TCN Series

Highest CV/CC Conductive Polymer Chip Capacitors Undertab

FEATURES

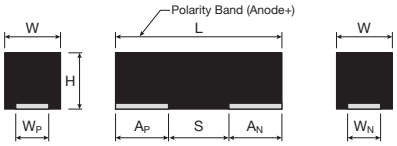
- Highest CV/cc in Broad Range of Low Profiles
- Conductive Polymer Electrode
- Benign Failure Mode Under Recommended use Conditions
- Lower ESR
- Undertab Terminations Layout:
  - High Volumetric Efficiency
  - High PCB Assembly Density
  - High Capacitance in Smaller Dimensions
- 3x Reflow 260°C Compatible
- 100% Surge Current Tested
- 8 Case Sizes Available

APPLICATIONS

- Consumer Applications (e.g. Mobiles, MP3 etc.)
- Bulk Decoupling of SoC (System on Chip)

RoHS COMPLIANT

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

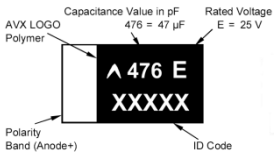


CASE DIMENSIONS millimeters (inches)

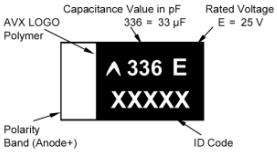
Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) -0.10 (0.004)	H max.	W_P±0.10 (0.004)	W_N±0.10 (0.004)	A_P±0.10 (0.004)	A_N±0.10 (0.004)	S Min.
S	1206	3216-12	3.20 (0.126)	1.60 (0.063)	1.20 (0.047)	1.30 (0.051)	1.30 (0.051)	1.15 (0.045)	1.15 (0.045)	0.90 (0.035)
L	1210	3528-10	3.50 (0.138)	2.80 (0.110)	1.00 (0.039)	2.50 (0.098)	2.10 (0.083)	1.15 (0.045)	1.35 (0.053)	1.00 (0.039)
T	1210	3528-12	3.50 (0.138)	2.80 (0.110)	1.20 (0.047)	2.50 (0.098)	2.10 (0.083)	1.15 (0.045)	1.35 (0.053)	1.00 (0.039)
H	1210	3528-15	3.50 (0.138)	2.80 (0.110)	1.50 (0.059)	2.50 (0.098)	2.10 (0.083)	1.15 (0.045)	1.35 (0.053)	1.00 (0.039)
X	2917	7343-15	7.30 (0.287)	4.30 (0.169)	1.50 (0.059)	3.25 (0.128)	3.25 (0.128)	2.00 (0.079)	3.20 (0.126)	2.10 (0.083)
Z	2917	7343-15	7.30 ±0.30 (0.287 ±0.012)	4.30 ±0.30 (0.169 ±0.012)	1.50 (0.059)	2.40 (0.094)	2.40 (0.094)	1.30 ±0.30 (0.051 ±0.012)	1.30 ±0.30 (0.051 ±0.012)	4.40 (0.173)
4	2924	7361-20	7.30 (0.287)	6.10 (0.240)	2.00 (0.079)	4.75 (0.187)	4.75 (0.187)	2.00 (0.079)	3.20 (0.126)	2.10 (0.083)
8	2924	7361-20	7.30 ±0.30 (0.287 ±0.012)	6.10 (0.240)	2.00 (0.079)	4.45 (0.175)	4.45 (0.175)	1.60 ±0.30 (0.063 ±0.012)	1.60 ±0.30 (0.063 ±0.012)	3.80 (0.150)

MARKING

H, L, S, T, X, Z CASE



4, 8 CASE



HOW TO ORDER

TCN T 157 M 006 R 0200 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%

Additional Character
E = Black Resin
(it is possible to order PN without "E" as identical product)

ESR in mΩ

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

Rated DC Voltage

006 = 6.3Vdc	025 = 25Vdc
010 = 10Vdc	035 = 35Vdc
016 = 16Vdc	050 = 50Vdc
020 = 20Vdc	

TECHNICAL SPECIFICATIONS

Technical Data:		All technical data relate to an ambient temperature of +25°C							
Capacitance Range:		4.7 µF to 1500 µF							
Capacitance Tolerance:		±20%							
Leakage Current DCL:		0.1CV							
Rated Voltage DC (V_R)	≤ +85°C:	6.3	10	16	20	25	35	50	
Category Voltage (V_C)	≤ +105°C:	5	8	13	16	20	28	40	
Surge Voltage (V_S)	≤ +85°C:	8	13	21	26	33	46	65	
Surge Voltage (V_S)	≤ +105°C:	6	10	16	20	25	35	50	
Temperature Range:		-55°C to +105°C							

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.

CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC to 85°C / 0.66DC to 105°C						
µF	Code	6.3V (J)	10V (A)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
4.7	475						T(200)	
10	106						T(150, 200)	
22	226					T(200)		
33	336			L(200)/T(200)				4(200)
47	476			T(150)		X(100)	X(150)/Z(150)	
100	107	L(200)/S(250)			Z(100)	4(100)	4(100)/8(100)	
150	157	T(200)		X(100)		4(70)/8(70)		
220	227	H(170)		4(70)	4(100)	4(100)		
330	337			4(70)	4(100)			
470	477	X(50)		4(70,100)				
680	687		4(70)					
1000	108	4(55)						
1500	158	4(55)						

Released ratings, (ESR ratings in mOhms in parentheses)
Engineering Samples - Please Contact AVX
Note: Voltage ratings are minimum values. AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

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RATINGS & PART NUMBER REFERENCE

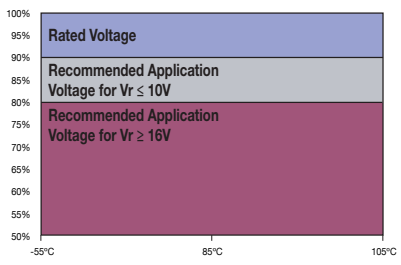
AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Maximum Operating Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)			Product Category	MSL
								45°C	85°C	105°C		
6.3 Volt @ 85°C												
TCNL107M006#0200E	L	100	6.3	105	60	10	200	700	500	300	3	5
TCNS107M006#0250E	S	100	6.3	105	60	10	250	600	400	300	3	3
TCNT157M006#0200E	T	150	6.3	105	90	10	200	700	500	300	3	4
TCNH227M006#0170E	H	220	6.3	105	132	10	170	800	600	400	3	4
TCNX477M006#0050E	X	470	6.3	85	282	10	50	1900	1300	–	5	5
TCN4108M006#0055E	4	1000	6.3	85	600	20	55	1860	1302	–	5	4
TCN4158M006#0055E	4	1500	6.3	85	900	20	55	1860	1302	–	5	4
10 Volt @ 85°C												
TCN4687M010#0070E	4	680	10	105	680	20	70	1650	1155	660	3	4
16 Volt @ 85°C												
TCNL336M016#0200E	L	33	16	85	52.8	6	200	700	500	–	5	5
TCNT336M016#0200E	T	33	16	105	52.8	6	200	700	500	300	3	4
TCNT476M016#0150E	T	47	16	105	75.2	6	150	800	600	400	3	4
TCNX157M016#0100E	X	150	16	105	240	6	100	1300	900	600	3	4
TCN4227M016#0070E	4	220	16	105	352	20	70	1650	1155	660	2	4
TCN4337M016#0070E	4	330	16	105	528	20	70	1650	1155	660	3	4
TCN4477M016#0070E	4	470	16	105	752	20	70	1650	1155	660	3	4
TCN4477M016#0100E	4	470	16	105	752	20	100	1380	966	552	3	4
20 Volt @ 85°C												
TCNZ107M020#0100E	Z	100	20	105	200	8	100	1300	900	600	3	4
TCN4227M020#0100E	4	220	20	85	440	10	100	1380	966	–	5	4
TCN4337M020#0100E	4	330	20	105	660	20	100	1380	966	552	3	4
25 Volt @ 85°C												
TCNT226M025#0200E	T	22	25	105	55	6	200	700	500	300	3	4
TCNX476M025#0100E	X	47	25	105	117.5	6	100	1300	900	600	2	5
TCN4107M025#0100E	4	100	25	105	250	6	100	1380	966	552	2	4
TCN4157M025#0070E	4	150	25	105	375	6	70	1650	1155	660	2	4
TCN8157M025#0070E	8	150	25	105	375	8	70	1650	1155	660	2	3
TCN4227M025#0100E	4	220	25	105	550	10	100	1380	966	552	3	4
35 Volt @ 85°C												
TCNT475M035#0200E	T	4.7	35	105	16.5	10	200	700	500	300	3	4
TCNT106M035#0150E	T	10	35	105	35	10	150	800	600	400	3	4
TCNT106M035#0200E	T	10	35	105	35	10	200	700	500	300	3	4
TCNX476M035#0150E	X	47	35	105	165	10	150	1100	800	500	3	4
TCNZ476M035#0150E	Z	47	35	105	165	10	150	1100	800	500	3	4
TCN4107M035#0100E	4	100	35	105	350	10	100	1380	966	552	2	3
TCN8107M035#0100E	8	100	35	105	350	10	100	1380	966	552	2	3
50 Volt @ 85°C												
TCN4336M050#0200E	4	33	50	85	165	12	200	970	679	-	5	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 259.
NOTE: AVX reserves the right to supply higher voltage ratings in the same case size to the same reliability standards.

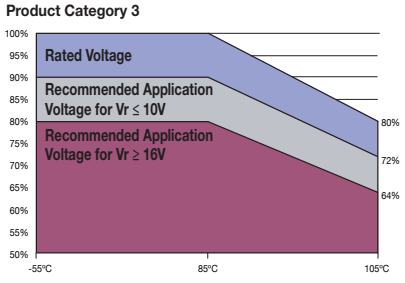
RECOMMENDED DERATING FACTOR

Voltage and temperature derating as percentage of Vr

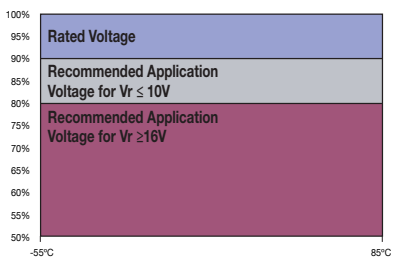
Product Category 2



Product Category 3



Product Category 5



PRODUCT CATEGORY 2, 3 (TEMPERATURE RANGE -55°C TO +105°C)

<table>
<tr><th>TEST</th><th>Condition</th><th colspan="7">Characteristics</th></tr>
<tr><td rowspan="5">Endurance</td><td rowspan="5">Apply rated voltage (Ur) at 85ºC for 2000 hours through a circuit impedance of ≤0.1Ω/V (all CATEGORIES). And / or apply rated voltage (Ur) (CATEGORY 2) or 0.8x rated voltage (CATEGORY 3) at 105°C for 2000 hours through a circuit impedance of ≤0.1Ω/V. Always stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±20% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">1.5 x initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">2 x initial limit</td></tr>
<tr><td rowspan="6">Storage Life</td><td rowspan="6">Store at 105ºC, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL (V_R ≤ 75V)</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td>DCL (V_R > 75V)</td><td colspan="6">2 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±20% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">1.5 x initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">2 x initial limit</td></tr>
<tr><td rowspan="5">Humidity</td><td rowspan="5">Store at 65ºC and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">3 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within +30/-20% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">1.5 x initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">2 x initial limit</td></tr>
<tr><td rowspan="4">Temperature Stability</td><td rowspan="4"><table><tr><th>Step</th><th>Temperature°C</th><th>Duration(min)</th></tr><tr><td>1</td><td>+20</td><td>15</td></tr><tr><td>2</td><td>-55</td><td>15</td></tr><tr><td>3</td><td>+20</td><td>15</td></tr><tr><td>4</td><td>+85</td><td>15</td></tr><tr><td>5</td><td>+105</td><td>15</td></tr><tr><td>6</td><td>+20</td><td>15</td></tr></table></td><td></td><td>+20ºC</td><td>-55ºC</td><td>+20ºC</td><td>+85ºC</td><td>+105ºC</td><td>+20ºC</td></tr>
<tr><td>DCL</td><td>IL*</td><td>n/a</td><td>IL*</td><td>10 x IL*</td><td>12.5 x IL*</td><td>IL*</td></tr>
<tr><td>ΔC/C</td><td>n/a</td><td>+0/-20%</td><td>±5%</td><td>+20/-0%</td><td>+30/-0%</td><td>±5%</td></tr>
<tr><td>DF</td><td>IL*</td><td>1.5 x IL*</td><td>IL*</td><td>1.5 x IL*</td><td>2 x IL*</td><td>IL*</td></tr>
<tr><td rowspan="4">Surge Voltage</td><td rowspan="4">Apply 1.3x rated voltage (Ur) at 105ºC for CATEGORY 2, or apply 1.3x 0.8x rated voltage (Ur) at 105ºC for CATEGORY 3 for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within +10/-20% of initial value for Vr ≤ 10V
within +20/-30% of initial value for Vr ≥ 16V</td></tr>
<tr><td>DF</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td rowspan="5">Mechanical Shock</td><td rowspan="5">MIL-STD-202, Method 213, Condition C</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±5% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">initial limit</td></tr>
<tr><td rowspan="5">Vibration</td><td rowspan="5">MIL-STD-202, Method 204, Condition D</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±5% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">initial limit</td></tr>
</table>

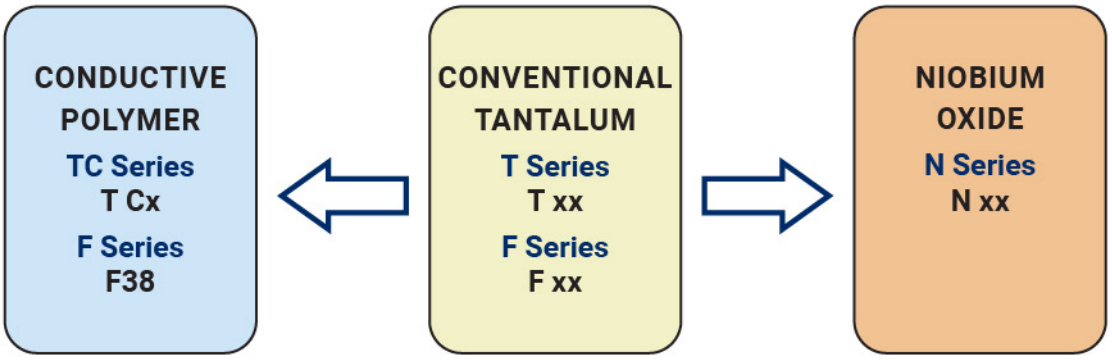
*Initial Limit Initial measurement max. 1hr after the removal from dry pack or after pretreatment at 85°C for 24 hours.

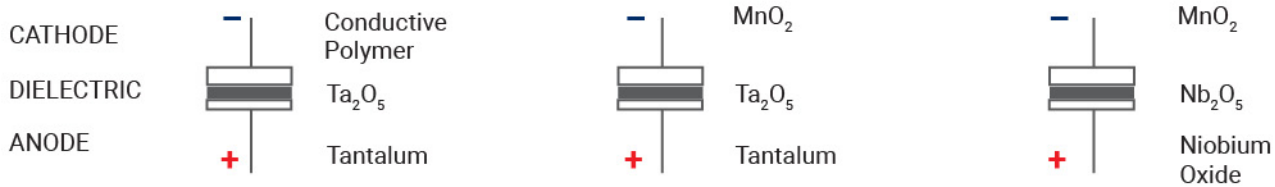
PRODUCT CATEGORY 5 (TEMPERATURE RANGE -55°C TO +85°C)

<table>
<tr><th>TEST</th><th>Condition</th><th colspan="6">Characteristics</th></tr>
<tr><td rowspan="5">Endurance</td><td rowspan="5">Apply rated voltage (Ur) at 85ºC for 2000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="5">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="5">1.25 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="5">within ±20% of initial value</td></tr>
<tr><td>DF</td><td colspan="5">1.5 x initial limit</td></tr>
<tr><td>ESR</td><td colspan="5">2 x initial limit</td></tr>
<tr><td rowspan="5">Storage Life</td><td rowspan="5">Store at 85ºC, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="5">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="5">1.25 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="5">within ±20% of initial value</td></tr>
<tr><td>DF</td><td colspan="5">1.5 x initial limit</td></tr>
<tr><td>ESR</td><td colspan="5">2 x initial limit</td></tr>
<tr><td rowspan="5">Humidity</td><td rowspan="5">Store at 65ºC and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="5">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="5">5 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="5">within +40/-20% of initial value</td></tr>
<tr><td>DF</td><td colspan="5">1.5 x initial limit</td></tr>
<tr><td>ESR</td><td colspan="5">2 x initial limit</td></tr>
<tr><td rowspan="6">Temperature Stability</td><td colspan="3"><table><tr><th>Step</th><th>Temperature°C</th><th>Duration(min)</th></tr><tr><td>1</td><td>+20</td><td>15</td></tr><tr><td>2</td><td>-55</td><td>15</td></tr><tr><td>3</td><td>+20</td><td>15</td></tr><tr><td>4</td><td>+85</td><td>15</td></tr><tr><td>5</td><td>+20</td><td>15</td></tr></table></td><td></td><td>+20ºC</td><td>-55ºC</td><td>+20ºC</td><td>+85ºC</td><td>+20ºC</td></tr>
<tr><td>DCL</td><td>IL*</td><td>n/a</td><td>IL*</td><td>10 x IL*</td><td>IL*</td></tr>
<tr><td>ΔC/C</td><td>n/a</td><td>+0/-20%</td><td>±5%</td><td>+20/-0%</td><td>±5%</td></tr>
<tr><td>DF</td><td>IL*</td><td>1.5 x IL*</td><td>IL*</td><td>1.5 x IL*</td><td>IL*</td></tr>
<tr><td rowspan="4">Surge Voltage</td><td rowspan="4">Apply 1.3x rated voltage (Ur) at 85ºC for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω</td><td>Visual examination</td><td colspan="5">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="5">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="5">within +10/-20% of initial value for Vr ≤ 10V
within +20/-30% of initial value for Vr ≥ 16V</td></tr>
<tr><td>DF</td><td colspan="5">1.25 x initial limit</td></tr>
<tr><td rowspan="5">Mechanical Shock</td><td rowspan="5">MIL-STD-202, Method 213, Condition C</td><td>Visual examination</td><td colspan="5">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="5">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="5">within ±5% of initial value</td></tr>
<tr><td>DF</td><td colspan="5">initial limit</td></tr>
<tr><td>ESR</td><td colspan="5">initial limit</td></tr>
<tr><td rowspan="5">Vibration</td><td rowspan="5">MIL-STD-202, Method 204, Condition D</td><td>Visual examination</td><td colspan="5">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="5">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="5">within ±5% of initial value</td></tr>
<tr><td>DF</td><td colspan="5">initial limit</td></tr>
<tr><td>ESR</td><td colspan="5">initial limit</td></tr>
</table>

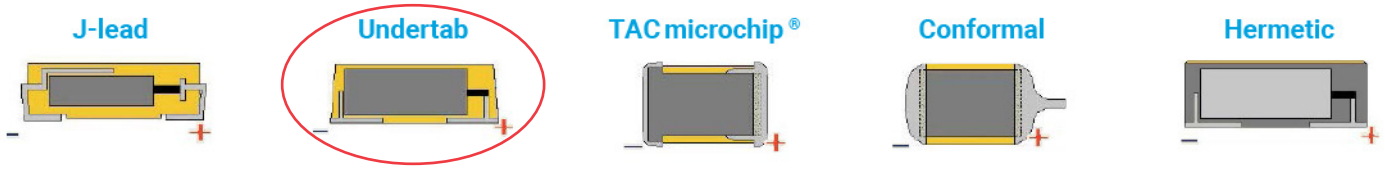
*Initial Limit Initial measurement max. 1hr after the removal from dry pack or after pretreatment at 85°C for 24 hours.

SOLID ELECTROLYTIC CAPACITOR ROADMAP

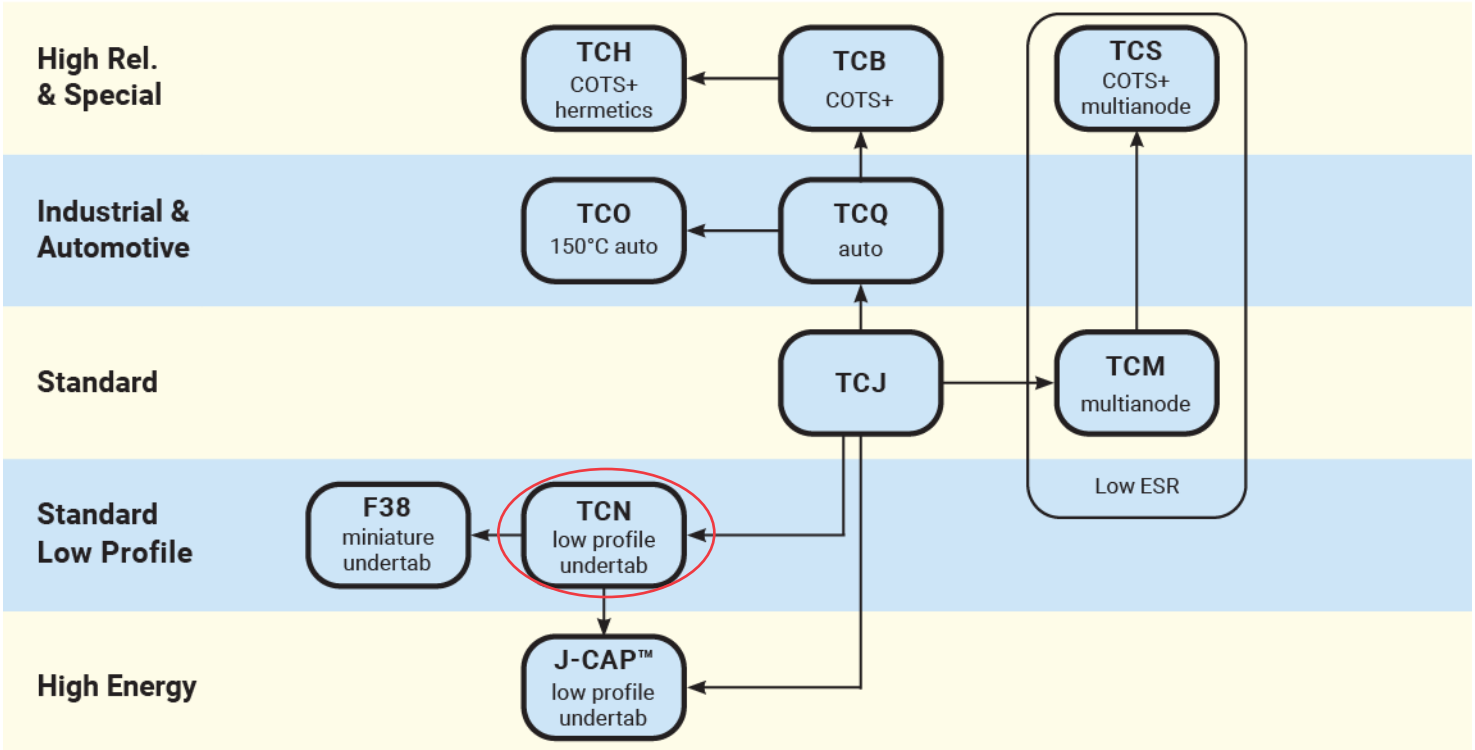




FIVE CAPACITOR CONSTRUCTION STYLES



SERIES LINE UP : Conductive Polymer



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