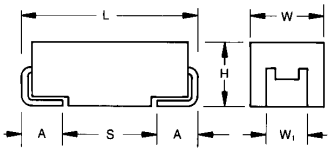
TCS Series

COTS-Plus Polymer Solid Electrolytic Multianode Capacitor



FEATURES

- Robust design for long operation lifetime
- Volumetric efficiency
- Statistical screening with Accelerated Ageing
- Surge testing level option'
- Improved basic reliability 0.5%/1000hrs
- Humidity 85°C/85%RH, Vr, 500 hours
- - 55 to +125°C operation temperature
- Shock and Vibration by MIL-STD-202
- DCL 0.1 CV
- Low ESR
- 3x reflow 260°C compatible
- High frequency capacitance retention
- Benign failure mode under recommended use conditions

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

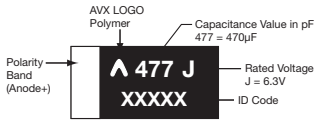
For RoHS compliant products, please select correct termination style.

APPLICATIONS

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

MARKING

E 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.
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)
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	^	++
Type	**Case Size** See table above	**Capacitance Code** pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** M = ±20%	**Rated DC Voltage** 002 = 2.5Vdc 004 = 4Vdc 006 = 6.3Vdc 025 = 25Vdc 035 = 35Vdc	**ESR** C = Std ESR L = Low ESR	**Packaging** R = 7" T&R	**Inspection Level** S = Standard Conformance	**Reliability Grade** Z = Non-ER	**Qualification Level** 0 = N/A	**Termination Finish** 7 = 100% Tin H = Sn/Pb Non RoHS	**Surge Test Option** 00 = Standard 23 = 10x Cycles, 25°C 24 = 10x Cycles, -55°C & +85°C

TECHNICAL SPECIFICATIONS

Technical Data:	All technical data relate to an ambient temperature of +25°C
Capacitance Range:	22 µF to 1000 µF
Capacitance Tolerance:	±20%
Leakage Current DCL:	0.1CV
Temperature Range:	-55°C to +125°C
Reliability:	0.5% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance, 60% confidence level
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 AVX Conductive Polymer Capacitor Guidelines for more information or contact factory for application assistance.

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COTS-Plus Polymer Solid Electrolytic Multianode Capacitor

CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V_R)				
µF	Code	2.5 (e)	4V (G)	6.3V (J)	25V (E)	35V (V)
22	226					E(60)
33	336				E(60)	E(60)
47	476				E(60)	
330	337			E(15)		
470	477	E(10,12)	E(10,12)	E(10,12)		
680	687	E(10,12)	E(10,12)			
1000	108	E(10,12)	E(10,12)			

Released Ratings, (ESR ratings in mOhms in parentheses)

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)	100kHz RMS Current (mA)				MSL	Humidity 85°C/85% RH Vr (hrs)
								45°C	85°C	105°C	125°C		
2.5 Volt													
TCSE477M002LRSZ0^++	E	470	2.5	125	117.5	8	10	6400	4500	2900	1600	3	500
TCSE477M002CRSZ0^++	E	470	2.5	125	117.5	8	12	5800	4100	2600	1500	3	500
TCSE687M002LRSZ0^++	E	680	2.5	125	170	8	10	6400	4500	2900	1600	3	500
TCSE687M002CRSZ0^++	E	680	2.5	125	170	8	12	5800	4100	2600	1500	3	500
TCSE108M002LRSZ0^++	E	1000	2.5	125	250	8	10	6400	4500	2900	1600	3	500
TCSE108M002CRSZ0^++	E	1000	2.5	125	250	8	12	5800	4100	2600	1500	3	500
4 Volt													
TCSE477M004LRSZ0^++	E	470	4	125	188	8	10	6400	4500	2900	1600	3	500
TCSE477M004CRSZ0^++	E	470	4	125	188	8	12	5800	4100	2600	1500	3	500
TCSE687M004LRSZ0^++	E	680	4	125	272	8	10	6400	4500	2900	1600	3	500
TCSE687M004CRSZ0^++	E	680	4	125	272	8	12	5800	4100	2600	1500	3	500
TCSE108M004LRSZ0^++	E	1000	4	125	400	8	10	6400	4500	2900	1600	3	500
TCSE108M004CRSZ0^++	E	1000	4	125	400	8	12	5800	4100	2600	1500	3	500
6.3 Volt													
TCSE337M006CRSZ0^++	E	330	6.3	125	208	8	15	5200	3600	2300	1300	3	500
TCSE477M006LRSZ0^++	E	470	6.3	125	296	8	10	6400	4500	2900	1600	3	500
TCSE477M006CRSZ0^++	E	470	6.3	125	296	8	12	5800	4100	2600	1500	3	500
25 Volt													
TCSE336M025CRSZ0^++	E	33	25	125	82.5	8	60	2600	1800	1200	700	3	500
TCSE476M025CRSZ0^++	E	47	25	125	117.5	8	60	2600	1800	1200	700	3	500
35 Volt													
TCSE226M035CRSZ0^++	E	22	35	125	77	8	60	2600	1800	1200	700	3	500
TCSE336M035CRSZ0^++	E	33	35	125	115.5	8	60	2600	1800	1200	700	3	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.

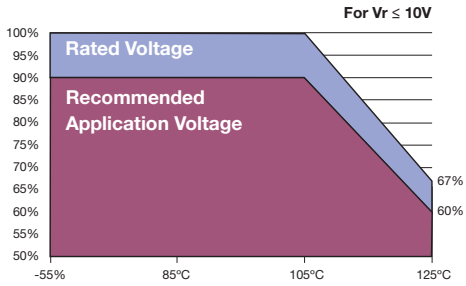
ESR allowed to move up to 1.25 times catalog limit post mounting.

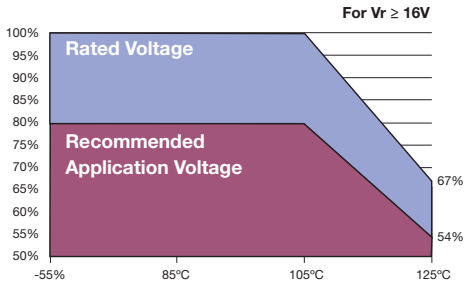
NOTE: AVX reserves the right to supply a higher voltage rating or tighter tolerance part in the same case size, to the same reliability standards.

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

<table>
<tr><th rowspan="2">TEST</th><th colspan="4">TCS COST-Plus series (Temperature range -55ºC to +125ºC)</th></tr>
<tr><th colspan="3">Condition</th><th colspan="3">Characteristics</th></tr>
<tr><td>Endurance</td><td colspan="3">Determine after application of rated voltage for 2000 +48/-0 hours at 105±2ºC. Also determine after application of 125ºC 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.</td><td>Visual examination</td><td colspan="2">no visible damage</td></tr>
<tr><td></td><td></td><td></td><td>DCL</td><td colspan="2">1.25 x initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ΔC/C</td><td colspan="2">within +10/-20% of initial value</td></tr>
<tr><td></td><td></td><td></td><td>DF</td><td colspan="2">initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ESR</td><td colspan="2">2 x initial limit</td></tr>
<tr><td>Storage Life</td><td colspan="3">125ºC, 0V, 2000h</td><td>Visual examination</td><td colspan="2">no visible damage</td></tr>
<tr><td></td><td></td><td></td><td>DCL</td><td colspan="2">2 x initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ΔC/C</td><td colspan="2">within +10/-20% of initial value</td></tr>
<tr><td></td><td></td><td></td><td>DF</td><td colspan="2">initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ESR</td><td colspan="2">2 x initial limit</td></tr>
<tr><td>Biased Humidity</td><td colspan="3">Determine after leaving for 500 or 1000 hours at 85±2ºC, 85% relative humidity and rated voltage and then recovery 1-2 hours at room temperature.</td><td>Visual examination</td><td colspan="2">no visible damage</td></tr>
<tr><td></td><td></td><td></td><td>DCL</td><td colspan="2">3 x initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ΔC/C</td><td colspan="2">within +35/-5% of initial value</td></tr>
<tr><td></td><td></td><td></td><td>DF</td><td colspan="2">initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ESR</td><td colspan="2">2 x initial limit</td></tr>
<tr><td>Temperature Stability</td><td colspan="3"><table><tr><th>Step</th><th>Temperature°C</th><th>Duration(min)</th></tr><tr><td>1</td><td>+20±2</td><td>15</td></tr><tr><td>2</td><td>-55+0/-3</td><td>15</td></tr><tr><td>3</td><td>+20±2</td><td>15</td></tr><tr><td>4</td><td>+85+3/-0</td><td>15</td></tr><tr><td>5</td><td>+125+3/-0</td><td>15</td></tr><tr><td>6</td><td>+20±2</td><td>15</td></tr></table></td><td></td><td>+20ºC</td><td>-55ºC</td><td>+20ºC</td><td>+85ºC</td><td>+125ºC</td><td>+20ºC</td></tr>
<tr><td></td><td></td><td></td><td>DCL</td><td>IL*</td><td>n/a</td><td>IL*</td><td>10 x IL*</td><td>12.5 x IL*</td><td>IL*</td></tr>
<tr><td></td><td></td><td></td><td>ΔC/C</td><td>n/a</td><td>+0/-20%</td><td>±5%</td><td>+20/-0%</td><td>+30/-0%</td><td>±5%</td></tr>
<tr><td></td><td></td><td></td><td>DF</td><td>IL*</td><td>1.5 x IL*</td><td>IL*</td><td>1.5 x IL*</td><td>2 x IL*</td><td>IL*</td></tr>
<tr><td>Surge Voltage</td><td colspan="3">Test temperature: 125ºC+3/0ºC
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</td><td>Visual examination</td><td colspan="5">no visible damage</td></tr>
<tr><td></td><td></td><td></td><td>DCL</td><td colspan="5">initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ΔC/C</td><td colspan="5">within +5/-20% of initial value</td></tr>
<tr><td></td><td></td><td></td><td>DF</td><td colspan="5">initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ESR</td><td colspan="5">1.25 x initial limit</td></tr>
<tr><td>Mechanical Shock/Vibration</td><td colspan="3">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</td><td>Visual examination</td><td colspan="5">no visible damage</td></tr>
<tr><td></td><td></td><td></td><td>DCL</td><td colspan="5">initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ΔC/C</td><td colspan="5">within ±10% of initial value</td></tr>
<tr><td></td><td></td><td></td><td>DF</td><td colspan="5">initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ESR</td><td colspan="5">1.25 x initial limit</td></tr>
</table>

*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.