

TCR Series



Professional Conductive Polymer Chip Capacitors



FEATURES

- Conductive polymer electrode
- Benign failure mode under recommended use conditions
- Robust design for long operation lifetime
- AVX maverick part control Q-process with statistical screening
- Improved basic reliability 0.5%/1000hrs
- Humidity 85°C/85%RH, Vr, (up to 500 or 1000 hours see reference table)
- -55 to +125°C operation temperature
- DCL 0.1 CxV, 0.05CV on selected codes
- 3x reflow 260°C compatible
- Low ESR



LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



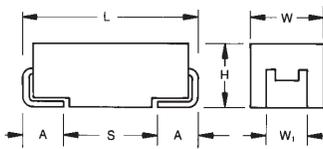
SnPb termination option is not
RoHS compliant.



APPLICATIONS

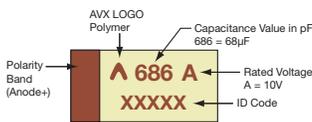
- Long life time DC/DC converter applications in Telecommunications, Industrial, Avionics

For additional information on Q-process please consult the AVX technical publication "Reaching the Highest Reliability for Tantalum Capacitors" (see the link: <http://www.avx.com/docs/techinfo/Qprocess.pdf>)



MARKING

B, D, T, Y 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 ₁ ±0.20 (0.008) | A+0.30 (0.012) -0.20 (0.008) | S Min. |
|------|----------|------------|----------------|------------------------------|------------------------------|------------------------------|------------------------------|--------------|
| B | 1210 | 3528-21 | 3.50 (0.138) | 2.80 (0.110) | 1.90 (0.075) | 2.20 (0.087) | 0.80 (0.031) | 1.40 (0.055) |
| 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) |
| T | 1210 | 3528-12 | 3.50 (0.138) | 2.80 (0.110) | 1.20 (0.047) max. | 2.20 (0.087) | 0.80 (0.031) | 1.40 (0.055) |
| Y | 2917 | 7343-20 | 7.30 (0.287) | 4.30 (0.169) | 2.00 (0.079) max. | 2.40 (0.094) | 1.30 (0.051) | 4.40 (0.173) |

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

*Codes under development

HOW TO ORDER

TCR

Type

D

Case Size

See table above

476

Capacitance Code

pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

M

Tolerance

M = ±20%

016

Rated DC Voltage

004 = 4Vdc
006 = 6.3Vdc
010 = 10Vdc
016 = 16Vdc
020 = 20Vdc
025 = 25Vdc
035 = 35Vdc
050 = 50Vdc

#

Packaging

R = Pure Tin 7" Reel
S = Pure Tin 13" Reel
H = Tin Lead 7" Reel (contact manufacturer)
K = Tin Lead 13" Reel (contact manufacturer)

0070

ESR in mΩ

J

DCL

J = 0.1CV

TECHNICAL SPECIFICATIONS

| | |
|------------------------|---|
| Technical Data: | All technical data relate to an ambient temperature of +25°C |
| Capacitance Range: | 10µF to 220µF |
| Capacitance Tolerance: | ±20% |
| Leakage Current DCL: | (J) 0.1CV |
| Temperature Range: | -55°C to +125°C |
| Basic Reliability: | 0.5% per 1000 hours at 85°C, Vr with 0.1ΩV series impedance, 60% confidence level |
| Termination Finish: | Sn Plating (standard) and SnPb Plating upon request |

NOTE: Conductive Polymer Capacitors are designed to operate within the limits of the environmental conditions specified for each series. If operated continuously at their maximum temperature and / or humidity limit, or beyond these limits, capacitors may exhibit a parametric shift in capacitance and increases in ESR. These changes may occur earlier if the specified environmental conditions are exceeded. Similarly, their normal operational time period will be significantly extended if their general duty cycle includes operation below maximum temperature within humidity controlled environments. Careful attention should be paid to maximum temperature with associated high humidity environments as well as voltage derating, ripple current and current surges. Please reference the AVX Conductive Polymer Capacitor Guidelines for more information or contact factory for application assistance.



CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

| Capacitance | | Rated Voltage DC (V _r) | | | | | | | |
|-------------|------|------------------------------------|----------|---------|---------|---------|---------|---------|---------|
| µF | Code | 4V (G) | 6.3V (J) | 10V (A) | 16V (C) | 20V (D) | 25V (E) | 35V (V) | 50V (T) |
| 10 | 106 | | | | | | | D(70) | D(120) |
| 15 | 156 | | | | | | D(70) | | |
| 22 | 226 | | B(70) | | | D(70) | | | |
| 33 | 336 | | B(70) | T(70)* | D(70) | | | | |
| 47 | 476 | | B(70) | | D(70) | | | | |
| 68 | 686 | | | D(70) | | | | | |
| 100 | 107 | | | D(70) | | | | | |
| 150 | 157 | | D(40) | | | | | | |
| 220 | 227 | D(40), Y(40) | | | | | | | |

Available Ratings, (ESR ratings in mOhms in brackets)

Engineering samples - please contact manufacturer

*Codes under development – subject to change

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

RATINGS & PART NUMBER REFERENCE

| AVX Part No. | Case Size | Capacitance (µF) | Rated Voltage (V) | Maximum Operating Temperature (°C) | DCL Max. (µA) | DF Max. (%) | ESR Max @ 100kHz (mΩ) | MSL | 100kHz RMS Current (mA) | | | | Humidity 85°C/85%RH, Vr (hrs) | |
|-------------------|-----------|------------------|-------------------|------------------------------------|---------------|-------------|-----------------------|-----|-------------------------|------|-------|-------|-------------------------------|--|
| | | | | | | | | | 45°C | 85°C | 105°C | 125°C | | |
| 4 Volt | | | | | | | | | | | | | | |
| TCRD227M004#0040J | D | 220 | 4 | 125 | 88 | 6 | 40 | 3 | 2400 | 1700 | 1100 | 600 | 1000 | |
| TCRY227M004#0040J | Y | 220 | 4 | 125 | 88 | 6 | 40 | 3 | 2200 | 1500 | 1000 | 600 | 500 | |
| 6.3 Volt | | | | | | | | | | | | | | |
| TCRB226M006#0070J | B | 22 | 6.3 | 125 | 13 | 6 | 70 | 3 | 1300 | 900 | 600 | 300 | 500 | |
| TCRB336M006#0070J | B | 33 | 6.3 | 125 | 19 | 6 | 70 | 3 | 1300 | 900 | 600 | 300 | 500 | |
| TCRB476M006#0070J | B | 47 | 6.3 | 125 | 28 | 6 | 70 | 3 | 1300 | 900 | 600 | 300 | 500 | |
| TCRD157M006#0040J | D | 150 | 6.3 | 125 | 90 | 6 | 40 | 3 | 2400 | 1700 | 1100 | 600 | 1000 | |
| 10 Volt | | | | | | | | | | | | | | |
| TCRD686M010#0070J | D | 68 | 10 | 125 | 68 | 6 | 70 | 3 | 1800 | 1300 | 800 | 500 | 1000 | |
| TCRD107M010#0070J | D | 100 | 10 | 125 | 100 | 6 | 70 | 3 | 1800 | 1300 | 800 | 500 | 1000 | |
| 16 Volt | | | | | | | | | | | | | | |
| TCRD336M016#0070J | D | 33 | 16 | 125 | 52 | 6 | 70 | 3 | 1800 | 1300 | 800 | 500 | 1000 | |
| TCRD476M016#0070J | D | 47 | 16 | 125 | 75 | 6 | 70 | 3 | 1800 | 1300 | 800 | 500 | 1000 | |
| 20 Volt | | | | | | | | | | | | | | |
| TCRD226M020#0070J | D | 22 | 20 | 125 | 44 | 8 | 70 | 3 | 1800 | 1300 | 800 | 500 | 1000 | |
| 25 Volt | | | | | | | | | | | | | | |
| TCRD156M025#0070J | D | 15 | 25 | 125 | 37 | 8 | 70 | 3 | 1800 | 1300 | 800 | 500 | 1000 | |
| 35 Volt | | | | | | | | | | | | | | |
| TCRD106M035#0070J | D | 10 | 35 | 125 | 35 | 8 | 70 | 3 | 1800 | 1300 | 800 | 500 | 1000 | |
| 50 Volt | | | | | | | | | | | | | | |
| TCRD106M050#0120J | D | 10 | 50 | 125 | 50 | 10 | 120 | 3 | 1400 | 1000 | 600 | 400 | 500 | |

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, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

ESR allowed to move up to 1.25 times catalog limit post mounting.

For typical weight and composition see page 226.

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

TCR Series

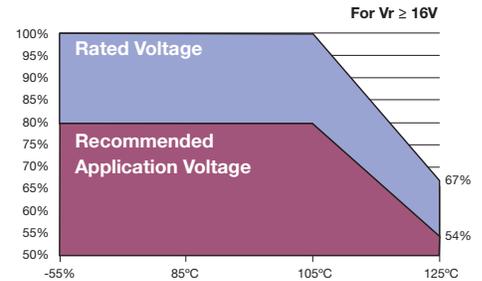
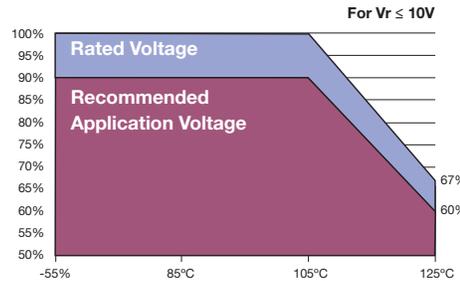


Professional Conductive Polymer Chip Capacitors

RECOMMENDED DERATING FACTOR

Voltage and temperature derating as percentage of Vr.

| Rated voltage | Operating Temperature | | |
|---------------|-----------------------|-------|-------|
| | ≤85°C | 105°C | 125°C |
| ≤10V | 90% | 90% | 60% |
| ≥16V | 80% | 80% | 54% |



QUALIFICATION TABLE

| TEST | TCR series (Temperature range -55°C to +125°C) | | | | | | | | | |
|----------------------------|--|---------------|---------------|--------------------|----------------------------------|-------|-----------|----------|------------|---------|
| | Condition | | | Characteristics | | | | | | |
| Endurance | Determine after application of rated voltage for 2000 +48/-0 hours at 105±2°C. Also determine after application of 125°C temperature, 2/3 rated voltage for 2000 +48/-0 hours. After test leaving 1-2 hours at room temperature. Power supply impedance to be ≤0.1Ω/V. | | | Visual examination | no visible damage | | | | | |
| | | | | DCL | 2 x initial limit | | | | | |
| | | | | ΔC/C | within +20/-30% of initial value | | | | | |
| | | | | DF | 2 x initial limit | | | | | |
| | | | | ESR | 2 x initial limit | | | | | |
| Storage Life | 125°C, 0V, 2000h | | | Visual examination | no visible damage | | | | | |
| | | | | DCL | 2 x initial limit | | | | | |
| | | | | ΔC/C | within ±20% of initial value | | | | | |
| | | | | DF | 2 x initial limit | | | | | |
| | | | | ESR | 2 x initial limit | | | | | |
| Biased Humidity | Determine after leaving for 500 or 1000 hours at 85±2°C, 85% relative humidity and rated voltage and then recovery 1-2 hours at room temperature. | | | Visual examination | no visible damage | | | | | |
| | | | | DCL | 3 x initial limit | | | | | |
| | | | | ΔC/C | within +30/-20% of initial value | | | | | |
| | | | | DF | 1.5 x initial limit | | | | | |
| | | | | ESR | 2 x initial limit | | | | | |
| Temperature Stability | Step | Temperature°C | Duration(min) | | | | | | | |
| | 1 | +20±2 | 15 | +20°C | -55°C | +20°C | +85°C | +125°C | +20°C | |
| | 2 | -55+0/-3 | 15 | DCL | IL* | n/a | IL* | 10 x IL* | 12.5 x IL* | IL* |
| | 3 | +20±2 | 15 | | ΔC/C | n/a | ±20% | ±5% | ±20% | ±30% |
| | 4 | +85+3/-0 | 15 | DF | | IL* | 1.5 x IL* | IL* | 1.5 x IL* | 2 x IL* |
| | 5 | +125+3/-0 | 15 | | | | | | | |
| 6 | +20±2 | 15 | | | | | | | | |
| Surge Voltage | Test temperature: 125°C±3/0°C Surge voltage: 1.3 x 2/3 rated voltage Charge/Discharge resistance: 1000±100Ω Number of cycles: 1000x Cycle duration: 6 min; 30 sec charge, 5 min 30 sec discharge | | | Visual examination | no visible damage | | | | | |
| | | | | DCL | initial limit | | | | | |
| | | | | ΔC/C | within +20/-30% of initial value | | | | | |
| | | | | DF | 1.25 x initial limit | | | | | |
| | | | | ESR | 1.25 x initial limit | | | | | |
| Mechanical Shock/Vibration | MIL-STD-202, Method 213, Condition I, 100 G peak MIL-STD-202, Method 204, Condition D, 10 Hz to 2,000 Hz, 20 G peak | | | Visual examination | no visible damage | | | | | |
| | | | | DCL | initial limit | | | | | |
| | | | | ΔC/C | within ±10% of initial value | | | | | |
| | | | | DF | initial limit | | | | | |
| | | | | ESR | 1.25 x initial limit | | | | | |

*Initial Limit

For use outside of recommended conditions and special request, please contact manufacturer.
Initial measurement max. 1hr after the removal from dry pack or after pretreatment at 85°C for 24 hours.