

# WIRE BONDABLE BURIED SINGLE LAYER CAPACITORS

## PRESIDIO ADVANTAGE

- ◆ Presidio's patented thick film technology buries electrodes into the ceramic body (Fig. 1) allowing a 10:1 advantage over a conventional construction (Fig. 2). It offers the designer: (a) more bandwidth through increased device capacitance, (b) more stable capacitance over temperature and (c) more capacitance in smaller case sizes for increased board density.

Filled vias connect the buried electrodes with the outside top and bottom metallization pads; 99.95% pure Au is standard for all metal connections allowing proven wire bond techniques with AuSn or conductive epoxy die attach techniques.

- ◆ Excellent low loss performance for high Q applications as demonstrated with a 10 pF NPO capacitor shown in Fig. 6 below.
- ◆ Ease of dielectric material selection: Presidio offers 3 ceramic materials while most other suppliers offer more than 15.
- ◆ RoHS compliant.

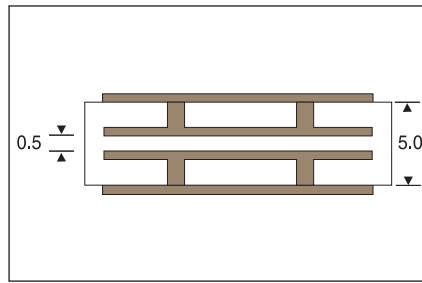


Fig. 1. Construction of Buried Electrodes

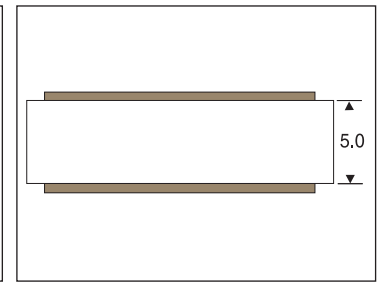


Fig. 2. Conventional Single Layer Capacitor

## KENT SIMULATOR

Using the KENT SIMULATOR (Fig. 3), a designer can obtain commonly needed RF capacitor parameters in graphical format for popular Presidio Components RF capacitors. In addition, S-parameters for selected capacitors can be saved in S2P format. All device parameters are derived from a series transmission line model developed by Dr. Gordon Kent and available at [www.presidiocomponents.com](http://www.presidiocomponents.com). A technical discussion of the simulation used in the Kent Simulator is presented by Gordon Kent in the "Summary of the Capacitor Simulator."

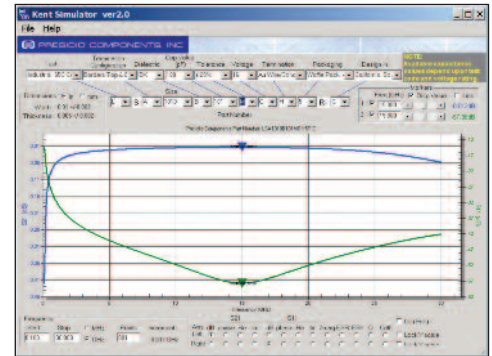


Fig. 3. Kent Simulator Version 2.0  
LSA1010B101MGH5C-

## TYPICAL APPLICATIONS

### FILTER CAPACITOR

A filter design requires a specific capacitance value,  $C_F$ , and at the upper end of the filter response,  $f_F$ , the effective capacity must not exceed  $C_F$  by more than a specified amount of  $\Delta C$ . Once  $C_F$  is determined, case size, voltage rating and temperature characteristics can be selected. Typically, lower loss Class I materials like NPQ and NPO are first choice. See Fig. 4.

### RESONANCE-FREE BROADBAND COUPLING/DECOUPLING CAPACITOR

Class II "BX" dielectric is typical for DC block or RF bypass applications to operate resonance free over a specified broad frequency range. Low impedance is typically more important than the capacitance value which should be large enough to cover the 3 dB low edge of the bandwidth. See Fig. 5.

### MINIMUM LOSS, FINITE BAND COUPLING CAPACITOR

When minimum loss is required, e.g. a low noise circuit, a high Q capacitor with Class I dielectric (NPQ or NPO) is recommended. Any parallel resonance frequency of the capacitor should be outside of the use frequency band. The best capacitor choice puts the series resonance at the band center (approximately  $f_0 / 2$ ). See Fig. 6.

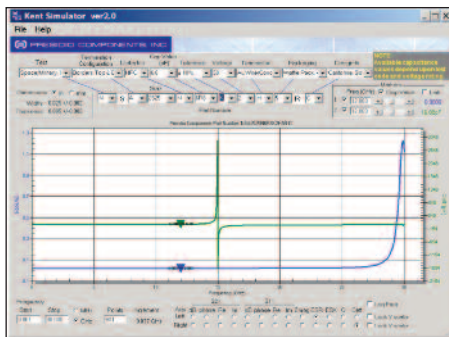


Fig. 4. Modeled ESR/50 and Ceff of part  
NSA2525N6R8K2H5C-

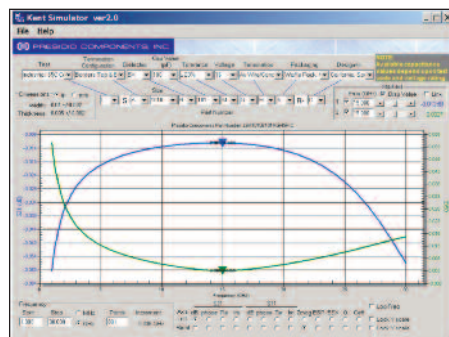


Fig. 5. Modeled S21 and Z/50 of part  
LSA1010B101MGH5C-, Class II Dielectric

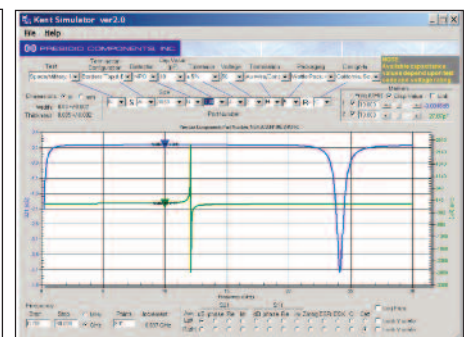


Fig. 6. Modeled S21 and Ceff of part  
NSA3030N100J2H5C-, Class 1 Dielectric



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## GLOBAL PART NUMBER EXAMPLE (How to Order)

<b>L</b>	<b>S</b>	<b>A</b>	<b>1010</b>	<b>B</b>	<b>101</b>	<b>M</b>	<b>G</b>	<b>H</b>	<b>5</b>	<b>C</b>	<b>-</b>	<b>*</b>
Test Code	Product	Termination Configuration	Size (Pg. 5)	Dielectric	Capacitance Code	Capacitance Tolerance	Voltage	Termination	Packaging	RoHS Compliant	Hyphen Required	Design-In Code (See Page 14)

## Test Codes, Dielectric Codes and Specifications

TEST CODES:	FIT*			Mil-PRF-38534E		MIL-PRF-49464		Cust. Spec.
	65° C	85° C	100° C	Table C-III		Table VI	Table VII	
	L	M	N	H	K	A	B	
<b>Upgradable to Codes:</b>								
				H	H, K	H, K, A, B		
<b>ELECTRICAL SPECIFICATIONS</b>	<b>NPQ Dielectric Code Q</b>	<b>NPO Dielectric Code N</b>	<b>BX Dielectric Code B</b>	<b>Tested as per MIL-PRF-49464C</b>	<b>Test Samples</b>		<b>Test Samples</b>	
Temperature Coefficient Limits	0 ± 25 ppm/ °C	0 ± 30 ppm/ °C	± 20%	Para. 4.8.10				
Temperature Coefficient Limit Cycle	-55° to +125° C	-55° to +125° C	-55° to +125° C	Para. 4.8.10				
Capacitance	1 MHz, 1 V AC RMS	1 MHz, 1 V AC RMS	1 kHz, 1 V AC RMS	Para. 4.8.4	100%	100%	100%	100%
Dissipation Factor, maximum	0.1%	0.15%	100 & 50V : 2.5%	Para. 4.8.5	100%	100%	100%	100%
Dissipation Factor, maximum	0.1%	0.15%	16 & 25V : 3.5%	Para. 4.8.5	100%	100%	100%	100%
Dissipation Factor, maximum	0.1%	0.15%	10V : 5%	Para. 4.8.5	100%	100%	N/A	N/A
Dissipation Factor, maximum	0.1%	0.15%	6.3V : 7.5%	Para. 4.8.5	100%	N/A	N/A	N/A
Insulation Resistance @ +25° C at WVDC	100,000 MΩ min.	100,000 MΩ min.	100,000 MΩ min.	Para. 4.8.6	1% AQL	1% AQL	1% AQL	100%
Insulation Resistance @ +125° C at WVDC	10,000 MΩ min.	10,000 MΩ min.	10,000 MΩ min.	Para. 4.8.6				100%
Dielectric Withstanding Voltage (DWV)	250% of WVDC	250% of WVDC	250% of WVDC	Para. 4.8.7	1% AQL	1% AQL	1% AQL	100%
Aging Effects	None	None	2.5% typ./decade hr.	Presidio Specification				
<b>VISUAL &amp; MECHANICAL SPECIFICATIONS</b>								
Visual, Workmanship	No slivers, cracks, demetalization	No slivers, cracks, demetalization	No slivers, cracks, demetalization	Para. 4.8.1	100%	100%	100%	100%
Bond Strength, minimum	3 grams, 0.001" dia. Au wire	3 grams, 0.001" dia. Au wire	3 grams, 0.001" dia. Au wire	Para. 4.8.8			10	10
Shear Strength, minimum	Size dependent	Size dependent	Size dependent	Para. 4.8.9				13
Physical Dimensions	See Page 5	See Page 5	See Page 5	Para. 4.8.1				13
99.8% Gold Metalization, minimum	100 μin (2.5 μm)	100 μin (2.5 μm)	100 μin (2.5 μm)	Para. 1.2.1.7				
<b>ENVIRONMENTAL TESTS (TEST CODES K, A, B)</b>								
Thermal Shock & Voltage Conditioning	5 cycles/100 hr min.	5 cycles/100 hr min.	5 cycles/100 hr min.	Para. 4.8.3			10	100%
Constant Acceleration				PRF-38534E			10	
Temperature Coefficient Limits, 0 Volt	0 ± 25 ppm/ °C	0 ± 30 ppm/ °C	± 20%	Para. 4.8.10				12
Immersion	0.5% or 0.5 pF cap. change	0.5% or 0.5 pF cap. change	± 10% cap. change	Para. 4.8.11				12
Humidity, Steady State, Low Voltage	240 hours min.	240 hours min.	240 hours min.	Para. 4.8.12				12
Life Test	2000 hours	2000 hours	2000 hours	Para. 4.8.13				25
RoHS Compliant	Yes	Yes	Yes					

\*FIT (Failure In Time) Calculations are based on assumed CONTINUOUS operating temperatures 65° C, 85° C and 100° C

### Termination Configuration Codes

Code	Description	A	B	C
A	Borders top and bottom			
B	Borders top, full metalization at bottom	Standard	High Reliability AuSn	Millimeterwave
C	Fully metalized top and bottom			

### Capacitance Codes

First two digits = Significant figures of capacitance in picofarads  
 Third digit = Additional number of zeros  
 Example: 0R1 = 0.1 pF    100 = 10 pF  
 1R0 = 1.0 pF    101 = 100 pF

### Capacitance Tolerance Codes

Code	Tolerance	Cap Range	Dielectrics
A	± .05 pF	< 2.2 pF	NPQ, NPO
B	± .1 pF	< 10 pF	NPQ, NPO
C	± .25 pF	< 10 pF	NPQ, NPO
D	± .5 pF	< 10 pF	NPQ, NPO
G	± 2%	> 9.1 pF	NPQ, NPO
J	± 5%	> 9.1 pF	NPQ, NPO
K	± 10%	> 0.45 pF	all
M	± 20%	> 0.45 pF	all

### Working Voltage

Code	WVDC	Code	WVDC
3	100	G	16
2	50	F	12
1	25	E	10
		C	6.3

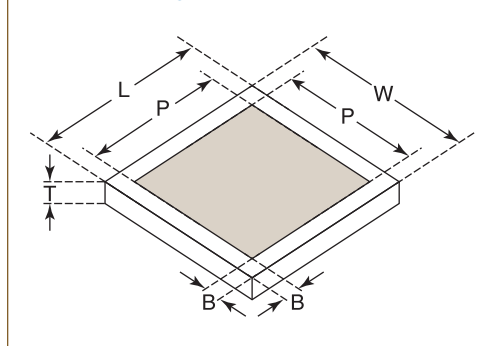
### Termination Codes

Code	Material	Wire	Attachment
H	99.8% Au	Au	Conductive Epoxy or AuSn
	100 μin min. thickness		

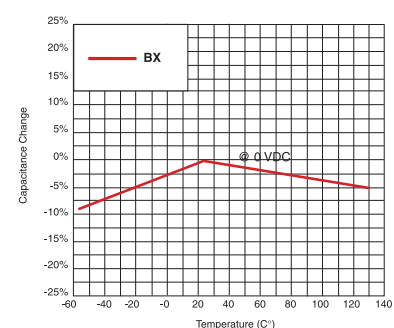
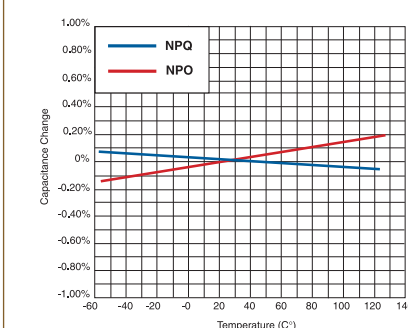
### RoHS

Code	Compliant
N	No
R	Legacy, ended 2012
C	Yes, started January 2013

### Dimensions Diagram



### Temperature Coefficient Limits



**SELECTION TABLE: BURIED SINGLE LAYER CAPACITORS — WIRE BONDABLE**

SIZE CODE	W inch (mm)	L inch (mm)	T inch (mm)	Nominal P inch (mm)	Minimum B inch (mm)	Working Voltage (WVDC) Max. Capacitance (pF)	INDUSTRIAL Test Code L			MILITARY Test Code M			SPACE Test Code N			Modeled Performance Data & S2P Files
							NPQ (pF)	NPO (pF)	BX (pF)	NPQ (pF)	NPO (pF)	BX (pF)	NPQ (pF)	NPO (pF)	BX (pF)	
1010	0.010 (0.254) ± 0.003 (0.076)	0.010 (0.254) ± 0.003 (0.076)	0.005 (0.127) ± 0.002 (0.051)	0.007 (0.178)	0.0005 (0.013)	50 Min:	0.5	1.5	6.2	0.3	1.0	6.2	—	—	—	Download Kent Simulator from Presidio's Website  <a href="#">Web Link</a>
						50 Max:	0.7	2.2	68	0.5	1.5	47	—	—	—	
						25 Max:	0.8	2.4	82	0.6	1.8	56	—	—	—	
						16 Max:	0.9	2.7	100	0.7	2.2	68	—	—	—	
						10 Max:	1.3	3.9	120	0.8	2.4	82	—	—	—	
6.3 Max:	—	—	300	—	—	—	—	—	—							
1212	0.012 (0.305) ± 0.002 (0.051)	0.012 (0.305) ± 0.002 (0.051)	0.005 (0.127) ± 0.002 (0.051)	0.009 (0.229)	0.0005 (0.013)	50 Min:	0.8	2.4	10	0.5	1.5	10	0.1	0.6	6.2	
						50 Max:	1.0	3.3	100	0.8	2.4	75	0.5	1.5	56	
						25 Max:	1.2	3.9	120	0.9	2.7	91	0.8	2.4	75	
						16 Max:	1.5	4.3	150	1.0	3.3	100	0.9	2.7	82	
						10 Max:	2.0	6.2	180	1.2	3.9	120	—	—	—	
1515	0.015 (0.381) ± 0.002 (0.051)	0.015 (0.381) ± 0.002 (0.051)	0.005 (0.127) ± 0.002 (0.051)	0.011 (0.279)	0.001 (0.025)	100 Min:	0.1	0.6	15	0.1	0.6	15	0.1	0.6	15	
						100 Max:	1.5	4.7	150	1.0	3.0	82	0.5	1.5	47	
						50 Max:	2.2	6.8	200	1.5	4.7	100	1.0	3.0	82	
						25 Max:	2.4	7.5	240	1.8	5.6	120	1.5	4.7	100	
						16 Max:	2.7	8.2	270	2.2	6.8	150	1.8	5.6	120	
						10 Max:	3.9	12	330	2.4	7.5	180	—	—	—	
						6.3 Max:	—	—	680	—	—	—	—	—	—	
1717	0.017 (0.432) ± 0.002 (0.051)	0.017 (0.432) ± 0.002 (0.051)	0.005 (0.127) ± 0.002 (0.051)	0.013 (0.330)	0.001 (0.025)	100 Min:	0.2	0.7	18	0.2	0.7	18	0.2	0.7	18	
						100 Max:	1.8	5.6	180	1.2	3.9	100	0.6	2.0	62	
						50 Max:	2.7	8.2	270	1.8	5.6	150	1.2	3.9	100	
						25 Max:	3.0	10	300	2.2	6.8	180	1.8	5.6	120	
						16 Max:	3.6	12	360	2.7	8.2	220	2.2	6.8	150	
						10 Max:	5.1	15	430	3.0	10	240	—	—	—	
2020	0.020 (0.508) ± 0.002 (0.051)	0.020 (0.508) ± 0.002 (0.051)	0.005 (0.127) ± 0.002 (0.051)	0.016 (0.406)	0.001 (0.025)	100 Min:	0.2	1.0	22	0.2	1.0	22	0.2	1.0	22	
						100 Max:	2.7	8.2	240	1.8	5.6	150	0.9	2.7	82	
						50 Max:	3.9	10	360	2.7	8.2	220	1.8	5.6	150	
						25 Max:	4.3	12	390	3.3	9.1	240	2.7	8.2	180	
						16 Max:	4.7	15	510	3.9	10	300	3.3	9.1	270	
						10 Max:	6.8	22	560	4.3	12	330	—	—	—	
2222	0.022 (0.559) ± 0.002 (0.051)	0.022 (0.559) ± 0.002 (0.051)	0.005 (0.127) ± 0.002 (0.051)	0.018 (0.457)	0.001 (0.025)	100 Min:	0.2	1.2	24	0.2	1.2	24	0.2	1.2	24	
						100 Max:	3.0	9.1	270	2.0	5.6	200	1.0	3.0	91	
						50 Max:	4.3	12	390	3.0	9.1	270	2.0	5.6	180	
						25 Max:	4.7	15	430	3.6	10	330	3.0	9.1	270	
						16 Max:	5.1	18	620	4.3	12	390	3.6	10	330	
						10 Max:	7.5	24	750	4.7	15	470	—	—	—	
2525	0.025 (0.635) ± 0.002 (0.051)	0.025 (0.635) ± 0.002 (0.051)	0.005 (0.127) ± 0.002 (0.051)	0.021 (0.533)	0.001 (0.025)	100 Min:	0.3	1.5	30	0.3	1.5	30	0.3	1.5	30	
						100 Max:	3.6	10	330	2.4	6.8	270	1.2	3.6	100	
						50 Max:	5.1	15	470	3.6	10	360	2.4	6.8	270	
						25 Max:	5.6	18	620	4.3	12	430	3.6	10	330	
						16 Max:	6.2	20	820	5.1	15	510	4.3	12	390	
						10 Max:	9.1	30	1,000	5.6	18	560	—	—	—	
2727	0.027 (0.686) ± 0.002 (0.051)	0.027 (0.686) ± 0.002 (0.051)	0.005 (0.127) ± 0.002 (0.051)	0.023 (0.584)	0.001 (0.025)	100 Min:	0.3	1.5	33	0.3	1.5	33	0.3	1.5	33	
						100 Max:	3.9	12	360	2.4	7.5	330	1.2	3.9	120	
						50 Max:	5.6	18	560	3.9	12	430	2.4	7.5	330	
						25 Max:	6.2	20	750	4.7	15	510	3.9	12	390	
						16 Max:	6.8	22	1,000	5.6	18	620	4.7	15	430	
						10 Max:	10	33	1,200	6.2	20	680	—	—	—	
3030	0.030 (0.762) ± 0.002 (0.051)	0.030 (0.762) ± 0.002 (0.051)	0.007 (0.178) ± 0.002 (0.051)	0.026 (0.660)	0.001 (0.025)	100 Min:	0.6	2.4	51	0.6	2.4	51	0.6	2.4	51	
						100 Max:	6.8	20	620	4.3	12	390	2.2	6.8	200	
						50 Max:	9.1	30	910	6.8	20	560	4.3	12	430	
						25 Max:	10	33	1,000	7.5	24	680	6.8	20	470	
						16 Max:	12	39	1,200	9.1	30	820	7.5	24	750	
						10 Max:	18	56	1,500	10	33	910	—	—	—	
3535	0.035 (0.889) ± 0.002 (0.051)	0.035 (0.889) ± 0.002 (0.051)	0.007 (0.178) ± 0.003 (0.076)	0.031 (0.787)	0.001 (0.025)	100 Min:	0.8	3.3	75	0.8	3.3	75	0.8	3.3	75	
						100 Max:	9.1	30	910	6.2	20	560	3.0	10	300	
						50 Max:	12	43	1,200	9.1	30	1,000	6.2	20	620	
						25 Max:	15	47	1,500	10	36	1,000	9.1	30	680	
						16 Max:	18	56	1,800	12	43	1,200	10	36	1,000	
						10 Max:	24	75	2,200	15	47	1,500	—	—	—	

# A WORD TO THE DESIGN ENGINEER

After the design work is done, outsourcing manufacturing on a global basis is a management option. At Presidio Components, we are striving for complete customer satisfaction which includes “after” service for all of our products.

We added a “Design In” locator code for quick traceability, if needed. Please select your location from the list below and add the appropriate code at the end of the part number.

If you need assistance give us a call at **(858) 578-9390** or email us at **info@presidiocomponents.com**.

## UNITED STATES

USA	Code	USA	Code
Alabama	G	Nebraska	P
Alaska	P	Nevada, North	B
Arizona	D	Nevada, South	C
Arkansas	P	New Hampshire	L
California, North	B	New Jersey	J
California, South	C	New Mexico	D
Colorado	E	New York, Metro	J
Connecticut	L	New York, Upstate	K
Delaware	I	North Carolina	G
District of Columbia	H	North Dakota	O
Florida	G	Ohio	M
Georgia	G	Oklahoma	P
Hawaii	P	Oregon	A
Idaho	A	Pennsylvania	I
Illinois	N	Rhode Island	L
Indiana	M	South Carolina	G
Iowa	O	South Dakota	O
Kansas	P	Tennessee	G
Kentucky	M	Texas	F
Louisiana	P	Utah	E
Maine	L	Vermont	L
Maryland	H	Virginia	H
Massachusetts	L	Washington	A
Michigan	N	West Virginia	P
Minnesota	O	Wisconsin, East	N
Mississippi	G	Wisconsin, West	O
Missouri	N	Wyoming	E
Montana	A		

## OUTSIDE THE UNITED STATES

Americas	Code	Europe	Code
Canada	R	Austria	3
Mexico	R	Belgium	1
Caribbean	R	Denmark	5
Central America	R	Finland	5
South America	R	France	2
		Germany	3
		Ireland	6
		Italy	4
		Luxembourg	1
		Netherlands	1
		Norway	5
		Sweden	5
		Switzerland	3
		United Kingdom	6
		Other European Countries	7
		<b>Other</b>	
		India	2
		Israel	8
		Rest of World	9

