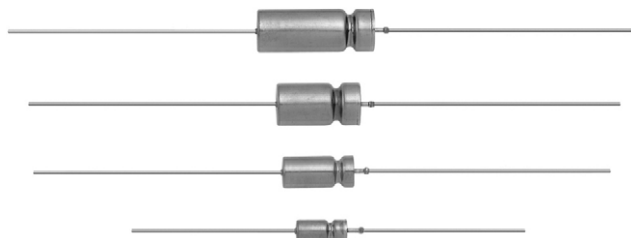


# Wet Tantalum HI-TMP® Capacitors Tantalum Case with Glass-to-Tantalum Hermetic Seal for -55 °C to +200 °C Operation



## PERFORMANCE CHARACTERISTICS

**Operating Temperature:** -55 °C to +85 °C

(to +200 °C with voltage derating)

**Capacitance Tolerance:** at 120 Hz, +25 °C; ± 20 % standard; ± 10 %

**DC Leakage Current (DCL Max.):** at +25 °C and above: leakage current shall not exceed the values listed in the Standard Ratings tables.

**Life Test:** capacitors are capable of withstanding a minimum 500 h life test at a temperature of +200 °C at the applicable derated DC working voltage.

## FEATURES

- High capacitance
- Hermetically sealed, tantalum case
- +200 °C high temperature
- Terminations: axial, standard tin / lead (SnPb)
- 100 % tin (RoHS-compliant) available
- Mounting: through-hole
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS\***  
Available

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

## Note

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

## APPLICATIONS

- Industrial
- Petroleum exploration
- High temperature / high stress environment

## ORDERING INFORMATION

| 134D  | 227         | X0                         | 100   | K                                | 6  | E3   |
|---|-------------|----------------------------|---|----------------------------------|--|--|
| TYPE  | CAPACITANCE | CAPACITANCE TOLERANCE      | DC VOLTAGE RATING AT +85 °C   | CASE CODE                        | STYLE NUMBER   | RoHS COMPLIANT   |
| 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 % | 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 | High temperature<br>8 = no outer insulating sleeve<br>6 = high temperature film insulation (above +125 °C) | E3 = 100 % tin termination (RoHS compliant design)<br>Blank = SnPb termination (standard design) |

## Note

- Packaging: the use of formed plastic trays for packaging these axial lead components is standard. Tape and reel is not available due to the unit weight

## DIMENSIONS in inches [millimeters]

| CASE CODE |                    | D                              | L <sub>1</sub> (1)                                 | L <sub>2</sub> (Max.) | E                               | WEIGHT (g) (Max.) |
|-----------|--------------------|--------------------------------|--|-----------------------|---------------------------------|-------------------|
| TYPE 134D | CLR 79 / 81 EQUIV. |                                |  |                       |                                 |                   |
| C         | T1                 | 0.188 ± 0.016<br>[4.78 ± 0.41] | 0.453 + 0.031 / - 0.016<br>[11.51 + 0.79 / - 0.41] | 0.734<br>[18.64]      | 1.500 ± 0.250<br>[38.10 ± 6.35] | 2.6               |
| F         | T2                 | 0.281 ± 0.016<br>[7.14 ± 0.41] | 0.641 + 0.031 / - 0.016<br>[16.28 + 0.79 / - 0.41] | 0.922<br>[23.42]      | 2.250 ± 0.250<br>[57.15 ± 6.35] | 6.2               |
| T         | T3                 | 0.375 ± 0.016<br>[9.53 ± 0.41] | 0.766 + 0.031 / - 0.016<br>[19.46 + 0.79 / - 0.41] | 1.047<br>[26.59]      | 2.250 ± 0.250<br>[57.15 ± 6.35] | 11.6              |
| K         | T4                 | 0.375 ± 0.016<br>[9.53 ± 0.41] | 1.062 + 0.031 / - 0.016<br>[26.97 + 0.79 / - 0.41] | 1.343<br>[34.11]      | 2.250 ± 0.250<br>[57.15 ± 6.35] | 17.7              |

## Note

(1) For insulated parts, add 0.015 inches [0.38 mm] to the diameter. The insulation shall lap over the ends of the capacitor body

**STANDARD RATINGS**

| CAPACITANCE<br>AT 25 °C<br>120 Hz<br>(μF)  | CASE<br>CODE | MAX.<br>120 Hz<br>ESR<br>(Ω) | MAX. DCL<br>(μA)<br>25 °C | 85 °C/<br>125 °C | MAX.<br>IMP., Z<br>AT -25 °C<br>(Ω) | MAX.<br>ΔCAP.<br>AT -25 °C<br>(%) | TYP.<br>ΔCAP. (%)<br>85 °C | 125 °C | AC<br>RIPPLE<br>85 °C<br>40 kHz<br>(mA) RMS | PART NUMBER          | LIFE TEST<br>PERFORMANCE<br>(h AT +200 °C) |
|--|--------------|------------------------------|---------------------------|------------------|-------------------------------------|-----------------------------------|----------------------------|--------|---|----------------------|--|
| <b>50 V<sub>DC</sub> AT 85 °C; 30 V<sub>DC</sub> AT 125 °C; 30 V<sub>DC</sub> AT 200 °C</b>  |              |                              |                           |                  |                                     |                                   |                            |        |   |                      |  |
| 68   | C            | 1.50                         | 1                         | 5                | 22                                  | -6                                | 12                         | 55     | 1400  | 134D686(1)050C(2)(3) | 500  |
| 220  | F            | 0.90                         | 2                         | 10               | 9                                   | -15                               | 13                         | 50     | 2300  | 134D227(1)050F(2)(3) | 500  |
| 470  | T            | 0.75                         | 3                         | 25               | 6                                   | -24                               | 10                         | 25     | 2650  | 134D477(1)050T(2)(3) | 500  |
| 680  | K            | 0.70                         | 5                         | 40               | 4                                   | -22                               | 12                         | 40     | 2900  | 134D687(1)050K(2)(3) | 500  |
| <b>60 V<sub>DC</sub> AT 85 °C; 40 V<sub>DC</sub> AT 125 °C; 36 V<sub>DC</sub> AT 200 °C</b>  |              |                              |                           |                  |                                     |                                   |                            |        |   |                      |  |
| 47   | C            | 2.00                         | 1                         | 5                | 34                                  | -8                                | 8                          | 12     | 1250  | 134D476(1)060C(2)(3) | 500  |
| 150  | F            | 1.10                         | 2                         | 10               | 13                                  | -11                               | 10                         | 30     | 2050  | 134D157(1)060F(2)(3) | 500  |
| 390  | T            | 0.90                         | 3                         | 25               | 7                                   | -27                               | 10                         | 25     | 2450  | 134D397(1)060T(2)(3) | 500  |
| 560  | K            | 0.80                         | 5                         | 40               | 5                                   | -21                               | 12                         | 40     | 2700  | 134D567(1)060K(2)(3) | 500  |
| <b>75 V<sub>DC</sub> AT 85 °C; 50 V<sub>DC</sub> AT 125 °C; 45 V<sub>DC</sub> AT 200 °C</b>  |              |                              |                           |                  |                                     |                                   |                            |        |   |                      |  |
| 33   | C            | 2.50                         | 1                         | 5                | 45                                  | -3.5                              | 8                          | 25     | 1100  | 134D336(1)075C(2)(3) | 500  |
| 110  | F            | 1.30                         | 2                         | 10               | 16                                  | -8                                | 8                          | 30     | 1900  | 134D117(1)075F(2)(3) | 500  |
| 330  | T            | 1.00                         | 3                         | 30               | 8                                   | -30                               | 10                         | 25     | 2300  | 134D337(1)075T(2)(3) | 500  |
| 470  | K            | 0.90                         | 5                         | 50               | 6                                   | -20                               | 10                         | 40     | 2550  | 134D477(1)075K(2)(3) | 500  |
| <b>100 V<sub>DC</sub> AT 85 °C; 65 V<sub>DC</sub> AT 125 °C; 60 V<sub>DC</sub> AT 200 °C</b> |              |                              |                           |                  |                                     |                                   |                            |        |   |                      |  |
| 15   | C            | 3.50                         | 1                         | 5                | 95                                  | -2.5                              | 8                          | 25     | 950   | 134D156(1)100C(2)(3) | 500  |
| 68   | F            | 2.10                         | 2                         | 10               | 25                                  | -6                                | 8                          | 25     | 1500  | 134D686(1)100F(2)(3) | 500  |
| 150  | T            | 1.60                         | 3                         | 25               | 14                                  | -12                               | 8                          | 22     | 1800  | 134D157(1)100T(2)(3) | 500  |
| 220  | K            | 1.20                         | 5                         | 50               | 13                                  | -44                               | 8                          | 15     | 2200  | 134D227(1)100K(2)(3) | 1000                                       |
| <b>125 V<sub>DC</sub> AT 85 °C; 85 V<sub>DC</sub> AT 125 °C; 75 V<sub>DC</sub> AT 200 °C</b> |              |                              |                           |                  |                                     |                                   |                            |        |   |                      |  |
| 10   | C            | 5.50                         | 1                         | 5                | 145                                 | -2.5                              | 8                          | 20     | 750   | 134D106(1)125C(2)(3) | 500  |
| 47   | F            | 2.30                         | 2                         | 10               | 35                                  | -5                                | 7                          | 20     | 1450  | 134D476(1)125F(2)(3) | 500  |
| 50   | F            | 2.30                         | 3                         | 10               | 35                                  | -5                                | 7                          | 20     | 1450  | 134D506(1)125F(2)(3) | 500  |
| 100  | T            | 1.80                         | 3                         | 25               | 24                                  | -20                               | 8                          | 20     | 1700  | 134D107(1)125T(2)(3) | 500  |
| 150  | K            | 1.60                         | 5                         | 50               | 13                                  | -10                               | 6                          | 12     | 1900  | 134D157(1)125K(2)(3) | 500  |

**Note**

- Part number definitions:
  - Capacitance tolerance: X9 = 10 %, X0 = 20 %
  - Style number: 8 = no film insulation, 6 = high temperature film insulation
  - Termination: blank = standard tin/lead, E3 = RoHS compliant 100 % tin



| EXTENDED RATINGS   |                  |                              |                  |     |                                     |                                   |                   |      |   |                      |  |
|--|------------------|------------------------------|------------------|-----|-------------------------------------|-----------------------------------|-------------------|------|---|----------------------|--|
| CAPACITANCE<br>AT 25 °C<br>120 Hz<br>(μF)  | CASE<br>CODE     | MAX.<br>120 Hz<br>ESR<br>(Ω) | MAX. DCL<br>(μA) |     | MAX.<br>IMP., Z<br>AT -25 °C<br>(Ω) | MAX.<br>ΔCAP.<br>AT -25 °C<br>(%) | TYP.<br>ΔCAP. (%) |      | AC<br>RIPPLE<br>85 °C<br>40 kHz<br>(mA) RMS | PART NUMBER          | LIFE TEST<br>PERFORMANCE<br>(h AT +200 °C) |
| 50 V <sub>DC</sub> AT 85 °C; 30 V <sub>DC</sub> AT 125 °C; 30 V <sub>DC</sub> AT 200 °C  |                  |                              |                  |     |                                     |                                   |                   |      |   |                      |  |
|  | C<br>F<br>T<br>K |                              |                  |     |                                     |                                   |                   |      |   |                      |  |
| 60 V <sub>DC</sub> AT 85 °C; 40 V <sub>DC</sub> AT 125 °C; 36 V <sub>DC</sub> AT 200 °C  |                  |                              |                  |     |                                     |                                   |                   |      |   |                      |  |
| 1000   | C<br>F<br>T<br>K | 0.50                         | 20               | 120 | 3                                   | -25                               | < 12              | < 15 | 3500  | 134D108(1)060K(2)(3) | 500  |
| 75 V <sub>DC</sub> AT 85 °C; 50 V <sub>DC</sub> AT 125 °C; 45 V <sub>DC</sub> AT 200 °C  |                  |                              |                  |     |                                     |                                   |                   |      |   |                      |  |
| 180  | C<br>F<br>T      | 1.50                         | 5                | 25  |                                     |                                   | 15                | 20   | 2000  | 134D187(1)075F(2)(3) | 500  |
| 750  | K                | 0.60                         | 20               | 120 | 3                                   | -25                               | < 10              | < 15 | 3500  | 134D757(1)075K(2)(3) | 500  |
| 1000   | K                | 0.50                         | 25               | 90  | 3                                   | -30                               | < 20              | < 25 | 3500  | 134D108(1)075K(2)(3) | 500  |
| 100 V <sub>DC</sub> AT 85 °C; 65 V <sub>DC</sub> AT 125 °C; 60 V <sub>DC</sub> AT 200 °C |                  |                              |                  |     |                                     |                                   |                   |      |   |                      |  |
| 220  | C<br>F<br>T      | 1.60                         | 5                | 30  | 15                                  | -40                               | 10                | 15   | 1800  | 134D227(1)100T(2)(3) | 500  |
| 400  | K                | 0.70                         | 10               | 120 | 5                                   | -15                               | 10                | 15   | 3250  | 134D407(1)100K(2)(3) | 500  |
| 470  | K                | 0.70                         | 25               | 200 | 8                                   | -15                               | 5                 | 10   | 3250  | 134D477(1)100K(2)(3) | 1000                                       |
| 560  | K                | 0.70                         | 25               | 200 | 5                                   | -25                               | 15                | 20   | 5500  | 134D567(1)100K(2)(3) | 1000                                       |
| 750  | K                | 0.90                         | 30               | 150 | 4                                   | -30                               | 20                | 25   | 4500  | 134D757(1)100K(2)(3) | 500  |
| 125 V <sub>DC</sub> AT 85 °C; 85 V <sub>DC</sub> AT 125 °C; 75 V <sub>DC</sub> AT 200 °C |                  |                              |                  |     |                                     |                                   |                   |      |   |                      |  |
| 240  | C<br>F<br>T      | 0.80                         | 10               | 50  | 10                                  | -10                               | 6                 | 12   | 2500  | 134D247(1)125K(2)(3) | 500  |
| 350  | K                | 0.80                         | 25               | 250 | 15                                  | -55                               | 8                 | 12   | 3250  | 134D357(1)125K(2)(3) | 1000 <sup>(1)</sup>                        |

**Notes**

- In bold and italic: preliminary rating and electrical values. Contact marketing for availability
- Part number definitions:
  - (1) Capacitance tolerance: X9 = 10 %, X0 = 20 %
  - (2) Style number: 8 = no film insulation, 6 = high temperature film insulation
  - (3) Termination: blank = standard tin / lead, E3 = RoHS compliant 100 % tin
- (1) This rating withstands 62 V<sub>DC</sub> at 200 °C for 1000 h

| RIPPLE CURRENT MULTIPLIERS VS. FREQUENCY, TEMPERATURE, AND APPLIED PEAK VOLTAGE |          |        |      |      |      |        |      |      |      |       |      |      |      |        |      |      |      |        |      |      |      |         |      |      |      |
|---|----------|--------|------|------|------|--------|------|------|------|-------|------|------|------|--------|------|------|------|--------|------|------|------|---------|------|------|------|
| FREQUENCY OF<br>APPLIED RIPPLE<br>CURRENT                                       |          | 120 Hz |      |      |      | 800 Hz |      |      |      | 1 kHz |      |      |      | 10 kHz |      |      |      | 40 kHz |      |      |      | 100 kHz |      |      |      |
| AMBIENT STILL<br>AIR TEMP. IN °C  |          | ≤ 55   | 85   | 105  | 125  | ≤ 55   | 85   | 105  | 125  | ≤ 55  | 85   | 105  | 125  | ≤ 55   | 85   | 105  | 125  | ≤ 55   | 85   | 105  | 125  | ≤ 55    | 85   | 105  | 125  |
| % of<br>85 °C<br>rated<br>peak<br>voltage                                       | 100 %    | 0.60   | 0.39 | -    | -    | 0.71   | 0.43 | -    | -    | 0.72  | 0.46 | -    | -    | 0.88   | 0.55 | -    | -    | 1.0    | 0.63 | -    | -    | 1.1     | 0.69 | -    | -    |
|   | 90 %     | 0.60   | 0.46 | -    | -    | 0.71   | 0.55 | -    | -    | 0.72  | 0.55 | -    | -    | 0.88   | 0.67 | -    | -    | 1.0    | 0.77 | -    | -    | 1.1     | 0.85 | -    | -    |
|   | 80 %     | 0.60   | 0.52 | 0.35 | -    | 0.71   | 0.62 | 0.42 | -    | 0.72  | 0.62 | 0.42 | -    | 0.88   | 0.76 | 0.52 | -    | 1.0    | 0.87 | 0.59 | -    | 1.1     | 0.96 | 0.65 | -    |
|   | 70 %     | 0.60   | 0.58 | 0.44 | -    | 0.71   | 0.69 | 0.52 | -    | 0.72  | 0.70 | 0.52 | -    | 0.88   | 0.85 | 0.64 | -    | 1.0    | 0.97 | 0.73 | -    | 1.1     | 1.07 | 0.80 | -    |
|   | 66 2/3 % | 0.60   | 0.60 | 0.46 | 0.27 | 0.71   | 0.71 | 0.55 | 0.32 | 0.72  | 0.72 | 0.55 | 0.32 | 0.88   | 0.88 | 0.68 | 0.40 | 1.0    | 1.0  | 0.77 | 0.45 | 1.1     | 1.1  | 0.85 | 0.50 |

**TYPICAL PERFORMANCE CHARACTERISTICS OF 134D CAPACITORS**

| <b>ELECTRICAL CHARACTERISTICS</b> |  |
|-----------------------------------|--|
| ITEM                              | PERFORMANCE CHARACTERISTICS  |
| Operating temperature range       | -55 °C to +85 °C (to +200 °C with voltage derating)  |
| Capacitor tolerance               | ± 20 %, ± 10 % at 120 Hz, at +25 °C  |
| Capacitor change by temperature   | Limit per Standard Ratings table   |
| ESR                               | Limit per Standard Ratings table, at +25 °C, 120 Hz  |
| Impedance                         | Limit per Standard Ratings table, at -55 °C, 120 Hz  |
| DCL (leakage current)             | Limit per Standard Ratings table   |
| AC ripple current                 | Limit per Standard Ratings table, at +85 °C and 40 kHz   |
| Reverse voltage                   | None   |
| Surge voltage                     | Surge voltage shall be in accordance with MIL-PRF-39006 and Table 2 of DSCC93026.<br>The DC rated surge voltage is the maximum voltage to which the capacitors can be subjected under any conditions including transients and peak ripple at the highest line voltage.<br>The DC surge voltage is 115 % of rated DC voltage. |

| <b>PERFORMANCE CHARACTERISTICS</b> |  |
|------------------------------------|--|
| ITEM                               | PERFORMANCE CHARACTERISTICS  |
| Life testing                       | Capacitors shall be capable of withstanding a minimum 500 h life test at a temperature +200 °C at derated voltage. |

| <b>ENVIRONMENTAL CHARACTERISTICS</b> |                                      |  |
|--------------------------------------|--------------------------------------|--|
| ITEM                                 | CONDITION                            | COMMENTS   |
| Seal                                 | MIL-PRF-39006                        | When the capacitors are tested as specified in MIL-PRF-39006, there shall be no evidence of leakage.     |
| Moisture resistance                  | MIL-PRF-39006                        | Moisture resistance shall be in accordance with MIL-PRF-39006.<br>Number of cycles: 10 continuous cycles |
| Barometric pressure (reduced)        | MIL-STD-202, method 105, condition E | Altitude 150 000 feet  |

| <b>MECHANICAL CHARACTERISTICS</b> |  |  |
|-----------------------------------|--|--|
| ITEM                              | CONDITION  | COMMENTS   |
| Shock (specified pulse)           | MIL-STD-202, method 213, condition I (100 g)     | The capacitors shall meet the requirements of MIL-PRF-39006.   |
| Vibration, high frequency         | MIL-STD-202, method 204, condition D (20 g peak) | The capacitors shall meet the requirements of MIL-PRF-39006.   |
| Thermal shock                     | MIL-STD-202, method 107, condition A             | Thermal shock shall be in accordance with MIL-PRF-39006 when tested for 30 cycles.   |
| Solderability                     | MIL-STD-202, method 208, ANSI/J-STD-002, test A  | Solderability shall be in accordance with MIL-PRF-39006.   |
| Terminal strength                 | MIL-STD-202, method 211                          | Terminal strength shall be in accordance with MIL-PRF-39006.   |
| Resistance to solder heat         | MIL-STD-202, method 210, condition C             | The capacitors shall meet the requirements of MIL-PRF-39006.   |
| Terminals                         | MIL-STD-1276                                     | Terminals shall be as specified in MIL-STD-1276. The length and diameter of the terminals shall be as specified in Dimensions table. All terminals shall be permanently secured internally and externally, as applicable. All external joints shall be welded. |
| Marking                           | MIL-STD-1285                                     | Marking of capacitors conforms to method I of MIL-STD-1285 and include capacitance (in µF), capacitance tolerance letter, rated voltage, date code, lot symbol, and Vishay trademark.  |

| <b>SELECTOR GUIDES</b>     |  |
|----------------------------|--|
| Tantalum Selector Guide    | <a href="http://www.vishay.com/doc?49054">www.vishay.com/doc?49054</a> |
| Parameter Comparison Guide | <a href="http://www.vishay.com/doc?42088">www.vishay.com/doc?42088</a> |



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