

# TCQ Series

## Automotive Conductive Polymer Chip Capacitors



### FEATURES

- Conductive Polymer Electrode
- Low ESR with high ripple current capability
- Robust Design for Automotive Applications
- 100% Surge Current Tested
- Meets Requirements of AEC-Q200
- -55 to +125°C Operation Temperature
- Full Voltage Range: 2.5-50V
- 3x reflow cycles according to J-STD-020

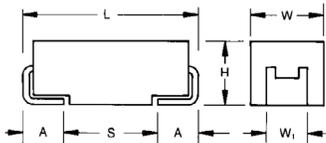


### APPLICATIONS

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

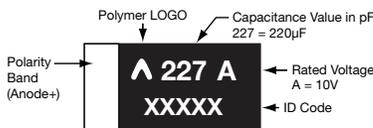
Not recommended for use of conductive polymer parts in high power applications. For more information please see KYOCERA AVX [automotive application guide](#) at [kyocera-avx.com](#), or contact manufacturer.

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



### MARKING

#### B, D, E, 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)	W <sub>t</sub> ±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)
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)
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)

W<sub>t</sub> 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 002 = 2.5Vdc 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 A = NiPdAu 7" Reel B = NiPdAu 13" Reel A, B = please contact manufacturer	ESR in mΩ	Additional Character E = Black resin (single) M = Black resin (multi)

### TECHNICAL SPECIFICATIONS

Technical Data:	All technical data relate to an ambient temperature of +25°C
Capacitance Range:	2.2 µF to 680 µF
Capacitance Tolerance:	±20%
Leakage Current DCL:	0.1CV
Temperature Range:	-55°C to +125°C
	Meets 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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### CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V <sub>R</sub> ) @ 105°C								
µF	Code	2.5 (e)	4V (G)	6.3V (J)	10V (A)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
2.2	225									B(300)
3.3	335									B(300)
4.7	475								B(150,200)	
10	106						B(150)	B(150)	B(200), D(70)	D(90)
15	156					B(90)	B(150)	D(70)	D(125)	
22	226			B(70)	B(70)	B(70)	B(150),D(70)	D(100)	D(65), D(100)	
33	336			B(70)	B(70)	D(70),Y(70)	D(70)	D(60,100)	E(65), U(70)	
47	476			B(70)	B(70)	D(70),Y(70)	D(70),Y(70)	D(65), E(50)	E(75), U(70)	
68	686			B(70)	D(25,40)	D(70)		E(60)		
100	107	B(55,70)	B(55,70)	B(45)	D(25,40)		E(40)	U(70)		
150	157			D(25,40)	D(25)	E(25,40)				
220	227		D(25),Y(25)	D(25)	D(25)					
330	337		D(25)	D(25)	E(25, 50)					
470	477	D(6)	D(25)	E(25, 50)	E(25, 50)					
680	687	D(6,9)		E(25, 50)						

Released ratings, (ESR ratings in mOhms in parentheses)

Engineering samples - please contact KYOCERA AVX

Note: Voltage ratings are minimum values. KYOCERA AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

### RATINGS & PART NUMBER REFERENCE

Part Number	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		
<b>2.5 Volt</b>													
TCQB107M002#0055E	B	100	2.5	125	25	6	55	1508	1055	678	377	1000	3
TCQB107M002#0070E	B	100	2.5	125	25	6	70	1336	935	601	334	1000	3
TCQD477M002#0006M	D	470	2.5	125	117.5	10	6	8660	8660	6062	2165	1000	3
TCQD687M002#0006M	D	680	2.5	125	170	10	6	8660	8660	6062	2165	1000	3
TCQD687M002#0009M	D	680	2.5	125	170	10	9	7070	7070	4949	1768	1000	3
<b>4 Volt</b>													
TCQB107M004#0055E	B	100	4	125	40	6	55	1508	1055	678	377	1000	3
TCQB107M004#0070E	B	100	4	125	40	8	70	1336	935	601	334	1000	3
TCQD227M004#0025E	D	220	4	125	88	6	25	3000	2100	1350	750	1000	3
TCQY227M004#0025E	Y	220	4	125	88	6	25	2720	1904	1224	680	1000	3
TCQD337M004#0025E	D	330	4	125	132	6	25	4240	4240	2970	1060	1000	3
TCQD477M004#0025E	D	470	4	125	188	6	25	3000	2100	1350	750	1000	3
<b>6.3 Volt</b>													
TCQB226M006#0070E	B	22	6.3	125	13.2	6	70	1336	935	601	334	1000	3
TCQB336M006#0070E	B	33	6.3	125	19.8	6	70	1336	935	601	334	1000	3
TCQB476M006#0070E	B	47	6.3	125	28.2	6	70	1336	935	601	334	1000	3
TCQB686M006#0070E	B	68	6.3	125	40.8	8	70	1336	935	601	334	1000	3
TCQB107M006#0045E	B	100	6.3	125	60	8	45	1667	1167	750	417	1000	3
TCQD157M006#0025E	D	150	6.3	125	90	6	25	3000	2100	1350	750	1000	3
TCQD157M006#0040E	D	150	6.3	125	90	6	40	2372	1660	1067	593	1000	3
TCQD227M006#0025E	D	220	6.3	125	132	6	25	3000	2100	1350	750	1000	3
TCQD337M006#0025E	D	330	6.3	125	198	6	25	4240	4240	2970	1060	1000	3
TCQE477M006#0025E	E	470	6.3	125	296.1	10	25	4470	4470	3129	1117.5	1000	3
TCQE477M006#0050E	E	470	6.3	125	296.1	10	50	3160	3160	2214	791	1000	3
TCQE687M006#0025E	E	680	6.3	125	428.4	10	25	4470	4470	3129	1117.5	1000	3
TCQE687M006#0050E	E	680	6.3	125	428.4	10	50	3160	3160	2214	791	1000	3
<b>10 Volt</b>													
TCQB226M010#0070E	B	22	10	125	22	6	70	1336	935	601	334	1000	3
TCQB336M010#0070E	B	33	10	125	33	6	70	1336	935	601	334	1000	3
TCQB476M010#0070E	B	47	10	125	47	6	70	1336	935	601	334	1000	3
TCQD686M010#0025E	D	68	10	125	68	6	25	3000	2100	1350	750	1000	3
TCQD686M010#0040E	D	68	10	125	68	6	40	2372	1660	1067	593	1000	3
TCQD107M010#0025E	D	100	10	125	100	6	25	3000	2100	1350	750	1000	3
TCQD107M010#0040E	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
TCQE337M010#0025E	E	330	10	125	330	10	25	4470	4470	3129	1117.5	1000	3
TCQE337M010#0050E	E	330	10	125	330	10	50	3160	3160	2214	791	1000	3
TCQE477M010#0025E	E	470	10	125	470	10	25	4470	4470	3129	1117.5	1000	3
TCQE477M010#0050E	E	470	10	125	470	10	50	3160	3160	2214	791	1000	3
<b>16 Volt</b>													
TCQB156M016#0090E	B	15	16	125	24	8	90	1179	825	530	295	1000	3
TCQB226M016#0070E	B	22	16	125	35.2	8	70	1336	935	601	334	1000	3
TCQD336M016#0070E	D	33	16	125	52.8	6	70	1793	1255	807	448	1000	3

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# TCQ Series

## Automotive Conductive Polymer Chip Capacitors



### RATINGS & PART NUMBER REFERENCE

Part Number	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		
TCQY336M016#0070E	Y	33	16	125	52.8	6	70	1626	1138	732	406	1000	3
TCQD476M016#0070E	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
TCQD686M016#0070E	D	68	16	125	109	8	70	1793	1255	807	448	1000	3
TCQE157M016#0025E	E	150	16	125	240	8	25	3162	2214	1423	791	1000	3
TCQE157M016#0040E	E	150	16	125	240	10	40	2500	1750	1125	625	1000	3
<b>20 Volt</b>													
TCQB106M020#0150E	B	10	20	125	20	8	150	913	639	411	228	1000	3
TCQB156M020#0150E	B	15	20	125	30	8	150	913	639	411	228	1000	3
TCQB226M020#0150E	B	22	20	125	44	8	150	913	639	411	228	1000	3
TCQD226M020#0070E	D	22	20	125	44	6	70	1793	1255	807	448	1000	3
TCQD336M020#0070E	D	33	20	125	66	8	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
TCQE107M020#0040E	E	100	20	125	200	10	40	2500	1750	1125	625	1000	3
<b>25 Volt</b>													
TCQB106M025#0150E	B	10	25	125	25	8	150	913	639	411	228	1000	3
TCQD156M025#0070E	D	15	25	125	37.5	6	70	1793	1255	807	448	1000	3
TCQD226M025#0100E	D	22	25	125	55	8	100	1500	1050	675	375	1000	3
TCQD336M025#0060E	D	33	25	125	82.5	8	60	1936	1356	871	484	1000	3
TCQD336M025#0100E	D	33	25	125	82.5	8	100	1500	1050	675	375	1000	3
TCQD476M025#0065E	D	47	25	125	117.5	10	65	2631	2631	1842	658	1000	3
TCQE476M025#0050E	E	47	25	125	117.5	10	50	2236	1565	1006	559	1000	3
TCQE686M025#0060E	E	68	25	125	170	10	60	2041	1429	919	510	1000	3
TCQU107M025R0070E	U	100	25	125	250	12	70	2330	1631	1048	582	1000	3
<b>35 Volt</b>													
TCQB475M035#0150E	B	4.7	35	125	16.5	8	150	913	639	411	228	1000	3
TCQB475M035#0200E	B	4.7	35	125	16.5	8	200	791	553	356	198	1000	3
TCQB106M035#0200E	B	10	35	125	35	8	200	791	553	356	198	1000	3
TCQD106M035#0070E	D	10	35	125	35	6	70	1793	1255	807	448	1000	3
TCQD156M035#0125E	D	15	35	125	52.5	8	125	1342	939	604	335	1000	3
TCQD226M035#0065E	D	22	35	125	77	8	65	1861	1302	837	465	1000	3
TCQD226M035#0100E	D	22	35	125	77	8	100	1500	1050	675	375	1000	3
TCQU336M035R0070E	U	33	35	125	115.5	12	70	2330	1631	1048	582	1000	3
TCQE336M035#0065E	E	33	35	125	115.5	10	65	1961	1373	883	490	1000	3
TCQE476M035#0075E	E	47	35	125	164.5	10	75	1826	1278	822	456	1000	3
TCQU476M035R0070E	U	47	35	125	164.5	12	70	2330	1631	1048	582	1000	3
<b>50 Volt</b>													
TCQB225M050#0300E	B	2.2	50	125	11	8	300	645	452	290	161	1000	3
TCQB335M050#0300E	B	3.3	50	125	16.5	8	300	645	452	290	161	1000	3
TCQD106M050#0090E	D	10	50	125	50	10	90	1581	1107	712	395	1000	3

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.

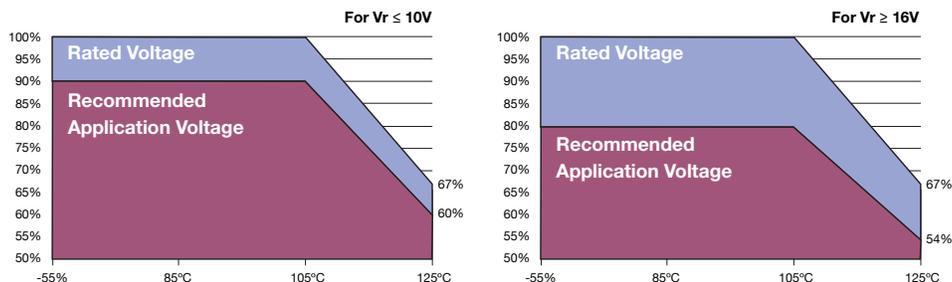
ESR allowed to move up to 1.25 times catalog limit post mounting. For typical weight and composition see page 253.

**NOTE: KYOCERA AVX reserves the right to supply higher voltage ratings 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%



# TCQ Series

## Automotive Conductive Polymer Chip Capacitors



### QUALIFICATION TABLE

TEST	TCQ series (Temperature range -55°C to 125°C)									
	Condition			Characteristics						
<b>Endurance</b>	Apply 2/3 rated voltage (Ur) at 125°C for 2000 hours through a circuit impedance of $\leq 0.1\Omega/V$ . Stabilize at room temperature for 1-2 hours before measuring.			Visual examination	no visible damage					
				DCL	2 x initial limit					
				$\Delta C/C$	within +10/-20% of initial value					
				DF	2 x initial limit					
				ESR	2 x initial limit					
<b>Storage Life</b>	Store at 125°C, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.			Visual examination	no visible damage					
				DCL	2x initial limit					
				$\Delta C/C$	within +10/-20% of initial value					
				DF	2 x initial limit					
				ESR	2 x initial limit					
<b>Biased Humidity</b>	Apply rated voltage (Ur) at 85°C, 85% relative humidity for 1000 hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.			Visual examination	no visible damage					
				DCL	2 x initial limit					
				$\Delta C/C$	within +35/-5% of initial value					
				DF	1.5 x initial limit					
				ESR	2 x initial limit					
<b>Temperature Stability</b>	Step	Temperature°C	Duration(min)		+20°C	-55°C	+20°C	+85°C	+125°C	+20°C
	1	+20	15							
	2	-55	15	DCL	IL*	n/a	IL*	10 x IL*	12.5 x IL*	IL*
	3	+20	15							
	4	+85	15	$\Delta C/C$	n/a	$\pm 20\%$	$\pm 5\%$	$\pm 20\%$	$\pm 30\%$	$\pm 5\%$
	5	+125	15	DF	IL*	IL*	IL*	1.2 x IL*	1.5 x IL*	IL*
6	+20	15								
<b>Surge Voltage</b>	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 1000 $\Omega$			Visual examination	no visible damage					
				DCL	initial limit					
				$\Delta C/C$	within +10/-20% of initial value for Vr $\leq$ 10V within +20/-30% of initial value for Vr $\geq$ 16V					
				DF	initial limit for Vr $\leq$ 10V 1.25x initial limit for Vr $\geq$ 16V					
				ESR	1.25 x initial limit					
<b>Mechanical Shock</b>	MIL-STD-202, Method 213, Condition F			Visual examination	no visible damage					
				DCL	initial limit					
				$\Delta C/C$	within $\pm 10\%$ of initial value					
				DF	initial limit					
				ESR	1.25 x initial limit					
<b>Vibration</b>	MIL-STD-202, Method 204, Condition D			Visual examination	no visible damage					
				DCL	initial limit					
				$\Delta C/C$	within $\pm 10\%$ of initial value					
				DF	initial limit					
				ESR	1.25 x initial limit					

\*Initial Limit

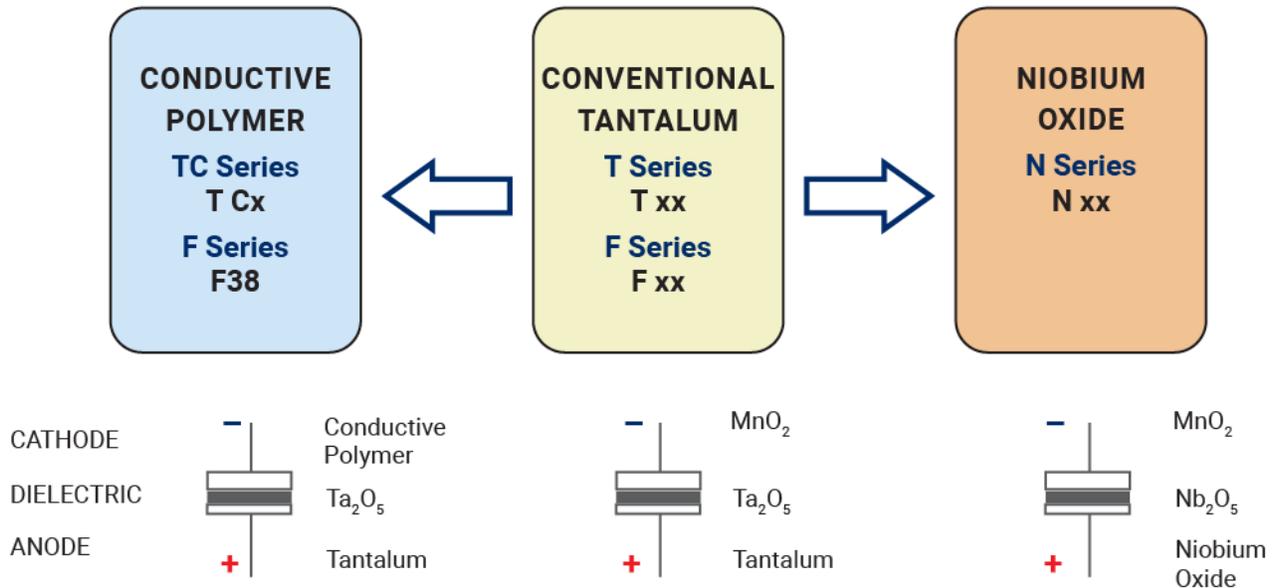
For use outside of recommended conditions and special request, please contact KYOCERA AVX.

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

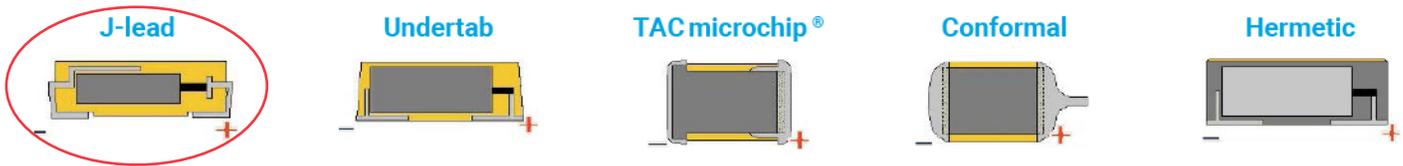
# TCQ Series

## Automotive Conductive Polymer Chip Capacitors

### SOLID ELECTROLYTIC CAPACITOR ROADMAP



### FIVE CAPACITOR CONSTRUCTION STYLES



### SERIES LINE UP : Conductive Polymer

