#### Stackpole Electronics, Inc.

Multilayer Ceramic Chip Capacitor

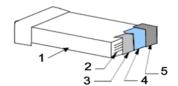
Resistive Product Solutions

#### 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	Standard	Tolerance	Capacitance Range										
r ype/Code	Code	Code	Description	50V	100V									
CML0402	COG	С	± 0.25 pF	0.1 pF - 8.2 pF	1									
CIVILU402	COG	J	± 5%	10 pF - 1000 pF	-									
CML0603	C0G	С	± 0.25 pF	0.1 pF - 6.8 pF	0.5 pF - 8.2 pF									
CIVILUOUS	COG	J	± 5%	10 pF - 6800 pF	10 pF - 1000 pF									
CML0805	C0G	С	± 0.25 pF	0.3 pF - 6,8 pF	0.5 pF - 8.2 pF									
CIVILOGOS	000	J	± 5%	10 pF - 0.022 uF	10 pF - 3300 pF									
		С	± 0.25 pF	0.3 pF - 8.2 pF	0.5 pF - 8.2 pF									
CML1206	C0G	1	± 5%	10 pF - 3300 pF	10 pF - 3300 pF									
		J	± 370	3900 pF - 4700 pF	•									
CML1210	C0G	С	± 0.25 pF	-	1 pF - 8.2 pF									
CIVIL 12 10	COG	J	± 5%	10 pF - 0.1 uF	10 pF - 6800 pF									
CML1812	C0G	С	± 0.25 pF	-	3 pF - 8.2 pF									
CIVIL 1012	COG	J	± 5%	10 pF - 0.1 uF	10 pF - 0.01 uF									

Note: Capacitance values < 10 pF: B =  $\pm$  0.1 pF may be available Capacitance values  $\geq$  10 pF: G =  $\pm$  2% may be available

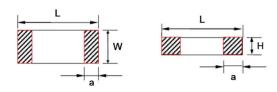
#### How to Order 10 11 12 13 16 17 18 С 0 4 0 2 C 0 G 1 0 0 Т 5 0 V Dielectric Capacitance Range Max Working **Product Series** Size Packaging Tolerance ( Code Description 0.1pF to 0.10uF (E12) Size and Quantity Code Code Code Description Voltage Code Description EIA Code Capacitance 0402 C0G 50V Multilayer В 7" Paper Reel Refer to Packaging ± 0.1 pF CML Т Specifications Ceramic 0603 С ± 0.25 pF 7" Plastic Tape 100V 0R1 0.1 pF 100 0805 10 pF G ± 2% 100 pF 1206 101 ± 5% 1210 102 1000 pF 103 0.01 uF 1812 (\*) Other tolerances may be available. Contact Stackpole. 104 0.1 uF

				Сар	acitance	e and Vo	oltage A	vailable				
Die	electric						COG					
EIA	Size	0402	06	03	08	05		206	12	10	18	12
Code	VDCW	50V	50V	100V	50V	100V	50V	100V	50V	100V	50V	100V
0R1	0.1 pF											
0R2 0R3	0.2 pF 0.3 pF											
0R3	0.3 pF 0.4 pF											
0R5	0.5 pF											
0R6	0.6 pF											
0R7	0.7 pF											
0R8	0.8 pF											
0R9 1R0	0.9 pF 1 pF											
1R0	1.2 pF											
1R5	1.5 pF											
1R8	1.8 pF											
2R0	2 pF											
2R2	2.2 pF											
2R7 3R0	2.7 pF 3 pF											
3R3	3.3 pF											
3R9	3.9 pF											
4R7	4.7 pF											
5R0	5 pF											
5R6	5.6 pF											
6R8 8R2	6.8 pF 8.2 pF											
100	10 pF											
120	12 pF											
150	15 pF											
180	18 pF											
220	22 pF											
270 330	27 pF 33 pF											
390	39 pF											
470	47 pF											
560	56 pF											
680	68 pF											
820	82 pF											
101 121	100 pF 120 pF											
151	150 pF											
181	180 pF											
221	220 pF											
271	270 pF											
331 391	330 pF 390 pF											
471	470 pF											
561	560 pF											
681	680 pF											
751	750 pF											
821	820 pF											
102 122	1000 pF 1200 pF											
152	1500 pF											
182	1800 pF											
222	2200 pF											
272	2700 pF											
332	3300 pF											
392 472	3900 pF 4700 pF											
562	4700 pF 5600 pF											
682	6800 pF											
822	8200 pF											
103	0.01 uF											
103	0.01 uF											

Multilayer Ceramic Chip Capacitor

	Capacitance and Voltage Available (cont.)													
Die	electric		COG											
EIA	Size	0402	02 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



Typo/Codo	Voltage	Canacitanas Valus		W	Н		Unit	Packaging (7	7" Reel) Qty.
Type/Code	Voltage	Capacitance Value	L	VV	Г	а	Unit	Paper Tape	Plastic Tape
CML0402C0G	50V	0.1 pF - 1000 pF	$0.039 \pm 0.008$ $1.00 \pm 0.20$	$0.020 \pm 0.008$ $0.50 \pm 0.20$	$0.020 \pm 0.002$ $0.50 \pm 0.05$	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	-
		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	$0.020 \pm 0.008$ $0.50 \pm 0.20$	inches mm	4000	-
CML0805C0G	50V	1800 pF - 3900 pF 5600 pF - 8200 pF	$0.079 \pm 0.008$ $2.00 \pm 0.20$	0.049 ± 0.008 1.25 ± 0.20	$0.031 \pm 0.004$ $0.80 \pm 0.09$	$0.020 \pm 0.008$ $0.50 \pm 0.20$	inches mm	4000	-
CIVILUOUSCUG		0.01 uF - 0.022 uF	$0.079 \pm 0.008$ $2.00 \pm 0.20$	0.049 ± 0.008 1.25 ± 0.20	0.047 ± 0.004 1.20 ± 0.10	$0.020 \pm 0.008$ $0.50 \pm 0.20$	inches mm	1	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	-
	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	-
CML1206C0G	500	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
CIVIL 12 10C0G	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
CMI 1912CCC	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
CML1812C0G	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

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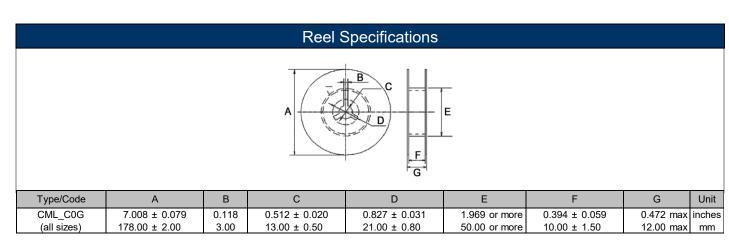
Test   Test Specification   Test Condition   Cog				Environmental Charac	teristics						
Capacitance   Should be within the specified tolerance.   Cap ≤ 1000 pF   1.0 ± 0.2 \text{ yms, 1.4 ft.≥ ± 10% } Cap ≥ 1000 pF   1.0 ± 0.2 \text{ yms, 1.4 ft.≥ ± 10% } Cap ≥ 1000 pF   1.0 ± 0.2 \text{ yms, 1.4 ft.≥ ± 10% } Cap ≥ 1000 pF   1.0 ± 0.2 \text{ yms, 1.4 ft.≥ ± 10% } Cap ≥ 1000 pF   1.0 ± 0.2 \text{ yms, 1.4 ft.≥ ± 10% } Cap ≥ 1000 pF   1.0 ± 0.2 \text{ yms, 1.4 ft.≥ ± 10% } Cap ≥ 1000 pF   1.0 ± 0.2 \text{ yms, 1.4 ft.≥ ± 10% } So ≥ 0.15% So ≥	Test			Test Specification		Test Condition					
Cap ≤ 1000 pF 1 0 2 0 2 Vms 1. MHz ± 10% Cap > 1000 pF 1 0 2 0 2 Vms 1. MHz ± 10% Cap > 1000 pF 1 0 2 0 2 Vms 1. MHz ± 10% Cap > 1000 pF 1 0 2 0 2 Vms 1. MHz ± 10% Cap > 1000 pF 1 0 2 0 2 Vms 1. MHz ± 10% Cap > 1000 pF 1 0 2 0 2 Vms 1. MHz ± 10% Cap > 1000 pF 1 0 2 0 2 Vms 1. MHz ± 10% Cap > 1000 pF 1 0 2 0 2 Vms 1. MHz ± 10% Cap > 1000 pF 1 0 2 0 2 Vms 1. MHz ± 10% Cap > 1000 pF 1 0 2 0 2 Vms 1. MHz ± 10% Cap > 1000 pF 1 MHZ ± 10% Cap S = 1000 pF 1 MHZ ± 10% Cap S = 1000 pF 1 MHZ ± 10% Cap S = 1000 pF				,		C0G: (Class I)					
Dissipation Factor (DF)	Capacitance		Should	be within the specified tolerance.	Cap ≤ 1000		Hz ± 10%				
Dissipation Factor (PF)				'							
Count   Co				DF							
1.5 ((150 / C) + 7   x 10 - 4   Sp   2   C + 50   F	Dissinction Factor	COC			Cr < 5 pF	<u> </u>					
Soliderability   So	-			1.5 [(150 / Cr) + 7] x 10 - 4	5 pF ≤ Cr < 50 pF	1 MHZ ± 10%	1 + 0.2 \/rmc				
Insulation Resistance   CCG   CC ≤ 10 nF, Ri ≥ 50000 MΩ   C > 10 nF, Ri ≥ 50000 MΩ   C > 10 nF, Ri ≥ 5000 S   Test Humidity: ≤ 75%   Test Current: ≤ 50 mA   Test Humidity: ≤ 75%   Test Current: ≤ 50 mA   Measuring voltage   Class 1: 300% rated voltage   Duration: 1 - 5 seconds   Charge/Discharge Current: ≤ 50 mA   Measuring voltage   Class 1: 300% rated voltage   Duration: 1 - 5 seconds   Charge/Discharge Current: ≤ 50 mA   Measuring voltage   Class 1: 300% rated voltage   Duration: 1 - 5 seconds   Charge/Discharge Current: ≤ 50 mA   Measuring voltage   Class 1: 300% rated voltage   Duration: 1 - 5 seconds   Charge/Discharge Current: ≤ 50 mA   Measuring voltage   Class 1: 300% rated voltage   Duration: 1 - 5 seconds   Charge/Discharge Current: ≤ 50 mA   Measuring voltage   Class 1: 50 mA   Measuring voltage   Charge   Ch	(DF)	(Class I)		≤ 0.15%	50 pF ≤ Cr ≤ 1000 pF		I I U.Z VIIIIS				
Duration: 60 ± 5 seconds				≤ 0.15%	> 1000 pF						
CVG							Max 500V)				
Class   C		COG									
Dielectric Withstanding Voltage  No breakdown or damage.  At least 95% of the terminal electrode is covered by new solder.  Visual appearance: No visible damage.    Visual appearance: No visible damage.	Insulation Resistance					,					
Dielectric Withstanding Voltage   No breakdown or damage.   No breakdown or damage.   Solder ability   No breakdown or damage.   Solder ability   No breakdown or damage.   At least 95% of the terminal electrode is covered by new solder.   Solder Temperature: 235°C ± 5% (Sn/Pb: 5337)   Solder Temperature: 245°C ± 5% (Sn/Pb: 5337)   Solder Temperature: 100°C ± 50°C   Solder Temperature: 245°C ± 5% (Sn/Pb: 5337)   Solder Temperature: 100°C ± 50°C   Solder Temperature: 245°C ± 5% (Sn/Pb: 5337)   Solder Temperature: 100°C ± 50°C   Solder Temp		(======,)		C > 10 nF, RI*CR ≥ 500 S		•	°C				
Voltage											
Voltage         No breakdown or damage.         Duration: 1 ~ 5 seconds           Solderability         At least 95% of the terminal electrode is covered by new solder. Visual appearance: No visible damage.         Preheating Conditions: 80°C to 120°C, 10 ~ 30 seconds           Resistance to Soldering Heat         Item         COG           Resistance to Soldering Heat         DF         Same to initial value Appearance: No visible damage. Barrance: No visible damage. Barrance: No visible damage. A covered by new solder.         Preheating Conditions: 100°C to 200°C; 10 ± 2 minutes           Resistance to Flexure of Substrate (Bending Strength)         DF         Same to initial value Appearance: No visible damage. A covered by new solder.         Recovery Condition: 100°C to 200°C; 10 ± 2 minutes           Resistance to Flexure of Substrate (Bending Strength)         Appearance: No visible damage. Δ covered by new solder.         Resistance to Flexure of Substrate (Bending Strength)           Resistance to Flexure of Substrate (Bending Strength)         No visible damage. Δ covered by new solder.         Appearance: No visible damage. Δ covered by new solder.           Termination Adhesion         No visible damage. Δ covered by new solder.         Termination the bending position.           Termination Adhesion         No visible damage. Δ covered by new solder.         Termination the bending position.           Termination Adhesion         No visible damage. Δ covered by new solder.         Duration: 10 ± 1 seconds the bending position.     <	Dielectric				01-						
Solderability   At least 95% of the terminal electrode is covered by new solder.   Preheating Conditions: 80°C to 120°C, 10 − 30 seconds   Solder Temperature: 236°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Clean the capacitor with solvent and examine it with a lebector of the seconds   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Clean the capacitor with solvent and examine it with a lebector of the seconds   Clean the capacitor with solvent and examine it with a lebector of the seconds   Clean the capacitor with solvent and examine it with a lebector of the seconds   Clean the capacitor with solvent and examine it with a lebector of the seconds   Clean the capacitor with solvent and examine it with a lebector of the seconds   Clean the capacitor with solvent and examine it with a lebector of the seconds   Clean the capacitor with solvent and examine it with a lebector of the seconds   Clean the capacitor with solvent and ex	Withstanding			No breakdown or damage.			9				
At least 95% of the terminal electrode is covered by new solder.   Solder Temperature: 245°C ± 5% (Sn/Pb: 63/37)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5% (Clead-free)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5°C (Lead-free)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5°C (Lead-free)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5°C (Lead-free)   Duration: 2 ± 0.5 seconds   Solder Temperature: 245°C ± 5°C (Lead-free)   Duration: 2 ± 0.5 seconds   Solder Temperature: 256°C ± 5°C   Solder Temperature: 256°C ± 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 Conditions: Nom temperature.   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.   Temperature: 1 hour   Recovery Time: 24 ± 1 hours   Initial Measurement   Solder Temperature: 24 ± 2 hours   Recovery Time: 24 ± 2 hours   Recovery Temperature: 1 hour   Recovery Time: 24 ± 1 hours   Initial Measurement   Solder Temperature: 2 hours   Solder Temperature: 256°C ± 5°C   Solder Temperature: 256°C ± 5°C   Solder Temperature: 256°C ± 5°C   Solder Temperature: 256°C ± 5°C (Lead-free)   Duration: 10 ± 1 seconds   Clean the capacitor with solvent and examine it with a 10X (min.) microscope.   Recovery Time: 24 ± 2 hours   Recovery Time: 24 ± 2 hours   Solder Temperature: 1 hour   Recovery Time: 24 ± 1 hours   Solder Temperature: 1 hour   Solder Temperature: 100°C   Solder Temperature: 100°C   Solder Temperature: 100°C   Solder Temperature: 25°C ± 5°C (Lead-free)   Duration: 10 ± 1 seconds   Clean the capacitor with solvent and examine it with a 10X (min.) microscope.   Recovery Time: 24 ± 1 hours   Solder Temperature: 100°C   Sold	Voltage						A may				
Solderability   At least 95% of the terminal electrode is covered by new solder. Visual appearance: No visible damage.   Solder Temperature: 235°C ± 5°C (Lead-free)											
Solderability   Solder and electrode is covered by the solder.											
Resistance to Solder Temperature: 245°C ± 5°C (Lead-free)	Solderability	At least 9		,							
Resistance to Soldering Heat   Same to initial value   Appearance: No visible damage. Δ C/C: ≤ ± 10%	Coldorability		Visual	appearance: No visible damage.							
Resistance to Soldering Heat											
Resistance to Soldering Heat  Resistance to Soldering Heat  DF Same to initial value Appearance: No visible damage. A C/C: ≤ ± 10%  Resistance to Flexure of Substrate (Bending Strength)  Termination Adhesion  Termination Adhesion  Termination Cycle  Temperature Cycle  AC/C		Iten	n	COG							
Resistance to Soldering Heat    DF   Same to Initial value											
Soldering Heat    DF   Same to initial value   R   Same to initial value   Appearance: No visible damage. At least 95% of the terminal electrode is covered by new solder.    Resistance to   Flexure of Substrate (Bending Strength)	D	Δ C/	C	•		•					
Appearance: No visible damage. At least 95% of the terminal electrode is covered by new solder.   Recovery Time: 24 ± 2 hours   Recovery Condition: Room temperature.		DF		Ü	Clean the capa	citor with solvent and ex	amine it with				
Appearance: No visible damage. At least 95% of the terminal electrode is covered by new solder.   Test Board: Al2O3 or PCB Warp: 1 mm Speed: 0.5 mm/second	Soldering Heat	IR		Same to initial value	<del>-</del>						
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.  Appearance: No visible damage. Δ C/C: ≤ ± 10%  Termination Adhesion  No visible damage  Applied Force: 5 N Duration: 10 ± 1 seconds  Preheating Conditions: up-category Temperature: 1 hours Initial Measurement Cycling times: 5 times, 1 cycle, 4 steps:  Step Temp. (°C) Time (min.)  COG: -55°C 30 ± 3  Up-category temp. COG: -55°C 30 ± 3  Up-category temp. COG: -125°C 30 ± 3  Up-category temp. COG: +125°C 30 ± 3		Appeara	nce: No	visible damage. At least 95% of the terminal			rs				
Resistance to Flexure of Substrate (Bending Strength)       Appearance: No visible damage. Δ C/C: ≤ ± 10%			elec	trode is covered by new solder.	Recovery	Condition: Room tempe	erature.				
Resistance to Flexure of Substrate (Bending Strength)       Appearance: No visible damage. Δ C/C: ≤ ± 10%					Te	st Board: Al2O3 or PCE	}				
Resistance to Flexure of Substrate (Bending Strength)  Appearance: No visible damage. Δ C/C: ≤ ± 10%  Termination Adhesion  No visible damage  No visible damage  Applied Force: 5 N Duration: 10 ± 1 seconds  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.)  Low-category temp. COG: -55°C 2 Normal temp. (+20) 2 - 3  Up-category temp. 3 Up-category temp. 3 COG: -125°C 4 Normal temp. (+20°C) 2 - 3						•					
Resistance to Flexure of Substrate (Bending Strength)         Appearance: No visible damage. Δ C/C: ≤ ± 10%         Termination Adhesion         No visible damage         Applied Force: 5 N Duration: 10 ± 1 seconds         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. CoG: -55°C       30 ± 3         2       Normal temp. (+20)       2 - 3         3       Up-category temp. CoG: +125°C       30 ± 3         4       Normal temp. (+20°C)       2 - 3						•					
Resistance to Flexure of Substrate (Bending Strength)       Appearance: No visible damage. Δ C/C: ≤ ± 10%         Termination Adhesion       No visible damage       Applied Force: 5 N Duration: 10 ± 1 seconds         Preheating Conditions: up-category Temperature: 1 hour Recovery Time: 24 ± 1 hours Initial Measurement Cycling times: 5 times, 1 cycle, 4 steps:       COG: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger         Temperature Cycle       1 Low-category temp. (°C) Time (min.)         1 COG: -55°C       30 ± 3         2 Normal temp. (+20)       2 - 3         3 Up-category temp.       30 ± 3         COG: +125°C       30 ± 3         4 Normal temp. (+20°C)       2 - 3					The measurement sh		pard in the bending				
Flexure of Substrate (Bending Strength)         Appearance: No visible damage. Δ C/C: ≤ ± 10%           Termination Adhesion         No visible damage         Applied Force: 5 N Duration: 10 ± 1 seconds           Preheating Conditions: up-category Temperature: 1 hour Recovery Time: 24 ± 1 hours Initial Measurement         Recovery Time: 24 ± 1 hours Initial Measurement           Cog: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger         Step         Temp. (°C)         Time (min.)           1         Low-category temp. Cog: -55°C         30 ± 3           2         Normal temp. (+20)         2 - 3           3         Up-category temp. Cog: +125°C         30 ± 3           4         Normal temp. (+20°C)         2 - 3						position.					
Flexure of Substrate (Bending Strength)         Appearance: No visible damage. Δ C/C: ≤ ± 10%           Termination Adhesion         No visible damage         Applied Force: 5 N Duration: 10 ± 1 seconds           Preheating Conditions: up-category Temperature: 1 hour Recovery Time: 24 ± 1 hours Initial Measurement         Recovery Time: 24 ± 1 hours Initial Measurement           Cog: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger         Step         Temp. (°C)         Time (min.)           1         Low-category temp. Cog: -55°C         30 ± 3           2         Normal temp. (+20)         2 - 3           3         Up-category temp. Cog: +125°C         30 ± 3           4         Normal temp. (+20°C)         2 - 3	Resistance to					. A					
(Bending Strength)		Ar	pearance	e: No visible damage. Δ C/C: ≤ ± 10%		T = 10					
Termination Adhesion  No visible damage  Applied Force: 5 N Duration: 10 ± 1 seconds  Preheating Conditions: up-category Temperature: 1 hour Recovery Time: 24 ± 1 hours Initial Measurement Cycling times: 5 times, 1 cycle, 4 steps:  COG: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger  Temperature Cycle  COG:			, p = u. u			7   [ →					
Unit: mm           Applied Force: 5 N Duration: 10 ± 1 seconds           Preheating Conditions: up-category Temperature: 1 hour Recovery Time: 24 ± 1 hours Initial Measurement Cycling times: 5 times, 1 cycle, 4 steps:           Step         Temperature (°C)         Time (min.)           1         Low-category temp. C0G: -55°C         30 ± 3           2         Normal temp. (+20)         2 - 3           3         Up-category temp. C0G: +125°C         30 ± 3           4         Normal temp. (+20°C)         2 - 3											
Unit: mm           Applied Force: 5 N Duration: 10 ± 1 seconds           Preheating Conditions: up-category Temperature: 1 hour Recovery Time: 24 ± 1 hours Initial Measurement Cycling times: 5 times, 1 cycle, 4 steps:           Step         Temperature (°C)         Time (min.)           1         Low-category temp. C0G: -55°C         30 ± 3           2         Normal temp. (+20)         2 - 3           3         Up-category temp. C0G: +125°C         30 ± 3           4         Normal temp. (+20°C)         2 - 3					Q	<del>                                      </del>					
Unit: mm           Applied Force: 5 N Duration: 10 ± 1 seconds           Preheating Conditions: up-category Temperature: 1 hour Recovery Time: 24 ± 1 hours Initial Measurement Cycling times: 5 times, 1 cycle, 4 steps:           Step         Temperature (°C)         Time (min.)           1         Low-category temp. C0G: -55°C         30 ± 3           2         Normal temp. (+20)         2 - 3           3         Up-category temp. C0G: +125°C         30 ± 3           4         Normal temp. (+20°C)         2 - 3						<b>A</b>					
Unit: mm           Applied Force: 5 N Duration: 10 ± 1 seconds           Preheating Conditions: up-category Temperature: 1 hour Recovery Time: 24 ± 1 hours Initial Measurement Cycling times: 5 times, 1 cycle, 4 steps:           Step         Temperature (°C)         Time (min.)           1         Low-category temp. C0G: -55°C         30 ± 3           2         Normal temp. (+20)         2 - 3           3         Up-category temp. C0G: +125°C         30 ± 3           4         Normal temp. (+20°C)         2 - 3					45 +	2 45+2					
Termination Adhesion         No visible damage         Applied Force: 5 N Duration: 10 ± 1 seconds           Termination Adhesion         Preheating Conditions: up-category Temperature: 1 hour Recovery Time: 24 ± 1 hours Initial Measurement           Temperature Cycle         COG: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger         Step         Temp. (°C)         Time (min.)           Temperature Cycle         1         Low-category temp. COG: -55°C         30 ± 3           Up-category temp. COG: +125°C         30 ± 3           Up-category temp. COG: +125°C         4         Normal temp. (+20°C)         2 - 3           4         Normal temp. (+20°C)         2 - 3					10 2						
Duration: 10 ± 1 seconds											
Preheating Conditions: up-category Temperature: 1 hour Recovery Time: 24 ± 1 hours Initial Measurement Cycle   COG: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger   Step   Temp. (°C)   Time (min.)	Termination Adhesion			No visible damage							
Temperature: 1 hour Recovery Time: 24 ± 1 hours Initial Measurement Cycling times: 5 times, 1 cycle, 4 steps:  COG: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger  Temperature Cycle    COG: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger   Step   Temp. (°C)   Time (min.)							agory				
Recovery Time: 24 ± 1 hours   Initial Measurement   Cycling times: 5 times, 1 cycle, 4 steps:						•	gory				
Cog: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger   Cycling times: 5 times, 1 cycle, 4 steps:						•	re				
Cycling times: 5 times, 1 cycle, 4 steps:         COG: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger       Step       Tempe. (°C)       Time (min.)         1       Low-category temp. COG: -55°C       30 ± 3         2       Normal temp. (+20)       2 - 3         3       Up-category temp. COG: +125°C       30 ± 3         4       Normal temp. (+20°C)       2 - 3					1100	•					
Temperature Cycle  COG: Δ C/C: ≤ ± 1% or ± 1 pF, whichever is larger  1					Cycling t		stens:				
Temperature Cycle  1		C0	G: Δ C/C	:: ≤ ± 1% or ± 1 pF, whichever is larger	, ,						
1 C0G: -55°C 30 ± 3 2 Normal temp. (+20) 2 - 3 3 Up-category temp. C0G: +125°C 30 ± 3 4 Normal temp. (+20°C) 2 - 3	Temperature Cycle			1 ,	•						
3	'				1		30 ± 3				
3 C0G: +125°C 30 ± 3 4 Normal temp. (+20°C) 2 - 3											
4 Normal temp. (+20°C) 2 - 3					Un-category temp						
Recovery time after test: 24 ± 2 hours											
					Recover	y time after test: 24 ± 2	hours				

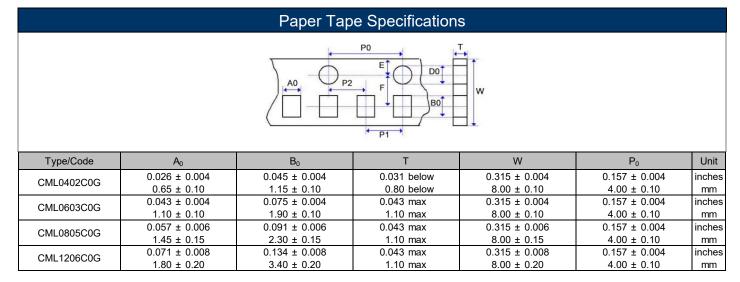
#### Stackpole Electronics, Inc.

Multilayer Ceramic Chip Capacitor

Resistive Product Solutions

	Environmental Characteris	tics (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: 40°C ± 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
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)





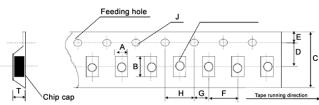
Multilayer Ceramic Chip Capacitor

#### Stackpole Electronics, Inc.

Resistive Product Solutions

	Paper Tape Specifications (cont.)													
Type/Code	P <sub>1</sub>	P <sub>2</sub>	D <sub>0</sub>	E	F	Unit								
CML0402C0G	0.079 ± 0.002	0.079 ± 0.002	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches								
CIVILU402C0G	2.00 ± 0.05	2.00 ± 0.05	1.5-0/+0.10	1.75 ± 0.05	3.50 ± 0.05	mm								
CML0603C0G	0.079 ± 0.004	0.157 ± 0.002	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches								
CIVILUOUSCUG	2.00 ± 0.10	4.00 ± 0.05	1.5-0/+0.10	1.75 ± 0.05	3.50 ± 0.05	mm								
CML0805C0G	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches								
CIVILUOUSCUG	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.75 ± 0.05	3.50 ± 0.05	mm								
CML1206C0G	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	0.069 ± 0.004	0.138 ± 0.002	inches								
CIVIL 1200C0G	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.75 ± 0.10	3.50 ± 0.05	mm								

### Plastic Tape Specifications



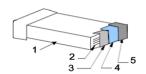
Type/Code	А	В	С	D	Е	Unit
CML0805C0G	0.061 ± 0.008	$0.093 \pm 0.008$	0.315 ± 0.008	0.138 ± 0.002	0.069 ± 0.004	inches
CIVILUOUSCUG	1.55 ± 0.20	2.35 ± 0.20	8.00 ± 0.20	$3.50 \pm 0.05$	1.75 ± 0.10	mm
CML1206C0G	0.077 ± 0.008	0.142 ± 0.008	0.315 ± 0.008	0.138 ± 0.002	$0.069 \pm 0.004$	inches
CIVIL 1200C0G	1.95 ± 0.20	$3.60 \pm 0.20$	8.00 ± 0.20	$3.50 \pm 0.05$	1.75 ± 0.10	mm
CML1210C0G	0.106 ± 0.004	0.135 ± 0.004	0.315 ± 0.004	0.138 ± 0.002	$0.069 \pm 0.004$	inches
CIVIL 12 10C0G	2.70 ± 0.10	3.42 ± 0.10	8.00 ± 0.10	3.50 ± 0.05	1.75 ± 0.10	mm
CML1812C0G	0.144 ± 0.004	0.195 ± 0.004	0.472 ± 0.004	0.217 ± 0.002	0.069 ± 0.004	inches
CIVIL 10 12CUG	3.66 ± 0.10	4.95 ± 0.10	12.00 ± 0.10	5.50 ± 0.05	1.75 ± 0.10	mm
Type/Code	F	G	Н	J	Т	Unit
CML0805C0G	0.157 ± 0.004	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	0.059 max	inches
CIVILUOUSCUG	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.50 max	mm
CML1206C0G	0.157 ± 0.004	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	0.073 max	inches
CIVIL 1200C0G	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.85 max	mm
CML1210C0G	0.157 ± 0.004	0.079 ± 0.002	0.157 ± 0.004	0.059-0/+0.004	0.126 max	inches
CIVIL 12 TUCUG	4.00 ± 0.10	$2.00 \pm 0.05$	4.00 ± 0.10	1.5-0/+0.10	3.20 max	mm
CML1812C0G	0.315 ± 0.004	0.079 ± 0.002	0.157 ± 0.004	0.059-0/+0.004	0.157 max	inches
CIVIL 18 12 COG	8.00 ± 0.10	$2.00 \pm 0.05$	4.00 ± 0.10	1.5-0/+0.10	4.00 max	mm

#### 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



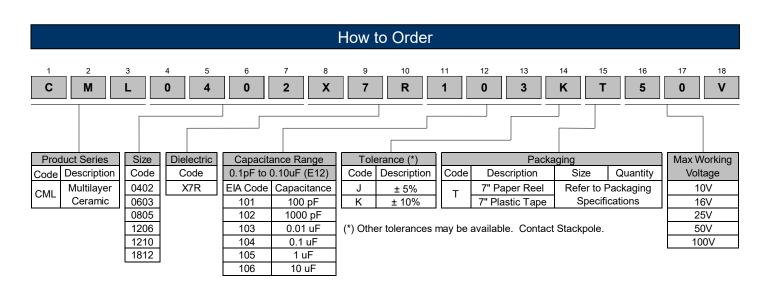
#### Construction



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

			Electri	cal Specifi	cations			
T /OI -	Dielectric	Standard	d Tolerance			Capacitance Range	е	
Type/Code	Code	Code	Description	10V	16V	25V	50V	100V
CML0402	X7R	К	± 10%		120 pF	- 0.039 uF		-
CIVILU4U2	A/K	N.	± 10%		0.012 uF - 0.1 u	F		-
						150 pF - 0.1 uF		
CML0603	X7R	К	± 10%		0.012 ul	F - 0.18 uF		-
CIVILUOUS	AIN	K	± 1076		0.12 uF - 0.33 u	F		-
				0.12 uF	- 2.2 uF		-	
						150 pF - 0.1 uF		
CML0805	X7R	K	± 10%		0.12 uF	- 0.39 uF		-
				-	0.12 ul	F - 2.2 uF		-
CML1206	X7R	к	± 10%			150 pF - 1 uF		
CIVIL 1200	Arix	IX	1 1070		2.2 uF	- 4.7 uF		-
						-		150 pF - 2.2 uF
CML1210	X7R	К	± 10%		220 pl	F - 10 uF		-
CIVIL 12 10	A/K	N.	I 1070	-	2:	2 uF		-
				47 uF		-	•	
						-		270 pF - 1 uF
CML1812	X7R	K	± 10%	-		-		
				-	6.	8 uF		-

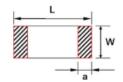
Note: J = 5% tolerance may be available

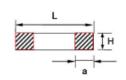


			Сарас						pac	citance and Voltage Available							aila	)											
Die	electric															7R													
EIA	Size		04	102				0603	3				0805	5				1200	3				121	)			18	12	
Code	VDCW	10V	16V	25V	50V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	16V	25V	50V	100V
101	100 pF																												
121	120 pF																												
151	150 pF																												
181	180 pF																												
201 221	200 pF 220 pF																												
271	270 pF																												
331	330 pF																												
391	390 pF																												
471	470 pF																												
561	560 pF																												
681 751	680 pF 750 pF																												
821	820 pF																												
102	1000 pF																												
122	1200 pF																												
152	1500 pF																												
182	1800 pF																												
222 272	2200 pF 2700 pF																												
332	3300 pF																												
392	3900 pF																												
472	4700 pF																												
562	5600 pF																												
682	6800 pF																												
822	8200 pF																												
103	0.01 uF																												
123 153	0.012 uF 0.015 uF																												
	0.018 uF																												
	0.022 uF																												
273	0.027 uF																												
333	0.033 uF																												
393	0.039 uF																												
473	0.047 uF																												
563 683	0.056 uF 0.068 uF																												
823	0.082 uF																												
104	0.002 ur																												
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			1																									
474 564	0.47 uF 0.56 uF			1																									
684	0.56 uF 0.68 uF			1																									
824	0.82 uF			1																									
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			<u> </u>																									

2

#### Mechanical Specifications and Packaging Specifications





								Packaging (	7" Reel) Qty.		
Type/Code	Voltage	Capacitance Range	L	W	Н	а	Unit	Paper Tape	Plastic Tape		
CML0402X7R	10V - 50V	100 pF - 0.47 uF	$0.039 \pm 0.008$	0.020 ± 0.008	$0.020 \pm 0.002$	0.010 ± 0.004	inches	10000	_		
OMEOTOZATIC	10 0 - 30 0	100 pt = 0.47 ut	1.00 ± 0.20	0.50 ± 0.20	0.50 ± 0.05	0.25 ± 0.10	mm	10000	_		
CML0603X7R	10V - 100V	150 pF - 2.2 uF	$0.063 \pm 0.008$	0.031 ± 0.008	0.031 ± 0.004	0.012 ± 0.004	inches	4000	_		
OWLOODSXIIC	100 - 1000	100 pr - 2.2 ur	1.60 ± 0.20	0.80 ± 0.20	0.80 ± 0.10	0.30 ± 0.10	mm	4000	_		
		150 pF - 0.33 uF	$0.079 \pm 0.008$	0.049 ± 0.008	0.031 ± 0.004	0.020 ± 0.008	inches	4000	_		
		100 pr 0.00 ur	2.00 ± 0.20	1.25 ± 0.20	0.80 ± 0.10	0.50 ± 0.20	mm	4000			
		0.47 uF	$0.079 \pm 0.008$	0.049 ± 0.008	0.031 ± 0.004	0.020 ± 0.008	inches	4000	_		
			2.00 ± 0.20	1.25 ± 0.20	$0.80 \pm 0.10$	$0.50 \pm 0.20$	mm				
		0.56 uF - 0.68 uF	$0.079 \pm 0.008$	$0.049 \pm 0.008$	$0.047 \pm 0.004$	$0.020 \pm 0.008$	inches	_	3000		
			2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	$0.50 \pm 0.20$	mm				
	10V	0.82 uF - 1 uF	$0.079 \pm 0.008$	0.049 ± 0.008	$0.039 \pm 0.004$	0.020 ± 0.008	inches	_	3000		
			2.00 ± 0.20	1.25 ± 0.20	1.00 ± 0.10	0.50 ± 0.20	mm				
		1.5 uF	$0.079 \pm 0.008$	0.049 ± 0.008	$0.047 \pm 0.004$	0.020 ± 0.008	inches	-	3000		
			2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	0.50 ± 0.20	mm				
		2.2 uF	0.079 ± 0.008	0.049 ± 0.008	0.031 ± 0.004	0.020 ± 0.008	inches	4000	-		
			2.00 ± 0.20	1.25 ± 0.20	0.80 ± 0.10	0.50 ± 0.20	mm				
		3.3 uF - 10 uF	0.079 ± 0.008	0.049 ± 0.008	0.047 ± 0.004	0.020 ± 0.008	inches	-	2000		
			2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	0.50 ± 0.20	mm				
		150 pF - 0.33 uF	0.079 ± 0.008	0.049 ± 0.008	0.031 ± 0.004	0.020 ± 0.008	inches	4000	-		
			2.00 ± 0.20	1.25 ± 0.20	0.80 ± 0.10	0.50 ± 0.20	mm				
		0.47 uF	0.079 ± 0.008	0.049 ± 0.008	0.031 ± 0.004	0.020 ± 0.008	inches	4000	-		
			2.00 ± 0.20	1.25 ± 0.20	0.80 ± 0.10	0.50 ± 0.20	mm				
		0.56 uF - 0.68 uF	0.079 ± 0.008	0.049 ± 0.008	0.047 ± 0.004	0.020 ± 0.008	inches	-	3000		
CML0805X7R			2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	0.50 ± 0.20	mm				
	16V	0.82 uF - 1 uF	0.079 ± 0.008	0.049 ± 0.008	0.039 ± 0.004	0.020 ± 0.008	inches	-	3000		
			$2.00 \pm 0.20$ $0.079 \pm 0.008$	1.25 ± 0.20 0.049 ± 0.008	1.00 ± 0.10 0.047 ± 0.004	$0.50 \pm 0.20$ $0.020 \pm 0.008$	mm inches				
		1.5 uF						-	3000		
			$2.00 \pm 0.20$ $0.079 \pm 0.008$	1.25 ± 0.20 0.049 ± 0.008	1.20 ± 0.10 0.031 ± 0.004	$0.50 \pm 0.20$ $0.020 \pm 0.008$	mm inches				
		2.2 uF	2.00 ± 0.20	1.25 ± 0.20	0.80 ± 0.10	0.50 ± 0.008	mm	4000	-		
			0.079 ± 0.008	0.049 ± 0.008	0.047 ± 0.004	0.020 ± 0.008	inches				
		3.3 uF - 4.7 uF	2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	0.50 ± 0.008	mm	-	2000		
			0.079 ± 0.008	0.049 ± 0.008	0.031 ± 0.004	0.020 ± 0.008	inches				
		150 pF - 0.33 uF	2.00 ± 0.20	1.25 ± 0.20	0.80 ± 0.10	0.50 ± 0.20	mm	4000	-		
			$0.079 \pm 0.008$	0.049 ± 0.008	0.031 ± 0.004	0.020 ± 0.008	inches				
		0.47 uF	0.47 uF	() // / III <del>-</del>	2.00 ± 0.20	1.25 ± 0.20	0.80 ± 0.10	0.50 ± 0.20	mm	4000	-
			0.079 + 0.008 0.049 + 0.008 0.0	0.047 ± 0.004	0.020 ± 0.008	inches					
		0.56 uF - 0.68 uF	2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	0.50 ± 0.20	mm	-	3000		
	25V		$0.079 \pm 0.008$	0.049 ± 0.008	0.039 ± 0.004	0.020 ± 0.008	inches				
		0.82 uF - 1 uF	2.00 ± 0.20	1.25 ± 0.20	1.00 ± 0.10	0.50 ± 0.20	mm	-	3000		
			$0.079 \pm 0.008$	0.049 ± 0.008	0.047 ± 0.004	0.020 ± 0.008	inches				
		1.5 uF - 2.2 uF	2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	$0.50 \pm 0.20$	mm	-	2000		
			0.079 ± 0.008	0.049 ± 0.008	0.047 ± 0.004	0.020 ± 0.008	inches				
		3.3 uF - 4.7 uF	2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	$0.50 \pm 0.20$	mm	-	2000		

Multilayer Ceramic Chip Capacitor

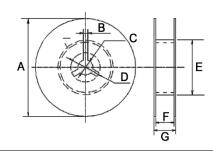
	N	/lechanical Sp	ecifications	and Packa	aging Speci	ifications (c	ont.)		
Type/Code	Voltage	Capacitance Range	L	W	Н	а	Unit		7" Reel) Qty. Plastic Tape
		150 pF - 0.33 uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
		0.47 uF	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	-
	50V	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
CML0805X7R		0.82 uF - 1 uF	$0.079 \pm 0.008$ $2.00 \pm 0.20$	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
CIVILOGOSATIC		1.5 uF - 2.2 uF	$0.079 \pm 0.008$ $2.00 \pm 0.20$	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
		100 pF	$0.079 \pm 0.008$ $2.00 \pm 0.20$	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	-
	100V	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	$0.079 \pm 0.008$ $2.00 \pm 0.20$	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
		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
	10V	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
		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
	16V - 25V	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	-
CML1206X7R		2.2 uF - 3.3 uF	0.126 ± 0.012 3.20 ± 0.30	0.063 ± 0.012 1.60 ± 0.30 0.063 ± 0.012	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 0.126 ± 0.012	1.60 ± 0.012 0.063 ± 0.012	0.063 ± 0.004 1.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	inches mm	-	2000
		200 pF - 0.33 uF	3.20 ± 0.30	1.60 ± 0.012 0.063 ± 0.012	0.031 ± 0.004 0.80 ± 0.10 0.047 ± 0.004	0.024 ± 0.012 0.60 ± 0.30 0.024 ± 0.012	inches mm inches	4000	-
		0.47 uF - 0.68 uF	$0.126 \pm 0.012$ $3.20 \pm 0.30$	1.60 ± 0.012 0.063 ± 0.012	1.20 ± 0.10	0.60 ± 0.30	mm	-	3000
	50V	0.82 uF - 1.5 uF	0.126 ± 0.012 3.20 ± 0.30 0.126 ± 0.012	1.60 ± 0.012 0.063 ± 0.012	0.031 ± 0.004 0.80 ± 0.10 0.047 ± 0.004	0.60 ± 0.30 0.024 ± 0.012	inches mm	4000	-
		2.2 uF - 3.3 uF	3.20 ± 0.30	1.60 ± 0.012 0.063 ± 0.012	1.20 ± 0.10	0.60 ± 0.30	inches mm	-	3000
		4.7 uF	0.126 ± 0.012 3.20 ± 0.30 0.126 ± 0.012	1.60 ± 0.012 0.063 ± 0.012	0.063 ± 0.004 1.60 ± 0.10 0.031 ± 0.004	0.024 ± 0.012 0.60 ± 0.30 0.024 ± 0.012	inches mm inches	-	2000
		150 pF - 0.056 uF	$3.20 \pm 0.012$ $3.20 \pm 0.30$ $0.126 \pm 0.012$	1.60 ± 0.012 0.063 ± 0.012	0.031 ± 0.004 0.80 ± 0.10 0.047 ± 0.004	0.60 ± 0.30 0.024 ± 0.012	mm	4000	-
	100V	0.068 uF - 0.33 uF	$3.20 \pm 0.012$ $3.20 \pm 0.30$ $0.126 \pm 0.012$	1.60 ± 0.012 0.063 ± 0.012	1.20 ± 0.10 0.063 ± 0.004	0.60 ± 0.30 0.024 ± 0.012	mm	-	3000
		0.47 uF - 1 uF	$0.126 \pm 0.012$ $3.20 \pm 0.30$	0.063 ± 0.012 1.60 ± 0.30	0.063 ± 0.004 1.60 ± 0.10	$0.024 \pm 0.012$ $0.60 \pm 0.30$	inches mm	-	2000

	N	/lechanical Sp	ecifications	and Packa	aging Speci	ifications (c	ont.)		
T (0.1								Packaging (	7" Reel) Qty.
Type/Code	Voltage	Capacitance Range	L	W	Н	а	Unit	Paper Tape	Plastic Tape
		000 5 0 47 5	0.126 ± 0.012	0.098 ± 0.012	0.047 ± 0.004	0.024 ± 0.012	inches		0000
		220 pF - 0.47 uF	3.20 ± 0.30	2.50 ± 0.30	1.20 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
			0.126 ± 0.012	0.098 ± 0.012	0.063 ± 0.004	0.024 ± 0.012	inches		2222
		0.68 uF - 1 uF	$3.20 \pm 0.30$	2.50 ± 0.30	1.60 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
	40) /	47.5	0.126 ± 0.012	0.098 ± 0.012	0.047 ± 0.004	0.024 ± 0.012	inches		0000
	10V	4.7 uF	3.20 ± 0.30	2.50 ± 0.30	1.20 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
		40 =	0.126 ± 0.012	0.098 ± 0.012	0.071 ± 0.004	0.024 ± 0.012	inches		2222
		10 uF	3.20 ± 0.30	2.50 ± 0.30	1.80 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
		47	0.126 ± 0.012	0.098 ± 0.012	0.098 ± 0.010	0.024 ± 0.012	inches		500
		47 uF	3.20 ± 0.30	2.50 ± 0.30	2.50 ± 0.25	$0.60 \pm 0.30$	mm	-	500
		000 5 0 47 5	0.126 ± 0.012	0.098 ± 0.012	0.047 ± 0.004	0.024 ± 0.012	inches		0000
		220 pF - 0.47 uF	3.20 ± 0.30	2.50 ± 0.30	1.20 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
			0.126 ± 0.012	0.098 ± 0.012	0.063 ± 0.004	0.024 ± 0.012	inches		2222
		0.68 uF - 1 uF	3.20 ± 0.30	2.50 ± 0.30	1.60 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
	40)/ 05)/	47.5	0.126 ± 0.012	0.098 ± 0.012	0.047 ± 0.004	0.024 ± 0.012	inches		0000
014140401/70	16V - 25V	4.7 uF	$3.20 \pm 0.30$	2.50 ± 0.30	1.20 ± 0.10	0.60 ± 0.30	mm	-	2000
CML1210X7R		40 5	0.126 ± 0.012	0.098 ± 0.012	0.071 ± 0.004	0.024 ± 0.012	inches		2222
		10 uF	3.20 ± 0.30	2.50 ± 0.30	1.80 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
		00 5	0.126 ± 0.012	0.098 ± 0.012	0.098 ± 0.010	0.024 ± 0.012	inches		500
		22 uF	3.20 ± 0.30	2.50 ± 0.30	2.50 ± 0.25	$0.60 \pm 0.30$	mm	-	500
		220 pF - 0.47 uF	0.126 ± 0.012	0.098 ± 0.012	0.047 ± 0.004	0.024 ± 0.012	inches		2000
			$3.20 \pm 0.30$	2.50 ± 0.30	1.20 ± 0.10	$0.60 \pm 0.30$	mm	_	2000
			0.126 ± 0.012	0.098 ± 0.012	0.063 ± 0.004	0.024 ± 0.012	inches		0000
	501/	0.68 uF - 1 uF	$3.20 \pm 0.30$	2.50 ± 0.30	1.60 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
	50V	4.7 uF	0.126 ± 0.012	0.098 ± 0.012	0.071 ± 0.004	0.024 ± 0.012	inches		2000
		4.7 ur	$3.20 \pm 0.30$	2.50 ± 0.30	1.80 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
		10 uF	0.126 ± 0.012	0.098 ± 0.012	0.098 ± 0.010	0.024 ± 0.012	inches		500
		10 uF	$3.20 \pm 0.30$	2.50 ± 0.30	2.50 ± 0.25	$0.60 \pm 0.30$	mm	-	500
		150 pF - 0.22 uF	0.126 ± 0.012	0.098 ± 0.012	0.055 ± 0.004	0.024 ± 0.012	inches		2000
	100V	150 pr - 0.22 ur	$3.20 \pm 0.30$	2.50 ± 0.30	1.40 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
	1000	0.33 uF - 2.2 uF	0.126 ± 0.012	0.098 ± 0.012	$0.063 \pm 0.004$	0.024 ± 0.012	inches		2000
		0.33 ur - 2.2 ur	$3.20 \pm 0.30$	2.50 ± 0.30	1.60 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
		470 pF - 1 uF	0.177 ± 0.016	0.126 ± 0.012	$0.063 \pm 0.004$	0.024 ± 0.012	inches		1000
	16V - 25V	470 pr - 1 ur	4.50 ± 0.40	3.20 ± 0.30	1.60 ± 0.10	$0.60 \pm 0.30$	mm	_	1000
	100 - 250	1.5 uF - 6.8 uF	0.177 ± 0.016	0.126 ± 0.012	0.071 ± 0.004	0.024 ± 0.012	inches		1000
		1.5 ur - 0.6 ur	$4.50 \pm 0.40$	3.20 ± 0.30	1.80 ± 0.10	$0.60 \pm 0.30$	mm	-	1000
		470 pF - 1 uF	0.177 ± 0.016	0.126 ± 0.012	$0.063 \pm 0.004$	0.024 ± 0.012	inches		1000
CML1812X7R	50V	470 pr - 1 ur	$4.50 \pm 0.40$	3.20 ± 0.30	1.60 ± 0.10	$0.60 \pm 0.30$	mm	_	1000
OIVIL 10 12A/K	30 V	1.5 uF - 4.7 uF	0.177 ± 0.016	0.126 ± 0.012	0.071 ± 0.004	0.024 ± 0.012	inches	_	1000
		1.0 ui - 4.7 ui	4.50 ± 0.40	3.20 ± 0.30	1.80 ± 0.10	0.60 ± 0.30	mm	_	1000
		270 pF - 0.56 uF	0.177 ± 0.016	0.126 ± 0.012	0.063 ± 0.004	0.024 ± 0.012	inches	_	1000
	100\/	270 pr - 0.30 ur	4.50 ± 0.40	3.20 ± 0.30	1.60 ± 0.10	0.60 ± 0.30	mm	_	1000
	100 V	0.68 uF - 1 uF 0.1	0.177 ± 0.016	0.126 ± 0.012	0.063 ± 0.009	0.024 ± 0.012	inches	_	500
		0.00 ui - i ui	4.50 ± 0.40	3.20 ± 0.30	1.60 ± 0.24	$0.60 \pm 0.30$	mm	_	300

Flexure of Substrate (Bending Strength)					Environme	ental Characterist	tics		
Should be within the specified tolerance.   Cap ≤ 10uF 10 ± 0.2 Vmms, 1 KHz± 10%   Cap ≤ 10uF 10 ± 0.1 Vmms, 120 Hz± 10%   Cap ≤ 10uF 10 ± 0.1 Vmms, 120 Hz± 10%   Cap ≤ 10uF 0.5 ± 0.1 Vmms, 120 Hz± 10%   Cap ≤ 10uF 0.5 ± 0.1 Vmms, 120 Hz± 10%   Cap ≤ 10uF 0.5 ± 0.1 Vmms, 120 Hz± 10%   Cap ≤ 10uF 0.5 ± 0.1 Vmms, 120 Hz± 10%   Cap ≤ 10uF 0.5 ± 0.1 Vmms, 120 Hz± 10%   Cap ≤ 10uF 1.0 ± 0.2 Vmms, 1 KHz± 10%   Cap ≤ 10uF 1.0 vmms, 1 Vmm	Test				Test Specification			Test Condition	
Feator (DF)   Cap   10 ± 0 ± 0 ± 0.0 ±	Capacitance			Should be	e within the specified tolera	nce.		uF 1.0 ± 0.2 Vrms, 1	
Measuring Voltage: Rated Voltage (Max 500V)	Factor				≤ 3.5% (C < 0.47uF)	≤ 5% (C < 0.15uF)			
Class II: 250% rated voltage	Insulation Resistance				C ≤ 25nF, Ri ≥ 10000M	Ω	Measuring V D Test	/oltage: Rated Voltaç uration: 60 ± 5 seco Test Humidity: ≤ 75 :Temperature: 25°C Test Current: ≤ 50 n	ge (Max 500V) nds % ± ± 5°C nA
Solderability  Al least 95% of the terminal electrode is covered by new solder.  Visual appearance: No visible damage.    Termination Adhesion   Appearance: No visible damage	Withstanding			No	breakdown or damage.		Charge/[	ass II: 250% rated vo Duration: 1 ~ 5 secor Discharge Current: 5	Itage nds 50 mA max.
Resistance to Soldering   Heat   DF   Same to initial value   Same to initial value   Same to initial value   Appearance: No visible damage. At least 95% of the terminal electrode is covered by new solder.	Solderability		At least 95			•	Solder Tempe Di Solder Temp Di	erature: $235^{\circ}C \pm 5\%$ uration: $2 \pm 0.5$ secon perature: $245^{\circ}C \pm 5^{\circ}$ uration: $2 \pm 0.5$ secon	o (Sn/Pb: 63/37) onds °C (Lead-free) onds
Soldering Heat R Same to initial value RAppearance: No visible damage. At least 19% of the terminal electrode is covered by new solder.  Resistance to Flexure of Substrate (Bending Strength)  Termination Adhesion  Temperature Cycle  Temperature Cycle  Soldering Heat R Same to initial value Same to initial value Appearance: No visible damage. Δ C/C: ≤ ± 10%  Same to initial value Same to initial value a 10X (min.) microscope. Recovery Time: 24 ± 2 hours Recovery Condition: Room temperature.  Test Board: Al203 or PCB Warp: 1 mm Speed: 0.5 mm / second The measurement should be made with the board in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement should be made with the board in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement should be made with the board in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement should be made with the board in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the bending position. Unit: mm  Speed: 0.5 mm / second The measurement in the part i		Λ C/C Solder Temperature: 265°C ± 5							
Appearance: No visible damage. At least 95% of the terminal electrode is covered by new solder:         Recovery Time: 24 ± 2 hours Recovery Condition: Room temperature.           Resistance to Flexure of Substrate (Bending Strength)         Appearance: No visible damage. Δ C/C: ≤ ± 10%           Termination Adhesion         No visible damage         Δ C/C: ≤ ± 10%           Termination Adhesion         No visible damage         Applied Force: 5 N Duration: 10 ± 1 seconds Initial Measurement Cycling times: 5 times, 1 cycle, 4 steps: Nitial Measurement Cycling times: 5 times, 1 cycle, 4 steps: Step           Temperature Cycle         Cycle         Tempe. (*C)         Time (min.)           Temperature Cycle         1         Low-category tempe. 30 ± 3 (±20°C)           3         Up-category temp. 30 ± 3 (±20°C)         3 (±20°C)           4         Normal temp. (±20°C)         2 - 3 (±20°C)           4         Normal temp. (±20°C)         2 - 3 (±20°C)	Soldering	D	F		Same to initial v	Clean the capacitor with solvent and examine it with			
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  Substrate (Bending) Strength)  Termination Adhesion  Termination Adhesion  No visible damage  Applied Force: 5 N Duration: 10 ± 1 seconds  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.)  Low-category  1 Low-category  1 Low-category  1 Low-category  1 Low-category  1 Low-category  1 Low-category  2 Normal temp. 30 ± 3  X7R: 55°C  3 Up-category temp. 30 ± 3  X7R: +125°C  4 Normal temp. 2 − 3  4 Normal temp. 30 ± 3  X7R: +125°C	Пеас	Appearance: No visible damage. At least 95% of the terminal electrode is covered				Red	covery Time: 24 ± 2	hours	
Adhesion         Duration: 10 ± 1 seconds           Preheating Conditions: up-category temperature 1 hour Recovery Time: 24 ± 1 hours Initial Measurement           Cycling times: 5 times, 1 cycle, 4 steps:           Step         Tempe. (°C)         Time (min.)           Low-category         1         temp. 30 ± 3           X7R: -55°C         2         Normal temp. (+20°C)         2 - 3           3         Up-category temp. X7R: +125°C         30 ± 3           X7R: +125°C         4         Normal temp. (+20°C)         2 - 3	Substrate (Bending Strength)		Арі	oearance: I	No visible damage. Δ C/C:	≤ ± 10%	S	Warp: 1 mm Speed: 0.5 mm / secont should be made w bending position. Unit: mm	ond ith the board in the
Recovery Time: $24 \pm 1$ hours Initial Measurement Cycling times: $5$ times, $1$ cycle, $4$ steps:    Step   Temp. (°C)   Time (min.)					No visible damage			uration: 10 ± 1 seco	nds
	•			,	X7R: Δ C/C: ≤± 10%		Cycling t Step  1  2	covery Time: 24 ± 1 Initial Measuremen imes: 5 times, 1 cycl Temp. (°C) Low-category temp. X7R: -55°C Normal temp. (+20°C) Up-category temp. X7R: +125°C Normal temp.	hours t le, 4 steps: Time (min.) 30 ± 3 2 - 3 30 ± 3
Recovery time after test: 24 ± 2 hours									

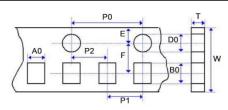
	Environmental Characteristic	es (cont.)
Test	Test Specification	Test Condition
Moisture Resistance	X7R: $\Delta$ C/C: ≤ ± 10% DF: Not more than twice of initial value. IR: X7R: Ri ≥ 1000M $\Omega$ or RI*CR ≥ 25S whichever is smaller Appearance: No visible damage	Temperature: 40°C ± 2°C Humidity: 90 ~ 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	Α	В	С	D	E	F	G	Unit
CML_X7R	7.008 ± 0.079	0.118	0.512 ± 0.020	0.827 ± 0.031	1.969 or more	0.394 ± 0.059	0.472 max	inches
(all sizes)	178.00 ± 2.00	3.00	13.00 ± 0.50	21.00 ± 0.80	50.00 or more	10.00 ± 1.50	12.00 max	mm

#### Paper Tape Specifications



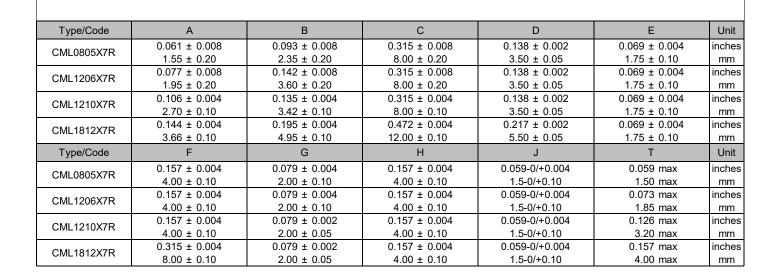
Type/Code	A0	В0	T	W	P0	Unit
CML0402X7R	0.026 ± 0.004	0.045 ± 0.004	0.031 below	0.315 ± 0.004	0.157 ± 0.004	inches
CIVILU4U2X/K	$0.65 \pm 0.10$	1.15 ± 0.10	0.80 below	8.00 ± 0.10	4.00 ± 0.10	mm
CML0603X7R	$0.043 \pm 0.004$	0.075 ± 0.004	0.043 max	0.315 ± 0.004	0.157 ± 0.004	inches
CIVILUOUSA/R	1.10 ± 0.10	1.90 ± 0.10	1.10 max	8.00 ± 0.10	4.00 ± 0.10	mm
CML0805X7R	$0.057 \pm 0.006$	0.091 ± 0.006	0.043 max	0.315 ± 0.006	0.157 ± 0.004	inches
CIVILUOUSX/IN	1.45 ± 0.15	2.30 ± 0.15	1.10 max	8.00 ± 0.15	4.00 ± 0.10	mm
CML1206X7R	0.071 ± 0.008	0.134 ± 0.008	0.043 max	0.315 ± 0.008	0.157 ± 0.004	inches
CIVIL 1200X/K	1.80 ± 0.20	$3.40 \pm 0.20$	1.10 max	8.00 ± 0.20	4.00 ± 0.10	mm

	Paper Tape Specifications (cont.)											
Type/Code	P1	P2	D0	E	F	Unit						
CML0402X7R	0.079 ± 0.002	0.079 ± 0.002	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches						
CIVILU4U2X/K	$2.00 \pm 0.05$	2.00 ± 0.05	1.5-0/+0.10	1.75 ± 0.05	3.50 ± 0.05	mm						
CML0603X7R	$0.079 \pm 0.004$	0.157 ± 0.002	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches						
CIVILUOUSX/IX	$2.00 \pm 0.10$	4.00 ± 0.05	1.5-0/+0.10	1.75 ± 0.05	$3.50 \pm 0.05$	mm						
CML0805X7R	$0.079 \pm 0.004$	0.157 ± 0.004	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches						
CIVILUOUSX/IX	$2.00 \pm 0.10$	4.00 ± 0.10	1.5-0/+0.10	1.75 ± 0.05	$3.50 \pm 0.05$	mm						
CML1206X7R	$0.079 \pm 0.004$	0.157 ± 0.004	0.059-0/+0.004	0.069 ± 0.004	0.138 ± 0.002	inches						
CIVIL 1200X/ K	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.75 ± 0.10	3.50 ± 0.05	mm						

Plastic Tape Specifications

# Feeding hole A B D

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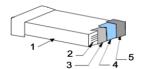


#### Features:

- 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



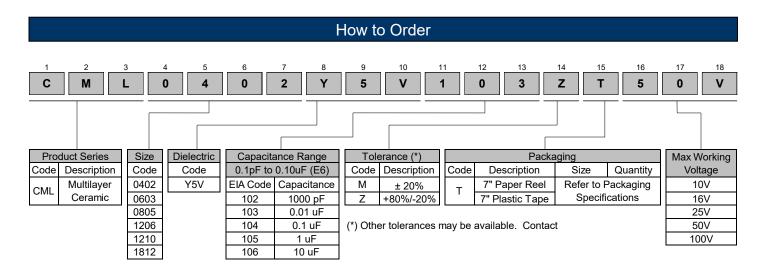
#### Construction



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

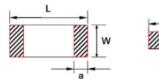
				Electrical S	Specifications	S					
Type / Code	Dielectric	Standard	Tolerance	Capacitance Range							
Type / Code	Code	Code	Description	10V	100V						
					1000 pF	<sup>-</sup> - 0.1 uF		-			
CML0402	Y5V	Z	+80% / -		0.12 uF - 0.18 uF			-			
CIVILU402	130	۷	20%	0.12 uF ·	- 0.47 uF		-				
				0.12 uF - 1 uF	0.12 uF - 1 uF						
			+80% / -			10000 pF - 0.1 uF					
CML0603	Y5V	Z	20%		10000 pF	- 0.82 uF		-			
			2070		0.18 uF - 2.2 uF			-			
CML0805	Y5V	Z	+80% / -			0.012 uF - 0.1 uF					
CIVILUOUS	130	2	20%		1 uF - 4.7 uF			-			
			+80% / -			10000 pF - 1 uF					
CML1206	Y5V	Z	20%		2.2 uF	- 4.7 uF		-			
			20%	10	uF		-				
CML1210	Y5V	Z	+80% / -	- 0.015 uF - 1 uF							
CML1812	Y5V	Z	+80% / -		·	-	_	0.15 uF - 2.2 uF			

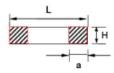
Note: M = ±20% tolerance may be available



	Capacitance and Voltage Available																					
Die	electric											Y5										
EIA	Size		04	02				0603					0805					1206			1210	1812
Code	VDCW	10V		25V	50V	10V			50V	100	10V	16V		50V	100V	10V	16V		50V	100V	10V	16V
102	1000 pF	101	101	201	001	101	101	201	001	100	10 0	101	201	001	1001	101	101	201	001	1001	101	101
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																					
	0.015 uF																					
	0.018 uf																					
223	0.022 uF																					
	0.027 uF																					
	0.033 uF																					
	0.039 uF																					
473	0.047 uF																					
	0.056 uF																					
	0.068 uF																					
	0.082 uF 0.1 uF																					<del>                                     </del>
104 124	0.1 uF 0.12 uF																					
154	0.12 uF 0.15 uF																					
224	0.13 uF																					
334	0.22 ur 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



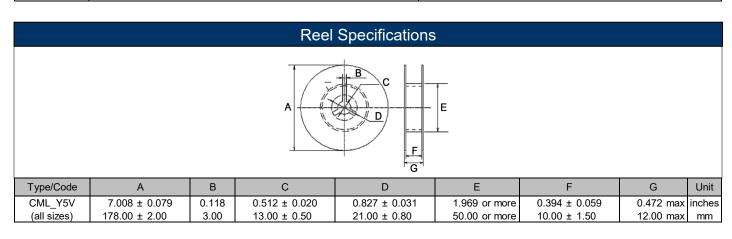


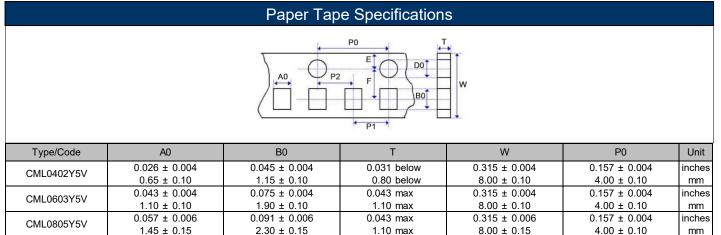
Type / Code	Voltage	Capacitance Range	L	W	Н	а	Unit	Packaging (	
, , , , , , , , , , , , , , , , , , ,	9		0.000 + 0.000	0.000 + 0.000	0.000 + 0.000	0.040 + 0.004	in the	Paper Tape	Plastic Tape
CML0402Y5V	10V - 50V	1000 pF - 1 uF	1.00 ± 0.20	0.020 ± 0.008 0.50 ± 0.20	0.020 ± 0.002 0.50 ± 0.05	$0.010 \pm 0.004$ $0.25 \pm 0.10$	inches	10000	-
			$0.063 \pm 0.008$	$0.50 \pm 0.20$ $0.031 \pm 0.008$	$0.30 \pm 0.05$ $0.031 \pm 0.004$	0.25 ± 0.10 0.012 ± 0.004	mm inches		
CML0603Y5V	10V - 100V	1000 pF - 10 uF			$0.031 \pm 0.004$ $0.80 \pm 0.09$			4000	-
			1.60 ± 0.20 0.079 ± 0.008	$0.80 \pm 0.20$		$0.30 \pm 0.10$ $0.020 \pm 0.008$	mm inches		
		1000 pF - 0.22 uF	2.00 ± 0.20	1.25 ± 0.20	0.028 ± 0.020 0.70 ± 0.50	$0.020 \pm 0.008$ $0.50 \pm 0.20$	mm	4000	-
			0.079 ± 0.008	0.049 ± 0.008	0.70 ± 0.30 0.031 ± 0.004	0.020 ± 0.008	inches		
	10V	0.33 uF - 2.2 uF	$2.00 \pm 0.20$	1.25 ± 0.20	0.80 ± 0.10	$0.50 \pm 0.20$	mm	4000	-
				0.049 ± 0.008			inches		
		3.3 uF - 22 uF	2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	$0.50 \pm 0.20$	mm	-	3000
			0.079 ± 0.008	0.049 ± 0.008	0.028 ± 0.002	0.020 ± 0.008	inches		
		1000 pF - 0.22 uF	2.00 ± 0.20	1.25 ± 0.20	$0.020 \pm 0.002$ $0.70 \pm 0.05$	$0.50 \pm 0.20$	mm	4000	-
				0.049 ± 0.008		0.020 ± 0.008	inches		
	16V	0.33 uF - 2.2 uF	2.00 ± 0.20	1.25 ± 0.20	0.80 ± 0.10	$0.50 \pm 0.20$	mm	4000	-
			0.079 ± 0.008	0.049 ± 0.008	0.047 ± 0.004	0.020 ± 0.008	inches		
		3.3 uF - 10 uF	2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	$0.50 \pm 0.20$	mm	-	3000
CML0805Y5V				0.049 ± 0.008		0.020 ± 0.008	inches		
		1000 pF - 0.22 uF	2.00 ± 0.20	1.25 ± 0.20	0.70 ± 0.05	$0.50 \pm 0.20$	mm	4000	-
		0.33 uF - 2.2 uF		0.049 ± 0.008			inches		
	25V		2.00 ± 0.20	1.25 ± 0.20	0.80 ± 0.10	$0.50 \pm 0.20$	mm	4000	-
		3.3 uF - 4.7 uF	$0.079 \pm 0.008$		$0.047 \pm 0.004$		inches		
			2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	$0.50 \pm 0.20$	mm	-	3000
				0.049 ± 0.008			inches		
		1000 pF - 0.22 uF	2.00 ± 0.20	1.25 ± 0.20	0.70 ± 0.05	0.50 ± 0.20	mm	4000	-
	50V		0.079 ± 0.008				inches		
		0.33 uF - 2.2 uF	2.00 ± 0.20	1.25 ± 0.20	0.80 ± 0.10	$0.50 \pm 0.20$	mm	4000	-
			0.079 ± 0.008				inches		
	100V	0.01 uF - 0.1 uF	2.00 ± 0.20	1.25 ± 0.20	$0.70 \pm 0.05$	$0.50 \pm 0.20$	mm	4000	-
				0.063 ± 0.012	0.031 ± 0.004		inches		
		1000 pF - 10 uF	3.20 ± 0.30	1.60 ± 0.30	0.80 ± 0.10	$0.60 \pm 0.30$	mm	4000	-
	10V - 16V	00 5		0.063 ± 0.012			inches		2222
0141 4000 (5) (		22 uF	$3.20 \pm 0.30$	1.60 ± 0.30	1.60 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
CML1206Y5V	05) (	1000 5 10 5		0.063 ± 0.012	0.031 ± 0.004		inches	1000	
	25V	1000 pF - 10 uF	3.20 ± 0.30	1.60 ± 0.30	$0.80 \pm 0.10$	$0.60 \pm 0.30$	mm	4000	-
	FOV 400V	4000 - 5 4 7 5				0.024 ± 0.012	inches	4000	
	50V - 100V	1000 pF - 4.7 uF	3.20 ± 0.30	1.60 ± 0.30	$0.80 \pm 0.10$	$0.60 \pm 0.30$	mm	4000	-
OMI 4040\/5\/	100) (	0.045.05.4.05	0.126 ± 0.012	0.098 ± 0.012	$0.039 \pm 0.004$		inches		2000
CML1210Y5V	100V	0.015 uF - 1 uF	3.20 ± 0.30	2.50 ± 0.30	1.00 ± 0.10	$0.60 \pm 0.30$	mm	-	2000
OMI 4040\/5\/	10017	0.45 0.0 5	0.177 ± 0.016	0.126 ± 0.012	0.063 ± 0.004	0.024 ± 0.012	inches		1000
CML1812Y5V	100V	0.15 uF - 2.2 uF	4.50 ± 0.40	$3.20 \pm 0.30$	1.60 ± 0.10	$0.60 \pm 0.30$	mm	-	1000

Multilayer Ceramic Chip Capacitor

			Environm	ental Charac	cteristics				
Test		Test Spe	ecification			Test Condition			
Capacitance		Should be within the	specified tolerar	nce.		Y5V: (Class II) uF 1.0 ± 0.2 Vrms, 1 KHz uF 0.5 ± 0.1 Vrms, 120 H			
Dissipation	\/\(\(\)\/	≥ 25V	16V	10V	Gup* 100	31 0.0 2 0.1 VIIII0, 120 11	221070		
Factor (DF)	Y5V (Class II)	≤ 7% (C < 1uF) ≤ 9% (C ≥ 1uF)	≤ 15%	≤ 15%	Cap > 10	uF 1.0 ± 0.2 Vrms, 1 KHz uF 0.5 ± 0.1 Vrms, 120 H	z ± 10%		
Insulation Resistance	Y5V (Class II)		25 nF, Ri ≥ 4,000 25 nF, Ri*CR > 10		D Tesi	/oltage: Rated Voltage (I uration: 60 ± 5 seconds Test Humidity: ≤ 75% t Temperature: 25°C ± 5 Test Current: ≤ 50 mA	,		
Dielectric Withstanding Voltage		No breakdow	n or damage.		[ Charge/l	Measuring voltage: ass II: 250% rated voltage Duration: 1 ~ 5 seconds Discharge Current: 50 m	nA max.		
						itions: 80°C to 120°C, 1			
Solderability	At least 95°	% of the terminal elec	ctrode is covered	by new solder.		,	,		
Colderability		Visual appearance:		Solder Temperature: 245°C ± 5 °C (Lead-free Duration: 2 ± 0.5 seconds					
-	Item		Y5V						
-	Δ C/C DF	C	-10 ~ +20% ame to initial value			•			
Resistance to	IR					nditions: 100°C to 200°C; 10 ± 2 minute er Temperature: 265°C ± 5°C Duration: 10 ± 1 seconds pacitor with solvent and examine it with a 10X (min.) microscope. ecovery Time: 24 ± 2 hours			
Soldering Heat	a 10Y /min \ microscope						Ramine it with		
	At least 959	Appearance: No of the terminal elec	o visible damage. ctrode is covered		Red				
Resistance to Flexure of Substrate (Bending Strength)	Арре	earance: No visible	damage. Δ C/C:	≤±10%	5	est Board: Al2O3 or PCE Warp: 1 mm Speed: 0.5 mm / second nt should be made with the bending position. Unit: mm			
Termination Adhesion		No visible	e damage		D	Applied Force: 5 N uration: 10 ± 1 seconds			
Temperature Cycle		Y5V: Δ C/	C: ≤±20%		Red	ditions: up-category tempovery Time: 24 ± 1 hou Initial Measurement times: 5 times, 1 cycle, 4  Temp. (°C)  Low-category temp.  Y5V: -25 °C  Normal temp. (+20°C)  Up-category temp.  Y5V: +85°C	rs		
					4 Recove	Normal temp. (+20°C) ry time after test: 24 ± 2	2 - 3 hours		

	Environmental Characteri	stics (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: 40°C ± 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)





0.043 max

1.10 max

 $0.315 \pm 0.008$ 

 $8.00 \pm 0.20$ 

CML1206Y5V

inches

mm

 $0.157 \pm 0.004$ 

 $4.00 \pm 0.10$ 

 $0.134 \pm 0.008$ 

3.40 ± 0.20

 $0.071 \pm 0.008$ 

 $1.80 \pm 0.20$ 

	Paper Tape Specifications (cont.)											
Type/Code	P1	P2	D0	Е	F	Unit						
CML0402Y5V	0.079 ± 0.002	0.079 ± 0.002	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches						
CIVILU40213V	2.00 ± 0.05	2.00 ± 0.05	1.5-0/+0.10	1.75 ± 0.05	$3.50 \pm 0.05$	mm						
CML0603Y5V	0.079 ± 0.004	0.157 ± 0.002	0.059-0/+0.004	$0.069 \pm 0.002$	0.138 ± 0.002	inches						
CIVILUOUSTSV	2.00 ± 0.10	4.00 ± 0.05	1.5-0/+0.10	1.75 ± 0.05	$3.50 \pm 0.05$	mm						
CML0805Y5V	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches						
CIVILUOUSTSV	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.75 ± 0.05	$3.50 \pm 0.05$	mm						
CML1206Y5V	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	$0.069 \pm 0.004$	0.138 ± 0.002	inches						
GIVIL 120015V	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.75 ± 0.10	3.50 ± 0.05	mm						

## Plastic Tape Specifications Feeding hole

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