

KPS HV, Large Case, SM Series, C0G Dielectric, 500VDC-10KVDC (Industrial Grade)

Overview

KPS HV (KEMET Power Solutions, High Voltage), Large Case (≥ 1515), SM Series capacitors in C0G dielectric are designed to meet robust performance standards required in higher reliability industrial applications. Utilizing lead-frame technology, SM Series devices isolate the multilayer ceramic chip component from the printed circuit board providing advanced mechanical and thermal stress performance. Isolation of the chip component also addresses concerns for audible, microphonic noise that may occur when a bias voltage is applied. Although this technology does not eliminate the potential for mechanical damage that may propagate during extreme environmental and handling conditions, it does demonstrate superior performance over non-isolating systems. Available in both formed "L" and "J" lead configurations, SM Series devices offer up to 10mm of board flex capability and

exhibit lower ESR, ESL and higher current discharge capability when compared to other dielectric solutions.

Combined with the stability of an C0G dielectric, KEMET's High Voltage SM Series devices exhibit no change in capacitance with respect to time and voltage and boasts a negligible change in capacitance with reference to ambient temperature. Capacitance change is limited to $\pm 30\text{ppm}/^\circ\text{C}$ from -55°C to $+125^\circ\text{C}$.

KEMET's Industrial grade products offer additional screening options for higher reliability applications. Both Group A and Group B testing/inspection options per MIL-PRF-49467 are available for the SM Series.

Benefits

- -55°C to $+125^\circ\text{C}$ operating temperature range
- Large Case Sizes (≥ 1515)
- Formed "L" or "J" leadframe configurations.
- Group A & B screening per MIL-PRF-49467 available
- Reliable & robust leadframe termination system
- DC voltage ratings of 500V, 1KV, 2KV, 3KV, 4KV, 5KV, 7.5KV & 10KV
- Capacitance offerings ranging from 10pF up to 0.39 μF
- Advanced protection against thermal & mechanical stress
- Provides up to 10mm of board flex capability
- Reduces audible, microphonic noise
- Low ESR & ESL
- Non-polar device, minimizing installation concerns
- Silver plated copper alloy leadframe termination system

Applications

Typical applications include switch mode power supplies (input filters, resonators, tank circuits, snubber circuits, output filters), high voltage coupling and DC blocking, voltage multiplier circuits, DC/DC converters and coupling capacitors in Ćuk converters, noise reduction (piezoelectric/mechanical), circuits with a direct battery or power source connection, critical and safety relevant circuits without (integrated) current limitation and any application that is subject to high levels of board flexure or temperature cycling. Markets include power supply, LCD fluorescent backlight ballasts, HID lighting, telecom equipment, industrial and medical equipment/control and Military.



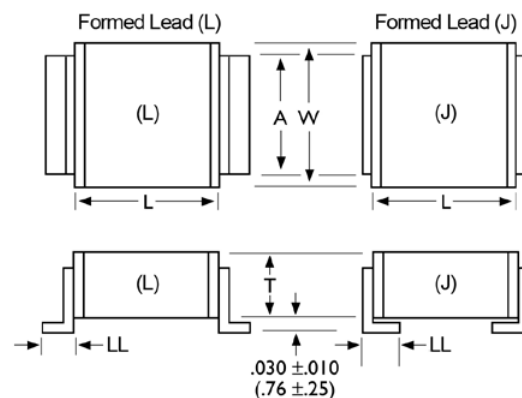
Ordering Information

SM20		N	472	J	501	B	M
Style/Size		Dielectric	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Lead Configuration ¹	Testing/ Inspection Option ²
SM20	SM30	N = C0G	2 Sig. Digits + Number of Zeros.	J = $\pm 5\%$ K = $\pm 10\%$ M = $\pm 20\%$ P = $+100\%$, -0% Z = $+80\%$, -20%	501 = 500V 102 = 1000V 202 = 2000V 302 = 3000V 402 = 4000V 502 = 5000V	A = Formed "L" B = Formed "J"	Blank = None M = Group A per MIL-PRF-49467
SM21	SM31						
SM22	SM33						
SM23	SM34						
SM24	SM35						
SM25	SM36						
SM26							

¹ Standard lead configuration is formed "J". If the appropriate character is excluded from the ordering code, the assumed lead configuration will be formed "J".

² Group B testing/inspection option per MIL-PRF-49467 is available upon request. Please contact KEMET for ordering details.

Dimensions – Inches (Millimeters)



Style/ Size	L Length	W Width	T Thickness Max.	A Lead Width Max.	LL Lead Length (Formed "L")	LL Lead Length (Formed "J")
SM20	0.150 ± 0.015 (3.81 ± 0.38)	0.150 ± 0.015 (3.81 ± 0.38)	0.130 (3.30)	0.100 (2.54)	0.100 ± 0.020 (2.54 ± 0.51)	0.040 ± 0.010 (1.02 ± 0.25)
SM21	0.200 ± 0.020 (5.08 ± 0.51)	0.200 ± 0.020 (5.08 ± 0.51)	0.180 (4.57)			
SM22	0.250 ± 0.020 (6.35 ± 0.51)	0.200 ± 0.020 (5.08 ± 0.51)	0.220 (5.59)	0.200 (5.08)		
SM23	0.350 ± 0.030 (8.89 ± 0.76)	0.300 ± 0.030 (7.62 ± 0.76)		0.300 (7.62)		
SM24	0.450 ± 0.030 (11.43 ± 0.76)	0.400 ± 0.030 (10.20 ± 0.76)		0.400 (10.20)		
SM25	0.550 ± 0.030 (14.00 ± 0.76)	0.500 ± 0.030 (12.70 ± 0.76)		0.500 (12.70)		
SM26	0.650 ± 0.030 (16.50 ± 0.76)	0.600 ± 0.030 (15.20 ± 0.76)	0.140 (3.55)	0.100 (2.54)		0.100 ± 0.020 (2.54 ± 0.51)
SM30	0.300 ± 0.030 (7.62 ± 0.76)	0.150 ± 0.015 (3.81 ± 0.38)	0.130 (3.30)			
SM31	0.400 ± 0.030 (10.20 ± 0.76)	0.200 ± 0.020 (5.08 ± 0.51)	0.180 (4.57)	0.200 (5.08)		
SM33	0.700 ± 0.030 (17.08 ± 0.76)	0.300 ± 0.030 (7.62 ± 0.76)	0.220 (5.59)	0.300 (7.62)		
SM34	0.900 ± 0.030 (22.90 ± 0.76)	0.400 ± 0.030 (10.20 ± 0.76)		0.400 (10.2)		
SM35	1.100 ± 0.030 (27.90 ± 0.76)	0.500 ± 0.030 (12.70 ± 0.76)		0.500 (12.7)		
SM36	1.350 ± 0.030 (33.00 ± 0.76)	0.600 ± 0.030 (15.20 ± 0.76)				

Qualification/Certification

Industrial Grade products are subject to internal qualification. Details regarding test methods and conditions are referenced in Table 3 , Performance and Reliability.

Environmental Compliance

RoHS compliant with Exemption(s)

Electrical Parameters/Characteristics

Item	Parameters/Characteristics
Operating Temperature Range	-55°C to +125°C
Capacitance Change with Reference to +25°C and 0 VDC Applied (TCC)	±30PPM/°C
Aging Rate (Max % Cap Loss/Decade Hour)	0%
Dielectric Withstanding Voltage	150% of rated voltage for voltage rating of ≤ 1250Vdc 120% of rated voltage for voltage rating of > 1250Vdc (5 ± 1 seconds and charge/discharge not exceeding 50mA)
Dissipation Factor (DF) Maximum Limits @ 25°C	0.15%
Insulation Resistance (IR) Limit @ 25°C	1000 megohm microfarads or 100GΩ (Rated voltage DC applied for 120 ± 5 secs @ 25°C for voltage rating of ≤ 500VDC) (500VDC applied for 120 ± 5 secs @ 25°C for voltage rating of > 500VDC)

To obtain IR limit, divide MΩ-μF value by the capacitance and compare to GΩ limit. Select the lower of the two limits.

Capacitance and Dissipation Factor (DF) measured under the following conditions:

1MHz ± 100kHz and 1.0Vrms ± 0.2V if capacitance ≤ 100pF

1kHz ± 50Hz and 1.0Vrms ± 0.2V if capacitance > 100pF

Note: When measuring capacitance it is important to ensure the set voltage level is held constant. The HP4284 & Agilent E4980 have a feature known as Automatic Level Control (ALC). The ALC feature should be switched to "ON".

Post Environmental Limits

High Temperature Life, Biased Humidity, Moisture Resistance				
Dielectric	Rated DC Voltage	Capacitance Value	DF (%)	Cap Shift
C0G	All	All	0.25	0.3% or ± 0.25 pf

(SMD MLCCs) – KPS HV, Large Case, SM Series, COG Dielectric, 500VDC-10KVDC (Industrial Grade)

Table 1A – SM20 - SM24 Style/Size

Style/Size	SM20				SM21				SM22				SM23				SM24					Cap Tol				
Dimensions - In. (mm)																										
Length	0.150 ± 0.015 (3.81 ± 0.38)				0.200 ± 0.020 (5.08 ± 0.51)				0.250 ± 0.020 (6.35 ± 0.51)				0.350 ± 0.030 (8.89 ± 0.76)				0.450 ± 0.030 (11.43 ± 0.76)									
Width	0.150 ± 0.015 (3.81 ± 0.38)				0.200 ± 0.020 (5.08 ± 0.51)				0.200 ± 0.020 (5.08 ± 0.51)				0.300 ± 0.030 (7.62 ± 0.76)				0.400 ± 0.030 (10.20 ± 0.76)									
Thickness Max.	0.130 (3.30)				0.180 (4.57)				0.180 (4.57)				0.220 (5.59)				0.220 (5.59)									
Lead Width Max.	0.100 (2.54)				0.100 (2.54)				0.100 (2.54)				0.200 (5.08)				0.300 (7.62)									
Lead Length "L"	0.100 ± 0.020 (2.54 ± 0.51)				0.100 ± 0.020 (2.54 ± 0.51)				0.100 ± 0.020 (2.54 ± 0.51)				0.100 ± 0.020 (2.54 ± 0.51)				0.100 ± 0.020 (2.54 ± 0.51)									
Lead Length "J"	0.040 ± 0.010 (1.02 ± 0.25)				0.040 ± 0.010 (1.02 ± 0.25)				0.040 ± 0.010 (1.02 ± 0.25)				0.100 ± 0.020 (2.54 ± 0.51)				0.100 ± 0.020 (2.54 ± 0.51)									
COG Dielectric																										
Voltage Code	501	102	202	302	501	102	202	302	501	102	202	302	501	102	202	302	402	501	102	202	302	402	502	Cap Tol		
Voltage DC	500	1K	2K	3K	500	1K	2K	3K	500	1K	2K	3K	500	1K	2K	3K	4K	500	1K	2K	3K	4K	5K			
Capacitance	Capacitance Code																									
22pF								220	220																	
27pF								270	270																	
33pF								330	330	330	330	330	330													
39pF	390	390	390	390	390	390	390	390	390	390	390	390	390													
47pF	470	470	470	470	470	470	470	470	470	470	470	470	470													
56pF	560	560	560	560	560	560	560	560	560	560	560	560	560								560	560	560	560	560	560
68pF	680	680	680	680	680	680	680	680	680	680	680	680	680								680	680	680	680	680	680
82pF	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820
100pF	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101
120pF	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121
150pF	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151
180pF	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181
220pF	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221	221
270pF	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271
330pF	331	331	331		331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331
390pF	391	391	391		391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391
470pF	471	471	471		471	471	471	471	471	471	471	471	471	471	471	471	471	471	471	471	471	471	471	471	471	471
560pF	561	561	561		561	561	561	561	561	561	561	561	561	561	561	561	561	561	561	561	561	561	561	561	561	561
680pF	681	681	681		681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681
820pF	821	821	821		821	821	821	821	821	821	821	821	821	821	821	821	821	821	821	821	821	821	821	821	821	821
1,000pF	102	102			102	102	102		102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102
1,200pF	122	122			122	122	122		122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122
1,500pF	152	152			152	152	152		152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152
1,800pF	182	182			182	182	182		182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182
2,200pF	222	222			222	222	222		222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
2,700pF	272	272			272	272			272	272	272			272	272	272			272	272	272	272				
3,300pF					332	332			332	332	332			332	332	332			332	332	332	332				
3,900pF					392	392			392	392				392	392	392			392	392	392	392				
4,700pF					472	472			472	472				472	472	472			472	472	472	472				
5,600pF									562	562				562	562	562			562	562	562	562				
6,800pF									682	682				682	682			682	682	682	682					
8,200pF									822					822	822			822	822	822	822					
0.01µF									103					103	103			103	103	103	103					
0.012µF									123					123	123			123	123	123	123					
0.015µF									153					153	153			153	153	153	153					
0.018µF									183					183				183	183	183	183					
0.022µF														223				223	223	223	223					
0.027µF														273				273	273	273	273					
0.033µF														333				333	333	333	333					
0.039µF																		393	393	393	393					
0.047µF																		473	473	473	473					
0.039µF																		393	393	393	393					
0.047µF																		473	473	473	473					

Table 1B – SM25 - SM31 Style/Size

Style/Size	SM25					SM26					SM30					SM31					Cap Tol				
Dimensions - In. (mm)																									
Length	0.550 ± 0.030 (14.00 ± 0.76)					0.650 ± 0.030 (16.50 ± 0.76)					0.300 ± 0.030 (7.62 ± 0.76)					0.400 ± 0.030 (10.20 ± 0.76)									
Width	0.500 ± 0.030 (12.70 ± 0.76)					0.600 ± 0.030 (15.20 ± 0.76)					0.150 ± 0.015 (3.81 ± 0.38)					0.200 ± 0.020 (5.08 ± 0.51)									
Thickness Max.	0.220 (5.59)					0.220 (5.59)					0.140 (3.55)					0.130 (3.30)									
Lead Width Max.	0.400 (10.20)					0.500 (12.70)					0.100 (2.54)					0.100 (2.54)									
Lead Length "L"	0.100 ± 0.020 (2.54 ± 0.51)					0.100 ± 0.020 (2.54 ± 0.51)					0.100 ± 0.020 (2.54 ± 0.51)					0.100 ± 0.020 (2.54 ± 0.51)									
Lead Length "J"	0.100 ± 0.020 (2.54 ± 0.51)					0.100 ± 0.020 (2.54 ± 0.51)					0.100 ± 0.020 (2.54 ± 0.51)					0.100 ± 0.020 (2.54 ± 0.51)									
COG Dielectric																									
Voltage Code	501	102	202	302	402	502	501	102	202	302	402	502	501	102	202	302	402	501	102	202	302	402	502	Cap Tol	
Voltage DC	500	1K	2K	3K	4K	5K	500	1K	2K	3K	4K	5K	500	1K	2K	3K	4K	500	1K	2K	3K	4K	5K		
Capacitance	Capacitance Code																								
10pF																							100		
12pF																								120	
15pF													150	150	150	150	150							150	
18pF													180	180	180	180	180							180	
22pF													220	220	220	220	220							220	
27pF													270	270	270	270	270							270	
33pF													330	330	330	330	330							330	
39pF													390	390	390	390	390							390	
47pF													470	470	470	470	470							470	
56pF													560	560	560	560	560							560	
68pF													680	680	680	680	680							680	
82pF													820	820	820	820	820							820	
100pF													101	101	101	101	101							101	
120pF													121	121	121	121	121							121	
150pF													151	151	151	151	151							151	
180pF				181	181	181	181	181	181	181	181	181	181	181	181	181								181	
220pF				221	221	221	221	221	221	221	221	221	221	221	221	221								221	
270pF	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271	271								271	
330pF	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331								331	
390pF	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391	391								391	
470pF	471	471	471	471	471	471	471	471	471	471	471	471	471	471	471	471								471	
560pF	561	561	561	561	561	561	561	561	561	561	561	561	561	561	561	561								561	
680pF	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681								681	
820pF	821	821	821	821	821	821	821	821	821	821	821	821	821	821	821	821								821	
1,000pF	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102								102	
1,200pF	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122								122	
1,500pF	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152								152	
1,800pF	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182								182	
2,200pF	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222								222	
2,700pF	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272	272								272	
3,300pF	332	332	332	332			332	332	332	332	332	332	332	332	332	332								332	
3,900pF	392	392	392	392			392	392	392	392	392	392	392	392	392	392								392	
4,700pF	472	472	472	472			472	472	472	472	472	472	472	472	472	472								472	
5,600pF	562	562	562	562			562	562	562	562	562	562	562	562	562	562								562	
6,800pF	682	682	682				682	682	682	682														682	
8,200pF	822	822	822				822	822	822	822														822	
0.01µF	103	103	103				103	103	103															103	
0.012µF	123	123	123				123	123	123															123	
0.015µF	153	153					153	153	153															153	
0.018µF	183	183					183	183	183															183	
0.022µF	223	223					223	223	223															223	
0.027µF	273	273					273	273																273	
0.033µF	333	333					333	333																333	
0.039µF	393	393					393	393																393	
0.047µF	473	473					473	473																473	
0.056µF							563	563																563	
0.068µF							683	683																683	

Table 1D – SM36 Style/Size

Style/Size	SM36								Cap Tol
Dimensions - In. (mm)									
Length	1.350 ± 0.030 (33.00 ± 0.76)								
Width	0.600 ± 0.030 (15.20 ± 0.76)								
Thickness Max.	0.220 (5.59)								
Lead Width Max.	0.500 (12.7)								
Lead Length "L"	0.100 ± 0.020 (2.54 ± 0.51)								
Lead Length "J"	0.100 ± 0.020 (2.54 ± 0.51)								
COG Dielectric									
Voltage Code	501	102	202	302	402	502	752	103	
Voltage DC	500	1K	2K	3K	4K	5K	7.5K	10K	
Capacitance	Capacitance Code								J, K M, P Z
120pF									
150pF	151	151	151	151	151	151	151	151	
180pF	181	181	181	181	181	181	181	181	
220pF	221	221	221	221	221	221	221	221	
270pF	271	271	271	271	271	271	271	271	
330pF	331	331	331	331	331	331	331	331	
390pF	391	391	391	391	391	391	391	391	
470pF	471	471	471	471	471	471	471	471	
560pF	561	561	561	561	561	561	561	561	
680pF	681	681	681	681	681	681	681	681	
820pF	821	821	821	821	821	821	821	821	
1,000pF	102	102	102	102	102	102	102	102	
1,200pF	122	122	122	122	122	122	122	122	
1,500pF	152	152	152	152	152	152	152	152	
1,800pF	182	182	182	182	182	182	182	182	
2,200pF	222	222	222	222	222	222	222	222	
2,700pF	272	272	272	272	272	272	272	272	
3,300pF	332	332	332	332	332	332	332	332	
3,900pF	392	392	392	392	392	392	392	392	
4,700pF	472	472	472	472	472	472	472	472	
5,600pF	562	562	562	562	562	562	562	562	
6,800pF	682	682	682	682	682	682	682	682	
8,200pF	822	822	822	822	822	822	822	822	
0.01µF	103	103	103	103	103	103	103	103	
0.012µF	123	123	123	123	123	123	123	123	
0.015µF	153	153	153	153	153	153	153	153	
0.018µF	183	183	183	183	183	183	183	183	
0.022µF	223	223	223	223	223	223	223	223	
0.027µF	273	273	273	273	273	273	273	273	
0.033µF	333	333	333	333	333	333	333	333	
0.039µF	393	393	393	393	393	393	393	393	
0.047µF	473	473	473	473	473	473	473	473	
0.056µF	563	563	563	563	563	563	563	563	
0.068µF	683	683	683	683	683	683	683	683	
0.082µF	823	823	823	823	823	823	823	823	
0.1µF	104	104	104	104	104	104	104	104	
0.12µF	124	124	124	124	124	124	124	124	
0.15µF	154	154	154	154	154	154	154	154	
0.18µF	184	184	184	184	184	184	184	184	
0.22µF	224	224	224	224	224	224	224	224	
0.27µF	274	274	274	274	274	274	274	274	
0.33µF	334	334	334	334	334	334	334	334	
0.39µF	394	394	394	394	394	394	394	394	

Table 2 – Chip Thickness / Packaging Quantities

Series	Style/Size	Tray Quantity Min. ¹	Tray Quantity Max. ¹
SM	SM20	1	50
	SM21		
	SM22		
	SM23		
	SM24		
	SM25		
	SM26		
	SM30		
	SM31		
	SM33		25
	SM34		10
	SM35		
	SM36		

¹ Minimum order value applies. Contact KEMET for details.

Soldering Process

The capacitors and assemblies outlined in this specification sheet are susceptible to thermal shock damage due to their large ceramic mass. Temperature profiles used should provide adequate temperature rise and cool-down time to prevent damage from thermal shock. In general, KEMET recommends against hand soldering for these types of large ceramic devices.

Recommended Soldering Technique:

- Solder reflow only

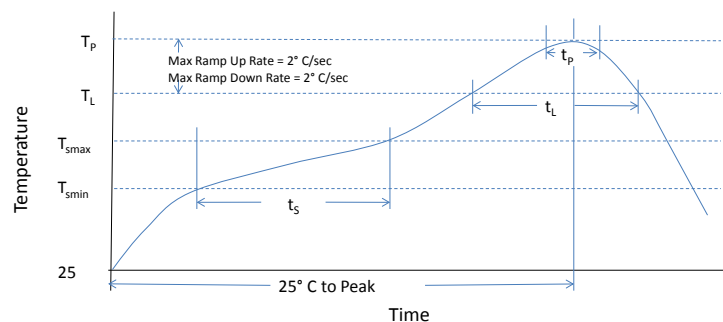
Preheating and Reflow Profile Notes:

Due to differences in the coefficient of thermal expansion for the different materials of construction, it is critical to monitor and control the heating and cooling rates during the soldering process. During the reflow soldering process, the maximum recommended heating and cooling rate (dT/dt) is 4°C/second. To ensure optimal component reliability, KEMET's recommended heating and cooling rate is 2°C/second. After soldering, the capacitors should be air cooled to room temperature before further processing. Forced air cooling is not recommended.

Recommended Reflow Soldering Profile:

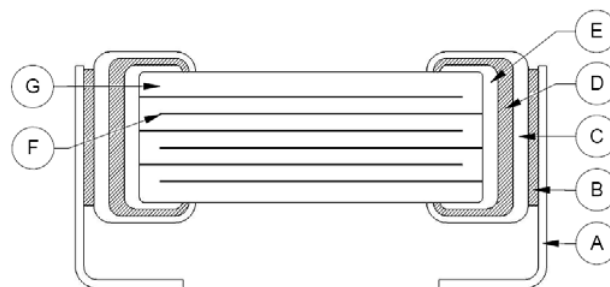
Profile Feature	SnPb Assembly
Preheat/Soak	
Temperature Min (T_{smin})	100°C
Temperature Max (T_{smax})	150°C
Time (t_s) from T_{smin} to T_{smax}	60-90 sec
Ramp-up Rate (T_L to T_p)	2°C/sec
Liquidous Temperature (T_L)	183°C
Time Above Liquidous (t_L)	95 sec
Peak Temperature (T_p)	240°C
Time within 5°C of Max Peak Temperature (t_p)	5 sec
Ramp-down Rate (T_p to T_L)	2°C/sec
Time 25°C to Peak Temperature	3.5 minutes

Note 1: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.



Construction

Reference	Item	Material
A	Leadframe	Phosphor Bronze - Alloy 510 (Silver plated / Nickel Underplate)
B	Leadframe Attach Material	Silver Epoxy
C	MLCC Termination System	Solderable Silver
D		
E	Electrode	PdAg
F	Dielectric	BaTiO ₃



Note: Image is exaggerated in order to clearly identify all components of construction

Product Marking

Product marking is an extra-cost option. These devices will be supplied unmarked unless otherwise specified and/or requested. For more detailed information regarding marked product and how to request this option, please contact KEMET.

Table 3 – Performance & Reliability: Test Methods and Conditions

Stress	Reference	Test or Inspection Method
Board Flex	JIS-C-6429	Appendix 2, Note: 2 mm (min) for all except 3 mm for COG.
Solderability	J-STD-002	Magnification 50 X. Conditions:
		a) Method B, 4 hours @ 155°C, dry heat @ 235°C
		b) Method B @ 215°C category 3
		c) Method D, category 3 @ 260°C
		1000 cycles (-55°C to +125°C). Measurement at 24 hours +/- 2 hours after test conclusion.
Biased Humidity	MIL-STD-202 Method 103	Load Humidity: 1000 hours 85°C/85%RH and 300VDC Max. Add 100K ohm resistor. Measurement at 24 hrs. +/- 2 hrs after test conclusion.
		Low Volt Humidity: 1000 hours 85°C/85%RH and 1.5V. Add 100K ohm resistor. Measurement at 24 hrs. +/- 2 hrs after test conclusion.
		t = 24 hours/cycle. Steps 7a & 7b not required. Unpowered. Measurement at 24 hours. +/- 2 hours after test conclusion.
Thermal Shock	MIL-STD-202 Method 107	-55°C/+125°C. Note: Number of cycles required – 300. Maximum transfer time – 20 seconds. D14 dwell time – 15 minutes. Air-Air.
High Temperature Life	MIL-STD-202 Method 108 / EIA -198	1000 hours at 125°C (85°C for X5R, Z5U and Y5V) with rated voltage applied.
Storage Life	MIL-STD-202 Method 108	150°C, 0VDC, for 1000 hours.
Vibration	MIL-STD-202 Method 204	5 g for 20 min., 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10–2000 Hz.
Resistance to Soldering Heat	MIL-STD-202 Method 210	Condition B. No preheat of samples. Note: single wave solder – procedure 2.
Terminal Strength	MIL-STD-202 Method 211	Conditions A (2.3kg or 5lbs).
Mechanical Shock	MIL-STD-202 Method 213	Figure 1 of Method 213, Condition F.
Resistance to Solvents	MIL-STD-202 Method 215	Add aqueous wash chemical – OKEM Clean or equivalent.

Storage and Handling

Ceramic chip capacitors should be stored in normal working environments. While the chips themselves are quite robust in other environments, solderability will be degraded by exposure to high temperatures, high humidity, corrosive atmospheres, and long term storage. In addition, packaging materials will be degraded by high temperature – reels may soften or warp, and tape peel force may increase. KEMET recommends that maximum storage temperature not exceed 40°C, and maximum storage humidity not exceed 70% relative humidity. In addition, temperature fluctuations should be minimized to avoid condensation on the parts, and atmospheres should be free of chlorine and sulfur bearing compounds. For optimized solderability, chip stock should be used promptly, preferably within 1.5 years of receipt.

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Paris, France
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Sasso Marconi, Italy
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Milan, Italy
Tel: 39-02-57518176

Rome, Italy
Tel: 39-06-23231718

Madrid, Spain
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Tel: 49-8191-3350800

Dortmund, Germany
Tel: 49-2307-3619672

Kwidzyn, Poland
Tel: 48-55-279-7025

Northern Europe

Bishop's Stortford, United Kingdom
Tel: 44-1279-757201

Weymouth, United Kingdom
Tel: 44-1305-830747

Coatbridge, Scotland
Tel: 44-1236-434455

Färjestaden, Sweden
Tel: 46-485-563934

Espoo, Finland
Tel: 358-9-5406-5000

Asia

Northeast Asia

Hong Kong
Tel: 852-2305-1168

Shenzhen, China
Tel: 86-755-2518-1306

Beijing, China
Tel: 86-10-5829-1711

Shanghai, China
Tel: 86-21-6447-0707

Taipei, Taiwan
Tel: 886-2-27528585

Southeast Asia

Singapore
Tel: 65-6586-1900

Penang, Malaysia
Tel: 60-4-6430200

Bangalore, India
Tel: 91-806-53-76817

Note: KEMET reserves the right to modify minor details of internal and external construction at any time in the interest of product improvement. KEMET does not assume any responsibility for infringement that might result from the use of KEMET Capacitors in potential circuit designs. KEMET is a registered trademark of KEMET Electronics Corporation.

Other KEMET Resources

Tools	
Resource	Location
Configure A Part: CapEdge	http://capacitoredge.kemet.com
SPICE & FIT Software	http://www.kemet.com/spice
Search Our FAQs: KnowledgeEdge	http://www.kemet.com/keask

Product Information	
Resource	Location
Products	http://www.kemet.com/products
Technical Resources (Including Soldering Techniques)	http://www.kemet.com/technicalpapers
RoHS Statement	http://www.kemet.com/rohs
Quality Documents	http://www.kemet.com/qualitydocuments

Product Request	
Resource	Location
Sample Request	http://www.kemet.com/sample
Engineering Kit Request	http://www.kemet.com/kits

Contact	
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Website	www.kemet.com
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Call Us	1-877-MyKEMET
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Although we design and manufacture our products to the most stringent quality and safety standards, given the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage.

Although all product-related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicated or that other measures may not be required.

