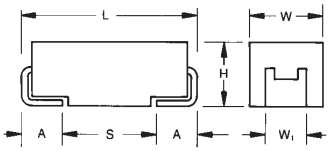
TCQ Series

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: 4-35V
- DCL 0.1 CV
- 3x reflow 260°C compatible

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

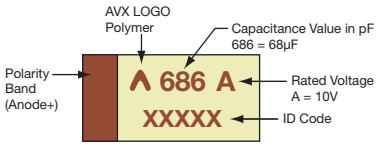
RoHS COMPLIANT

APPLICATIONS

- Automotive, DC/DC converters, Telecommunications, Industrial Reference AVX polymer guide for more information.

MARKING

B, D, Y CASE



AVX's qualification of TCQ capacitors meets requirements of AEC-Q200. TCQ series is manufactured in an ISO TS 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.
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)
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
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	**Packaging** R = Pure Tin 7" Reel S = Pure Tin 13" Reel	**ESR in mΩ**

TECHNICAL SPECIFICATIONS

Technical Data:	All technical data relate to an ambient temperature of +25°C
Capacitance Range:	4.7 µF to 220 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)
3.3	335							
4.7	475							B(200)*
6.8	685						B(200)*	
10	106					B(200)*		D(70)
15	156						D(70)	
22	226		B(70)	B(70)*		D(70)		
33	336		B(70)	B(70)*	D(70)			
47	476		B(70)	B(70)*	D(70)			
68	686			D(25,40)				
100	107			D(25,40)				
150	157		D(25,40)					
220	227	D(25), Y(25)						

Available Ratings, (ESR ratings in mOhms in brackets)

Engineering samples - please contact manufacturer

*Codes under development - subject to change

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 Temp. (°C)	DCL Max (µA)	DF Max (%)	ESR Max @ 100kHz (mΩ)	MSL	100kHz RMS Current (mA)				Humidity 85°C/85%RH, Vr (hrs)
									45°C	85°C	105°C	125°C	
4 Volt													
TCQD227M004#0025	D	220	4	125	88	6	25	3	3000	2100	1350	750	1000
TCQY227M004#0025	Y	220	4	125	88	6	25	3	2720	1904	1224	680	500
6.3 Volt													
TCQB226M006#0070	B	22	6.3	125	13.2	6	70	3	1336	935	601	334	500
TCQB336M006#0070	B	33	6.3	125	19.8	6	70	3	1336	935	601	334	500
TCQB476M006#0070	B	47	6.3	125	28.2	6	70	3	1336	935	601	334	500
TCQD157M006#0025	D	150	6.3	125	90	6	25	3	3000	2100	1350	750	1000
TCQD157M006#0040	D	150	6.3	125	90	6	40	3	2372	1660	1067	593	1000
10 Volt													
TCQD686M010#0025	D	68	10	125	68	6	25	3	3000	2100	1350	750	1000
TCQD686M010#0040	D	68	10	125	68	6	40	3	2372	1660	1067	593	1000
TCQD107M010#0025	D	100	10	125	100	6	25	3	3000	2100	1350	750	1000
TCQD107M010#0040	D	100	10	125	100	6	40	3	2372	1660	1067	593	1000
16 Volt													
TCQD336M016#0070	D	33	16	125	52.8	6	70	3	1793	1255	807	448	1000
TCQD476M016#0070	D	47	16	125	75.2	6	70	3	1793	1255	807	448	1000
20 Volt													
TCQD226M020#0070	D	22	20	125	44	6	70	3	1793	1255	807	448	1000
25 Volt													
TCQD156M025#0070	D	15	25	125	37.5	6	70	3	1793	1255	807	448	1000
35 Volt													
TCQD106M035#0070	D	10	35	125	35	6	70	3	1793	1255	807	448	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.

For typical weight and composition see page 223.

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.

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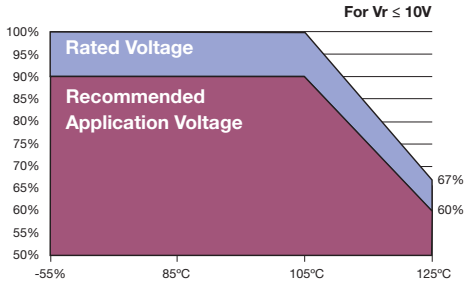
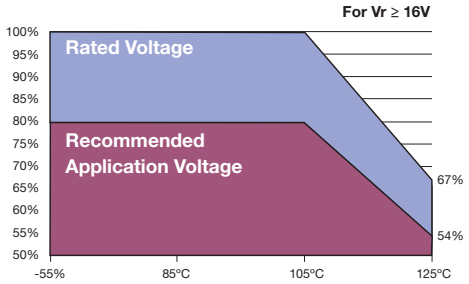
RECOMMENDED DERATING FACTOR

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	Determine after application of 125°C temperature, 2/3 rated voltage for 1000 +48/-0 hours and then leaving 1-2 hours at room temperature. Power supply impedance to be ≤ 0.1Ω/V.			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	125°C, 0V, 1000h			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	Determine after leaving for 1000 (500) 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	ΔC/C	n/a	±20%	±5%	±20%	±30%	±5%
	3	+20±2	15	DF	IL*	IL*	IL*	1.2 x IL*	1.5 x IL*	IL*
	4	+85+3/-0	15							
	5	+125+3/-0	15							
	6	+20±2	15							
Surge Voltage	Test temperature: 125°C +3/0°C Surge voltage: 1.3x 2/3x rated voltage at 125°C Charge/Discharge resistance: 1000±100Ω Number of cycles: 1000x Cycle duration: 6 min; 30 sec charge, 5 min 30 sec discharge			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					

*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.

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