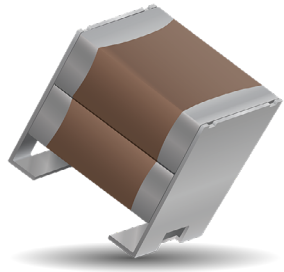


Stack Capacitor, KGP Series

General Specifications



GENERAL DESCRIPTION

Stack Capacitor, KGP series are designed for high frequency operations, such as a rectifier power supply. This series is manufactured using green materials without lead and cadmium. By having the metal lead frames, it allows for the capacitor to absorb both heat and mechanical stress. This series also features low ESR and ESL.

FEATURES

- High cap value in same mounting area
- Excellent bending stress
- Restrains noise
- Suppression of weld cracking by thermal stress

APPLICATIONS

- Power Supplies
- DC-DC Converter
- High Voltage Coupling / DC Blocking
- Industrial Control Circuits
- Down-Hole Application
- Charging Stations

HOW TO ORDER

KGP	55	M	R7	1H	476	M	S	2	J
Series Commercial Grade Stacked Cap (P)	Size 32 = 1210 43 = 1812 44 = 1825 55 = 2220 56 = 2225	Thickness Max (mm) 1210 case size "S" = 3.40mm "T" = 6.35mm 1812 case size "S" = 3.40mm "T" = 6.35mm 2220 case size "H" = 3.40mm "K" = 5.75mm "L" = 6.35mm "M" = 6.95mm	Dielectric CG = C0G R7 = X7R T7 = X7T	Rated Voltage 1H = 50V 2A = 100V 2D = 200V 2E = 250V 2W = 450V 2H = 500V 2J = 630V 3A = 1000V 3N = 1500V	Capacitance Code e.g. 0.1μF = 104 1μF = 105	Capacitance Tolerance K = ±10% M = ±20%	Packaging Code 	No. of Stacked Chips 1 = 1 Stack 2 = 2 Stack	Lead Shape J = J Shape L = L Shape

PACKAGING

Case Size	Packaging Code	Reel Size	No. of Stacked Chips	Packaging Quantity
1210	L	13"	1	1500
1210	L	13"	2	1000
1812	S	13"	1	1500
1812	S	13"	2	500
2220	S	13"	1	1000
2220	S	13"	2	500

Stack Capacitor, KGP Series

General Specifications

DIMENSIONS, LEAD SHAPE

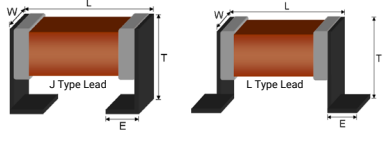
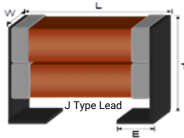
Case Size Inch (mm)	L (mm)	W (mm)	Maximum Thickness (mm)		E (mm)	
			1 Stack	2 Stack		
1210 (3225)	3.50 ± 0.40	2.50 ± 0.40	3.4	5.15 5.75 6.35 6.95	1.10 ± 0.15	
1812 (4532)	4.80 ± 0.40	3.20 ± 0.40			1.40 ± 0.15	
1825 (4563)	4.80 ± 0.40	6.30 ± 0.50			1.70 ± 0.15	
2220 (5750)	6.00 ± 0.50	5.00 ± 0.50			1.70 ± 0.15	
2225 (5763)	6.00 ± 0.50	6.30 ± 0.50			1.70 ± 0.15	

Fig. 5.1 The outline of Stacked Capacitors

*Please check with factory for thickness confirmation

MAXIMUM CAPACITANCE CODE**

C0G

Case Size	No. of Stacked Caps	Rated Voltage							
		50V	100V	200V	250V	500V	630V	1000V	1500V
1210	1	393	223	473	473	333	333	223	182
	2*	823	473	104	104	683	683	473	392
1812	1	104	473	273	273	223	223	123	332
	2*	224	104	563	563	473	473	223	682
1825	1	104	104	683	683	683	683	103	472
	2*	224	224	134	134	134	134	223	103
2220	1	104	104	683	683	104	104	333	472
	2*	224	224	134	134	224	224	683	104
2225	1	104	104	104	104	683	683	103	103
	2*	224	224	224	224	184	134	223	223

X7R

Case Size	No. of Stacked Caps	Rated Voltage							
		50V	100V	200V	250V	500V	630V	1000V	1500V
1210	1	106	475	684	684	154	154	473	333
	2*	226	106	135	135	334	334	104	683
1812	1	106	475	105	105	474	224	104	223
	2*	226	106	225	225	105	474	224	473
1825	1	106	106	225	105	564	564	104	563
	2*	226	226	475	225	125	125	224	124
2220	1	226	226	225	225	474	474	334	563
	2*	476	476	475	475	105	105	684	124
2225	1	106	106	275	275	564	564	334	104
	2*	226	226	565	565	125	125	684	224

X7T

Case Size	No. of Stacked Caps	Rated Voltage		
		250V	450V	630V
1210	1	334	224	154
	2*	684	474	334
1812	1	105	474	274
	2*	225	105	564
2220	1	225	105	564
	2*	475	225	125

*M tolerance (±20%) only available

** Please contact factory for non specified cap value availability

Stack Capacitor, KGP Series

General Specifications



ELECTRICAL SPECIFICATIONS

Dielectric	C0G	X7R														
Size	1210, 1812, 1825, 2220, 2225	1210, 1812, 1825, 2220, 2225														
Rated Voltage (WVDC)	50V, 100V, 200V, 250V, 500V, 630V,1000V,1500V	50V, 100V, 200V, 250V, 500V, 630V, 1000V, 1500V														
Capacitance Range	220nF Max.	47μF Max.														
Capacitance Tolerance	Reference to Table 5	Reference to Table 5														
Tan δ	<table><tr><th>Cap. Range</th><th>Q Spec.</th></tr><tr><td>Cap. < 30pF</td><td>Q ≥ 400 + 20C</td></tr><tr><td>Cap. ≥ 30pF</td><td>Q ≥ 1000</td></tr></table>	Cap. Range	Q Spec.	Cap. < 30pF	Q ≥ 400 + 20C	Cap. ≥ 30pF	Q ≥ 1000	<table><tr><th>Cap. Range</th><th>Q Spec.</th></tr><tr><td>1210≥2.2μF</td><td>≤5.0%</td></tr><tr><td>1812~2225≥4.7μF</td><td>≤5.0%</td></tr><tr><td>Other</td><td>≤2.5%</td></tr></table>	Cap. Range	Q Spec.	1210≥2.2μF	≤5.0%	1812~2225≥4.7μF	≤5.0%	Other	≤2.5%
Cap. Range	Q Spec.															
Cap. < 30pF	Q ≥ 400 + 20C															
Cap. ≥ 30pF	Q ≥ 1000															
Cap. Range	Q Spec.															
1210≥2.2μF	≤5.0%															
1812~2225≥4.7μF	≤5.0%															
Other	≤2.5%															
Capacitance & Tan δ Test Condition	Measured at the condition of 30~70% related humidity	Measured at the condition of 30~70% related humidity														
	For 25°C at ambient temperature	Preconditioning for Class II MLCC: Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement														
	<table><tr><th>Cap. Range</th><th>Test Condition</th></tr><tr><td>Cap.<1000pF</td><td>1.0±0.2Vrms, 1.0MHz±10%</td></tr><tr><td>Cap.≥1000pF</td><td>1.0±0.2Vrms, 1.0KHz±10%</td></tr></table>	Cap. Range	Test Condition	Cap.<1000pF	1.0±0.2Vrms, 1.0MHz±10%	Cap.≥1000pF	1.0±0.2Vrms, 1.0KHz±10%	<table><tr><th>Cap. Range</th><th>Test Condition</th></tr><tr><td>Cap.≤10μF</td><td>1.0±0.2Vrms, 1.0KHz±10%</td></tr><tr><td>Cap.>10μF</td><td>0.5±0.2Vrms, 120Hz±20%</td></tr></table>	Cap. Range	Test Condition	Cap.≤10μF	1.0±0.2Vrms, 1.0KHz±10%	Cap.>10μF	0.5±0.2Vrms, 120Hz±20%		
	Cap. Range	Test Condition														
Cap.<1000pF	1.0±0.2Vrms, 1.0MHz±10%															
Cap.≥1000pF	1.0±0.2Vrms, 1.0KHz±10%															
Cap. Range	Test Condition															
Cap.≤10μF	1.0±0.2Vrms, 1.0KHz±10%															
Cap.>10μF	0.5±0.2Vrms, 120Hz±20%															
Insulation Resistance Ur	≥10GΩ or RxC≥500Ω·F, whichever is smaller	≥10GΩ or RxC≥100Ω·F, whichever is smaller														
Operating Temperature	-55°C to +125°C	-55°C to +125°C														
Capacitance Characteristic	±30ppm /°C	±15%														
Termination	L / J type lead	L / J type lead														

Dielectric	X7T								
Size	1210, 1812, 2220								
Rated Voltage (WVDC)	250V, 450V, 630V								
Capacitance Range	4.7μF Max.								
Capacitance Tolerance	Reference to Table 5								
Tan δ	<table border="1"> <thead> <tr> <th>Cap. Range</th><th>D.F. Spec.</th></tr> </thead> <tbody> <tr> <td>1210$\geq 2.2\mu F$</td><td>$\leq 5.0\%$</td></tr> <tr> <td>1812~2225$\geq 4.7\mu F$</td><td>$\leq 5.0\%$</td></tr> <tr> <td>Other</td><td>$\leq 2.5\%$</td></tr> </tbody> </table>	Cap. Range	D.F. Spec.	1210 $\geq 2.2\mu F$	$\leq 5.0\%$	1812~2225 $\geq 4.7\mu F$	$\leq 5.0\%$	Other	$\leq 2.5\%$
Cap. Range	D.F. Spec.								
1210 $\geq 2.2\mu F$	$\leq 5.0\%$								
1812~2225 $\geq 4.7\mu F$	$\leq 5.0\%$								
Other	$\leq 2.5\%$								
Capacitance & Tan δ Test Condition	Measured at the condition of 30~70% related humidity Preconditioning for Class II MLCC : Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition (25°C) for 24±2 hours before measurement <table border="1"> <thead> <tr> <th>Cap. Range</th><th>Test Condition</th></tr> </thead> <tbody> <tr> <td>Cap.≤10μF</td><td>1.0±0.2Vrms, 1.0KHz ± 10%</td></tr> <tr> <td>Cap.>10μF</td><td>0.5±0.2Vrms, 120Hz ± 20%</td></tr> </tbody> </table>	Cap. Range	Test Condition	Cap.≤10μF	1.0±0.2Vrms, 1.0KHz ± 10%	Cap.>10μF	0.5±0.2Vrms, 120Hz ± 20%		
Cap. Range	Test Condition								
Cap.≤10μF	1.0±0.2Vrms, 1.0KHz ± 10%								
Cap.>10μF	0.5±0.2Vrms, 120Hz ± 20%								
Insulation Resistance Ur	$\geq 10G\Omega$ or $RxC \geq 100\Omega \cdot F$, whichever is smaller								
Operating Temperature	-55°C to +125°C								
Capacitance Characteristic	+22%~-33%								
Termination	L / J type lead								

Stack Capacitor, KGP Series

General Specifications

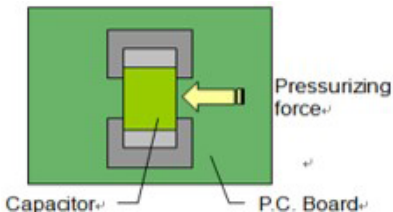
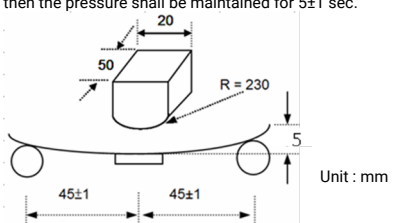


TESTING METHODS

Item	Test Condition	Requirements																		
Visual and Dimensions	---	* No remarkable defect. * Dimensions to confirm to individual specification sheet.																		
Capacitance		* Shall not exceed the limits given in the detailed spec.																		
Q/D.F. (Dissipation Factor)	* Class I : Cap.≤1000pF, 1.0±0.2Vrms, 1MHz±10%. Cap.>1000pF, 1.0±0.2Vrms, 1KHz±10%.																			
	* Class II : Cap.≤10μF, 1.0±0.2Vrms, 1KHz±10%. Cap.>10μF, 0.5±0.2Vrms, 120Hz±20%.																			
		<table><tr><th>Dielectric</th><th>Cap. Range</th><th>Q/D.F.</th></tr><tr><td rowspan="2">Class I (C0G)</td><td>Cap.≥30pF</td><td>Q≥1000</td></tr><tr><td>Cap.<30pF</td><td>Q≥400+20C</td></tr><tr><td rowspan="2">Class II (X7R/X7T)</td><td>1210≥2.2μF & 1812~2220≥4.7μF</td><td>D.F.≤5.0%</td></tr><tr><td>Other</td><td>D.F.≤2.5%</td></tr></table>	Dielectric	Cap. Range	Q/D.F.	Class I (C0G)	Cap.≥30pF	Q≥1000	Cap.<30pF	Q≥400+20C	Class II (X7R/X7T)	1210≥2.2μF & 1812~2220≥4.7μF	D.F.≤5.0%	Other	D.F.≤2.5%					
	Dielectric	Cap. Range	Q/D.F.																	
Class I (C0G)	Cap.≥30pF	Q≥1000																		
	Cap.<30pF	Q≥400+20C																		
Class II (X7R/X7T)	1210≥2.2μF & 1812~2220≥4.7μF	D.F.≤5.0%																		
	Other	D.F.≤2.5%																		
Temperature Coefficient	* With no electrical load. <table><tr><th>T.C.</th><th>Operating Temp.</th></tr><tr><td>C0G</td><td>-55~125°C at 25°C</td></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr><tr><td>X7T</td><td>-55~125°C at 25°C</td></tr></table>	T.C.	Operating Temp.	C0G	-55~125°C at 25°C	X7R	-55~125°C at 25°C	X7T	-55~125°C at 25°C	<table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>C0G</td><td>Within ±30ppm/°C</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>X7T</td><td>Within +22% ~ -33%</td></tr></table>	T.C.	Capacitance Change	C0G	Within ±30ppm/°C	X7R	Within ±15%	X7T	Within +22% ~ -33%		
T.C.	Operating Temp.																			
C0G	-55~125°C at 25°C																			
X7R	-55~125°C at 25°C																			
X7T	-55~125°C at 25°C																			
T.C.	Capacitance Change																			
C0G	Within ±30ppm/°C																			
X7R	Within ±15%																			
X7T	Within +22% ~ -33%																			
Insulation Resistance	<table><tr><th>Rated Vol. (V)</th><th>Apply Voltage</th><th>Test Time</th></tr><tr><td>≤100</td><td>1 times of U_R</td><td>Max. 120 sec.</td></tr><tr><td>100<V≤500</td><td>1 times of U_R</td><td>60 sec.</td></tr><tr><td>>500</td><td>500Vdc</td><td>60 sec.</td></tr></table>	Rated Vol. (V)	Apply Voltage	Test Time	≤100	1 times of U _R	Max. 120 sec.	100<V≤500	1 times of U _R	60 sec.	>500	500Vdc	60 sec.	<table><tr><th>Dielectric</th><th>Requirements</th></tr><tr><td>Class I</td><td>≥10GΩ or RxC≥500Q-F, whichever is smaller</td></tr><tr><td>Class II</td><td>≥10GΩ or RxC≥100Q-F, whichever is smaller</td></tr></table>	Dielectric	Requirements	Class I	≥10GΩ or RxC≥500Q-F, whichever is smaller	Class II	≥10GΩ or RxC≥100Q-F, whichever is smaller
Rated Vol. (V)	Apply Voltage	Test Time																		
≤100	1 times of U _R	Max. 120 sec.																		
100<V≤500	1 times of U _R	60 sec.																		
>500	500Vdc	60 sec.																		
Dielectric	Requirements																			
Class I	≥10GΩ or RxC≥500Q-F, whichever is smaller																			
Class II	≥10GΩ or RxC≥100Q-F, whichever is smaller																			
Dielectric Strength	C0G(NPO)/X7R: <table><tr><th>Rated Voltage</th><th>Condition</th></tr><tr><td>≤100</td><td>2.5 times of U_R</td></tr><tr><td>100<V≤250</td><td>2.0 times of U_R</td></tr><tr><td>250<V≤500</td><td>1.5 times of U_R</td></tr><tr><td>630≤V≤3000V</td><td>1.2 times of U_R</td></tr></table> X7T: <table><tr><th>Rated Voltage</th><th>Condition</th></tr><tr><td>250</td><td>1.5 times of U_R</td></tr><tr><td>450</td><td>1.5 times of U_R</td></tr><tr><td>≥630</td><td>1.2 times of U_R</td></tr></table> * Duration : 1 to 5 sec. * Charge and discharge current less than 50mA.	Rated Voltage	Condition	≤100	2.5 times of U _R	100<V≤250	2.0 times of U _R	250<V≤500	1.5 times of U _R	630≤V≤3000V	1.2 times of U _R	Rated Voltage	Condition	250	1.5 times of U _R	450	1.5 times of U _R	≥630	1.2 times of U _R	* No evidence of damage or flash over during test.
Rated Voltage	Condition																			
≤100	2.5 times of U _R																			
100<V≤250	2.0 times of U _R																			
250<V≤500	1.5 times of U _R																			
630≤V≤3000V	1.2 times of U _R																			
Rated Voltage	Condition																			
250	1.5 times of U _R																			
450	1.5 times of U _R																			
≥630	1.2 times of U _R																			
Temperature Cycle	* Conduct the 100 cycles according to the temperatures and time. <table><tr><th>Step</th><th>Temp.(°C)</th><th>Time(min.)</th></tr><tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table> * Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	Step	Temp.(°C)	Time(min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	* No remarkable damage. * Cap. change : C0G Within ±2.5% or ±0.25pF, whichever is larger. X7R, X7T Within ±7.5%. * Q/D.F. : C0G : Q≥100% of initial requirement. X7R, X7T : D.F.≤150% of initial requirement. * I.R. : To meet the initial requirement.			
Step	Temp.(°C)	Time(min.)																		
1	Min. operating temp. +0/-3	30±3																		
2	Room temp.	2~3																		
3	Max. operating temp. +3/-0	30±3																		
4	Room temp.	2~3																		
Humidity (Damp Heat) Steady State	* Test temp. : 40±2°C. * Humidity : 90~95%RH. * Test time : 500 +24/-0hrs. * Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	* No remarkable damage. * Cap. change : C0G Within ±5.0% or ±0.5pF, whichever is larger. X7R, X7T Within ±12.5%. * Q/D.F. : C0G : Q≥350. X7R, X7T : D.F.≤200% of initial requirement. * I.R. (Class I):. : ≥1GΩ or RxC≥500-F, whichever is smaller. * I.R. (Class II): ≥1GΩ or RxC≥10Q-F, whichever is smaller.																		
Humidity (Damp Heat) Load	* Test temp. : 40±2°C. * Humidity : 90~95%RH. * Test time : 500 +24/-0hrs. * To apply voltage : Rated voltage (500V max.). * Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	* No remarkable damage. * Cap. change : C0G Within ±7.5% or ±0.75pF, whichever is larger. X7R, X7T Within ±12.5%. * Q/D.F. : C0G : Q≥200. X7R, X7T : D.F.≤200% of initial requirement. * I.R. : ≥500MQ or RxC≥250-F, whichever is smaller.																		

Stack Capacitor, KGP Series

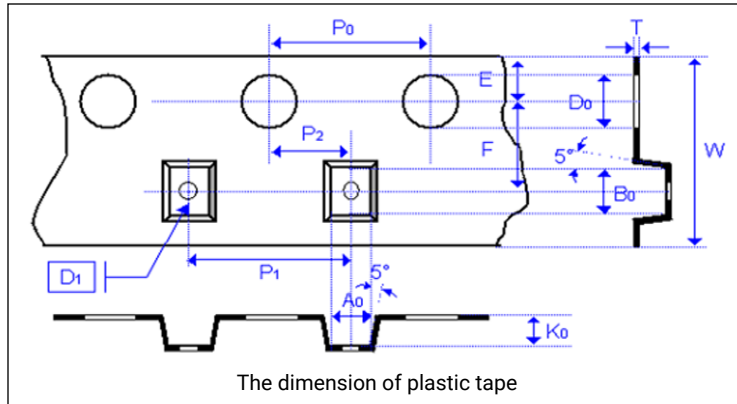
General Specifications

Item	Test Condition	Requirements																																																	
High Temperature Load (Endurance)	* Test temp. : 125±3°C. * To apply voltage : <table><tr><th>Dielectric</th><th>Rated Vol.(V)</th><th>Apply Voltage</th></tr><tr><td rowspan="4">C0G/X7R</td><td>≤100</td><td>2.0 times of U_R</td></tr><tr><td>200≤V≤ 500</td><td>1.5 times of U_R</td></tr><tr><td>=630</td><td>1.2 times of U_R</td></tr><tr><td>>1000</td><td>1.0 times of U_R</td></tr></table> * Exception items (X7R only) : (1) 150% of rated voltage for below range : <table><tr><th>Rated Vol.(V)</th><th>Size</th><th>Cap. Range</th></tr><tr><td>ALL</td><td>ALL</td><td>Cap.≥106</td></tr><tr><td rowspan="5">50V & 100V</td><td>1210</td><td rowspan="5">Cap.≥105</td></tr><tr><td>1812</td></tr><tr><td>1825</td></tr><tr><td>2220</td></tr><tr><td>2225</td></tr></table> (2) 120% of rated voltage for below range : <table><tr><th>Size</th><th>Dielectric</th><th>Rated Voltage</th><th>Capacitance</th></tr><tr><td>2220</td><td>X7R</td><td>≥100V</td><td>Cap.≥15μF</td></tr></table> (3) 100% of rated voltage for below range : <table><tr><th>Size</th><th>Dielectric</th><th>Rated Voltage</th><th>Capacitance</th></tr><tr><td>1206</td><td>X7R</td><td>≥100V</td><td>Cap.≥2.2μF</td></tr><tr><td>1210</td><td>X7R</td><td>≥100V</td><td>Cap.≥3.3μF</td></tr><tr><td>2220</td><td>X7R</td><td>≥100V</td><td>Cap.≥22μF</td></tr></table> X7T : 250 150% of rated voltage = 375V 450 120% of rated voltage = 540V 630 100% of rated voltage = 630V * Test time : 1000 +24/-0 hrs. * Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	Dielectric	Rated Vol.(V)	Apply Voltage	C0G/X7R	≤100	2.0 times of U_R	200≤V≤ 500	1.5 times of U_R	=630	1.2 times of U_R	>1000	1.0 times of U_R	Rated Vol.(V)	Size	Cap. Range	ALL	ALL	Cap.≥106	50V & 100V	1210	Cap.≥105	1812	1825	2220	2225	Size	Dielectric	Rated Voltage	Capacitance	2220	X7R	≥100V	Cap.≥15μF	Size	Dielectric	Rated Voltage	Capacitance	1206	X7R	≥100V	Cap.≥2.2μF	1210	X7R	≥100V	Cap.≥3.3μF	2220	X7R	≥100V	Cap.≥22μF	* No remarkable damage. * Cap. change : C0G Within ±3.0% or ±0.3pF, whichever is larger. X7R, X7T Within ±12.5%. * Q/D.F. : C0G : Q≥350. X7R, X7T : D.F.≤200% of initial requirement. * I.R. (Class I). : ≥1GΩ or RxC≥500-F, whichever is smaller. * I.R. (Class II) : ≥1GΩ or RxC≥100-F, whichever is smaller.
	Dielectric	Rated Vol.(V)	Apply Voltage																																																
	C0G/X7R	≤100	2.0 times of U_R																																																
		200≤V≤ 500	1.5 times of U_R																																																
		=630	1.2 times of U_R																																																
		>1000	1.0 times of U_R																																																
	Rated Vol.(V)	Size	Cap. Range																																																
	ALL	ALL	Cap.≥106																																																
	50V & 100V	1210	Cap.≥105																																																
		1812																																																	
1825																																																			
2220																																																			
2225																																																			
Size	Dielectric	Rated Voltage	Capacitance																																																
2220	X7R	≥100V	Cap.≥15μF																																																
Size	Dielectric	Rated Voltage	Capacitance																																																
1206	X7R	≥100V	Cap.≥2.2μF																																																
1210	X7R	≥100V	Cap.≥3.3μF																																																
2220	X7R	≥100V	Cap.≥22μF																																																
Adhesive Strength of Termination	* Capacitors mounted on a substrate. A force of 10N applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10±1 second. 	*No remarkable damage or removal of the terminations.																																																	
	Bending Test	* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 5mm and then the pressure shall be maintained for 5±1 sec.  Unit : mm	* No remarkable damage. <table><tr><th>Dielectric</th><th>Cap. Change</th></tr><tr><td>C0G</td><td>Within ±3.0% or ±2.0pF, whichever is larger</td></tr><tr><td>X7R</td><td>Within ±12.5%</td></tr><tr><td>X7T</td><td>Within ±12.5%</td></tr></table> (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test)	Dielectric	Cap. Change	C0G	Within ±3.0% or ±2.0pF, whichever is larger	X7R	Within ±12.5%	X7T	Within ±12.5%																																								
Dielectric		Cap. Change																																																	
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X7R	Within ±12.5%																																																		
X7T	Within ±12.5%																																																		
Vibration Resistance	* Vibration frequency : 10~55 Hz/min. * Total amplitude : 1.5mm. * Test time : 6 hrs. (Two hrs each in three mutually perpendicular directions) * Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	* No remarkable damage. * Cap. change and D.F. : To meet initial spec.																																																	
	Resistance to Soldering Heat	* Reflow soldering : Peak 260±5°C. * Preheating : 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. * Before initial measurement (Class II only) : Perform 150 +0/-10°C for 1 hr and then set for 48±4 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	* No remarkable damage. * Cap. Change : C0G : Within ±2.5% or ±0.25pF, whichever is larger. X7R, X7T : Within ±7.5%. * Q/D.F. & I.R. : To meet the initial requirement.																																																

Stack Capacitor, KGP Series

General Specifications

EMBOSED TAPE DIMENSIONS



Size	1210 case size (1 chip)	1210 case size (2 chip)	1812 case size (1 chip)	1812 case size (2 chip)	2220 case size (1 chip)	2220 case size (2 chip)
Chip Thickness	3.00±0.35	6.00±0.35	3.60±0.35	6.00±0.35 6.60±0.35	3.60±0.35	6.00±0.35 6.60±0.35
W	12.00±0.30	12.00±0.30	16.00±0.30	16.00±0.30	16.00±0.30	16.00±0.30
E	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10
F	5.50±0.10	5.50±0.10	7.50±0.10	7.50±0.10	7.50±0.10	7.50±0.10
P	8.00±0.10	8.00±0.10	8.00±0.10	12.00±0.10	12.00±0.10	12.00±0.10
P ₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP ₀	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P ₂	2.00±0.10	2.00±0.10	2.00±0.10	2.00±0.10	2.00±0.10	2.00±0.10
D ₀	Ø1.50 +0.10/-0	Ø1.50 +0.10/-0	Ø1.50 +0.10/-0	Ø1.50 +0.10/-0	Ø1.50 +0.10/-0	Ø1.50 +0.10/-0
T	0.40±0.05	0.40±0.05	0.40±0.05	0.40±0.05	0.40±0.05	0.50±0.05
A ₀	3.00±0.10	3.00±0.10	3.52±0.10	3.67±0.10	5.70±0.10	5.75±0.10
B ₀	3.82±0.10	4.00±0.10	5.08±0.10	5.03±0.10	6.45±0.10	6.60±0.10
K ₀	3.40±0.10	6.40±0.10	4.00±0.10	7.00±0.10	5.00±0.10	7.00±0.10
Unit:	mm	mm	mm	mm	mm	mm

REEL DIMENSIONS

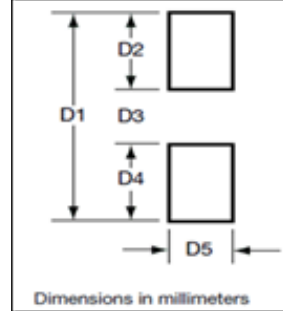
Reel size	13"	
A	330.0±0.50 mm	
B	2.00±0.50 mm	
C	13.00+0.50/-0.20 mm	
T	2.00+0.50/-0.20 mm	

Fig. 9.2 The dimension of reel

Stack Capacitor, KGP Series

General Specifications

FOOTPRINT DIMENSIONS

Size	1210	1812	1825	2220	2225	Fig. 10.1 Illustration of Footprint
D1	4.90	6.80	6.80	8.40	8.40	 Dimensions in millimeters
D2	1.40	1.60	1.60	2.20	2.20	
D3	2.10	3.60	3.60	4.00	4.00	
D4	1.40	1.60	1.60	2.20	2.20	
D5	2.80	3.80	6.80	5.50	6.80	

STORAGE

To prevent the damage of solderability of terminations, the following storage conditions are recommended:

- Indoors under 5 ~ 40°C and 20% ~ 70% RH.
- No harmful gases containing sulfuric acid, ammonia, hydrogen sulfide or chlorine.
- Packaging should not be opened until the capacitors are required for use. If opened, the pack should be re-sealed as soon as is practicable. Taped product should be stored out of direct sunlight, which might promote deterioration in tape or adhesion performance. The product is recommended to be used within 12 months after shipment and checked the solderability before use.

HANDLING

Chip capacitors are dense, hard, brittle, and abrasive materials. They are liable to suffer mechanical damage, in the form of cracks or chips. Chip Capacitors should be handled with care to avoid contamination or damage. To use vacuum or plastic tweezers to pick up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.

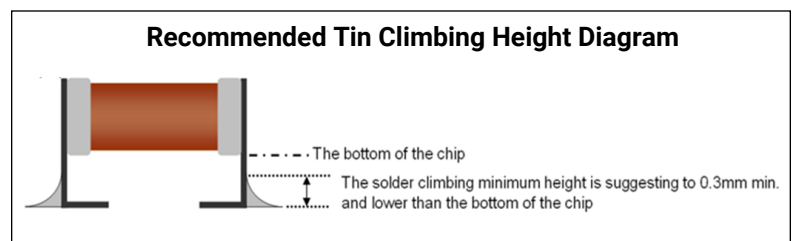
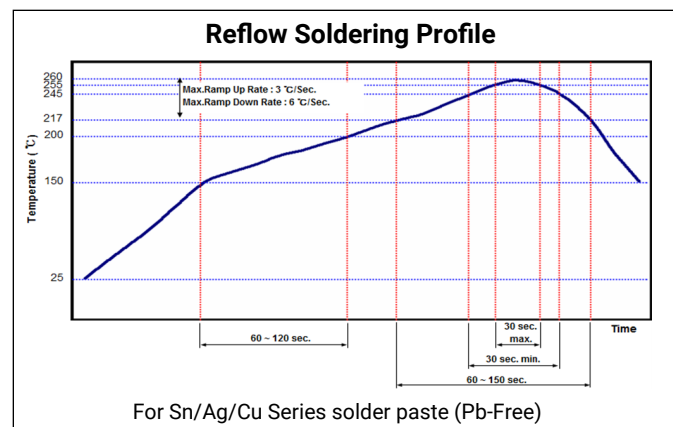
PREHEAT

In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required. The rate of preheat should not exceed 3°C per second.

SOLDERING

Use mildly activated rosin fluxes do not use activated flux. The amount of solder in each solder joint should be controlled to prevent the damage of chip capacitors caused by the stress between solder, chips, and substrate.

a.) Reflow soldering : (Please make sure that solder is smoothly applied higher than 0.3mm and lower than the level of the bottom of the chip)



COOLING

After soldering, cool the chips and the substrate gradually to room temperature. Natural cooling in air is recommended to minimize stress in the solder joint.

CLEANING

All flux residues must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contamination that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is depends upon many factors such as component mix, flux, and solder paste and assembly method. The ability of the cleaning system to remove flux residues and contamination from under the chips is very important.