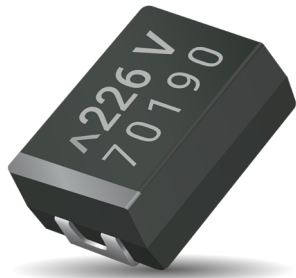
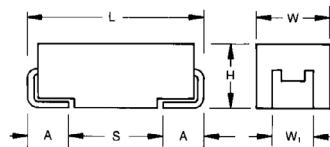
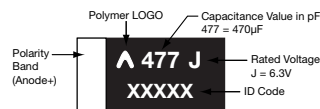


TCS SERIES

COTS-Plus & Automotive Polymer Solid Electrolytic Multianode Capacitor



MARKING D, E, U CASE



FEATURES

- Robust design for long operation lifetime
- Volumetric efficiency
- Statistical screening with Accelerated Ageing
- Surge testing level option
- 0.5% / 1000 hours at 85°C, rated voltage with 0.1 Ω/V series impedance and 60% confidence level
- Selected codes meet requirements of AEC-Q200
- Humidity 85°C/85%RH, Vr, up to 1000 hours
- -55 to +125°C operation temperature
- Shock and Vibration by MIL-STD-202
- DCL 0.1 CV
- Low ESR
- 3x reflow cycles according to J-STD-020
- High frequency capacitance retention
- Benign failure mode under recommended use conditions



APPLICATIONS

DC/DC converters, Telecommunication (coupling/decoupling), Industrial & special, Automotive (body electronics, cabin controls, infotainment, comfort, after market etc).

Not recommended for use of conductive polymer parts in high power applications. For more information please see the KYOCERA AVX [Automotive Applications Guide](#) at kyocera-avx.com, or contact manufacturer.

KYOCERA AVX's qualification of TCS capacitors meets requirements of AEC-Q200. TCS series is manufactured in an IATF 16949 certified facility.

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)	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 = 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)
	Selected codes meet requirements of AEC-Q200

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.

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COTS-Plus & Automotive 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(60)		E(75)
33	336							E(60)	E(60)		E(50,75)
47	476							E(60)	E(45, 60)		
68	686						E(25)	E(50)		U(40,50)	
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	D(6), 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. 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
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
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
35 Volt													
TCSE226M035CRSZ0^++E	E	22	35	125	77	8	60	2600	1800	1200	700	3	1000
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

TCS SERIES

COTS-Plus & Automotive 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		
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

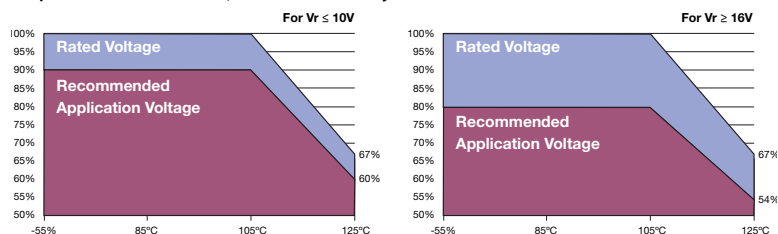
Moisture Sensitivity Level (MSL) is defined according to J-STD-020. All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes. ESR allowed to move up to 1.25 times catalog 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				Visual examination	no visible damage					
	Surge voltage: 1.3 x 2/3 rated voltage				DCL	initial limit					
	Charge/Discharge resistance: 1000±100Ω Number of cycles: 1000x				ΔC/C	within ±10% of initial value					
	Cycle duration: 6min; 30 sec charge, 5min; 30 sec discharge				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

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.