

# TRM Professional Multianode

## Tantalum Ultra Low ESR Capacitor



### FEATURES

- Improved reliability – 0.5%/1khrs (twice better than standard)
- DCL reduced by 25% to 0.0075 CV
- Robust against higher thermo-mechanical stresses during assembly process
- Multi-anode construction
- Super low ESR
- CV range 4.7-1500µF / 2.5-50V
- “Mirror” construction used with D case capacitors reduces ESL to half
- Automotive, industrial and other higher end applications



SnPb termination option is not  
RoHS compliant.

### APPLICATIONS

- Automotive, Avionics and Industrial high power DC/DC converters



#### MULTIANODE CONSTRUCTION



#### MULTIANODE TPM D, Y LOW SELF INDUCTANCE CONSTRUCTION “MIRROR” DESIGN



### MARKING

#### D, E, U CASE



### CASE DIMENSIONS: millimeters (inches)

| Code | EIA Code | EIA Metric | L±0.20 (0.008) | W+0.20 (0.008) -0.10 (0.004) | H+0.20 (0.008) -0.10 (0.004) | W <sub>1</sub> ±0.20 (0.008) | A+0.30 (0.012) -0.20 (0.008) | S Min.       |
|------|----------|------------|----------------|------------------------------|------------------------------|------------------------------|------------------------------|--------------|
| D    | 2917     | 7343-31    | 7.30 (0.287)   | 4.30 (0.169)                 | 2.90 (0.114)                 | 2.40 (0.094)                 | 1.30 (0.051)                 | 4.40 (0.173) |
| E    | 2917     | 7343-43    | 7.30 (0.287)   | 4.30 (0.169)                 | 4.10 (0.162)                 | 2.40 (0.094)                 | 1.30 (0.051)                 | 4.40 (0.173) |
| U    | 2924     | 7361-43    | 7.30 (0.287)   | 6.10 (0.240)                 | 4.10 (0.162)                 | 3.10 (0.122)                 | 1.30 (0.051)                 | 4.40 (0.173) |

W1 dimension applies to the termination width for A dimensional area only.

### HOW TO ORDER

| TRM  | E                            | 108  | *                                 | 004   | R  | 0023      |
|------|------------------------------|--|-----------------------------------|---|--|-----------|
| Type | Case Size<br>See table above | Capacitance Code<br>pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow) | Tolerance<br>K = ±10%<br>M = ±20% | Rated DC Voltage<br>002 = 2.5Vdc<br>004 = 4Vdc<br>006 = 6.3Vdc<br>010 = 10Vdc<br>012 = 12Vdc<br>016 = 16Vdc<br>020 = 20Vdc<br>025 = 25Vdc<br>035 = 35Vdc<br>050 = 50Vdc | Packaging<br>R = Pure Tin 7" Reel<br>S = Pure Tin 13" Reel<br>H = Tin Lead 7" Reel<br>(Contact Manufacturer)<br>K = Tin Lead 13" Reel<br>(Contact Manufacturer)<br>H, K = Non RoHS | ESR in mΩ |

### TECHNICAL SPECIFICATIONS

|                                    |  |     |     |     |    |    |    |    |    |    |    |
|------------------------------------|--|-----|-----|-----|----|----|----|----|----|----|----|
| Technical Data:                    | All technical data relate to an ambient temperature of +25°C                                   |     |     |     |    |    |    |    |    |    |    |
| Capacitance Range:                 | 4.7 µF to 1500 µF  |     |     |     |    |    |    |    |    |    |    |
| Capacitance Tolerance:             | ±10%; ±20%   |     |     |     |    |    |    |    |    |    |    |
| Rated Voltage (V <sub>R</sub> )    | ≤ +85°C:   | 2.5 | 4   | 6.3 | 10 | 12 | 16 | 20 | 25 | 35 | 50 |
| Category Voltage (V <sub>C</sub> ) | ≤ +125°C:  | 1.7 | 2.7 | 4   | 7  | 8  | 10 | 13 | 17 | 23 | 33 |
| Surge Voltage (V <sub>S</sub> )    | ≤ +85°C:   | 3.3 | 5.2 | 8   | 13 | 16 | 20 | 26 | 32 | 46 | 65 |
| Surge Voltage (V <sub>S</sub> )    | ≤ +125°C:  | 2.2 | 3.4 | 5   | 8  | 10 | 13 | 16 | 20 | 28 | 40 |
| Temperature Range:                 | -55°C to +125°C  |     |     |     |    |    |    |    |    |    |    |
| Reliability:                       | 0.5% per 1000 hours at 85°C, V <sub>R</sub> with 0.1Ω/V series impedance, 60% confidence level |     |     |     |    |    |    |    |    |    |    |
|                                    | Meets requirements of AEC-Q200   |     |     |     |    |    |    |    |    |    |    |



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### CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

| Capacitance |      | Rated Voltage DC (V <sub>R</sub> ) to 85°C |                   |          |          |         |          |          |         |                    |         |
|-------------|------|--|-------------------|----------|----------|---------|----------|----------|---------|--------------------|---------|
| µF          | Code | 2.5V (e)                                   | 4V (G)            | 6.3V (J) | 10V (A)  | 12V (B) | 16V (C)  | 20V (D)  | 25V (E) | 35V (V)            | 50V (T) |
| 4.7         | 475  |  |                   |          |          |         |          |          |         |                    | D(200)  |
| 6.8         | 685  |  |                   |          |          |         |          |          |         |                    |         |
| 10          | 106  |  |                   |          |          |         |          |          |         | D(120)             |         |
| 15          | 156  |  |                   |          |          |         |          |          |         |                    |         |
| 22          | 226  |  |                   |          |          |         |          |          |         | D(70)<br>E(60,100) |         |
| 33          | 336  |  |                   |          |          |         |          |          | D(65)   | E(50,65)           |         |
| 47          | 476  |  |                   |          |          |         | D(100)   | D(55)    | E(65)   |                    |         |
| 68          | 686  |  |                   |          |          |         |          |          |         |                    |         |
| 100         | 107  |  |                   |          |          |         |          | E(35,45) |         |                    |         |
| 150         | 157  |  |                   |          | D(45)    |         | E(30,40) |          |         |                    |         |
| 220         | 227  |  |                   |          | D(35)    | E(35)   | U(30,40) |          |         |                    |         |
| 330         | 337  |  | D(35)             | D(35)    | E(35)    |         |          |          |         |                    |         |
| 470         | 477  |  | D(35)             | E(30)    | U(23,30) |         |          |          |         |                    |         |
| 680         | 687  |  | E(23)             | U(18,23) |          |         |          |          |         |                    |         |
| 1000        | 108  | D(25)                                      | E(23)<br>U(18,23) |          |          |         |          |          |         |                    |         |
| 1500        | 158  | E(18)<br>U(18,23)                          |                   |          |          |         |          |          |         |                    |         |

Released ratings, (ESR ratings in mOhms in parentheses)

Note: Voltage ratings are minimum values. AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

# TRM Professional Multianode

## Tantalum Ultra Low ESR Capacitor



### RATINGS & PART NUMBER REFERENCE

| AVX Part No.           | Case Size | Capacitance (µF) | Rated Voltage (V) | Rated Temperature (°C) | Category Voltage (V) | Category Temperature (°C) | DCL Max. (µA) | DF Max. (%) | ESR Max. @ 100kHz (mΩ) | 100kHz RMS Current (A) |       |       | MSL |
|------------------------|-----------|------------------|-------------------|------------------------|----------------------|---------------------------|---------------|-------------|------------------------|------------------------|-------|-------|-----|
|                        |           |                  |                   |                        |                      |                           |               |             |                        | 25°C                   | 85°C  | 125°C |     |
| <b>2.5 Volt @ 85°C</b> |           |                  |                   |                        |                      |                           |               |             |                        |                        |       |       |     |
| TRMD108*002#0025       | D         | 1000             | 2.5               | 85                     | 1.7                  | 125                       | 18.8          | 8           | 25                     | 3.194                  | 2.874 | 1.277 | 3   |
| TRME158*002#0018       | E         | 1500             | 2.5               | 85                     | 1.7                  | 125                       | 28.1          | 6           | 18                     | 3.873                  | 3.486 | 1.549 | 3   |
| TRMU158*002R0018       | U         | 1500             | 2.5               | 85                     | 1.7                  | 125                       | 22.5          | 6           | 18                     | 4.048                  | 3.643 | 1.619 | 3   |
| TRMU158*002R0023       | U         | 1500             | 2.5               | 85                     | 1.7                  | 125                       | 22.5          | 6           | 23                     | 3.581                  | 3.223 | 1.433 | 3   |
| <b>4 Volt @ 85°C</b>   |           |                  |                   |                        |                      |                           |               |             |                        |                        |       |       |     |
| TRMD337*004#0035       | D         | 330              | 4                 | 85                     | 2.7                  | 125                       | 9.9           | 8           | 35                     | 2.699                  | 2.429 | 1.080 | 3   |
| TRMD477*004#0035       | D         | 470              | 4                 | 85                     | 2.7                  | 125                       | 14.1          | 8           | 35                     | 2.699                  | 2.429 | 1.080 | 3   |
| TRME687*004#0023       | E         | 680              | 4                 | 85                     | 2.7                  | 125                       | 20.4          | 6           | 23                     | 3.426                  | 3.084 | 1.370 | 3   |
| TRME108*004#0023       | E         | 1000             | 4                 | 85                     | 2.7                  | 125                       | 30            | 6           | 23                     | 3.426                  | 3.084 | 1.370 | 3   |
| TRMU108*004R0018       | U         | 1000             | 4                 | 85                     | 2.7                  | 125                       | 30            | 6           | 18                     | 4.048                  | 3.643 | 1.619 | 3   |
| TRMU108*004R0023       | U         | 1000             | 4                 | 85                     | 2.7                  | 125                       | 30            | 6           | 23                     | 3.581                  | 3.223 | 1.433 | 3   |
| <b>6.3 Volt @ 85°C</b> |           |                  |                   |                        |                      |                           |               |             |                        |                        |       |       |     |
| TRMD337*006#0035       | D         | 330              | 6.3               | 85                     | 4                    | 125                       | 14.9          | 8           | 35                     | 2.699                  | 2.429 | 1.080 | 3   |
| TRME477*006#0030       | E         | 470              | 6.3               | 85                     | 4                    | 125                       | 21.2          | 6           | 30                     | 3.000                  | 2.700 | 1.200 | 3   |
| TRMU687*006R0018       | U         | 680              | 6.3               | 85                     | 4                    | 125                       | 30.6          | 6           | 18                     | 4.048                  | 3.643 | 1.619 | 3   |
| TRMU687*006R0023       | U         | 680              | 6.3               | 85                     | 4                    | 125                       | 30.6          | 6           | 23                     | 3.581                  | 3.223 | 1.433 | 3   |
| <b>10 Volt @ 85°C</b>  |           |                  |                   |                        |                      |                           |               |             |                        |                        |       |       |     |
| TRMD157*010#0045       | D         | 150              | 10                | 85                     | 7                    | 125                       | 11.3          | 8           | 45                     | 2.380                  | 2.142 | 0.952 | 3   |
| TRMD227*010#0035       | D         | 220              | 10                | 85                     | 7                    | 125                       | 16.5          | 8           | 35                     | 2.699                  | 2.429 | 1.080 | 3   |
| TRME337*010#0035       | E         | 330              | 10                | 85                     | 7                    | 125                       | 24.8          | 6           | 35                     | 2.777                  | 2.500 | 1.111 | 3   |
| TRMU477*010R0023       | U         | 470              | 10                | 85                     | 7                    | 125                       | 35.3          | 8           | 23                     | 3.581                  | 3.223 | 1.433 | 3   |
| TRMU477*010R0030       | U         | 470              | 10                | 85                     | 7                    | 125                       | 35.3          | 8           | 30                     | 3.136                  | 2.822 | 1.254 | 3   |
| <b>12 Volt @ 85°C</b>  |           |                  |                   |                        |                      |                           |               |             |                        |                        |       |       |     |
| TRME227*012#0035       | E         | 220              | 12                | 85                     | 8.4                  | 125                       | 19.8          | 6           | 35                     | 2.777                  | 2.500 | 1.111 | 3   |
| <b>16 Volt @ 85°C</b>  |           |                  |                   |                        |                      |                           |               |             |                        |                        |       |       |     |
| TRMD476*016#0100       | D         | 47               | 16                | 85                     | 10                   | 125                       | 5.6           | 8           | 100                    | 1.597                  | 1.437 | 0.639 | 3   |
| TRME157*016#0030       | E         | 150              | 16                | 85                     | 10                   | 125                       | 18            | 6           | 30                     | 3.000                  | 2.700 | 1.200 | 3   |
| TRME157*016#0040       | E         | 150              | 16                | 85                     | 10                   | 125                       | 18            | 6           | 40                     | 2.598                  | 2.338 | 1.039 | 3   |
| TRMU227*016R0030       | U         | 220              | 16                | 85                     | 10                   | 125                       | 26.4          | 8           | 30                     | 3.136                  | 2.822 | 1.254 | 3   |
| TRMU227*016R0040       | U         | 220              | 16                | 85                     | 10                   | 125                       | 26.4          | 8           | 40                     | 2.716                  | 2.444 | 1.086 | 3   |
| <b>20 Volt @ 85°C</b>  |           |                  |                   |                        |                      |                           |               |             |                        |                        |       |       |     |
| TRMD476*020#0055       | D         | 47               | 20                | 85                     | 13                   | 125                       | 7.1           | 8           | 55                     | 2.153                  | 1.938 | 0.861 | 3   |
| TRME107*020#0035       | E         | 100              | 20                | 85                     | 13                   | 125                       | 15            | 6           | 35                     | 2.777                  | 2.500 | 1.111 | 3   |
| TRME107*020#0045       | E         | 100              | 20                | 85                     | 13                   | 125                       | 15            | 6           | 45                     | 2.449                  | 2.205 | 0.980 | 3   |
| <b>25 Volt @ 85°C</b>  |           |                  |                   |                        |                      |                           |               |             |                        |                        |       |       |     |
| TRMD336*025#0065       | D         | 33               | 25                | 85                     | 17                   | 125                       | 6.2           | 8           | 65                     | 1.981                  | 1.783 | 0.792 | 3   |
| TRME476*025#0065       | E         | 47               | 25                | 85                     | 17                   | 125                       | 8.8           | 6           | 65                     | 2.038                  | 1.834 | 0.815 | 3   |
| <b>35 Volt @ 85°C</b>  |           |                  |                   |                        |                      |                           |               |             |                        |                        |       |       |     |
| TRMD106*035#0120       | D         | 10               | 35                | 85                     | 23                   | 125                       | 2.6           | 8           | 120                    | 1.458                  | 1.312 | 0.583 | 3   |
| TRMD226*035#0070       | D         | 22               | 35                | 85                     | 23                   | 125                       | 5.8           | 8           | 70                     | 1.909                  | 1.718 | 0.763 | 3   |
| TRME226*035#0060       | E         | 22               | 35                | 85                     | 23                   | 125                       | 5.8           | 6           | 60                     | 2.121                  | 1.909 | 0.849 | 3   |
| TRME226*035#0100       | E         | 22               | 35                | 85                     | 23                   | 125                       | 5.8           | 6           | 100                    | 1.643                  | 1.479 | 0.657 | 3   |
| TRME336*035#0050       | E         | 33               | 35                | 85                     | 23                   | 125                       | 8.7           | 6           | 50                     | 2.324                  | 2.091 | 0.930 | 3   |
| TRME336*035#0065       | E         | 33               | 35                | 85                     | 23                   | 125                       | 8.7           | 6           | 65                     | 2.038                  | 1.834 | 0.815 | 3   |
| <b>50 Volt @ 85°C</b>  |           |                  |                   |                        |                      |                           |               |             |                        |                        |       |       |     |
| TRMD475*050#0200       | D         | 4.7              | 50                | 85                     | 33                   | 125                       | 1.8           | 8           | 200                    | 1.129                  | 1.016 | 0.452 | 3   |

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.2 volts.

DCL is measured at rated voltage after 5 minutes.

The EIA & CECC standards for low ESR Solid Tantalum Capacitors allow an ESR movement to 1.25 times catalogue limit post mounting.

For typical weight and composition see page 274.

**NOTE: AVX reserves the right to supply higher voltage ratings or tighter tolerance part in the same case size, to the same reliability standards.**



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## Tantalum Ultra Low ESR Capacitor



### QUALIFICATION TABLE

| TEST                         | TRM professional multianode series (Temperature range -55°C to +125°C)  |               |               |                    |                                    |           |            |            |            |            |  |
|------------------------------|---|---------------|---------------|--------------------|------------------------------------|-----------|------------|------------|------------|------------|--|
|                              | Condition   |               |               | Characteristics    |                                    |           |            |            |            |            |  |
| <b>Endurance</b>             | Apply rated voltage (Ur) at 85°C and / or category voltage (Uc) at 125°C for 2000 hours through a circuit impedance of $\leq 0.1\Omega/V$ . Stabilize at room temperature for 1-2 hours before measuring. |               |               | Visual examination | no visible damage                  |           |            |            |            |            |  |
|                              |   |               |               | DCL                | initial limit                      |           |            |            |            |            |  |
|                              |   |               |               | $\Delta C/C$       | within $\pm 10\%$ of initial value |           |            |            |            |            |  |
|                              |   |               |               | DF                 | initial limit                      |           |            |            |            |            |  |
|                              |   |               |               | ESR                | 1.25 x initial limit               |           |            |            |            |            |  |
| <b>Storage Life</b>          | Store at 125°C, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.   |               |               | Visual examination | no visible damage                  |           |            |            |            |            |  |
|                              |   |               |               | DCL                | 1.25 x initial limit               |           |            |            |            |            |  |
|                              |   |               |               | $\Delta C/C$       | within $\pm 10\%$ of initial value |           |            |            |            |            |  |
|                              |   |               |               | DF                 | initial limit                      |           |            |            |            |            |  |
|                              |   |               |               | ESR                | 1.25 x initial limit               |           |            |            |            |            |  |
| <b>Humidity</b>              | Store at 65°C and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.  |               |               | Visual examination | no visible damage                  |           |            |            |            |            |  |
|                              |   |               |               | DCL                | 1.5 x initial limit                |           |            |            |            |            |  |
|                              |   |               |               | $\Delta C/C$       | within $\pm 10\%$ of initial value |           |            |            |            |            |  |
|                              |   |               |               | DF                 | 1.2 x initial limit                |           |            |            |            |            |  |
|                              |   |               |               | ESR                | 1.25 x initial limit               |           |            |            |            |            |  |
| <b>Biased Humidity</b>       | Apply rated voltage (Ur) at 85°C, 85% relative humidity for 1000 hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.  |               |               | Visual examination | no visible damage                  |           |            |            |            |            |  |
|                              |   |               |               | DCL                | 2 x initial limit                  |           |            |            |            |            |  |
|                              |   |               |               | $\Delta C/C$       | within $\pm 10\%$ of initial value |           |            |            |            |            |  |
|                              |   |               |               | DF                 | 1.2 x initial limit                |           |            |            |            |            |  |
|                              |   |               |               | ESR                | 1.25 x initial limit               |           |            |            |            |            |  |
| <b>Temperature Stability</b> | Step  | Temperature°C | Duration(min) |                    | +20°C                              | -55°C     | +20°C      | +85°C      | +125°C     | +20°C      |  |
|                              | 1   | +20           | 15            | DCL                | IL*                                | n/a       | IL*        | 10 x IL*   | 12.5 x IL* | IL*        |  |
|                              | 2   | -55           | 15            | $\Delta C/C$       | n/a                                | +0/-10%   | $\pm 5\%$  | +10/-0%    | +12/-0%    | $\pm 5\%$  |  |
|                              | 3   | +20           | 15            | DF                 | IL*                                | 1.5 x IL* | IL*        | 1.5 x IL*  | 2 x IL*    | IL*        |  |
|                              | 4   | +85           | 15            | ESR                | 1.25 x IL*                         | 2.5 x IL* | 1.25 x IL* | 1.25 x IL* | 1.25 x IL* | 1.25 x IL* |  |
|                              | 5   | +125          | 15            |                    |                                    |           |            |            |            |            |  |
|                              | 6   | +20           | 15            |                    |                                    |           |            |            |            |            |  |
| <b>Surge Voltage</b>         | Apply 1.3x category voltage (Uc) at 125°C for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000 $\Omega$                              |               |               | Visual examination | no visible damage                  |           |            |            |            |            |  |
|                              |   |               |               | DCL                | initial limit                      |           |            |            |            |            |  |
|                              |   |               |               | $\Delta C/C$       | within $\pm 5\%$ of initial value  |           |            |            |            |            |  |
|                              |   |               |               | DF                 | initial limit                      |           |            |            |            |            |  |
|                              |   |               |               | ESR                | 1.25 x initial limit               |           |            |            |            |            |  |
| <b>Mechanical Shock</b>      | MIL-STD-202, Method 213, Condition F  |               |               | Visual examination | no visible damage                  |           |            |            |            |            |  |
|                              |   |               |               | DCL                | initial limit                      |           |            |            |            |            |  |
|                              |   |               |               | $\Delta C/C$       | within $\pm 5\%$ of initial value  |           |            |            |            |            |  |
|                              |   |               |               | DF                 | initial limit                      |           |            |            |            |            |  |
|                              |   |               |               | ESR                | 1.25 x initial limit               |           |            |            |            |            |  |
| <b>Vibration</b>             | MIL-STD-202, Method 204, Condition D  |               |               | Visual examination | no visible damage                  |           |            |            |            |            |  |
|                              |   |               |               | DCL                | initial limit                      |           |            |            |            |            |  |
|                              |   |               |               | $\Delta C/C$       | within $\pm 5\%$ of initial value  |           |            |            |            |            |  |
|                              |   |               |               | DF                 | initial limit                      |           |            |            |            |            |  |
|                              |   |               |               | ESR                | 1.25 x initial limit               |           |            |            |            |            |  |

\*Initial Limit

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## Tantalum Ultra Low ESR Capacitor



### AVX SOLID ELECTROLYTIC CAPACITOR ROADMAP



### FIVE CAPACITOR CONSTRUCTION STYLES



### SERIES LINE UP: CONVENTIONAL SMD MnO<sub>2</sub>



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