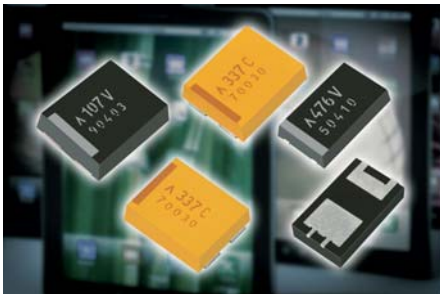
TCN Series

Highest CV/cc Conductive Polymer Chip Capacitors Undertab



FEATURES

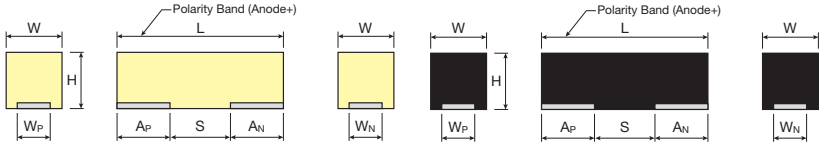
- Highest CV/cc in broad range of low profiles
- Conductive polymer electrode
- Benign failure mode under recommended use conditions
- Lower ESR
- Undertab terminations layout:
  - High Volumetric Efficiency
  - High PCB assembly density
  - High capacitance in smaller dimensions
- 3x reflow 260°C compatible
- 10 case sizes available

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

APPLICATIONS

- Consumer applications (e.g. mobiles, MP3 etc.)
- Bulk decoupling of SoC (System on chip)

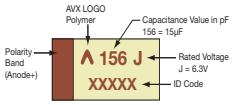


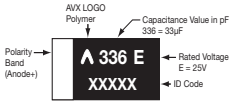
CASE DIMENSIONS: millimeters (inches)

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.
M	0805	2012-09	2.05 (0.081)	1.30 (0.051)	0.90 (0.035)	1.00 (0.039)	1.00 (0.039)	0.85 (0.033)	0.85 (0.033)	0.40 (0.016)
N	0805	2012-10	2.05 (0.081)	1.30 (0.051)	1.00 (0.039)	1.00 (0.039)	1.00 (0.039)	0.85 (0.033)	0.85 (0.033)	0.40 (0.016)
O	1206	3216-06	3.20 (0.126)	1.60 (0.063)	0.60 (0.024)	1.30 (0.051)	1.30 (0.051)	1.15 (0.045)	1.15 (0.045)	0.90 (0.035)
K	1206	3216-10	3.20 (0.126)	1.60 (0.063)	1.00 (0.039)	1.30 (0.051)	1.30 (0.051)	1.15 (0.045)	1.15 (0.045)	0.90 (0.035)
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)
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)

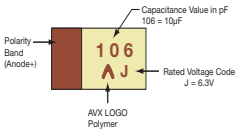
MARKING

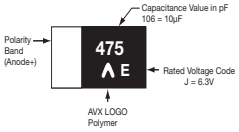
H, K, L, O, S, T, X CASE



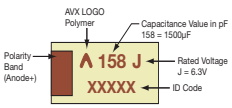


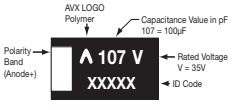
M, N CASE





4 CASE





HOW TO ORDER

TCN	L	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%	**Rated DC Voltage** 006 = 6.3Vdc 016 = 16Vdc 020 = 20Vdc 025 = 25Vdc 035 = 35Vdc	**Packaging** R = Pure Tin 7" Reel S = Pure Tin 13" Reel	**ESR in mΩ**	**Additional Character** E = Black resin

Part Numbers already changed to an "E" suffix will continue to be supplied with only black resin.
Those Part Numbers currently produced with gold resin will eventually change to black before July, 2020.

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TECHNICAL SPECIFICATIONS

Technical Data:		All technical data relate to an ambient temperature of +25°C								
Capacitance Range:		1.0 µF to 1500 µF								
Capacitance Tolerance:		±20%								
Leakage Current DCL:		0.1CV								
Rated Voltage (V_R)	≤ +85ºC:	4	6.3	10	16	20	25	35	50	
Category Voltage (V_C)	≤ +105ºC:	3.2	5	8	13	16	20	28	40	
Surge Voltage (V_S)	≤ +85ºC:	5.2	8	13	21	26	33	46	65	
Surge Voltage (V_S)	≤ +105ºC:	4	6	10	16	20	25	35	50	
Temperature Range:		-55°C to +105°C								
Reliability:		1% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance 60% confidence level								

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	4V (G)	6.3V (J)	10V (A)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
1.0	105								N(1500E)
4.7	475						N(500E)	L(300E) T(200E)	
6.8	685				O(500E)				
10	106			O(500E)	O(500E)		K(350E) S(350E)	T(200E)	
15	156		O(500E)	O(500E)					
22	226	O(500E)	O(500E)				T(200E)		
33	336				L(200E) T(200E)		T(250E)		
47	476		M(500E)		L(250E) T(200) T(150E)		X(100E)	X(150E)	
68	686								
100	107		K(200E,250E) L(200E) S(250E)				3(70)* 4(100E)	3(200)* 4(100E)	
150	157		L(200E) S(250E) T(200E)		X(100E)		4(70E)		
220	227		H(170E) T(200E)		4(70E)	4(100E)	4(100E)		
330	337				4(70E)	4(100E)			
470	477		X(50E)		4(100E)				
1000	108		X(200E)/3(100)* 4(55E)						
1500	158		4(55E)						

Note for designers - for the highlighted ratings, higher voltage options are now available in the same case size and are recommended for new designs.
Released ratings, (ESR ratings in mOhms in parentheses)
*Codes under developement - subject to change
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	Cap (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		
4 Volt @ 85°C												
TCNO226M004#0500E	O	22	4	105	8.8	10	500	400	300	200	3	3
6.3 Volt @ 85°C												
TCNO156M006#0500E	O	15	6.3	105	9	10	500	400	300	200	3	3
TCNO226M006#0500E	O	22	6.3	105	13.2	10	500	400	300	200	3	3
TCNM476M006#0500E	M	47	6.3	105	28.2	10	500	400	300	200	3	3
TCNK107M006#0200E	K	100	6.3	105	60	10	200	700	500	300	3	5
TCNK107M006#0250E	K	100	6.3	105	60	10	250	600	400	300	3	5
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
TCNL157M006#0200E	L	150	6.3	105	90	10	200	700	500	300	3	5
TCNS157M006#0250E	S	150	6.3	85	90	10	250	600	400	–	5	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
TCNT227M006#0200E	T	220	6.3	85	132	10	200	700	500	–	5	4
TCNX477M006#0050E	X	470	6.3	85	282	10	50	1900	1300	–	5	5
TCNX108M006#0200E	X	1000	6.3	85	600	30	200	900	600	–	5	5
TCN3108M006#0100	3	1000	6.3	105	600	20	100	1200	840	480	3	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												
TCNO106M010#0500E	O	10	10	105	10	10	500	400	300	200	3	3
TCNO156M010#0500E	O	15	10	105	15	10	500	400	300	200	3	3
16 Volt @ 85°C												
TCNO685M016#0500E	O	6.8	16	105	10.9	10	500	400	300	200	3	3
TCNO106M016#0500E	O	10	16	105	16	10	500	400	300	200	3	3
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
TCNL476M016#0250E	L	47	16	85	75.2	6	250	600	400	–	5	5
TCNT476M016#0150E	T	47	16	105	75.2	6	150	800	600	400	3	4
TCNT476M016#0200	T	47	16	105	75.2	6	200	700	500	300	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#0100E	4	470	16	85	752	20	100	1380	966	–	5	4
20 Volt @ 85°C												
TCN4227M020#0100E	4	220	20	85	440	10	100	1380	966	–	5	4
TCN4337M020#0100E	4	330	20	85	660	20	100	1380	966	–	5	4
25 Volt @ 85°C												
TCNN475M025#0500E	N	4.7	25	105	11.8	10	500	400	300	200	3	3
TCNK106M025#0350E	K	10	25	105	25	10	350	500	400	200	3	5
TCNS106M025#0350E	S	10	25	105	25	10	350	500	400	200	3	5
TCNT226M025#0200E	T	22	25	105	55	6	200	700	500	300	3	4
TCNT336M025#0250E	T	33	25	105	82.5	10	250	600	400	300	3	4
TCNX476M025#0100E	X	47	25	105	117.5	6	100	1300	900	600	2	5
TCN3107M025#0070	3	100	25	105	250	6	70	1440	1008	576	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
TCN4227M025#0100E	4	220	25	105	550	10	100	1380	966	552	3	4
35 Volt @ 85°C												
TCNL475M035#0300E	L	4.7	35	105	16.5	6	300	600	400	300	2	5
TCNT475M035#0200E	T	4.7	35	105	16.5	10	200	700	500	300	3	4
TCNT106M035#0200E	T	10	35	105	35	10	200	700	500	300	3	4
TCNX476M035#0150E	X	47	35	105	164.5	10	150	1100	800	500	3	4
TCN3107M035#0200	3	100	35	85	350	10	200	850	595	-	5	5
TCN4107M035#0100E	4	100	35	105	350	10	100	1380	966	552	2	3
50 Volt @ 85°C												
TCNN105M050#1500E	N	1	50	105	5	10	1500	200	100	100	3	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.

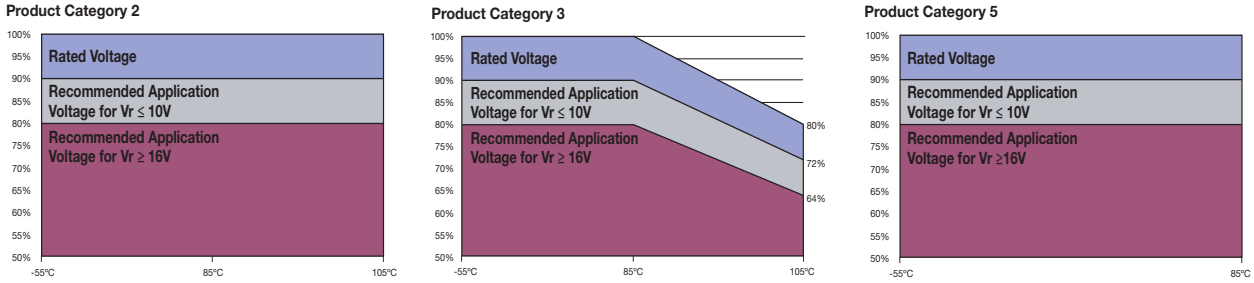
ESR allowed to move up to 1.25 times catalog limit post mounting.

For typical weight and composition see page 274.

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

TEST	Condition	Characteristics	
Endurance	Apply rated voltage (Ur) at 85°C 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.	Visual examination	no visible damage
		DCL	1.25 x initial limit
		ΔC/C	within ±20% of initial value
		DF	1.5 x initial limit
		ESR	2 x initial limit
Storage Life	Store at 105°C, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL ($V_R \leq 75V$)	1.25 x initial limit
		DCL ($V_R > 75V$)	2 x initial limit
		ΔC/C	within ±20% of initial value
		DF	1.5 x initial limit
		ESR	2 x initial limit
Humidity	Store at 65°C and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	3 x initial limit
		ΔC/C	within +30/-20% of initial value
		DF	1.5 x initial limit
		ESR	2 x initial limit
Temperature Stability	Step 1: Temperature °C +20, Duration (min) 15 Step 2: -55, 15 Step 3: +20, 15 Step 4: +85, 15 Step 5: +105, 15 Step 6: +20, 15		+20°C / -55°C / +20°C / +85°C / +105°C / +20°C
		DCL	IL* / n/a / IL* / 10 x IL* / 12.5 x IL* / IL*
		ΔC/C	n/a / +0/-20% / ±5% / +20/-0% / +30/-0% / ±5%
		DF	IL* / 1.5 x IL* / IL* / 1.5 x IL* / 2 x IL* / IL*
Surge Voltage	Apply 1.3x rated voltage (Ur) at 105°C for CATEGORY 2, or apply 1.3x 0.8x rated voltage (Ur) at 105°C 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	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	1.25 x initial limit
Mechanical Shock	MIL-STD-202, Method 213, Condition C	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±5% of initial value
		DF	initial limit
		ESR	initial limit
Vibration	MIL-STD-202, Method 204, Condition D	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±5% of initial value
		DF	initial limit
		ESR	initial limit

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

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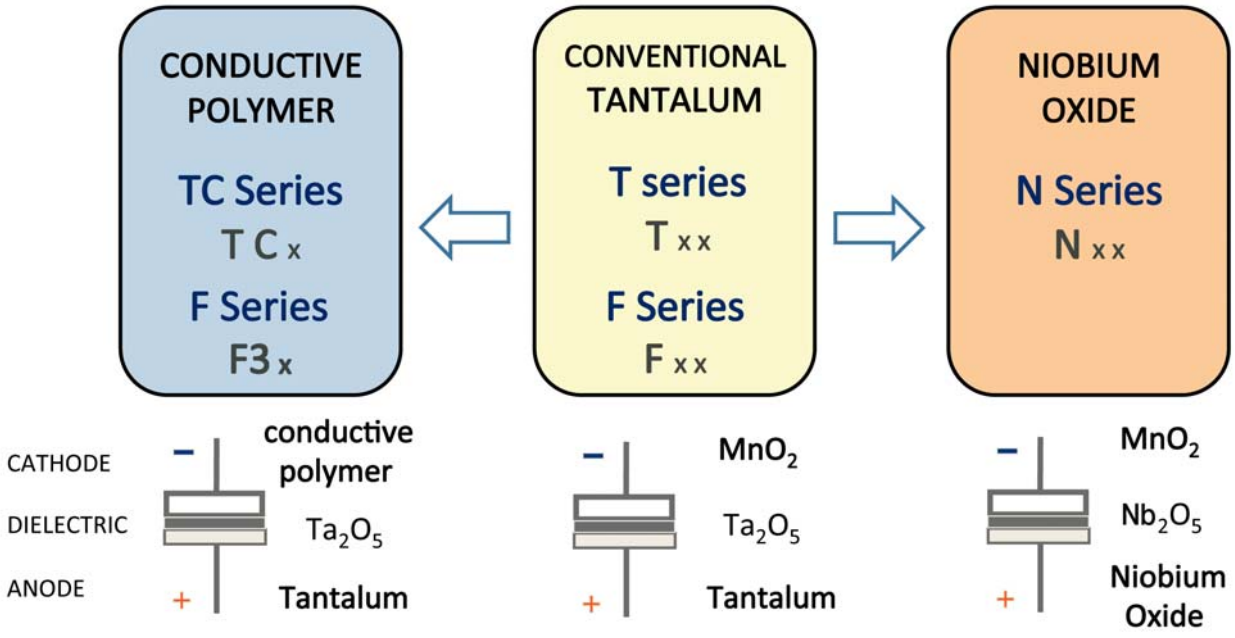
PRODUCT CATEGORY 5 (TEMPERATURE RANGE -55°C TO +85°C)

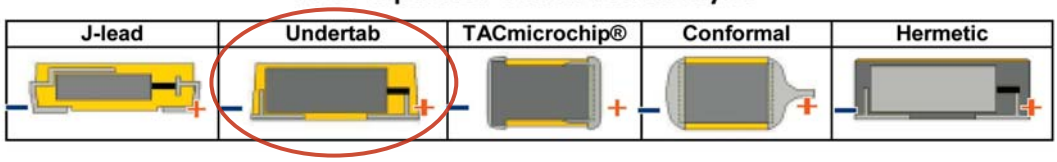
<table>
<tr><th>TEST</th><th>Condition</th><th colspan="6">Characteristics</th></tr>
<tr><td rowspan="5">Endurance</td><td rowspan="5">Apply rated voltage (Ur) at 85ºC for 2000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</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.

AVX SOLID ELECTROLYTIC CAPACITOR ROADMAP



Five Capacitor Construction Styles



SERIES LINE UP: CONDUCTIVE POLYMER

