CML_C0G Series

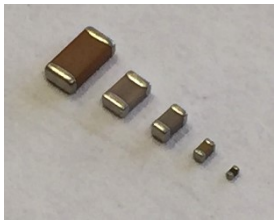
Multilayer Ceramic Chip Capacitor

Stackpole Electronics, Inc.

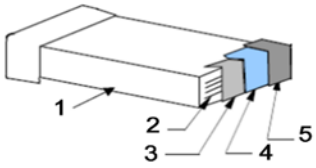
Resistive Product Solutions

Features:

- Lead free, Halogen free, RoHS and REACH compliant
- -55°C to 125°C operating temperature range
- EIA sizes 0402, 0603, 0805, 1206, 1210 and 1812
- Capacitance offering from 0.1 pF to 0.1 uF



Construction



1 - Ceramic layers (dielectric)

2 - Inner electrodes

3 - Base termination

4 - Nickel plating layer

5 - Tin plating layer

Electrical Specifications

Type/Code	Dielectric Code	Standard Tolerance		Capacitance Range	
		Code	Description	50V	100V
CML0402	C0G	C	± 0.25 pF	0.1 pF - 8.2 pF	-
		J	± 5%	10 pF - 1000 pF	-
CML0603	C0G	C	± 0.25 pF	0.1 pF - 6.8 pF	0.5 pF - 8.2 pF
		J	± 5%	10 pF - 6800 pF	10 pF - 1000 pF
CML0805	C0G	C	± 0.25 pF	0.3 pF - 6,8 pF	0.5 pF - 8.2 pF
		J	± 5%	10 pF - 0.022 uF	10 pF - 3300 pF
CML1206	C0G	C	± 0.25 pF	0.3 pF - 8.2 pF	0.5 pF - 8.2 pF
		J	± 5%	10 pF - 3300 pF	10 pF - 3300 pF
				3900 pF - 4700 pF	-
CML1210	C0G	C	± 0.25 pF	-	1 pF - 8.2 pF
		J	± 5%	10 pF - 0.1 uF	10 pF - 6800 pF
CML1812	C0G	C	± 0.25 pF	-	3 pF - 8.2 pF
		J	± 5%	10 pF - 0.1 uF	10 pF - 0.01 uF

Note: Capacitance values < 10 pF: B = ± 0.1 pF may be available
Capacitance values ≥ 10 pF: G = ± 2% may be available

How to Order

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
C	M	L	0	4	0	2	C	0	G	1	0	0	J	T	5	0	V

Product Series	
Code	Description
CML	Multilayer Ceramic

Size
Code
0402
0603
0805
1206
1210
1812

Dielectric
Code
C0G

Capacitance Range	
0.1pF to 0.10uF (E12)	
EIA Code	Capacitance
0R1	0.1 pF
100	10 pF
101	100 pF
102	1000 pF
103	0.01 uF
104	0.1 uF

Tolerance (*)	
Code	Description
B	± 0.1 pF
C	± 0.25 pF
G	± 2%
J	± 5%

(*) Other tolerances may be available. Contact Stackpole.

Packaging		
Code	Description	Size and Quantity
T	7" Paper Reel	Refer to Packaging Specifications
	7" Plastic Tape	

Max Working Voltage
50V
100V

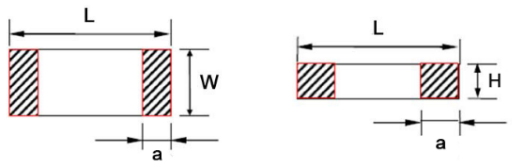
Capacitance and Voltage Available

Dielectric		C0G										
EIA	Size	0402	0603		0805		1206		1210		1812	
Code	VDCW	50V	50V	100V	50V	100V	50V	100V	50V	100V	50V	100V
0R1	0.1 pF	■	■									
0R2	0.2 pF	■	■									
0R3	0.3 pF	■	■		■		■					
0R4	0.4 pF	■	■		■		■					
0R5	0.5 pF	■	■	■	■	■	■	■				
0R6	0.6 pF	■	■	■	■	■	■	■				
0R7	0.7 pF	■	■	■	■	■	■	■				
0R8	0.8 pF	■	■	■	■	■	■	■				
0R9	0.9 pF	■	■	■	■	■	■	■				
1R0	1 pF	■	■	■	■	■	■	■		■		
1R2	1.2 pF	■	■	■	■	■	■	■		■		
1R5	1.5 pF	■	■	■	■	■	■	■		■		
1R8	1.8 pF	■	■	■	■	■	■	■		■		
2R0	2 pF			■	■	■	■	■		■		
2R2	2.2 pF	■	■	■	■	■	■	■		■		
2R7	2.7 pF	■	■	■	■	■	■	■		■		
3R0	3 pF			■	■	■	■	■		■		■
3R3	3.3 pF	■	■	■	■	■	■	■		■		■
3R9	3.9 pF	■	■	■	■	■	■	■		■		■
4R7	4.7 pF	■	■	■	■	■	■	■		■		■
5R0	5 pF			■	■	■	■	■		■		■
5R6	5.6 pF	■	■	■	■	■	■	■		■		■
6R8	6.8 pF	■	■	■	■	■	■	■		■		■
8R2	8.2 pF			■	■	■	■	■		■		■
100	10 pF	■	■	■	■	■	■	■	■	■	■	■
120	12 pF	■	■	■	■	■	■	■	■	■	■	■
150	15 pF	■	■	■	■	■	■	■	■	■	■	■
180	18 pF	■	■	■	■	■	■	■	■	■	■	■
220	22 pF	■	■	■	■	■	■	■	■	■	■	■
270	27 pF	■	■	■	■	■	■	■	■	■	■	■
330	33 pF	■	■	■	■	■	■	■	■	■	■	■
390	39 pF	■	■	■	■	■	■	■	■	■	■	■
470	47 pF	■	■	■	■	■	■	■	■	■	■	■
560	56 pF	■	■	■	■	■	■	■	■	■	■	■
680	68 pF	■	■	■	■	■	■	■	■	■	■	■
820	82 pF	■	■	■	■	■	■	■	■	■	■	■
101	100 pF	■	■	■	■	■	■	■	■	■	■	■
121	120 pF	■	■	■	■	■	■	■	■	■	■	■
151	150 pF	■	■	■	■	■	■	■	■	■	■	■
181	180 pF	■	■	■	■	■	■	■	■	■	■	■
221	220 pF	■	■	■	■	■	■	■	■	■	■	■
271	270 pF	■	■	■	■	■	■	■	■	■	■	■
331	330 pF	■	■	■	■	■	■	■	■	■	■	■
391	390 pF	■	■	■	■	■	■	■	■	■	■	■
471	470 pF	■	■	■	■	■	■	■	■	■	■	■
561	560 pF	■	■	■	■	■	■	■	■	■	■	■
681	680 pF	■	■	■	■	■	■	■	■	■	■	■
751	750 pF			■	■		■	■	■	■	■	■
821	820 pF	■	■	■	■	■	■	■	■	■	■	■
102	1000 pF	■	■	■	■	■	■	■	■	■	■	■
122	1200 pF		■		■	■	■	■	■	■	■	■
152	1500 pF		■		■	■	■	■	■	■	■	■
182	1800 pF		■		■	■	■	■	■	■	■	■
222	2200 pF		■		■	■	■	■	■	■	■	■
272	2700 pF		■		■	■	■	■	■	■	■	■
332	3300 pF		■		■	■	■	■	■	■	■	■
392	3900 pF		■		■		■		■	■	■	■
472	4700 pF		■		■		■		■	■	■	■
562	5600 pF		■		■		■		■	■	■	■
682	6800 pF		■		■		■		■	■	■	■
822	8200 pF				■		■		■		■	■
103	0.01 uF				■		■		■		■	■

Capacitance and Voltage Available (cont.)

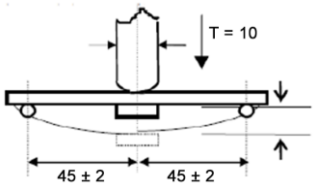
Dielectric		C0G										
EIA	Size	0402	0603		0805		1206		1210		1812	
Code	VDCW	50V	50V	100V	50V	100V	50V	100V	50V	100V	50V	100V
123	0.012 uF											
153	0.015 uF											
183	0.018 uF											
223	0.022 uF											
273	0.027 uF											
333	0.033 uF											
473	0.047 uF											
563	0.056 uF											
683	0.068 uF											
823	0.082 uF											
104	0.1 uF											

Mechanical Specifications and Packaging Specifications



Type/Code	Voltage	Capacitance Value	L	W	H	a	Unit	Packaging (7" Reel) Qty.	
								Paper Tape	Plastic Tape
CML0402C0G	50V	0.1 pF - 1000 pF	0.039 ± 0.008 1.00 ± 0.20	0.020 ± 0.008 0.50 ± 0.20	0.020 ± 0.002 0.50 ± 0.05	0.010 ± 0.004 0.25 ± 0.10	inches mm	10000	-
CML0603C0G	50V - 100V	0.1 pF - 6800 pF	0.063 ± 0.008 1.60 ± 0.20	0.031 ± 0.008 0.80 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.012 ± 0.004 0.30 ± 0.10	inches mm	4000	-
CML0805C0G	50V	0.3 pF - 1500 pF 4700 pF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.028 ± 0.002 0.70 ± 0.05	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		1800 pF - 3900 pF 5600 pF - 8200 pF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.09	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.01 uF - 0.022 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	2000
	100V	0.5 pF - 3300 pF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
CML1206C0G	50V	0.3 pF - 8200 pF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.028 ± 0.002 0.70 ± 0.05	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
		0.01 uF - 0.1 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
	100V	0.5 pF - 3300 pF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.031 ± 0.004 0.80 ± 0.09	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
CML1210C0G	50V	10 pF - 0.1 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	3000
	100V	1 pF - 6800 pF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
CML1812C0G	50V	10 pF - 0.1 uF	0.177 ± 0.016 4.50 ± 0.40	0.126 ± 0.012 3.20 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	1000
	100V	3 pF - 0.01 uF	0.177 ± 0.016 4.50 ± 0.40	0.126 ± 0.012 3.20 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	1000

Environmental Characteristics

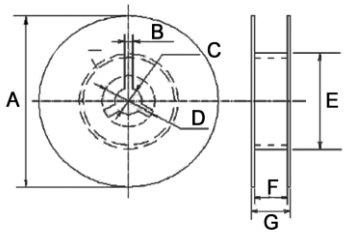
<table>
<tr><th>Test</th><th colspan="3">Test Specification</th><th colspan="3">Test Condition</th></tr>
<tr><td>Capacitance</td><td colspan="3">Should be within the specified tolerance.</td><td colspan="3">C0G: (Class I)
Cap ≤ 1000 pF 1.0 ± 0.2 Vrms, 1 MHz ± 10%
Cap > 1000 pF 1.0 ± 0.2 Vrms, 1 KHz ± 10%</td></tr>
<tr><td rowspan="5">Dissipation Factor (DF)</td><td rowspan="5">C0G (Class I)</td><td>DF</td><td>Capacitance</td><td>Measuring Frequency</td><td>Measuring Voltage</td></tr>
<tr><td>≤ 0.56%</td><td>Cr < 5 pF</td><td rowspan="3">1 MHZ ± 10%</td><td rowspan="4">1 ± 0.2 Vrms</td></tr>
<tr><td>1.5 [(150 / Cr) + 7] x 10 - 4</td><td>5 pF ≤ Cr < 50 pF</td></tr>
<tr><td>≤ 0.15%</td><td>50 pF ≤ Cr ≤ 1000 pF</td></tr>
<tr><td>≤ 0.15%</td><td>> 1000 pF</td><td>1 KHZ ± 10%</td></tr>
<tr><td>Insulation Resistance</td><td>C0G (Class I)</td><td colspan="2">C ≤ 10 nF, Ri ≥ 50000 MΩ
C > 10 nF, RI*CR ≥ 500 S</td><td colspan="2">Measuring Voltage: Rated Voltage (Max 500V)
Duration: 60 ± 5 seconds
Test Humidity: ≤ 75%
Test Temperature: 25°C ± 5°C
Test Current: ≤ 50 mA</td></tr>
<tr><td>Dielectric Withstanding Voltage</td><td colspan="3">No breakdown or damage.</td><td colspan="2">Measuring voltage:
Class I: 300% rated voltage
Duration: 1 ~ 5 seconds
Charge/Discharge Current: 50 mA max.</td></tr>
<tr><td rowspan="3">Solderability</td><td colspan="3" rowspan="3">At least 95% of the terminal electrode is covered by new solder.
Visual appearance: No visible damage.</td><td colspan="2">Preheating Conditions: 80ºC to 120°C, 10 ~ 30 seconds</td></tr>
<tr><td colspan="2">Solder Temperature: 235ºC ± 5% (Sn/Pb: 63/37)
Duration: 2 ± 0.5 seconds</td></tr>
<tr><td colspan="2">Solder Temperature: 245ºC ± 5°C (Lead-free)
Duration: 2 ± 0.5 seconds</td></tr>
<tr><td>Resistance to Soldering Heat</td><td colspan="3">Item: C0G
Δ C/C: ≤ ± 0.5% or ± 0.5 pF whichever is larger
DF: Same to initial value
IR: Same to initial value
Appearance: No visible damage. At least 95% of the terminal electrode is covered by new solder.</td><td colspan="2">Preheating Conditions: 100ºC to 200°C; 10 ± 2 minutes
Solder Temperature: 265ºC ± 5°C
Duration: 10 ± 1 seconds
Clean the capacitor with solvent and examine it with a 10X (min.) microscope.
Recovery Time: 24 ± 2 hours
Recovery Condition: Room temperature.</td></tr>
<tr><td>Resistance to Flexure of Substrate (Bending Strength)</td><td colspan="3">Appearance: No visible damage. Δ C/C: ≤ ± 10%</td><td colspan="2">Test Board: Al2O3 or PCB
Warp: 1 mm
Speed: 0.5 mm/second
The measurement should be made with the board in the bending position.
 

Unit: mm</td></tr>
<tr><td>Termination Adhesion</td><td colspan="3">No visible damage</td><td colspan="2">Applied Force: 5 N
Duration: 10 ± 1 seconds</td></tr>
<tr><td>Temperature Cycle</td><td colspan="3">C0G: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger</td><td colspan="2">Preheating Conditions: up-category Temperature: 1 hour
Recovery Time: 24 ± 1 hours
Initial Measurement
Cycling times: 5 times, 1 cycle, 4 steps:
Step: Temp. (°C): Time (min.)
1: Low-category temp. C0G: -55ºC: 30 ± 3
2: Normal temp. (+20): 2 - 3
3: Up-category temp. C0G: +125ºC: 30 ± 3
4: Normal temp. (+20ºC): 2 - 3
Recovery time after test: 24 ± 2 hours</td></tr>
</table>

Environmental Characteristics (cont.)

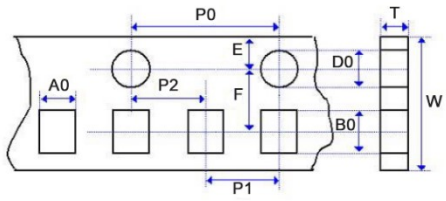
Test	Test Specification	Test Condition
Moisture Resistance	C0G: Δ C/C: ≤ ± 2% or ± 1 pF, whichever is larger DF: Not more than twice of initial value. IR: C0G: Ri ≥ 2500 M Ω or RI*CR ≥ 25 S whichever is smaller Appearance: No visible damage	Temperature: 40ºC ± 2°C Humidity: 90 ~ 95% R.H. Duration: 500 hours Recovery Conditions: Room temperature Recovery Time: 24 hours (Class I)
Life Test	C0G: Δ C/C: ≤ ± 2% or ± 1 pF, whichever is larger DF: Not more than twice of initial value. IR: C0G: Ri ≥ 4000 M Ω or RI*CR ≥ 40 S whichever is smaller Appearance: No visible damage	Low-voltage (< 100V) Applied Voltage: 1.5 x rated voltage Duration: 1000 hours Temperature: 125°C (C0G) Charge/Discharge Current: 50 mA max. Recovery Conditions: Room temperature Recovery Time: 24 hours (Class I)
Middle and High Voltage Life Test	C0G: Δ C/C: ≤ ± 2% or ± 1 pF, whichever is larger DF: Not more than twice of initial value. IR: C0G: Ri ≥ 4000 M Ω or Ri*CR ≥ 40 S whichever is smaller Appearance: No visible damage	Applied voltage: 100V ≤ rated voltage < 500V: 2 multiple 500V ≤ rated voltage ≤ 1000V: 1.5 multiple > 1000V rated voltage: 1.2 multiple Duration: 1000 hours Charge/Discharge Current: 50 mA max. Temperature: 125°C (C0G) Recovery Conditions: Room temperature Recovery Time: 24 hours (Class I)

Reel Specifications



Type/Code	A	B	C	D	E	F	G	Unit
CML_C0G (all sizes)	7.008 ± 0.079 178.00 ± 2.00	0.118 3.00	0.512 ± 0.020 13.00 ± 0.50	0.827 ± 0.031 21.00 ± 0.80	1.969 or more 50.00 or more	0.394 ± 0.059 10.00 ± 1.50	0.472 max 12.00 max	inches mm

Paper Tape Specifications

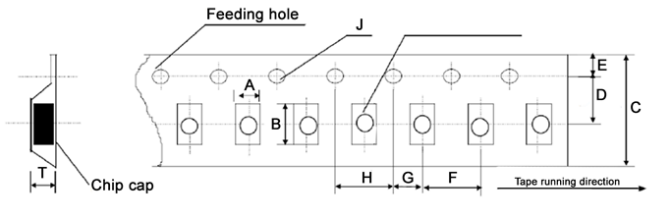


Type/Code	A_0	B_0	T	W	P_0	Unit
CML0402C0G	0.026 ± 0.004 0.65 ± 0.10	0.045 ± 0.004 1.15 ± 0.10	0.031 below 0.80 below	0.315 ± 0.004 8.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	inches mm
CML0603C0G	0.043 ± 0.004 1.10 ± 0.10	0.075 ± 0.004 1.90 ± 0.10	0.043 max 1.10 max	0.315 ± 0.004 8.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	inches mm
CML0805C0G	0.057 ± 0.006 1.45 ± 0.15	0.091 ± 0.006 2.30 ± 0.15	0.043 max 1.10 max	0.315 ± 0.006 8.00 ± 0.15	0.157 ± 0.004 4.00 ± 0.10	inches mm
CML1206C0G	0.071 ± 0.008 1.80 ± 0.20	0.134 ± 0.008 3.40 ± 0.20	0.043 max 1.10 max	0.315 ± 0.008 8.00 ± 0.20	0.157 ± 0.004 4.00 ± 0.10	inches mm

Paper Tape Specifications (cont.)

Type/Code	P_1	P_2	D_0	E	F	Unit
CML0402C0G	0.079 ± 0.002 2.00 ± 0.05	0.079 ± 0.002 2.00 ± 0.05	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
CML0603C0G	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.002 4.00 ± 0.05	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
CML0805C0G	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
CML1206C0G	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	inches mm

Plastic Tape Specifications



Type/Code	A	B	C	D	E	Unit
CML0805C0G	0.061 ± 0.008 1.55 ± 0.20	0.093 ± 0.008 2.35 ± 0.20	0.315 ± 0.008 8.00 ± 0.20	0.138 ± 0.002 3.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
CML1206C0G	0.077 ± 0.008 1.95 ± 0.20	0.142 ± 0.008 3.60 ± 0.20	0.315 ± 0.008 8.00 ± 0.20	0.138 ± 0.002 3.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
CML1210C0G	0.106 ± 0.004 2.70 ± 0.10	0.135 ± 0.004 3.42 ± 0.10	0.315 ± 0.004 8.00 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
CML1812C0G	0.144 ± 0.004 3.66 ± 0.10	0.195 ± 0.004 4.95 ± 0.10	0.472 ± 0.004 12.00 ± 0.10	0.217 ± 0.002 5.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
Type/Code	F	G	H	J	T	Unit
CML0805C0G	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.059 max 1.50 max	inches mm
CML1206C0G	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.073 max 1.85 max	inches mm
CML1210C0G	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.126 max 3.20 max	inches mm
CML1812C0G	0.315 ± 0.004 8.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.157 max 4.00 max	inches mm

CML_X7R Series

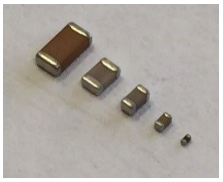
Multilayer Ceramic Chip Capacitor

Stackpole Electronics, Inc.

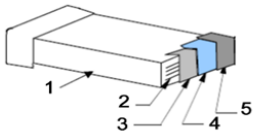
Resistive Product Solutions

Features:

- Lead free, Halogen free, RoHS and REACH compliant
- -55°C to 125°C operating temperature range
- EIA sizes 0402, 0603, 0805, 1206, 1210 and 1812
- Capacitance offering from 100 pF to 47 uF



Construction



1 - Ceramic layers (dielectric)
2 - Inner electrodes
3 - Base termination
4 - Nickel plating layer
5 - Tin plating layer

Electrical Specifications

Type/Code	Dielectric Code	Standard Tolerance		Capacitance Range				
		Code	Description	10V	16V	25V	50V	100V
CML0402	X7R	K	± 10%	120 pF - 0.039 uF				-
				0.012 uF - 0.1 uF			-	
CML0603	X7R	K	± 10%	150 pF - 0.1 uF				
				0.012 uF - 0.18 uF				-
				0.12 uF - 0.33 uF			-	
				0.12 uF - 2.2 uF		-		
CML0805	X7R	K	± 10%	150 pF - 0.1 uF				
				0.12 uF - 0.39 uF				-
				-	0.12 uF - 2.2 uF		-	
CML1206	X7R	K	± 10%	150 pF - 1 uF				
				2.2 uF - 4.7 uF				-
CML1210	X7R	K	± 10%	-				150 pF - 2.2 uF
				220 pF - 10 uF				-
				-	22 uF		-	
				47 uF	-			
CML1812	X7R	K	± 10%	-				270 pF - 1 uF
				-	470 pF - 4.7 uF			-
				-	6.8 uF		-	

Note: J = 5% tolerance may be available

How to Order

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
C	M	L	0	4	0	2	X	7	R	1	0	3	K	T	5	0	V

Product Series	
Code	Description
CML	Multilayer Ceramic

Size
Code
0402
0603
0805
1206
1210
1812

Dielectric
Code
X7R

Capacitance Range	
0.1pF to 0.10uF (E12)	
EIA Code	Capacitance
101	100 pF
102	1000 pF
103	0.01 uF
104	0.1 uF
105	1 uF
106	10 uF

Tolerance (*)	
Code	Description
J	± 5%
K	± 10%

(*) Other tolerances may be available. Contact Stackpole.

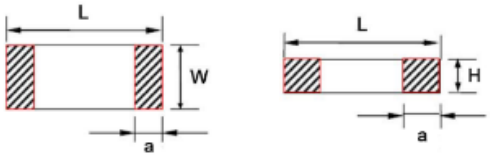
Packaging			
Code	Description	Size	Quantity
T	7" Paper Reel	Refer to Packaging Specifications	
	7" Plastic Tape		

Max Working Voltage
10V
16V
25V
50V
100V

Capacitance and Voltage Available

Dielectric		X7R																								
EIA	Size	0402				0603					0805					1206					1210					1812			
Code	VDCW	10V	16V	25V	50V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	16V	25V	50V	100V
101	100 pF	■	■	■	■										■														
121	120 pF	■	■	■	■																								
151	150 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■					■					■				
181	180 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■					■					■				
201	200 pF															■	■	■	■										
221	220 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
271	270 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				■
331	330 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				■
391	390 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				■
471	470 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
561	560 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
681	680 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
751	750 pF									■					■					■					■				■
821	820 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
102	1000 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
122	1200 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
152	1500 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
182	1800 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
222	2200 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
272	2700 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
332	3300 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
392	3900 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
472	4700 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
562	5600 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
682	6800 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
822	8200 pF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
103	0.01 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
123	0.012 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
153	0.015 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
183	0.018 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
223	0.022 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
273	0.027 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
333	0.033 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
393	0.039 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
473	0.047 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
563	0.056 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
683	0.068 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
823	0.082 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
104	0.1 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
124	0.12 uF										■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■
154	0.15 uF	■	■			■	■	■	■		■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■
184	0.18 uF						■																						
224	0.22 uF	■	■			■	■	■	■		■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■
274	0.27 uF						■																						
334	0.33 uF	■				■	■	■	■		■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■
394	0.39 uF						■																		■				■
474	0.47 uF	■				■	■	■	■		■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■
564	0.56 uF										■	■	■	■						■					■	■	■	■	■
684	0.68 uF					■	■	■			■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■
824	0.82 uF										■	■	■	■		■	■	■	■	■					■				■
105	1 uF					■	■	■			■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■
125	1.2 uF																								■				
155	1.5 uF					■					■	■	■	■		■	■	■	■						■	■	■	■	
225	2.2 uF					■	■				■	■	■	■		■	■	■	■		■					■	■	■	
335	3.3 uf										■	■	■			■	■	■	■							■	■	■	
475	4.7 uF										■	■	■	■		■	■	■	■		■	■	■	■		■	■	■	
685	6.8 uF										■															■	■		
106	10 uF										■					■	■	■			■	■	■	■					
226	22 uf															■						■	■						
476	47 uF																				■								

Mechanical Specifications and Packaging Specifications

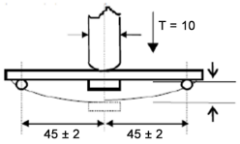


Type/Code	Voltage	Capacitance Range	L	W	H	a	Unit	Packaging (7" Reel) Qty.	
								Paper Tape	Plastic Tape
CML0402X7R	10V - 50V	100 pF - 0.47 uF	0.039 ± 0.008 1.00 ± 0.20	0.020 ± 0.008 0.50 ± 0.20	0.020 ± 0.002 0.50 ± 0.05	0.010 ± 0.004 0.25 ± 0.10	inches mm	10000	-
CML0603X7R	10V - 100V	150 pF - 2.2 uF	0.063 ± 0.008 1.60 ± 0.20	0.031 ± 0.008 0.80 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.012 ± 0.004 0.30 ± 0.10	inches mm	4000	-
CML0805X7R	10V	150 pF - 0.33 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.47 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.56 uF - 0.68 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
		0.82 uF - 1 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.039 ± 0.004 1.00 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
		1.5 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
		2.2 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		3.3 uF - 10 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	2000
	16V	150 pF - 0.33 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.47 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.56 uF - 0.68 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
		0.82 uF - 1 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.039 ± 0.004 1.00 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
		1.5 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
		2.2 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		3.3 uF - 4.7 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	2000
	25V	150 pF - 0.33 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.47 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.56 uF - 0.68 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
		0.82 uF - 1 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.039 ± 0.004 1.00 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
		1.5 uF - 2.2 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	2000
		3.3 uF - 4.7 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	2000

Mechanical Specifications and Packaging Specifications (cont.)									
Type/Code	Voltage	Capacitance Range	L	W	H	a	Unit	Packaging (7" Reel) Qty.	
								Paper Tape	Plastic Tape
CML0805X7R	50V	150 pF - 0.33 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.47 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.56 uF - 0.68 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
		0.82 uF - 1 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.039 ± 0.004 1.00 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
		1.5 uF - 2.2 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
	100V	100 pF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.028 ± 0.020 0.70 ± 0.50	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		150 pF - 0.047 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.056 uF - 0.1 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
CML1206X7R	10V	200 pF - 0.33 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.031 ± 0.004 0.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
		0.47 uF - 0.68 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	3000
		0.82 uF - 1.5 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.031 ± 0.004 0.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
		2.2 uF - 3.3 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	3000
		4.7 uF - 22 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
	16V - 25V	200 pF - 0.33 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.031 ± 0.004 0.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
		0.47 uF - 0.68 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	3000
		0.82 uF - 1.5 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.031 ± 0.004 0.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
		2.2 uF - 3.3 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	3000
		4.7 uF - 10 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
	50V	200 pF - 0.33 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.031 ± 0.004 0.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
		0.47 uF - 0.68 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	3000
		0.82 uF - 1.5 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.031 ± 0.004 0.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
		2.2 uF - 3.3 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	3000
		4.7 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
	100V	150 pF - 0.056 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.031 ± 0.004 0.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
		0.068 uF - 0.33 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	3000
		0.47 uF - 1 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000

Mechanical Specifications and Packaging Specifications (cont.)									
Type/Code	Voltage	Capacitance Range	L	W	H	a	Unit	Packaging (7" Reel) Qty.	
								Paper Tape	Plastic Tape
CML1210X7R	10V	220 pF - 0.47 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		0.68 uF - 1 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		4.7 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		10 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.071 ± 0.004 1.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		47 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.098 ± 0.010 2.50 ± 0.25	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	500
	16V - 25V	220 pF - 0.47 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		0.68 uF - 1 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		4.7 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		10 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.071 ± 0.004 1.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		22 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.098 ± 0.010 2.50 ± 0.25	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	500
	50V	220 pF - 0.47 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.047 ± 0.004 1.20 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		0.68 uF - 1 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		4.7 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.071 ± 0.004 1.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		10 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.098 ± 0.010 2.50 ± 0.25	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	500
	100V	150 pF - 0.22 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.055 ± 0.004 1.40 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		0.33 uF - 2.2 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
CML1812X7R	16V - 25V	470 pF - 1 uF	0.177 ± 0.016 4.50 ± 0.40	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	1000
		1.5 uF - 6.8 uF	0.177 ± 0.016 4.50 ± 0.40	0.126 ± 0.012 3.20 ± 0.30	0.071 ± 0.004 1.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	1000
	50V	470 pF - 1 uF	0.177 ± 0.016 4.50 ± 0.40	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	1000
		1.5 uF - 4.7 uF	0.177 ± 0.016 4.50 ± 0.40	0.126 ± 0.012 3.20 ± 0.30	0.071 ± 0.004 1.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	1000
	100V	270 pF - 0.56 uF	0.177 ± 0.016 4.50 ± 0.40	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	1000
		0.68 uF - 1 uF	0.177 ± 0.016 4.50 ± 0.40	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.009 1.60 ± 0.24	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	500

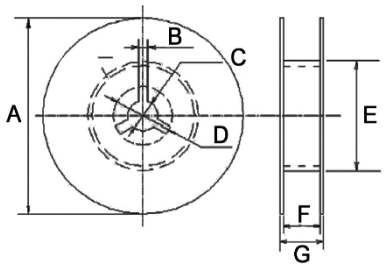
Environmental Characteristics

<table>
<tr><th>Test</th><th colspan="7">Test Specification</th><th>Test Condition</th></tr>
<tr><td>Capacitance</td><td colspan="7">Should be within the specified tolerance.</td><td>X7R: (Class II)
Cap ≤ 10uF 1.0 ± 0.2 Vrms, 1 KHz ± 10%
Cap > 10uF 0.5 ± 0.1 Vrms, 120 Hz ± 10%</td></tr>
<tr><td rowspan="2">Dissipation Factor (DF)</td><td rowspan="2">X7R (Class II)</td><td rowspan="2">X7R (≥ 0402)</td><td>≥ 50V</td><td>25V</td><td>16V</td><td colspan="2">10V</td><td rowspan="2">Cap ≤ 10uF 1.0 ± 0.2 Vrms, 1 KHz ± 10%
Cap > 10uF 0.5 ± 0.1 Vrms, 120 Hz ± 10%</td></tr>
<tr><td>≤ 2.5%</td><td colspan="2">≤ 3.5% (C < 0.47uF)
≤ 10.0% (C ≥ 0.47uF)</td><td colspan="2">≤ 5% (C < 0.15uF)
≤ 10.0% (C ≥ 0.15 uF)</td></tr>
<tr><td>Insulation Resistance</td><td>X7R (Class II)</td><td colspan="6">C ≤ 25nF, Ri ≥ 10000M Ω
C > 25nF, RI*CR > 100S</td><td>Measuring Voltage: Rated Voltage (Max 500V)
Duration: 60 ± 5 seconds
Test Humidity: ≤ 75%
Test Temperature: 25°C ± 5°C
Test Current: ≤ 50 mA</td></tr>
<tr><td>Dielectric Withstanding Voltage</td><td colspan="7">No breakdown or damage.</td><td>Measuring voltage:
Class II: 250% rated voltage
Duration: 1 ~ 5 seconds
Charge/Discharge Current: 50 mA max.</td></tr>
<tr><td rowspan="3">Solderability</td><td colspan="7" rowspan="3">At least 95% of the terminal electrode is covered by new solder.
Visual appearance: No visible damage.</td><td>Preheating Conditions: 80ºC to 120°C, 10 ~ 30 seconds</td></tr>
<tr><td>Solder Temperature: 235ºC ± 5% (Sn/Pb: 63/37)
Duration: 2 ± 0.5 seconds</td></tr>
<tr><td>Solder Temperature: 245ºC ± 5°C (Lead-free)
Duration: 2 ± 0.5 seconds</td></tr>
<tr><td rowspan="5">Resistance to Soldering Heat</td><td colspan="2">Item</td><td colspan="4">X7R</td><td rowspan="5">Preheating Conditions: 100ºC to 200°C; 10 ± 2 minutes
Solder Temperature: 265ºC ± 5°C
Duration: 10 ± 1 seconds
Clean the capacitor with solvent and examine it with a 10X (min.) microscope.
Recovery Time: 24 ± 2 hours
Recovery Condition: Room temperature.</td></tr>
<tr><td colspan="2">Δ C/C</td><td colspan="4">-5 ~ + 10%</td></tr>
<tr><td colspan="2">DF</td><td colspan="4">Same to initial value</td></tr>
<tr><td colspan="2">IR</td><td colspan="4">Same to initial value</td></tr>
<tr><td colspan="6">Appearance: No visible damage. At least 95% of the terminal electrode is covered by new solder.</td></tr>
<tr><td>Resistance to Flexure of Substrate (Bending Strength)</td><td colspan="7">Appearance: No visible damage. Δ C/C: ≤ ± 10%</td><td>Test Board: Al2O3 or PCB
Warp: 1 mm
Speed: 0.5 mm / second
The measurement should be made with the board in the bending position.
Unit: mm
 
</td></tr>
<tr><td>Termination Adhesion</td><td colspan="7">No visible damage</td><td>Applied Force: 5 N
Duration: 10 ± 1 seconds</td></tr>
<tr><td>Temperature Cycle</td><td colspan="7">X7R: Δ C/C: ≤ ± 10%</td><td>Preheating Conditions: up-category temperature 1 hour
Recovery Time: 24 ± 1 hours
Initial Measurement
Cycling times: 5 times, 1 cycle, 4 steps:
<table>
<tr><th>Step</th><th>Temp. (°C)</th><th>Time (min.)</th></tr>
<tr><td>1</td><td>Low-category temp.
X7R: -55ºC</td><td>30 ± 3</td></tr>
<tr><td>2</td><td>Normal temp.
(+20ºC)</td><td>2 - 3</td></tr>
<tr><td>3</td><td>Up-category temp.
X7R: +125ºC</td><td>30 ± 3</td></tr>
<tr><td>4</td><td>Normal temp.
(+20ºC)</td><td>2 - 3</td></tr>
<tr><td colspan="3">Recovery time after test: 24 ± 2 hours</td></tr>
</table></td></tr>
</table>

Environmental Characteristics (cont.)

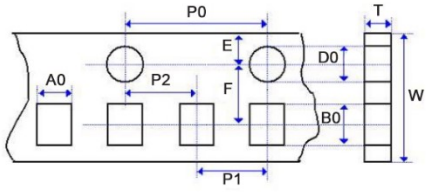
Test	Test Specification	Test Condition
Moisture Resistance	X7R: Δ C/C: ≤ ± 10% DF: Not more than twice of initial value. IR: X7R: Ri ≥ 1000M Ω or RI*CR ≥ 25S whichever is smaller Appearance: No visible damage	Temperature: 40ºC ± 2°C Humidity: 90 ~ 95% R.H. Duration: 500 hours Recovery Conditions: Room temperature Recovery Time: 48 hours (Class II)
Life Test	X7R: Δ C/C: ≤ ± 20% DF: Not more than twice of initial value. IR: X7R: Ri ≥ 2000M Ω or RI*CR ≥ 50 S whichever is smaller Appearance: No visible damage	Low-voltage (< 100V) Applied Voltage: 1.5 x rated voltage Duration: 1000 hours Temperature: 125°C (X7R) Charge/Discharge Current: 50 mA max. Recovery Conditions: Room temperature Recovery Time: 48 hours (Class II)
Middle and High Voltage Life Test	X7R: Δ C/C: ≤ ± 20% DF: Not more than twice of initial value. IR: X7R Ri ≥ 2000M Ω or Ri*CR ≥ 50 S whichever is smaller Appearance: No visible damage	Applied voltage: 100V ≤ rated voltage < 500V: 2 multiple 500V ≤ rated voltage ≤ 1000V: 1.5 multiple > 1000V rated voltage: 1.2 multiple Duration: 1000 hours Charge/Discharge Current: 50 mA max. Temperature: 125°C (X7R) Recovery Conditions: Room temperature Recovery Time: 48 hours (Class II)

Reel Specifications



Type/Code	A	B	C	D	E	F	G	Unit
CML_X7R (all sizes)	7.008 ± 0.079 178.00 ± 2.00	0.118 3.00	0.512 ± 0.020 13.00 ± 0.50	0.827 ± 0.031 21.00 ± 0.80	1.969 or more 50.00 or more	0.394 ± 0.059 10.00 ± 1.50	0.472 max 12.00 max	inches mm

Paper Tape Specifications

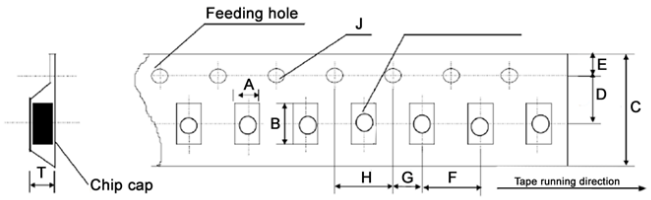


Type/Code	A0	B0	T	W	P0	Unit
CML0402X7R	0.026 ± 0.004 0.65 ± 0.10	0.045 ± 0.004 1.15 ± 0.10	0.031 below 0.80 below	0.315 ± 0.004 8.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	inches mm
CML0603X7R	0.043 ± 0.004 1.10 ± 0.10	0.075 ± 0.004 1.90 ± 0.10	0.043 max 1.10 max	0.315 ± 0.004 8.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	inches mm
CML0805X7R	0.057 ± 0.006 1.45 ± 0.15	0.091 ± 0.006 2.30 ± 0.15	0.043 max 1.10 max	0.315 ± 0.006 8.00 ± 0.15	0.157 ± 0.004 4.00 ± 0.10	inches mm
CML1206X7R	0.071 ± 0.008 1.80 ± 0.20	0.134 ± 0.008 3.40 ± 0.20	0.043 max 1.10 max	0.315 ± 0.008 8.00 ± 0.20	0.157 ± 0.004 4.00 ± 0.10	inches mm

Paper Tape Specifications (cont.)

Type/Code	P1	P2	D0	E	F	Unit
CML0402X7R	0.079 ± 0.002 2.00 ± 0.05	0.079 ± 0.002 2.00 ± 0.05	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
CML0603X7R	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.002 4.00 ± 0.05	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
CML0805X7R	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
CML1206X7R	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	inches mm

Plastic Tape Specifications



Type/Code	A	B	C	D	E	Unit
CML0805X7R	0.061 ± 0.008 1.55 ± 0.20	0.093 ± 0.008 2.35 ± 0.20	0.315 ± 0.008 8.00 ± 0.20	0.138 ± 0.002 3.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
CML1206X7R	0.077 ± 0.008 1.95 ± 0.20	0.142 ± 0.008 3.60 ± 0.20	0.315 ± 0.008 8.00 ± 0.20	0.138 ± 0.002 3.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
CML1210X7R	0.106 ± 0.004 2.70 ± 0.10	0.135 ± 0.004 3.42 ± 0.10	0.315 ± 0.004 8.00 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
CML1812X7R	0.144 ± 0.004 3.66 ± 0.10	0.195 ± 0.004 4.95 ± 0.10	0.472 ± 0.004 12.00 ± 0.10	0.217 ± 0.002 5.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
Type/Code	F	G	H	J	T	Unit
CML0805X7R	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.059 max 1.50 max	inches mm
CML1206X7R	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.073 max 1.85 max	inches mm
CML1210X7R	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.126 max 3.20 max	inches mm
CML1812X7R	0.315 ± 0.004 8.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.157 max 4.00 max	inches mm

CML_Y5V Series

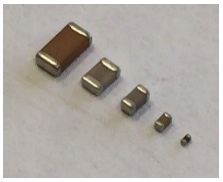
Multilayer Ceramic Chip Capacitor

Stackpole Electronics, Inc.

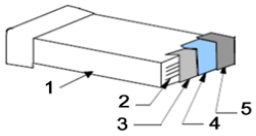
Resistive Product Solutions

Features:

- Lead free, Halogen free, RoHS and REACH compliant
- -30°C to 85°C operating temperature range
- EIA sizes 0402, 0603, 0805, 1206, 1210 and 1812
- Capacitance offering from 1000 pF to 22 uF



Construction



1 - Ceramic layers (dielectric)
2 - Inner electrodes
3 - Base termination
4 - Nickel plating layer
5 - Tin plating layer

Electrical Specifications

Type / Code	Dielectric Code	Standard Tolerance		Capacitance Range				
		Code	Description	10V	16V	25V	50V	100V
CML0402	Y5V	Z	+80% / -20%	1000 pF - 0.1 uF				-
				0.12 uF - 0.18 uF			-	
				0.12 uF - 0.47 uF		-		
				0.12 uF - 1 uF	-			
CML0603	Y5V	Z	+80% / -20%	10000 pF - 0.1 uF				
				10000 pF - 0.82 uF				-
				0.18 uF - 2.2 uF			-	
CML0805	Y5V	Z	+80% / -20%	0.012 uF - 0.1 uF				
				1 uF - 4.7 uF			-	
CML1206	Y5V	Z	+80% / -20%	10000 pF - 1 uF				
				2.2 uF - 4.7 uF				-
				10 uF		-		
CML1210	Y5V	Z	+80% / -	-				0.015 uF - 1 uF
CML1812	Y5V	Z	+80% / -	-				0.15 uF - 2.2 uF

Note: M = ±20% tolerance may be available

How to Order

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
C	M	L	0	4	0	2	Y	5	V	1	0	3	Z	T	5	0	V

Product Series	
Code	Description
CML	Multilayer Ceramic

Size
Code
0402
0603
0805
1206
1210
1812

Dielectric
Code
Y5V

Capacitance Range	
0.1pF to 0.10uF (E6)	
EIA Code	Capacitance
102	1000 pF
103	0.01 uF
104	0.1 uF
105	1 uF
106	10 uF

Tolerance (*)	
Code	Description
M	± 20%
Z	+80%/-20%

(*) Other tolerances may be available. Contact

Packaging			
Code	Description	Size	Quantity
T	7" Paper Reel	Refer to Packaging Specifications	
	7" Plastic Tape		

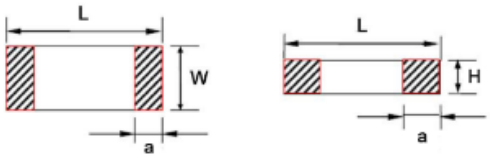
Max Working Voltage
10V
16V
25V
50V
100V

www.seielect.com
marketing@seielect.com

Capacitance and Voltage Available

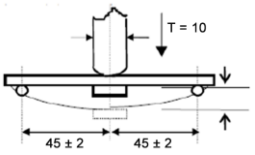
Dielectric		Y5V																				
EIA	Size	0402				0603					0805					1206					1210	1812
Code	VDCW	10V	16V	25V	50V	10V	16V	25V	50V	100	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V
102	1000 pF	■	■	■	■	■	■	■	■		■	■	■	■		■	■	■	■			
122	1200 pF	■	■	■	■	■	■	■	■		■	■	■	■		■	■	■	■			
152	1500 pF	■	■	■	■	■	■	■	■		■	■	■	■		■	■	■	■			
182	1800 pF	■	■	■	■	■	■	■	■		■	■	■	■		■	■	■	■			
222	2200 pF	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■			
272	2700 pF	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■			
332	3300 pF	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■			
392	3900 pF	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■			
472	4700 pF	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■			
562	5600 pF	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■			
682	6800 pF	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■			
822	8200 pF	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■			
103	0.01 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
123	0.012 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
153	0.015 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
183	0.018 uf	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
223	0.022 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
273	0.027 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
333	0.033 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
393	0.039 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
473	0.047 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
563	0.056 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
683	0.068 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
823	0.082 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
104	0.1 uF	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
124	0.12 uF										■	■	■	■								
154	0.15 uF	■	■	■		■	■	■	■		■	■	■	■		■	■	■	■	■	■	■
224	0.22 uF	■	■	■		■	■	■	■		■	■	■	■		■	■	■	■	■	■	■
334	0.33 uF	■				■	■	■	■		■	■	■	■		■	■	■	■	■	■	■
394	0.39 uF																			■	■	■
474	0.47 uF	■				■	■	■	■		■	■	■	■		■	■	■	■	■	■	■
564	0.56 uF										■	■	■	■							■	■
684	0.68 uF	■				■	■	■	■		■	■	■	■		■	■	■	■		■	■
824	0.82 uF										■	■	■	■		■	■	■	■		■	■
105	1 uF	■				■	■	■	■		■	■	■	■		■	■	■	■		■	■
125	1.2 uF																					■
135	1.3 uF																					■
155	1.5 uF					■	■	■			■	■	■	■		■	■	■	■			
225	2.2 uF					■	■	■			■	■	■	■		■	■	■	■			■
335	3.3 uF					■					■	■	■			■	■	■	■			
475	4.7 uF					■					■	■	■			■	■	■	■			
685	6.8 uF					■					■	■				■	■	■				
106	10 uF					■					■	■				■	■	■				
226	22 uF															■	■					

Mechanical Specifications and Packaging Specifications



Type / Code	Voltage	Capacitance Range	L	W	H	a	Unit	Packaging (7" Reel) Qty.	
								Paper Tape	Plastic Tape
CML0402Y5V	10V - 50V	1000 pF - 1 uF	0.039 ± 0.008 1.00 ± 0.20	0.020 ± 0.008 0.50 ± 0.20	0.020 ± 0.002 0.50 ± 0.05	0.010 ± 0.004 0.25 ± 0.10	inches mm	10000	-
CML0603Y5V	10V - 100V	1000 pF - 10 uF	0.063 ± 0.008 1.60 ± 0.20	0.031 ± 0.008 0.80 ± 0.20	0.031 ± 0.004 0.80 ± 0.09	0.012 ± 0.004 0.30 ± 0.10	inches mm	4000	-
CML0805Y5V	10V	1000 pF - 0.22 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.028 ± 0.020 0.70 ± 0.50	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.33 uF - 2.2 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		3.3 uF - 22 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
	16V	1000 pF - 0.22 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.028 ± 0.002 0.70 ± 0.05	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.33 uF - 2.2 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		3.3 uF - 10 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
	25V	1000 pF - 0.22 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.028 ± 0.002 0.70 ± 0.05	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.33 uF - 2.2 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		3.3 uF - 4.7 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
	50V	1000 pF - 0.22 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.028 ± 0.002 0.70 ± 0.05	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.33 uF - 2.2 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
	100V	0.01 uF - 0.1 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.028 ± 0.002 0.70 ± 0.05	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
CML1206Y5V	10V - 16V	1000 pF - 10 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.031 ± 0.004 0.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
		22 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
	25V	1000 pF - 10 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.031 ± 0.004 0.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
	50V - 100V	1000 pF - 4.7 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30	0.031 ± 0.004 0.80 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	4000	-
CML1210Y5V	100V	0.015 uF - 1 uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.012 2.50 ± 0.30	0.039 ± 0.004 1.00 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
CML1812Y5V	100V	0.15 uF - 2.2 uF	0.177 ± 0.016 4.50 ± 0.40	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	1000

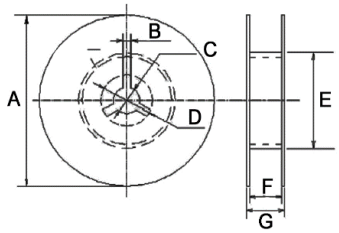
Environmental Characteristics

<table>
<tr><th>Test</th><th colspan="5">Test Specification</th><th>Test Condition</th></tr>
<tr><td>Capacitance</td><td colspan="5">Should be within the specified tolerance.</td><td>Y5V: (Class II)
Cap ≤ 10uF 1.0 ± 0.2 Vrms, 1 KHz ± 10%
Cap > 10uF 0.5 ± 0.1 Vrms, 120 Hz ± 10%</td></tr>
<tr><td rowspan="2">Dissipation Factor (DF)</td><td rowspan="2">Y5V (Class II)</td><td>≥ 25V</td><td>16V</td><td>10V</td><td rowspan="2">Cap ≤ 10uF 1.0 ± 0.2 Vrms, 1 KHz ± 10%
Cap > 10uF 0.5 ± 0.1 Vrms, 120 Hz ± 10%</td></tr>
<tr><td>≤ 7% (C < 1uF)
≤ 9% (C ≥ 1uF)</td><td>≤ 15%</td><td>≤ 15%</td></tr>
<tr><td>Insulation Resistance</td><td>Y5V (Class II)</td><td colspan="3">C ≤ 25 nF, Ri ≥ 4,000 MΩ
C > 25 nF, Ri*CR > 100 S</td><td>Measuring Voltage: Rated Voltage (Max 500V)
Duration: 60 ± 5 seconds
Test Humidity: ≤ 75%
Test Temperature: 25°C ± 5°C
Test Current: ≤ 50 mA</td></tr>
<tr><td>Dielectric Withstanding Voltage</td><td colspan="5">No breakdown or damage.</td><td>Measuring voltage:
Class II: 250% rated voltage
Duration: 1 ~ 5 seconds
Charge/Discharge Current: 50 mA max.</td></tr>
<tr><td rowspan="3">Solderability</td><td colspan="5" rowspan="3">At least 95% of the terminal electrode is covered by new solder.
Visual appearance: No visible damage.</td><td>Preheating Conditions: 80ºC to 120°C, 10 ~ 30 seconds</td></tr>
<tr><td>Solder Temperature: 235ºC ± 5% (Sn/Pb: 63/37)
Duration: 2 ± 0.5 seconds</td></tr>
<tr><td>Solder Temperature: 245ºC ± 5 °C (Lead-free)
Duration: 2 ± 0.5 seconds</td></tr>
<tr><td rowspan="6">Resistance to Soldering Heat</td><td colspan="2">Item</td><td colspan="2">Y5V</td><td rowspan="6">Preheating Conditions: 100ºC to 200°C; 10 ± 2 minutes
Solder Temperature: 265ºC ± 5°C
Duration: 10 ± 1 seconds
Clean the capacitor with solvent and examine it with a 10X (min.) microscope.
Recovery Time: 24 ± 2 hours
Recovery Condition: Room temperature.</td></tr>
<tr><td colspan="2">Δ C/C</td><td colspan="2">-10 ~ +20%</td></tr>
<tr><td colspan="2">DF</td><td colspan="2">Same to initial value</td></tr>
<tr><td colspan="2">IR</td><td colspan="2">Same to initial value</td></tr>
<tr><td colspan="4">Appearance: No visible damage.
At least 95% of the terminal electrode is covered by new solder.</td></tr>
<tr><td>Resistance to Flexure of Substrate (Bending Strength)</td><td colspan="5">Appearance: No visible damage. Δ C/C: ≤ ± 10%</td><td>Test Board: Al2O3 or PCB
Warp: 1 mm
Speed: 0.5 mm / second
The measurement should be made with the board in the bending position.
Unit: mm
 
</td></tr>
<tr><td>Termination Adhesion</td><td colspan="5">No visible damage</td><td>Applied Force: 5 N
Duration: 10 ± 1 seconds</td></tr>
<tr><td rowspan="6">Temperature Cycle</td><td colspan="5" rowspan="6">Y5V: Δ C/C: ≤ ± 20%</td><td>Preheating Conditions: up-category temperature 1 hour
Recovery Time: 24 ± 1 hours
Initial Measurement
Cycling times: 5 times, 1 cycle, 4 steps:</td></tr>
<tr><td>Step | Temp. (°C) | Time (min.)</td></tr>
<tr><td>1 | Low-category temp. Y5V: -25 ºC | 30 ± 3</td></tr>
<tr><td>2 | Normal temp. (+20ºC) | 2 - 3</td></tr>
<tr><td>3 | Up-category temp. Y5V: +85ºC | 30 ± 3</td></tr>
<tr><td>4 | Normal temp. (+20ºC) | 2 - 3</td></tr>
<tr><td>Recovery time after test: 24 ± 2 hours</td></tr>
</table>

Environmental Characteristics (cont.)

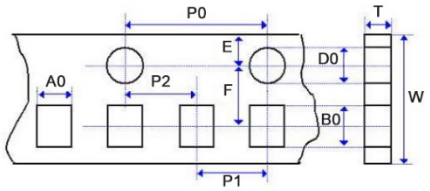
Test	Test Specification	Test Condition
Moisture Resistance	Y5V: Δ C/C: ≤ ± 30% DF: Not more than twice of initial value. IR: Y5V: Ri ≥ 1000 MΩ or Ri*CR ≥ 25 S whichever is smaller Appearance: No visible damage	Temperature: 40ºC ± 2 °C Humidity: 90 ~ 95% R.H. Duration: 500 hours Recovery Conditions: Room temperature Recovery Time: 48 hours (Class II)
Life Test	Y5V: Δ C/C: ≤ ± 30% DF: Not more than twice of initial value. IR: Y5V: Ri ≥ 2000 MΩ or Ri*CR ≥ 50 S whichever is smaller Appearance: No visible damage	Low-voltage (<100V) Applied Voltage: 1.5 x rated voltage Duration: 1000 hours Temperature: 85°C (Y5V) Charge/Discharge Current: 50mA max. Recovery Conditions: Room temperature Recovery Time: 48 hours (Class II)
Middle and High Voltage Life Test	Y5V: Δ C/C: ≤ ± 30% DF: Not more than twice of initial value. IR: Y5V Ri ≥ 2000 MΩ or Ri*CR ≥ 50 S whichever is smaller Appearance: No visible damage	Applied voltage: 100 V ≤ rated voltage < 500 V: 2 multiple 500V ≤ rated voltage ≤ 1000 V: 1.5 multiple > 1000V rated voltage: 1.2 multiple Duration: 1000 hours Charge/Discharge Current: 50 mA max. Temperature: 85°C (Y5V) Recovery Conditions: Room temperature Recovery Time: 48 hours (Class II)

Reel Specifications



Type/Code	A	B	C	D	E	F	G	Unit
CML_Y5V (all sizes)	7.008 ± 0.079 178.00 ± 2.00	0.118 3.00	0.512 ± 0.020 13.00 ± 0.50	0.827 ± 0.031 21.00 ± 0.80	1.969 or more 50.00 or more	0.394 ± 0.059 10.00 ± 1.50	0.472 max 12.00 max	inches mm

Paper Tape Specifications

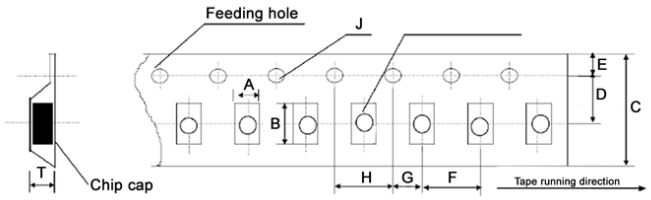


Type/Code	A0	B0	T	W	P0	Unit
CML0402Y5V	0.026 ± 0.004 0.65 ± 0.10	0.045 ± 0.004 1.15 ± 0.10	0.031 below 0.80 below	0.315 ± 0.004 8.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	inches mm
CML0603Y5V	0.043 ± 0.004 1.10 ± 0.10	0.075 ± 0.004 1.90 ± 0.10	0.043 max 1.10 max	0.315 ± 0.004 8.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	inches mm
CML0805Y5V	0.057 ± 0.006 1.45 ± 0.15	0.091 ± 0.006 2.30 ± 0.15	0.043 max 1.10 max	0.315 ± 0.006 8.00 ± 0.15	0.157 ± 0.004 4.00 ± 0.10	inches mm
CML1206Y5V	0.071 ± 0.008 1.80 ± 0.20	0.134 ± 0.008 3.40 ± 0.20	0.043 max 1.10 max	0.315 ± 0.008 8.00 ± 0.20	0.157 ± 0.004 4.00 ± 0.10	inches mm

Paper Tape Specifications (cont.)

Type/Code	P1	P2	D0	E	F	Unit
CML0402Y5V	0.079 ± 0.002 2.00 ± 0.05	0.079 ± 0.002 2.00 ± 0.05	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
CML0603Y5V	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.002 4.00 ± 0.05	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
CML0805Y5V	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
CML1206Y5V	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	inches mm

Plastic Tape Specifications



Type/Code	A	B	C	D	E	Unit
CML0805Y5V	0.061 ± 0.008 1.55 ± 0.20	0.093 ± 0.008 2.35 ± 0.20	0.315 ± 0.008 8.00 ± 0.20	0.138 ± 0.002 3.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
CML1206Y5V	0.077 ± 0.008 1.95 ± 0.20	0.142 ± 0.008 3.60 ± 0.20	0.315 ± 0.008 8.00 ± 0.20	0.138 ± 0.002 3.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
CML1210Y5V	0.106 ± 0.004 2.70 ± 0.10	0.135 ± 0.004 3.42 ± 0.10	0.315 ± 0.004 8.00 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
CML1812Y5V	0.144 ± 0.004 3.66 ± 0.10	0.195 ± 0.004 4.95 ± 0.10	0.472 ± 0.004 12.00 ± 0.10	0.217 ± 0.002 5.50 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	inches mm
Type/Code	F	G	H	J	T	Unit
CML0805Y5V	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.059 max 1.50 max	inches mm
CML1206Y5V	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.073 max 1.85 max	inches mm
CML1210Y5V	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.126 max 3.20 max	inches mm
CML1812Y5V	0.315 ± 0.004 8.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10	0.157 max 4.00 max	inches mm