# 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**

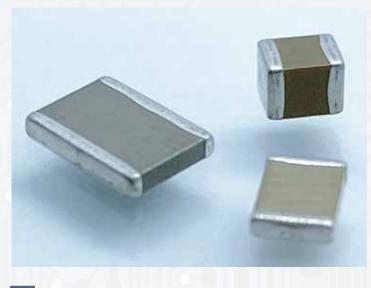
- Large capacitance values in small sizes
- Excellent high frequency characteristics



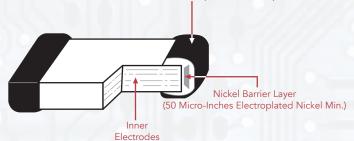
## CHIP CAPACITOR SELECTION

#### DIELECTRIC TYPE

COG (NPO) - Capacitance change with temperature is 0-30ppml°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 (∆cMAX @ VDCW)	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% Typlical	•25°C, VDCW: >100GOFor 1000QF, whichever is less •125°C, Vocw: >10GQF 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  $\pm 15\%$  from -55°C to  $\pm 125$ °C (-55°C to  $\pm 85$ ° C for X5R). The capacitance change is non-linear.

#### Stable class II dielectric

OPERATING TEMPERATURE RANGE	TEMPERATURE COEFFICIENT	TEMPERATURE VOLTAGE COEFFICIENT (∆cMAX @ VDcw)	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: >100GQFor 1000QF, whichever is less •125°C, Vocw: >10GQF or100QF whichever is less	2.5 X VDCW	<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, ZSU 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 - YSV 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. YSVs 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 (∆cMAX @ Vocw)	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	10GQ or 100QF whichever is less, 25°C, Vocw	2.5 X VDCW	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.



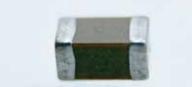
## CAPACITOR TERMINATION

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







..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



DIMENSI	ION (MM)				GM	C01			
L(	L1)				0.4 ±	0.02			
	N					0.02			
	Н				0.2 ±	0.02			
	L2/L3)				0.07	~ 0.14			
_	CTRIC	NPO	/COG		X7R	7		X5R	
	OLTAGE	6.3	10/16	6.3	10	16	6.3	10	16
	RANGE								
0.5pF	0R5								
0.75	R75 1R0								
1.2	1R2				2 11				
1.5	1R5 1R8								
2	2R0								
2.2	2R2								
2.7	2R7 3R0								
3.3	3R3								
3.6	3R6								
3.9	3R9 4R0								
4.7	4R7								
5	5R0								
5.6	5R6 6R0								
6.8	6R8								
7 8	7R0 8R0								
8.2	8R2								
10	100								
11 12	110 120								
15	150								
18 20	180								
22	200 220								
27	270								
30	300 330								
39	390								
43 47	430 470								
51	510								
56	560								
62 68	620 680								
82	820								
100	101								
120 150	121 151								
180	181								
220 270	221 271								
330	331								
390 470	391 471								
560	561	_							
680	681								
820 1.0nF	821 102								
1.2	122								
1.5	152 182								
2.2	222								
2.7	272								
3.3	332 392								
4.7	472				11 1				
5.6 6.8	562 682								
8.2	822								
10 12	103 123								
15	153								
18	183	111							
22 27	223 273								
33	333							111	1
39 47	393								
56	473 563								
68	683	w			. 3				
82 100	823 104				14.74				
120	124				7.74				
220 470	224 474								
	7/7								



	ON (MM) L1)							C02					
						_							
	N					_		0.03					
	+							0.03					
BW(I	L2/L3)						0.15	± 0.05					
DIELE	CTRIC	NPO,	/COG		Х	5R				X7R			Y5V/Z5U
RATED V	OLTAGE	25	50	4/6.3V	10	16	25	6.3	10	16	25	50	6.3
CAP. F	RANGE			TI.									
0.1pF	0R1												
0.2	0R2										11, 11,		
0.3	0R3							100		11-11			
0.4	0R4												
0.47	R47												
0.5	0R5												
0.56	R56 0R6			_									
0.8	OR7												
0.75	R75												
0.8	OR8												
0.82	R82 0R9												
1	1R0												
1.2	1R2												
1.3	1R3												
1.5	1R5 1R6												
1.6	1R6 1R8												
2	2R0												
2.2	2R2												
2.5	2R5												
2.7	2R7 2R8												
3.3	3R3												
3.9	3R9												
4.3 4.7	4R3 4R7												
5.6	5R6												
6.8	6R8												
8.2	8R2												
10 11	100 110												
12	120												
15	150												
18	180												
20 22	200 220												
24	240												
27	270												
30	300												
33 39	330 390												
43	430												
47	470												
51 56	510 560												
62	620												
68	680												
75	750												
82 100	820 101												
120	121												
150	151												
180	181												
220 270	221 271												
330	331												
390	391												
470 560	471 561		_										
680	681												
820	821												
1.0nF	102												
1.2 1.5	122 152												
1.8	182												
2.2	222												
2.7 3.3	272 332												
3.3	332 392												
4.7	472												
5.6	562												
6.8 8.2	682 822												
10	103												
12	123	100											
15	153												
18 22	183 223												
27	273												
33	333												
39	393												
47 56	473 563												
68	683												
82	823												
100 220	104 224												
470	474												
1.0uF	105										1		
2.2	225												
4.7	475												

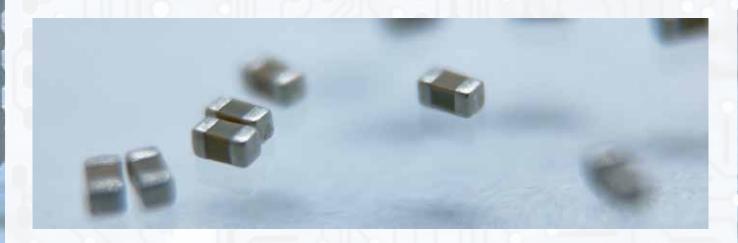


	ON (MM)										G	MC	204									
	L1)												0.05									
	٧												0.05									
	H											.5 ±										
	2/LW)						_					~	0.35									
	CTRIC OLTAGE	6.3/10		NPO 25		G 100	200	6.3	10	X5R 16		50	6.3/10		X7R	100	200	6.3	Y5\ 10	V & 2	Z5U 25	50
	RANGE	0.3/10	10	23	30	100	200	0.3	10	10	25	50	0.3/10	10/23	50	100	200	0.3	10	10	25	50
0.47	R47																					H
0.5	0R5																					
0.56	R56 0R6							Н														H
0.68	R68																					
0.75	0R7 R75							Н														H
0.8	0R8																					L
0.9	0R9 1R0							Н														H
1.2	1R2																					L
1.3	1R3 1R5							Н														H
1.6	1R6																					F
1.8	1R8 2R0																					H
2.2	2R2																					
2.4	2R4 2R7										H											H
3	3R0																					F
3.3 3.5	3R3 3R5																					H
3.6	3R6																					F
3.9 4	3R9 4R0																					H
4.3	4R3																					Г
4.7 5	4R7 5R0							Н														H
5.1	5R1																					L
5.6	5R6 6R0							Н														H
6.2	6R2																					E
6.8 7	6R8 7R0							H			_											H
7.5	7R5																					
8.2	8R0 8R2							Н														H
9	9R0																					
9.1	9R1 100							H														H
11	110																					
12 13	120 130							H														H
15	150																					
18 20	180 200							Н														H
22	220																					
24 27	240 270							Н														H
30	300																					Е
33 36	330 360							Н														H
39	390													1								
43 47	430 470																					H
51	510																					
56 62	560 620										H											H
68	680																					
75 82	750 820																					H
91	910																					F
100 110	101 111																					H
120	121																					F
130 150	131 151																					H
180	181																					F
200 220	201 221																					H
240	241																					F
270 300	271 301																					H
330	331																					F
360 390	361 391																					H
430	431																					
470 560	471 561																					H
680	681																					
750 820	751 821																					$\vdash$
1.0nF	102																					
1.2	122 152																					F
1.8	182																					H



DIMENSI	ON (MM)		ī								t	G	MC	C04	Ħ	Н					_			
L(L	.1)									Т	Т	1.0	0 ± 0	0.05										
W	1													0.05										
Н													.5 ±											
BW(L2				-		-																		
			-	_		-			_		_	0.1	~	0.35		_			_		_	_	_	
DIELEC					COG	7					5R					X7F					Y5\	√ & Z		
RATED V	OLTAGE	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. R																								
2.2	222																							
2.7	272																							
3.3	332			_															_		_			_
3.9	392					_													-		$\vdash$			-
4.7 5.6	472 562																							
6.8	682					_													-		_			
8.2	822					_															_			
10	103																							
12	123																							
15	153																							
18	183																							
22	223																							
27	273																							
33	333																							
39	393			_														_						
47 56	473					$\vdash$												_						
68	563 683					_												_						
82	823					_																		
100	104					_												-						
150	154																							
220	224																							
270	274																							
390	394																							
470	474																							
560	564																							
680 820	684 824					_																		
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 22	156 226																							
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\*\*\*\*





DIMENS	SION (MM)									(	ЗM	C1	0	Ī							
L(	(L1)										1.6 :	± 0.2									
	W										0.8	± 0.2									
	Н										1.0	max									
BW(L	_2/LW)										0.1	~ 0.4									
	CTRIC	_		/CO				5R					X7R					_	V & Z	_	
	VOLTAGE	25	50	100	200	6.3	10	16	25	6.3	10	16	25	50	100	200	6.3	10	16	25	50
0.4PF	RANGE R40																				
0.47	R47																				
0.5	0R5 0R6																				
0.7	R70																				
0.75 0.8	R75 0R8																				
1	1R0																				
1.2	1R2 1R3																				
1.5	1R5																				
1.8	1R8 2R0																				
2.2	2R0 2R2																				
2.4	2R4																				
2.7	2R7 3R0																				
3.3	3R3																				
3.6	3R6 3R9																				
4	4R0																				
4.3 4.7	4R3 4R7																				
5	5R0																				
5.1 5.6	5R1 5R6																				
6	6R0																				
6.2	6R2 6R8																				
7	7R0																				
7.5 8	7R5 8R0																				
8.2	8R2												1								
9.1	9R0 9R1																				
10	100																				
11 12	110 120																				
13	130																				
15 16	150 160																				
18	180																				
20 22	200																				
24	240																				
27 30	270 300																				
33	330																				
36 39	360 390																				
43	430																				
47 51	470 510																				
56	560																				
62 68	620 680																				
75	750																				
82 91	820 910																				
100	101																				
120 130	121 131																Н				
150	151																П				
160 180	161 181																Н				
200	201																				
220 240	221 241																Н				
270	271							1													
300 330	301 331																				
390	391																				
430 470	431 471																				
510	511								1												
560 620	561 621																				
680	681																				
750 820	751 821																				
910	911																				



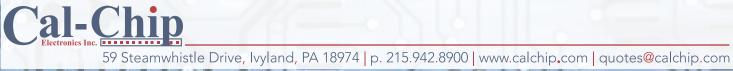
DIMENSI	ON (MM)									C	iM(	C10	)								
L(	L1)										1.6 ±	0.2									
	N										0.8 ±										
	Н										1.0 r										
	2/LW)										0.1 ~										
											0.1 ~	0.4									
DIELE	CTRIC		NPO/	/COG	i		>	(5R					X7R					Y5'	V & Z	25U	
RATED V	OLTAGE	25	50	100	200	6.3	10	16/25	35	6.3	10	16	25	50	100	200	6.3	10	16	25	5
CAP. F	RANGE																				Г
1.0nF	102																				Н
1.2	122																				Н
1.5	152																				г
1.8	182																				Г
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																				
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																				
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																				
10	106																				Ĺ
22	226																				
47	476																				





0805

DIMENS	SION (MM)												(	ЗM	C2	1						T					
	.(L1)		2.	.0 ± 0	0.3	7				2.0 :	± 0.3							2.0	± 0.3					2.	0 ± 0	0.3	
	W		1.3	25 ±						1.25	± 0.2	2						1.25	± 0.2	2				1.2	25 ±	0.2	
	Н			1.4							.5								.5						1.5		
	(L2/L3)			25 ~ (					(		~ 0.7	5					C		~ 0.7	5					25 ~ (		
	ECTRIC VOLTAGE	41		PO/C		000		40			7R		400	200	4	6.3	10		5R 25	35	50	63	6.3		5V/Z		50
	RANGE	16	16 25 50 100 200				6.3	10	16	25	35	50	100	200	-	0.3	10	10	23	33	30	03	0.3	10	10	23	30
0.4pF	0R4																										
0.47	R47 R50						_																				
0.56	R56																										
0.75	R75 0R8																										
0.82	R82																										
1	1R0																										
1.1	1R1 1R2																										
1.3	1R3																										
1.5	1R5																										
1.6	1R6 1R8																										
2	2R0																										
2.2	2R2 2R4																										
2.7	2R7																										
3	3R0																										
3.3	3R3 3R6																										
3.9	3R9																										
4.3	4R0 4R3																										
4.7	4R7																										
5 5.1	5R0 5R1																										
5.6	5R6																										
6	6R0																										
6.2	6R2 6R8																										
7	7R0																										
7.5	7R5 8R0						_																				
8.2	8R2																										
9 9.1	9R0 9R1																										
10	100																										
11	110																										
12 13	120 130																										
15	150																										
16 18	160																										
18 20	200																										
22 24	220 240																										
27	270																										
30	300																										
33 36	330 360																										
39	390																										
43 47	430 470																										
51	510																										
56 62	560 620																										
68	680																										
75	750																										
82 91	820 910																										
100	101																										
120 130	121 131																										
150	151																										
160	161																										
180 200	181 201																										
220	221																										
240 270	241 271																										
300	301																										



DIMENS	ION (MM)										П	Т	(	ЗM	C2	1		T				т	П		_		
L(I	L1)		2.	0 ± 0	).3					2.0 :	± 0.3							2.0 =	± 0.3					2.	0 ± 0	.3	
V	N		1.2	25 ±	0.2					1.25	± 0.2	2						1.25	± 0.2	2				1.2	25 ± (	0.2	
H	Н			1.4						1	.5							1.	.5						1.5		
BW(l	L2/L3)		0.2	5 ~ 0	).75				C	).25	~ 0.7	5					(	.25 -	~ 0.7	5				0.2	5 ~ C	.75	
	CTRIC			O/C							7R								5R						5V/Z5		
CAP. F	OLTAGE RANGE	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
330	331																										
360	361																										
390 430	391 431																										
470	471																										
510	511																										
560 620	561 621																						_				
680	681																										
750	751																										
820 910	821 911																							_			
1.0nF	102																										
1.2	122 152																										
1.5 1.8	152 182																										
2.2	222																										
2.4	242 272																										
3.3	332																							_			
3.9	392																										
4.7	472																										
5.6 6.8	562 682																										
8.2	822																										
10	103																										
12 15	123 153																										
18	183																										
22	223																										
27 33	273 333																										
39	393																										
47 56	473 563																										
68	683																										
82	823																										
100 120	104 124																										
150	154																										
180	184																										
220 270	224 274																										
330	334																										
390	394																										
470 560	474 564																										
680	684																										
820	824																										
1.0 uF 1.2	105 125																										
1.5	155														-5												
1.8	185																										
2.2 3.3	225 335																										
4.7	475					- 11																					
4.7	475																										
6.8	685 106																										
15	156																										
22	226																										
33 47	336 476																										
100	107										14																
150 220	157																										
330	227 337																										



DIMENSI	ON (MM)									Т	C	M	C3	1	П		Т		П				
	L1)		3.2 :	± 0.3	3			3.	2 ± (	0.3					3.2 :	± 0.3	3			3.:	2 ± (	0.3	
٧	N		1.6 :	± 0.2	2			1.	6 ± (	0.2					1.6 =	± 0.2	2			1.0	6 ± (	0.2	
H	Н		1.8	max				1.	8 m	ax					1.8	max				1.	8 m	ax	
BW(L	L2/L3)	0	.25	~ 0.7	75			0.2	5 ~ (	0.75				0	.25	- 0.7	<b>'</b> 5			0.2	5 ~ (	0.75	
DIELE	CTRIC	1	NPO,	/CO	G				X7R						X	5R				Y5	V/Z	5U	
	OLTAGE	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. F																							L
0.47pF 0.5	0R47 R50								_							_					_		⊢
0.56	R56																						┢
0.68	R68																						
0.75	R75																						
0.8	0R8 1R0																						⊢
1.1	1R1																						⊢
1.2	1R2																						T
1.3	1R3																						
1.5	1R5 1R6																						L
1.6	1R8								_							_					_		⊢
2	2R0					$\vdash$			$\vdash$		$\vdash$					$\vdash$	$\vdash$				$\vdash$		$\vdash$
2.2	2R2																						
2.4	2R4					$\Box$			$\vdash$		$\Box$					$\vdash$	$\vdash$				$\vdash$		Ē
2.7	2R7 3R0							$\vdash$	$\vdash$	$\vdash$						$\vdash$	_	$\vdash$	$\vdash$		$\vdash$	$\vdash$	$\vdash$
3.3	3R3																						$\vdash$
3.6	3R6																						
3.9	3R9					$\Box$					$\Box$												Ľ
4.3	4R0 4R3								_							_					_		⊢
4.7	4R7																						⊢
5	5R0																						T
5.1	5R1																						
5.6	5R6 6R0																						L
6.2	6R2								_							_					_		⊢
6.8	6R8																						H
7	7R0																						
7.5	7R5																						
8.2	8R0 8R2																						⊢
9	9R0																						H
9.1	9R1																						
10	100																						L
11 12	110 120																						⊢
13	130																						┢
15	150																						
16	160																						
18 20	180 200							$\vdash$	-	$\vdash$				$\vdash$		-	-	$\vdash$	$\vdash$	$\vdash$	-	$\vdash$	$\vdash$
22	220					Н					Н												$\vdash$
24	240																						L
27	270					$\Box$					$\Box$												Ľ
30	300 330							$\vdash$	-	$\vdash$				$\vdash$		-	-	$\vdash$	$\vdash$	$\vdash$	-	$\vdash$	$\vdash$
36	360					Н					Н												$\vdash$
39	390																						
43	430																						
47 51	470 510								<u> </u>							<u> </u>	_				$\vdash$		$\vdash$
56	560								$\vdash$							$\vdash$	$\vdash$				$\vdash$		$\vdash$
62	620																						H
68	680																						
75	750					$\square$		$\vdash$	$\vdash$		$\square$					$\vdash$	$\vdash$				L.		L
82 91	820 910					$\vdash$		$\vdash$	$\vdash$	$\vdash$	$\vdash$			$\vdash$		$\vdash$	$\vdash$	$\vdash$	$\vdash$	$\vdash$	$\vdash$	$\vdash$	$\vdash$
100	101															$\vdash$	$\vdash$				$\vdash$		$\vdash$
120	121																						L
130	131																						Г
150	151													<u> </u>				<u> </u>	<u> </u>	<u> </u>		<u> </u>	$\vdash$
160 180	161 181													$\vdash$		$\vdash$	$\vdash$	$\vdash$	$\vdash$	$\vdash$	$\vdash$	$\vdash$	$\vdash$
200	201																	$\vdash$	$\vdash$			$\vdash$	$\vdash$
220	221																						
240	241 271																						



DIMENS	ion (MM)											GM	C31						П				
	(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	
	Н			max					.8 ma							max					.8 ma		
	(L2/L3)			~ 0.75				0.2	25 ~ 0						0.25						5 ~ 0		
	ECTRIC			/COG	000		40		X7R		1 400	000			_	5R	05	=0			5V/Z5	_	=0
	VOLTAGE RANGE	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
300	301																						
330 360	331 361																						
390	391																						
430	431																						
470 510	471 511																						
560	561																						
620	621																						
680 750	681 751																						
820	821																						
910	911																						
1.0nF	102																						
1.2	122 152																		$\vdash$				
1.8	182																						
2.2	222 242																						
2.4	272																						
3.3	332																						
3.9 4.7	392 472																						
5.6	562																						
6.8	682																						
8.2	822 103																						
12	123																						
15	153																						
18 22	183 223																						
27	273																						
33	333																						
39 47	393 473																						
56	563																						
68	683																						
82 100	823 104																						
120	124																						
150 180	154 184																						
220	224																						
270	274																						
330 390	334 394																						
470	474																						
560	564																						
680 820	684 824																						
1.0 uF	105																						
1.2	125																						
1.5	155 185																						
2.2	225																						
2.7	275 335																						
3.3 4.7	475																						
4.7	475																						
6.8	685 106										$\vdash \vdash \vdash$												
15	156																						
22	226																						
33 47	336 476					$\vdash \vdash$					$\vdash$												
68	686																						
100	107																						
220 330	227 337					$\vdash \vdash$					$\vdash$												
330	33/		$\Box$	oxdot		$\Box$			Щ.		$oldsymbol{\sqcup}$								$\Box$				



DIMENSI	ON (MANA)							1				GI	ИС	32										
L(L			3.	2 ± (	0.3				3.	2 ± 0	0.3					3.2 :	± 0.3				3.	2 ± (	0.3	
V				5 ± (						5 ± 0						2.5 :						5 ± 0		
				.2 ma						.8 ma							max					.8 ma		
BW(L				5 ~ (						5 ~ 0					C	.25		5				5 ~ (		
DIELEC			_	O/C					0.2	X7R							5R					5V/Z		
RATED V		16				200	6.3	10	16	25		100	200	4	6.3	_	16	25	50	6.3		16		50
CAP. R		.0				200	0.0				- 00	100	200	Ė	0.0			20	- 00	0.0				
0.5pF	0R5																							
0.4	R40																							
0.47	R47 R70																							
0.75	R75																							
1	1R0																							
1.1	1R1																							
1.2	1R2 1R3																							
1.3 1.5	1R3																							
1.6	1R6																							
1.8	1R8																							
2	2R0																							
2.2	2R2 2R4																							
2.7	2R7						Н										$\vdash$		$\vdash$					
3	3R0						Н																	
3.3	3R3																							
3.6 3.9	3R6 3R9									_		_		_			<u> </u>		<u> </u>		_	_	_	_
4	4R0						$\vdash$																	$\vdash$
4.3	4R3																							
4.7	4R7																							
5	5R0																							
5.1 5.6	5R1 5R6																							
6	6R0																							
6.2	6R2																							
6.8	6R8 7R0																							
7.5	7R0 7R5																							
8	8R0																							
8.2	8R2																							
9 9.1	9R0 9R1																							
10	100																							
11	110																							
12	120																							
13 15	130 150																							
16	160																							
18	180																							
20	200																							
22 24	220 240																							
27	270																							
30	300																							
33	330																							
36 39	360 390									_		_		_			<u> </u>		<u> </u>		_	_	_	_
43	430						$\vdash$			<del></del>		<del></del>		<del></del>			$\vdash$		$\vdash$		<del></del>	<del></del>	<del></del>	$\vdash$
47	470																							
51	510																							
56 62	560 620																							$\vdash$
68	680						$\vdash$																	
75	750																							
82	820																							
91 100	910													<u> </u>			<u> </u>		<u> </u>		<u> </u>	<u> </u>	<u> </u>	$\vdash$
120	121													$\vdash$			$\vdash$		$\vdash$		$\vdash$	$\vdash$	$\vdash$	$\vdash$
130	131																							
150	151																							
160 180	161 181																							
200	201													-			<u> </u>		<u> </u>		-	-	-	
220	221																							
240	241																							
270	271 301																							
300								1																



| 2/L3)<br>CTRIC<br>DLTAGE         |   | 2.   | 2 ± (<br>5 ± (   |  |   |  
  |   | 3.   
  | 2 ± 0  
  | 0.3  | _   
|   |   |   | 32-   | ± 0.3  
          |  |     |  | 3  | 2 ± 0   | ).3  |   |
|----------------------------------|---|--|--|--|---
--
---|---
--
---
--
---|--|--|---|---
---|---|---|--|-----|--
--|---|--|---|
| 2/L3)<br>CTRIC<br>OLTAGE<br>ANGE |   |  |  | 0.3  |   |  
  |   |  
  |  
  |  |   
|   |   |   | J.2 -   | - 0.5  
          |  |     |  | 0  |   | -  |   |
| 2/L3)<br>CTRIC<br>DLTAGE<br>ANGE |   | 2.   |  |  |   |  
  |   | 2.   
  | 5 ± 0  
  | .3   |   
|   |   |   | 2.5 :   | ± 0.3  
          |  |     |  | 2.   | 5 ± 0   | ).3  |   |
| TRIC<br>DLTAGE<br>ANGE           |   |  | .2 m   | ax   |   |  
  |   | 2.   
  | .8 ma  
  | x  |   
|   |   |   |   | max  
          |  |     |  | 2.   | .8 ma   | x  |   |
| OLTAGE<br>ANGE                   |   | 0.2  | 5 ~ (  | 0.75   |   |  
  |   | 0.2  
  | 5 ~ 0  
  | .75  |   
|   |   | 0   | .25   | ~ 0.7  
          | 5  |     |  | 0.2  | 5 ~ C   | .75  |   |
| ANGE                             |   | NP   | O/C  | OG   |   |  
  |   |  
  | X7R  
  |  |   
|   |   |   | X   | 5R   
          |  |     |  | Y  | 5V/Z5   | 5U   |   |
|                                  | 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  |
| 361                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 391                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 431                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 471<br>511                       |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  | -   |
| 561                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 681                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
|                                  |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 911                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 102                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
|                                  |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  | _   |
| 182                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  | -   |
| 222                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 242                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  | $oxed{\square}$                                       |  | $\vdash$  |
| 332                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  | $\vdash$  |
| 392                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 472                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  | $\vdash$  |
| 682                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 822                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 103                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 153                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 183                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 223                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
|                                  |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 393                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
|                                  |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 683                              |   |  |  |  | Н   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 823                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
|                                  |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 154                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 184                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
|                                  |   |  |  |  | Н   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 334                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 394                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 474<br>564                       |   |  |  |  | Н   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 684                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 824<br>105                       |   |  |  |  | Н   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 125                              |   |  |  |  | Н   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 155                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 185<br>225                       |   |  |  |  | $\square$   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 275                              |   |  |  |  | Н   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 335                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
|                                  |   |  |  |  | Н   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 685                              |   |  |  |  | H   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 825                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
|                                  |   |  |  |  | Н   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 226                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
| 336                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  |   |
|                                  |   |  |  |  | $\vdash \vdash$   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  | $\vdash$  |
| 107                              |   |  |  |  | Н   |  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  | $\vdash$  |
| 157                              |   |  |  |  |   |  
  |   |  
  |  
  |  |   
|   |   |   |   |  
          |  |     |  |  |   |  |   |
|                                  |   |  |  |  | $\square$   | $\square$  
  |   |  
  |  
  |  |   
          |  |     |  |  |   |  | $\vdash$  |
|                                  | 561<br>681<br>751<br>821<br>911<br>102<br>152<br>182<br>222<br>242<br>272<br>332<br>392<br>472<br>562<br>682<br>822<br>103<br>123<br>153<br>183<br>223<br>273<br>333<br>393<br>473<br>563<br>683<br>823<br>104<br>124<br>125<br>126<br>127<br>128<br>129<br>129<br>129<br>129<br>129<br>129<br>129<br>129 | 561 681 751 821 911 102 1122 152 182 222 242 272 332 392 472 562 682 822 103 123 153 183 223 273 333 333 393 473 563 683 823 104 124 154 184 224 274 334 394 474 394 474 564 684 824 105 125 125 155 155 185 225 275 335 475 475 685 825 106 156 226 336 476 686 107 157 227 337 | 561 681 751 821 751 821 911 102 1122 152 182 222 242 272 332 332 392 472 562 682 822 103 123 153 183 223 273 333 183 223 273 333 393 473 563 683 823 104 124 154 184 224 274 334 394 474 564 686 684 824 105 125 155 185 185 225 275 335 475 475 685 885 106 1156 226 336 476 686 107 1157 227 337 | 561         681         751         821         911         102         1122         152         182         222         242         272         332         392         472         562         682         822         103         123         153         183         223         273         333         393         473         563         683         823         104         124         154         184         224         274         334         394         474         564         684         824         105         125         155         185         225         275         335         475         468         825         106 | 561         681         751         821         911         102         152         182         222         242         272         332         392         472         562         682         822         103         123         153         183         223         273         333         393         473         563         683         823         104         124         154         184         224         274         334         394         474         564         684         824         105         125         155         155         155         155         125         125         125         125         155         125         1 | 561         681         751         821         911         102         1122         152         182         222         242         272         332         392         472         562         682         822         103         123         153         183         223         273         333         393         473         563         683         823         104         124         154         184         224         274         334         394         474         564         684         824         105         125         155         1685         225         275         335         475         475         685         825 <td< td=""><td>561       681         751       821         911       102         152       182         222       242         272       332         332       392         472       562         682       822         103       123         153       183         223       273         333       393         473       563         683       823         104       124         124       154         184       224         274       334         394       474         474       564         684       824         105       125         125       155         155       155         155       155         156       226         336       475         475       685         825       106         156       226         336       475         475       466         686       107         157       227         337       1</td><td>561       681         751       821         911       102         152       182         222       242         272       332         3392       472         562       682         822       103         103       123         153       183         223       273         333       333         393       473         563       683         823       104         124       154         184       224         274       334         394       474         477       564         684       824         105       125         155       155         155       155         155       155         1685       825         206       106         156       226         336       475         475       665         685       825         210       106         156       107         157       227         337       <td< td=""><td>561       681         751       821         821       911         102       122         152       182         222       224         242       272         332       392         472       562         662       822         103       123         153       183         223       273         333       393         473       563         683       823         104       124         124       154         184       224         274       334         334       334         3394       474         473       564         684       824         105       155         185       155         185       155         185       155         185       155         185       155         185       155         185       156         186       156         187       157         1885       156         196       <td< td=""><td>561       681         751       8821         911       102         122       152         152       182         222       242         272       332         392       472         562       682         682       822         103       123         153       183         223       273         333       393         473       563         683       823         104       124         154       184         184       224         274       334         394       474         564       684         824       105         105       155         155       155         185       225         225       335         475       475         475       475         476       686         867       106         107       157         227       333         337       106</td><td>561       681         751       821         911       102         122       152         182       222         242       272         332       392         472       562         682       822         823       103         123       153         183       223         2273       333         393       473         563       663         683       823         104       124         154       184         184       184         224       274         334       334         334       334         334       334         334       334         334       334         335       155         155       155         155       155         155       155         225       275         335       156         225       275         335       156         326       336         337       157         157</td><td>561       681         681       751         821       911         102       1122         152       182         222       242         222       242         222       242         222       242         332       332         3992       472         562       682         822       103         153       183         223       273         333       393         473       563         683       823         104       124         154       184         224       274         274       334         334       394         474       44         564       684         884       824         105       125         125       155         1335       166         825       106         106       107         157       23         335       475         475       49         336       49         337       40</td><td>561       681         681       821         971       102         1122       122         152       182         222       242         222       242         272       332         392       472         552       662         662       622         103       123         153       183         183       223         273       333         3993       473         563       663         683       823         104       124         154       184         224       274         334       394         394       474         564       684         684       105         125       155         155       155         175       166         685       1825         106       167         107       157         156       1685         825       106         106       169         107       177         157       &lt;</td><td>561       681         681       751         821       911         102       122         152       182         222       224         272       332         392       472         562       682         802       103         123       223         273       333         333       393         473       563         683       823         104       124         154       184         184       184         224       224         2274       334         334       34         474       44         474       44         474       44         424       474         225       525         275       335         336       476         685       68         106       68         107       106         107       107         157       108         106       109         107       109         108       109<td>561       681         681       751         921       911         102       122         152       182         222       242         272       332         392       472         562       682         822       103         123       13         153       183         223       273         233       393         473       563         683       823         104       124         154       184         184       14         224       14         274       184         154       184         154       184         154       184         154       184         154       184         155       185         125       15         185       15         185       15         185       15         185       15         185       15         185       15         185       15         186       16</td><td>561       681         681       751         821       991         102       122         152       182         222       242         242       1         332       392         472       562         682       822         103       1         123       153         153       333         393       473         473       343         563       663         683       823         104       124         124       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184</td><td>551 681 751 821 911 102 1122 1152 182 222 242 272 332 333 333 393 393 393 393 393 393 39</td><td>  Set                                      </td><td>561 681 751 821 911 102 1122 152 152 162 162 162 272 242 242 244 254 274 332 333 333 333 393 993 473 474 474 484 484 484 484 484 487 484 487 487</td><td>  Section   Sect</td><td>561 751 821 791 102 112 1122 1122 1122 1122 1122 1122</td><td>  Section   Sect</td><td>981 751 821 911 102 1122 1122 1122 1122 1123 1124 1127 1129 1129 1129 1129 1129 1129 1129</td></td></td<></td></td<></td></td<> | 561       681         751       821         911       102         152       182         222       242         272       332         332       392         472       562         682       822         103       123         153       183         223       273         333       393         473       563         683       823         104       124         124       154         184       224         274       334         394       474         474       564         684       824         105       125         125       155         155       155         155       155         156       226         336       475         475       685         825       106         156       226         336       475         475       466         686       107         157       227         337       1 | 561       681         751       821         911       102         152       182         222       242         272       332         3392       472         562       682         822       103         103       123         153       183         223       273         333       333         393       473         563       683         823       104         124       154         184       224         274       334         394       474         477       564         684       824         105       125         155       155         155       155         155       155         1685       825         206       106         156       226         336       475         475       665         685       825         210       106         156       107         157       227         337 <td< td=""><td>561       681         751       821         821       911         102       122         152       182         222       224         242       272         332       392         472       562         662       822         103       123         153       183         223       273         333       393         473       563         683       823         104       124         124       154         184       224         274       334         334       334         3394       474         473       564         684       824         105       155         185       155         185       155         185       155         185       155         185       155         185       155         185       156         186       156         187       157         1885       156         196       <td< td=""><td>561       681         751       8821         911       102         122       152         152       182         222       242         272       332         392       472         562       682         682       822         103       123         153       183         223       273         333       393         473       563         683       823         104       124         154       184         184       224         274       334         394       474         564       684         824       105         105       155         155       155         185       225         225       335         475       475         475       475         476       686         867       106         107       157         227       333         337       106</td><td>561       681         751       821         911       102         122       152         182       222         242       272         332       392         472       562         682       822         823       103         123       153         183       223         2273       333         393       473         563       663         683       823         104       124         154       184         184       184         224       274         334       334         334       334         334       334         334       334         334       334         335       155         155       155         155       155         155       155         225       275         335       156         225       275         335       156         326       336         337       157         157</td><td>561       681         681       751         821       911         102       1122         152       182         222       242         222       242         222       242         222       242         332       332         3992       472         562       682         822       103         153       183         223       273         333       393         473       563         683       823         104       124         154       184         224       274         274       334         334       394         474       44         564       684         884       824         105       125         125       155         1335       166         825       106         106       107         157       23         335       475         475       49         336       49         337       40</td><td>561       681         681       821         971       102         1122       122         152       182         222       242         222       242         272       332         392       472         552       662         662       622         103       123         153       183         183       223         273       333         3993       473         563       663         683       823         104       124         154       184         224       274         334       394         394       474         564       684         684       105         125       155         155       155         175       166         685       1825         106       167         107       157         156       1685         825       106         106       169         107       177         157       &lt;</td><td>561       681         681       751         821       911         102       122         152       182         222       224         272       332         392       472         562       682         802       103         123       223         273       333         333       393         473       563         683       823         104       124         154       184         184       184         224       224         2274       334         334       34         474       44         474       44         474       44         424       474         225       525         275       335         336       476         685       68         106       68         107       106         107       107         157       108         106       109         107       109         108       109<td>561       681         681       751         921       911         102       122         152       182         222       242         272       332         392       472         562       682         822       103         123       13         153       183         223       273         233       393         473       563         683       823         104       124         154       184         184       14         224       14         274       184         154       184         154       184         154       184         154       184         154       184         155       185         125       15         185       15         185       15         185       15         185       15         185       15         185       15         185       15         186       16</td><td>561       681         681       751         821       991         102       122         152       182         222       242         242       1         332       392         472       562         682       822         103       1         123       153         153       333         393       473         473       343         563       663         683       823         104       124         124       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184</td><td>551 681 751 821 911 102 1122 1152 182 222 242 272 332 333 333 393 393 393 393 393 393 39</td><td>  Set                                      </td><td>561 681 751 821 911 102 1122 152 152 162 162 162 272 242 242 244 254 274 332 333 333 333 393 993 473 474 474 484 484 484 484 484 487 484 487 487</td><td>  Section   Sect</td><td>561 751 821 791 102 112 1122 1122 1122 1122 1122 1122</td><td>  Section   Sect</td><td>981 751 821 911 102 1122 1122 1122 1122 1123 1124 1127 1129 1129 1129 1129 1129 1129 1129</td></td></td<></td></td<> | 561       681         751       821         821       911         102       122         152       182         222       224         242       272         332       392         472       562         662       822         103       123         153       183         223       273         333       393         473       563         683       823         104       124         124       154         184       224         274       334         334       334         3394       474         473       564         684       824         105       155         185       155         185       155         185       155         185       155         185       155         185       155         185       156         186       156         187       157         1885       156         196 <td< td=""><td>561       681         751       8821         911       102         122       152         152       182         222       242         272       332         392       472         562       682         682       822         103       123         153       183         223       273         333       393         473       563         683       823         104       124         154       184         184       224         274       334         394       474         564       684         824       105         105       155         155       155         185       225         225       335         475       475         475       475         476       686         867       106         107       157         227       333         337       106</td><td>561       681         751       821         911       102         122       152         182       222         242       272         332       392         472       562         682       822         823       103         123       153         183       223         2273       333         393       473         563       663         683       823         104       124         154       184         184       184         224       274         334       334         334       334         334       334         334       334         334       334         335       155         155       155         155       155         155       155         225       275         335       156         225       275         335       156         326       336         337       157         157</td><td>561       681         681       751         821       911         102       1122         152       182         222       242         222       242         222       242         222       242         332       332         3992       472         562       682         822       103         153       183         223       273         333       393         473       563         683       823         104       124         154       184         224       274         274       334         334       394         474       44         564       684         884       824         105       125         125       155         1335       166         825       106         106       107         157       23         335       475         475       49         336       49         337       40</td><td>561       681         681       821         971       102         1122       122         152       182         222       242         222       242         272       332         392       472         552       662         662       622         103       123         153       183         183       223         273       333         3993       473         563       663         683       823         104       124         154       184         224       274         334       394         394       474         564       684         684       105         125       155         155       155         175       166         685       1825         106       167         107       157         156       1685         825       106         106       169         107       177         157       &lt;</td><td>561       681         681       751         821       911         102       122         152       182         222       224         272       332         392       472         562       682         802       103         123       223         273       333         333       393         473       563         683       823         104       124         154       184         184       184         224       224         2274       334         334       34         474       44         474       44         474       44         424       474         225       525         275       335         336       476         685       68         106       68         107       106         107       107         157       108         106       109         107       109         108       109<td>561       681         681       751         921       911         102       122         152       182         222       242         272       332         392       472         562       682         822       103         123       13         153       183         223       273         233       393         473       563         683       823         104       124         154       184         184       14         224       14         274       184         154       184         154       184         154       184         154       184         154       184         155       185         125       15         185       15         185       15         185       15         185       15         185       15         185       15         185       15         186       16</td><td>561       681         681       751         821       991         102       122         152       182         222       242         242       1         332       392         472       562         682       822         103       1         123       153         153       333         393       473         473       343         563       663         683       823         104       124         124       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184</td><td>551 681 751 821 911 102 1122 1152 182 222 242 272 332 333 333 393 393 393 393 393 393 39</td><td>  Set                                      </td><td>561 681 751 821 911 102 1122 152 152 162 162 162 272 242 242 244 254 274 332 333 333 333 393 993 473 474 474 484 484 484 484 484 487 484 487 487</td><td>  Section   Sect</td><td>561 751 821 791 102 112 1122 1122 1122 1122 1122 1122</td><td>  Section   Sect</td><td>981 751 821 911 102 1122 1122 1122 1122 1123 1124 1127 1129 1129 1129 1129 1129 1129 1129</td></td></td<> | 561       681         751       8821         911       102         122       152         152       182         222       242         272       332         392       472         562       682         682       822         103       123         153       183         223       273         333       393         473       563         683       823         104       124         154       184         184       224         274       334         394       474         564       684         824       105         105       155         155       155         185       225         225       335         475       475         475       475         476       686         867       106         107       157         227       333         337       106 | 561       681         751       821         911       102         122       152         182       222         242       272         332       392         472       562         682       822         823       103         123       153         183       223         2273       333         393       473         563       663         683       823         104       124         154       184         184       184         224       274         334       334         334       334         334       334         334       334         334       334         335       155         155       155         155       155         155       155         225       275         335       156         225       275         335       156         326       336         337       157         157 | 561       681         681       751         821       911         102       1122         152       182         222       242         222       242         222       242         222       242         332       332         3992       472         562       682         822       103         153       183         223       273         333       393         473       563         683       823         104       124         154       184         224       274         274       334         334       394         474       44         564       684         884       824         105       125         125       155         1335       166         825       106         106       107         157       23         335       475         475       49         336       49         337       40 | 561       681         681       821         971       102         1122       122         152       182         222       242         222       242         272       332         392       472         552       662         662       622         103       123         153       183         183       223         273       333         3993       473         563       663         683       823         104       124         154       184         224       274         334       394         394       474         564       684         684       105         125       155         155       155         175       166         685       1825         106       167         107       157         156       1685         825       106         106       169         107       177         157       < | 561       681         681       751         821       911         102       122         152       182         222       224         272       332         392       472         562       682         802       103         123       223         273       333         333       393         473       563         683       823         104       124         154       184         184       184         224       224         2274       334         334       34         474       44         474       44         474       44         424       474         225       525         275       335         336       476         685       68         106       68         107       106         107       107         157       108         106       109         107       109         108       109 <td>561       681         681       751         921       911         102       122         152       182         222       242         272       332         392       472         562       682         822       103         123       13         153       183         223       273         233       393         473       563         683       823         104       124         154       184         184       14         224       14         274       184         154       184         154       184         154       184         154       184         154       184         155       185         125       15         185       15         185       15         185       15         185       15         185       15         185       15         185       15         186       16</td> <td>561       681         681       751         821       991         102       122         152       182         222       242         242       1         332       392         472       562         682       822         103       1         123       153         153       333         393       473         473       343         563       663         683       823         104       124         124       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184</td> <td>551 681 751 821 911 102 1122 1152 182 222 242 272 332 333 333 393 393 393 393 393 393 39</td> <td>  Set                                      </td> <td>561 681 751 821 911 102 1122 152 152 162 162 162 272 242 242 244 254 274 332 333 333 333 393 993 473 474 474 484 484 484 484 484 487 484 487 487</td> <td>  Section   Sect</td> <td>561 751 821 791 102 112 1122 1122 1122 1122 1122 1122</td> <td>  Section   Sect</td> <td>981 751 821 911 102 1122 1122 1122 1122 1123 1124 1127 1129 1129 1129 1129 1129 1129 1129</td> | 561       681         681       751         921       911         102       122         152       182         222       242         272       332         392       472         562       682         822       103         123       13         153       183         223       273         233       393         473       563         683       823         104       124         154       184         184       14         224       14         274       184         154       184         154       184         154       184         154       184         154       184         155       185         125       15         185       15         185       15         185       15         185       15         185       15         185       15         185       15         186       16 | 561       681         681       751         821       991         102       122         152       182         222       242         242       1         332       392         472       562         682       822         103       1         123       153         153       333         393       473         473       343         563       663         683       823         104       124         124       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184       1         184 | 551 681 751 821 911 102 1122 1152 182 222 242 272 332 333 333 393 393 393 393 393 393 39 | Set | 561 681 751 821 911 102 1122 152 152 162 162 162 272 242 242 244 254 274 332 333 333 333 393 993 473 474 474 484 484 484 484 484 487 484 487 487 | Section   Sect | 561 751 821 791 102 112 1122 1122 1122 1122 1122 1122 | Section   Sect | 981 751 821 911 102 1122 1122 1122 1122 1123 1124 1127 1129 1129 1129 1129 1129 1129 1129 |

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



1812

DIMENSI	ON (MM)			G	MC	40		
L(I		4.5	57 ± 0	.25		4.57 :	± 0.25	
V	V	2.0	)3 ± 0	.25		2.03 :	± 0.25	
ŀ	1	2	2.1 ma	х		3 n	nax	
BW(L	.2/L3)	0.2	25 ~ 0	.75		0.25	~ 0.75	
DIELE		-	PO/CC	_			7R	
RATED V CAP. R		50	100	200	25	50	100	200
9.1	9R1							
10 11	100 110							
12	120							
13	130							
15 16	150 160							
18	180							
20	200							
22	220 240							
27	270							
30	300							
33 36	330 360							
39	390							
43	430							
47 51	470 510							
56	560							
62	620							
68 75	680 750							
82	820							
91 100	910 101							
120	121							
130	131							
150 160	151 161							
180	181							
200	201							
220	221 241							
270	271							
300	301							
330 360	331 361							
390	391							
430	431							
470 510	471 511							
560	561							
620 680	621 681							
750	751							
820	821							
910 1.0nF	911 102							
1.2	122							
1.5	152							
1.8	182 222							
2.4	242							
2.7	272							
3.3	332 392							
4.7	472							
5.6 6.8	562 682							
8.2	822							
10	103							
12 15	123 153							
18	183							
22 27	223 273							
33	333							
39	393							
47 56	473 563							
68	683							
82	823							
100 120	104 124							
150	154							
180	184							
220 270	224 274							
330	334							
390	394							
470 560	474 564							
300	304							

1808

	ION (MM)									GΜ	_								
	(L1) W	_	5 ± 0.				4.5 ±		i			4.5 ±					5 ± 0.		
	H	_	.2 ± 0					± 0.3 nax					± 0.3 nax				2 ± 0 3 ma		
	(L2/L3)	_	5 ~ 0			(	).25		5		(	).25		5			5 ~ 0		
	lectric	_	PO/C	_			_	7R				_	5R			_	5V/Z5	_	
	Voltage	50	100	200	10	16	25	50	100	200	6.3	10	16	25	6.3	10	16	25	50
0.5pF	Range 0R5																		
0.4	R40																		
0.47	R47																		
0.7 0.75	R70 R75																		
1	1R0																		
1.1	1R1																		
1.2	1R2																		
1.3	1R3 1R5	-									_								
1.6	1R6	+																	
1.8	1R8																		
2	2R0																		
2.2	2R2 2R4	+-																	
2.4	2R4 2R7																		
3	3R0																		
3.3	3R3																		
3.6	3R6 3R9																		
4	4R0																		
4.3	4R3																		
4.7	4R7	-																	
5.1	5R0 5R1	+																	
5.6	5R6																		
6	6R0																		
6.2	6R2 6R8																		
6.8	7R0																		
7.5	7R5																		
8	8R0																		
8.2 9	8R2 9R0	+									_	_							
9.1	9R1																		
10	100																		
11	110																		
12	120																		
15	150																		
16	160																		
18	180																		
20	200																		
24	240																		
27	270																		
30	300																		
36	360																		
39	390																		
43	430																		
47 51	470 510																		
56	560																		
62	620																		
68 75	680 750																		
82	820																		
91	910																		
100	101																		
120	121																		
150	151																		
160	161																		
180	181																		
200 220	201										-								
220	221 241																		
270	271																		
300	301																		
330 360	331 361																		
300	301										_								



_	
$\infty$	
$\frac{1}{2}$	

						_							_		_		_		_
DIMENSI	ON (MM)								(	ЗM	C4:	3							
	L1)	4.5	± 0	.35		4	.5 ±	0.3	5		4	.5 ±	0.3	5		4.5	± 0	.35	
V	V	3.2	2 ± (	0.3			3.2 =	± 0.3	3			3.2 ±	± 0.3	}		3.2	2 ± 0	).3	
	+		2 m			Т		nax					nax				3 ma		
	_2/L3)		5 ~ (			0		- 0.7	'5		0	.25 -		75			5 ~ C		
						0.			J		0.			J					
	CTRIC OLTAGE	_	O/C		40	4.		7R	400	000		_	SR	0.5		_	V/Z	_	
	RANGE	50	100	200	10	16	25	50	100	200	6.3	10	16	25	6.3	10	16	25	50
390	391																		
430	431																		
470	471																		
510	511																		
560	561																		
680 750	681 751																		
820	821																		
910	911																		
1.0nF	102																		
1.2	122																		
1.5	152																		
1.8	182 222																		
2.2	222																		
2.7	272																		
3.3	332																		
3.9	392																		
4.7	472																		
5.6	562																		
6.8 8.2	682 822																		
10	103																		
12	123																		
15	153																		
18	183															7%			
22	223																		
27	273																		
33 39	333 393																		
47	473																		
56	563																		
68	683																		
82	823																		
100	104																		
120 150	124 154																		
180	184																		
220	224																		
270	274																		
330	334																		
470	474																		
560 680	564 684																		
820	824																		
1.0 uF	105																		
1.2	125																		
1.5	155																		
1.8	185 225																		
2.2	225																		
3.3	335																		
4.7	475																		
6.8	685																		
10	106																		
15	156																		
33	226 336																		
47	476																		
68	686																		
100	107																		
150	157																		
220	227																		
330	337																		

	DIMENSI	ON (MM)			(	ЗM	C4:	5		
2		_1)	-	5 ± 0				± 0.		
1825	V		-	3 ± 0				3 ± 0		
$\mathcal{O}$	BW(L		-	.2 ma 5 ~ 0				.2 ma 5 ~ 0		
	DIELE		-	5 ~ C			0.2	X7R	1.75	
	RATED V	OLTAGE	50	100		16	25	50	100	200
	9.1	ANGE 9R1							_	
	10	100								
	11 12	110 120							_	
	13	130								
	15 16	150 160								
	18	180								
	20 22	200 220								
	24	240								
	27 30	270 300								
	33	330								
	36 39	360								
	43	390 430								
	47	470								
	51 56	510 560								
	62	620								
	68 75	680 750								
	82	820								
	91 100	910 101								
	120	121								
	130 150	131 151								
	160	161								
	180	181								
	200 220	201 221								
	240	241								
	270 300	271 301								
	330	331								
	360 390	361 391								
	430	431								
	470 510	471 511								
	560	561								
	680 750	681 751								
	820	821								
	910 1.0nF	911 102								
	1.2	122								
	1.5 1.8	152 182								
	2.2	222								
	2.4	242								
	2.7 3.3	272 332								
	3.9	392								
	4.7 5.6	472 562								
	6.8	682								
	8.2 10	822 103								
	12	123								
	15 18	153 183								
	22	223								
	27 33	273 333								
	39	393								
	47 56	473 563								
	68	683								
	82 100	823 104								
	120	124								
	150 180	154 184								
	220	224								
	270 330	274 334								
	470	474								
	560	564								
	680 820	684 824								
	1.0 uF	105								
	1.2	125 155								
	1.8	185								
	2.2	225								. 1



DIMENSI	ON (MM)								(	ЗM	C5!	5							
	L1)	5.	7 ± (	).4		5.	7 ± (	).4				7 ± 0	0.4			5.	7 ± (	).4	
	N	_	0 ± 0				0 ± 0					0 ± 0					0 ± 0		
ŀ	+	2.	.2 ma	эx		3	.5 m	ax			3.	5 ma	ях			3.	.5 ma	эx	
BW(l	_2/L3)	0.2	5 ~ (	).75		0.2	5 ~ (				0.2	5 ~ (					5 ~ (		
	CTRIC	_	O/C				X7R					X5R	_				5V/Z		
	OLTAGE RANGE	50	100	200	16	25	50	100	200	6.3	10	16	25	50	6.3	10	16	25	50
270pF	271																		
300	301																		
330	331																		
360 390	361 391																		
430	431																		
470	471																		
510 560	511 561																		
680	681																		
750	751																		
820	821																		
910 1.0nF	911 102																		
1.2	122																		
1.5	152																		
1.8	182 222																		
2.4	242																		
2.7	272																		
3.3	332																		
3.9 4.7	392 472																		
5.6	562																		
6.8	682																		
8.2 10	822 103																		
12	123																		
15	153																		
18	183																		
22 27	223 273																		
33	333																		
39	393																		
47 56	473 563			_															
68	683																		
82	823																		
100 120	104 124																		
150	154																		
180	184																		
220	224																		
270 330	274 334																		
390	394																		
470	474																		
560 680	564 684																		
820	824																		
1.0 uF	105																		
1.2 1.5	125 155																		
1.5	185																		
2.2	225																		
2.7	275																		
3.3	335 395																		
4.7	475																		
5.6	565																		
6.8 8.2	685 825																		
10	106																		
15	156																		
22	226																		
33 47	336 476																		
68	686							1											
100	107																		
150 220	157 227																		
330	337																		
			_			_	_			_				_			_	_	

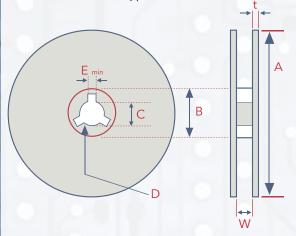


DIMENSI	ON (MM)						G	MC5	57					
	L1)	5	5.7 ± 0.	4		5	5.7 ± 0.				5	5.7 ± 0.	4	
	V	ć	.3 ± 0.	4		5	5.0 ± 0.	4			5	5.0 ± 0.	4	
ı	-	:	2.2 max	<			3.5 max	<				3.5 max	ĸ	
BW(I	_2/L3)	0.	25 ~ 0.	75		0.:	25 ~ 0.	75			0.	25 ~ 0.	75	
BW(l	_2/L3)	Ν	IPO/CO	G			X7R				1	Y5V/Z5	U	
DIELE	CTRIC	50	100	200	16	25	50	100	200	6.3	10	16	25	50
	OLTAGE													
	RANGE													
270 300	271 301													
330	331													
360	361													
390 430	391 431													
470	471													
510	511													
560 620	561 621													
680	681													
750	751													
820 910	821 911													
1.0nF	102													
1.2	122													
1.5	152 182													
2.2	222													
2.4	242 272													
3.3	332													
3.9	392													
4.7 5.6	472 562													
6.8	682													
7.5	752													
8.2 10	822 103													
12	123													
15	153													
18 22	183 223													
27	273													
33	333													
39 47	393 473													
56	563													
68 82	683 823													
100	104													
120	124													
150 180	154 184													
220	224													
270	274													
330 390	334 394													
470	474		714											
560	564													
680 820	684 824													
1.0 uF	105													
1.2	125 155													
1.8	185													
2.2	225													
3.3	275 335													
4.7	475													
5.6	565													
6.8 8.2	685 825													
10	106													
15	156													
33	226 336				7									
47	476													
68	686													
100 150	107 157													
220	227													
330	337					13								



# PACKAGING (TAPING)

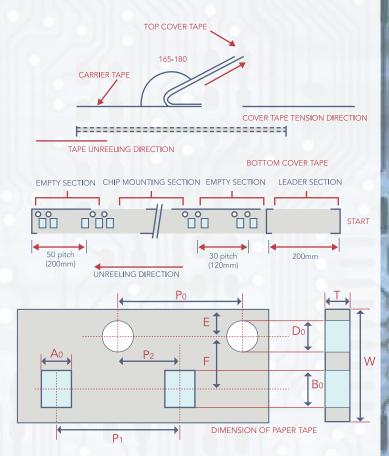
Per EIA-481 - Reel Type Size



								UNIT: mr
SYMBOL	TAPE WIDTH	Α	В	С	D	Е	W	t
	4mm	φ178±2.0	ΜΙΝφ50	φ13±0.5	21±0.8	2.0±0.5	5±0.5	1.2±0.2
7" Reel	8mm	φ178±2.0	ΜΙΝφ50	φ13±0.5	21±0.8	2.0±0.5	10±0.5	0.9±0.2
	12mm	φ178±2.0	ΜΙΝφ50	φ13±0.5	21±0.8	2.0±0.5	13±0.5	1.2±0.2
10" Reel	8mm	φ258±2.0	ΜΙΝφ70	φ13±0.5	21±0.8	2.0±0.5	10±0.5	1.8±0.2
13" Reel	8mm	φ330±2.0	ΜΙΝφ70	φ13±0.5	21±0.8	2.0±0.5	10±0.5	1.8±0.2
13 Reel	12mm	φ330±2.0	ΜΙΝφ70	φ13±0.5	21±0.8	2.0±0.5	13±0.5	2.2±0.2

CarrierTape (Standard)

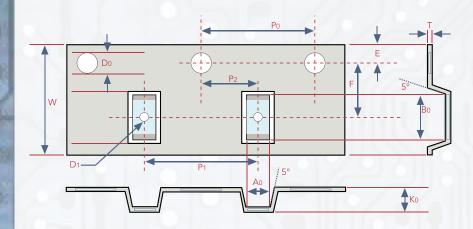
- To peel off the cover tape by the method shown in the right figure apply a peel-off force of 20GF 60GF (card board); 10GF 75GF (plastic tape).
- -The cover tape should not touch the top or bottom ofthe chip.
- If the cover tape has been peeled off it may be difficult to remove the chip due to punch-hole 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.

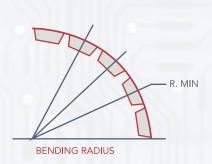


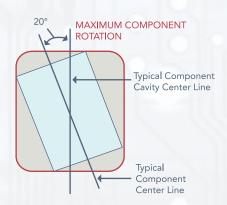
								1	111							
TYPE	Ao	Во	Т	Ko	W	Po	10XPo	P1	P <sub>2</sub>	Do	D1	Е	F	MOUNTING HOLE	STD. REEL QTY 7"	OPTIONA REEL QTY (10/13')
01005	0.25±0.04	0.45±0.04	0.36±0.05	*	8.0±0.30	4.0±0.10	40.0±0.10	2.0±0.05	2.0±0.05	1.5±0.1	*	1.75±0.1	3.5±0.05		20,000	50,000 D
0201	0.39±0.07	0.69±0.07	<0.50	*	8.0±0.10	4.0±0.10	40.0±0.10	2.0±0.05	2.0±0.05	1.55±0.05	*	1.75±0.05	3.5±0.05	l e	10,000 15,000	50,000 E
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	Angular Punch Hole	10,000	40,000 E 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 E 15,000 C
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 E 15,000 C 20,000 C
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 E 15,000 C 20,000 C

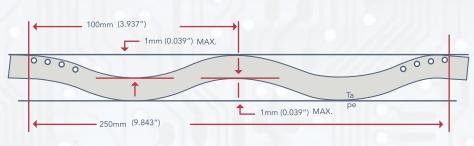
# PACKAGING (TAPING)

Tape & Reel Dimensions









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

TYPE	Ao	Во	Т	Ko	W	Po	10XPo	P1	P <sub>2</sub>	Do	D1	Е	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) Productmustbestoredinthefollowingconditions-Temperature;5to35degreesCelsius/40to95degreesFahrenheit 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.

