

# MULTILAYER CERAMIC CHIP CAPACITORS

## - GMC SERIES -

### APPLICATIONS

- Can be used on surface mount assembly equipment
- Our fully integrated manufacturing and total quality control systems ensure unprecedented high standards of quality and reliability.

### FEATURES

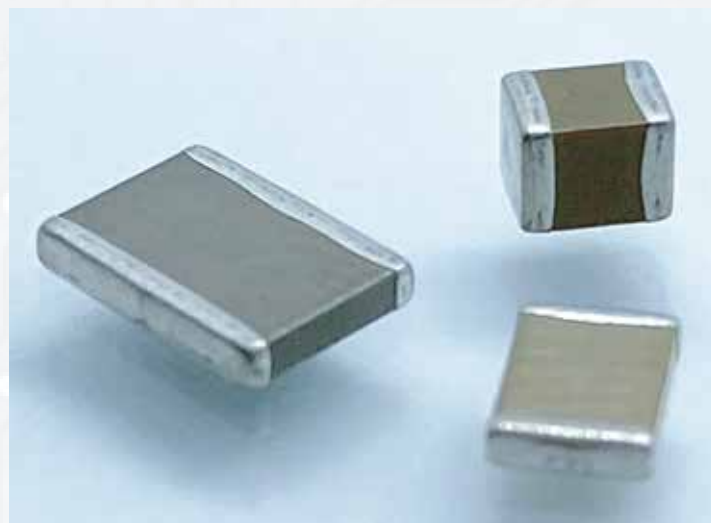
- Large capacitance values in small sizes
- Excellent high frequency characteristics

### CHIP CAPACITOR SELECTION

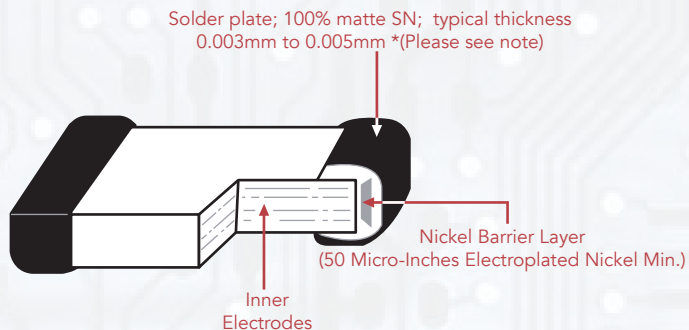
#### DIELECTRIC TYPE

**COG (NPO)** - Capacitance change with temperature is 0-30ppm/°C which is less than -0.3%/°C from -55°C to +125°C. Typical capacitance change with life is less than -0.1 % for NPOs, one-fifth that shown by most other dielectrics. NPO formulations show no aging characteristics.

Ultra stable class I dielectric: linear temperature coefficient, low loss, negligible change of electrical properties with time, voltage and frequency.



### CONSTRUCTION



OPERATING TEMPERATURE RANGE	TEMPERATURE COEFFICIENT	TEMPERATURE VOLTAGE COEFFICIENT ( $\Delta C_{MAX}$ @ $V_{DCW}$ )	DISSIPATION FACTOR	INSULATION RESISTANCE	DIELECTRIC WITHSTANDING VOLTAGE	AGING RATE	TEST PARAMETERS
-55°C to° +125 C	0±30ppm/°C	0±30ppm/°C	0.1% Max, 0.02% Typical	•25°C, VDCW: >100GΩFor 1000QF, whichever is less •125°C, Vocw: >10GΩF or 100QF whichever is less	3 X Vdcw	0% per decade hour	• C<1000pF f=1MHz V=1.0Vrms ±0.2Vrms T=25°C • C>1000pF f=1KHz V=1.0Vrms ±0.2Vrms T=25°C

**X7R/X5R** - Its temperature variation of capacitance is within ±15% from -55°C to +125°C (-55°C to +85° C for X5R). The capacitance change is non-linear.

Stable class II dielectric

OPERATING TEMPERATURE RANGE	TEMPERATURE COEFFICIENT	TEMPERATURE VOLTAGE COEFFICIENT ( $\Delta C_{MAX}$ @ $V_{DCW}$ )	DISSIPATION FACTOR	INSULATION RESISTANCE	DIELECTRIC WITHSTANDING VOLTAGE	AGING RATE	TEST PARAMETERS
X7R=-55C to+125C X5R=-55C to+85C	±15%	X7R/X5R Not Applicable	2.5% Max, 1.8% Typical	• 25°C, Vdcw: >100GΩFor 1000QF, whichever is less •125°C, Vocw: >10GΩF or100QF whichever is less	2.5 X Vbcw	<2% per decade hour	1KHz 1.0Vrms ±0.2Vrms 25°C values> or = to 10uF 1.0Vrms 120Hz

## CHIP CAPACITOR SELECTION

**Z5U** - Despite their capacitance instability, Z5U formulations are very popular because of their small size, temperature range low ESL, low ESR and excellent frequency response. These features are particularly important for decoupling application where only a minimum capacitance value is required.

**Y5V** - Y5V formulations are for general purpose use in a limited temperature range. They have a wide temperature characteristic of +22% - 82% capacitance change over the operating temperature range of -30°C to +85°C. Y5Vs high dielectric constant allows the manufacture of very high capacitance values (up to 22MF) in small physical sizes.

High capacitance per unit volume: general purpose product

OPERATING TEMPERATURE RANGE	TEMPERATURE COEFFICIENT	TEMPERATURE VOLTAGE COEFFICIENT ( $\Delta C_{MAX}$ @ $V_{DCW}$ )	DISSIPATION FACTOR	INSULATION RESISTANCE	DIELECTRIC WITHSTANDING VOLTAGE	AGING RATE	TEST PARAMETERS
-30°C to +85°C	+22% -82%	N/A	3.0% Max, 2.0% Typical	10GΩ or 100QF whichever is less, 25°C, $V_{ocw}$	2.5 X $V_{DCW}$	3.0% per decade hour	1 KHz, 1 Vrms 25°C values > or = to 10uF 1.0Vrms 120Hz

## CAPACITANCE VALUE & TOLERANCE

Determined by circuit requirements. Note that chip prices decrease with lower capacitance value and looser tolerance.

## VOLTAGE

Determined by circuit requirements. Units are designed to exceed the withstanding voltage specification, i.e., the user need not incorporate an additional safety margin.

## CAPACITOR SIZE

Select the smallest unit permitted by the circuit constraints that provides the required capacitance and voltage rating. All Cal-Chip capacitors conform to EIA specifications.

## CAPACITOR TERMINATION

Nickel barrier is standard and recommended for units exposed to repeated solder cycles, to minimize leaching of the termination.

GMC	21	CG	102	J	50	NT	D
PRODUCT TYPE	DIMENSIONS	DIELECTRIC	CAPACITANCE	TOLERANCE	VOLTAGE DC	TERMINATION	PACKAGING CODE
	01: 01005 02: 0201 04: 0402 10: 0603 21: 0805 31: 1206 32: 1210 40: 1808 43: 1812 45: 1825 55: 2220 57: 2225	CG: COG/NPO X7R X5R Z5U Y5V	0R5: 0.5pF 5R0: 5.0pF 100: 10pF 101: 100pF 102: 1000pF 103: .01uF 104: .1uF 105: 1.0uF 106: 10uF 107: 100uF	A: +/--.05pF B: +/--.1pF C: +/--.25pF D: +/--.5pF F: +/--1% G: +/--2% J: +/--5% K: +/--10% M: +/--20% Z: -20%/+80%	4R0: 4.0V 6R3: 6.3V 10: 10V 16: 16V 25: 25V 35: 35V 50: 50V 63: 63V 100: 100V 200: 200V	NT: Sn/Ni PT: Pd/Ag	Blank: 7" reel D: See page 19 & 20 G: See page 19 & 20 Q: See page 19 & 20



..Note: Cal-Chip has completed the Lead-Free transition. All parts shipped will be lead-free. The customer designator of "LF" is no longer available. Lead-Free material will continue to have a green RoHS symbol on the label.



DIMENSION (MM)		GMC01							
L(L1)		0.4 ± 0.02							
W		0.2 ± 0.02							
H		0.2 ± 0.02							
BW(L2/L3)		0.07 ~ 0.14							
DIELECTRIC		NPO/COG		X7R			X5R		
RATED VOLTAGE		6.3	10/16	6.3	10	16	6.3	10	16
CAP. RANGE									
0.5pF	0R5								
0.75	R75								
1	1R0								
1.2	1R2								
1.5	1R5								
1.8	1R8								
2	2R0								
2.2	2R2								
2.7	2R7								
3	3R0								
3.3	3R3								
3.6	3R6								
3.9	3R9								
4	4R0								
4.7	4R7								
5	5R0								
5.6	5R6								
6	6R0								
6.8	6R8								
7	7R0								
8	8R0								
8.2	8R2								
10	100								
11	110								
12	120								
15	150								
18	180								
20	200								
22	220								
27	270								
30	300								
33	330								
39	390								
43	430								
47	470								
51	510								
56	560								
62	620								
68	680								
82	820								
100	101								
120	121								
150	151								
180	181								
220	221								
270	271								
330	331								
390	391								
470	471								
560	561								
680	681								
820	821								
1.0nF	102								
1.2	122								
1.5	152								
1.8	182								
2.2	222								
2.7	272								
3.3	332								
3.9	392								
4.7	472								
5.6	562								
6.8	682								
8.2	822								
10	103								
12	123								
15	153								
18	183								
22	223								
27	273								
33	333								
39	393								
47	473								
56	563								
68	683								
82	823								
100	104								
120	124								
220	224								
470	474								
1uf	105								

01005

0201

DIMENSION (MM)		GMC02											
L(L1)		0.6 ± 0.03											
W		0.3 ± 0.03											
H		0.3 ± 0.03											
BW(L2/L3)		0.15 ± 0.05											
DIELECTRIC		NPO/COG		X5R					X7R				Y5V/Z5U
RATED VOLTAGE		25	50	4/6.3V	10	16	25	6.3	10	16	25	50	6.3
CAP. RANGE													
0.1pF	OR1												
0.2	OR2												
0.3	OR3												
0.4	OR4												
0.47	R47												
0.5	OR5												
0.56	R56												
0.6	OR6												
0.7	OR7												
0.75	R75												
0.8	OR8												
0.82	R82												
0.9	OR9												
1	1R0												
1.2	1R2												
1.3	1R3												
1.5	1R5												
1.6	1R6												
1.8	1R8												
2	2R0												
2.2	2R2												
2.5	2R5												
2.7	2R7												
2.8	2R8												
3.3	3R3												
3.9	3R9												
4.3	4R3												
4.7	4R7												
5.6	5R6												
6.8	6R8												
8.2	8R2												
10	100												
11	110												
12	120												
15	150												
18	180												
20	200												
22	220												
24	240												
27	270												
30	300												
33	330												
39	390												
43	430												
47	470												
51	510												
56	560												
62	620												
68	680												
75	750												
82	820												
100	101												
120	121												
150	151												
180	181												
220	221												
270	271												
330	331												
390	391												
470	471												
560	561												
680	681												
820	821												
1.0nF	102												
1.2	122												
1.5	152												
1.8	182												
2.2	222												
2.7	272												
3.3	332												
3.9	392												
4.7	472												
5.6	562												
6.8	682												
8.2	822												
10	103												
12	123												
15	153												
18	183												
22	223												
27	273												
33	333												
39	393												
47	473												
56	563												
68	683												
82	823												
100	104												
220	224												
470	474												
1.0uF	105												
2.2	225												
4.7	475												

Height 0.39MM  
 Height 0.56MM

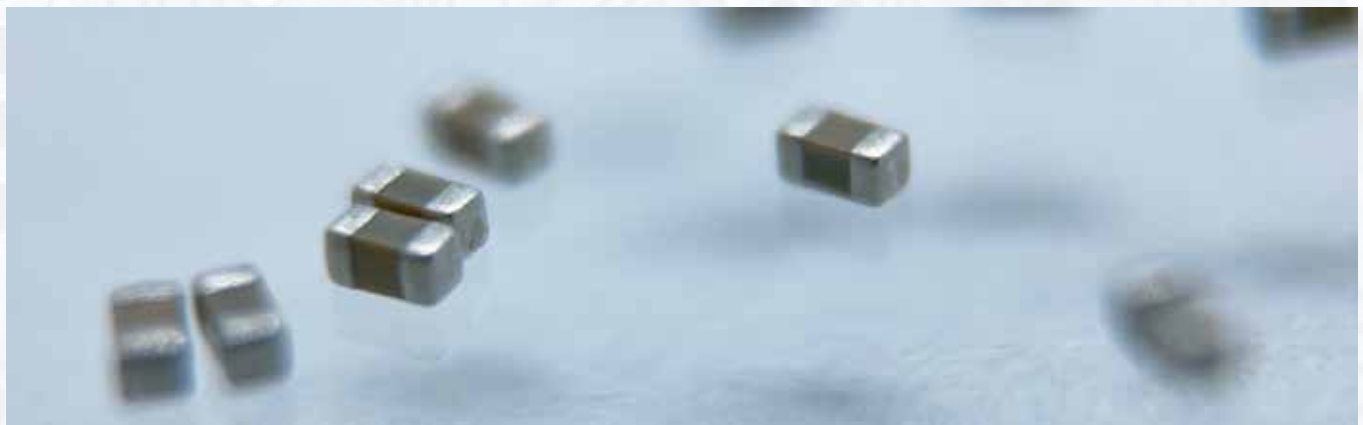


DIMENSION (MM)		GMC04																				
L(L1)		1.0 ± 0.05																				
W		0.5 ± 0.05																				
H		0.5 ± 0.1																				
BW(L2/LW)		0.1 ~ 0.35																				
DIELECTRIC		NPO/COG					X5R					X7R					Y5V & Z5U					
RATED VOLTAGE		6.3/10	16	25	50	100	200	6.3	10	16	25	50	6.3/10	16/25	50	100	200	6.3	10	16	25	50
CAP. RANGE																						
0.47	R47																					
0.5	0R5																					
0.56	R56																					
0.6	0R6																					
0.68	R68																					
0.7	0R7																					
0.75	R75																					
0.8	0R8																					
0.9	0R9																					
1	1R0																					
1.2	1R2																					
1.3	1R3																					
1.5	1R5																					
1.6	1R6																					
1.8	1R8																					
2	2R0																					
2.2	2R2																					
2.4	2R4																					
2.7	2R7																					
3	3R0																					
3.3	3R3																					
3.5	3R5																					
3.6	3R6																					
3.9	3R9																					
4	4R0																					
4.3	4R3																					
4.7	4R7																					
5	5R0																					
5.1	5R1																					
5.6	5R6																					
6	6R0																					
6.2	6R2																					
6.8	6R8																					
7	7R0																					
7.5	7R5																					
8	8R0																					
8.2	8R2																					
9	9R0																					
9.1	9R1																					
10	100																					
11	110																					
12	120																					
13	130																					
15	150																					
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36	360																					
39	390																					
43	430																					
47	470																					
51	510																					
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62	620																					
68	680																					
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82	820																					
91	910																					
100	101																					
110	111																					
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220	221																					
240	241																					
270	271																					
300	301																					
330	331																					
360	361																					
390	391																					
430	431																					
470	471																					
560	561																					
680	681																					
750	751																					
820	821																					
1.0nF	102																					
1.2	122																					
1.5	152																					
1.8	182																					

DIMENSION (MM)		GMC04																						
L(L1)		1.0 ± 0.05																						
W		0.5 ± 0.05																						
H		0.5 ± 0.1																						
BW(L2/LW)		0.1 ~ 0.35																						
DIELECTRIC		NPO/COG					X5R					X7R					Y5V & Z5U							
RATED VOLTAGE		6.3/10	16	25	50	100	200	6.3	10	16	25	35	50	6.3/10	16	25	50	100	200	6.3	10	16	25	50
CAP. RANGE																								
2.2	222																							
2.7	272																							
3.3	332																							
3.9	392																							
4.7	472																							
5.6	562																							
6.8	682																							
8.2	822																							
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100	104																							
150	154																							
220	224																							
270	274																							
390	394																							
470	474																							
560	564																							
680	684																							
820	824																							
1.0 uF	105																							
2.2	225																							
2.7	275																							
3.3	335																							
3.9	395																							
4.7	475																							
5.6	565																							
6.8	685																							
8.2	825																							
10	106																							
15	156																							
22	226																							
33	336																							
47	476																							

\*\*\*\*Please note L/W/H deviation for the 10uF is +/- .2mm\*\*\*\*

\*\*\*\*Please note L/W/H deviation for the 22uF is +/- .3mm\*\*\*\*



DIMENSION (MM)		GMC10																			
L(L1)		1.6 ± 0.2																			
W		0.8 ± 0.2																			
H		1.0 max																			
BW(L2/LW)		0.1 ~ 0.4																			
DIELECTRIC		NPO/COG				X5R				X7R				Y5V & Z5U							
RATED VOLTAGE		25	50	100	200	6.3	10	16	25	6.3	10	16	25	50	100	200	6.3	10	16	25	50
CAP. RANGE																					
0.4PF	R40																				
0.47	R47																				
0.5	0R5																				
0.6	0R6																				
0.7	R70																				
0.75	R75																				
0.8	0R8																				
1	1R0																				
1.2	1R2																				
1.3	1R3																				
1.5	1R5																				
1.8	1R8																				
2	2R0																				
2.2	2R2																				
2.4	2R4																				
2.7	2R7																				
3	3R0																				
3.3	3R3																				
3.6	3R6																				
3.9	3R9																				
4	4R0																				
4.3	4R3																				
4.7	4R7																				
5	5R0																				
5.1	5R1																				
5.6	5R6																				
6	6R0																				
6.2	6R2																				
6.8	6R8																				
7	7R0																				
7.5	7R5																				
8	8R0																				
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270	271																				
300	301																				
330	331																				
390	391																				
430	431																				
470	471																				
510	511																				
560	561																				
620	621																				
680	681																				
750	751																				
820	821																				
910	911																				

DIMENSION (MM)		GMC10																			
L(L1)		1.6 ± 0.2																			
W		0.8 ± 0.2																			
H		1.0 max																			
BW(L2/LW)		0.1 ~ 0.4																			
DIELECTRIC		NPO/COG				X5R				X7R								Y5V & Z5U			
RATED VOLTAGE		25	50	100	200	6.3	10	16/25	35	6.3	10	16	25	50	100	200	6.3	10	16	25	50
CAP. RANGE																					
1.0nF	102																				
1.2	122																				
1.5	152																				
1.8	182																				
2.2	222																				
2.7	272																				
3.3	332																				
3.9	392																				
4.7	472																				
5.6	562																				
6.8	682																				
7.5	752																				
8.2	822																				
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560	564																				
680	684																				
820	824																				
1.0 uF	105																				
2.2	225																				
2.7	275																				
3.3	335																				
3.9	395																				
4.7	475																				
10	106																				
22	226																				
47	476																				



DIMENSION (MM)		GMC21																											
L(L1)	2.0 ± 0.3	2.0 ± 0.3								2.0 ± 0.3								2.0 ± 0.3											
W	1.25 ± 0.2	1.25 ± 0.2								1.25 ± 0.2								1.25 ± 0.2											
H	1.4	1.0								1.5								1.5											
BW(L2/L3)	0.25 ~ 0.75	0.25 ~ 0.75								0.25 ~ 0.75								0.25 ~ 0.75											
DIELECTRIC	NPO/COG	X7R								X5R								Y5V/Z5U											
RATED VOLTAGE	16 25 50 100 200	6.3 10 16 25 35 50 100 200	4 6.3 10 16 25 35 50 63	6.3 10 16 25 50																									
CAP. RANGE																													
0.4pF	0R4																												
0.47	R47																												
0.5	R50																												
0.56	R56																												
0.75	R75																												
0.8	0R8																												
0.82	R82																												
1	1R0																												
1.1	1R1																												
1.2	1R2																												
1.3	1R3																												
1.5	1R5																												
1.6	1R6																												
1.8	1R8																												
2	2R0																												
2.2	2R2																												
2.4	2R4																												
2.7	2R7																												
3	3R0																												
3.3	3R3																												
3.6	3R6																												
3.9	3R9																												
4	4R0																												
4.3	4R3																												
4.7	4R7																												
5	5R0																												
5.1	5R1																												
5.6	5R6																												
6	6R0																												
6.2	6R2																												
6.8	6R8																												
7	7R0																												
7.5	7R5																												
8	8R0																												
8.2	8R2																												
9	9R0																												
9.1	9R1																												
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51	510																												
56	560																												
62	620																												
68	680																												
75	750																												
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200	201																												
220	221																												
240	241																												
270	271																												
300	301																												

DIMENSION (MM)		GMC21																									
L(L1)	2.0 ± 0.3	2.0 ± 0.3						2.0 ± 0.3						2.0 ± 0.3						2.0 ± 0.3							
W	1.25 ± 0.2	1.25 ± 0.2						1.25 ± 0.2						1.25 ± 0.2						1.25 ± 0.2							
H	1.4	1.35		1.45				1.5						1.5													
BW(L2/L3)	0.25 ~ 0.75	0.25 ~ 0.75						0.25 ~ 0.75						0.25 ~ 0.75													
DIELECTRIC	NPO/COG	X7R						X5R						Y5V/Z5U													
RATED VOLTAGE		16	25	50	100	200	6.3	10	16	25	35	50	100	200	4	6.3	10	16	25	35	50	63	6.3	10	16	25	50
CAP. RANGE																											
330	331																										
360	361																										
390	391																										
430	431																										
470	471																										
510	511																										
560	561																										
620	621																										
680	681																										
750	751																										
820	821																										
910	911																										
1.0nF	102																										
1.2	122																										
1.5	152																										
1.8	182																										
2.2	222																										
2.4	242																										
2.7	272																										
3.3	332																										
3.9	392																										
4.7	472																										
5.6	562																										
6.8	682																										
8.2	822																										
10	103																										
12	123																										
15	153																										
18	183																										
22	223																										
27	273																										
33	333																										
39	393																										
47	473																										
56	563																										
68	683																										
82	823																										
100	104																										
120	124																										
150	154																										
180	184																										
220	224																										
270	274																										
330	334																										
390	394																										
470	474																										
560	564																										
680	684																										
820	824																										
1.0 uF	105																										
1.2	125																										
1.5	155																										
1.8	185																										
2.2	225																										
3.3	335																										
4.7	475																										
4.7	475																										
6.8	685																										
10	106																										
15	156																										
22	226																										
33	336																										
47	476																										
100	107																										
150	157																										
220	227																										
330	337																										

■ 1.45 max thickness or height



DIMENSION (MM)		GMC31																					
L(L1)	3.2 ± 0.3	3.2 ± 0.3					3.2 ± 0.3					3.2 ± 0.3											
W	1.6 ± 0.2	1.6 ± 0.2					1.6 ± 0.2					1.6 ± 0.2											
H	1.8 max	1.8 max					1.8 max					1.8 max											
BW(L2/L3)	0.25 ~ 0.75	0.25 ~ 0.75					0.25 ~ 0.75					0.25 ~ 0.75											
DIELECTRIC	NPO/COG	X7R										X5R					Y5V/Z5U						
RATED VOLTAGE		25	50	100	200	6.3	10	16	25	50	100	200	4	6.3	10	16	25	50	6.3	10	16	25	50
CAP. RANGE																							
0.47pF	0R47																						
0.5	R50																						
0.56	R56																						
0.68	R68																						
0.75	R75																						
0.8	0R8																						
1	1R0																						
1.1	1R1																						
1.2	1R2																						
1.3	1R3																						
1.5	1R5																						
1.6	1R6																						
1.8	1R8																						
2	2R0																						
2.2	2R2																						
2.4	2R4																						
2.7	2R7																						
3	3R0																						
3.3	3R3																						
3.6	3R6																						
3.9	3R9																						
4	4R0																						
4.3	4R3																						
4.7	4R7																						
5	5R0																						
5.1	5R1																						
5.6	5R6																						
6	6R0																						
6.2	6R2																						
6.8	6R8																						
7	7R0																						
7.5	7R5																						
8	8R0																						
8.2	8R2																						
9	9R0																						
9.1	9R1																						
10	100																						
11	110																						
12	120																						
13	130																						
15	150																						
16	160																						
18	180																						
20	200																						
22	220																						
24	240																						
27	270																						
30	300																						
33	330																						
36	360																						
39	390																						
43	430																						
47	470																						
51	510																						
56	560																						
62	620																						
68	680																						
75	750																						
82	820																						
91	910																						
100	101																						
120	121																						
130	131																						
150	151																						
160	161																						
180	181																						
200	201																						
220	221																						
240	241																						
270	271																						



DIMENSION (MM)		GMC32																			
L(L1)	3.2 ± 0.3	3.2 ± 0.3					3.2 ± 0.3					3.2 ± 0.3					3.2 ± 0.3				
W	2.5 ± 0.3	2.5 ± 0.3					2.5 ± 0.3					2.5 ± 0.3					2.5 ± 0.3				
H	2.2 max	2.8 max					2.8 max					2.8 max					2.8 max				
BW(L2/L3)	0.25 ~ 0.75	0.25 ~ 0.75					0.25 ~ 0.75					0.25 ~ 0.75					0.25 ~ 0.75				
DIELECTRIC	NPO/COG	X7R					X5R					Y5V/Z5U									
RATED VOLTAGE	16 25 50 100 200	6.3 10 16 25 50 100 200	4 6.3 10 16 25 50	6.3 10 16 25 50																	
CAP. RANGE																					
0.5pF	0R5																				
0.4	R40																				
0.47	R47																				
0.7	R70																				
0.75	R75																				
1	1R0																				
1.1	1R1																				
1.2	1R2																				
1.3	1R3																				
1.5	1R5																				
1.6	1R6																				
1.8	1R8																				
2	2R0																				
2.2	2R2																				
2.4	2R4																				
2.7	2R7																				
3	3R0																				
3.3	3R3																				
3.6	3R6																				
3.9	3R9																				
4	4R0																				
4.3	4R3																				
4.7	4R7																				
5	5R0																				
5.1	5R1																				
5.6	5R6																				
6	6R0																				
6.2	6R2																				
6.8	6R8																				
7	7R0																				
7.5	7R5																				
8	8R0																				
8.2	8R2																				
9	9R0																				
9.1	9R1																				
10	100																				
11	110																				
12	120																				
13	130																				
15	150																				
16	160																				
18	180																				
20	200																				
22	220																				
24	240																				
27	270																				
30	300																				
33	330																				
36	360																				
39	390																				
43	430																				
47	470																				
51	510																				
56	560																				
62	620																				
68	680																				
75	750																				
82	820																				
91	910																				
100	101																				
120	121																				
130	131																				
150	151																				
160	161																				
180	181																				
200	201																				
220	221																				
240	241																				
270	271																				
300	301																				
330	331																				

DIMENSION (MM)		GMC32																													
L(L1)	3.2 ± 0.3	3.2 ± 0.3					3.2 ± 0.3					3.2 ± 0.3					3.2 ± 0.3														
W	2.5 ± 0.3	2.5 ± 0.3					2.5 ± 0.3					2.5 ± 0.3					2.5 ± 0.3														
H	2.2 MAX	2.8 MAX					2.8 MAX					2.8 MAX					2.8 MAX														
BW(L2/L3)	0.25 ~ 0.75	0.25 ~ 0.75					0.25 ~ 0.75					0.25 ~ 0.75					0.25 ~ 0.75														
DIELECTRIC	NPO/COG	X7R					X7S					X5R					Y5V/Z5U														
RATED VOLTAGE	16	25	50	100	200	6.3	10	16	25	35	50	100	200	4	6.3	10	16	100	4	6.3	10	16	25	35	50	100	6.3	10	16	25	50
CAP. RANGE																															
360pF	361																														
390	391																														
430	431																														
470	471																														
510	511																														
560	561																														
680	681																														
750	751																														
820	821																														
910	911																														
1.0nF	102																														
1.2	122																														
1.5	152																														
1.8	182																														
2.2	222																														
2.4	242																														
2.7	272																														
3.3	332																														
3.9	392																														
4.7	472																														
5.6	562																														
6.8	682																														
8.2	822																														
10	103																														
12	123																														
15	153																														
18	183																														
22	223																														
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33	333																														
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47	473																														
56	563																														
68	683																														
82	823																														
100	104																														
120	124																														
150	154																														
180	184																														
220	224																														
270	274																														
330	334																														
390	394																														
470	474																														
560	564																														
680	684																														
820	824																														
1.0 uF	105																														
1.5	155																														
1.8	185																														
2.2	225																														
3.3	335																														
4.7	475																														
6.8	685																														
8.2	825																														
10	106																														
15	156																														
22	226																														
33	336																														
47	476																														
68	686																														
100	107																														
150	157																														
220	227																														
330	337																														

For GMC32X5R (1210) size (L) tolerance for values > 100uf, tolerance increases to 3.2mm +/- 0.4 mm.



DIMENSION (MM)		GMC40							
L(L1)		4.57 ± 0.25				4.57 ± 0.25			
W		2.03 ± 0.25				2.03 ± 0.25			
H		2.1 max				3 max			
BW(L2/L3)		0.25 ~ 0.75				0.25 ~ 0.75			
DIELECTRIC		NPO/COG				X7R			
RATED VOLTAGE		50	100	200	25	50	100	200	
CAP. RANGE									
9.1	9R1								
10	100								
11	110								
12	120								
13	130								
15	150								
16	160								
18	180								
20	200								
22	220								
24	240								
27	270								
30	300								
33	330								
36	360								
39	390								
43	430								
47	470								
51	510								
56	560								
62	620								
68	680								
75	750								
82	820								
91	910								
100	101								
120	121								
130	131								
150	151								
160	161								
180	181								
200	201								
220	221								
240	241								
270	271								
300	301								
330	331								
360	361								
390	391								
430	431								
470	471								
510	511								
560	561								
620	621								
680	681								
750	751								
820	821								
910	911								
1.0nF	102								
1.2	122								
1.5	152								
1.8	182								
2.2	222								
2.4	242								
2.7	272								
3.3	332								
3.9	392								
4.7	472								
5.6	562								
6.8	682								
8.2	822								
10	103								
12	123								
15	153								
18	183								
22	223								
27	273								
33	333								
39	393								
47	473								
56	563								
68	683								
82	823								
100	104								
120	124								
150	154								
180	184								
220	224								
270	274								
330	334								
390	394								
470	474								
560	564								

1808

DIMENSION (MM)		GMC43																	
L(L1)		4.5 ± 0.35				4.5 ± 0.35				4.5 ± 0.35				4.5 ± 0.35					
W		3.2 ± 0.3				3.2 ± 0.3				3.2 ± 0.3				3.2 ± 0.3					
H		2.2 max				3 max				3 max				3 max					
BW(L2/L3)		0.25 ~ 0.75				0.25 ~ 0.75				0.25 ~ 0.75				0.25 ~ 0.75					
DIELECTRIC		NPO/COG				X7R				X5R				Y5V/Z5U					
Rated Voltage		50	100	200	10	16	25	50	100	200	6.3	10	16	25	6.3	10	16	25	50
Cap. Range																			
0.5pF	0R5																		
0.4	R40																		
0.47	R47																		
0.7	R70																		
0.75	R75																		
1	1R0																		
1.1	1R1																		
1.2	1R2																		
1.3	1R3																		
1.5	1R5																		
1.6	1R6																		
1.8	1R8																		
2	2R0																		
2.2	2R2																		
2.4	2R4																		
2.7	2R7																		
3	3R0																		
3.3	3R3																		
3.6	3R6																		
3.9	3R9																		
4	4R0																		
4.3	4R3																		
4.7	4R7																		
5	5R0																		
5.1	5R1																		
5.6	5R6																		
6	6R0																		
6.2	6R2																		
6.8	6R8																		
7	7R0																		
7.5	7R5																		
8	8R0																		
8.2	8R2																		
9	9R0																		
9.1	9R1																		
10	100																		
11	110																		
12	120																		
13	130																		
15	150																		
16	160																		
18	180																		
20	200																		
22	220																		
24	240																		
27	270																		
30	300																		
33	330																		
36	360																		
39	390																		
43	430																		
47	470																		
51	510																		
56	560																		
62	620																		
68	680																		
75	750																		
82	820																		
91	910																		
100	101																		
120	121																		
130	131																		
150	151																		
160	161																		
180	181																		
200	201																		
220	221																		
240	241																		
270	271																		
300	301																		
330	331																		
360	361																		

1812

1812

DIMENSION (MM)		GMC43																		
L(L1)	4.5 ± 0.35	4.5 ± 0.35				4.5 ± 0.35				4.5 ± 0.35				4.5 ± 0.35						
W	3.2 ± 0.3	3.2 ± 0.3				3.2 ± 0.3				3.2 ± 0.3				3.2 ± 0.3						
H	2.2 max	3 max				3 max				3 max				3 max						
BW(L2/L3)	0.25 ~ 0.75	0.25 ~ 0.75				0.25 ~ 0.75				0.25 ~ 0.75				0.25 ~ 0.75						
DIELECTRIC	NPO/COG	X7R								X5R				Y5V/Z5U						
RATED VOLTAGE		50	100	200	10	16	25	50	100	200	6.3	10	16	25	6.3	10	16	25	50	
CAP. RANGE																				
	390	391																		
	430	431																		
	470	471																		
	510	511																		
	560	561																		
	680	681																		
	750	751																		
	820	821																		
	910	911																		
	1.0nF	102																		
	1.2	122																		
	1.5	152																		
	1.8	182																		
	2.2	222																		
	2.4	242																		
	2.7	272																		
	3.3	332																		
	3.9	392																		
	4.7	472																		
	5.6	562																		
	6.8	682																		
	8.2	822																		
	10	103																		
	12	123																		
	15	153																		
	18	183																		
	22	223																		
	27	273																		
	33	333																		
	39	393																		
	47	473																		
	56	563																		
	68	683																		
	82	823																		
	100	104																		
	120	124																		
	150	154																		
	180	184																		
	220	224																		
	270	274																		
	330	334																		
	470	474																		
	560	564																		
	680	684																		
	820	824																		
	1.0 uF	105																		
	1.2	125																		
	1.5	155																		
	1.8	185																		
	2.2	225																		
	2.7	275																		
	3.3	335																		
	4.7	475																		
	6.8	685																		
	10	106																		
	15	156																		
	22	226																		
	33	336																		
	47	476																		
	68	686																		
	100	107																		
	150	157																		
	220	227																		
	330	337																		

1825

DIMENSION (MM)		GMC45														
L(L1)	4.5 ± 0.35	4.5 ± 0.35					4.5 ± 0.35									
W	6.3 ± 0.4	6.3 ± 0.4					6.3 ± 0.4									
H	2.2 max	3.2 max					3.2 max									
BW(L2/L3)	0.25 ~ 0.75	0.25 ~ 0.75					0.25 ~ 0.75									
DIELECTRIC	NPO/COG	X7R														
RATED VOLTAGE		50	100	200	16	25	50	100	200	16	25	50	100	200		
CAP. RANGE																
	9.1	9R1														
	10	100														
	11	110														
	12	120														
	13	130														
	15	150														
	16	160														
	18	180														
	20	200														
	22	220														
	24	240														
	27	270														
	30	300														
	33	330														
	36	360														
	39	390														
	43	430														
	47	470														
	51	510														
	56	560														
	62	620														
	68	680														
	75	750														
	82	820														
	91	910														
	100	101														
	120	121														
	130	131														
	150	151														
	160	161														
	180	181														
	200	201														
	220	221														
	240	241														
	270	271														
	300	301														
	330	331														
	360	361														
	390	391														
	430	431														
	470	471														
	510	511														
	560	561														
	680	681														
	750	751														
	820	821														
	910	911														
	1.0nF	102														
	1.2	122														
	1.5	152														
	1.8	182														
	2.2	222														
	2.4	242														
	2.7	272														
	3.3	332														
	3.9	392														
	4.7	472														
	5.6	562														
	6.8	682														
	8.2	822														
	10	103														
	12	123														
	15	153														
	18	183														
	22	223														
	27	273														
	33	333														
	39	393														
	47	473														
	56	563														
	68	683														
	82	823														
	100	104														
	120	124														
	150	154														
	180	184														
	220	224														
	270	274														
	330	334														
	470	474														
	560	564														
	680	684														
	820	824														
	1.0 uF	105														
	1.2	125														
	1.5	155														
	1.8	185														
	2.2	225														
	2.7	275														
	3.3	335														
	4.7	475														
	6.8	685														
	10	106														
	15	156														
	22	226														
	33	336														
	47	476														
	68	686														
	100	107														
	150	157														
	220	227														
	330	337														

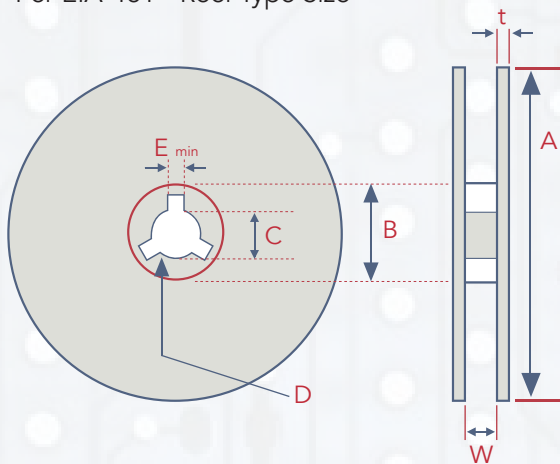
DIMENSION (MM)		GMC55																			
L(L1)	5.7 ± 0.4	5.7 ± 0.4					5.7 ± 0.4					5.7 ± 0.4									
W	5.0 ± 0.4	5.0 ± 0.4					5.0 ± 0.4					5.0 ± 0.4									
H	2.2 max	3.5 max					3.5 max					3.5 max									
BW(L2/L3)	0.25 ~ 0.75	0.25 ~ 0.75					0.25 ~ 0.75					0.25 ~ 0.75									
DIELECTRIC	NPO/COG	X7R					X5R					Y5V/Z5U									
RATED VOLTAGE	50 100 200	16 25 50 100 200	6.3 10 16 25 50	6.3 10 16 25 50	6.3 10 16 25 50																
CAP. RANGE																					
270pF	271																				
300	301																				
330	331																				
360	361																				
390	391																				
430	431																				
470	471																				
510	511																				
560	561																				
680	681																				
750	751																				
820	821																				
910	911																				
1.0nF	102																				
1.2	122																				
1.5	152																				
1.8	182																				
2.2	222																				
2.4	242																				
2.7	272																				
3.3	332																				
3.9	392																				
4.7	472																				
5.6	562																				
6.8	682																				
8.2	822																				
10	103																				
12	123																				
15	153																				
18	183																				
22	223																				
27	273																				
33	333																				
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82	823																				
100	104																				
120	124																				
150	154																				
180	184																				
220	224																				
270	274																				
330	334																				
390	394																				
470	474																				
560	564																				
680	684																				
820	824																				
1.0 uF	105																				
1.2	125																				
1.5	155																				
1.8	185																				
2.2	225																				
2.7	275																				
3.3	335																				
3.9	395																				
4.7	475																				
5.6	565																				
6.8	685																				
8.2	825																				
10	106																				
15	156																				
22	226																				
33	336																				
47	476																				
68	686																				
100	107																				
150	157																				
220	227																				
330	337																				

2225

DIMENSION (MM)		GMC57											
L(L1)	5.7 ± 0.4	6.3 ± 0.4						6.3 ± 0.4					
W	6.3 ± 0.4	5.0 ± 0.4						5.0 ± 0.4					
H	2.2 max	3.5 max						3.5 max					
BW(L2/L3)	0.25 ~ 0.75	0.25 ~ 0.75						0.25 ~ 0.75					
BW(L2/L3)	NPO/COG	X7R						Y5V/Z5U					
DIELECTRIC	50 100 200	16	25	50	100	200	6.3	10	16	25	50		
RATED VOLTAGE													
CAP. RANGE													
270	271												
300	301												
330	331												
360	361												
390	391												
430	431												
470	471												
510	511												
560	561												
620	621												
680	681												
750	751												
820	821												
910	911												
1.0nF	102												
1.2	122												
1.5	152												
1.8	182												
2.2	222												
2.4	242												
2.7	272												
3.3	332												
3.9	392												
4.7	472												
5.6	562												
6.8	682												
7.5	752												
8.2	822												
10	103												
12	123												
15	153												
18	183												
22	223												
27	273												
33	333												
39	393												
47	473												
56	563												
68	683												
82	823												
100	104												
120	124												
150	154												
180	184												
220	224												
270	274												
330	334												
390	394												
470	474												
560	564												
680	684												
820	824												
1.0 uF	105												
1.2	125												
1.5	155												
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33	336												
47	476												
68	686												
100	107												
150	157												
220	227												
330	337												

# PACKAGING (TAPING)

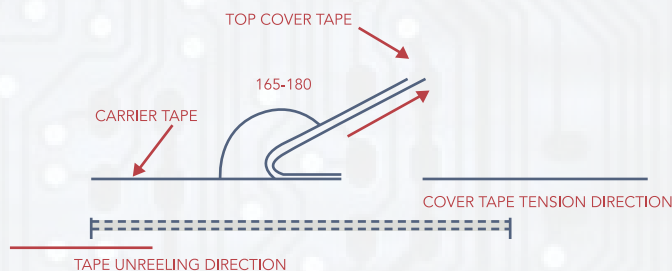
Per EIA-481 - Reel Type Size



UNIT: mm

SYMBOL	TAPE WIDTH	A	B	C	D	E	W	t
7" Reel	4mm	$\phi 178 \pm 2.0$	MIN $\phi 50$	$\phi 13 \pm 0.5$	$21 \pm 0.8$	$2.0 \pm 0.5$	$5 \pm 0.5$	$1.2 \pm 0.2$
	8mm	$\phi 178 \pm 2.0$	MIN $\phi 50$	$\phi 13 \pm 0.5$	$21 \pm 0.8$	$2.0 \pm 0.5$	$10 \pm 0.5$	$0.9 \pm 0.2$
	12mm	$\phi 178 \pm 2.0$	MIN $\phi 50$	$\phi 13 \pm 0.5$	$21 \pm 0.8$	$2.0 \pm 0.5$	$13 \pm 0.5$	$1.2 \pm 0.2$
10" Reel	8mm	$\phi 258 \pm 2.0$	MIN $\phi 70$	$\phi 13 \pm 0.5$	$21 \pm 0.8$	$2.0 \pm 0.5$	$10 \pm 0.5$	$1.8 \pm 0.2$
	12mm	$\phi 330 \pm 2.0$	MIN $\phi 70$	$\phi 13 \pm 0.5$	$21 \pm 0.8$	$2.0 \pm 0.5$	$10 \pm 0.5$	$1.8 \pm 0.2$
13" Reel	8mm	$\phi 330 \pm 2.0$	MIN $\phi 70$	$\phi 13 \pm 0.5$	$21 \pm 0.8$	$2.0 \pm 0.5$	$10 \pm 0.5$	$1.8 \pm 0.2$
	12mm	$\phi 330 \pm 2.0$	MIN $\phi 70$	$\phi 13 \pm 0.5$	$21 \pm 0.8$	$2.0 \pm 0.5$	$13 \pm 0.5$	$2.2 \pm 0.2$

## CarrierTape (Standard)



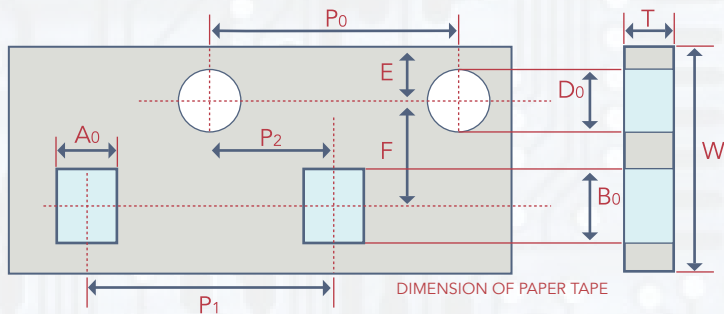
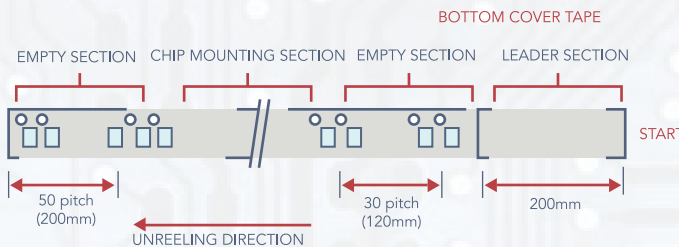
- To peel off the cover tape by the method shown in the right figure apply a peel-off force of 20GF - 60GF (card board); 10GF - 75GF (plastic tape).

-The cover tape should not touch the top or bottom of the chip.

- If the cover tape has been peeled off it may be difficult to remove the chip due to punch-hole clearance, dirt, and debris. Make sure therefore that no paper waste will adhere to and block the absorption nozzle.

- If the cover tape has been peeled off from the top, stick it back on with a suitable adhesive.

- Follow the illustration for the start and end of the winding operation.



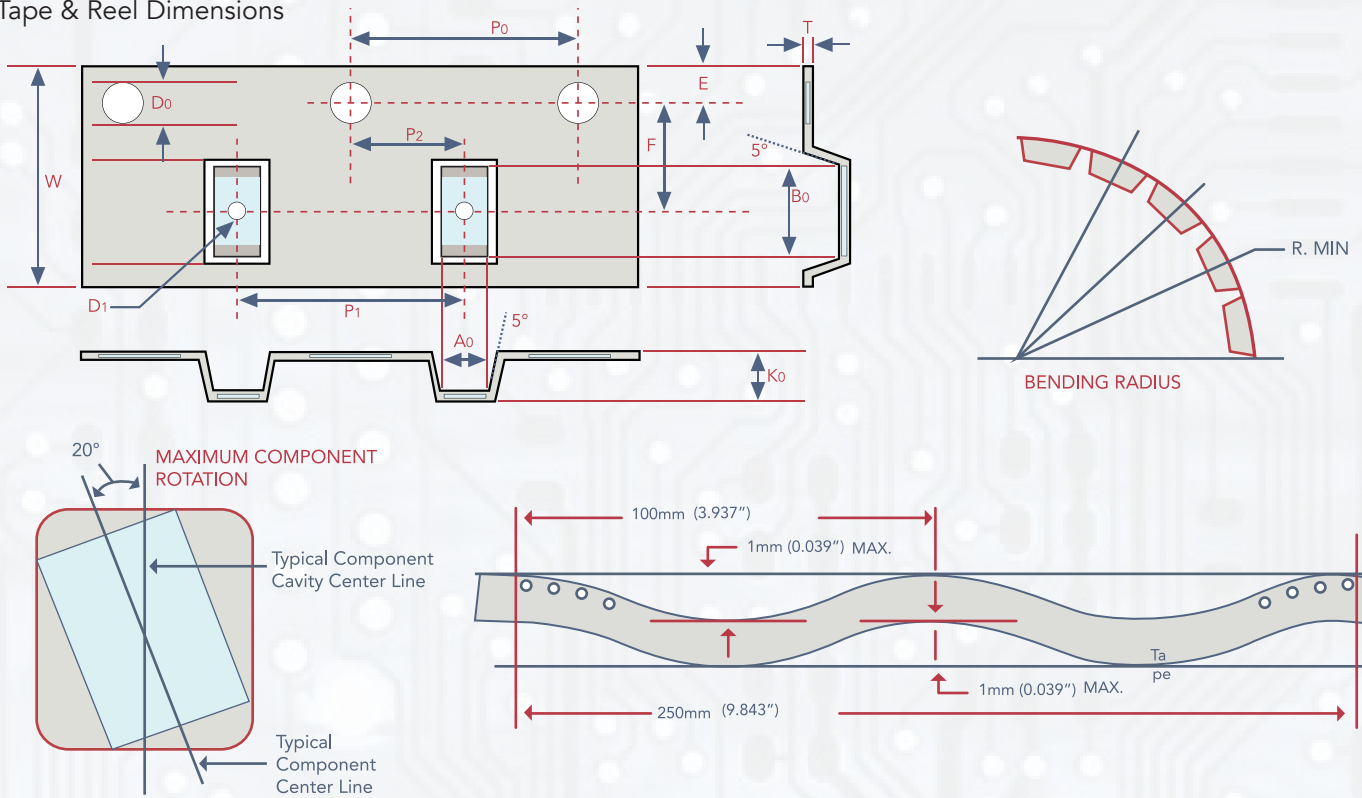
CARDBOARD CARRIER TAPE FOR 01005, 0201, 0402, 0603, 0805, 1206

UNIT=mm

TYPE	A <sub>0</sub>	B <sub>0</sub>	T	K <sub>0</sub>	W	P <sub>0</sub>	10XP <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	D <sub>0</sub>	D <sub>1</sub>	E	F	MOUNTING HOLE	STD. REEL QTY 7"	OPTIONAL REEL QTY (10/13)
01005	0.25±0.04	0.45±0.04	0.36±0.05	*	8.0±0.30	4.0±0.10	40.0±0.10	2.0±0.05	2.0±0.05	1.5±0.1	*	1.75±0.1	3.5±0.05	Angular Punch Hole	20,000	50,000 D
0201	0.39±0.07	0.69±0.07	<0.50	*	8.0±0.10	4.0±0.10	40.0±0.10	2.0±0.05	2.0±0.05	1.55±0.05	*	1.75±0.05	3.5±0.05		10,000 15,000	50,000 D
0402	0.7±0.20	1.2±0.20	<0.80	*	8.0±0.10	4.0±0.10	40.0±0.10	2.0±0.05	2.0±0.05	1.55±0.05	*	1.75±0.05	3.5±0.05		10,000	40,000 D 50,000 G
0603	1.1±0.20	1.9±0.20	<1.20	*	8.0±0.10	4.0±0.10	40.0±0.10	2.0±0.05	2.0±0.05	1.55±0.05	*	1.75±0.05	3.5±0.05		4,000	10,000 D 15,000 G
0805	1.65±0.20	2.4±0.20	<01.30	*	8.0±0.10	4.0±0.10	40.0±0.10	2.0±0.05	2.0±0.05	1.55±0.05	*	1.75±0.05	3.5±0.05		4,000	10,000 D 15,000 G 20,000 Q
1206	2.0±0.20	3.6±0.20	<01.30	*	8.0±0.10	4.0±0.10	40.0±0.10	2.0±0.05	2.0±0.05	1.55±0.05	*	1.75±0.05	3.5±0.05		4,000	10,000 D 15,000 G 20,000 Q

# PACKAGING (TAPING)

## Tape & Reel Dimensions



- Embossed plastic carrier tape for 0805/1206/1210/1808/1812/1825/2220 AND 2225 type

TYPE	A <sub>0</sub>	B <sub>0</sub>	T	K <sub>0</sub>	W	P <sub>0</sub>	10XP <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	D <sub>0</sub>	D <sub>1</sub>	E	F	MOUNTING HOLE	STD. REEL QTY 7"	OPTIONAL REEL QTY (10/13")
0805	<1.80	<2.70	0.23±0.10	<2.50	8.0±0.20	4.0±0.10	40.0±0.20	4.0±0.10	2.0±0.05	1.5±0.10	1.0±0.10	1.75±0.10	3.5±0.05	Angular Embossed Hole	2,000 3,000	10,000 D 15,000 G
1206	<2.30	<4.00	0.23±0.10	<2.50	8.0±0.20	4.0±0.10	40.0±0.20	4.0±0.10	2.0±0.05	1.5±0.10	1.0±0.10	1.75±0.10	3.5±0.05		2,000 3,000	8,000 D 10,000 G
1210	<3.20	<3.95	0.23±0.10	<3.00	8.0±0.20	4.0±0.10	40.0±0.20	4.0±0.10	2.0±0.05	1.5±0.10	1.0±0.10	1.75±0.10	3.5±0.05		500 1,000 2,000 3,000	4,000 D 8,000 G
1808	<2.50	<5.30	0.25±0.10	<2.50	12.0±0.20	4.0±0.10	40.0±0.20	4.0±0.10	2.0±0.05	1.5±0.10	1.0±0.10	1.75±0.10	5.5±0.10		1,000 2,000 3,000	
1812	<3.90	<5.30	0.25±0.10	<3.50	12.0±0.20	4.0±0.10	40.0±0.20	8.0±0.10	2.0±0.05	1.5±0.10	1.5±0.10	1.75±0.10	5.5±0.10		500 1,000	3,000 D
1825	<6.80	<5.30	0.30±0.10	<3.10	12.0±0.20	4.0±0.10	40.0±0.20	8.0±0.10	2.0±0.05	1.5±0.10	1.5±0.10	1.75±0.10	5.5±0.10		500 1,000	
2220	<5.80	<6.50	0.30±0.10	<3.10	12.0±0.20	4.0±0.10	40.0±0.20	8.0±0.10	2.0±0.05	1.5±0.10	1.5±0.10	1.75±0.10	5.5±0.10		500 1,000	
2225	<6.80	<6.50	0.30±0.10	<3.10	12.0±0.20	4.0±0.10	40.0±0.20	8.0±0.10	2.0±0.05	1.5±0.10	1.5±0.10	1.75±0.10	5.5±0.10		500 700	

**WARRANTY:** All passive components supplied by Calchip Electronics, 59 Steamwhistle Drive, Ivyland, PA. 18974, are under warranty for a period of 2 years from the date of manufacture. Product will meet or exceed all reliability and test specifications expressed by Calchip for the above mentioned time period provided storage conditions (stated below) are met. Product Storage Instructions:

- 1) Product must be kept away from direct sunlight.
- 2) Product must be stored in the following conditions - Temperature; 5 to 35 degrees Celsius / 40 to 95 degrees Fahrenheit Humidity; 45 to 85%
- 3) Product to be kept free of moisture, dirt and debris.

**\*\*WHEN THESE CONDITIONS ARE NOT MET, PRODUCT LIFE COULD BE SHORTENED\*\*\*\***

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