

# TCS SERIES

## COTS-Plus Polymer Solid Electrolytic Multianode Capacitor



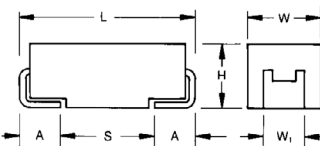
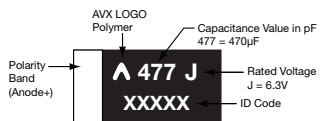
### FEATURES

- 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



### MARKING

#### E CASE



### APPLICATIONS

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

### 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.
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)

W<sub>1</sub> 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 Voltage	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 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 = Standard 23 = 10x Cycles, 25°C 24 = 10x Cycles, -55°C & +85°C	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 AVX Conductive Polymer Capacitor Guidelines for more information or contact factory for application assistance.

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### 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)	50V (T)
15	156									E(100)
22	226								E(60)	E(75)
33	336							E(60)	E(60)	
47	476							E(60)	E(45, 60)	
68	686						E(25)	E(50)		
100	107					E(25)	E(25)			
150	157					E(25,40)				
220	227				E(25)	E(25,40)				
330	337			E(15)	E(15,25)	E(15, 25)				
470	477	E(10,12)	E(10,12)	E(10,12)	E(15, 25)					
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 <sup>++E</sup>	E	470	2.5	125	117.5	8	10	6400	4500	2900	1600	3	500
TCSE477M002CRSZ0 <sup>++E</sup>	E	470	2.5	125	117.5	8	12	5800	4100	2600	1500	3	500
TCSE687M002LRSZ0 <sup>++E</sup>	E	680	2.5	125	170	8	10	6400	4500	2900	1600	3	500
TCSE687M002CRSZ0 <sup>++E</sup>	E	680	2.5	125	170	8	12	5800	4100	2600	1500	3	500
TCSE108M002LRSZ0 <sup>++E</sup>	E	1000	2.5	125	250	8	10	6400	4500	2900	1600	3	500
TCSE108M002CRSZ0 <sup>++E</sup>	E	1000	2.5	125	250	8	12	5800	4100	2600	1500	3	500
4 Volt													
TCSE477M004LRSZ0 <sup>++E</sup>	E	470	4	125	188	8	10	6400	4500	2900	1600	3	500
TCSE477M004CRSZ0 <sup>++E</sup>	E	470	4	125	188	8	12	5800	4100	2600	1500	3	500
TCSE687M004LRSZ0 <sup>++E</sup>	E	680	4	125	272	8	10	6400	4500	2900	1600	3	500
TCSE687M004CRSZ0 <sup>++E</sup>	E	680	4	125	272	8	12	5800	4100	2600	1500	3	500
TCSE108M004LRSZ0 <sup>++E</sup>	E	1000	4	125	400	8	10	6400	4500	2900	1600	3	500
TCSE108M004CRSZ0 <sup>++E</sup>	E	1000	4	125	400	8	12	5800	4100	2600	1500	3	500
6.3 Volt													
TCSE337M006CRSZ0 <sup>++E</sup>	E	330	6.3	125	198	8	15	5200	3600	2300	1300	3	500
TCSE477M006LRSZ0 <sup>++E</sup>	E	470	6.3	125	282	8	10	6400	4500	2900	1600	3	500
TCSE477M006CRSZ0 <sup>++E</sup>	E	470	6.3	125	282	8	12	5800	4100	2600	1500	3	500
10 Volt													
TCSE227M010CRSZ0 <sup>++E</sup>	E	220	10	125	220	8	25	4000	2800	1800	1000	3	500
TCSE337M010LRSZ0 <sup>++E</sup>	E	330	10	125	330	8	15	5200	3600	2300	1300	3	500
TCSE337M010CRSZ0 <sup>++E</sup>	E	330	10	125	330	8	25	4000	2800	1800	1000	3	500
TCSE477M010LRSZ0 <sup>++E</sup>	E	470	10	125	470	10	15	5200	3600	2300	1300	3	500
TCSE477M010CRSZ0 <sup>++E</sup>	E	470	10	125	470	10	25	4000	2800	1800	1000	3	500
16 Volt													
TCSE107M016CRSZ0 <sup>++E</sup>	E	100	16	125	160	8	25	4000	2800	1800	1000	3	500
TCSE157M016LRSZ0 <sup>++E</sup>	E	150	16	125	240	8	25	4000	2800	1800	1000	3	500
TCSE157M016CRSZ0 <sup>++E</sup>	E	150	16	125	240	8	40	3200	2200	1400	800	3	500
TCSE227M016LRSZ0 <sup>++E</sup>	E	220	16	125	352	8	25	4000	2800	1800	1000	3	500
TCSE227M016CRSZ0 <sup>++E</sup>	E	220	16	125	352	8	40	3200	2200	1400	800	3	500
TCSE337M016LRSZ0 <sup>++E</sup>	E	330	16	125	528	10	15	5200	3600	2300	1300	3	500
TCSE337M016CRSZ0 <sup>++E</sup>	E	330	16	125	528	10	25	4000	2800	1800	1000	3	500
20 Volt													
TCSE686M020CRSZ0 <sup>++E</sup>	E	68	20	125	136	8	25	4000	2800	1800	1000	3	500
TCSE107M020CRSZ0 <sup>++E</sup>	E	100	20	125	200	8	25	4000	2800	1800	1000	3	500
25 Volt													
TCSE336M025CRSZ0 <sup>++E</sup>	E	33	25	125	82.5	8	60	2600	1800	1200	700	3	500
TCSE476M025CRSZ0 <sup>++E</sup>	E	47	25	125	117.5	8	60	2600	1800	1200	700	3	500
TCSE686M025CRSZ0 <sup>++E</sup>	E	68	25	125	170	8	50	2900	2000	1300	700	3	500
35 Volt													
TCSE226M035CRSZ0 <sup>++E</sup>	E	22	35	125	77	8	60	2600	1800	1200	700	3	500
TCSE336M035CRSZ0 <sup>++E</sup>	E	33	35	125	115.5	8	60	2600	1800	1200	700	3	500
TCSE476M035LRSZ0 <sup>++E</sup>	E	47	35	125	164.5	8	45	3000	2100	1400	800	3	500
TCSE476M035CRSZ0 <sup>++E</sup>	E	47	35	125	164.5	8	60	2600	1800	1200	700	3	500
50 Volt													
TCSE156M050CRSZ0 <sup>++E</sup>	E	15	50	125	75	10	100	2000	1400	900	500	3	500
TCSE226M050CRSZ0 <sup>++E</sup>	E	22	50	125	110	10	75	2300	1600	1000	600	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.**



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

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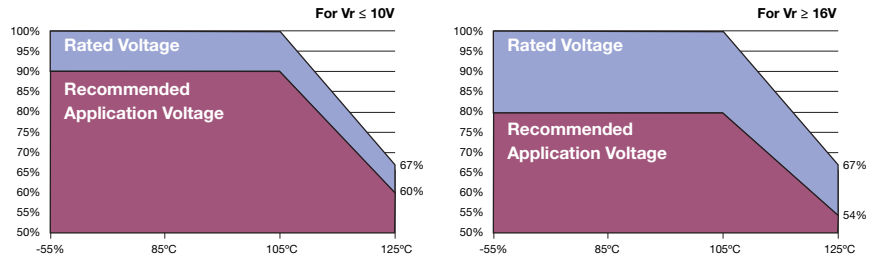
## COTS-Plus Polymer Solid Electrolytic Multianode Capacitor



### 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 COTS-Plus series (Temperature range -55°C to +125°C)										
	Condition			Characteristics							
<b>Endurance</b>	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						
<b>Storage Life</b>	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						
<b>Biased Humidity</b>	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 +35/-5% of initial value						
				DF	initial limit						
				ESR	2 x initial limit						
<b>Temperature Stability</b>	Step	Temperature°C	Duration (min)								
	1	+20±2	15	DCL	+20°C	-55°C	+20°C	+85°C	+125°C	+20°C	
	2	-55+0/-3	15		IL*	n/a	IL*	10 x IL*	12.5 x IL*	IL*	
	3	+20±2	15	ΔC/C	n/a	+0/-20%	±5%	+20/-0%	+30/-0%	±5%	
	4	+85+3/-0	15		DF	IL*	1.5 x IL*	IL*	1.5 x IL*	2 x IL*	IL*
	5	+125+3/-0	15	ESR	1.25 x initial limit						
6	+20±2	15									
<b>Surge Voltage</b>	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: 6min; 30 sec charge, 5min; 30 sec discharge			Visual examination	no visible damage						
				DCL	initial limit						
				ΔC/C	within +5/-20% of initial value						
				DF	initial limit						
				ESR	1.25 x initial limit						
<b>Mechanical Shock/Vibration</b>	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.