Stackpole Electronics, Inc.

Multilayer Ceramic Chip Capacitor

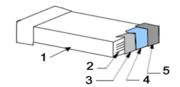
Resistive Product Solutions

Features:

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



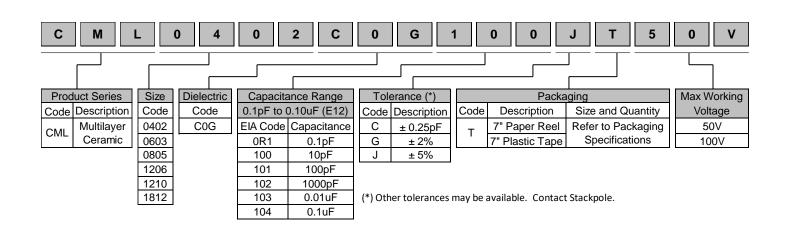
Construction



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

	Electrical Specifications									
Tuna/Cada	Dielectric	Standard	Tolerance	Capacitance Range						
Type/Code	Code	Code	Description	50V	100V					
CML0402	COG	С	± 0.25pF	0.1pF - 8.2pF	-					
CIVILU402	COG	J	± 5%	10pF - 1000pF	-					
CML0603	C0G	С	± 0.25pF	0.5pF - 8.2pF	0.5pF - 8.2pF					
CIVILUOUS	COG	J	± 5%	10pF - 0.01uF	10pF - 0.01uF					
CML0805	C0G	С	± 0.25pF	0.5pF - 8.2pF	0.5pF - 8.2pF					
CIVILOGOS	000	J	± 5%	10pF - 0.022uF	10pF - 0.022uF					
CML1206	C0G	С	± 0.25pF	1.2pF - 8.2pF	1.2pF - 8.2pF					
CIVIL 1200	COG	J	± 5%	10pF - 0.1uF	10pF - 0.022uF					
CML1210	COG	J	± 5%	10pF - 0.047uF	10pF - 0.047uF					
CML1812	C0G	J	± 5%	10pF - 0.1uF	10pF - 0.1uF					

How to Order



Multilayer Ceramic Chip Capacitor Resistive Product Solutions

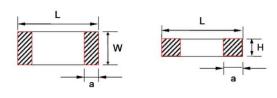
				Cap	acitance	e and Vo	oltage A	vailable				
Die	electric						C0G					
EIA	Size	0402	06			05	12			10		12
Code	VDCW	50V	50V	100V	50V	100V	50V	100V	50V	100V	50V	100V
0R1	0.1 pF										 	
0R2 0R3	0.2 pF 0.3 pF										<u> </u>	
0R3	0.3 pr 0.4 pF											
0R5	0.5 pF											
0R6	0.6 pF											
0R7	0.7 pF											
0R8	0.8 pF											
0R9	0.9 pF											
1R0	1 pF										ļ	
1R2 1R5	1.2 pF 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										<u> </u>	
3R9	3.9 pF 4.7 pF											
4R7 5R0	4.7 pr 5 pF										 	
5R6	5.6 pF											
6R8	6.8 pF										1	
8R2	8.2 pF											
100	10 pF											
120	12 pF											
150	15 pF											
180	18 pF											
220 270	22 pF 27 pF											
330	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	330 pF											
391	390 pF											
471 561	470 pF 560 pF											
681	680 pF											
821	820 pF											
102	1000 pF											
122	1200 pF											
152	1500 pF											
182	1800 pF											
222	2200 pF											
272 332	2700 pF 3300 pF											
392	3900 pF											
472	4700 pF											
562	5600 pF											
682	6800 pF											
822	8200 pF											

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Multilayer Ceramic Chip Capacitor

	Capacitance and Voltage Available (cont.)											
Die	Dielectric C0G											
EIA	Size	0402	06	03	80	305	12	:06	1210		1812	
Code	VDCW	50V	50V	100V	50V	100V	50V	100V	50V	100V	50V	100V
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											
473	0.047 uF											
563	0.056 uF											
683	0.068 uF											
823	0.082 uF											
104	0.1 uF											
	= Available		-	5	-	•			-	5		

Mechanical Specifications and Packaging Specifications



Type/Code	Voltage	Capacitance Value	L	W	Н	а	Unit	Packaging (7 Paper Tape	7" Reel) Qty. Plastic Tape
CML0402C0G	50V	0.1pF - 1000pF	0.039 ± 0.008	0.020 ± 0.008	0.020 ± 0.002	0.010 ± 0.004	inches	10000	2,4
CIVILU402C0G	50 V	0. грг - 1000рг	1.00 ± 0.20	0.50 ± 0.20	0.50 ± 0.05	0.25 ± 0.10	mm	10000	-
CML0603C0G	50V and 100V	0.5pF - 0.01uF	0.063 ± 0.008	0.031 ± 0.008	0.031 ± 0.008	0.016 ± 0.008	inches	4000	_
CIVILOUGGOOG	30 v and 100 v	0.5pi - 0.01ui	1.60 ± 0.20	0.80 ± 0.20	0.80 ± 0.20	0.40 ± 0.20	mm	4000	_
		0.5pF - 2200pF	0.079 ± 0.008	0.049 ± 0.008	0.028 ± 0.008	0.020 ± 0.008	inches	4000	_
CML0805C0G	50V and 100V	0.0pi 2200pi	2.00 ± 0.20	1.25 ± 0.20	0.70 ± 0.20	0.50 ± 0.20	mm	4000	
CIVILOUGGOOG	30 v and 100 v	2700pF - 0.022uF	0.079 ± 0.008	0.049 ± 0.008	0.049 ± 0.006	0.020 ± 0.008	inches	_	3000
		2700pi - 0.022ui	2.00 ± 0.20	1.25 ± 0.20	1.25 ± 0.15	0.50 ± 0.20	mm	_	3000
		1.2pF - 6800pF	0.126 ± 0.012		0.035 ± 0.008		inches	4000	_
		1.201 000001	3.20 ± 0.30	1.60 ± 0.30	0.90 ± 0.20	0.60 ± 0.30	mm	4000	
	50\/ and 100\/	V and 100V 8200pF and 0.01uF 0.012uF - 0.022uF			0.049 ± 0.004	0.024 ± 0.012	inches	_	3000
CML1206C0G			3.20 ± 0.30	1.60 ± 0.30	1.25 ± 0.10	0.60 ± 0.30	mm		3000
OWE120000			0.126 ± 0.012 3.20 ± 0.30		0.063 ± 0.012		inches	_	2000
		0.012uF - 0.022uF		1.60 ± 0.30	1.60 ± 0.30	0.60 ± 0.30	mm		2000
	50V	0.027uF - 0.1uF	0.126 ± 0.012		0.063 ± 0.012		inches	_	2000
	301	0.027 01 0.101	3.20 ± 0.30	1.60 ± 0.30	1.60 ± 0.30	0.60 ± 0.30	mm		2000
		10pF - 0.01uF			0.037 ± 0.004		inches	_	3000
		1001 0.0101	3.20 ± 0.30	2.50 ± 0.20	0.95 ± 0.10	0.75 ± 0.25	mm		0000
CML1210C0G	50V and 100V	0.012uF and 0.015uF	0.126 ± 0.012	0.098 ± 0.008		0.030 ± 0.010	inches	_	3000
OWEIZIOOOG	00 v and 100 v	0.01241 4114 0.01041	3.20 ± 0.30	2.50 ± 0.20	1.25 ± 0.10	0.75 ± 0.25	mm		
		0.018uF - 0.047uF	0.126 ± 0.012	0.098 ± 0.008			inches	_	1000
		0.01001 0.01701	3.20 ± 0.30	2.50 ± 0.20	2.00 ± 0.20	0.75 ± 0.25	mm		1000
		10pF - 0.033uF	0.177 ± 0.016	0.126 ± 0.012	0.049 ± 0.004	0.030 ± 0.010	inches	_	1000
CML1812C0G	50V and 100V	10pi 0.000di	4.50 ± 0.40	3.20 ± 0.30	1.25 ± 0.10	0.75 ± 0.25	mm		1000
5.0.2.312000	001 4114 1001	0.039uF - 0.1uF			0.098 ± 0.012		inches	_	500
		5.000di 5.1di	4.50 ± 0.40	3.20 ± 0.40	2.50 ± 0.30	0.60 ± 0.30	mm		000

Stackpole Electronics, Inc. Resistive Product Solutions

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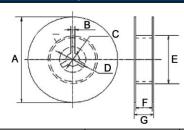
			Environmental Charac	teristics			
Test			Test Specification		Test Condition		
Capacitance		Should	be within the specified tolerance.		C0G: (Class I) 0pF 1.0 ± 0.2 Vrms, 1 MI 0pF 1.0 ± 0.2 Vrms, 1 KI		
			DF	Capacitance		Measuring Voltage	
Dissipation Factor	COG		≤ 0.56%	Cr < 5pF		J J	
(DF)	(Class I)		1.5 [(150 / Cr) + 7] x 10 - 4	5pF ≤ Cr < 50pF	1 MHZ ± 10%	1 ± 0.2 Vrms	
(DI)	(Olass I)		≤ 0.15%	50pF ≤ Cr ≤ 1000pF		1 ± 0.2 VIII3	
			≤ 0.15%	> 1000pF	1 KHZ ± 10%		
					/oltage: Rated Voltage (
	COG		0		Ouration: 60 ± 5 seconds		
Insulation Resistance	(Class I)		$C \le 10 \text{ nF}, \text{ Ri} \ge 50000 \text{ M}\Omega$	T	Test Humidity: ≤ 75%	.00	
			C > 10 nF, RI*CR ≥ 500 S		t Temperature: 25°C ± 5)*C	
					Test Current: ≤ 50 mA Measuring voltage:		
Dielectric				CI	ass I: 300% rated voltag	0	
Withstanding			No breakdown or damage.		Duration: 1 ~ 5 seconds	C	
Voltage					Discharge Current: 50 m	nΔ may	
					litions: 80°C to 120°C, 1		
					erature: 235°C ± 5% (Sr		
Solderability	At least 9		e terminal electrode is covered by new solder.		uration: 2 ± 0.5 seconds	,	
,		Visual	appearance: No visible damage.		perature: 245°C ± 5°C (
					uration: 2 ± 0.5 seconds		
	lten	n	COG		ditions: 100°C to 200°C;		
	A C	·C	≤ ± 0.5% or ± 0.5pF		r Temperature: 265°C ±		
Resistance to	Δ C/	C	whichever is larger		ouration: 10 ± 1 seconds		
	DF		Same to initial value	Clean the cap	acitor with solvent and ex	camine it with	
Soldering Heat	IR		Same to initial value	a	a 10X (min.) microscope.		
	Appeara	ance: No	visible damage. At least 95% of the terminal		covery Time: 24 ± 2 hou		
		elec	trode is covered by new solder.		Condition: Room tempor		
					est Board: Al2O3 or PCE Warp: 1 mm Speed: 0.5 mm/second		
Resistance to				The measurement should be made with the board in the bendin position.			
Flexure of Substrate (Bending Strength)	Αţ	opearance	e: No visible damage. Δ C/C: ≤ ± 10%	T = 10			
				45 ±	2 45±2 ↑		
Termination Adhesion			No visible damage		Unit: mm Applied Force: 5 N		
					ouration: 10 ± 1 seconds		
				Prehe	ating Conditions: up-cate	egory	
					Temperature: 1 hour		
				Re	covery Time: 24 ± 1 hou Initial Measurement	rs	
				Cycling		ctone:	
				Step	times: 5 times, 1 cycle, 4 Temp. (°C)	Time (min.)	
Temperature Cycle	CO	G: A C/C:	: ≤ ± 2.5% or ± 1pF, whichever is larger	•	Low-category temp.		
i simporature Oyole	000	C. A 0/0.	. = ± 2.0 % or ± 1pr , willollever is larger	1	C0G: -55°C	30 ± 3	
				2	Normal temp. (+20)	2 - 3	
					Up-category temp.		
				3	C0G: +125°C	30 ± 3	
				4	Normal temp. (+20°C)	2 - 3	
					ry time after test: 24 ± 2		
				•	-		

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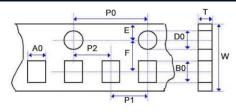
	Environmental Characteristics (cont.)							
Test	Test Specification	Test Condition						
		Temperature: 40°C ± 2°C						
Moisture	C0G: Δ C/C: ≤ ±5% or ± 1pF, whichever is larger	Humidity: 90 ~ 95% R.H.						
Resistance	DF: Not more than twice of initial value.	Duration: 500 hours						
Nesisiance	IR: C0G: Ri ≥ 2500 M Ω or RI*CR ≥ 25 S whichever is smaller	Recovery Conditions: Room temperature						
	Appearance: No visible damage	Recovery Time: 24 hours (Class I)						
		Low-voltage (< 100V)						
	C0G: Δ C/C: ≤ ± 3% or ± 1pF, whichever is larger	Applied Voltage: 1.5 x rated voltage						
		Duration: 1000 hours						
Life Test	DF: Not more than twice of initial value.	Temperature: 125°C (C0G)						
	IR: C0G: Ri ≥ 4000 M Ω or RI*CR ≥ 40 S whichever is smaller	Charge/Discharge Current: 50 mA max.						
		Recovery Conditions: Room temperature						
	Appearance: No visible damage	Recovery Time: 24 hours (Class I)						
		Applied voltage:						
	C0G: Δ C/C: ≤ ± 2% or ± 1pF, whichever is larger	100V ≤ rated voltage < 500V: 2 multiple						
		500V ≤ rated voltage ≤ 1000V: 1.5 multiple						
Middle and High		> 1000V rated voltage: 1.2 multiple						
Voltage Life Test	DF: Not more than twice of initial value.	Duration: 1000 hours						
Voltage Life 1 est	IR: C0G: Ri ≥ 4000 M Ω or Ri*CR ≥ 40 S whichever is smaller	Charge/Discharge Current: 50 mA max.						
		Temperature: 125°C (C0G)						
		Recovery Conditions: Room temperature						
	Appearance: No visible damage	Recovery Time: 24 hours (Class I)						

Reel Specifications



Type/Code	Α	В	С	D	E	F	G	Unit
CML_C0G	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 except 1812)	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
CML_C0G	7.008 ± 0.079	0.118	0.512 ± 0.020	0.827 ± 0.031	1.969 or more	0.488 ± 0.079	not defined	inches
(1812 size)	178.00 ± 2.00	3.00	13.00 ± 0.50	21.00 ± 0.80	50.00 or more	12.40 ± 2.00	not defined	mm

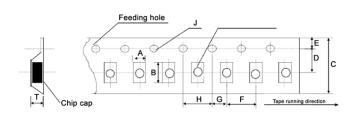
Packaging Specifications - Paper Tape



Type/Code	A ₀	B ₀	Т	W	P ₀	Unit
CML0402C0G	0.028 ± 0.008	0.047 ± 0.008	0.031 below	0.315 ± 0.004	0.157 ± 0.004	inches
CIVILU402C0G	0.70 ± 0.20	1.20 ± 0.20	0.80 below	8.00 ± 0.10	4.00 ± 0.10	mm
CML0603C0G	0.043 ± 0.012	0.071 ± 0.012	0.047 max	0.315 ± 0.004	0.157 ± 0.004	inches
CIVILUOUSCUG	1.10 ± 0.30	1.80 ± 0.30	1.20 max	8.00 ± 0.10	4.00 ± 0.10	mm
CML0805C0G	0.059 ± 0.008	0.091 ± 0.008	0.045 max	0.315 ± 0.006	0.157 ± 0.004	inches
CIVILUOUSCUG	1.50 ± 0.20	2.30 ± 0.20	1.15 max	8.00 ± 0.15	4.00 ± 0.10	mm
CML1206C0G	0.075 ± 0.020	0.138 ± 0.020	0.047 max	0.315 ± 0.008	0.157 ± 0.004	inches
CIVIL 1200C0G	1.90 ± 0.50	3.50 ± 0.50	1.20 max	8.00 ± 0.20	4.00 ± 0.10	mm

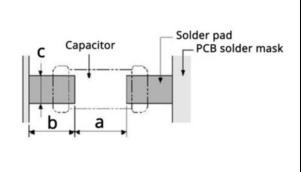
	Packaging Specifications – Paper Tape (cont.)									
Type/Code	P ₁	P ₂	D_0	Е	F	Unit				
CML0402C0G	0.079 ± 0.002	0.079 ± 0.002	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches				
CIVILU402C0G	2.00 ± 0.05	2.00 ± 0.05	1.5-0/+0.10	1.75 ± 0.05	3.50 ± 0.05	mm				
CML0603C0G	0.157 ± 0.002	0.079 ± 0.004	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches				
CIVILUOUSCUG	4.00 ± 0.05	2.00 ± 0.10	1.5-0/+0.10	1.75 ± 0.05	3.50 ± 0.05	mm				
CML0805C0G	0.157 ± 0.004	0.079 ± 0.004	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches				
CIVILUOUSCUG	4.00 ± 0.10	2.00 ± 0.10	1.5-0/+0.10	1.75 ± 0.05	3.50 ± 0.05	mm				
CML1206C0G	0.157 ± 0.004	0.079 ± 0.004	0.059-0/+0.004	0.069 ± 0.004	0.138 ± 0.002	inches				
CIVIL 1200C0G	4.00 ± 0.10	2.00 ± 0.10	1.5-0/+0.10	1.75 ± 0.10	3.50 ± 0.05	mm				

Packaging Specifications - Plastic Tape



Type/Code	A	В	С	D	Е	Unit
CML0805C0G	0.061 ± 0.010	0.094 ± 0.012	0.315 ± 0.008	0.138 ± 0.002	0.069 ± 0.004	inches
CIVILUOUSCUG	1.55 ± 0.25	2.40 ± 0.30	8.00 ± 0.20	3.50 ± 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 ± 0.004	inches
(≤ 0.01uF)	1.95 ± 0.20	3.60 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	mm
CML1206C0G	0.079 ± 0.012	0.146 ± 0.012	0.315 ± 0.008	0.138 ± 0.002	0.069 ± 0.004	inches
(≥ 0.012uF)	2.00 ± 0.30	3.70 ± 0.30	8.00 ± 0.20	3.50 ± 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 ± 0.004	inches
CIVIL 12 TOCOG	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 18 12 COG	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
2.	F 0.157 ± 0.004	G 0.079 ± 0.004	0.157 ± 0.004	J 0.059-0/+0.004	0.079 max	Unit
Type/Code CML0805C0G		-			0.079 max 2.00 max	
2.	0.157 ± 0.004	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004		inches
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	2.00 max	inches mm
CML0805C0G CML1206C0G	0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004	0.079 ± 0.004 2.00 ± 0.10 0.079 ± 0.004	0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004	0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004	2.00 max 0.079 max	inches mm inches
CML0805C0G CML1206C0G (≤ 0.01uF)	0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10 0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004 1.5-0/+0.10	2.00 max 0.079 max 2.00 max	inches mm inches mm
CML0805C0G CML1206C0G (≤ 0.01uF) CML1206C0G (≥ 0.012uF)	0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004	0.079 ± 0.004 2.00 ± 0.10 0.079 ± 0.004 2.00 ± 0.10 0.079 ± 0.004	0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004	0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004	2.00 max 0.079 max 2.00 max 0.098 max	inches mm inches mm inches
CML0805C0G CML1206C0G (≤ 0.01uF) CML1206C0G	0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10 0.079 ± 0.004 2.00 ± 0.10 0.079 ± 0.004 2.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10	0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004 1.5-0/+0.10	2.00 max 0.079 max 2.00 max 0.098 max 2.50 max	inches mm inches mm inches mm
CML0805C0G CML1206C0G (≤ 0.01uF) CML1206C0G (≥ 0.012uF)	0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004	0.079 ± 0.004 2.00 ± 0.10 0.079 ± 0.004 2.00 ± 0.10 0.079 ± 0.004 2.00 ± 0.10 0.079 ± 0.004 0.079 ± 0.002	0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004 4.00 ± 0.10 0.157 ± 0.004	0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004	2.00 max 0.079 max 2.00 max 0.098 max 2.50 max 0.126 max	inches mm inches mm inches mm inches

	Recommended Solder Pad for Wave Soldering								
Type	0603	0805	1206	1210	Unit				
Length (L)	0.063	0.079	0.126	0.126	inches				
Length (L)	1.60	2.00	3.20	3.20	mm	8 8			
Width (W)	0.031	0.049	0.063	0.098	inches	c Capacitor			
vviatii (vv)	0.80	1.25	1.60	2.50	mm				
а	0.031 ~ 0.039	0.039 ~ 0.055	0.071 ~ 0.098	0.071 ~ 0.098	inches	•			
а	0.80 ~ 1.00	1.00 ~ 1.40	1.80 ~ 2.50	1.80 ~ 2.50	mm				
b	0.020 ~ 0.031	0.031 ~ 0.059	0.031 ~ 0.067	0.031 ~ 0.067	inches	1			
D	0.50 ~ 0.80	0.80 ~ 1.50	0.80 ~ 1.70	0.80 ~ 1.70	mm	b a			
С	0.024 ~ 0.031	0.035 ~ 0.047	0.047 ~ 0.063	0.071 ~ 0.098	inches				
C	0.60 ~ 0.80	0.90 ~ 1.20	1.20 ~ 1.60	1.80 ~ 2.50	mm				
NOTE: Solo	der pad informat	tion is for refere	nce only.			-			



Stackpole Electronics, Inc.

Multilayer Ceramic Chip Capacitor Resistive Product Solution

	Recommended Solder Pad for Reflow Soldering									
Туре	0402	0402 0603 0805 1206		1210	1812	Unit				
Length (L)	0.043	0.063	0.079	0.126	0.126	0.177	inches			
Length (L)	1.10	1.60	2.00	3.20	3.20	4.50	mm			
Width (W)	0.020	0.031	0.049	0.063	0.098	0.126	inches			
vviatii (vv)	0.50	0.80	1.25	1.60	2.50	3.20	mm			
a	0.018 ~ 0.022	0.024 ~ 0.031	0.031 ~ 0.047	0.071 ~ 0.098	0.071 ~ 0.098	0.098 ~ 0.138	inches			
a	0.45 ~ 0.55	0.60 ~ 0.80	0.80 ~ 1.20	1.80 ~ 2.50	1.80 ~ 2.50	2.50 ~ 3.50	mm			
b	0.016 ~ 0.020	0.024 ~ 0.031	0.024 ~ 0.047	0.024 ~ 0.059	0.024 ~ 0.059	0.039 ~ 0.071	inches			
D	0.40 ~ 0.50	0.60 ~ 0.80	0.60 ~ 1.20	0.60 ~ 1.50	0.60 ~ 1.50	1.00 ~ 1.80	mm			
	0.018 ~ 0.022	0.024 ~ 0.031	0.035 ~ 0.063	0.047 ~ 0.079	0.071 ~ 0.126	0.091 ~ 0.138	inches			
С	0.45 ~ 0.55	0.60 ~ 0.80	0.90 ~ 1.60	1.20 ~ 2.00	1.80 ~ 3.20	2.30 ~ 3.50	mm			

NOTE: Solder pad information is for reference only.

RoHS Compliance

Stackpole Electronics has joined the worldwide effort to reduce the amount of lead in electronic components and to meet the various regulatory requirements now prevalent, such as the European Union's directive regarding "Restrictions on Hazardous Substances" (RoHS 3). As part of this ongoing program, we periodically update this document with the status regarding the availability of our compliant components. All our standard part numbers are compliant to EU Directive 2011/65/EU of the European Parliament as amended by Directive (EU) 2015/863/EU as regards the list of restricted substances.

	RoHS Compliance Status										
Standard Product Series	Description	Package / Termination Type	Standard Series RoHS Compliant	Lead-Free Termination Composition	Lead-Free Mfg. Effective Date (Std Product Series)	Lead-Free Effective Date Code (YY/WW)					
CML	Multilayer Ceramic Chip Capacitor	SMD	YES	100% Matte Sn over Ni	Always	Always					

"Conflict Metals" Commitment

We at Stackpole Electronics, Inc. are joined with our industry in opposing the use of metals mined in the "conflict region" of the eastern Democratic Republic of the Congo (DRC) in our products. Recognizing that the supply chain for metals used in the electronics industry is very complex, we work closely with our own suppliers to verify to the extent possible that the materials and products we supply do not contain metals sourced from this conflict region. As such, we are in compliance with the requirements of Dodd-Frank Act regarding Conflict Minerals.

Compliance to "REACH"

We certify that all passive components supplied by Stackpole Electronics, Inc. are SVHC (Substances of Very High Concern) free and compliant with the requirements of EU Directive 1907/2006/EC, "The Registration, Evaluation, Authorization and Restriction of Chemicals", otherwise referred to as REACH. Contact us for complete list of REACH Substance Candidate List.

Environmental Policy

It is the policy of Stackpole Electronics, Inc. to protect the environment in all localities in which we operate. We continually strive to improve our effect on the environment. We observe all applicable laws and regulations regarding the protection of our environment and all requests related to the environment to which we have agreed. We are committed to the prevention of all forms of pollution.

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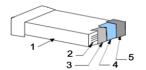
Resistive Product Solutions

Features:

- -55°C to 85°C operating temperature range
- EIA sizes 0402, 0603, 0805, 1206, 1210 and 1812
- Capacitance offering from 0.047 uF to 100 uF
- RoHS compliant, REACH compliant, lead free and halogen free



Construction

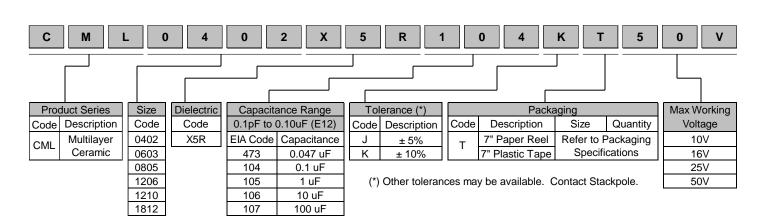


- 1 Ceramic layers (dielectric)
- 2 Inner electrodes
- 3 Base termination
- 4 Nickel plating layer
- 5 Tin plating layer

				Electrical Spe	ecifications						
Type / Code	Dielectric	Standard	Tolerance	Capacitance Range							
Type / Code	Code	Code	Description	10V	16V	25V	50V				
					120 pF -	0.039 uF					
CML0402	X5R	K	± 10%		0.047 uF - 0.1 uF		-				
				0.12 uF -	· 0.47 uF		=				
CML0603	X5R	K	± 10%		0.47 u	F - 1 uF					
CIVILUOUS	AGK	N.	± 10%		1.2 uF - 2.2 uF		-				
CML0805	X5R	К	± 10%	150 pF - 0.39 uF							
CIVILUOUS	AGK	K	± 10%		0.47 uF - 2.2 uF		=				
CML1206	X5R	K	± 10%		150 pF	- 4.7 uF					
CIVIL 1206	AGK	K	± 10%	10 uF		=					
					4.7 uF - 22 uF		-				
CML1210	X5R	K	± 10%	33 uF -	· 47 uF		-				
				68 uF - 100 uF		-					
				=	4.7 uF	- 6.8 uF	-				
CML1812	X5R	K	+ 100/	·	10 uF		-				
CIVILIOIZ	ASK	5R K	± 10%	15 uF	· 22 uF		-				
				33 uF - 47 uF		-					

Note: $J = \pm 5\%$ tolerance may be available

How to Order



						(Capa	acita	nce	and	Volt	age	Ava	ilabl	е							
Di	electric											X5R										
EIA	Size		04	02			06	03			0805			12	06		1210			1812		
Code	VDCW	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	10V	16V	25V	50V	10V	16V	25V	10V	16V	25V
473	0.047 uF																					
563	0.056 uF																					
683	0.068 uF																					
823	0.082 uF																					
104	0.1 uF																					
154	0.15 uF																					
224	0.22 uF																					
334	0.33 uF																					
474	0.47 uF																					
684	0.68 uF																					
105	1 uF																					
155	1.5 uF																					
225	2.2 uF																					
335	3.3 uF																					
475	4.7 uF																					
685	6.8 uF																					
106	10 uF																					
156	15 uF																					
226	22 uF																					
336	<u>33</u> uF																					
476	47 uF																					
686	68 uF																					
107	100 uF																					

Mechanical Specifications and Packaging Specifications

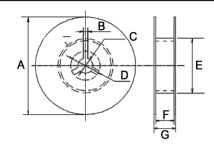
Type / Code	Voltage	Capacitance Range	_	W	Н	а	Unit	Packaging (7	7" Reel) Qty.	
Type / Code	voltage	Capacitance Kange	_	VV	Е	a	Offic	Paper Tape	Plastic Tape	
CML0402X5R	10V - 50V	0.1 uF - 4.7 uF	0.039 ± 0.008	0.020 ± 0.008	0.020 ± 0.002	0.010 ± 0.004	inches	10000		
CIVILU402X3K	100 - 300	0.1 uF - 4.7 uF	1.00 ± 0.20	0.50 ± 0.20	0.50 ± 0.05	0.25 ± 0.10	mm	10000	-	
CML0603X5R	10V - 50V	0.47 uF - 10 uF	0.063 ± 0.008	0.031 ± 0.008	0.031 ± 0.004	0.012 ± 0.004	inches	4000		
CIVILUOUSASIN	100 - 300	0.47 ur - 10 ur	1.60 ± 0.20	0.80 ± 0.20	0.80 ± 0.10	0.30 ± 0.10	mm	4000	_	
		1 uF	0.079 ± 0.008	0.049 ± 0.008	0.039 ± 0.004	0.020 ± 0.008	inches		3000	
		T UF	2.00 ± 0.20	1.25 ± 0.20	1.00 ± 0.10	0.50 ± 0.20	mm	•	3000	
		1.5 uF	0.079 ± 0.008	0.049 ± 0.008	0.047 ± 0.004	0.020 ± 0.008	inches		3000	
	10V - 16V		2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	0.50 ± 0.20	mm	•	3000	
		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	4000	-	
CML0805X5R			0.079 ± 0.008	0.049 ± 0.008	0.047 ± 0.004	0.020 ± 0.008	inches		2000	
CIVILUOUSASIN		3.3 ur - 22 ur	2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	0.50 ± 0.20	mm	•	2000	
		1 uF	0.079 ± 0.008	0.049 ± 0.008	0.039 ± 0.004	0.020 ± 0.008	inches		3000	
		Tur	2.00 ± 0.20	1.25 ± 0.20	1.00 ± 0.10	0.50 ± 0.20	mm		3000	
	25V	1.5 uF - 2.2 uF	0.079 ± 0.008	0.049 ± 0.008	0.047 ± 0.004	0.020 ± 0.008	inches		3000	
	237	1.5 ur - 2.2 ur	2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	0.50 ± 0.20	mm	•	3000	
		0.079 ± 0.008	0.049 ± 0.008	0.047 ± 0.004	0.020 ± 0.008	inches	_	2000		
		3.3 di - 10 di	2.00 ± 0.20	1.25 ± 0.20	1.20 ± 0.10	0.50 ± 0.20	mm	•	2000	

	N	lechanical Spe	cifications	and Packa	aging Spec	ifications (cont.))	
Type / Code	Voltage	Capacitance Range	L	W	Н	а	Unit	Packaging (7" Reel) Qty. Plastic Tape
		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		-	3000
	10V	4.7 uF - 22 uF	0.126 ± 0.012	0.063 ± 0.012	0.063 ± 0.004	0.024 ± 0.012		-	2000
		47 uF		1.60 ± 0.30 0.063 ± 0.012				-	2000
CML1206X5R		2.2 uF - 3.3 uF		1.60 ± 0.30 0.063 ± 0.012				-	3000
	16V - 25V	4.7 uF - 22 uF		1.60 ± 0.30 0.063 ± 0.012		0.60 ± 0.30 0.024 ± 0.012		-	2000
	50\/	2.2 uF - 3.3 uF		1.60 ± 0.30 0.063 ± 0.012		0.60 ± 0.30 0.024 ± 0.012		-	3000
	50V	4.7 uF - 10 uF		1.60 ± 0.30 0.063 ± 0.012				-	2000
	10V	4.7 uF		1.60 ± 0.30 0.098 ± 0.012			mm inches	-	2000
		6.8 uF - 10 uF		2.50 ± 0.30 0.098 ± 0.012			mm inches	-	2000
			3.20 ± 0.30 0.126 ± 0.012	2.50 ± 0.30 0.098 ± 0.012	1.80 ± 0.10 0.098 ± 0.010	0.60 ± 0.30 0.024 ± 0.012	mm inches	_	500
		4.7 uF		2.50 ± 0.30 0.098 ± 0.012	2.50 ± 0.25 0.047 ± 0.004	0.60 ± 0.30 0.024 ± 0.012	mm inches	_	2000
CML1210X5R	16V	6.8 uF - 10 uF		2.50 ± 0.30 0.098 ± 0.012	1.20 ± 0.10 0.071 ± 0.004	0.60 ± 0.30 0.024 ± 0.012	mm inches	_	2000
OWETZTOAGIK	100	15 uF - 47 uF	3.20 ± 0.30 0.126 ± 0.012	2.50 ± 0.30 0.098 ± 0.012	1.80 ± 0.10 0.098 ± 0.010	0.60 ± 0.30 0.024 ± 0.012	mm inches		500
		4.7 uF	3.20 ± 0.30 0.126 ± 0.012	2.50 ± 0.30 0.098 ± 0.012	2.50 ± 0.25 0.047 ± 0.004	0.60 ± 0.30 0.024 ± 0.012	mm inches	-	2000
	05)/		3.20 ± 0.30 0.126 ± 0.012	2.50 ± 0.30 0.098 ± 0.012	1.20 ± 0.10 0.071 ± 0.004	0.60 ± 0.30 0.024 ± 0.012	mm inches	-	
	25V	25V 6.8 uF - 10 uF	3.20 ± 0.30 0.126 ± 0.012	2.50 ± 0.30 0.098 ± 0.012	1.80 ± 0.10 0.098 ± 0.010	0.60 ± 0.30 0.024 ± 0.012	mm inches	-	2000
		15 uF - 22 uF	3.20 ± 0.30	2.50 ± 0.30 0.126 ± 0.012	2.50 ± 0.25 0.071 ± 0.004	0.60 ± 0.30	mm	-	500
CML1812X5R	10V - 25V	4.7 uF - 47 uF	4.50 ± 0.40	3.20 ± 0.30	1.80 ± 0.10	0.60 ± 0.30	mm	-	1000

	Environmental Characteristics									
Test				Test Specifica	ition		Test Condition			
Capacitance			Should be v	vithin the spec	cified toleranc	e.	X5R: (Class II) Cap ≤ 10 uF 1.0 ± 0.2 Vrms, 1 KHz ± 10% Cap > 10 uF 0.5 ± 0.1 Vrms, 120 Hz ± 10%			
Dissipation Factor (DF)	X5R (Class II)	X5R (≥ 0402)	≥ 50V ≤ 2.5%	,	16V < 0.47 uF) ≥ 0.47 uF)	10V ≤ 5% (C < 0.15 uF) ≤ 10.0% (C ≥ 0.15	Cap ≤ 10 uF 1.0 ± 0.2 Vrms, 1 KHz ± 10% Cap > 10 uF 0.5 ± 0.1 Vrms, 120 Hz ± 10%			
Insulation Resistance	X5R (Class II)			C ≤ 25 nF, Ri C > 25 nF, R	≥ 10,000 MΩ I*CR > 100 S		Measuring Voltage: Rated Voltage (Max 500V) Duration: 60 ± 5 seconds Test Humidity: ≤ 75% Test Temperature: 25°C ± 5°C Test Current: ≤ 50 mA			
Dielectric Withstanding Voltage			No b	reakdown or o	damage.		Measuring voltage: Class II: 250% rated voltage Duration: 1 ~ 5 seconds Charge/Discharge Current: 50 mA max.			

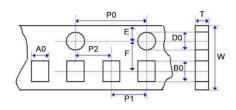
		Environmental Characteristic	cs (cont.)				
Test		Test Specification		Test Condition			
Solderability		6 of the terminal electrode is covered by new solder. Visual appearance: No visible damage.	Preheating Conditions: 80°C to 120°C, 10 ~ 30 seconds Solder Temperature: 235°C ± 5% (Sn/Pb: 63/37) Duration: 2 ± 0.5 seconds Solder Temperature: 245°C ± 5°C (Lead-free) Duration: 2 ± 0.5 seconds				
	Item	X5R		ditions: 100°C to 200°C;			
	Δ C/C	-5 ~ + 10%	Solde	r Temperature: 265°C ± Ouration: 10 ± 1 seconds			
Resistance to	DF	Same to initial value	Clean the capa	acitor with solvent and ex	amine it with		
Soldering Heat	IR	Same to initial value	a	a 10X (min.) microscope.			
	Appearance: No	visible damage. At least 95% of the terminal electrode is	Re	covery Time: 24 ± 2 hou	rs		
		covered by new solder.		y Condition: Room tempe			
Resistance to Flexure of Substrate (Bending Strength)	Арре	arance: No visible damage. Δ C/C: ≤ ± 10%	5	est Board: Al2O3 or PCE Warp: 1 mm Speed: 0.5 mm/ second int should be made with the bending position. Unit: mm T = 10			
Termination Adhesion		No visible damage	D	Applied Force: 5 N Duration: 10 ± 1 seconds			
Temperature Cycle		X5R: Δ C/C: ≤ ± 10%	Preheating Cond Red Cycling Step 1 2 3	ditions: up-category temp covery Time: 24 ± 1 hou Initial Measurement times: 5 times, 1 cycle, 4 Temp. (°C) Low-category temp. X5R: -55°C Normal temp. (+20°C) Up-category temp. X5R: +85°C Normal temp. (+20°C)	steps: Time (min.) 30 ± 3 2 - 3 30 ± 3 2 - 3		
Moisture Resistance		X5R: Δ C/C: ≤ ± 10% DF: Not more than twice of initial value. X5R: Ri ≥ 1000 MΩ or RI*CR ≥ 25 S whichever is smaller Appearance: No visible damage Appearance: No visible damage Recovery Conditions: Room temperature Recovery Time: 48 hours (Class II)					
Life Test		X5R: Δ C/C: ≤ ± 20% DF: Not more than twice of initial value. Ri ≥ 2000 MΩ or RI*CR ≥ 50 S whichever is smaller Appearance: No visible damage	T Charge/ Recovery	Low-voltage (< 100V) d Voltage: 1.5 x rated vo Duration: 1000 hours emperature: 85°C (X5R) Discharge Current: 50 m / Conditions: Room temp //ery Time: 48 hours (Cla	A max. erature		

Reel Specifications



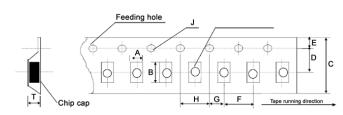
Type/Code	А	В	С	D	Е	F	G	Unit
CML_X5R	7.008 ± 0.079	0.118	0.512 ± 0.020	0.827 ± 0.031	1.969 or more	0.394 ± 0.059	0.472 max	inches
(all sizes)	178.00 ± 2.00	3.00	13.00 ± 0.50	21.00 ± 0.80	50.00 or more	10.00 ± 1.50	12.00 max	mm

Paper Tape Specifications



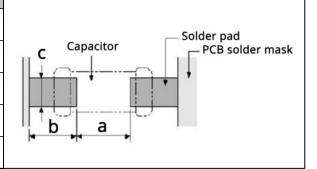
Type/Code	A0	В0	Т	W	P0	Unit
CML0402X5R	0.026 ± 0.004	0.045 ± 0.004	0.031 below	0.315 ± 0.004	0.157 ± 0.004	inches
CIVILU402A3R	0.65 ± 0.10	1.15 ± 0.10	0.80 below	8.00 ± 0.10	4.00 ± 0.10	mm
CML0603X5R	0.043 ± 0.004	0.075 ± 0.004	0.043 max	0.315 ± 0.004	0.157 ± 0.004	inches
CIVILUOUSASK	1.10 ± 0.10	1.90 ± 0.10	1.10 max	8.00 ± 0.10	4.00 ± 0.10	mm
CML0805X5R	0.057 ± 0.006	0.091 ± 0.006	0.043 max	0.315 ± 0.006	0.157 ± 0.004	inches
CIVILUOUSASIA	1.45 ± 0.15	2.30 ± 0.15	1.10 max	8.00 ± 0.15	4.00 ± 0.10	mm
CML1206X5R	0.071 ± 0.008	0.134 ± 0.008	0.043 max	0.315 ± 0.008	0.157 ± 0.004	inches
CIVIL 1200ASK	1.80 ± 0.20	3.40 ± 0.20	1.10 max	8.00 ± 0.20	4.00 ± 0.10	mm
Type/Code	P1	P2	D0	E	F	Unit
CML0402X5R	0.079 ± 0.002	0.079 ± 0.002	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches
CIVILU402A5R	2.00 ± 0.05	2.00 ± 0.05	1.5-0/+0.10	1.75 ± 0.05	3.50 ± 0.05	mm
CML0603X5R	0.079 ± 0.004	0.157 ± 0.002	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches
CIVILUOUSASK	2.00 ± 0.10	4.00 ± 0.05	1.5-0/+0.10	1.75 ± 0.05	3.50 ± 0.05	mm
CML0805X5R	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches
CIVILUOUSASK	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.75 ± 0.05	3.50 ± 0.05	mm
CML1206X5R	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	0.069 ± 0.004	0.138 ± 0.002	inches
CIVIL 1200ASK	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	A	В	С	D	Е	Unit
CML0805X5R	0.061 ± 0.008	0.093 ± 0.008	0.315 ± 0.008	0.138 ± 0.002	0.069 ± 0.004	inches
CIVILU803A3R	1.55 ± 0.20	2.35 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	mm
CML1206X5R	0.077 ± 0.008	0.142 ± 0.008	0.315 ± 0.008	0.138 ± 0.002	0.069 ± 0.004	inches
CIVIL 1200ASK	1.95 ± 0.20	3.60 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	mm
CML1210X5R	0.106 ± 0.004	0.135 ± 0.004	0.315 ± 0.004	0.138 ± 0.002	0.069 ± 0.004	inches
CIVIL 12 10 ASK	2.70 ± 0.10	3.42 ± 0.10	8.00 ± 0.10	3.50 ± 0.05	1.75 ± 0.10	mm
CML1812X5R	0.144 ± 0.004	0.195 ± 0.004	0.472 ± 0.004	0.217 ± 0.002	0.069 ± 0.004	inches
CIVIL 1812ASK	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
CML0805X5R	0.157 ± 0.004	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	0.059 max	inches
CIVILUOUSASK	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.50 max	mm
CML1206X5R	0.157 ± 0.004	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	0.073 max	inches
CIVIL 1200ASK	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.85 max	mm
CML1210X5R	0.157 ± 0.004	0.079 ± 0.002	0.157 ± 0.004	0.059-0/+0.004	0.126 max	inches
GIVIL 12 TUXSR	4.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	1.5-0/+0.10	3.20 max	mm
CML1812X5R	0.315 ± 0.004	0.079 ± 0.002	0.157 ± 0.004	0.059-0/+0.004	0.157 max	inches
CIVIL 1612A3R	8.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	1.5-0/+0.10	4.00 max	mm

		Red	commended	d Solder Pa	d for
Туре	0603	0805	1206	1210	Unit
Length (L) 0.063		0.079	0.126	0.126	inches
Length (L)	1.60	2.00	3.20	3.20	mm
Width (W)	0.031	0.049	0.063	0.098	inches
vviatii (vv)	0.80	1.25	1.60	2.50	mm
а	0.031 ~ 0.039	0.039 ~ 0.055	0.071 ~ 0.098	0.071 ~ 0.098	inches
а	0.80 ~ 1.00	1.00 ~ 1.40	1.80 ~ 2.50	1.80 ~ 2.50	mm
b	0.020 ~ 0.031	0.031 ~ 0.059	0.031 ~ 0.067	0.031 ~ 0.067	inches
U	0.50 ~ 0.80	0.80 ~ 1.50	0.80 ~ 1.70	0.80 ~ 1.70	mm
	0.024 ~ 0.031	0.035 ~ 0.047	0.047 ~ 0.063	0.071 ~ 0.098	inches
С	0.60 ~ 0.80	0.90 ~ 1.20	1.20 ~ 1.60	1.80 ~ 2.50	mm



Wave Soldering

NOTE: Solder pad information is for reference only.

	Recommended Solder Pad for Reflow Soldering												
Туре	0402	0603	0805	1206	1210	1812	Unit						
Length (L)	0.043	0.063	0.079	0.126	0.126	0.177	inches						
Length (L)	1.10	1.60	2.00	3.20	3.20	4.50	mm						
Width (W)	0.020	0.031	0.049	0.063	0.098	0.126	inches						
vviatii (vv)	0.50	0.80	1.25	1.60	2.50	3.20	mm						
2	0.018 ~ 0.022	0.024 ~ 0.031	0.031 ~ 0.047	0.071 ~ 0.098	0.071 ~ 0.098	0.098 ~ 0.138	inches						
a	0.45 ~ 0.55	0.60 ~ 0.80	0.80 ~ 1.20	1.80 ~ 2.50	1.80 ~ 2.50	2.50 ~ 3.50	mm						
b	0.016 ~ 0.020	0.024 ~ 0.031	0.024 ~ 0.047	0.024 ~ 0.059	0.024 ~ 0.059	0.039 ~ 0.071	inches						
D	0.40 ~ 0.50	0.60 ~ 0.80	0.60 ~ 1.20	0.60 ~ 1.50	0.60 ~ 1.50	1.00 ~ 1.80	mm						
	0.018 ~ 0.022	0.024 ~ 0.031	0.035 ~ 0.063	0.047 ~ 0.079	0.071 ~ 0.126	0.091 ~ 0.138	inches						
С	0.45 ~ 0.55	0.60 ~ 0.80	0.90 ~ 1.60	1.20 ~ 2.00	1.80 ~ 3.20	2.30 ~ 3.50	mm						

NOTE: Solder pad information is for reference only.

CML X5R Series

Stackpole Electronics, Inc.

Multilayer Ceramic Chip Capacitor

Resistive Product Solutions

RoHS Compliance

Stackpole Electronics has joined the worldwide effort to reduce the amount of lead in electronic components and to meet the various regulatory requirements now prevalent, such as the European Union's directive regarding "Restrictions on Hazardous Substances" (RoHS 3). As part of this ongoing program, we periodically update this document with the status regarding the availability of our compliant components. All our standard part numbers are compliant to EU Directive 2011/65/EU of the European Parliament as amended by Directive (EU) 2015/863/EU as regards the list of restricted substances.

	RoHS Compliance Status											
Standard Product Series	Description	Package / Termination Type	Standard Series RoHS Compliant	Lead-Free Termination Composition	Lead-Free Mfg. Effective Date (Std Product Series)	Lead-Free Effective Date Code (YY/WW)						
CML	Multilayer Ceramic Chip Capacitor	SMD	YES	100% Matte Sn over Ni	Always	Always						

"Conflict Metals" Commitment

We at Stackpole Electronics, Inc. are joined with our industry in opposing the use of metals mined in the "conflict region" of the eastern Democratic Republic of the Congo (DRC) in our products. Recognizing that the supply chain for metals used in the electronics industry is very complex, we work closely with our own suppliers to verify to the extent possible that the materials and products we supply do not contain metals sourced from this conflict region. As such, we are in compliance with the requirements of Dodd-Frank Act regarding Conflict Minerals.

Compliance to "REACH"

We certify that all passive components supplied by Stackpole Electronics, Inc. are SVHC (Substances of Very High Concern) free and compliant with the requirements of EU Directive 1907/2006/EC, "The Registration, Evaluation, Authorization and Restriction of Chemicals", otherwise referred to as REACH. Contact us for complete list of REACH Substance Candidate List.

Environmental Policy

It is the policy of Stackpole Electronics, Inc. to protect the environment in all localities in which we operate. We continually strive to improve our effect on the environment. We observe all applicable laws and regulations regarding the protection of our environment and all requests related to the environment to which we have agreed. We are committed to the prevention of all forms of pollution.

7

Multilayer Ceramic Chip Capacitor

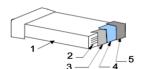
Resistive Product Solutions

Features:

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



Construction

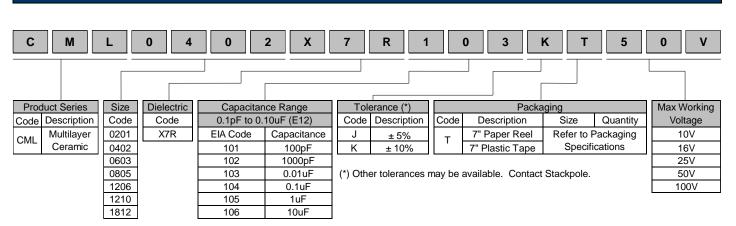


- 1 Ceramic layers (dielectric)
- 2 Inner electrodes
- 3 Base termination
- 4 Nickel plating layer
- 5 Tin plating layer

				Electrical S	pecifications						
Tuna/Cada	Dielectric	Standard	Tolerance			Capacitance Range)				
Type/Code	Code	Code	Description	10V	16V	25V	50V	100V			
CML0201	X7R	K	± 10%	1000pF - 0.022uF	100pF - 0.022uF	100pF - 0.01uF	100pF - 1000pF	-			
				100pF - 0.47uF			•				
CMI 0402	X7R	К	± 10%	100pF - 0.22uF -							
CML0402	A/K	N.	± 10%	100pF - 0.1uF -							
				100pF - 4700pF							
				100pF	- 2.2uF		-				
CML0603	X7R	K	± 10%		100pF	- 1.0uF		-			
						100pF - 0.1uF					
				100pF	- 10uF	-					
CML0805	X7R	К	± 10%		100pF - 4.7uF		-				
CIVILOGOS	X/IX	IX.	1070		100pF	- 2.2uF		-			
						100pF - 0.47uF					
				150pF	- 22uF		-				
CML1206	X7R	К	± 10%		150pF - 10uF		-				
CIVIL 1200	X/IX	IX.	1070		150pF	- 4.7uF		-			
						150pF - 2.2uF					
				1000pF - 47uF -							
CML1210	X7R	К	± 10%	1000pF - 22uF -							
J1210	714		070	1000pF - 10uF -							
				1000pF - 4.7uF							
CML1812	X7R	K	± 10%	1000pF	- 1.0uF	1000pF	- 10uF	1000pF - 2.2uF			

Note: J = 5% tolerance may be available

How to Order

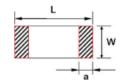


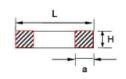
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									Ca	ра	cit	ance	e a	nd \	/olt	aq	e A	va	ilal	ole												
Die	electric									_						K7R																
EIA	Size		0201			04	402				0603	3	Т		080	5		Ī		1206					1210)				1812	,	
Code	VDCW	10V ²	16V 25\	√ 50V	10V 1	6V 2	5V 50	0V 100V	10V	16V	25V	50V 10	0V 1	0V 16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V
101	100 pF																													\Box		
121	120 pF																													\Box	\Box	
151	150 pF																															
181 201	180 pF 200 pF																													-		
201	200 pF 220 pF																													-	\rightarrow	
271	270 pF																													-	\rightarrow	
331	330 pF																													\neg		
391	390 pF																															
471	470 pF																															
561	560 pF																															
681	680 pF																															
821 102	820 pF 1000 pF																															
122	1200 pF																															
152	1500 pF																															
182	1800 pF																															
222	2200 pF																															
272	2700 pF												Ţ																			
332	3300 pF												Ţ																			
392	3900 pF 4700 pF																															
472 562	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	\sqcup																														
333	0.033 uF	\vdash		_																												
393	0.039 uF	\vdash		+																												
473 563	0.047 uF 0.056 uF			+									-																			
683	0.056 uF																															
823	0.082 uF			1																												
104	0.1 uF			1																												
124	0.12 uF																															
154	0.15 uF						\neg																									
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	\sqcup	\perp			\perp	\perp																									
684	0.68 uF	\sqcup		1			\perp																									
824	0.82 uF						\perp																									
105	1 uF	\sqcup		1			\perp	_																								
155	1.5 uF	\vdash	_	-		\perp	\perp	_		,																						
225	2.2 uF	\vdash		-			\perp																									
335	3.3 uf	\vdash		-		_	\perp		1																							
475	4.7 uF	\vdash	-	+		+	+	-	1																							
685	6.8 uF	\vdash	\perp	-	\vdash	+	+	+	1																							-
106	10 uF	\vdash	+	+	\vdash	+	+	+	1				_																			
226	22 uF	\vdash					-	-	1				-		+		-													\dashv		
476	47 uF	ш							Щ						Ь—			Щ	ш								L					

= Available

Mechanical Specifications and Packaging Specifications



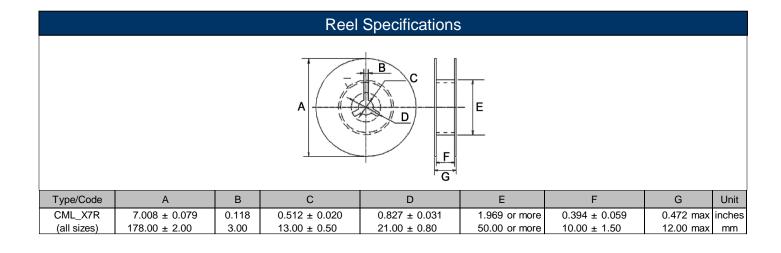


Type/Code	Voltage	Capacitance Range	L	W	Н	а	Unit		7" Reel) Qty. Plastic Tape
CML0201X7R	10V - 50V	100pF - 0.22uF	0.024 ± 0.001 0.60 ± 0.03	0.012 ± 0.001 0.30 ± 0.03	0.008 ± 0.001 0.20 ± 0.03	0.006 ± 0.002 0.15 ± 0.05	inches mm	15000	-
CML0402X7R	10V - 100V	100pF - 0.47uF	0.039 ± 0.008 1.00 ± 0.20	0.020 ± 0.008 0.50 ± 0.20	0.020 ± 0.008 0.50 ± 0.20	0.010 ± 0.004 0.25 ± 0.10	inches mm	10000	-
CML0603X7R	10V - 100V	150pF - 2.2uF	0.063 ± 0.008 1.60 ± 0.20	0.031 ± 0.008 0.80 ± 0.20	0.031 ± 0.008 0.80 ± 0.20	0.016 ± 0.008 0.40 ± 0.20	inches mm	4000	-
	40)/ == 440)/	100pF - 0.12uF	0.079 ± 0.006 2.00 ± 0.15	0.049 ± 0.004 1.25 ± 0.10	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
	10V and 16V	0.15uF - 10uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
	05)/	100pF - 0.12uF	0.079 ± 0.006 2.00 ± 0.15	0.049 ± 0.004 1.25 ± 0.10	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
ON # 0005)/7D	25V	0.15uF - 4.7uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
CML0805X7R	50)/	100pF - 0.12uF	0.079 ± 0.006 2.00 ± 0.15	0.049 ± 0.004 1.25 ± 0.10	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
	50V	0.15uF - 2.2uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
	4001/	100pF - 0.022uF	0.079 ± 0.006 2.00 ± 0.15	0.049 ± 0.004 1.25 ± 0.10	0.031 ± 0.004 0.80 ± 0.10	0.020 ± 0.008 0.50 ± 0.20	inches mm	4000	-
	100V	0.027uF - 0.47uF	0.079 ± 0.008 2.00 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.049 ± 0.008 1.25 ± 0.20	0.020 ± 0.008 0.50 ± 0.20	inches mm	-	3000
		150pF - 0.12uF	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	-
	401/	0.15uF - 0.39uF	0.126 ± 0.006 3.20 ± 0.15	0.063 ± 0.006 1.60 ± 0.15	0.037 ± 0.004 0.95 ± 0.10	0.024 ± 0.008 0.60 ± 0.20	inches mm	-	3000
	10V and 16V	0.47uF - 2.2uF	0.126 ± 0.006 3.20 ± 0.15	0.063 ± 0.006 1.60 ± 0.15	0.045 ± 0.006 1.15 ± 0.15	0.024 ± 0.008 0.60 ± 0.20	inches mm	-	3000
		3.3uF - 22uF	0.130 ± 0.012 3.30 ± 0.30	0.067 ± 0.008 1.70 ± 0.20	0.067 ± 0.008 1.70 ± 0.20	0.024 ± 0.008 0.60 ± 0.20	inches mm	-	3000
		150pF - 0.12uF	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	-
	051/	0.15uF - 0.39uF	0.126 ± 0.006 3.20 ± 0.15	0.063 ± 0.006 1.60 ± 0.15	0.037 ± 0.004 0.95 ± 0.10	0.024 ± 0.008 0.60 ± 0.20	inches mm	-	3000
	25V	0.47uF - 2.2uF	0.126 ± 0.006 3.20 ± 0.15	0.063 ± 0.006 1.60 ± 0.15	0.045 ± 0.006 1.15 ± 0.15	0.024 ± 0.008 0.60 ± 0.20	inches mm	-	3000
OM 1000)/75		3.3uF - 22uF	0.130 ± 0.012 3.30 ± 0.30	0.067 ± 0.008 1.70 ± 0.20	0.067 ± 0.008 1.70 ± 0.20	0.024 ± 0.008 0.60 ± 0.20	inches mm	-	3000
CML1206X7R		150pF - 0.12uF	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	-
	50)/	0.15uF - 0.22uF	0.126 ± 0.006 3.20 ± 0.15	0.063 ± 0.006 1.60 ± 0.15	0.037 ± 0.004 0.95 ± 0.10	0.024 ± 0.008 0.60 ± 0.20	inches mm	-	3000
	50V	0.27uF - 0.33uF	0.126 ± 0.006 3.20 ± 0.15	0.063 ± 0.006 1.60 ± 0.15	0.049 ± 0.004 1.25 ± 0.10	0.024 ± 0.008 0.60 ± 0.20	inches mm	-	3000
		0.39uF - 4.7uF	0.130 ± 0.012 3.30 ± 0.30	0.067 ± 0.008 1.70 ± 0.20	0.067 ± 0.008 1.70 ± 0.20		inches mm	-	2000
		150pF - 0.068uF	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	-
	4001/	0.082uF and 0.12uF	0.126 ± 0.006 3.20 ± 0.15	0.063 ± 0.006 1.60 ± 0.15	0.049 ± 0.004 1.25 ± 0.10	0.024 ± 0.008 0.60 ± 0.20	inches mm	-	3000
	100V	0.1uF	0.126 ± 0.006 3.20 ± 0.15	0.063 ± 0.006 1.60 ± 0.15	0.037 ± 0.004 0.95 ± 0.10	0.024 ± 0.008 0.60 ± 0.20	inches mm	-	3000
		0.15uF - 3.3uF	0.130 ± 0.012 3.30 ± 0.30	0.067 ± 0.008 1.70 ± 0.20	0.067 ± 0.012 1.70 ± 0.30	0.024 ± 0.008 0.60 ± 0.20	inches mm	-	2000

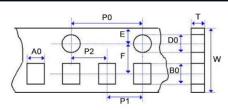
	N	lechanical Sp	ecifications	and Packa	iging Speci	fications (c	ont.)		
Type/Code	Voltage	Capacitance Range	L	W	н	а	Unit	Packaging (7" Reel) Qty. Plastic Tape
		1000pF - 0.47uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.008 2.50 ± 0.20	0.037 ± 0.004 0.95 ± 0.10	0.030 ± 0.010 0.75 ± 0.25	inches mm	-	3000
	10V	0.56uF - 1.0uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.008 2.50 ± 0.20	0.049 ± 0.004 1.25 ± 0.10	0.030 ± 0.010 0.75 ± 0.25	inches mm	-	3000
	100	4.7uF and 10uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.008 2.50 ± 0.20	0.079 ± 0.004 2.00 ± 0.10	0.030 ± 0.010 0.75 ± 0.25	inches mm	-	1000
		22uF and 47uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.008 2.50 ± 0.20	0.098 ± 0.004 2.50 ± 0.10	0.030 ± 0.010 0.75 ± 0.25	inches mm	-	1000
		1000pF - 0.47uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.008 2.50 ± 0.20	0.037 ± 0.004 0.95 ± 0.10	0.030 ± 0.010 0.75 ± 0.25	inches mm	-	3000
		0.56uF to 1.0uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.008 2.50 ± 0.20	0.049 ± 0.004 1.25 ± 0.10	0.030 ± 0.010 0.75 ± 0.25	inches mm	-	3000
	16V and 25V	1.5uF to 3.3uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.008 2.50 ± 0.20	0.071 ± 0.008 1.80 ± 0.20	0.030 ± 0.010 0.75 ± 0.25	inches mm	-	2000
		4.7uF and 10uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.008 2.50 ± 0.20	0.079 ± 0.004 2.00 ± 0.10	0.030 ± 0.010 0.75 ± 0.25	inches mm	-	1000
CML1210X7R		22uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.008 2.50 ± 0.20	0.098 ± 0.004 2.50 ± 0.10	0.030 ± 0.010 0.75 ± 0.25	inches mm	-	1000
		1000pF - 0.27uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.008 2.50 ± 0.20	0.037 ± 0.004 0.95 ± 0.10	0.030 ± 0.010 0.75 ± 0.25	inches mm	-	3000
	50V	0.33uF - 1.0uF	0.126 ± 0.012 3.20 ± 0.30	0.098 ± 0.008 2.50 ± 0.20 0.098 ± 0.012	0.049 ± 0.004 1.25 ± 0.10	0.030 ± 0.010 0.75 ± 0.25 0.030 ± 0.010	inches mm	-	3000
		1.5uF - 10uF	0.126 ± 0.016 3.20 ± 0.40 0.126 ± 0.012	0.098 ± 0.012 2.50 ± 0.30 0.098 ± 0.008	0.098 ± 0.012 2.50 ± 0.30 0.037 ± 0.004	0.030 ± 0.010 0.75 ± 0.25 0.030 ± 0.010	inches mm	-	1000
		1000pF - 0.12uF	3.20 ± 0.012 3.20 ± 0.30 0.126 ± 0.012	2.50 ± 0.008 0.098 ± 0.008	0.037 ± 0.004 0.95 ± 0.10 0.049 ± 0.004	0.030 ± 0.010 0.75 ± 0.25 0.030 ± 0.010	inches mm inches	-	3000
		0.15uF - 0.22uF	3.20 ± 0.012 3.20 ± 0.30 0.126 ± 0.012	2.50 ± 0.008 0.098 ± 0.008	1.25 ± 0.10 0.071 ± 0.008	0.030 ± 0.010 0.75 ± 0.25 0.030 ± 0.010	mm	-	3000
	100V	0.27uF and 0.33uF 0.39uF - 0.56uF	3.20 ± 0.30 0.126 ± 0.016	2.50 ± 0.20 0.098 ± 0.012	1.80 ± 0.20 0.098 ± 0.012	0.75 ± 0.25 0.030 ± 0.010	mm	-	2000
		1.5uF - 4.7uF	3.20 ± 0.40 0.126 ± 0.016	2.50 ± 0.30 0.098 ± 0.012	2.50 ± 0.30 0.083 ± 0.012	0.75 ± 0.25 0.030 ± 0.010	mm	-	1000
		0.68uF - 1.0uF	3.20 ± 0.40 0.177 ± 0.016	2.50 ± 0.30 0.126 ± 0.012	2.10 ± 0.30 0.049 ± 0.004	0.75 ± 0.25 0.030 ± 0.010	mm	-	1000
	10V and 16V	1000pF to 1.0uF	4.50 ± 0.40 0.177 ± 0.016	3.20 ± 0.30 0.126 ± 0.012	1.25 ± 0.10 0.049 ± 0.004	0.75 ± 0.25 0.030 ± 0.010	mm	-	1000
		1000pF to 1.5uF	4.50 ± 0.40 0.177 ± 0.016	3.20 ± 0.30 0.126 ± 0.012	1.25 ± 0.10 0.063 ± 0.008	0.75 ± 0.25 0.030 ± 0.010	mm	-	1000
	25V	2.2uF	4.50 ± 0.40 0.177 ± 0.016	3.20 ± 0.30 0.126 ± 0.012	1.60 ± 0.20 0.079 ± 0.008	0.75 ± 0.25 0.030 ± 0.010	mm inches	-	1000
		3.3uF 4.7uF - 10uF	4.50 ± 0.40 0.177 ± 0.016	3.20 ± 0.30 0.126 ± 0.016	2.00 ± 0.20 0.098 ± 0.008	0.75 ± 0.25 0.030 ± 0.010	mm inches	-	1000
CML1812X7R		1000pF - 0.56uF	4.50 ± 0.40 0.177 ± 0.016	3.20 ± 0.40 0.126 ± 0.012	2.50 ± 0.20 0.049 ± 0.004	0.75 ± 0.25 0.030 ± 0.010	mm inches	_	1000
OWE TO TEXT IT	50V	0.68uF - 1.5uF	4.50 ± 0.40 0.177 ± 0.016	3.20 ± 0.30 0.126 ± 0.012	1.25 ± 0.10 0.079 ± 0.008	0.75 ± 0.25 0.030 ± 0.010	mm inches	_	1000
		3.3uF 2.2uF	4.50 ± 0.40 0.177 ± 0.016	3.20 ± 0.30 0.126 ± 0.012	2.00 ± 0.20 0.098 ± 0.012	0.75 ± 0.25 0.030 ± 0.010	mm inches	-	500
		4.7uF - 10uF 1000pF - 0.39uF	4.50 ± 0.40 0.177 ± 0.016	3.20 ± 0.30 0.126 ± 0.012	2.50 ± 0.30 0.049 ± 0.004	0.75 ± 0.25 0.030 ± 0.010	inches	-	1000
	100V	0.47uF - 1.5uF	4.50 ± 0.40 0.177 ± 0.016	3.20 ± 0.30 0.126 ± 0.012	1.25 ± 0.10 0.079 ± 0.008	0.75 ± 0.25 0.030 ± 0.010 0.75 ± 0.25	inches	-	1000
		2.2uF	4.50 ± 0.40 0.177 ± 0.016 4.50 ± 0.40	3.20 ± 0.30 0.126 ± 0.016 3.20 ± 0.40	2.00 ± 0.20 0.098 ± 0.012 2.50 ± 0.30	0.75 ± 0.25 0.030 ± 0.010 0.75 ± 0.25	inches mm	-	500

		Environmental Characteristi	cs
Test		Test Specification	Test Condition
Capacitance		Should be within the specified tolerance.	X7R: (Class II) Cap ≤ 10uF 1.0 ± 0.2 Vrms, 1 KHz ± 10% Cap > 10uF 0.5 ± 0.1 Vrms, 120 Hz ± 10%
	100V - 2.5%	(except for 0603 ≥ 0.068uF, 0805 ≥ 0.1uF, 1206 ≥ 0.47uF, 1210 ≥ 2.2uF, 1812 ≥ 4.7uF are all 10%)	
	50V - 2.5%	(except for 0201, 0402 ≥ 0.012uF, 0603 ≥ 0.1uF, 0805 ≥ 0.18uF, 1206 ≥ 2.2uF, 1210 ≥ 10uF, 1812 ≥ 4.7uF are all 10%	
Dissipation Factor	25V - 3.5%	(except for 0201 ≥ 0.01uF, 0402 ≥ 0.056uF, 0603 ≥ 0.33uF, 0805 ≥ 1uF, 1206 ≥ 4.7uF, 1210 ≥ 22uF are all 10%	Cap ≤ 10uF 1.0 ± 0.2 Vrms, 1 KHz ± 10% Cap > 10uF 0.5 ± 0.1 Vrms, 120 Hz ± 10%
(DF)	16V - 3.5%	(except for 0201 ≥ 0.01uF, 0402 ≥ 0.033uF, 0603 ≥ 0.15uF, 0805 ≥ 0.68uF, 1206 ≥ 2.2uF, 1210 ≥ 22uF are all 10%	
	10V - 5%	(except for 0201 ≥ 0.012uF, 0402 ≥ 0.15uF, 0603 ≥ 0.33uF, 0805 ≥ 2.2uF, 1206 ≥ 2.2uF, 1210 ≥ 22uF are all 10%, and 0201 ≥ 0.1uF, and 0402 ≥ 1uF are all 15%	
Insulation Resistance	X7R (Class II)	C ≤ 25nF, Ri ≥ 10000M Ω C > 25nF, RI*CR > 100S	Measuring Voltage: Rated Voltage (Max 500V) Duration: 60 ± 5 seconds Test Humidity: ≤ 75% Test Temperature: 25°C ± 5°C Test Current: ≤ 50 mA
Dielectric Withstanding Voltage		No breakdown or damage.	Measuring voltage: Class II: 250% rated voltage Duration: 1 ~ 5 seconds Charge/Discharge Current: 50 mA max.
Solderability	At leas	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 Solder Temperature: 235°C ± 5% (Sn/Pb: 63/37) Duration: 2 ± 0.5 seconds Solder Temperature: 245°C ± 5°C (Lead-free) Duration: 2 ± 0.5 seconds
	Item	X7R	Preheating Conditions: 100°C to 200°C; 10 ± 2 minutes
Resistance to	Δ C/C	-5 ~ + 10%	Solder Temperature: 265°C ± 5°C Duration: 10 ± 1 seconds
Soldering	DF	Same to initial value	Clean the capacitor with solvent and examine it with
Heat	IR	Same to initial value	a 10X (min.) microscope.
	Appearance: No v	risible 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%	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

	Environmental Characteristics	(cont.)		
Test	Test Specification		Test Condition	
Termination	No visible damage		Applied Force: 5 N	
Adhesion	140 Visible damage		Ouration: 10 ± 1 secon	
			ditions: up-category to	•
		Re	covery Time: 24 ± 1 l Initial Measurement	
		Cycling	times: 5 times, 1 cycl	
		Step	Temp. (°C)	Time (min.)
	V7D A 0/0 4 + 400/		Low-category	(**************************************
	X7R: Δ C/C: ≤ ± 10%	1	temp.	30 ± 3
Temperature			X7R: -55°C	
Cycle		2	Normal temp.	2 - 3
			(+20°C)	
		3	Up-category temp.	30 ± 3
			X7R: +125°C	30 2 0
		4	Normal temp.	2 - 3
			(+20°C)	
		Recove	ery time after test: 24	± 2 hours
	X7R: ∆ C/C: ≤ 12.5%	_	400C · ·	000
Moisture	DF: Not more than twice of initial value.		emperature: 40°C ± 2 dumidity: 90 ~ 95% R	
Resistance	IR: X7R: Ri ≥ 1000M Ω or RI*CR ≥ 25S whichever is smaller		Duration: 500 hours	
1100.010.100	Appearance: No visible damage	Recover	/ Conditions: Room to	
	11		very Time: 48 hours (•
	X7R: Δ C/C: ≤ ± 25%		Low-voltage (< 100V	/)
		Applie	d Voltage: 1.5 x rated	•
	DF: Not more than twice of initial value.	_	Duration: 1000 hour	
Life Test	IR: X7R: Ri ≥ 2000M Ω or RI*CR ≥ 50 S whichever is smaller		emperature: 125°C (X	·
	Appearance: No visible damage		Discharge Current: 5 Conditions: Room to	
			very Time: 48 hours (
			100V ≤ rated voltage	
	X7R: Δ C/C: ≤ ± 20%	500V ≤ ra	ted voltage ≤ 1000V:	1.5 multiple
Middle and	DF: Not more than twice of initial value.	> 100	0V rated voltage: 1.2	multiple
High Voltage	IR: X7R Ri ≥ 2000M Ω or Ri*CR ≥ 50 S whichever is smaller		Duration: 1000 hour	
Life Test	Appearance: No visible damage	•	Discharge Current: 5	
			emperature: 125°C (X	
			/ Conditions: Room to very Time: 48 hours (•
		Keco/	rery Time. 40 Hours (Ciass II)

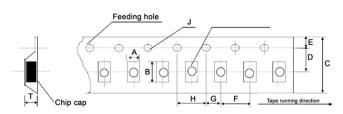


Packaging Specifications - Paper Tape



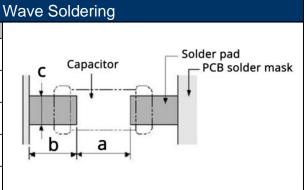
Type/Code	A0	В0	Т	W	P0	Unit
CML0402X7R	0.026 ± 0.004	0.045 ± 0.004	0.031 below	0.315 ± 0.004	0.157 ± 0.004	inches
CIVILU402X/K	0.65 ± 0.10	1.15 ± 0.10	0.80 below	8.00 ± 0.10	4.00 ± 0.10	mm
CML0603X7R	0.043 ± 0.004	0.075 ± 0.004	0.043 max	0.315 ± 0.004	0.157 ± 0.004	inches
CIVILUOUSATA	1.10 ± 0.10	1.90 ± 0.10	1.10 max	8.00 ± 0.10	4.00 ± 0.10	mm
CML0805X7R	0.057 ± 0.006	0.091 ± 0.006	0.043 max	0.315 ± 0.006	0.157 ± 0.004	inches
CIVILUOUSATA	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 ± 0.20	1.10 max	8.00 ± 0.20	4.00 ± 0.10	mm
Type/Code	P1	P2	D0	Е	F	Unit
71	P1 0.079 ± 0.002	P2 0.079 ± 0.002	D0 0.059-0/+0.004	E 0.069 ± 0.002	F 0.138 ± 0.002	Unit inches
Type/Code CML0402X7R				_	·	
CML0402X7R	0.079 ± 0.002	0.079 ± 0.002	0.059-0/+0.004	0.069 ± 0.002	0.138 ± 0.002	inches
71	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
CML0402X7R CML0603X7R	0.079 ± 0.002 2.00 ± 0.05 0.079 ± 0.004	0.079 ± 0.002 2.00 ± 0.05 0.157 ± 0.002	0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004	0.069 ± 0.002 1.75 ± 0.05 0.069 ± 0.002	0.138 ± 0.002 3.50 ± 0.05 0.138 ± 0.002	inches mm inches
CML0402X7R	0.079 ± 0.002 2.00 ± 0.05 0.079 ± 0.004 2.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05 0.157 ± 0.002 4.00 ± 0.05	0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004 1.5-0/+0.10	0.069 ± 0.002 1.75 ± 0.05 0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05 0.138 ± 0.002 3.50 ± 0.05	inches mm inches mm
CML0402X7R CML0603X7R	0.079 ± 0.002 2.00 ± 0.05 0.079 ± 0.004 2.00 ± 0.10 0.079 ± 0.004	0.079 ± 0.002 2.00 ± 0.05 0.157 ± 0.002 4.00 ± 0.05 0.157 ± 0.004	0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004 1.5-0/+0.10 0.059-0/+0.004	0.069 ± 0.002 1.75 ± 0.05 0.069 ± 0.002 1.75 ± 0.05 0.069 ± 0.002	0.138 ± 0.002 3.50 ± 0.05 0.138 ± 0.002 3.50 ± 0.05 0.138 ± 0.002	inches mm inches mm inches

Packaging Specifications - Plastic Tape



Type/Code	Α	В	С	D	Е	Unit
CML0805X7R	0.061 ± 0.008	0.093 ± 0.008	0.315 ± 0.008	0.138 ± 0.002	0.069 ± 0.004	inches
CIVILUOUSATA	1.55 ± 0.20	2.35 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	mm
CML1206X7R	0.077 ± 0.008	0.142 ± 0.008	0.315 ± 0.008	0.138 ± 0.002	0.069 ± 0.004	inches
CIVIL 1200X/ K	1.95 ± 0.20	3.60 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	mm
CML1210X7R	0.106 ± 0.004	0.135 ± 0.004	0.315 ± 0.004	0.138 ± 0.002	0.069 ± 0.004	inches
CIVIL 12 TUX/ K	2.70 ± 0.10	3.42 ± 0.10	8.00 ± 0.10	3.50 ± 0.05	1.75 ± 0.10	mm
CML1812X7R	0.144 ± 0.004	0.195 ± 0.004	0.472 ± 0.004	0.217 ± 0.002	0.069 ± 0.004	inches
CIVIL 1012X/K	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
CML0805X7R	0.157 ± 0.004	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	0.059 max	inches
CIVILUOUSA/R	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.50 max	mm
CML1206X7R	0.157 ± 0.004	0.079 ± 0.004	0.157 ± 0.004	0.059-0/+0.004	0.073 max	inches
CIVIL 1200A/R	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.5-0/+0.10	1.85 max	mm
CML1210X7R	0.157 ± 0.004	0.079 ± 0.002	0.157 ± 0.004	0.059-0/+0.004	0.126 max	inches
CIVIL 12 TUX/ K	4.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	1.5-0/+0.10	3.20 max	mm
CML1812X7R	0.315 ± 0.004	0.079 ± 0.002	0.157 ± 0.004	0.059-0/+0.004	0.157 max	inches
GIVIL 10 12 A/ K	8.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	1.5-0/+0.10	4.00 max	mm

	Recommended Solder Pad for N												
Type	0603	0805	1206	1210	Unit								
Length (L)	0.063	0.079	0.126	0.126	inches								
Length (L)	1.60	2.00	3.20	3.20	mm								
Width (W)	0.031	0.049	0.063	0.098	inches								
vviatii (vv)	0.80	1.25	1.60	2.50	mm								
а	0.031 ~ 0.039	0.039 ~ 0.055	0.071 ~ 0.098	0.071 ~ 0.098	inches								
а	0.80 ~ 1.00	1.00 ~ 1.40	1.80 ~ 2.50	1.80 ~ 2.50	mm								
b	0.020 ~ 0.031	0.031 ~ 0.059	0.031 ~ 0.067	0.031 ~ 0.067	inches								
	0.50 ~ 0.80	0.80 ~ 1.50	0.80 ~ 1.70	0.80 ~ 1.70	mm								
С	0.024 ~ 0.031	0.035 ~ 0.047	0.047 ~ 0.063	0.071 ~ 0.098	inches								
	0.60 ~ 0.80	0.90 ~ 1.20	1.20 ~ 1.60	1.80 ~ 2.50	mm								



NOTE: Solder pad information is for reference only.

	Reco	mmended S	older Pad for	Reflow Sold	ering		
Туре	0402	0603	0805	1206	1210	1812	Unit
Length (L)	0.043	0.063	0.079	0.126	0.126	0.177	inches
Length (L)	1.10	1.60	2.00	3.20	3.20	4.50	mm
Width (W)	0.020	0.031	0.049	0.063	0.098	0.126	inches
vviatii (vv)	0.50	0.80	1.25	1.60	2.50	3.20	mm
	0.018 ~ 0.022	0.024 ~ 0.031	0.031 ~ 0.047	0.071 ~ 0.098	0.071 ~ 0.098	0.098 ~ 0.138	inches
a	0.45 ~ 0.55	0.60 ~ 0.80	0.80 ~ 1.20	1.80 ~ 2.50	1.80 ~ 2.50	2.50 ~ 3.50	mm
b	0.016 ~ 0.020	0.024 ~ 0.031	0.024 ~ 0.047	0.024 ~ 0.059	0.024 ~ 0.059	0.039 ~ 0.071	inches
D D	0.40 ~ 0.50	0.60 ~ 0.80	0.60 ~ 1.20	0.60 ~ 1.50	0.60 ~ 1.50	1.00 ~ 1.80	mm
	0.018 ~ 0.022	0.024 ~ 0.031	0.035 ~ 0.063	0.047 ~ 0.079	0.071 ~ 0.126	0.091 ~ 0.138	inches
С	0.45 ~ 0.55	0.60 ~ 0.80	0.90 ~ 1.60	1.20 ~ 2.00	1.80 ~ 3.20	2.30 ~ 3.50	mm

NOTE: Solder pad information is for reference only.

Stackpole Electronics, Inc.

Multilayer Ceramic Chip Capacitor

Resistive Product Solutions

RoHS Compliance

Stackpole Electronics has joined the worldwide effort to reduce the amount of lead in electronic components and to meet the various regulatory requirements now prevalent, such as the European Union's directive regarding "Restrictions on Hazardous Substances" (RoHS 3). As part of this ongoing program, we periodically update this document with the status regarding the availability of our compliant components. All our standard part numbers are compliant to EU Directive 2011/65/EU of the European Parliament as amended by Directive (EU) 2015/863/EU as regards the list of restricted substances.

	RoHS Compliance Status											
Standard Product Series	Description	Package / Termination Type	Standard Series RoHS Compliant	Lead-Free Termination Composition	Lead-Free Mfg. Effective Date (Std Product Series)	Lead-Free Effective Date Code (YY/WW)						
CML	Multilayer Ceramic Chip Capacitor	SMD	YES	100% Matte Sn over Ni	Always	Always						

"Conflict Metals" Commitment

We at Stackpole Electronics, Inc. are joined with our industry in opposing the use of metals mined in the "conflict region" of the eastern Democratic Republic of the Congo (DRC) in our products. Recognizing that the supply chain for metals used in the electronics industry is very complex, we work closely with our own suppliers to verify to the extent possible that the materials and products we supply do not contain metals sourced from this conflict region. As such, we are in compliance with the requirements of Dodd-Frank Act regarding Conflict Minerals.

Compliance to "REACH"

We certify that all passive components supplied by Stackpole Electronics, Inc. are SVHC (Substances of Very High Concern) free and compliant with the requirements of EU Directive 1907/2006/EC, "The Registration, Evaluation, Authorization and Restriction of Chemicals", otherwise referred to as REACH. Contact us for complete list of REACH Substance Candidate List.

Environmental Policy

It is the policy of Stackpole Electronics, Inc. to protect the environment in all localities in which we operate. We continually strive to improve our effect on the environment. We observe all applicable laws and regulations regarding the protection of our environment and all requests related to the environment to which we have agreed. We are committed to the prevention of all forms of pollution.