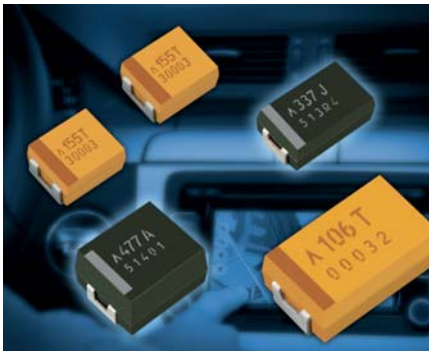
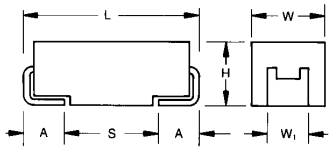
TCQ Series

Automotive Conductive Polymer Chip Capacitors





FEATURES

- Conductive polymer electrode
- Benign failure mode under recommended use conditions
- Robust design for automotive applications
- Meets requirements of AEC-Q200
- Humidity 85°C/85%RH, Vr, (up to 500 or 1000 hours see reference table)
- Basic reliability 1%/1000hrs@85°C Vr with 60% confidence level
- -55 to +125°C operation temperature
- Full voltage range: 4-50V
- DCL 0.1 CV
- 3x reflow 260°C compatible

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

APPLICATIONS

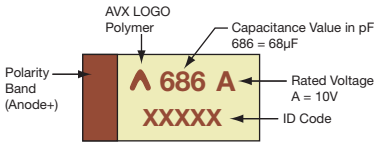
DC/DC converters, Telecommunication (coupling/decoupling), Industrial & special, Automotive (body electronics, cabin controls, infotainment, comfort, after market etc)

Not recommended for use of conductive polymer parts in safety critical or high temperature exposure applications. For more information please see AVX automotive application guide at avx.com (see the link: http://www.avx.com/docs/techinfo/ApplicationGuides/Automotive-Application-Guide.pdf), or contact manufacturer.

AVX's qualification of TCQ capacitors meets requirements of AEC-Q200. TCQ series is manufactured in an ISO TS 16949 certified facility.

MARKING

B, D, U, 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)	W1±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)
U	2924	7361-43	7.30 (0.287)	6.10 (0.240)	4.10 (0.162)	3.10 (0.120)	1.30 (0.051)	4.40 (0.173)
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.

HOW TO ORDER

TCQ	B	476	M	006	#	0070	E
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** 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	**ESR in mΩ**	**Additional Character** E = Black resin

TECHNICAL SPECIFICATIONS

Technical Data:	All technical data relate to an ambient temperature of +25°C
Capacitance Range:	10 µF to 470 µF
Capacitance Tolerance:	±20%
Leakage Current DCL:	0.1CV
Temperature Range:	-55°C to +125°C
Reliability:	1% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance 60% confidence level
	Meets requirements of AEC-Q200 (for humidity 85°C/85%RH, V_R details see reference table)

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 (V_R) @ 105°C							
µF	Code	4V (G)	6.3V (J)	10V (A)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
10	106							D(70)	D(90)
15	156						D(70)		
22	226		B(70)			D(70)			
33	336		B(70)		D(70),Y(70)			U(70)	
47	476		B(70)		D(70),Y(70)	D(70),Y(70)		U(70)	
68	686			D(25,40)					
100	107			D(25,40)			U(70)		
150	157		D(25,40)	D(25)					
220	227	D(25), Y(25)	D(25)	D(25)					
330	337	D(25)	D(25)						
470	477	D(25)							

Released ratings, (ESR ratings in mOhms in parentheses)
Note: Voltage ratings are minimum values. AVX reserves the right to supply higher volage 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 Temp. (°C)	DCL Max (µA)	DF Max (%)	ESR Max @ 100kHz (mΩ)	100kHz RMS Current (mA)				Humidity 85°C/85%RH, Vr (hrs)	MSL
								45°C	85°C	105°C	125°C		
4 Volt													
TCQD227M004#0025	D	220	4	125	88	6	25	3000	2100	1350	750	1000	3
TCQY227M004#0025	Y	220	4	125	88	6	25	2720	1904	1224	680	500	3
TCQD337M004#0025	D	330	4	125	132	6	25	3000	2100	1350	750	1000	3
TCQD477M004#0025	D	470	4	125	188	6	25	3000	2100	1350	750	1000	3
6.3 Volt													
TCQB226M006#0070	B	22	6.3	125	13.2	6	70	1336	935	601	334	500	3
TCQB336M006#0070	B	33	6.3	125	19.8	6	70	1336	935	601	334	500	3
TCQB476M006#0070	B	47	6.3	125	28.2	6	70	1336	935	601	334	500	3
TCQD157M006#0025	D	150	6.3	125	90	6	25	3000	2100	1350	750	1000	3
TCQD157M006#0040	D	150	6.3	125	90	6	40	2372	1660	1067	593	1000	3
TCQD227M006#0025	D	220	6.3	125	132	6	25	3000	2100	1350	750	1000	3
TCQD337M006#0025	D	330	6.3	125	198	6	25	3000	2100	1350	750	1000	3
10 Volt													
TCQD686M010#0025	D	68	10	125	68	6	25	3000	2100	1350	750	1000	3
TCQD686M010#0040	D	68	10	125	68	6	40	2372	1660	1067	593	1000	3
TCQD107M010#0025	D	100	10	125	100	6	25	3000	2100	1350	750	1000	3
TCQD107M010#0040	D	100	10	125	100	6	40	2372	1660	1067	593	1000	3
TCQD157M010#0025E	D	150	10	125	150	6	25	3000	2100	1350	750	1000	3
TCQD227M010#0025E	D	220	10	125	220	6	25	3000	2100	1350	750	1000	3
16 Volt													
TCQD336M016#0070	D	33	16	125	52.8	6	70	1793	1255	807	448	1000	3
TCQY336M016#0070E	Y	33	16	125	52.8	6	70	1626	1138	732	406	1000	3
TCQD476M016#0070	D	47	16	125	75.2	6	70	1793	1255	807	448	1000	3
TCQY476M016#0070E	Y	47	16	125	75.2	6	70	1626	1138	732	406	1000	3
20 Volt													
TCQD226M020#0070	D	22	20	125	44	6	70	1793	1255	807	448	1000	3
TCQD476M020#0070E	D	47	20	125	94	6	70	1793	1255	807	448	1000	3
TCQY476M020#0070E	Y	47	20	125	94	6	70	1626	1138	732	406	1000	3
25 Volt													
TCQD156M025#0070	D	15	25	125	37.5	6	70	1793	1255	807	448	1000	3
TCQU107M025#0070E	U	100	25	125	250	12	70	2330	1631	1048	582	500	3
35 Volt													
TCQD106M035#0070	D	10	35	125	35	6	70	1793	1255	807	448	1000	3
TCQU336M035#0070E	U	33	35	125	115.5	12	70	2330	1631	1048	582	500	3
TCQU476M035#0070E	U	47	35	125	164.5	12	70	2330	1631	1048	582	500	3
50 Volt													
TCQD106M050#0090	D	10	50	125	50	10	90	1581	1107	712	395	500	3

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.
All technical data relates to an ambient temperature of +25ºC. 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 273.

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

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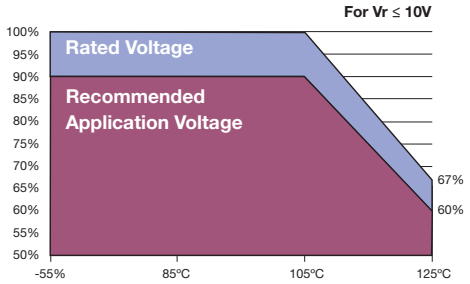
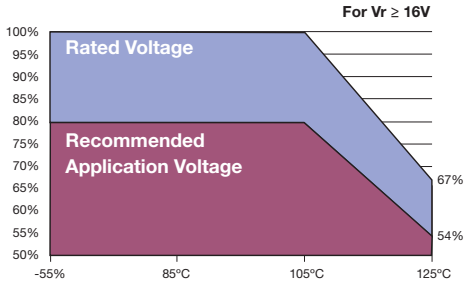
RECOMMENDED DERATING FACTOR

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

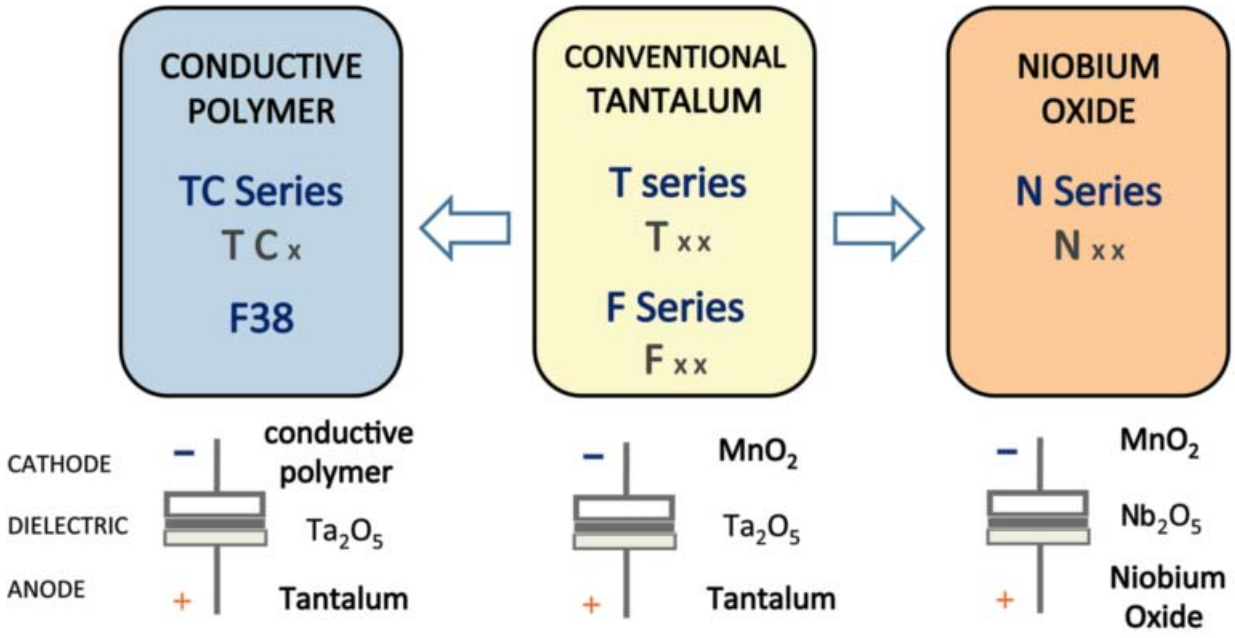
TEST	TCQ series (Temperature range -55°C to 125°C)		
	Condition	Characteristics	
Endurance	Apply 2/3 rated voltage (Ur) at 125°C for 1000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	2 x initial limit
		ΔC/C	within +10/-20% of initial value
		DF	2 x initial limit
		ESR	2 x initial limit
Storage Life	Store at 125°C, no voltage applied, for 1000 hours. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	2x initial limit
		ΔC/C	within +10/-20% of initial value
		DF	2 x initial limit
		ESR	2 x initial limit
Biased Humidity	Apply rated voltage (Ur) at 85°C, 85% relative humidity for 1000 (500) hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.	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 1: +20°C, 15 min Step 2: -55°C, 15 min Step 3: +20°C, 15 min Step 4: +85°C, 15 min Step 5: +125°C, 15 min Step 6: +20°C, 15 min		
			+20°C / -55°C / +20°C / +85°C / +125°C / +20°C
		DCL	IL* / n/a / IL* / 10 x IL* / 12.5 x IL* / IL*
		ΔC/C	n/a / ±20% / ±5% / ±20% / ±30% / ±5%
		DF	IL* / IL* / IL* / 1.2 x IL* / 1.5 x IL* / IL*
Surge Voltage	Apply 1.3x 2/3x rated voltage (Ur) at 125°C for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within +10/-20% of initial value for $V_r \leq 10V$ within +20/-30% of initial value for $V_r \geq 16V$
		DF	initial limit for Vr ≤ 10V 1.25x initial limit for Vr ≥ 16V
		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

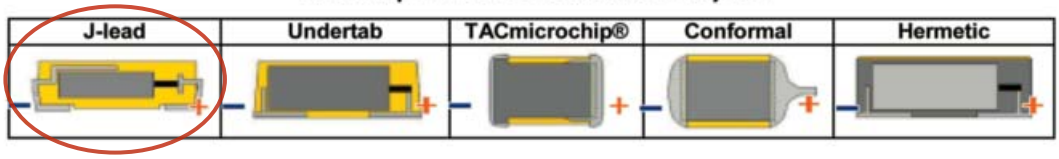
For use outside of recommended conditions and special request, please contact AVX.

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

AVX SOLID ELECTROLYTIC CAPACITOR ROADMAP



Five Capacitor Construction Styles



SERIES LINE UP: CONDUCTIVE POLYMER