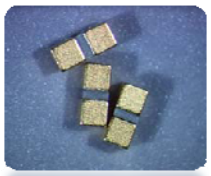
Milli-Cap®



The "Ideal" SMT Capacitor

Benefits:

- *0201, 0402, 0502 and 0602 footprints*
- *Increased Usable Bandwidth*
- *Ultra high series resonance*
- *Low loss, High Q*

Functional Applications:

- *Matching filter applications*
- *Test Equipment*
- *Photonics*
- *SONET*

Part Number Identification

P	42	CG	1R5	C	5	S	T
Product P = Milli-Cap®	**Case Size**	**Material**	**Capacitance**	**Capacitance Tolerance**	**Voltage Rating** 5 = 50VDC	**Termination**	**Packaging**

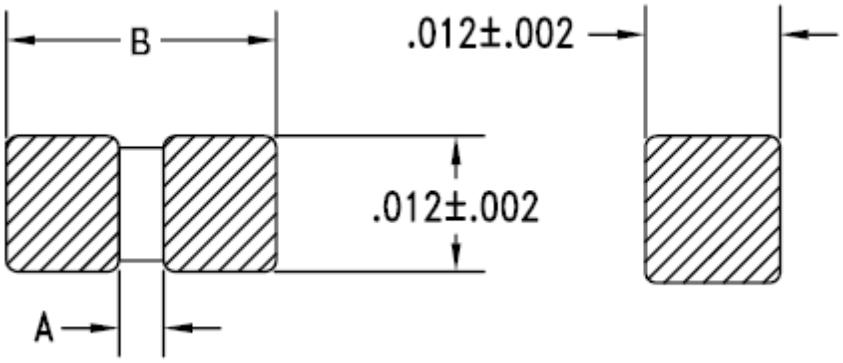


Figure 1 P21 (0201) Outline

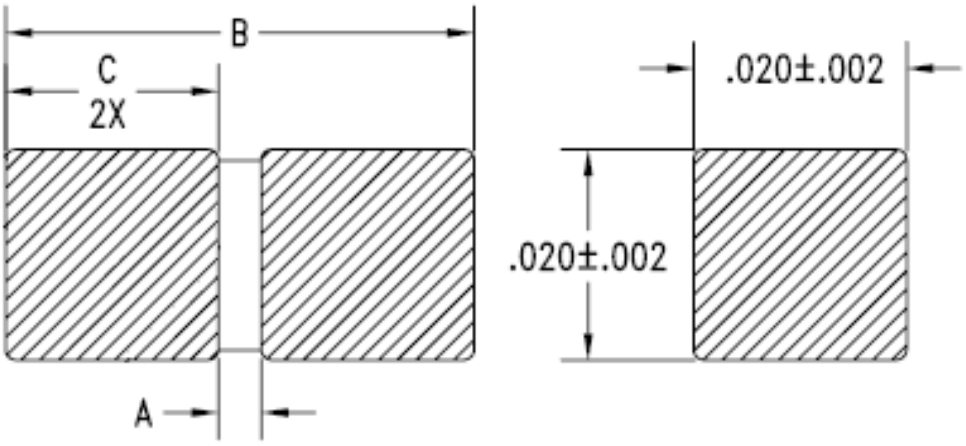


Figure 2 P42 (0402), P02 (0502) and P62 (0602) Outline

Drawings are not to scale.

Dielectric Laboratories Inc.
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QUALITY SYSTEMS AS9100, ISO 9001 AND ENVIRONMENTAL SYSTEM ISO 14001 CERTIFIED

Case Sizes and Ceramic Materials

Case Size Definitions

Case Size Code	Figure	Dim "A"	Dim "B" MAX	Dim "C" MAX
21 (0201)	1	See Capacitance Range Tables	0.024"	0.010"
42 (0402)	2		0.044"	0.020"
02 (0502)	2		0.054"	0.025"
62 (0602)	2		0.064"	0.030"

Ceramic Material Options

DLI Material Code	Temperature Coefficient Of Capacitance (-55°C to 125°C)	1 MHz Maximum Dissipation Factor	25°C Insulation Resistance
CF	0 ± 15 ppm/°C	0.60%	$>10^6\ \Omega$
CD	-20 ± 15 ppm/°C	0.15%	$>10^6\ \Omega$
CG	0 ± 30 ppm/°C	0.70%	$>10^6\ \Omega$
NR	-1500 ± 500 ppm/°C	0.25%	$>10^6\ \Omega$
NV	-4700 ± 1000 ppm/°C	1.20%	$>10^6\ \Omega$
BN	± 15%	3.0%	$>10^5\ \Omega$

Capacitance and Tolerance

Capacitance Code Definition

First Two Digits (If no 'R' is present)	Capacitance (pF)
Third Digit	10^x Multiplier
'R'	Decimal Point
Examples:	121 = 120 pF (12×10^1)
	120 = 12 pF (12×10^0)
	1R2 = 1.2 pF
	R12 = 0.12 pF

Capacitance Tolerance Options

Code	Description	Capacitance Range
A	± 0.05 pF	≤ 0.5 pF
B	± 0.1 pF	≤ 1.0 pF
C	± 0.25 pF	≤ 2.5 pF
K	± 10%	> 2.5 pF
M	± 20%	All with 'BN' Material

Available Capacitance Ranges

Capacitance Ranges for P21 (0201) Case Size (Figure 1)

Material	Capacitance Range (pF)	Dim "A"
CF	0.2 – 0.5	0.006" (+ .001", -.002")
CD	0.5 – 0.8	0.006" (+ .001", -.002")
CG	0.6 – 1.5	0.006" (+ .001", -.002")
NR	1.3 – 3.9	0.006" (+ .001", -.002")
NV	7.5 – 15	0.006" (+ .001", -.002")
BN	36 – 82	0.006" (± .001")

Capacitance Ranges for P42 (0402), P02 (0502) and P62 (0602) Case Sizes (Figure 2)

Material	Material Capacitance Range (pF)	Dim "A" and Maximum Capacitance (pF)		
		0.006" (+.001", -.002")	0.008" (± .001")	0.010" (± .001")
CF	0.2 – 0.5	0.5	0.3	0.2
CD	0.5 – 0.8	0.8	0.5	N/A
CG	0.6 – 1.5	1.5	0.8	0.6
NR	1.3 – 3.9	3.9	2.2	1.3
NV	7.5 – 15	15	10	7.5
BN	36 – 82	82	57	39

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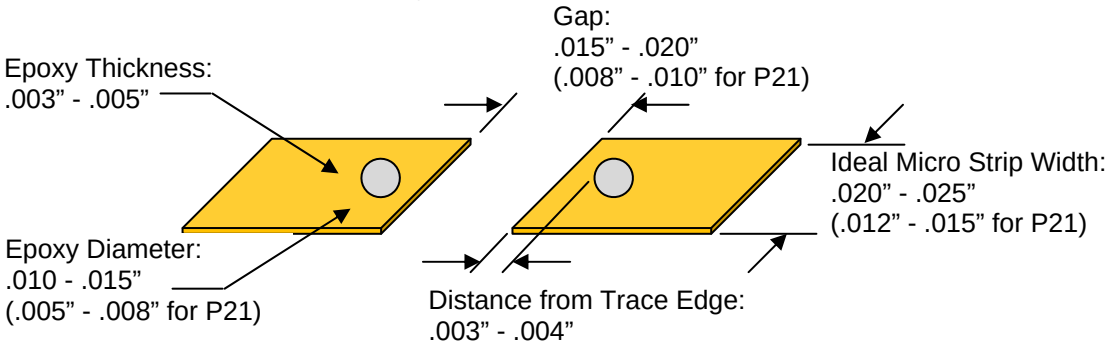
Termination Finish and Recommended Attachment Methods

Termination Finish	
Code	**Description**
S	7.5 ± 5µ" Au over 50µ" minimum Ni

Recommended Attachment Materials:

- Conductive Epoxy (EPO TEK® H20E, Ablebond® 84-1 LMI, etc.)
- Solder (SN62, SN63, etc.)

- ***Recommended Attachment to Soft or Hard Substrate Using Conductive Epoxy:***
  - ***Recommended Micro Strip Layout:***



  - ***Attachment Method***
    1. Place a single drop of conductive epoxy onto each micro-strip as illustrated; the edge of the epoxy shall be at least .003"- .004" back from the edge of the trace to prevent filling the gap with epoxy.
    2. Centering the termination gap of the capacitor within the gap in the micro strip, press with careful, even pressure onto the micro strip ensuring the terminations make good contact with the epoxy drops.
    3. Cure according to the epoxy manufacturer's preferred schedule
       - Typically 125°C to 150°C Max.
    4. After curing, inspect joint for epoxy shorts across the termination and micro strip gaps that would cause a short across the cap.

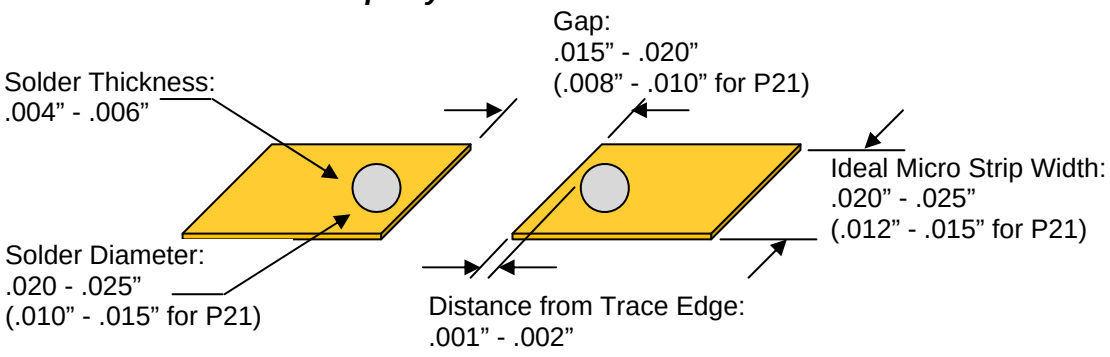
Isopropanol, and Methanol are both safe to use to pre clean Milli-Caps®
They are not to be used after mounting with conductive epoxy as they act as a solvent!



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Recommended Attachment Methods (Continued)

- **Recommended Attachment to Soft or Hard Substrate Using Solder:**
  - **Recommended Micro Strip Layout:**



  - **Attachment Method**

1. Place a single drop of solder paste onto each micro-strip as illustrated; the edge of the epoxy shall be at least .001"- .002" back from the edge of the trace to prevent filling the gap with solder.
2. Centering the termination gap of the capacitor within the gap in the micro strip, press with careful, even pressure onto the micro strip ensuring the terminations make good contact with the drops of solder paste.
3. Reflow according to the solder manufacturer's preferred profile, ensuring the reflow temperature does not exceed 250°C.
4. After the reflow step is completed, inspect joint for voids or excess flux and non-reflowed solder balls that can degrade performance or cause shorts across the gaps. Proper cleaning after the reflow process is crucial to avoiding performance degradation and discovering poor solder joints.

Isopropanol, and Methanol are both safe to use with soldered Milli-Caps®.

Packaging

Packaging Options	
Code	**Description**
Blank	Generic Waffle Pack
T	Tape and Reel, 7" Reel, 100pc Minimum, 5,000pc Maximum **(Consult with a sales representative for availability)**
S	Customer Specified (Drawing required, tooling charges may apply)

