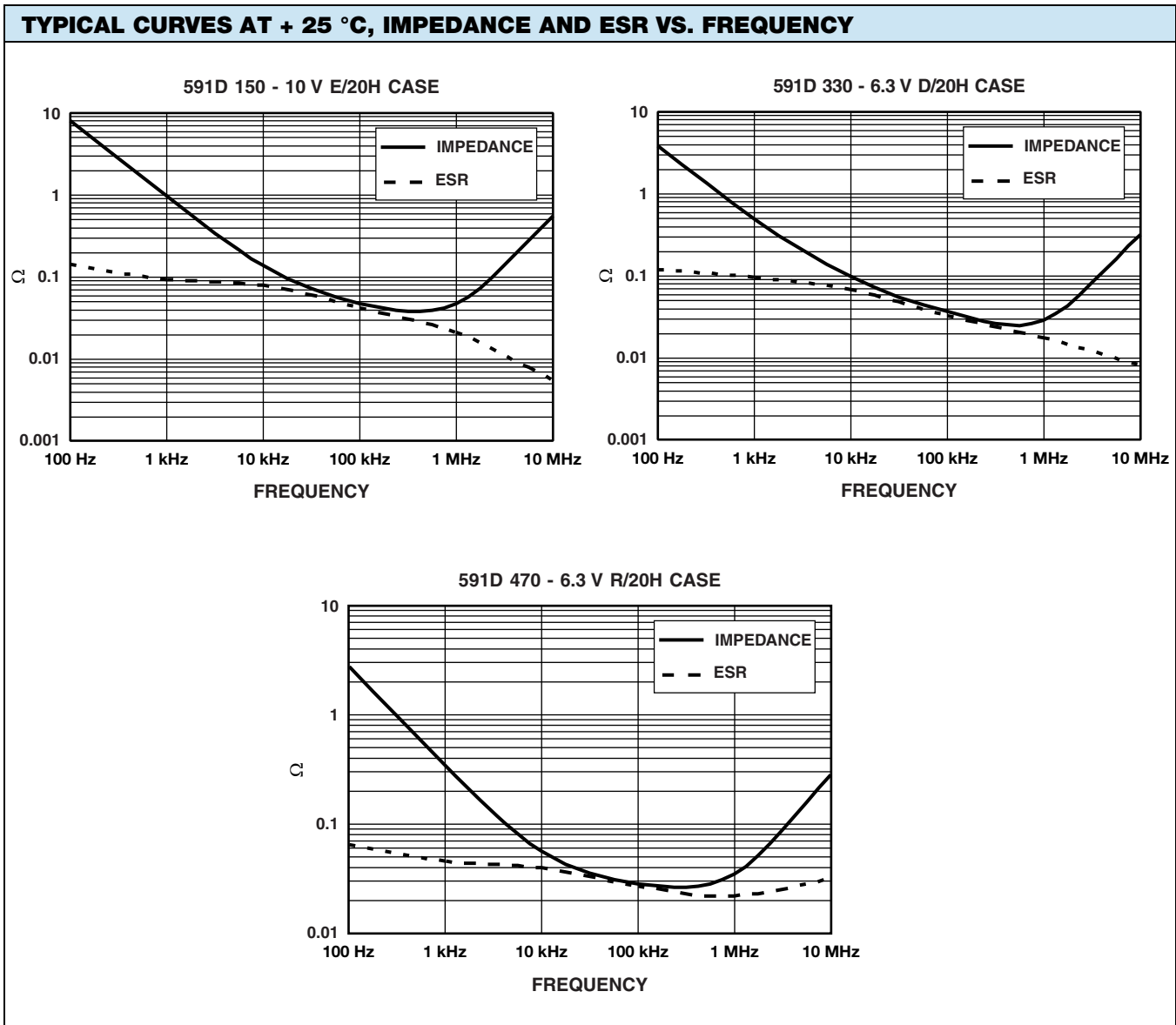
Note

- Part number definitions:
  - Tolerance: For 10 % tolerance, specify "X9"; for 20 % tolerance, change to "X0"
  - Termination: For 100 % tin specify "2", for gold plated specify "4", for solder plated 60/40 specify "8"
  - Packaging code: For 7" reels specify "T", for 13" reels specify "W"

| 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                |
| 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                |

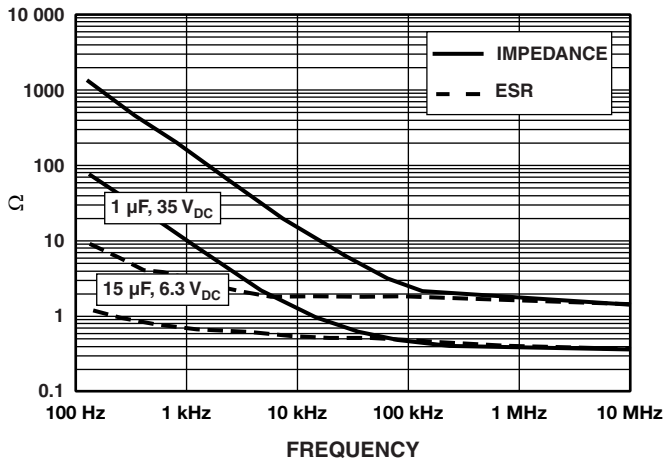


| CASE CODE/PART NUMBER X-REF |        |
|-----------------------------|--------|
| OLD                         | NEW    |
| A2_                         | A2_15H |
| B2_                         | B2_15H |
| C2_                         | C2_15H |
| D2_                         | D2_15H |
| R2_                         | R2_15H |
| U2_                         | C2_20H |
| V2_                         | D2_20H |
| W2_                         | R2_20H |

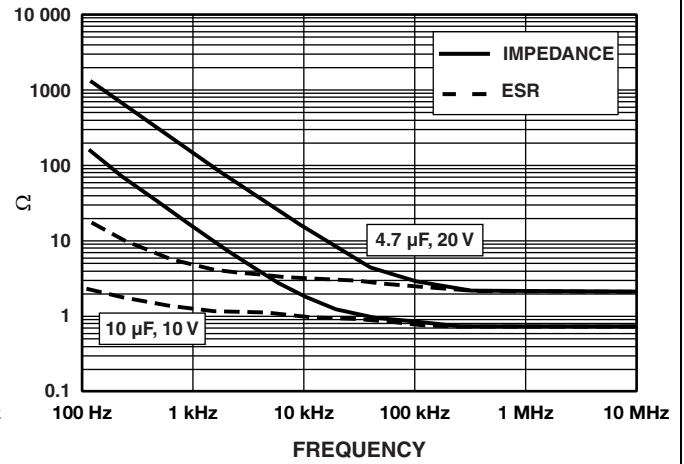


**TYPICAL CURVES AT + 25 °C, IMPEDANCE AND ESR VS. FREQUENCY**

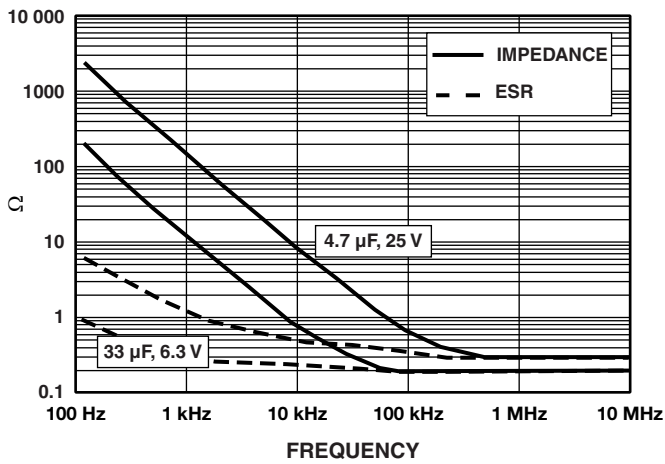
“A” CASE



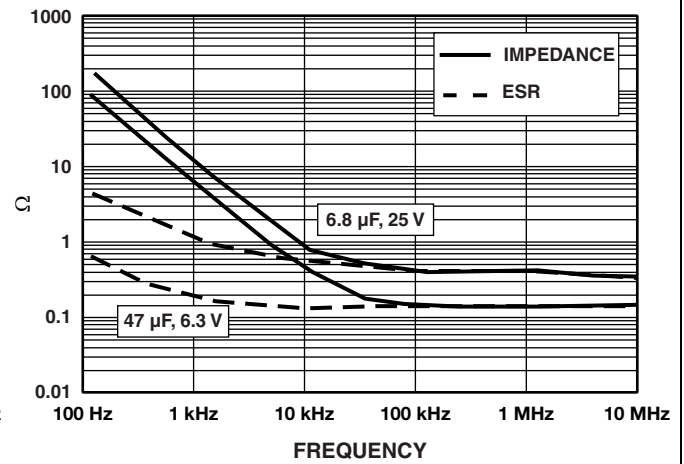
“B” CASE



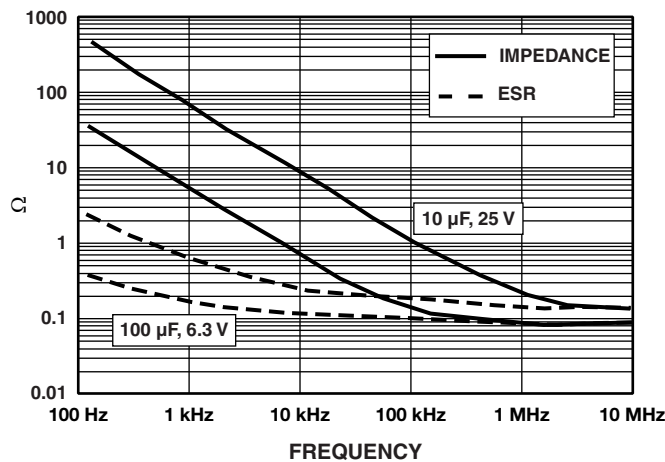
“C” CASE



“D” CASE



“R” CASE







| POWER DISSIPATION |        |  |
|-------------------|--------|--|
| CASE CODE         | HEIGHT | MAXIMUM PERMISSIBLE POWER DISSIPATION AT + 25 °C (W) IN FREE AIR |
| A                 | 13H    | 0.055  |
| A                 | 15H    | 0.060  |
| B                 | 15H    | 0.080  |
| B                 | 20H    | 0.085  |
| C                 | 15H    | 0.100  |
| C                 | 16H    | 0.100  |
| C                 | 20H    | 0.110  |
| D                 | 15H    | 0.125  |
| D                 | 20H    | 0.140  |
| M                 | 20H    | 0.175  |
| R                 | 15H    | 0.150  |
| R                 | 16H    | 0.155  |
| R                 | 18H    | 0.165  |
| R                 | 20H    | 0.175  |

| STANDARD PACKAGING QUANTITY |               |                |          |
|-----------------------------|---------------|----------------|----------|
| CASE CODE                   | HEIGHT        | UNITS PER REEL |          |
|                             |               | 7" REEL        | 13" REEL |
| A                           | Any           | 2500           | 10 000   |
| B                           | Any           | 2000           | 8000     |
| C                           | Any           | 1000           | 4000     |
| D                           | Any           | 1000           | 4000     |
| M                           | 20H           | 1000           | 2500     |
| R                           | 15H           | 1000           | 4000     |
| R                           | 16H; 18H; 20H | 1000           | 2500     |

| PRODUCT INFORMATION  |  |
|--|--|
| Conformal Coated Guide<br>• Recommended Pad Layouts<br>• Carrier Tape Information<br>• Reflow Profiles | <a href="http://www.vishay.com/doc?40150">www.vishay.com/doc?40150</a> |
| Moisture Sensitivity   | <a href="http://www.vishay.com/doc?40135">www.vishay.com/doc?40135</a> |
| SELECTOR GUIDES  |  |
| 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> |
| FAQ  |  |
| Frequently Asked Questions   | <a href="http://www.vishay.com/doc?40110">www.vishay.com/doc?40110</a> |



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