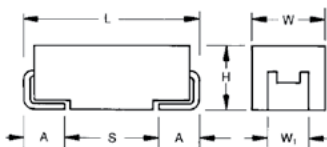


# TCO Series

## High Temperature Automotive Polymer Chip Capacitors



### FEATURES

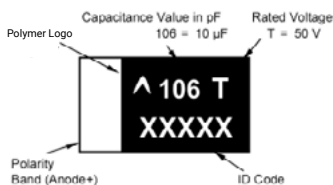
- Conductive Polymer Electrode
- Benign Failure Mode Under Recommended Use Conditions
- Robust Design for Automotive Applications
- Meets Requirements of AEC-Q200
- -55 to +150°C Operation Temperature
- Humidity 85°C/85%RH, Vr, 1000 Hours
- Basic Reliability 1%/1000hrs@85°C Vr with 60% Confidence Level
- DCL 0.1 CV
- 3x reflow 260°C Compatible
- 100% Surge Current Tested



### 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](http://kyocera-avx.com), or contact manufacturer.

### MARKING



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

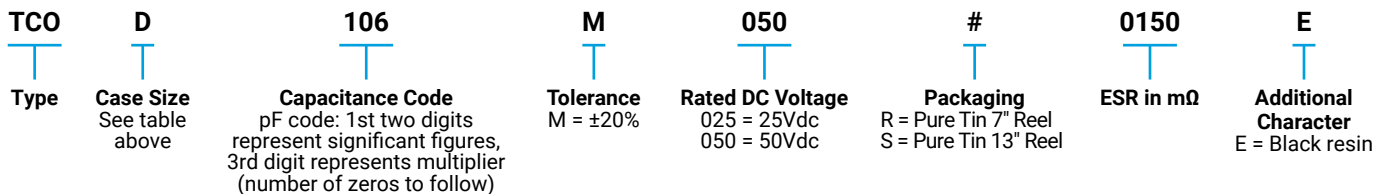
### CASE DIMENSIONS:

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)

W1 dimension applies to the termination width for A dimensional area only.

### HOW TO ORDER



### TECHNICAL SPECIFICATIONS

Technical Data:	All technical data relate to an ambient temperature of +25°C
Capacitance Range:	10 µF to 33µF
Capacitance Tolerance:	±20%
Leakage Current DCL:	0.1CV
Temperature Range:	-55°C to +150°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.

# TCO Series

## High Temperature Automotive Polymer Chip Capacitors

### CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC ( $V_R$ ) @ 105°C		
$\mu\text{F}$	Code	25V (E)	35V (V)	50V (T)
10	106			D(150)
15	156			
22	226			
33	336	D(100)		

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 ( $\mu\text{F}$ )	Rated Voltage (V)	Maximum Operating Temp. ( $^{\circ}\text{C}$ )	DCL Max ( $\mu\text{A}$ )	DF Max (%)	ESR Max @ 100kHz (m $\Omega$ )	100kHz RMS Current (mA)					Humidity 85°C/85% RH, $V_r$ (hrs)	MSL
								45°C	85°C	105°C	125°C	150°C		
<b>25 Volt</b>														
TCOD336M025#0100E	D	33	25	150	82.5	10	100	1500	1050	675	375	225	1000	3
<b>50 Volt</b>														
TCOD106M050#0150E	D	10	50	150	50	10	150	1225	857	551	306	184	1000	3

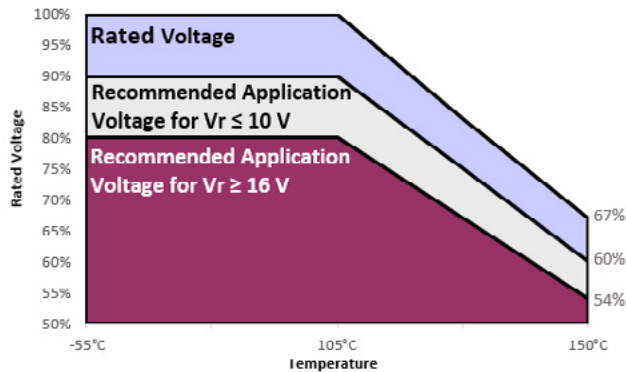
Moisture Sensitivity Level (MSL) is defined according to J-STD-020. All technical data relates to an ambient temperature of +25C.

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 259.

### RECOMMENDED DERATING FACTOR

Voltage and temperature derating as percentage of  $V_r$

Rated voltage	Operating Temperature		
	$\leq 85^{\circ}\text{C}$	105°C	150°C
$\leq 10\text{V}$	90%	90%	60%
$\geq 16\text{V}$	80%	80%	54%



# TCO Series

## High Temperature Automotive Polymer Chip Capacitors



### QUALIFICATION TABLE

TEST	TCO series (Temperature range -55°C to 150°C)									
	Condition			Characteristics						
<b>Endurance</b>	Apply rated voltage (Ur) at 105°C for 2000hrs and 2/3 rated voltage (Ur) at 150°C for 1000 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 150°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					
				$\Delta C/C$	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	+105°C	+150°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	+105	15	$\Delta C/C$	n/a	$\pm 20\%$	$\pm 5\%$	$\pm 20\%$	$\pm 30\%$	$\pm 5\%$
	5	+150	15	DF	IL*	IL*	IL*	1.5 x IL*	1.5 x IL*	IL*
6	+20	15								
<b>Surge Voltage</b>	Apply 1.3x 2/3x rated voltage (Ur) at 150°C for 1000 cycles, charge / discharge resistance 33 $\Omega$ .			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

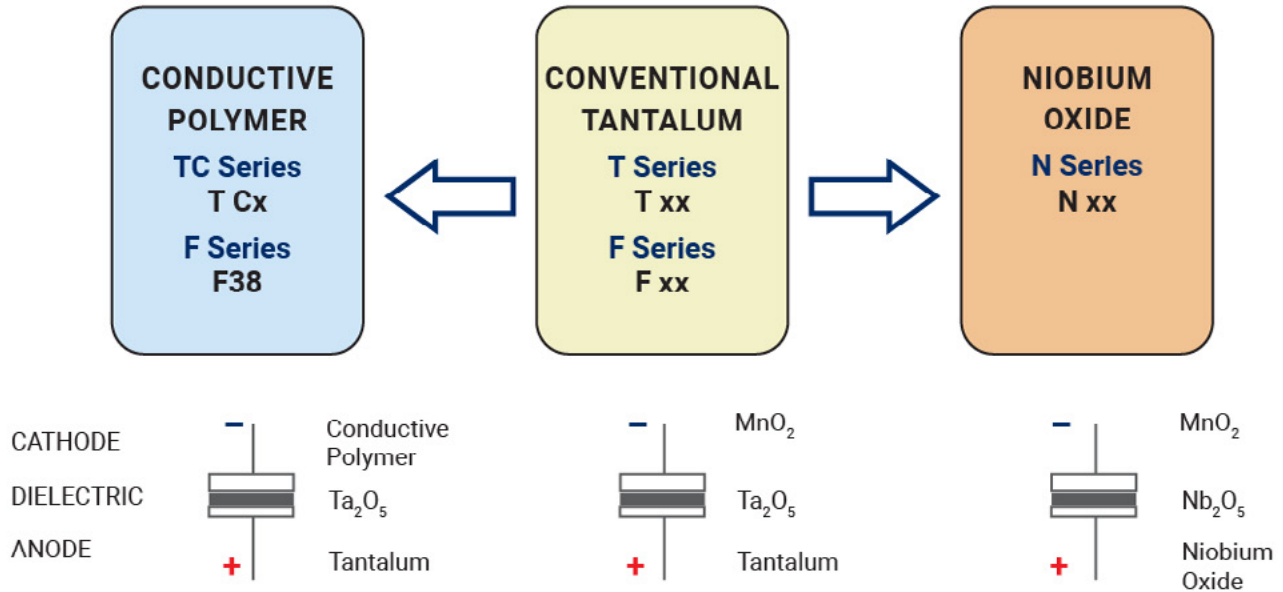
For use outside of recommended conditions and special request, please contact KYOCERA AVX.

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

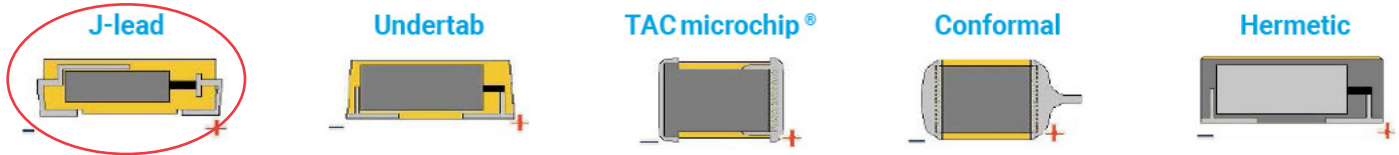
# TCO Series

## High Temperature Automotive Polymer Chip Capacitors

### SOLID ELECTROLYTIC CAPACITOR ROADMAP



### FIVE CAPACITOR CONSTRUCTION STYLES



### SERIES LINE UP : Conductive Polymer

