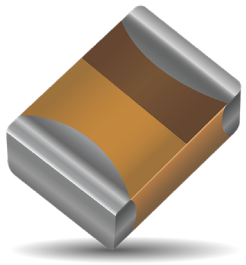
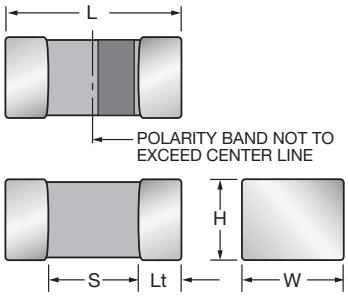
TLC Series

Tantalum Solid Electrolytic Chip Capacitors Consumer Series





FEATURES

- High Capacitance vs. Voltage Ratio
- Super High Volumetric Efficiency
- 100% Surge Current Tested
- CV Range: 0.47-220µF / 2-35V
- 9 Case Sizes Available
- Consumer Applications (Portable Hand-held Electronics, Cellular Phones, Digital Equipment etc.)

LEAD-FREE

LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

APPLICATIONS

- Consumer Portable Applications with Space Limitations

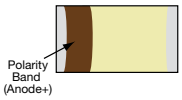
CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L+0.20 (0.008) -0.00 (0.000)	W+0.15 (0.006) -0.00 (0.000)	H+0.15 (0.006) -0.00 (0.000)	Termination Spacing (S)	Minimum Termination Length (Lt)
D	1206	3216-06	3.20 ± 0.20 (0.126 ± 0.008)	1.60 ± 0.20 (0.063 ± 0.008)	0.60 (0.024) max	1.80 (0.071) min	0.15 (0.006)
E*	0201	0603-03	0.60 ± 0.12 (0.024 ± 0.005)	0.33 ± 0.02 (0.013 ± 0.001)	0.33 ± 0.02 (0.013 ± 0.001)	0.20 (0.008) min	0.10 (0.004)
H	0805	2012-10	2.00 (0.079)	1.35 (0.053)	1.00 (0.039) max	0.70 (0.028) min	0.15 (0.006)
K	0402	1005-07	1.00 (0.039)	$0.50^{+0.20}_{-0.00}$ ($0.020^{+0.008}_{-0.000}$)	$0.50^{+0.20}_{-0.00}$ ($0.020^{+0.008}_{-0.000}$)	0.40 (0.016) min	0.10 (0.004)
L	0603	1608-10	1.60 (0.063)	0.85 (0.033)	0.85 (0.033)	0.55 (0.022) min	0.15 (0.006)
R	0805	2012-15	2.00 (0.079)	1.35 (0.053)	1.35 (0.053)	0.70 (0.028) min	0.15 (0.006)
T	1210	3528-12	3.50 ± 0.20 (0.138 ± 0.008)	$2.80^{+0.20}_{-0.10}$ ($0.110^{+0.008}_{-0.004}$)	1.20 (0.047) max	2.00 (0.079) min	0.15 (0.006)
U	0805	2012-06	2.00 (0.079)	1.35 (0.053)	0.60 (0.024) max	0.70 (0.028) min	0.15 (0.006)
V	1206	3216-08	3.20 ± 0.20 (0.126 ± 0.008)	1.60 ± 0.20 (0.063 ± 0.008)	0.75 (0.030) max	1.80 (0.071) min	0.15 (0.006)

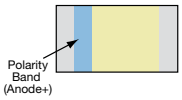
*Please contact KYOCERA AVX, availability upon request

MARKING

D, H, K, L, R, T, U, V CASE



E CASE



HOW TO ORDER

TLC	L	226	M	006	R	TA	4000
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=2Vdc 003=3Vdc 004=4Vdc 006=6.3Vdc 008=8Vdc 010=10Vdc 016=16Vdc 020=20Vdc 025=25Vdc 035=35Vdc	**Packaging** R, P = 7" Standard Tin Termination Plastic Tape X, Q = 4¼" Standard Tin Termination Plastic Tape A, M = 7" Gold Termination Plastic Tape F, N = 4¼" Gold Termination Plastic Tape H = Chip Tray (waffle) Only case E	**Standard Suffix** OR	**ESR in mΩ**

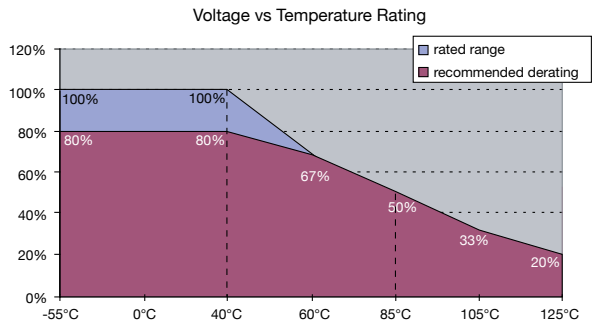
TECHNICAL SPECIFICATIONS

Technical Data:		All technical data relate to an ambient temperature of +25°C										
Capacitance Range:		0.47 µF to 220 µF										
Capacitance Tolerance:		±20%										
Rated Voltage (V_R)	-55°C ≤ +40°C:	2	3	4	6.3	8	10	16	20	25	35	
Category Voltage (V_C)	at 85°C:	1	1.5	2	3.2	4	5	8	10	12.5	17.5	
Category Voltage (V_C)	at 125°C:	0.4	0.6	0.8	1.3	1.6	2	3.2	4	5	7	
Temperature Range:		-55°C to +125°C with category voltage										
Reliability:		0.2% per 1000 hours at 85°C, 0.5xV_R with 0.1Ω/V series impedance with 60% confidence level										

CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Voltage Rating DC (V_R) to 40°C									
µF	Code	2.0V	3.0V	4.0V	6.3V	8V	10V	16V	20V	25V	35V
0.47	474				E*			K			
1.0	105				E*			K		L	R
2.2	225						K		H		
3.3	335							L			
4.7	475			K	K/U						
6.8	685		K	K			U				
10	106		K	K	K		U	V	R		
15	156	K		K			H/L				
22	226			U	L/U		L				
33	336			L/U	H/L L(4000)/U/V	L	H				
47	476	L	L/R	H/L	H/L/R/V	D	H/R				
68	686			R	R						
100	107			R	R/T		T				
150	157										
220	227			T							

Released ratings, (ESR ratings in mOhms in parentheses)
Engineering samples - please contact KYOCERA AVX
*Please contact KYOCERA AVX, availability upon request
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)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	ESR Max. @100kHz (Ω)	100kHz R MS Current (mA)			MSL
									25°C	85°C	125°C	
2 Volt @ 40°C												
TLCK156M002#TA	K	15	2	40	0.4	125	0.5	15	32	28	13	3
TLCL476M002#TA	L	47	2	40	0.4	125	0.9	7.5	58	52	23	3
3 Volt @ 40°C												
TLCK685M003#TA	K	6.8	3	40	0.6	125	0.5	15	32	28	13	3
TLCK106M003#TA	K	10	3	40	0.6	125	0.5	15	32	28	13	3
TLCL476M003#TA	L	47	3	40	0.6	125	1.4	7.5	58	52	23	3
TLCR476M003#TA	R	47	3	40	0.6	125	3.0	7.5	77	70	31	3
4 Volt @ 40°C												
TLCK475M004#TA	K	4.7	4	40	0.8	125	0.5	15	32	28	13	3
TLCK685M004#TA	K	6.8	4	40	0.8	125	0.5	15	32	28	13	3
TLCK106M004#TA	K	10	4	40	0.8	125	0.5	15	32	28	13	3
TLCK156M004#TA	K	15	4	40	0.8	125	3.0	15	32	28	13	3
TLCU226M004#TA	U	22	4	40	0.8	125	0.9	12	54	49	22	3
TLCL336M004#TA	L	33	4	40	0.8	125	1.3	7.5	58	52	23	3
TLCU336M004#TA	U	33	4	40	0.8	125	2.6	9	62	56	25	3
TLCH476M004#TA	H	47	4	40	0.8	125	1.9	5	89	80	36	3
TLCL476M004#TA	L	47	4	40	0.8	125	1.9	7.5	58	52	23	3
TLCR686M004#TA	R	68	4	40	0.8	125	2.7	5	95	85	38	3
TLCR107M004#TA	R	100	4	40	0.8	125	4.0	5	95	85	38	3
TLCT227M004#TA	T	220	4	40	0.8	125	8.8	1	200	180	80	3
6.3 Volt @ 40°C												
TLCE474M006HTA*	E	0.47	6.3	40	1.3	125	1.0	60	13	12	5	3
TLCE105M006HTA*	E	1	6.3	40	1.3	125	1.0	60	13	12	5	3
TLCK475M006#TA	K	4.7	6.3	40	1.3	125	0.5	15	32	28	13	3
TLCU475M006#TA	U	4.7	6.3	40	1.3	125	0.5	5	84	75	33	3
TLCK106M006#TA	K	10	6.3	40	1.3	125	3.1	15	32	28	13	3
TLCL226M006#TA	L	22	6.3	40	1.3	125	1.4	7.5	58	52	23	3
TLCU226M006#TA	U	22	6.3	40	1.3	125	2.8	12	54	49	22	3
TLCH336M006#TA	H	33	6.3	40	1.3	125	2.0	5	89	80	36	3
TLCL336M006#TA	L	33	6.3	40	1.3	125	2.1	7.5	58	52	23	3
TLCL336M006#4000	L	33	6.3	40	1.3	125	2.1	4	79	71	32	3
TLCU336M006#TA	U	33	6.3	40	1.3	125	10.4	7.5	68	61	27	3
TLCV336M006#TA	V	33	6.3	40	1.3	125	4.2	5	84	75	33	3
TLCH476M006#TA	H	47	6.3	40	1.3	125	3.0	5	89	80	36	3
TLCL476M006#TA	L	47	6.3	40	1.3	125	29.6	10	50	45	20	3
TLCR476M006#TA	R	47	6.3	40	1.3	125	6.0	5	95	85	38	3
TLCV476M006#TA	V	47	6.3	40	1.3	125	6.0	15	48	43	19	3
TLCR686M006#TA	R	68	6.3	40	1.3	125	4.3	5	95	85	38	3
TLCR107M006#TA	R	100	6.3	40	1.3	125	6.0	5	95	85	38	3
TLCT107M006#TA	T	100	6.3	40	1.3	125	31.5	15	52	46	21	3
8 Volt @ 40°C												
TLCL336M008#TA	L	33	8	40	1.6	125	26.4	10	50	45	20	3
TLCD476M008#TA	D	47	8	40	1.6	125	18.8	7	71	64	28	3
10 Volt @ 40°C												
TLCK225M010#TA	K	2.2	10	40	2	125	0.5	15	32	28	13	3
TLCU685M010#TA	U	6.8	10	40	2	125	0.7	5	84	75	33	3
TLCU106M010#TA	U	10	10	40	2	125	1.0	5	84	75	33	3
TLCH156M010#TA	H	15	10	40	2	125	1.5	5	89	80	36	3
TLCL156M010#TA	L	15	10	40	2	125	1.5	7.5	58	52	23	3
TLCL226M010#TA	L	22	10	40	2	125	11	10	50	45	20	3
TLCH336M010#TA	H	33	10	40	2	125	3.3	5	89	80	36	3
TLCH476M010#TA	H	47	10	40	2	125	23.5	7.5	73	66	29	3
TLCR476M010#TA	R	47	10	40	2	125	4.7	5	95	85	38	3
TLCT107M010#TA	T	100	10	40	2	125	10	1	200	180	80	3
16 Volt @ 40°C												
TLCK474M016#TA	K	0.47	16	40	3.2	125	0.5	15	32	28	13	3
TLCK105M016#TA	K	1	16	40	3.2	125	0.8	15	32	28	13	3
TLCL335M016#TA	L	3.3	16	40	3.2	125	0.5	7.5	58	52	23	3
TLCV106M016#TA	V	10	16	40	3.2	125	1.6	2	132	119	53	3

RATINGS & PART NUMBER REFERENCE

Part Number	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	ESR Max. @100kHz (Ω)	100kHz R MS Current (mA)			MSL
									25°C	85°C	125°C	
20 Volt @ 40°C												
TLCH225M020#TA	H	2.2	20	40	4	125	0.5	5	89	80	36	3
TLCR106M020#TA	R	10	20	40	4	125	2.0	5	95	85	38	3
25 Volt @ 40°C												
TLCL105M025#TA	L	1.0	25	40	5	125	0.5	7.5	58	52	23	3
35 Volt @ 40°C												
TLCR105M035#TA	R	1.0	35	40	7	125	0.5	5	95	85	38	3

*Please contact KYOCERA AVX, availability upon request

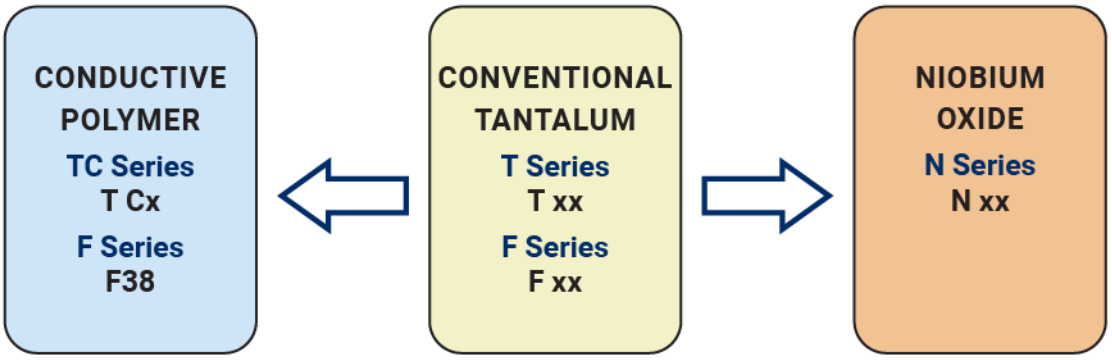
Moisture Sensitivity Level (MSL) is defined according to J-STD-020.
All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.2 volts.
DCL is measured at rated voltage after 5 minutes.
DCL allowed to move up to 2.00 times the 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.

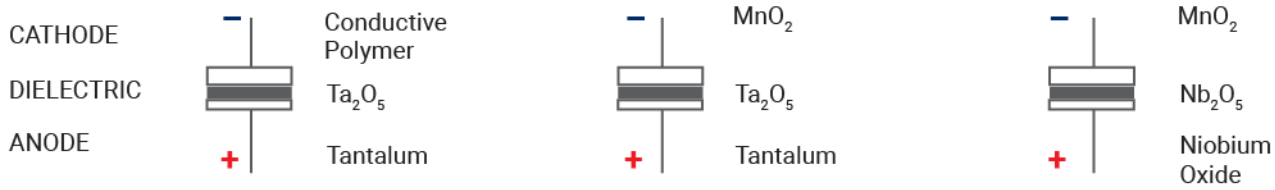
QUALIFICATION TABLE

<table>
<tr><th>TEST</th><th colspan="11">TLC series (Temperature range -55°C to +125°C)</th></tr>
<tr><th></th><th colspan="4">Condition</th><th colspan="7">Characteristics</th></tr>
<tr><td rowspan="4">Endurance</td><td colspan="4" rowspan="4">Apply rated voltage (Ur) at 40°C and / or category voltage (Uc) at 85°C 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="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 ±30% of initial value</td></tr>
<tr><td>ESR</td><td colspan="6">1.5 x initial limit</td></tr>
<tr><td rowspan="4">Humidity</td><td colspan="4" rowspan="4">Store at 40°C and 90-95% relative humidity for 56 days, 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">2 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">±30% of initial value</td></tr>
<tr><td>ESR</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td rowspan="10">Temperature Stability</td><td>Step</td><td>Temperature°C</td><td>Duration (min)</td><td>Voltage Applied</td><td></td><td>+20°C</td><td>-55°C</td><td>+20°C</td><td>+40°C</td><td>+60°C</td><td>+85°C</td><td>+125°C</td><td>+20°C</td></tr>
<tr><td>1</td><td>+20</td><td>15</td><td>N/A</td><td rowspan="3">DCL</td><td rowspan="3">IL*</td><td rowspan="3">n/a</td><td rowspan="3">IL*</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">IL*</td></tr>
<tr><td>2</td><td>-55</td><td>15</td><td>N/A</td></tr>
<tr><td>3</td><td>+20</td><td>15</td><td>N/A</td></tr>
<tr><td>4</td><td>+40</td><td>15</td><td>V_R</td><td rowspan="3">ΔC/C</td><td rowspan="3">n/a</td><td rowspan="3">+0/-25%</td><td rowspan="3">±5%</td><td rowspan="3">+10/-0%</td><td rowspan="3">+10/-0%</td><td rowspan="3">+20/-0%</td><td rowspan="3">+25/-0%</td><td rowspan="3">+20/-10%</td></tr>
<tr><td>5</td><td>+60</td><td>15</td><td>0.66 x V_R</td></tr>
<tr><td>6</td><td>+85</td><td>15</td><td>0.50 x V_R</td></tr>
<tr><td>7</td><td>+125</td><td>15</td><td>0.20 x V_R</td><td rowspan="3">ESR</td><td rowspan="3">IL*</td><td rowspan="3">n/a</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">1.25 x IL*</td></tr>
<tr><td>8</td><td>+20</td><td>15</td><td>N/A</td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td>Surge Voltage</td><td colspan="4">Apply 1.3x rated voltage (Ur) at 40°C 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">2 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±30% of initial value</td></tr>
<tr><td>ESR</td><td colspan="6">1.25 x initial limit</td></tr>
</table>

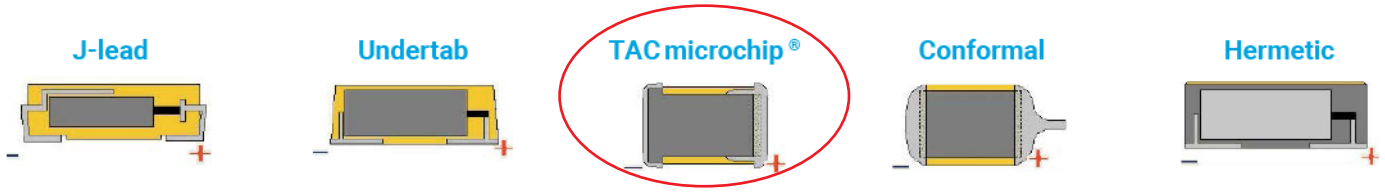
*Initial Limit

SOLID ELECTROLYTIC CAPACITOR ROADMAP





FIVE CAPACITOR CONSTRUCTION STYLES



SERIES LINE UP : CONVENTIONAL SMD MnO_2