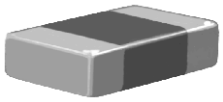
Multilayer Ceramic Chip Capacitors



FEATURES

- C0G is an ultra-stable dielectric offering a Temperature Coefficient of Capacitance (TCC) of 0 ± 30 ppm/°C
- Low Dissipation Factor (DF)
- Ideal for critical timing and tuning applications
- Ideal for snubber and surge suppression applications

RoHS COMPLIANT

GENERAL SPECIFICATIONS

NOTE: Electrical characteristics at + 25 °C unless otherwise specified

Capacitance Range: 1.0 pF to 0.056 µF

Temperature Coefficient of Capacitance (TCC):
0 ± 30 ppm/°C from - 55 °C to + 125 °C

Dissipation Factor (DF):
0.1 % maximum at 1.0 Vrms and 1 kHz for values > 1000 pF
0.1 % maximum at 1.0 Vrms and 1 MHz for values ≤ 1000 pF

Insulation Resistance (IR):
At + 25 °C and rated voltage 100 000 MΩ minimum or 1000 ΩF, whichever is less
At + 125 °C and rated voltage 10 000 MΩ minimum or 100 ΩF, whichever is less

Dielectric Withstanding Voltage (DWV):
This is the maximum voltage the capacitors are tested for a 1 to 5 second period and the charge/discharge current does not exceed 50 mA
≤ 200 Vdc : DWV at 250 % of rated voltage
500 Vdc: DWV at 200 % of rated voltage
630/1000 Vdc: DWV at 150 % of rated voltage
3000 Vdc: DWV at 120 % of rated voltage

ORDERING INFORMATION

VJ0805[3]	A	102	K	X	A	A	T	###[2]
CASE CODE	DIELECTRIC	CAPACITANCE NOMINAL CODE	CAPACITANCE TOLERANCE	TERMINATION	DC VOLTAGE RATING[1]	MARKING	PACKAGING	PROCESS CODE
0402 0603 0805 1206 1210 1808 1812 1825 2220 2225	A = C0G (NP0)	Expressed in picofarads (pF). The first two digits are significant, the third is a multiplier. An "R" indicates a decimal point. **Examples:** 102 = 1000 pF 1R8 = 1.8 pF	B = ± 0.10 pF C = ± 0.25 pF D = ± 0.5 pF F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 % **NOTE:** B, C, D < 10 pF F, G, J, K ≥ 10 pF	X = Ni barrier 100 % tin plated F = AgPd	X = 25 V A = 50 V B = 100 V C = 200 V E = 500 V L = 630 V G = 1000 V H = 3000 V	A = Unmarked M = Marked **NOTE:** Marking is only available for 0805 and 1206	T = 7" reel/plastic tape C = 7" reel/paper tape R = 11 1/4" reel/plastic tape P = 11 1/4" reel/paper tape O = 7" reel/flamed paper tape I = 11 1/4"/13" reel/flamed paper tape **NOTE:** "I" and "O" is used for "F" termination paper taped	

Note
1. DC voltage rating should not be exceeded in application
2. Process Code may be added with up to three digits, used to control non-standard products and/or special requirements
3. Case size designator may be replaced by a four digit drawing number used to control non-standard products and/or requirements

C0G (NP0) DIELECTRIC

STYLE		VJ0402			VJ0603			VJ0805				VJ1206					VJ1210[1)]				
EIA TYPE		0402			0603			0805				1206					1210				
VOLTAGE (Vdc)		25	50	100	50	100	200	50	100	200	500	50	100	200	500	630	50	100	200	500	630
CAP. CODE	CAP.																				
1R0	1.0 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
1R2	1.2 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
1R5	1.5 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
1R8	1.8 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
2R2	2.2 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
2R7	2.7 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
3R3	3.3 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
3R9	3.9 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
4R7	4.7 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
5R6	5.6 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
6R8	6.8 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
8R2	8.2 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•					
100	10 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•		
120	12 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•		
150	15 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•		
180	18 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•		
220	22 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•		
270	27 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•		
330	33 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•		
390	39 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•		
470	47 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•		
560	56 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•	•	•
680	68 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•	•	•
820	82 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•	•	•
101	100 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•	•	•
121	120 pF	••	••	••	••	••	••	••	••	••	•	•	•	•	•	•			•	•	•
151	150 pF	••	••		••	••	••	••	••	••	•	•	•	•	•	•			•	•	•
181	180 pF	••	••		••	••	••	••	••	••	•	•	•	•	•	•			•	•	•
221	220 pF	••	••		••	••	••	••	••	••	•	•	•	•	•	•	•	•	•	•	•
271	270 pF				••	••	••	••	••	••	•	•	•	•	•	•	•	•	•	•	•
331	330 pF				••	••		••	••	••	•	•	•	•	•	•	•	•	•	•	•
391	390 pF				••	••		••	••	••	•	•	•	•	•	•	•	•	•	•	•
471	470 pF				••			••	••	•		•	•	•	•	•	•	•	•	•	•
561	560 pF				••			••	••	•		•	•	•	•	•	•	•	•	•	•
681	680 pF				••			••	••	•		•	•	•	•	•	•	•	•	•	•
821	820 pF							••	••	•		•	•	•	•	•	•	•	•	•	•
102	1000 pF							••	••			•	•	•	•	•	•	•	•	•	•
122	1200 pF							•	•			•	•	•			•	•	•	•	•
152	1500 pF							•	•			•	•	•			•	•	•	•	•
182	1800 pF							•				•	•	•			•	•	•	•	•
222	2200 pF							•				•	•	•			•	•	•		
272	2700 pF							•				•	•	•			•	•	•		
332	3300 pF							•				•	•	•			•	•	•		
392	3900 pF							•				•	•				•	•	•		
472	4700 pF											•	•				•	•	•		
562	5600 pF											•					•	•	•		
682	6800 pF											•					•	•			
822	8200 pF											•					•				
103	0.010 µF											•					•				
123	0.012 µF																•				
153	0.015 µF																				
183	0.018 µF																				
223	0.022 µF																				
273	0.027 µF																				
333	0.033 µF																				
393	0.039 µF																				
473	0.047 µF																				
563	0.056 µF																				

Note

1. See soldering recommendations within this data book, or visit www.vishay.com/doc?45034

•• Available only in paper tape

C0G (NP0) DIELECTRIC

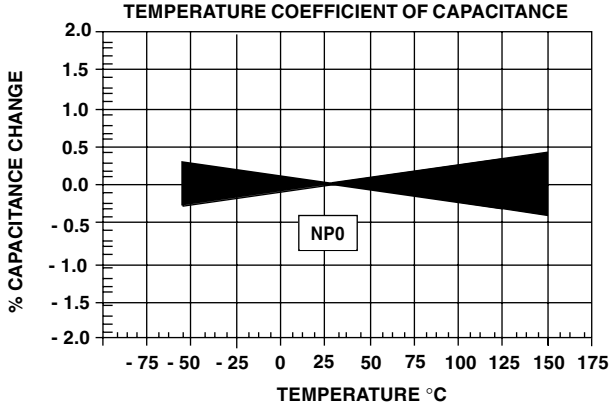
STYLE		VJ1808[1)]					VJ1812[1)]						VJ1825[1)]				VJ2220[1)]					VJ2225[1)]			
EIA TYPE		-					1812						1825				-					-			
VOLTAGE (VDC)		50	100	200	500	1000	50	100	200	500	1000	3000	50	100	200	500	50	100	200	500	1000	50	100	200	500
CAP. CODE	CAP.																								
1R0	1.0 pF																								
1R2	1.2 pF																								
1R5	1.5 pF																								
1R8	1.8 pF																								
2R2	2.2 pF																								
2R7	2.7 pF																								
3R3	3.3 pF																								
3R9	3.9 pF																								
4R7	4.7 pF																								
5R6	5.6 pF																								
6R8	6.8 pF																								
8R2	8.2 pF																								
100	10 pF								•	•															
120	12 pF								•	•		•													
150	15 pF								•	•		•													
180	18 pF								•	•	•	•													
220	22 pF								•	•	•	•													
270	27 pF								•	•	•	•													
330	33 pF								•	•	•	•													
390	39 pF								•	•	•	•													
470	47 pF								•	•	•	•													
560	56 pF								•	•	•	•													
680	68 pF			•					•	•	•	•													
820	82 pF			•					•	•	•	•													
101	100 pF			•					•	•	•	•			•	•									•
121	120 pF			•	•				•	•	•				•	•									•
151	150 pF			•	•				•	•	•				•	•									•
181	180 pF			•	•				•	•	•				•	•									•
221	220 pF	•	•	•	•	•			•	•	•				•	•									•
271	270 pF	•	•	•	•	•			•	•	•				•	•									•
331	330 pF	•	•	•	•	•			•	•	•				•	•									•
391	390 pF	•	•	•	•	•			•	•	•				•	•									•
471	470 pF	•	•	•	•	•	•	•	•	•	•				•	•									•
561	560 pF	•	•	•	•	•	•	•	•	•	•				•	•									•
681	680 pF	•	•	•	•	•	•	•	•	•	•				•	•									•
821	820 pF	•	•	•	•	•	•	•	•	•	•				•	•									•
102	1000 pF	•	•	•	•	•	•	•	•	•	•		•	•	•	•								•	•
122	1200 pF	•	•	•	•		•	•	•	•	•		•	•	•	•						•	•	•	•
152	1500 pF	•	•	•	•		•	•	•	•	•		•	•	•	•						•	•	•	•
182	1800 pF	•	•	•	•		•	•	•	•	•		•	•	•	•						•	•	•	•
222	2200 pF	•	•	•			•	•	•	•	•		•	•	•	•				•	•	•	•	•	•
272	2700 pF	•	•	•			•	•	•	•			•	•	•	•				•	•	•	•	•	•
332	3300 pF	•	•	•			•	•	•	•			•	•	•	•				•	•	•	•	•	•
392	3900 pF	•	•	•			•	•	•	•			•	•	•	•				•	•	•	•	•	•
472	4700 pF	•	•	•			•	•	•	•			•	•	•	•			•	•		•	•	•	•
562	5600 pF	•	•	•			•	•	•				•	•	•	•			•	•		•	•	•	•
682	6800 pF	•	•	•			•	•	•				•	•	•	•	•	•	•			•	•	•	•
822	8200 pF	•	•				•	•	•				•	•	•	•	•	•	•			•	•	•	•
103	0.010 µF	•					•	•	•				•	•	•	•	•	•	•			•	•	•	•
123	0.012 µF						•	•	•				•	•	•		•	•	•			•	•	•	•
153	0.015 µF						•	•					•	•	•		•	•				•	•	•	
183	0.018 µF						•						•	•	•		•	•				•	•	•	
223	0.022 µF						•						•	•	•		•	•				•	•	•	
273	0.027 µF												•	•	•		•					•	•	•	
333	0.033 µF												•	•			•					•	•	•	
393	0.039 µF												•									•	•	•	
473	0.047 µF																					•	•		
563	0.056 µF																					•			

Note

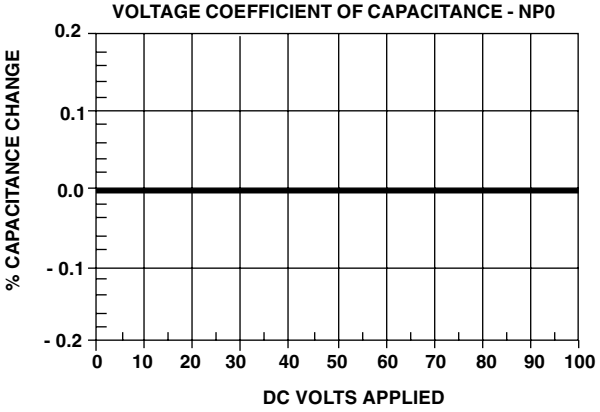
1. See soldering recommendations within this data book, or visit www.vishay.com/doc?45034

C0G (NP0) DIELECTRIC - TYPICAL PARAMETERS

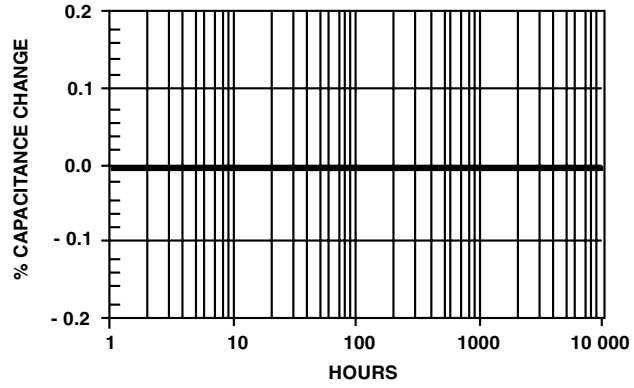
TYPICAL PARAMETER C0G (NP0)
TEMPERATURE COEFFICIENT OF CAPACITANCE



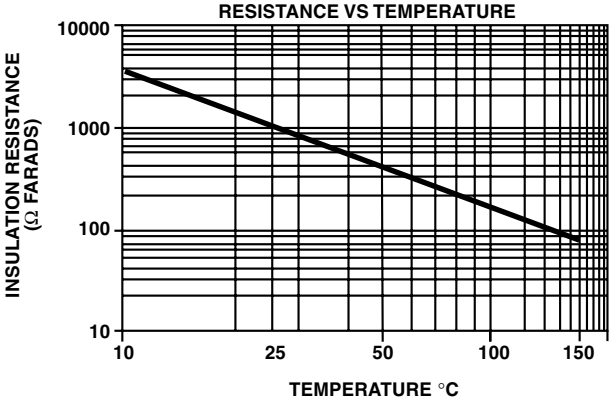
TYPICAL PARAMETER C0G (NP0)
VOLTAGE COEFFICIENT OF CAPACITANCE - NP0



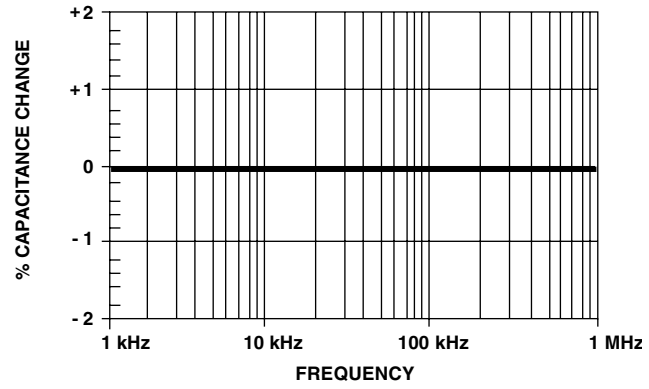
TYPICAL PARAMETER C0G (NP0)
AGING RATE - NP0



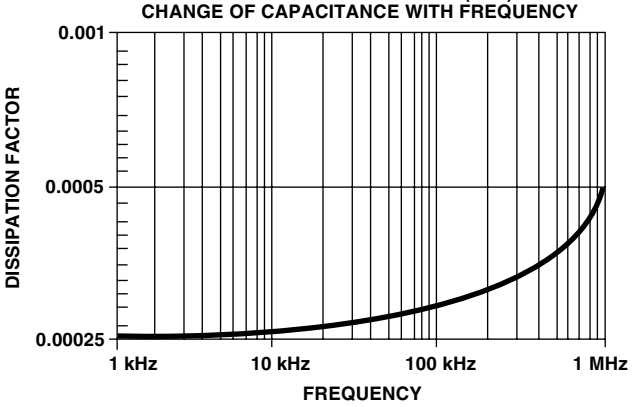
TYPICAL PARAMETER C0G (NP0)
MINIMUM INSULATION
RESISTANCE VS TEMPERATURE



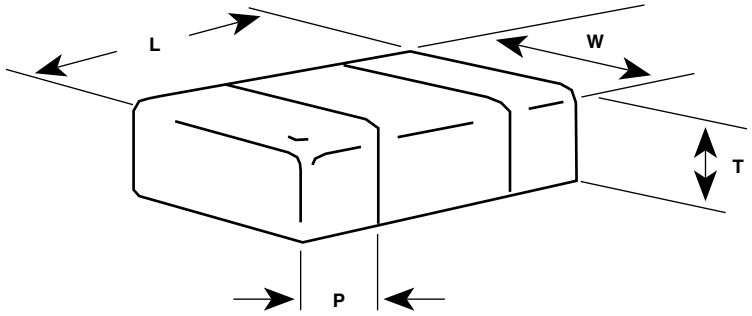
TYPICAL PARAMETER C0G (NP0)
CHANGE OF CAPACITANCE WITH FREQUENCY - NP0



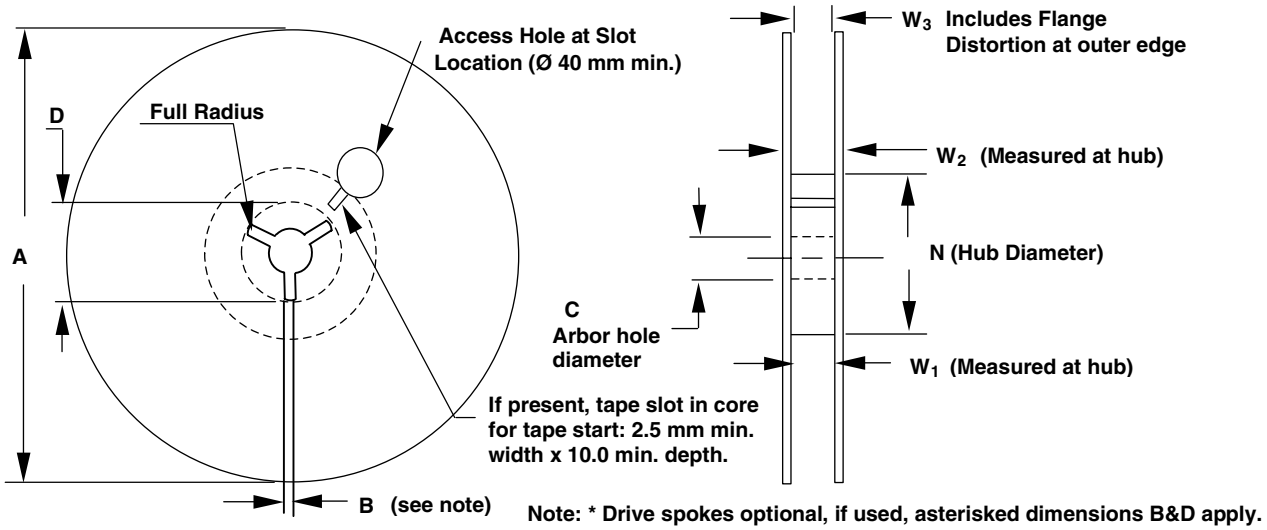
TYPICAL PARAMETER C0G (NP0)
CHANGE OF CAPACITANCE WITH FREQUENCY



DIMENSIONS in inches [millimeters]



EIA STYLE	VISHAY VITRAMON STYLE DESIGNATION	LENGTH (L)	WIDTH (W)	MAXIMUM THICKNESS (T)	TERMINATION (P)	
					(Min.)	(Max.)
0402	VJ0402	0.040 + 0.004/ - 0.002 [1.00 + 0.10/ - 0.05]	0.020 + 0.004/ - 0.002 [0.50 + 0.10/ - 0.05]	0.024 [0.60]	0.004 [0.10]	0.016 [0.41]
0603	VJ0603	0.063 ± 0.005 [1.60 ± 0.12]	0.031 ± 0.005 [0.80 ± 0.12]	0.036 [0.92]	0.012 [0.30]	0.018 [0.46]
-	VJ0612	0.063 ± 0.008 [1.60 ± 0.20]	0.126 ± 0.008 [3.20 ± 0.20]	0.067 [1.68]	0.010 [0.25]	0.018 [0.46]
-	VJ0508	0.049 ± 0.008 [1.25 ± 0.20]	0.079 ± 0.008 [2.00 ± 0.20]	0.042 [1.07]	0.005 [0.13]	0.018 [0.46]
0805	VJ0805	0.079 ± 0.008 [2.00 ± 0.20]	0.049 ± 0.008 [1.25 ± 0.20]	0.057 [1.45]	0.010 [0.25]	0.028 [0.71]
1206	VJ1206	0.126 ± 0.008 [3.20 ± 0.20]	0.063 ± 0.008 [1.60 ± 0.20]	0.067 [1.68]	0.010 [0.25]	0.028 [0.71]
1210	VJ1210	0.126 ± 0.008 [3.20 ± 0.20]	0.098 ± 0.008 [2.50 ± 0.20]	0.067 [1.68]	0.010 [0.25]	0.028 [0.71]
-	VJ1808	0.177 ± 0.010 [4.50 ± 0.25]	0.080 ± 0.010 [2.03 ± 0.25]	0.067 [1.68]	0.010 [0.25]	0.030 [0.76]
1812	VJ1812	0.177 ± 0.010 [4.50 ± 0.25]	0.126 ± 0.008 [3.20 ± 0.20]	0.086 [2.18]	0.010 [0.25]	0.030 [0.76]
1825	VJ1825	0.177 ± 0.010 [4.50 ± 0.25]	0.252 ± 0.010 [6.40 ± 0.25]	0.086 [2.18]	0.010 [0.25]	0.030 [0.76]
-	VJ2220	0.220 ± 0.008 [5.59 ± 0.20]	0.200 ± 0.010 [5.08 ± 0.25]	0.086 [2.18]	0.010 [0.25]	0.030 [0.76]
-	VJ2225	0.220 ± 0.010 [5.59 ± 0.25]	0.250 ± 0.010 [6.35 ± 0.25]	0.086 [2.18]	0.010 [0.25]	0.030 [0.76]
-	VJ3640	0.360 ± 0.015 [9.14 ± 0.38]	0.400 ± 0.015 [10.20 ± 0.38]	0.086 [2.18]	0.010 [0.25]	0.030 [0.76]



Note: * Drive spokes optional, if used, asterisked dimensions B&D apply.

REEL DIMENSIONS in inches (millimeters)								
TAPE SIZE	**A MAX.**	**B MIN.**	**C**	**D MIN.**	**N MIN.**	**W_1**	**W_2 MAX.**	**W_3**
8 mm	12.992 (330)	0.059 (1.5)	0.512 + 0.50 - 0.20	0.795 (20.2)	1.969 (50.0)	0.331 + 0.059/- 0.0 (8.4 + 1.5/- 0.0)	0.567 (14.4)	Shall accommodate tape width without interferance
12 mm						0.488 + 0.079/- 0.0 (12.4 + 2.0/- 0.0)	0.724 (18.4)	
16 mm			(13.0 + 0.50 - 0.20)		2.401 (61.0)	0.646 + 0.0789/- 0.0 (16.4 + 2.0/- 0.0)	0.882 (22.4)	

Note
1. For reels less than 360 mm diameter (A), the most widely used reel diameters are 178 mm ± 2 mm and 330 mm ± 2 mm. Reel diameters ranging from 254 mm to 292 mm also exist. Commonly used hub diameters are 80, 100, 150 and 178 mm.
2. Tape with components must wrap around hub without damage.

STANDARD PACKAGING QUANTITIES [1/2)]					
		7" REEL QUANTITIES		**11 1/4" AND 13"REEL QUANTITIES**	
BODY SIZE	**TAPE SIZE**	**PAPER TAPE PACKAGING CODE "C"/"O"[4)]**	**PLASTIC TAPE PACKAGING CODE "T"**	**PAPER TAPE PACKAGING CODE "P"/"I"[4)]**	**PLASTIC TAPE PACKAGING CODE "R"**
0402 [3)]	8 mm	5000/10 000	N/A	10 000/30 000	N/A
0603	8 mm	4000	4000	10 000	N/A
0805 [4)]	8 mm	3000	3000	10 000	10 000
1206 [5)]	8 mm	N/A	3000	N/A	10 000
1210 [5)]	8 mm	N/A	3000	N/A	10 000
1808	12 mm	N/A	3000	N/A	10 000
1812	12 mm	N/A	1000	N/A	5000
1825	12 mm	N/A	1000	N/A	4000
2220	12 mm	N/A	1000	N/A	4000
2225	12 mm	N/A	1000	N/A	4000
3640	16 mm	N/A	500	N/A	2000

Note
1. REFERENCE: EIA Standard RS 481 – "Taping of Surface Mount Components for Automatic Placement"
2. N/A = Not Available, not supported anymore
3. Quantity can vary with customer request
4. Flamed paper tape code "O" (7" reel) and "I" (11 ¼/13" reel) for AgPd terminated parts (termination code F)
5. Packaging "C/P" or "T/R" and quantity can depend from product thickness

EMBOSSED 8, 12 AND 16 MM CARRIER TAPE

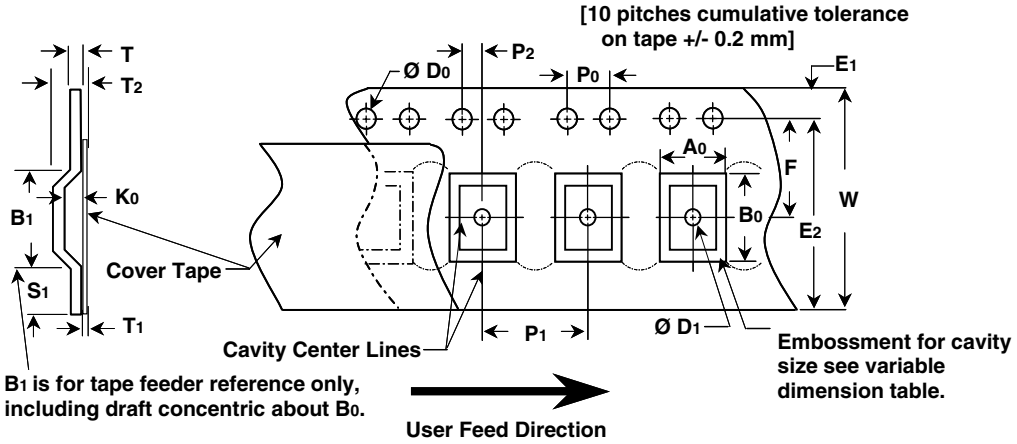


Figure 1

CONSTANT CARRIER TAPE METRIC DIMENSIONS in inches (millimeters)							
TAPE SIZE	**D_0**	**E_1**	**P_0**	**P_2**	**S_1 MIN.**	**T MAX.**	**T_1**
8 mm and 12 mm	0.059 + 0.004/- 0.0 (1.50 + 0.10/- 0.0)	0.069 + 0.004 (1.75 ± 0.10)	0.175 + 0.004 (4.0 ± 0.10)	0.079 + 0.002 (2.0 ± 0.05)	0.024 (0.60)	0.024) (0.60)	0.004 (0.10) Max.

VARIABLE CARRIER TAPE METRIC DIMENSIONS in inches (millimeters)									
TAPE SIZE	**B_1 MAX.**	**D_1 MIN.**	**E_2 MIN.**	**F**	**P_1**	**R MIN.**	**T_2**	**W MAX.**	**A_0, B_0 AND K_0**
8 mm 2 mm Pitch	0.171 (4.35)	0.177 (0.450)	0.246 (6.25)	0.138 ± 0.002 (3.50 ± 0.05)	0.79 ± 0.004 (2.00 ± 0.10)	0.984 (25.0)	0.098 (2.50) Max.	0.327 (8.30)	see note 1
8 mm 4 mm Pitch	0.171 (4.35)	0.177 (0.450)	0.246 (6.25)	0.138 ± 0.002 (3.50 ± 0.05)	0.157 ± 0.004 (4.00 ± 0.10)	0.984 (25.0)	0.098 (2.50) Max.	0.327 (8.30)	see note 1
12 mm 2 mm Pitch	0.323 (8.20)	0.059 (0.150)	0.404 (10.25)	0.217 ± 0.002 (5.50 ± 0.05)	0.157 ± 0.004 (4.00 ± 0.10)	1.181 (30.0)	0.256 (6.50) Max.	0.484 (12.30)	see note 1
16 mm 4 mm Pitch	0.476 (12.1)	0.059 (0.150)	0.561 (14.25)	0.295 ± 0.004 (7.50 ± 0.1)	0.157 ± 0.004 (4.00 ± 0.10)	1.181 (30.0)	0.341 (8.0) Max.	0.641 (16.3)	see note 1

Note

1. The cavity defined by Ao, Bo and Ko shall surround the component with sufficient clearance that:
   a) The component does not protrude above the top surface of the carrier tape.
   b) The component can be removed from the cavity in a vertical direction without mechanical restriction, after the cover tape has been removed.
   c) Rotation of the component is limited to 20° maximum for 8 and 12 mm tapes and 10° maximum for 16 mm figure 3 & 4.
   d) Lateral movement of the component is restricted to 0.5 mm maximum for 8 mm and 12mm wide tape and to 1.0 mm maximum for 16 mm wide tape figure 5.

PAPER 8 MM CARRIER TAPE

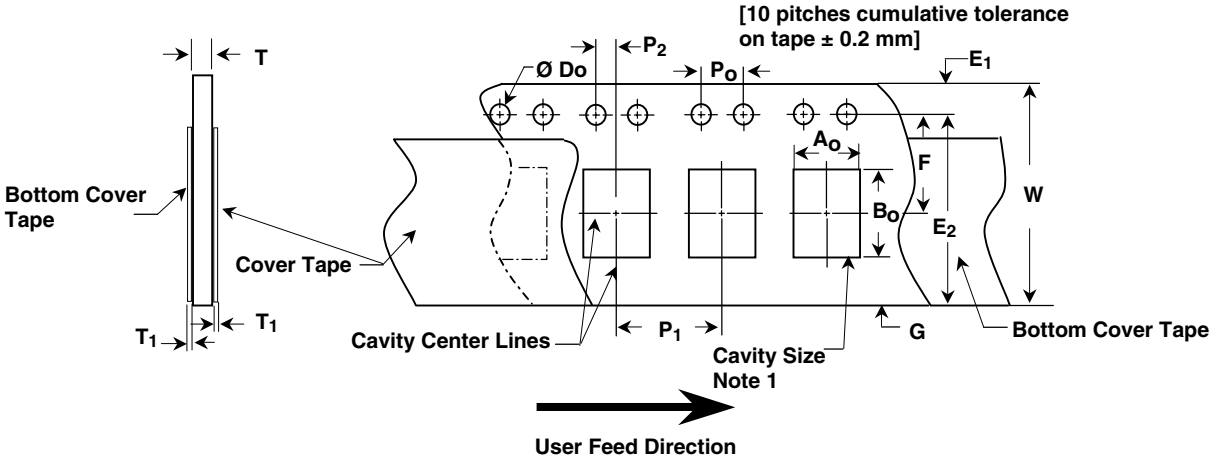


Figure 2

CONSTANT CARRIER TAPE METRIC DIMENSIONS in inches (millimeters)							
TAPE SIZE	**D_0**	**E_1**	**P_0**	**P_2**	**T_1 MAX.**	**G MIN.**	**R REF.**
8 mm	0.059 + 0.004/- 0.0 (1.50 + 0.10/- 0.0)	0.069 + 0.004 (1.75 ± 0.10)	0.175 + 0.004 (4.0 ± 0.10)	0.079 + 0.002 (2.0 ± 0.05)	0.024 (0.60)	0.029 (0.75)	0.010 (0.25)

VARIABLE CARRIER TAPE METRIC DIMENSIONS in inches (millimeters)						
TAPE SIZE	**E_2 MIN.**	**F**	**P_1**	**W MAX.**	**A_0, B_0 AND K_0**	**T**
8 mm 2 mm Pitch	0.246 (6.25)	0.138 ± 0.002 (3.50 ± 0.05)	0.79 ± 0.004 (2.00 ± 0.10)	0.327 (8.30)	see note 1	1.1 mm maximum for paper base tape
8 mm 4 mm Pitch	0.246 (6.25)	0.138 ± 0.002 (3.50 ± 0.05)	0.157 ± 0.004 (4.00 ± 0.10)	0.327 (8.30)	see note 1	1.1 mm maximum for paper base tape

Note

1. The cavity defined by Ao, Bo and Ko shall surround the component with sufficient clearance that:
   a) The component does not protrude above the top surface of the carrier tape.
   b) The component can be removed from the cavity in a vertical direction without mechanical restriction, after the cover tape has been removed.
   c) Rotation of the component is limited to 20° maximum for 8 and 12 mm tapes and 10° maximum for 16 mm figure 3 & 4.
   d) Lateral movement of the component is restricted to 0.5 mm maximum for 8 mm and 1 2mm wide tape and to 1.0 mm maximum for 16 mm wide tape figure 5.

MAXIMUM COMPONENT ROTATION FOR PUNCHED AND EMBOSSED CARRIER

Figure 3 Maximum Lateral Movement Carrier Top View

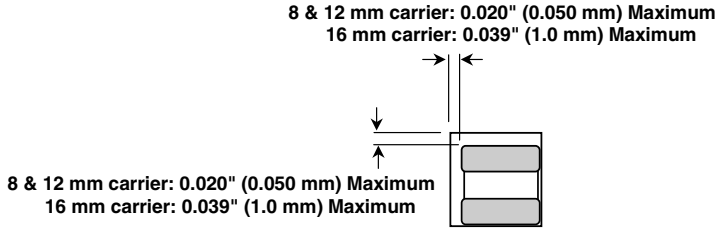
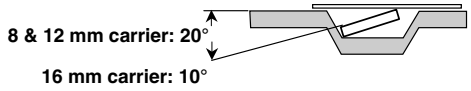
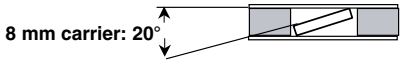


Figure 4

Maximum Component Rotation Embossed Carrier Side View

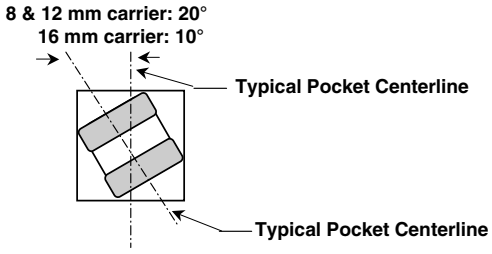


Maximum Component Rotation Paper Carrier Side View



MAXIMUM LATERAL MOVEMENT FOR PUNCHED AND EMBOSSED CARRIER

Figure 5 Maximum Component Rotation Top View



BENDING RADIUS FOR PUNCHED EMBOSSED CARRIER

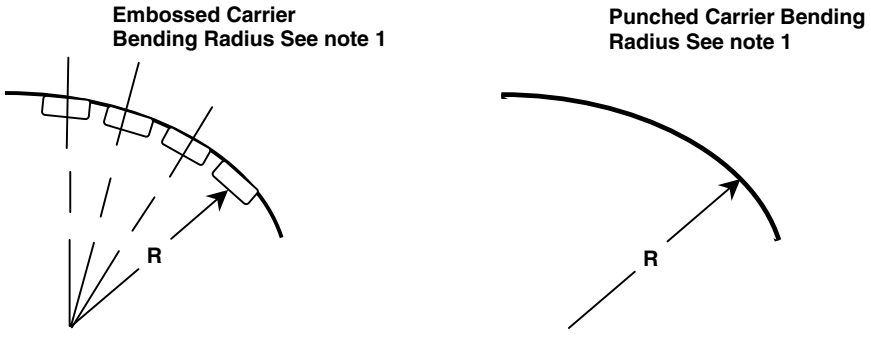


Figure 6

Note 1: The tape with or without components shall pass without damage round "R", see dimensions table

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