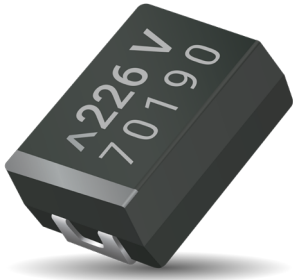


TCS SERIES

COTS-Plus Polymer Solid Electrolytic Multianode Capacitor

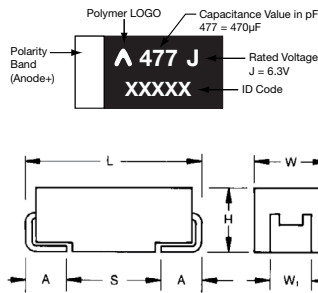


FEATURES

- Robust design for long operation lifetime
- Low ESR for higher ripple current
- High frequency capacitance retention
- Volumetric efficiency
- -55 to +125°C operation temperature
- Statistical screening with Accelerated Ageing
- Surge testing level option
- Several reliability screening grades (FRL) available
- Shock and Vibration by MIL-STD-202
- 3x reflow cycles according to J-STD-020



MARKING D, E, U CASE



APPLICATIONS

DC/DC converters, Signal processing (coupling/decoupling), Industrial & special

CASE DIMENSIONS mm (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) | W1±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

| TCS | E | 477 | M | 006 | C | R | S | Z | 0 | ^ | ++ | E |
|------|-----------------|---|-----------|---|----------------------------|------------|--------------------------|-------------------|---------------------|---------------------------------------|---|----------------------|
| Type | Case Size | Capacitance Code | Tolerance | Rated DC Voltage | ESR | Packaging | Inspection Level | Reliability Grade | Qualification Level | Termination Finish | Surge Test Option | Additional Character |
| | See table above | pF code: 1st two digits represent significant figures 3rd digit represents multiplier (number of zeros to follow) | M = ±20% | 002 = 2.5Vdc 004 = 4Vdc 006 = 6.3Vdc 010 = 10Vdc 016 = 16Vdc 020 = 20Vdc 025 = 25Vdc 035 = 35Vdc 040 = 40Vdc 050 = 50Vdc | C = Std ESR L = Low ESR | R = 7" T&R | S = Standard Conformance | Z = Non-ER | 0 = N/A | 7 = 100% Tin H = Sn/Pb Non RoHS | 00 = 4 cycles at 25°C +/- 5°C, after voltage ageing 23 = 10 cycles at 25°C +/- 5°C, after voltage ageing 24 = 10 cycles at -55°C -5°C, +0°C and +85°C +/- 5°C, after voltage ageing | E = Black resin |

TECHNICAL SPECIFICATIONS

| | |
|------------------------|--|
| Technical Data: | All technical data relate to an ambient temperature of +25°C |
| Capacitance Range: | 15µF to 1000 µF |
| Capacitance Tolerance: | ±20% |
| Leakage Current DCL: | 0.1CV |
| Temperature Range: | -55°C to +125°C |
| Termination Finish: | Sn Plating or SnPb Plating (Non RoHS) |

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 KYOCERA AVX Conductive Polymer Capacitor Guidelines for more information or contact factory for application assistance.

TCS SERIES

COTS-Plus Polymer Solid Electrolytic Multianode Capacitor



CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

| Capacitance | | Rated Voltage DC (VR) | | | | | | | | | |
|-------------|------|-----------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| µF | Code | 2.5 (e) | 4V (G) | 6.3V (J) | 10V (A) | 16V (C) | 20V (D) | 25V (E) | 35V (V) | 40V (G) | 50V (T) |
| 15 | 156 | | | | | | | | | | E(100) |
| 22 | 226 | | | | | | | | | | E(75) |
| 33 | 336 | | | | | | | E(60) | E(60) | | E(50,75) |
| 47 | 476 | | | | | | | E(60) | E(45,60) | | U(60) |
| 68 | 686 | | | | | | E(25) | E(50) | | U(40,50) | |
| 100 | 107 | | | | | E(25) | E(25) | E(35,60) | | | |
| 150 | 157 | | | | | E(25,40) | E(30,50) | | | | |
| 220 | 227 | | | | E(25) | E(25,40) | | | | | |
| 330 | 337 | | | E(15) | E(15,25) | E(15,25) | | | | | |
| 470 | 477 | D(6), E(10,12) | E(10,12) | E(10,12) | E(15,25) | | | | | | |
| 680 | 687 | D(6), E(10,12) | E(10,12) | | | | | | | | |
| 1000 | 108 | E(10,12) | E(10,12) | | | | | | | | |

Released Ratings, (ESR ratings in mOhms in parentheses)

Engineering samples - please contact KYOCERA AVX

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

RATINGS & PART NUMBER REFERENCE

| Part No. | Case Size | Capacitance (µF) | Rated Voltage (V) | Max Operating Temperature (°C) | DCL Max. (µA) | DF Max. (%) | ESR Max. @ 100kHz (mΩ) | 100kHz RMS Current (mA) | | | | MSL | Humidity 85°C/85%RH, Vr (hrs) |
|----------------------|-----------|------------------|-------------------|--------------------------------|---------------|-------------|------------------------|-------------------------|------|-------|-------|-----|-------------------------------|
| | | | | | | | | 45°C | 85°C | 105°C | 125°C | | |
| 2.5 Volt | | | | | | | | | | | | | |
| TCSD477M002LRSZ0+++E | D | 470 | 2.5 | 125 | 117.5 | 10 | 6 | 7700 | 5400 | 3500 | 1900 | 3 | 1000 |
| TCSD687M002LRSZ0+++E | D | 680 | 2.5 | 125 | 170 | 10 | 6 | 7700 | 5400 | 3500 | 1900 | 3 | 1000 |
| TCSE477M002LRSZ0+++E | E | 470 | 2.5 | 125 | 117.5 | 8 | 10 | 6400 | 4500 | 2900 | 1600 | 3 | 500 |
| TCSE477M002CRSZ0+++E | E | 470 | 2.5 | 125 | 117.5 | 8 | 12 | 5800 | 4100 | 2600 | 1500 | 3 | 500 |
| TCSE687M002LRSZ0+++E | E | 680 | 2.5 | 125 | 170 | 8 | 10 | 6400 | 4500 | 2900 | 1600 | 3 | 500 |
| TCSE687M002CRSZ0+++E | E | 680 | 2.5 | 125 | 170 | 8 | 12 | 5800 | 4100 | 2600 | 1500 | 3 | 500 |
| TCSE108M002LRSZ0+++E | E | 1000 | 2.5 | 125 | 250 | 8 | 10 | 6400 | 4500 | 2900 | 1600 | 3 | 500 |
| TCSE108M002CRSZ0+++E | E | 1000 | 2.5 | 125 | 250 | 8 | 12 | 5800 | 4100 | 2600 | 1500 | 3 | 500 |
| 4 Volt | | | | | | | | | | | | | |
| TCSE477M004LRSZ0+++E | E | 470 | 4 | 125 | 188 | 8 | 10 | 6400 | 4500 | 2900 | 1600 | 3 | 500 |
| TCSE477M004CRSZ0+++E | E | 470 | 4 | 125 | 188 | 8 | 12 | 5800 | 4100 | 2600 | 1500 | 3 | 500 |
| TCSE687M004LRSZ0+++E | E | 680 | 4 | 125 | 272 | 8 | 10 | 6400 | 4500 | 2900 | 1600 | 3 | 500 |
| TCSE687M004CRSZ0+++E | E | 680 | 4 | 125 | 272 | 8 | 12 | 5800 | 4100 | 2600 | 1500 | 3 | 500 |
| TCSE108M004LRSZ0+++E | E | 1000 | 4 | 125 | 400 | 8 | 10 | 6400 | 4500 | 2900 | 1600 | 3 | 500 |
| TCSE108M004CRSZ0+++E | E | 1000 | 4 | 125 | 400 | 8 | 12 | 5800 | 4100 | 2600 | 1500 | 3 | 500 |
| 6.3 Volt | | | | | | | | | | | | | |
| TCSE337M006CRSZ0+++E | E | 330 | 6.3 | 125 | 198 | 8 | 15 | 5200 | 3600 | 2300 | 1300 | 3 | 500 |
| TCSE477M006LRSZ0+++E | E | 470 | 6.3 | 125 | 282 | 8 | 10 | 6400 | 4500 | 2900 | 1600 | 3 | 500 |
| TCSE477M006CRSZ0+++E | E | 470 | 6.3 | 125 | 282 | 8 | 12 | 5800 | 4100 | 2600 | 1500 | 3 | 500 |
| 10 Volt | | | | | | | | | | | | | |
| TCSE227M010CRSZ0+++E | E | 220 | 10 | 125 | 220 | 8 | 25 | 4000 | 2800 | 1800 | 1000 | 3 | 500 |
| TCSE337M010LRSZ0+++E | E | 330 | 10 | 125 | 330 | 8 | 15 | 5200 | 3600 | 2300 | 1300 | 3 | 500 |
| TCSE337M010CRSZ0+++E | E | 330 | 10 | 125 | 330 | 8 | 25 | 4000 | 2800 | 1800 | 1000 | 3 | 500 |
| TCSE477M010LRSZ0+++E | E | 470 | 10 | 125 | 470 | 10 | 15 | 5200 | 3600 | 2300 | 1300 | 3 | 500 |
| TCSE477M010CRSZ0+++E | E | 470 | 10 | 125 | 470 | 10 | 25 | 4000 | 2800 | 1800 | 1000 | 3 | 500 |
| 16 Volt | | | | | | | | | | | | | |
| TCSE107M016CRSZ0+++E | E | 100 | 16 | 125 | 160 | 8 | 25 | 4000 | 2800 | 1800 | 1000 | 3 | 500 |
| TCSE157M016LRSZ0+++E | E | 150 | 16 | 125 | 240 | 8 | 25 | 4000 | 2800 | 1800 | 1000 | 3 | 500 |
| TCSE157M016CRSZ0+++E | E | 150 | 16 | 125 | 240 | 8 | 40 | 3200 | 2200 | 1400 | 800 | 3 | 500 |
| TCSE227M016LRSZ0+++E | E | 220 | 16 | 125 | 352 | 8 | 25 | 4000 | 2800 | 1800 | 1000 | 3 | 500 |
| TCSE227M016CRSZ0+++E | E | 220 | 16 | 125 | 352 | 8 | 40 | 3200 | 2200 | 1400 | 800 | 3 | 500 |
| TCSE337M016LRSZ0+++E | E | 330 | 16 | 125 | 528 | 10 | 15 | 5200 | 3600 | 2300 | 1300 | 3 | 500 |
| TCSE337M016CRSZ0+++E | E | 330 | 16 | 125 | 528 | 10 | 25 | 4000 | 2800 | 1800 | 1000 | 3 | 500 |
| 20 Volt | | | | | | | | | | | | | |
| TCSE686M020CRSZ0+++E | E | 68 | 20 | 125 | 136 | 8 | 25 | 4000 | 2800 | 1800 | 1000 | 3 | 500 |
| TCSE107M020CRSZ0+++E | E | 100 | 20 | 125 | 200 | 8 | 25 | 4000 | 2800 | 1800 | 1000 | 3 | 500 |
| TCSE157M020LRSZ0+++E | E | 150 | 20 | 125 | 300 | 8 | 30 | 3700 | 2600 | 1700 | 900 | 3 | 1000 |
| TCSE157M020CRSZ0+++E | E | 150 | 20 | 125 | 300 | 8 | 50 | 2900 | 2000 | 1300 | 700 | 3 | 1000 |
| 25 Volt | | | | | | | | | | | | | |
| TCSE336M025CRSZ0+++E | E | 33 | 25 | 125 | 82.5 | 8 | 60 | 2600 | 1800 | 1200 | 700 | 3 | 1000 |
| TCSE476M025CRSZ0+++E | E | 47 | 25 | 125 | 117.5 | 8 | 60 | 2600 | 1800 | 1200 | 700 | 3 | 1000 |
| TCSE686M025CRSZ0+++E | E | 68 | 25 | 125 | 170 | 8 | 50 | 2900 | 2000 | 1300 | 700 | 3 | 1000 |
| TCSE107M025LRSZ0+++E | E | 100 | 25 | 125 | 250 | 8 | 35 | 3400 | 2400 | 1500 | 900 | 3 | 1000 |
| TCSE107M025CRSZ0+++E | E | 100 | 25 | 125 | 250 | 8 | 60 | 2600 | 1800 | 1200 | 700 | 3 | 1000 |
| 35 Volt | | | | | | | | | | | | | |
| TCSE226M035CRSZ0+++E | E | 22 | 35 | 125 | 77 | 8 | 60 | 2600 | 1800 | 1200 | 700 | 3 | 1000 |

TCS SERIES

COTS-Plus Polymer Solid Electrolytic Multianode Capacitor



| Part No. | Case Size | Capacitance (μF) | Rated Voltage (V) | Max Operating Temperature (°C) | DCL Max. (μA) | DF Max. (%) | ESR Max. @ 100kHz (mΩ) | 100kHz RMS Current (mA) | | | | MSL | Humidity 85°C/85%RH, Vr (hrs) |
|------------------------------|-----------|------------------|-------------------|--------------------------------|---------------|-------------|------------------------|-------------------------|-------------|-------------|------------|----------|-------------------------------|
| | | | | | | | | 45°C | 85°C | 105°C | 125°C | | |
| TCSE336M035CRSZ0^++E | E | 33 | 35 | 125 | 115.5 | 8 | 60 | 2600 | 1800 | 1200 | 700 | 3 | 1000 |
| TCSE476M035LRSZ0^++E | E | 47 | 35 | 125 | 164.5 | 8 | 45 | 3000 | 2100 | 1400 | 800 | 3 | 1000 |
| TCSE476M035CRSZ0^++E | E | 47 | 35 | 125 | 164.5 | 8 | 60 | 2600 | 1800 | 1200 | 700 | 3 | 1000 |
| 40 Volts | | | | | | | | | | | | | |
| TCSU686M040LRSZ0^00E | U | 68 | 40 | 125 | 272 | 10 | 40 | 3300 | 2300 | 1500 | 800 | 3 | 1000 |
| TCSU686M040CRSZ0^00E | U | 68 | 40 | 125 | 272 | 10 | 50 | 2900 | 2000 | 1300 | 700 | 3 | 1000 |
| 50 Volt | | | | | | | | | | | | | |
| TCSE156M050CRSZ0^++E | E | 15 | 50 | 125 | 75 | 10 | 100 | 2000 | 1400 | 900 | 500 | 3 | 1000 |
| TCSE226M050CRSZ0^++E | E | 22 | 50 | 125 | 110 | 10 | 75 | 2300 | 1600 | 1000 | 600 | 3 | 1000 |
| TCSE336M050LRSZ0^++E | E | 33 | 50 | 125 | 165 | 10 | 50 | 2900 | 2000 | 1300 | 700 | 3 | 1000 |
| TCSE336M050CRSZ0^++E | E | 33 | 50 | 125 | 165 | 10 | 75 | 2300 | 1600 | 1000 | 600 | 3 | 1000 |
| TC <u>SU476M050CRSZ0^00E</u> | <u>U</u> | <u>47</u> | <u>50</u> | <u>125</u> | <u>235</u> | <u>10</u> | <u>60</u> | <u>2700</u> | <u>1900</u> | <u>1200</u> | <u>700</u> | <u>3</u> | <u>1000</u> |

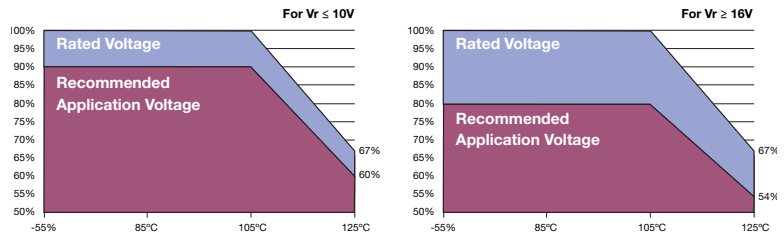
Moisture Sensitivity Level (MSL) is defined according to J-STD-020. All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes. ESR allowed to move up to 1.25 times catalog limit post mounting.

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

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 | TCS COST-Plus 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 | 1.25 x initial limit | | | | | | |
| | | | | ΔC/C | within +10/-20% of initial value | | | | | | |
| | | | | DF | 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 +10/-20% of initial value | | | | | | |
| | | | | DF | 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 | 2 x initial limit | | | | | | |
| | | | | ΔC/C | within +35/-5% of initial value | | | | | | |
| | | | | DF | 1.5 x initial limit | | | | | | |
| | | | | ESR | 2 x initial limit | | | | | | |
| Temperature Stability | Step | Temperature°C | Duration (min) | | +20°C | -55°C | +20°C | +85°C | +125°C | +20°C | |
| | 1 | +20±2 | 15 | DCL | IL* | n/a | IL* | 10 x IL* | 12.5 x IL* | IL* | |
| | 2 | -55+0/-3 | 15 | | | | | | | | |
| | 3 | +20±2 | 15 | ΔC/C | n/a | +0/-20% | ±5% | +20/-0% | +30/-0% | ±5% | |
| | 4 | +85+3/-0 | 15 | | | | | | | | |
| | 5 | +125+3/-0 | 15 | DF | IL* | 1.5 x IL* | IL* | 1.5 x IL* | 1.5 x IL* | IL* | |
| 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±1000 Number of cycles: 1000x Cycle duration: 6min; 30 sec charge, 5min; 30 sec discharge | | | Visual examination | no visible damage | | | | | | |
| | | | | DCL | initial limit | | | | | | |
| | | | | ΔC/C | within ±10% of initial value | | | | | | |
| | | | | DF | initial limit | | | | | | |
| | | | | ESR | 1.25 x initial limit | | | | | | |
| Mechanical Shock | MIL-STD-202, Method 213, Condition F | | | Visual examination | no visible damage | | | | | | |
| | | | | DCL | initial limit | | | | | | |
| | | | | ΔC/C | within ±10% of initial value | | | | | | |
| | | | | DF | initial limit | | | | | | |
| | | | | ESR | 1.25 x initial limit | | | | | | |
| Vibration | MIL-STD-202, Method 204, Condition D | | | 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

Initial measurement max. 1hr after the removal from dry pack or after pretreatment at 85°C for 24 hours.

In case of special request, please contact manufacturer.



The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.