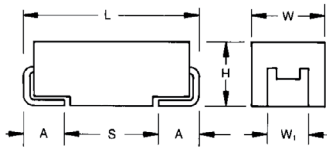
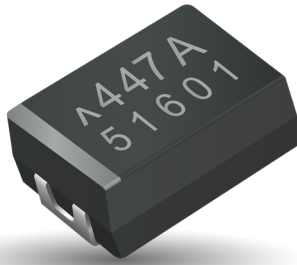
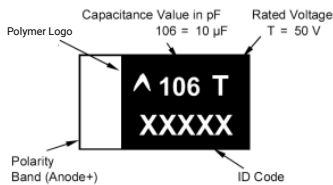


# TCO Series

## High Temperature Automotive Polymer Chip Capacitors



### MARKING



### FEATURES

- Conductive Polymer Electrode
- Robust Design for Automotive Applications
- 100% surge current tested
- Meets Requirements of AEC-Q200
- -55 to +150°C Operation Temperature
- Comply with humidity 85°C/85%RH, Vr, 1000 Hours test
- 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](http://kyocera-avx.com), or contact manufacturer.

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.
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)

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

### HOW TO ORDER

**TCO**  
Type

**D**  
Case Size  
See table above

**106**  
Capacitance Code  
pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

**M**  
Tolerance  
M = ±20%

**050**  
Rated DC Voltage  
020 = 20Vdc  
025 = 25Vdc  
050 = 50Vdc

**#**  
Packaging  
R = Pure Tin 7" Reel  
S = Pure Tin 13" Reel

**0150**  
ESR in mΩ

**E**  
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 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			
$\mu F$	Code	20V (D)	25V (E)	35V (V)	50V (T)
10	106				D(150)
15	156				
22	226	B(150)			
33	336		D(100)		

Released ratings, (ESR ratings in mOhms in parentheses)

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	150°C		
20 Volt														
TCOB226M020#0150E	B	22	20	150	44	8	150	913	639	411	228	137	1000	3
25 Volt														
TCOD336M025#0100E	D	33	25	150	82.5	10	100	1500	1050	675	375	225	1000	3
50 Volt														
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 +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.

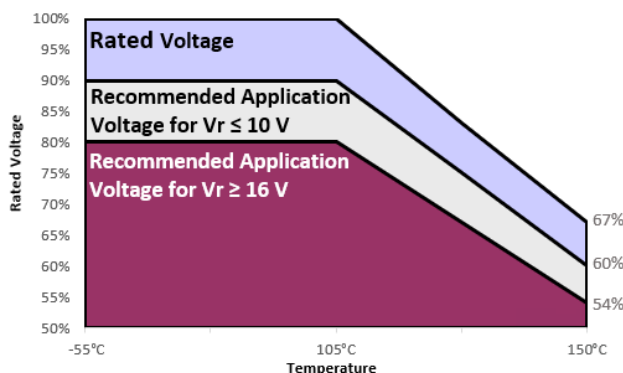
ESR allowed to move up to 1.25 times catalog limit post mounting.

For typical weight and composition see page 253.

### RECOMMENDED DERATING FACTOR

Voltage and temperature derating as percentage of  $V_R$

Rated voltage	Operating Temperature		
	$\leq 85^{\circ}C$	$105^{\circ}C$	$150^{\circ}C$
$\leq 10V$	90%	90%	60%
$\geq 16V$	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							
Endurance	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 ≤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 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						
				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 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	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	ΔC/C	n/a	±20%	±5%	±20%	±30%	±5%	
	5	+150	15								
	6	+20	15	DF	IL*	IL*	IL*	1.5 x IL*	1.5 x IL*	IL*	
Surge Voltage	Apply 1.3x 2/3x rated voltage (Ur) at 150°C for 1000 cycles, charge / discharge resistance 33Ω.			Visual examination	no visible damage						
				DCL	initial limit						
				ΔC/C	within +10/-20% of initial value for Vr ≤ 10V within +20/-30% of initial value for Vr ≥ 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

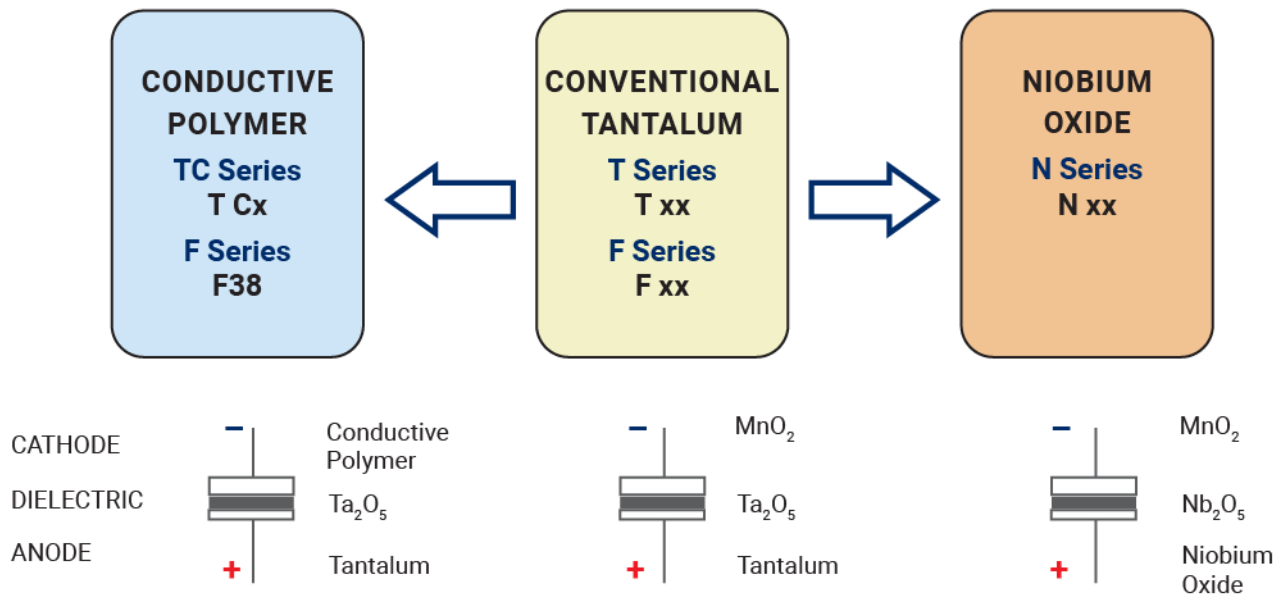
For use outside of recommended conditions and special request, please contact KYOCERA AVX.

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

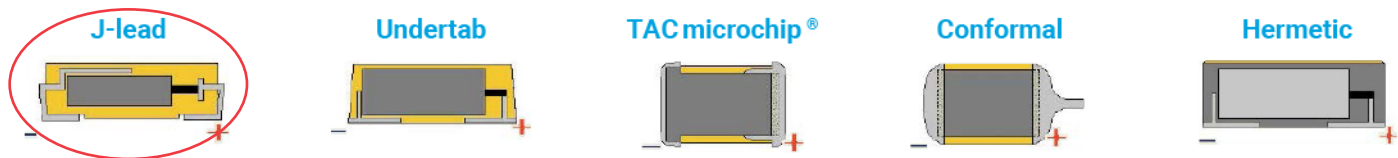
# TCO Series

## High Temperature Automotive Polymer Chip Capacitors

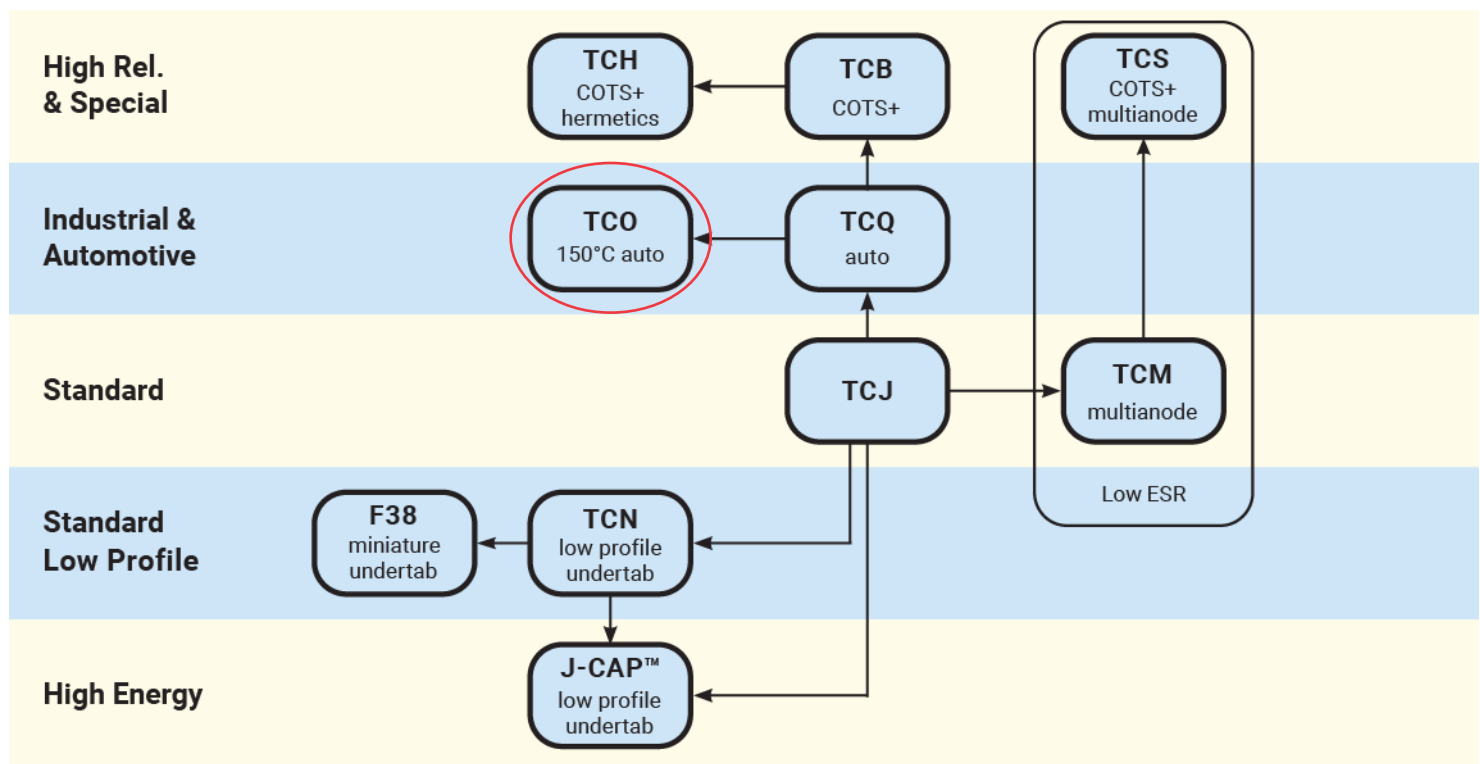
### SOLID ELECTROLYTIC CAPACITOR ROADMAP



### FIVE CAPACITOR CONSTRUCTION STYLES



### SERIES LINE UP : Conductive Polymer



# Mouser Electronics

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