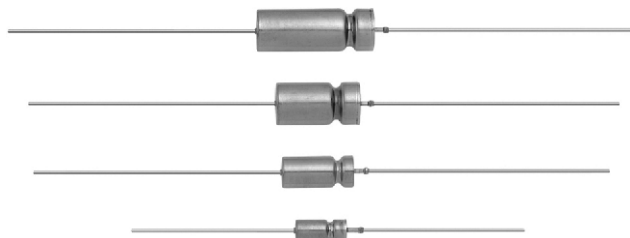


# Wet Tantalum Capacitors, Extended Capacitance, Tantalum Case with Glass-to-Tantalum Hermetic Seal for -55 °C to +125 °C



## FEATURES

- Enhanced performance, high reliability design
- Terminations: axial, standard tin / lead (Sn / Pb) plated
- The 13017 tantalum-case electrolytic capacitors provide all the advantages of Vishay's SuperTan® series devices, while offering improved reverse voltage and vibration capabilities
- Increased thermal shock capability of 300 cycles
- Designed for the avionics and aerospace applications

## PERFORMANCE CHARACTERISTICS

Refer to: Typical Performance Characteristics

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

(to +125 °C with voltage derating)

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

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

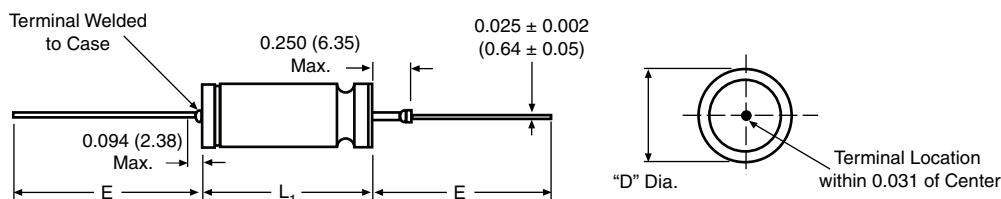
## ORDERING INFORMATION

| 13017              | -01         | K                        | S                            |
|--------------------|-------------|--------------------------|------------------------------|
| DLA DRAWING NUMBER | DASH NUMBER | CAPACITANCE TOLERANCE    |                              |
|                    |             | K = ± 10 %<br>M = ± 20 % | S = sleeved<br>U = unsleeved |

DLA LAND AND MARITIME  
COLUMBUS, OHIO

Drawing no.  
13017

## DIMENSIONS in inches [millimeters]



| CASE CODE | D<br>± 0.016 [0.41] | D MAX. INSULATED<br>(DIA.) | L <sub>1</sub> UNINSULATED<br>+0.031 [0.79]<br>-0.016 [0.41] | E<br>± 0.250 [6.35] MAX. |
|-----------|---------------------|----------------------------|--------------------------------------------------------------|--------------------------|
| T1        | 0.188 [4.78]        | 0.219 [5.56]               | 0.453 [11.51]                                                | 1.500 [38.10]            |
| T2        | 0.281 [7.14]        | 0.312 [7.92]               | 0.641 [16.28]                                                | 2.250 [57.15]            |
| T3        | 0.375 [9.52]        | 0.406 [10.31]              | 0.766 [19.46]                                                | 2.250 [57.15]            |
| T4        | 0.375 [9.52]        | 0.406 [10.31]              | 1.062 [26.97]                                                | 2.250 [57.15]            |

### Note

- Insulation sleeving will lap over the ends of the capacitor body.

**STANDARD RATINGS**

| CAPACITANCE<br>(μF)                                        | CASE<br>CODE | PART NUMBER    | MAX. ESR                   | MAX. IMP.                  | MAX. DCL |                          | MAX. CAPACITANCE<br>CHANGE (%) |        |         | AC<br>RIPPLE<br>+85 °C<br>40 kHz<br>(mA <sub>RMS</sub> ) |
|------------------------------------------------------------|--------------|----------------|----------------------------|----------------------------|----------|--------------------------|--------------------------------|--------|---------|----------------------------------------------------------|
|                                                            |              |                | AT +25 °C<br>120 Hz<br>(Ω) | AT -55 °C<br>120 Hz<br>(Ω) | +25 °C   | +85 °C<br>AND<br>+125 °C | -55 °C                         | +85 °C | +125 °C |                                                          |
| 25 V <sub>DC</sub> AT 85 °C, 15 V <sub>DC</sub> AT 125 °C  |              |                |                            |                            |          |                          |                                |        |         |                                                          |
| 120                                                        | T1           | 13017-01(1)(2) | 1.30                       | 25                         | 1        | 5                        | -42                            | 8      | 12      | 1250                                                     |
| 560                                                        | T2           | 13017-02(1)(2) | 0.83                       | 12                         | 2        | 10                       | -65                            | 14     | 18      | 2000                                                     |
| 1200                                                       | T3           | 13017-03(1)(2) | 0.65                       | 7                          | 5        | 20                       | -70                            | 15     | 20      | 2400                                                     |
| 1800                                                       | T4           | 13017-04(1)(2) | 0.50                       | 7                          | 6        | 25                       | -72                            | 15     | 20      | 3000                                                     |
| 30 V <sub>DC</sub> AT 85 °C, 20 V <sub>DC</sub> AT 125 °C  |              |                |                            |                            |          |                          |                                |        |         |                                                          |
| 100                                                        | T1           | 13017-05(1)(2) | 1.30                       | 25                         | 1        | 5                        | -38                            | 8      | 12      | 1200                                                     |
| 470                                                        | T2           | 13017-06(1)(2) | 0.85                       | 15                         | 2        | 10                       | -65                            | 14     | 18      | 1800                                                     |
| 1000                                                       | T3           | 13017-07(1)(2) | 0.70                       | 7                          | 7        | 25                       | -70                            | 15     | 25      | 2200                                                     |
| 1500                                                       | T4           | 13017-08(1)(2) | 0.60                       | 6                          | 12       | 35                       | -72                            | 15     | 25      | 2900                                                     |
| 50 V <sub>DC</sub> AT 85 °C, 30 V <sub>DC</sub> AT 125 °C  |              |                |                            |                            |          |                          |                                |        |         |                                                          |
| 68                                                         | T1           | 13017-09(1)(2) | 1.50                       | 35                         | 1        | 5                        | -25                            | 8      | 15      | 1050                                                     |
| 220                                                        | T2           | 13017-10(1)(2) | 0.90                       | 17.5                       | 2        | 10                       | -50                            | 8      | 15      | 1800                                                     |
| 470                                                        | T3           | 13017-11(1)(2) | 0.75                       | 10                         | 3        | 25                       | -45                            | 8      | 15      | 2100                                                     |
| 680                                                        | T4           | 13017-12(1)(2) | 0.70                       | 8                          | 5        | 40                       | -58                            | 10     | 20      | 2700                                                     |
| 60 V <sub>DC</sub> AT 85 °C, 40 V <sub>DC</sub> AT 125 °C  |              |                |                            |                            |          |                          |                                |        |         |                                                          |
| 47                                                         | T1           | 13017-13(1)(2) | 2.00                       | 44                         | 1        | 5                        | -25                            | 8      | 12      | 1050                                                     |
| 150                                                        | T2           | 13017-14(1)(2) | 1.10                       | 20                         | 2        | 10                       | -40                            | 8      | 15      | 1800                                                     |
| 390                                                        | T3           | 13017-15(1)(2) | 0.90                       | 15                         | 3        | 25                       | -45                            | 8      | 15      | 2100                                                     |
| 560                                                        | T4           | 13017-16(1)(2) | 0.80                       | 10                         | 5        | 40                       | -58                            | 8      | 15      | 2700                                                     |
| 75 V <sub>DC</sub> AT 85 °C, 50 V <sub>DC</sub> AT 125 °C  |              |                |                            |                            |          |                          |                                |        |         |                                                          |
| 33                                                         | T1           | 13017-17(1)(2) | 2.50                       | 66                         | 1        | 5                        | -25                            | 5      | 9       | 1050                                                     |
| 110                                                        | T2           | 13017-18(1)(2) | 1.30                       | 24                         | 2        | 10                       | -35                            | 6      | 10      | 1650                                                     |
| 330                                                        | T3           | 13017-19(1)(2) | 1.00                       | 12                         | 3        | 30                       | -45                            | 6      | 10      | 2100                                                     |
| 470                                                        | T4           | 13017-20(1)(2) | 0.90                       | 12                         | 5        | 50                       | -50                            | 6      | 10      | 2700                                                     |
| 100 V <sub>DC</sub> AT 85 °C, 65 V <sub>DC</sub> AT 125 °C |              |                |                            |                            |          |                          |                                |        |         |                                                          |
| 15                                                         | T1           | 13017-21(1)(2) | 3.50                       | 125                        | 1        | 5                        | -18                            | 3      | 10      | 1050                                                     |
| 68                                                         | T2           | 13017-22(1)(2) | 2.10                       | 37                         | 2        | 10                       | -30                            | 4      | 12      | 1650                                                     |
| 150                                                        | T3           | 13017-23(1)(2) | 1.60                       | 22                         | 3        | 25                       | -35                            | 6      | 12      | 2100                                                     |
| 220                                                        | T4           | 13017-24(1)(2) | 1.20                       | 15                         | 5        | 50                       | -40                            | 6      | 12      | 2700                                                     |
| 125 V <sub>DC</sub> AT 85 °C, 85 V <sub>DC</sub> AT 125 °C |              |                |                            |                            |          |                          |                                |        |         |                                                          |
| 10                                                         | T1           | 13017-25(1)(2) | 5.50                       | 175                        | 1        | 5                        | -15                            | 3      | 10      | 1050                                                     |
| 47                                                         | T2           | 13017-26(1)(2) | 2.30                       | 47                         | 2        | 10                       | -25                            | 5      | 12      | 1650                                                     |
| 82                                                         | T3           | 13017-27(1)(2) | 1.80                       | 40                         | 3        | 25                       | -35                            | 5      | 12      | 1950                                                     |
| 100                                                        | T3           | 13017-28(1)(2) | 1.80                       | 35                         | 3        | 25                       | -35                            | 5      | 12      | 2100                                                     |
| 150                                                        | T4           | 13017-29(1)(2) | 1.60                       | 20                         | 5        | 50                       | -35                            | 6      | 12      | 2700                                                     |

**Note**

- Part number definitions:
  - Capacitance tolerance: K = 10 %, M = 20 %
  - Case or body insulation: S = sleeved; U = unsleeved

**RIPPLE CURRENT MULTIPLIERS VS. FREQUENCY, TEMPERATURE, AND APPLIES 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 DLA 13017 CAPACITORS**

| <b>ELECTRICAL CHARACTERISTICS</b> |                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ITEM                              | PERFORMANCE CHARACTERISTICS                                                                                                                                                                                                                                                                                      |
| Operating temperature range       | -55 °C to +85 °C (to +125 °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                   | Reverse voltage shall be in accordance with MIL-PRF-39006, paragraphs 3.23 and 4.8.19, except DC potential will be maximum of 1.5 V.                                                                                                                                                                             |
| Surge voltage                     | Surge voltage shall be in accordance with MIL-PRF-39006 and DLA13017.<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 2000 h life test at a temperature +85 °C at rated voltage, or a 1000 h life test at 125 °C test at derated voltage.<br>After the test, the capacitors shall meet the following requirements:<br>a) DC leakage at 85 °C and 125 °C shall not exceed 125 % of the specified value<br>b) DC leakage at 25 °C shall not exceed the specified value<br>c) Capacitance shall be within + 10 %, - 20 % of initial value<br>d) ESR shall not exceed 200 % of the specified value |

| <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                                                                                    |

**MECHANICAL CHARACTERISTICS**

| 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 E (50 g peak)              | The capacitors shall meet the requirements of MIL-PRF-39006.                                                                                                                                                                                                   |
| Random vibration          | MIL-STD-202, method 214, condition II-G (overall RMS 27.78 g) | 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 300 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 $\mu\text{F}$ ), capacitance tolerance letter, rated voltage, date code, lot symbol and Vishay trademark.                                                               |

**SELECTOR GUIDES**

|                            |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| 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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