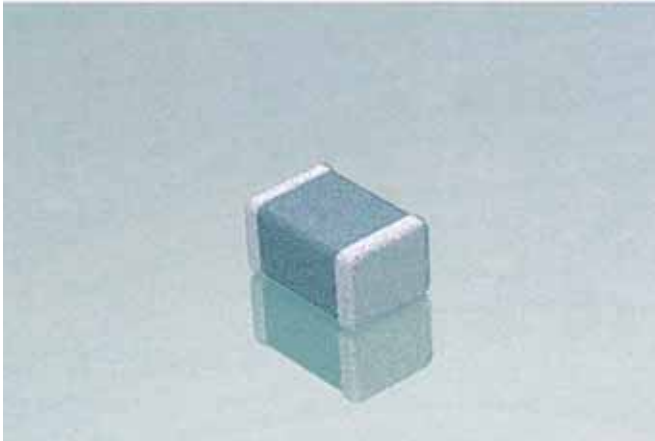


C0G (NP0) Dielectric



General Specifications



C0G (NP0) is the most popular formulation of the "temperature-compensating," EIA Class I ceramic materials. Modern C0G (NP0) formulations contain neodymium, samarium and other rare earth oxides.

C0G (NP0) ceramics offer one of the most stable capacitor dielectrics available. Capacitance change with temperature is $0 \pm 30 \text{ ppm}/^\circ\text{C}$ which is less than $\pm 0.3\% \Delta C$ from -55°C to $+125^\circ\text{C}$. Capacitance drift or hysteresis for C0G (NP0) ceramics is negligible at less than $\pm 0.05\%$ versus up to $\pm 2\%$ for films. Typical capacitance change with life is less than $\pm 0.1\%$ for C0G (NP0), one-fifth that shown by most other dielectrics. C0G (NP0) formulations show no aging characteristics.

The C0G (NP0) formulation usually has a "Q" in excess of 1000 and shows little capacitance or "Q" changes with frequency. Their dielectric absorption is typically less than 0.6% which is similar to mica and most films.

PART NUMBER (see page 2 for complete part number explanation)

0805

Size
(L" x W")

5

Voltage
6.3V = 6
10V = Z
16V = Y
25V = 3
50V = 5
100V = 1
200V = 2
500V = 7

A

Dielectric
C0G (NP0) = A

101

Capacitance Code (In pF)
2 Sig. Digits + Number of Zeros

J

Capacitance Tolerance
B = $\pm 10 \text{ pF}$ ($< 10 \text{ pF}$)
C = $\pm 25 \text{ pF}$ ($< 10 \text{ pF}$)
D = $\pm 50 \text{ pF}$ ($< 10 \text{ pF}$)
F = $\pm 1\%$ ($\geq 10 \text{ pF}$)
G = $\pm 2\%$ ($\geq 10 \text{ pF}$)
J = $\pm 5\%$
K = $\pm 10\%$

A

Failure Rate
A = Not Applicable

T

Terminations
T = Plated Ni and Sn
7 = Gold Plated

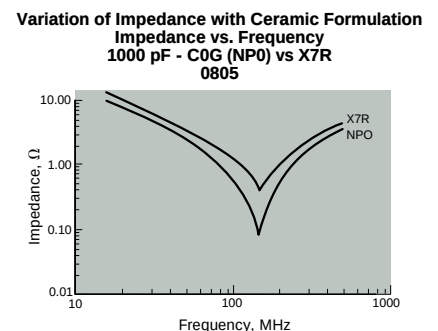
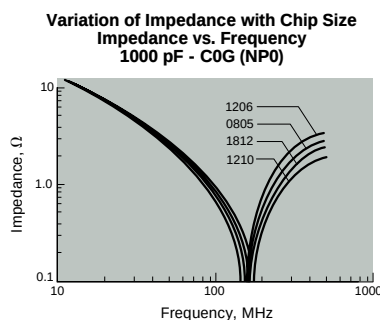
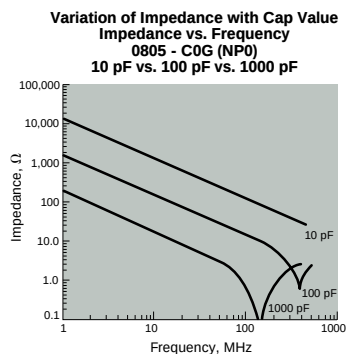
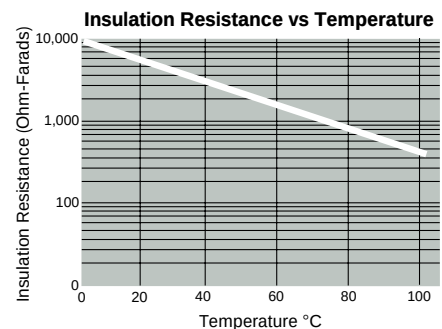
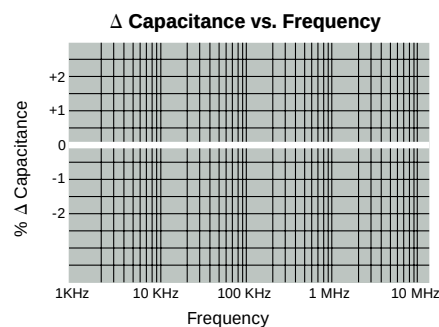
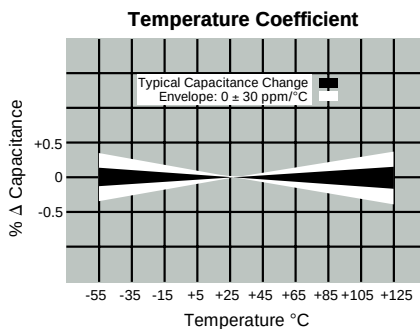
Contact Factory For
1 = Pd/Ag Term

2

Packaging
2 = 7" Reel
4 = 13" Reel
7 = Bulk Cass.
9 = Bulk

A

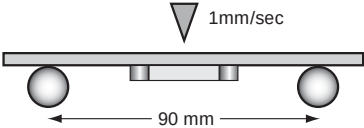
Special Code
A = Std. Product



C0G (NP0) Dielectric



Specifications and Test Methods

Parameter/Test		NP0 Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 MHz $\pm$ 10% for cap $\leq$ 1000 pF 1.0 kHz $\pm$ 10% for cap $>$ 1000 pF Voltage: 1.0Vrms $\pm$.2V	
Q		<30 pF: $Q \geq 400+20 \times \text{Cap Value}$ ≥ 30 pF: $Q \geq 1000$	Charge device with rated voltage for 60 $\pm$ 5 secs @ room temp/humidity	
Insulation Resistance		100,000M Ω or 1000M Ω - μ F, whichever is less	Charge device with 300% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max) Note: Charge device with 150% of rated voltage for 500V devices.	
Resistance to Flexure Stresses	Appearance	No defects	Deflection: 2mm Test Time: 30 seconds 	
	Capacitance Variation	$\pm 5\%$ or ± 5 pF, whichever is greater		
	Q	Meets Initial Values (As Above)		
	Insulation Resistance	$\geq$ Initial Value $\times$ 0.3		
Solderability		$\geq 95\%$ of each terminal should be covered with fresh solder	Dip device in eutectic solder at $230 \pm 5^\circ\text{C}$ for 5.0 ± 0.5 seconds	
Resistance to Solder Heat	Appearance	No defects, $<25\%$ leaching of either end terminal	Dip device in eutectic solder at 260°C for 60 seconds. Store at room temperature for 24 ± 2 hours before measuring electrical properties.	
	Capacitance Variation	$\leq \pm 2.5\%$ or $\pm .25$ pF, whichever is greater		
	Q	Meets Initial Values (As Above)		
	Insulation Resistance	Meets Initial Values (As Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
Thermal Shock	Appearance	No visual defects	Step 1: $-55^\circ\text{C} \pm 2^\circ$	30 ± 3 minutes
	Capacitance Variation	$\leq \pm 2.5\%$ or $\pm .25$ pF, whichever is greater	Step 2: Room Temp	≤ 3 minutes
	Q	Meets Initial Values (As Above)	Step 3: $+125^\circ\text{C} \pm 2^\circ$	30 ± 3 minutes
	Insulation Resistance	Meets Initial Values (As Above)	Step 4: Room Temp	≤ 3 minutes
	Dielectric Strength	Meets Initial Values (As Above)	Repeat for 5 cycles and measure after 24 hours at room temperature	
Load Life	Appearance	No visual defects	Charge device with twice rated voltage in test chamber set at $125^\circ\text{C} \pm 2^\circ\text{C}$ for 1000 hours (+48, -0). Remove from test chamber and stabilize at room temperature for 24 hours before measuring.	
	Capacitance Variation	$\leq \pm 3.0\%$ or $\pm .3$ pF, whichever is greater		
	Q (C=Nominal Cap)	≥ 30 pF: $Q \geq 350$ ≥ 10 pF, <30 pF: $Q \geq 275 + 5C/2$ <10 pF: $Q \geq 200 + 10C$		
	Insulation Resistance	$\geq$ Initial Value $\times$ 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
Load Humidity	Appearance	No visual defects	Store in a test chamber set at $85^\circ\text{C} \pm 2^\circ\text{C}/$ $85\% \pm 5\%$ relative humidity for 1000 hours (+48, -0) with rated voltage applied. Remove from chamber and stabilize at room temperature for 24 ± 2 hours before measuring.	
	Capacitance Variation	$\leq \pm 5.0\%$ or $\pm .5$ pF, whichever is greater		
	Q	≥ 30 pF: $Q \geq 350$ ≥ 10 pF, <30 pF: $Q \geq 275 + 5C/2$ <10 pF: $Q \geq 200 + 10C$		
	Insulation Resistance	$\geq$ Initial Value $\times$ 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		

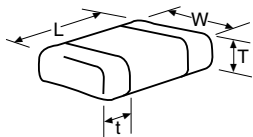
C0G (NP0) Dielectric

Capacitance Range



PREFERRED SIZES ARE SHADED

SIZE		0201			0402			0603				0805					1206					
Soldering		Reflow Only			Reflow Only			Reflow Only				Reflow/Wave					Reflow/Wave					
Packaging		All Paper			All Paper			All Paper				Paper/Embossed					Paper/Embossed					
(L) Length	MM (in.)	0.60 ± 0.03 (0.024 ± 0.001)			1.00 ± 0.10 (0.040 ± 0.004)			1.60 ± 0.15 (0.063 ± 0.006)				2.01 ± 0.20 (0.079 ± 0.008)					3.20 ± 0.20 (0.126 ± 0.008)					
(W) Width	MM (in.)	0.30 ± 0.03 (0.011 ± 0.001)			0.50 ± 0.10 (0.020 ± 0.004)			0.81 ± 0.15 (0.032 ± 0.006)				1.25 ± 0.20 (0.049 ± 0.008)					1.60 ± 0.20 (0.063 ± 0.008)					
(t) Terminal	MM (in.)	0.15 ± 0.05 (0.006 ± 0.002)			0.25 ± 0.15 (0.010 ± 0.006)			0.35 ± 0.15 (0.014 ± 0.006)				0.50 ± 0.25 (0.020 ± 0.010)					0.50 ± 0.25 (0.020 ± 0.010)					
VWDC		10	16	25	16	25	50	6.3	25	50	100	16	25	50	100	200	16	25	50	100	200	500
Cap (pF)	0.5			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	1.0			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	1.2			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	1.5			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	1.8			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	2.2			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	2.7			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	3.3			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	3.9			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	4.7			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	5.6			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	6.8			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	8.2			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	10			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	12			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	15			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	18			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	22			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	27			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	33			A	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	39		A		C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	47		A		C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	56		A		C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	68		A		C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	82	A			C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	100	A			C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	120				C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	150				C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	180				C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	220				C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	M
	270				C			G	G	G	G	J	J	J	J	M	J	J	J	J	J	M
	330				C			G	G	G	G	J	J	J	J	M	J	J	J	J	J	M
	390							G	G	G		J	J	J	J	M	J	J	J	J	J	M
	470							G	G	G		J	J	J	J	M	J	J	J	J	J	M
	560							G	G	G		J	J	J	J	M	J	J	J	J	J	M
	680							G	G	G		J	J	J	J	M	J	J	J	J	J	P
	820							G	G	G		J	J	J	J		J	J	J	J	J	
	1000							G	G	G		J	J	J	J		J	J	J	J	J	
	1200											J	J	J	J		J	J	J	J	J	
	1500											J	J	J	J		J	J	J	M	Q	
	1800											J	J	J	J		J	J	M	M	P	
	2200											J	J	J	M		J	J	M	P		
	2700											J	J	J	M		J	J	M	P		
	3300											N	N	N	M		J	J	M	P		
	3900											N	N	N			J	J	M	P		
	4700											N	N	N			J	J	M	P		
	5600											N	N	N			J	J	M			
	6800											N	N	N			M	M				
	8200											N	N	N			M	M				
Cap (μF)	0.010																					
	0.012																					
	0.015																					
	0.018																					
	0.022																					
	0.027																					
	0.033																					
	0.039																					
	0.047																					
	0.068																					
	0.082																					
	0.1																					
VWDC		10	16	25	16	25	50	6.3	25	50	100	16	25	50	100	200	16	25	50	100	200	500
SIZE		0201			0402			0603				0805					1206					
Letter		A	C	E	G	J		K	M	N		P	Q	X		Y		Z				
Max. Thickness		0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.86 (0.034)	0.94 (0.037)		1.02 (0.040)	1.27 (0.050)	1.40 (0.055)		1.52 (0.060)	1.78 (0.070)	2.29 (0.090)		2.54 (0.100)		2.79 (0.110)				
PAPER								EMBOSS														



C0G (NP0) Dielectric

Capacitance Range



PREFERRED SIZES ARE SHADED

SIZE		1210					1812					1825					2225				
Soldering		Reflow Only					Reflow Only					Reflow Only					Reflow Only				
Packaging		Paper/Embossed					All Embossed					All Embossed					All Embossed				
(L) Length	MM (in.)	3.20 ± 0.20 (0.126 ± 0.008)					4.50 ± 0.30 (0.177 ± 0.012)					4.50 ± 0.30 (0.177 ± 0.012)					5.72 ± 0.25 (0.225 ± 0.010)				
(W) Width	MM (in.)	2.50 ± 0.20 (0.098 ± 0.008)					3.20 ± 0.20 (0.126 ± 0.008)					6.40 ± 0.40 (0.252 ± 0.016)					6.35 ± 0.25 (0.250 ± 0.010)				
(t) Terminal	MM (in.)	0.50 ± 0.25 (0.020 ± 0.010)					0.61 ± 0.36 (0.024 ± 0.014)					0.61 ± 0.36 (0.024 ± 0.014)					0.64 ± 0.39 (0.025 ± 0.015)				
WVDC		25	50	100	200	500	25	50	100	200	500	50	100	200	500	50	100	200	500		
Cap (pF)	0.5																				
	1.0																				
	1.2																				
	1.5																				
	1.8																				
	2.2																				
	2.7																				
	3.3																				
	3.9																				
	4.7																				
	5.6																				
	6.8																				
	8.2																				
	10					J															
	12					J															
	15					J															
	18					J															
	22					J															
	27					J															
	33					J															
	39					J															
	47					J															
	56					J															
	68					J															
	82					J															
	100					J															
	120					J															
	150					J															
	180					J															
	220					J															
	270					J															
	330					J															
	390					M															
	470					M															
	560	J	J	J	J	M															
	680	J	J	J	J	M															
	820	J	J	J	J	M															
	1000	J	J	J	J	M	K	K	K	K	M	M	M	M	M		M	M	P		
	1200	J	J	J	M		K	K	K	K	M	M	M	M	M		M	M	P		
	1500	J	J	J	M		K	K	K	K	M	M	M	M	M		M	M	P		
	1800	J	J	J	M		K	K	K	K	M	M	M	M	M		M	M	P		
	2200	J	J	J	Q		K	K	K	K	P	M	M	M	M		M	M	P		
	2700	J	J	J	Q		K	K	K	P	Q	M	M	M	M		M	M	P		
	3300	J	J	J			K	K	K	P	Q	M	M	M	M		M	M	P		
	3900	J	J	M			K	K	K	P	Q	M	M	M	M		M	M	P		
	4700	J	J	M			K	K	K	P	Q	M	M	M	M		M	M	P		
	5600	J	J	M			K	K	M	P	X	M	M	M	M		M	M	P		
	6800	J	J				K	K	M	X		M	M	M	M	P	M	M	P		
	8200	J	J				K	M	M	X		M	M	M		P	M	M	P		
Cap (uF)	0.010	N	N				K	M	M	X		M	M	M		P	M	M	P		
	0.012	N	N				K	M				M	M	M			M	M	P		
	0.015						M	M				M	M	M			M	M	Y		
	0.018						M	M				P	M				M	M	Y		
	0.022						M	M				P					M	Y	Y		
	0.027						M	P				P					P	Y	Y		
	0.033						M	P									P	Y	Z		
	0.039						M	P									P	Y	Z		
	0.047						X	P									P				
	0.068						X	X									P				
	0.082						X	X									P				
	0.1						Y	Y									Q				
WVDC		25	50	100	200	500	25	50	100	200	500	50	100	200	500		50	100	200	500	
SIZE		1210					1812					1825					2225				
Letter		A	C	E	G	J	K	M	N	P	Q	X	Y	Z							
Max. Thickness		0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.86 (0.034)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)							
		PAPER					EMBOSS														



Packaging of Chip Components



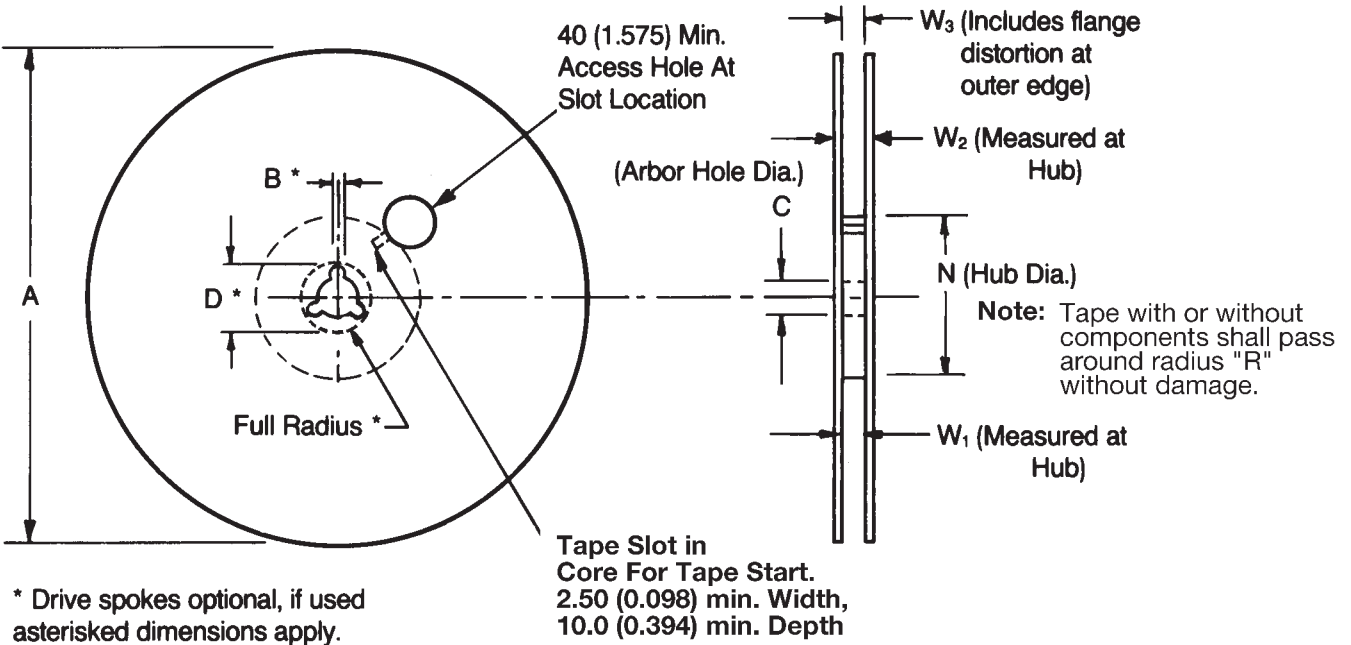
Automatic Insertion Packaging

TAPE & REEL QUANTITIES

All tape and reel specifications are in compliance with RS481.

	8mm	12mm	
Paper or Embossed Carrier	0612, 0508, 0805, 1206, 1210		
Embossed Only		1808	1812, 1825 2220, 2225
Paper Only	0201, 0306, 0402, 0603		
Qty. per Reel/7" Reel	2,000, 3,000 or 4,000, 10,000, 15,000 Contact factory for exact quantity	3,000	500, 1,000 Contact factory for exact quantity
Qty. per Reel/13" Reel	5,000, 10,000, 50,000 Contact factory for exact quantity	10,000	4,000

REEL DIMENSIONS



Tape Size ⁽¹⁾	A Max.	B* Min.	C	D* Min.	N Min.	W ₁	W ₂ Max.	W ₃
8mm	330 (12.992)	1.5 (0.059)	13.0 ^{+0.50} _{-0.20} (0.512 ^{+0.020} _{-0.008})	20.2 (0.795)	50.0 (1.969)	8.40 ^{+1.5} _{-0.0} (0.331 ^{+0.059} _{-0.0})	14.4 (0.567)	7.90 Min. (0.311) 10.9 Max. (0.429)
12mm						12.4 ^{+2.0} _{-0.0} (0.488 ^{+0.079} _{-0.0})		11.9 Min. (0.469) 15.4 Max. (0.607)

Metric dimensions will govern.

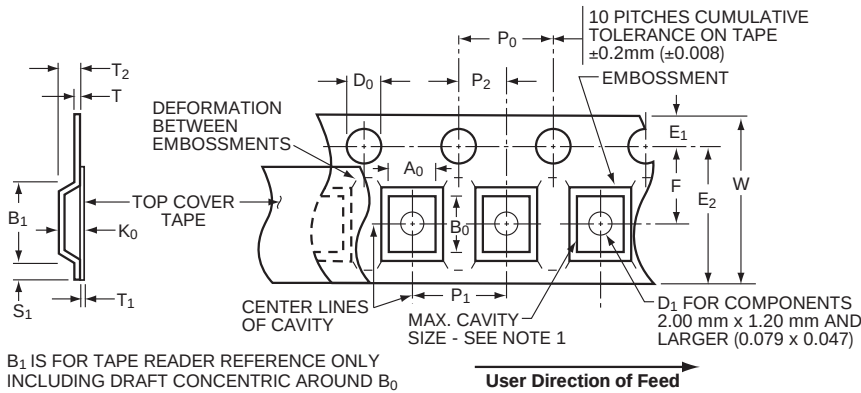
English measurements rounded and for reference only.

(1) For tape sizes 16mm and 24mm (used with chip size 3640) consult EIA RS-481 latest revision.

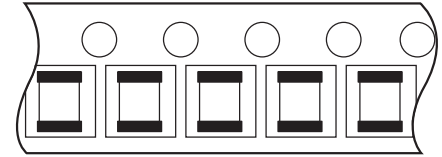
Embossed Carrier Configuration



8 & 12mm Tape Only



Chip Orientation



8 & 12mm Embossed Tape Metric Dimensions Will Govern

CONSTANT DIMENSIONS

Tape Size	D_0	E	P_0	P_2	S_1 Min.	T Max.	T_1
8mm and 12mm	$1.50^{+0.10}_{-0.0}$ (0.059 ^{+0.004})	1.75 ± 0.10 (0.069 $\pm$ 0.004)	4.0 ± 0.10 (0.157 $\pm$ 0.004)	2.0 ± 0.05 (0.079 $\pm$ 0.002)	0.60 (0.024)	0.60 (0.024)	0.10 (0.004) Max.

VARIABLE DIMENSIONS

Tape Size	B_1 Max.	D_1 Min.	E_2 Min.	F	P_1 See Note 5	R Min. See Note 2	T_2	W Max.	$A_0 B_0 K_0$
8mm	4.35 (0.171)	1.00 (0.039)	6.25 (0.246)	3.50 ± 0.05 (0.138 $\pm$ 0.002)	4.00 ± 0.10 (0.157 $\pm$ 0.004)	25.0 (0.984)	2.50 Max. (0.098)	8.30 (0.327)	See Note 1
12mm	8.20 (0.323)	1.50 (0.059)	10.25 (0.404)	5.50 ± 0.05 (0.217 $\pm$ 0.002)	4.00 ± 0.10 (0.157 $\pm$ 0.004)	30.0 (1.181)	6.50 Max. (0.256)	12.3 (0.484)	See Note 1
8mm 1/2 Pitch	4.35 (0.171)	1.00 (0.039)	6.25 (0.246)	3.50 ± 0.05 (0.138 $\pm$ 0.002)	2.00 ± 0.10 (0.079 $\pm$ 0.004)	25.0 (0.984)	2.50 Max. (0.098)	8.30 (0.327)	See Note 1
12mm Double Pitch	8.20 (0.323)	1.50 (0.059)	10.25 (0.404)	5.50 ± 0.05 (0.217 $\pm$ 0.002)	8.00 ± 0.10 (0.315 $\pm$ 0.004)	30.0 (1.181)	6.50 Max. (0.256)	12.3 (0.484)	See Note 1

NOTES:

1. The cavity defined by A_0 , B_0 , and K_0 shall be configured to provide the following:

Surround the component with sufficient clearance such that:

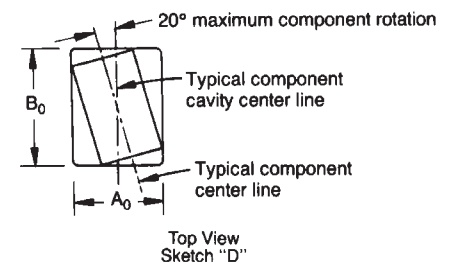
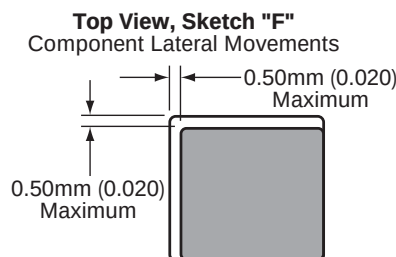
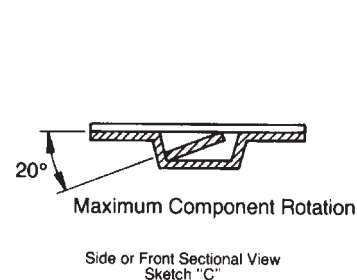
- the component does not protrude beyond the sealing plane of the cover tape.
- the component can be removed from the cavity in a vertical direction without mechanical restriction, after the cover tape has been removed.
- rotation of the component is limited to 20° maximum (see Sketches D & E).
- lateral movement of the component is restricted to 0.5mm maximum (see Sketch F).

2. Tape with or without components shall pass around radius "R" without damage.

3. Bar code labeling (if required) shall be on the side of the reel opposite the round sprocket holes. Refer to EIA-556.

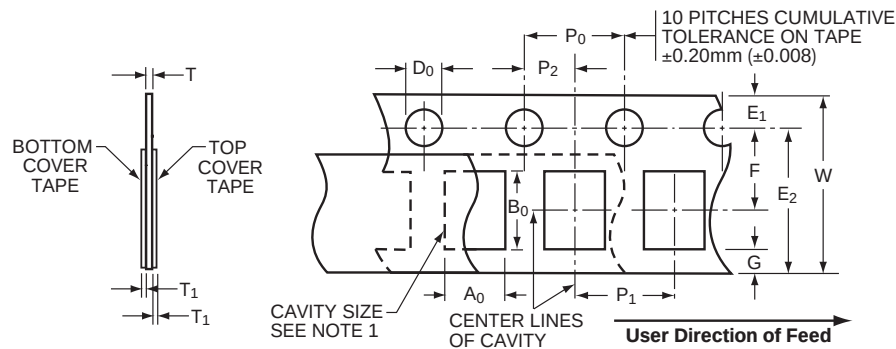
4. B_1 dimension is a reference dimension for tape feeder clearance only.

5. If $P_1 = 2.0$ mm, the tape may not properly index in all tape feeders.



Paper Carrier Configuration

8 & 12mm Tape Only



8 & 12mm Paper Tape Metric Dimensions Will Govern

CONSTANT DIMENSIONS

Tape Size	D_0	E	P_0	P_2	T_1	G. Min.	R Min.
8mm and 12mm	$1.50^{+0.10}_{-0.05}$ ($0.059^{+0.004}_{-0.004}$)	1.75 ± 0.10 (0.069 ± 0.004)	4.00 ± 0.10 (0.157 ± 0.004)	2.00 ± 0.05 (0.079 ± 0.002)	0.10 (0.004) Max.	0.75 (0.030) Min.	25.0 (0.984) See Note 2 Min.

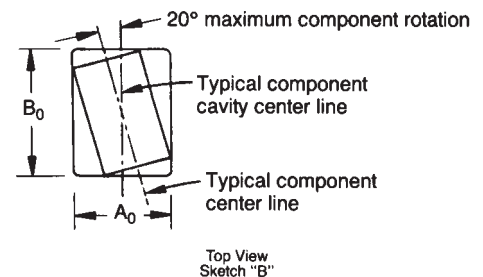
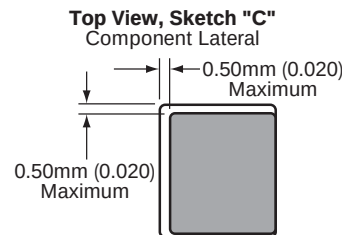
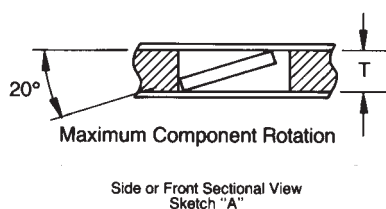
VARIABLE DIMENSIONS

Tape Size	P_1 See Note 4	E_2 Min.	F	W	$A_0 B_0$	T
8mm	4.00 ± 0.10 (0.157 ± 0.004)	6.25 (0.246)	3.50 ± 0.05 (0.138 ± 0.002)	$8.00^{+0.30}_{-0.10}$ ($0.315^{+0.012}_{-0.004}$)	See Note 1	1.10mm (0.043) Max. for Paper Base Tape and 1.60mm (0.063) Max. for Non-Paper Base Compositions
12mm	4.00 ± 0.010 (0.157 ± 0.004)	10.25 (0.404)	5.50 ± 0.05 (0.217 ± 0.002)	12.0 ± 0.30 (0.472 ± 0.012)		
8mm 1/2 Pitch	2.00 ± 0.05 (0.079 ± 0.002)	6.25 (0.246)	3.50 ± 0.05 (0.138 ± 0.002)	$8.00^{+0.30}_{-0.10}$ ($0.315^{+0.012}_{-0.004}$)		
12mm Double Pitch	8.00 ± 0.10 (0.315 ± 0.004)	10.25 (0.404)	5.50 ± 0.05 (0.217 ± 0.002)	12.0 ± 0.30 (0.472 ± 0.012)		

NOTES:

- The cavity defined by A_0 , B_0 , and T shall be configured to provide sufficient clearance surrounding the component so that:
 - the component does not protrude beyond either surface of the carrier tape;
 - the component can be removed from the cavity in a vertical direction without mechanical restriction after the top cover tape has been removed;
 - rotation of the component is limited to 20° maximum (see Sketches A & B);
 - lateral movement of the component is restricted to 0.5mm maximum (see Sketch C).

- Tape with or without components shall pass around radius "R" without damage.
- Bar code labeling (if required) shall be on the side of the reel opposite the sprocket holes. Refer to EIA-556.
- If $P_1 = 2.0\text{mm}$, the tape may not properly index in all tape feeders.



Bar Code Labeling Standard

AVX bar code labeling is available and follows latest version of EIA-556