

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

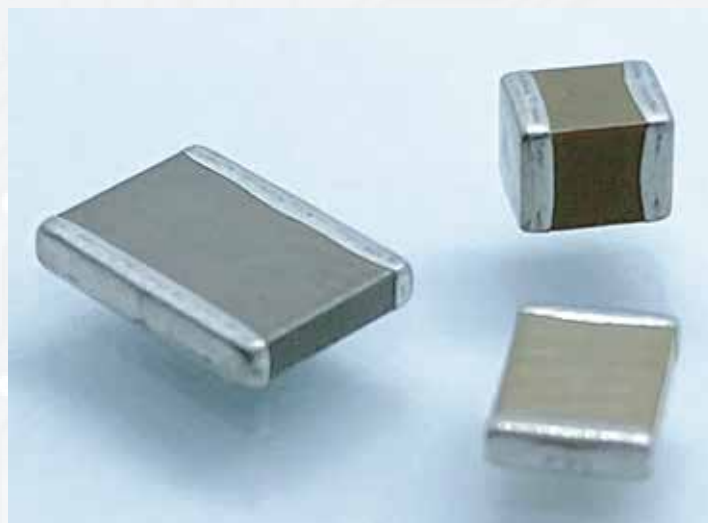
COG (NPO) - Capacitance change with temperature is 0-30ppm/°C which is less than -0.3%/°C from -55°C to +125°C. Typical capacitance change with life is less than -0.1 % for NPOs, one-fifth that shown by most other dielectrics. NPO formulations show no aging characteristics.

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

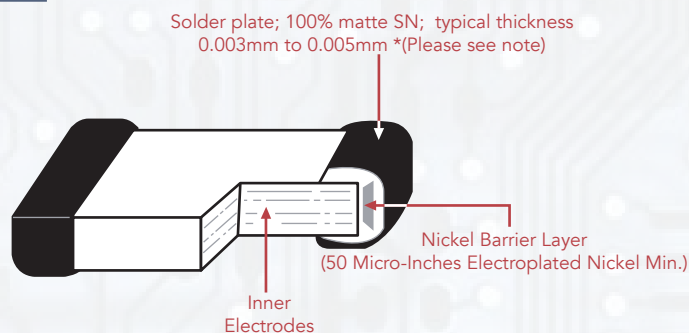
OPERATING TEMPERATURE RANGE	TEMPERATURE COEFFICIENT	TEMPERATURE VOLTAGE COEFFICIENT (ΔC_{MAX} @ V_{bcw})	DISSIPATION FACTOR	INSULATION RESISTANCE	DIELECTRIC WITHSTANDING VOLTAGE	AGING RATE	TEST PARAMETERS
-55°C to° +125 C	0±30ppm/°C	0±30ppm/°C	0.1% Max, 0.02% Typical	10,000M Ω - μ F min or 500M Ω - μ F min (or 100M Ω - μ F) product whichever is smaller (Rated voltage ≤16V :10,000M Ω min or 100M Ω - μ F whichever is smaller)	3 X V_{bcw}	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

Stable class II dielectric

OPERATING TEMPERATURE RANGE	TEMPERATURE COEFFICIENT	TEMPERATURE VOLTAGE COEFFICIENT (ΔC_{MAX} @ V_{bcw})	DISSIPATION FACTOR	INSULATION RESISTANCE	DIELECTRIC WITHSTANDING VOLTAGE	AGING RATE	TEST PARAMETERS
X7R=-55C to+125C X5R=-55C to+85C X6S=-55C to+105C X7S=-55C to+125C	±15% ±22%	X7R/X5R Not Applicable X6S/X7S Not Applicable	2.5% Max, 1.8% Typical	10,000M Ω - μ F min or 500M Ω - μ F min (or 100M Ω - μ F) product whichever is smaller (Rated voltage ≤16V :10,000M Ω min or 100M Ω - μ F whichever is smaller)	2.5 X V_{bcw}	<2% per decade hour	1KHz 1.0Vrms ±0.2Vrms 25°C values> or = to 10uF 0.5±0.1 volt



CONSTRUCTION



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 (ΔC_{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	10,000M Ω - μ F min or 500M Ω - μ F min (or 100M Ω - μ F) product whichever is smaller (Rated voltage $\leq 16V$: 10,000M Ω min or 100M Ω - μ F whichever is smaller)	2.5 X V_{DCW}	3.0% per decade hour	1 KHz, 1 Vrms 25°C values $> \text{ or } =$ 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.

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 X6S X7S	0R5: 0.5pF 5R0: 5.0pF R75: 0.75pF 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.

Cal-Chip
Electronics Inc.

01005

DIMENSION (MM)		GMC01				
L(L1)		0.4 ± 0.02				
W		0.2 ± 0.02				
H		0.2 ± 0.22 MAX				
BW(L2/L3)		0.07 ~ 0.14				
DIELECTRIC		NPO/COG				
RATED VOLTAGE		6.3	10	16V	25	50
CAP. RANGE						
0.2pF	0R2					
0.3pF	0R3					
0.4pF	0R4					
0.5pF	0R5					
0.6pF	0R6					
0.7pF	0R7					
0.75	R75					
0.8pF	0R8					
0.9pF	0R9					
1	1R0					
1.1	1R1					
1.2	1R2					
1.3	1R3					
1.4	1R4					
1.5	1R5					
1.6	1R6					
1.7	1R7					
1.8	1R8					
1.9	1R9					
2	2R0					
2.1	2R1					
2.2	2R2					
2.3	2R3					
2.4	2R4					
2.5	2R5					
2.6	2R6					
2.7	2R7					
2.8	2R8					
2.9	2R9					
3	3R0					
3.1	3R1					
3.2	3R2					
3.3	3R3					
3.4	3R4					
3.5	3R5					
3.6	3R6					
3.7	3R7					
3.9	3R9					
4	4R0					
4.1	4R1					
4.2	4R2					
4.3	4R3					
4.4	4R4					
4.5	4R5					
4.6	4R6					
4.7	4R7					
4.8	4R8					
4.9	0					
5	5R0					
5.1	5R1					
5.2	5R2					
5.3	5R3					
5.4	5R4					
5.5	5R5					
5.6	5R6					
5.7	5R7					
5.8	5R8					
5.9	5R9					
6	6R0					
6.1	6R1					
6.2	6R2					
6.3	6R3					
6.4	6R4					
6.5	6R5					
6.6	6R6					
6.7	6R7					
6.8	6R8					
6.9	6R9					
7	7R0					
7.1	7R1					
7.2	7R2					
7.3	7R3					
7.4	7R4					
7.5	7R5					
7.6	7R6					
7.7	7R7					
7.8	7R8					
7.9	7R9					
8	8R0					
8.1	8R1					
8.2	8R2					
8.3	8R3					

DIMENSION (MM)		GMC01										
L(L1)		0.4 ± 0.02										
W		0.2 ± 0.02										
H		0.2 ± 0.22 MAX										
BW(L2/L3)		0.07 ~ 0.14										
DIELECTRIC		NPO/COG					X7R			X5R		
RATED VOLTAGE		6.3	10	16V	25	50	6.3	10	16	6	10	16
CAP. RANGE												
8.5	8R5											
8.6	8R6											
8.7	8R7											
8.8	8R8											
8.9	8R9											
9	9R0											
9.1	9R1											
9.2	9R2											
9.3	9R3											
9.4	9R4											
9.5	9R5											
9.6	9R6											
9.7	9R7											
9.8	9R8											
9.9	9R9											
10	100											
11	110											
12	120											
13	130											
15	150											
16	160											
18	180											
20	200											
21	210											
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	920											
100	101											
120	121											
150	151											
180	181											
220	221											
241	240											
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											
270	274											
470	474											
1uF	105											

0201

DIMENSION (MM)		GMC02																				
L(L1)		0.6 ± 0.03																				
W		0.3 ± 0.03																				
H		0.3 ± 0.33 MAX		0.3 ± 0.55 MAX				0.3 ± 0.39 MAX				0.3 ± 0.33 MAX				0.3 ± 0.35 MAX				0.3 ± 0.33 MAX		
BW(L2/L3)		0.15 ± 0.05																				
DIELECTRIC		NPO/COG		X5R				X6S				X7R				X7S				Y5V/Z5U		
RATED VOLTAGE		25	50	4/6.3V	10	16	25	4/6.3V	10	16	25	50	6.3	10	16	25	50	4V	6.3V	10V	16V	6.3
CAP. RANGE																						
0.1pF	0R1																					
0.2	0R2																					
0.3	0R3																					
0.4	0R4																					
0.47	R47																					
0.5	0R5																					
0.56	R56																					
0.6	0R6																					
0.7	0R7																					
0.75	R75																					
0.8	0R8																					
0.82	R82																					
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																					
2.5	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																					
910	911																					
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																					
154	154																					
220	224																					
470	474																					
1.0uF	105																					
2.2	225																					
4.7	475																					

DIMENSION (MM)		GMC04						
L(L1)		1.0 ± 0.05						
W		0.5 ± 0.05						
H		0.5 ± 0.51 MAX						
BW(L2/LW)		0.1 ~ 0.35						
DIELECTRIC		NPO/COG						
RATED VOLTAGE		6.3	10	16	25	50	100	200
CAP. RANGE								
0.1pF	R10							
0.2	R20							
0.22	R22							
0.3	R30							
0.39	R39							
0.4	R40							
0.47	R47							
0.5	0R5							
0.56	R56							
0.6	0R6							
0.68	R68							
0.7	0R7							
0.75	R75							
0.8	0R8							
0.82	R82							
0.9	0R9							
1	1R0							
1.1	1R1							
1.2	1R2							
1.3	1R3							
1.5	1R5							
1.6	1R6							
1.7	1R7							
1.8	1R8							
1.9	1R9							
2	2R0							
2.1	2R1							
2.2	2R2							
2.3	2R3							
2.4	2R4							
2.5	2R5							
2.6	2R6							
2.7	2R7							
2.8	2R8							
2.9	2R9							
3	3R0							
3.1	3R1							
3.2	3R2							
3.3	3R3							
3.4	.R4							
3.5	3R5							
3.6	3R6							
3.7	3R7							
3.8	3R8							
3.9	3R9							
4	4R0							
4.1	4R1							
4.2	4R2							
4.3	4R3							
4.4	4R4							
4.5	4R5							
4.6	4R6							
4.7	4R7							
4.8	4R8							
4.9	4R9							
5	5R0							
5.1	5R1							
5.2	5R2							
5.3	5R3							
5.4	5R4							
5.5	5R5							
5.6	5R6							
5.7	5R7							
5.8	5R8							
5.9	5R9							
6	6R0							
6.1	6R1							
6.2	6R2							
6.3	6R3							
6.4	6R4							
6.5	6R5							
6.6	6R6							
6.7	6R7							
6.8	6R8							
6.9	6R9							
7	7R0							

[illegible]

A close-up photograph showing several small, dark, rectangular microchips (likely MEMS sensors) mounted on a light blue, textured surface. The chips are arranged in a cluster, with some showing distinct rectangular features on their top surfaces.

[illegible]

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								X6S								
RATED VOLTAGE		25	50	100	200	4	6.3	10	16	25	35	50	100	4	6	10	16	25	35	50		
CAP. RANGE																						
1.0nF	102																					
1.1	112																					
1.2	122																					
1.3	132																					
1.5	152																					
1.8	182																					
2.2	222																					
2.7	272																					
3	302																					
3.3	332																					
3.9	392																					
4.7	472																					
5.6	562																					
6.2	622																					
6.8	682																					
7.5	752																					
8.2	822																					
9.1	912																					
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																					
220	224																					
270	274																					
330	334																					
390	394																					
470	474																					
560	564																					
680	684																					
820	824																					
1.0 uF	105																					
1.5	155																					
2.2	225																					
2.7	275																					
3.3	335																					
3.9	395																					
4.7	475																					
6.8	685																					
10	106																					
22	226																					
47	476																					

0603

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		X7R								X7S						Y5V & Z5U					
RATED VOLTAGE		6.3	10	16	25	35	50	100	200	4	6.3	10	16	25	100	6.3	10	16	25	50	
CAP. RANGE																					
1.0nF	102																				
1.1	112																				
1.2	122																				
1.3	132																				
1.5	152																				
1.8	182																				
2.2	222																				
2.7	272																				
3	302																				
3.3	332																				
3.9	392																				
4.7	472																				
5.6	562																				
6.2	622																				
6.8	682																				
7.5	752																				
8.2	822																				
9.1	912																				
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																				
220	224																				
270	274																				
330	334																				
390	394																				
470	474																				
560	564																				
680	684																				
820	824																				
1.0 uF	105																				
1.5	155																				
2.2	225																				
2.7	275																				
3.3	335																				
3.9	395																				
4.7	475																				
6.8	685																				
10	106																				
22	226																				
47	476																				



Cal-Chip

0805

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		1.5 MAX					1.5 MAX					1.5 MAX					1.5 MAX				
BW(L2/L3)		0.25 ~ 0.75					0.25 ~ 0.75					0.25 ~ 0.75					0.25 ~ 0.75				
DIELECTRIC		X5R					X6S					Y5V/Z5U					Y5V/Z5U				
RATED VOLTAGE		4	6.3	10	16	25	35	50	100	4	6.3	10	16	25	35	50	6.3	10	16	25	50
CAP. RANGE																					
9.1	912																				
10	103																				
12	123																				
15	153																				
18	183																				
20	203																				
22	223																				
27	273																				
30	303																				
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																				
6.8	685																				
10	106																				
15	156																				
22	226																				
33	336																				
47	476																				
100	107																				
150	157																				
220	227																				
330	337																				

DIMENSION (MM)		GMC31															
L(L1)		3.2 ± 0.3				3.2 ± 0.3											
W		1.6 ± 0.2				1.6 ± 0.2											
H		1.8 MAX				1.8 MAX											
BW(L2/L3)		0.25 ~ 0.75				0.25 ~ 0.75											
DIELECTRIC		NPO/COG				X7R											
RATED VOLTAGE		25	50	100	200	6.3	10	16	25	50	100	200					
CAP. RANGE																	
0.47pF	0R47																
0.5	R50																
0.56	R56																
0.6	R60																
0.68	R68																
0.7	R70																
0.75	R75																
0.8	0R8																
0.9	R90																
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)		GMC31																
L(L1)		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				
H		1.8 MAX				1.8 MAX								1.8 MAX				
BW(L2/L3)		0.25 ~ 0.75				0.25 ~ 0.75								0.25 ~ 0.75				
DIELECTRIC		NPO/COG				X7R								X7S				
RATED VOLTAGE		25	50	100	200	6.3	10	16	25	35	50	100	200	4	6.3	10	16	100
CAP. RANGE																		
300pF	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	302																	
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																	
6.8	685																	
10	106																	
15	156																	
22	226																	
33	336																	
47	476																	
68	686																	
100	107																	
220	227																	
330	337																	

DIMENSION (MM)		GMC31																	
L(L1)		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					
H		1.8 MAX						1.8 MAX						1.8 MAX					
BW(L2/L3)		0.25 ~ 0.75						0.25 ~ 0.75						0.25 ~ 0.75					
DIELECTRIC		X5R						X6S						Y5V/Z5U					
RATED VOLTAGE		4	6.3	10	16	25	50	4	6.3	10	16	25	35	50	6.3	10	16	25	50
CAP. RANGE																			
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																		
6.8	685																		
10	106																		
15	156																		
22	226																		
33	336																		
47	476																		
68	686																		
100	107																		
220	227																		
330	337																		

1210

DIMENSION (MM)		GMC32											
L(L1)		3.2 ± 0.3					3.2 ± 0.3						
W		2.5 ± 0.3					2.5 ± 0.3						
H		2.2 MAX					2.8 MAX						
BW(L2/L3)		0.25 ~ 0.75					0.25 ~ 0.75						
DIELECTRIC		NPO/COG					X7R						
RATED VOLTAGE		16	25	50	100	200	6.3	10	16	25	50	100	200
CAP. RANGE													
10pF	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												

1210

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																																
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																																
1.5	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.

1808

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	50	100	200
CAP. RANGE							
10pF	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						
150	154						
180	184						
220	224						
270	274						
330	334						
390	394						
470	474						
560	564						

1812

DIMENSION (MM)		GMC43									
L(L1)		4.5 ± 0.35			4.5 ± 0.35						
W		3.2 ± 0.3			3.2 ± 0.3						
H		2.2 MAX			3 MAX						
BW(L2/L3)		0.25 ~ 0.75			0.25 ~ 0.75						
DIELECTRIC		NPO/COG			X7R						
RATED VOLTAGE		50	100	200	10	16	25	50	100	200	
CAP. RANGE											
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										

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				3.1 MAX				3.1 MAX				3.1 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	50	6.3	10	16	25	50
CAP. RANGE																					
390pF	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																				

2220

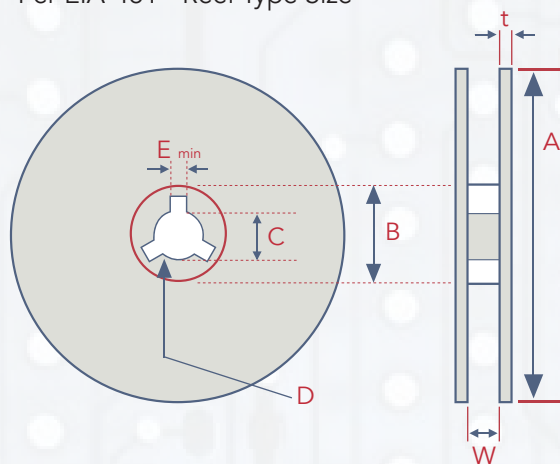
DIMENSION (MM)		GMC55																			
L(L1)		5.7 ± 0.4				5.7 ± 0.4				5.7 ± 0.4				5.7 ± 0.4							
W		5.0 ± 0.4				5.0 ± 0.4				5.0 ± 0.4				5.0 ± 0.4							
H		2.2 MAX				3.5 MAX				3.5 MAX				3.5 MAX							
BW(L2/L3)		0.25 ~ 0.75				0.25 ~ 0.75				0.25 ~ 0.75				0.25 ~ 0.75							
DIELECTRIC		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		
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																				
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																				
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																				

DIMENSION (MM)		GMC57							
L(L1)		5.7 ± 0.4			5.7 ± 0.4				
W		6.3 ± 0.4			5.0 ± 0.4				
H		2.2 MAX			3.5 MAX				
BW(L2/L3)		0.25 ~ 0.75			0.25 ~ 0.75				
DIELECTRIC		NPO/COG			X7R				
RATED VOLTAGE		50	100	200	16	25	50	100	200
CAP. RANGE									
270pF	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								
1.8	185								
2.2	225								
2.7	275								
3.3	335								
4.7	475								
5.6	565								
6.8	685								
8.2	825								
10	106								
15	156								



PACKAGING (TAPING)

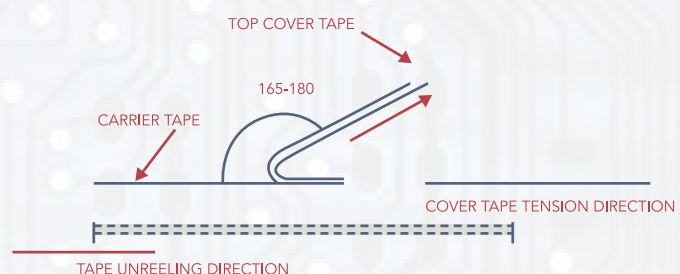
Per EIA-481 - Reel Type Size



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 ± 0.8	2.0 ± 0.5	5 ± 0.5	1.2 ± 0.2
	8mm	$\phi 178 \pm 2.0$	MIN $\phi 50$	$\phi 13 \pm 0.5$	21 ± 0.8	2.0 ± 0.5	10 ± 0.5	0.9 ± 0.2
	12mm	$\phi 178 \pm 2.0$	MIN $\phi 50$	$\phi 13 \pm 0.5$	21 ± 0.8	2.0 ± 0.5	13 ± 0.5	1.2 ± 0.2
10" Reel	8mm	$\phi 258 \pm 2.0$	MIN $\phi 70$	$\phi 13 \pm 0.5$	21 ± 0.8	2.0 ± 0.5	10 ± 0.5	1.8 ± 0.2
	12mm	$\phi 330 \pm 2.0$	MIN $\phi 70$	$\phi 13 \pm 0.5$	21 ± 0.8	2.0 ± 0.5	10 ± 0.5	1.8 ± 0.2
13" Reel	8mm	$\phi 330 \pm 2.0$	MIN $\phi 70$	$\phi 13 \pm 0.5$	21 ± 0.8	2.0 ± 0.5	10 ± 0.5	1.8 ± 0.2
	12mm	$\phi 330 \pm 2.0$	MIN $\phi 70$	$\phi 13 \pm 0.5$	21 ± 0.8	2.0 ± 0.5	13 ± 0.5	2.2 ± 0.2

CarrierTape (Standard)



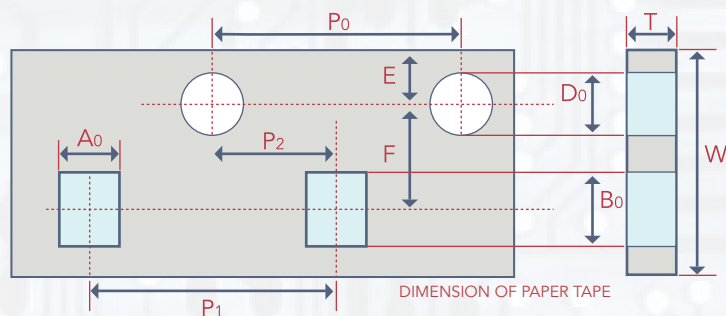
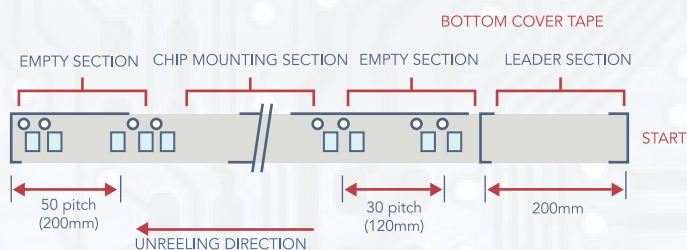
- To peel off the cover tape by the method shown in the right figure apply a peel-off force of 20GF - 60GF (card board); 10GF - 75GF (plastic tape).

- 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.



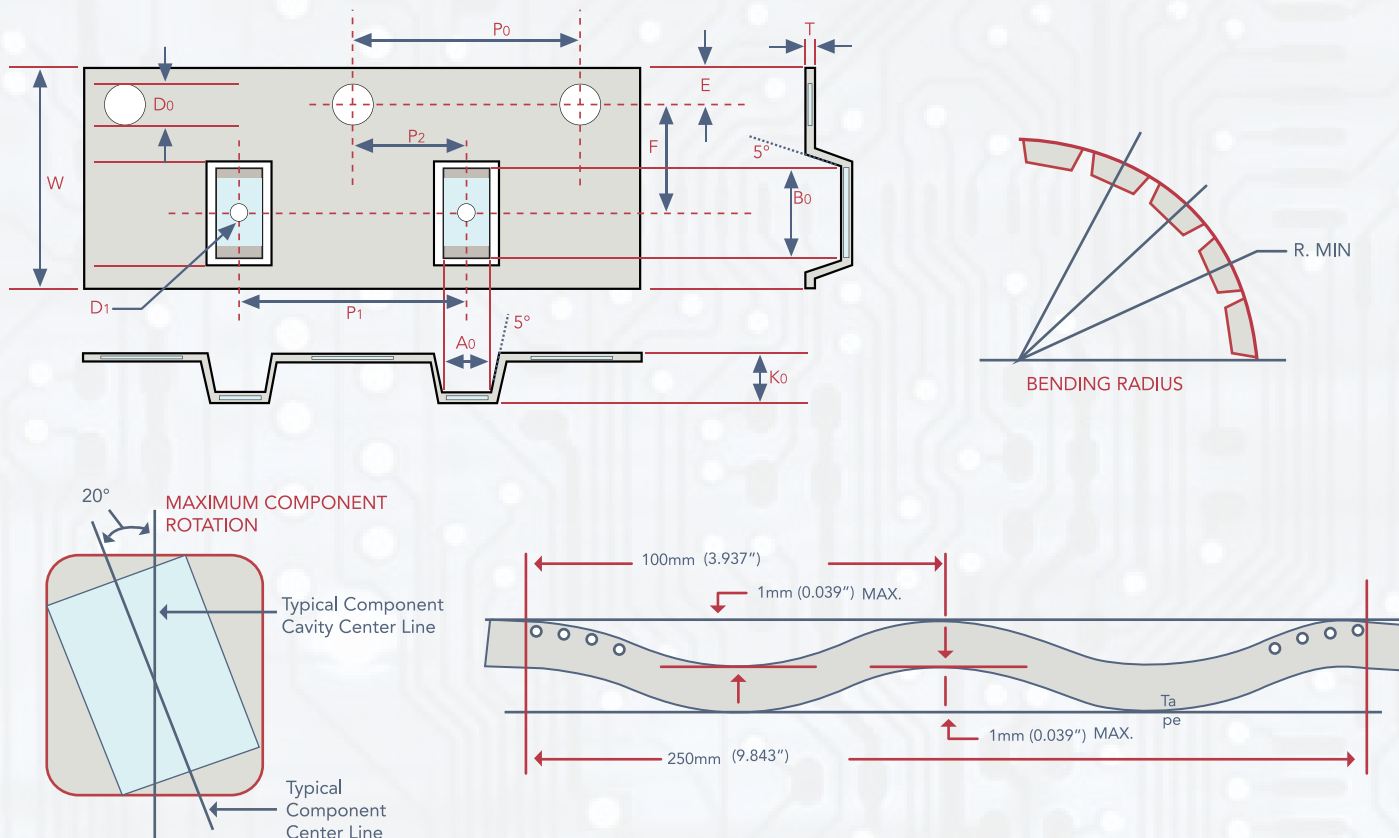
CARDBOARD CARRIER TAPE FOR 01005, 0201, 0402, 0603, 0805, 1206

UNIT=mm

TYPE	A ₀	B ₀	T	K ₀	W	P ₀	10XP ₀	P ₁	P ₂	D ₀	D ₁	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 ₀	B ₀	T	K ₀	W	P ₀	10XP ₀	P ₁	P ₂	D ₀	D ₁	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*******

NOTICE: Specifications are subject to change without notice. Contact your nearest Cal-Chip Sales Office for the latest specifications. All statements, information and data given herein are believed to be accurate and reliable, but are presented without guarantee, warranty, or responsibility of any kind, expressed or implied. Statements or suggestions concerning possible use of our products are made without representation or warranty that any such use is free of patent infringement and are not recommendations to infringe any patent. The user should not assume that all safety measures are indicated or that other measures may not be required. Specifications are typical and may not apply to all applications.

Cal-Chip
Electronics Inc.