PRESIDIO COMPONENTS, INC.

PRESIDIO founded in 1980

Specialist in the manufacture of Hi-Rel ceramic capacitors for Space and Military Applications

www.presidiocomponents.com

Presidio is a Family Business

- Alan Devoe, CEO (Employee #7, 35+ Years with Company)
  - Massachusetts Institute of Technology, BS Material Science
  - Massachusetts Institute of Technology, MS Management
  - Missouri Institute of Science and Tech, PHD Material Science (in progress)

- Lambert Devoe, CFO (employee #28, 30+ Years with Company)
  - Massachusetts Institute of Technology, BS
  - New York University, MS Finance

- Established in 1980 – San Diego, California
- All products still 100% made at San Diego facility
- 90,000 SQ FT (8,500 Sq M) facility
- ~250 Employees
- 23 Engineers (Ceramics, Material Science, Mechanical, Chemical, Electrical)
- 50+ Skilled Technicians Operators

www.presidiocomponents.com

PRESIDIO SPECIALITIES

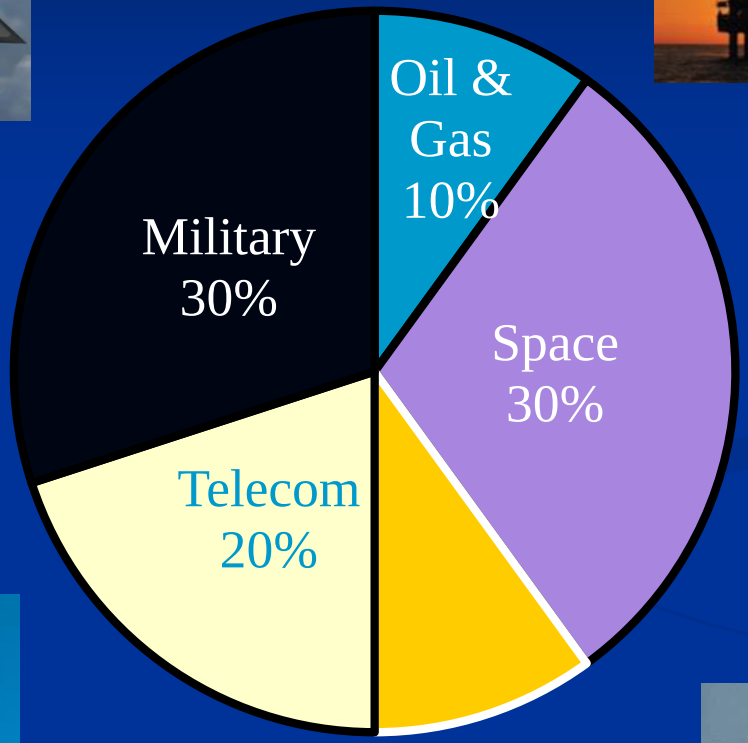
- ***Only manufactures Hi-Rel Ceramic Capacitors***
- ***100% US owned and 100% made in the USA***
- ***Only offer Precious Metal Electrodes (PME)***
- ***No Base Metal Electrodes (BME) and no plan to offer BME***
- ***Technologies oriented, solutions provider***
- ***Our Chief R&D engineer is our President***

- ***MIL-STD-790*** ***ISO 9001 Compliant***
  Product Assurance Quality
  Laboratory Suitability Certified.

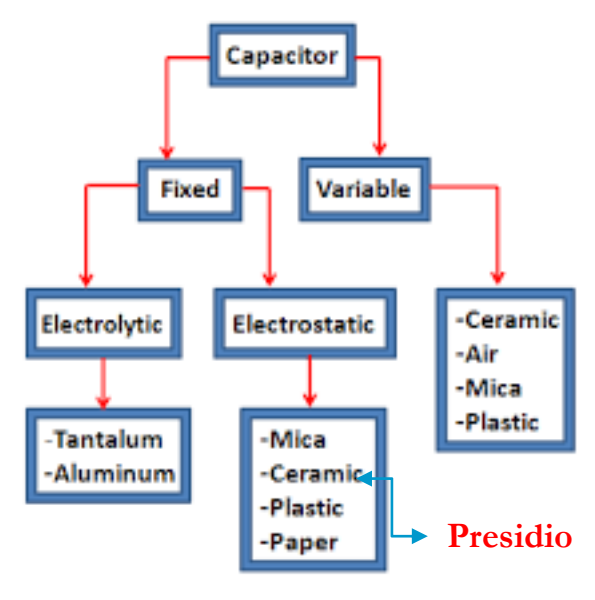
- ***~ 1/3rd of the employees work in the QC department.***

QUALITY- RELIABILITY- CONSISTENCY
by Design and Screening

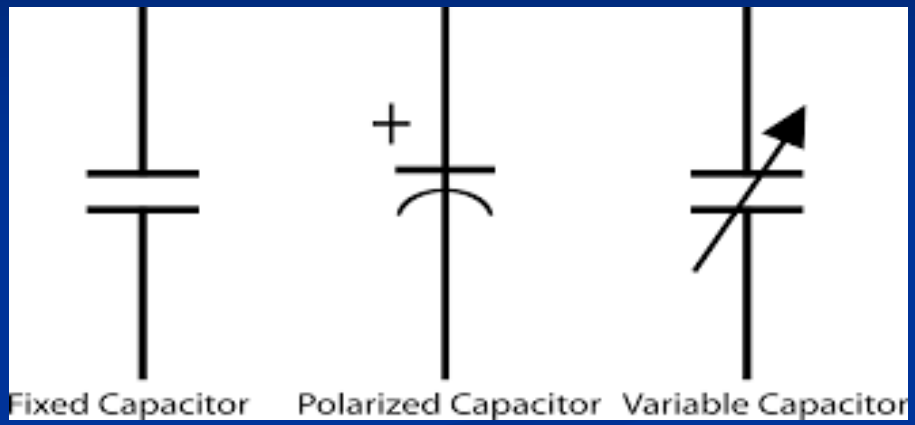
Market Segments



COMMON TYPE OF CAPACITORS



CAPACITOR SYMBOLS



Capacitor market, all types (100%)

Ceramic capacitor market (~60 %)

Presidio Components Market (0.001% <)

(not to scale)

IN VOLUME

Relatively few parts but critical for the Hi-Rel markets

Mil/Space Qualifications
Defense Logistics Agency - Qualified Product List
Supplier

- **QPL Mil-PRF-55681 'S' Level** — **Chips**
  - *Including all High Q CDR11, 12, 13, 14*
- **QPL Mil-PRF-123** — **Chips**
- **NASA S-311-P-829** *(Toughest specifications)* — **Chips**
  - *Most popular series, many part numbers at 4 weeks ARO*
- **Mil-PRF-32535 M & T Level *(partial qualifications)*** — **Chips**
  - *Remaining of the qualification in progress*

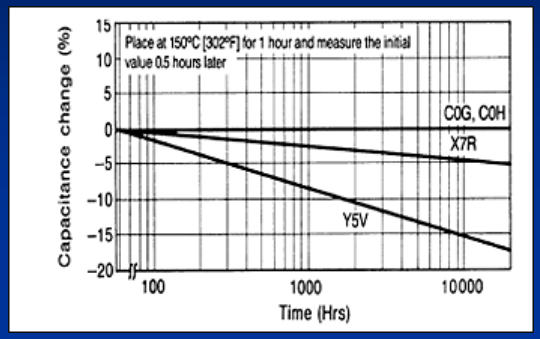
- **Dwg 06019/06022 – *High Q,*** *0505 & 1010 for space* — **Chips**
- **QPL Mil-PRF-49470 M & T Level** — **Stacks**
- **QPL Mil-PRF-49467** — **High Voltage Radial Lead**

Dielectrics: Characteristics

	CLASS II			CLASS I		
	X7R E2	BX ≤ 100V BR – 200V BQ – 500V	N2T	NPO / COG / E1 / BP		
K (typical)	~4000	~2200	450	90		
Q (typical)	60	100	1,000	~10,000		
TC **-55 / +125°C** ***(1 volt AC rms)***	±15% max.	±15% max.	-2200 ppm/°C	0 ±30 ppm/°C		
VTC **(-55 / +125°C)** **(with 100% rated voltage applied)**	Not specified	+15% - 25% (BX) - 40% (BR) - 50% (BQ)	-2200 ppm/°C	For **BP** only 0 ±30 ppm/°C		

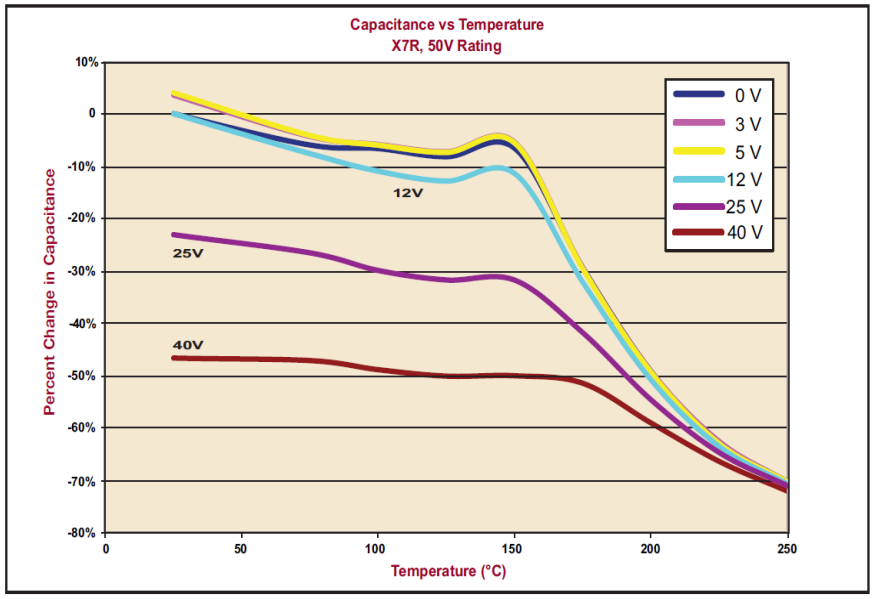
CLASS I: Dielectric constant K < 100 but stable with Voltage, Temperature & Time

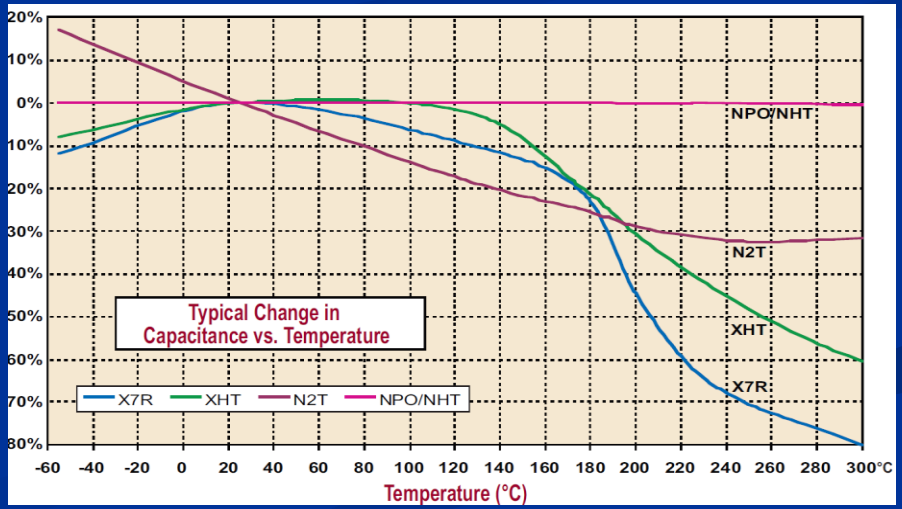
Ageing ~ 2.5% per decade hour



CLASS II: K > 2000 but Cap value drop with:

- Voltage
- Temperature
- Time

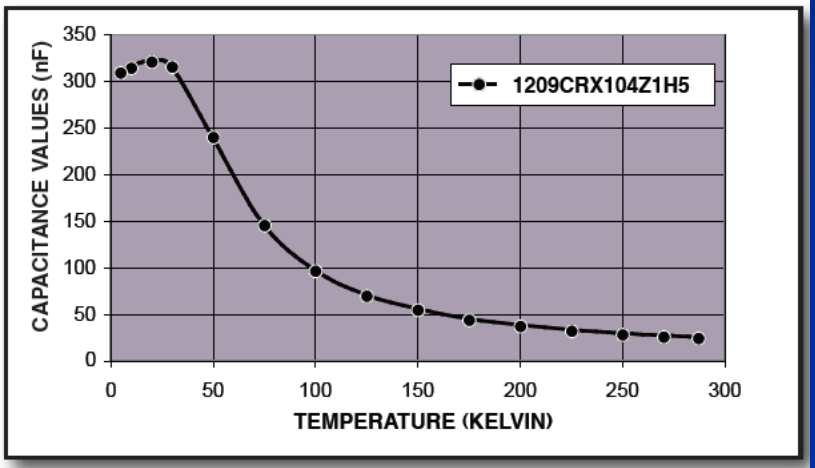


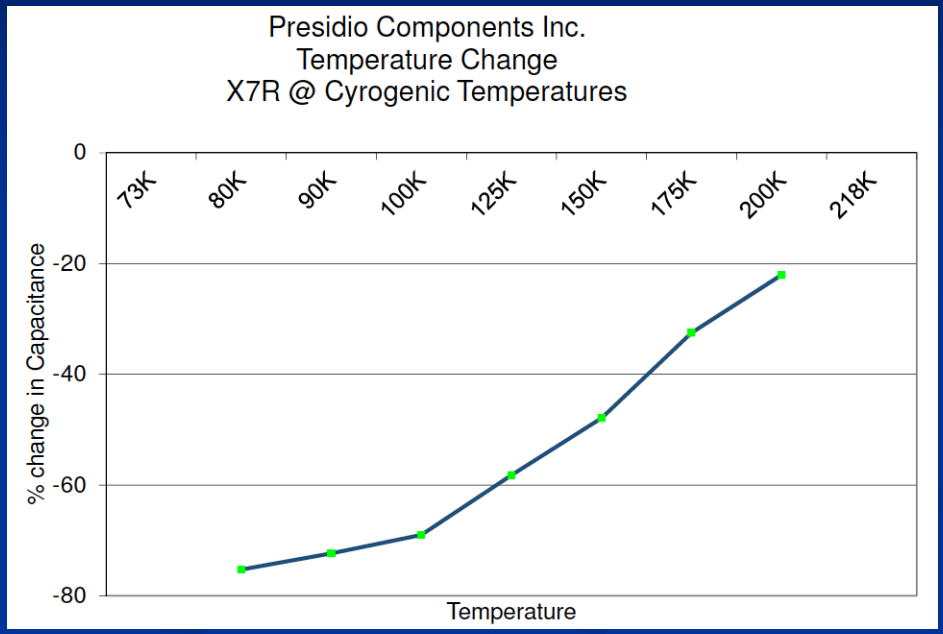


PRESIDIO special capability I
CRYO CAP down to 4K

CERAMIC TYPE:

- Cryogenic: Designated "CRX"





Comparison of Typical Performance Characteristics

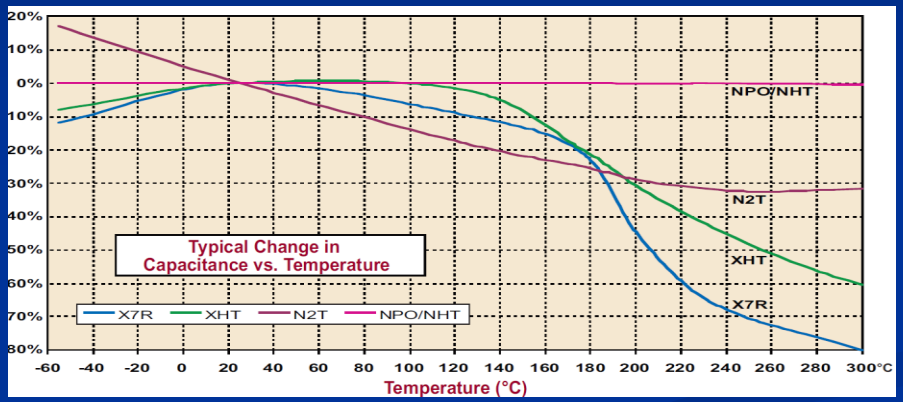
Type	Size	25° C			77K (Liquid Nitrogen)		
		CAP	DF	ESR	CAP	DF	ESR
Cryogenic Material	1209CRX	.02 µF	.5%	8 mΩ	.1 µF	.9%	14 mΩ
X7R Ceramic	1209X7R	.1 µF	1.4%	9 mΩ	.034 µF	9%	137 mΩ
NPO Ceramic	1209NPO	.01 µF	.1%	9 mΩ	.01 µF	.1%	1.2 mΩ

PRESIDIO special capabilities II
HIGH TEMP CAP up to 500°C+

HIGH TEMPERATURE
150°C · 175°C · 200°C · 225°C · 250°C · 500°C

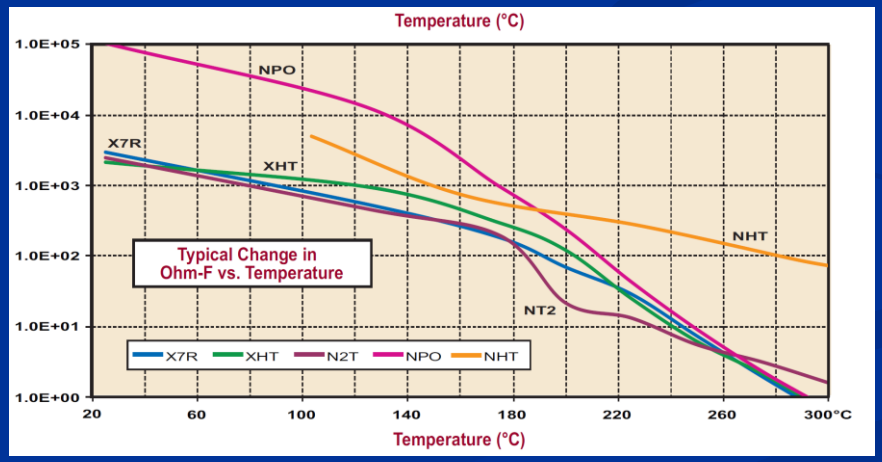
TEMPERATURE COEFFICIENT

Tested at 1VACRMS 1KHz
Capacitance Change



INSULATION RESISTANCE

Ohm-F



Hot Insulation Resistance aka Hot IR or Hi-Pot test is the critical electrical parameter to watch for High Temperature applications

PRESIDIO special capability III

PULSE ENERGY CAP

U.S. MANUFACTURER

HIGH RELIABILITY CERAMIC CAPACITORS FOR ELECTRONIC DETONATOR AND IGNITION SYSTEMS

MISSILE — ORDNANCE — DOWNHOLE

Available for High Temp Applications (250°C+)

Single or Multiple Pulse Firing Operations

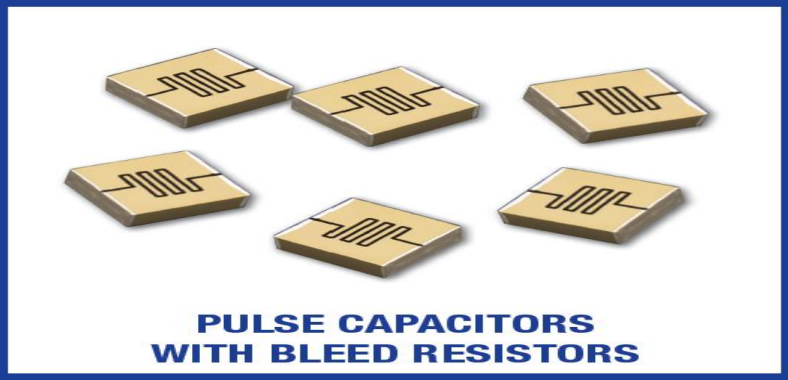
Energy Output Designed to Your Specifications

10V to 10KVA in Multiple Dielectrics: X7R, N2T, NPO

Available with Bleed Resistors for Additional Safety

Lead Frame Options for Board Flex Compliance

Stacked Capacitors for Increased Energy Density



PULSE CAPACITORS
WITH BLEED RESISTORS

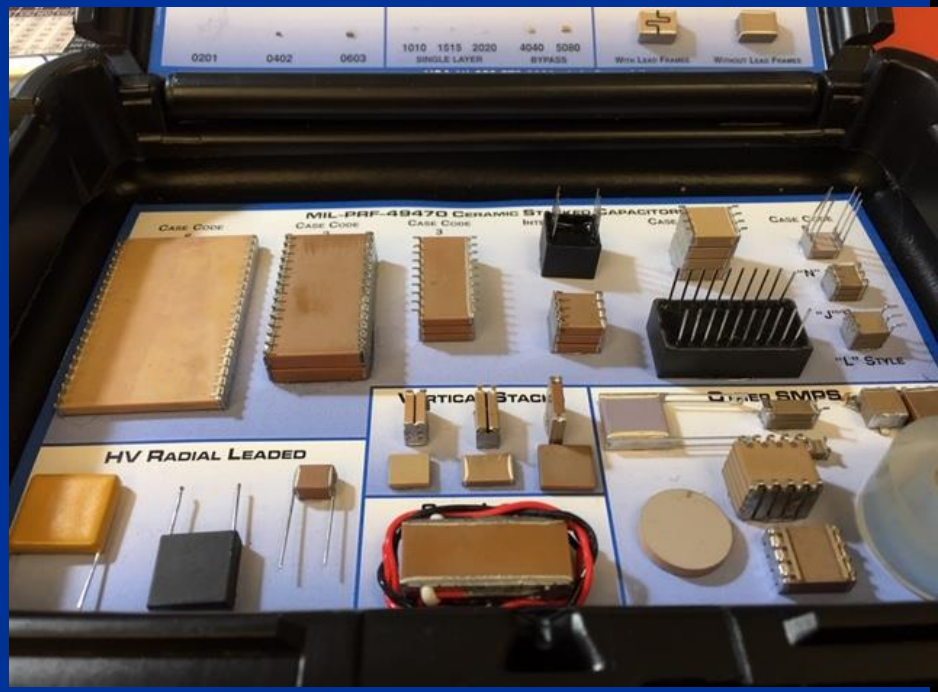
SOME OF OUR POPULAR SIZES INCLUDE:			
Size	Capacitance	Voltage	Dielectric
3040	.10 µF	1.8 kV	N2T
3240	.12 µF	1.8 kV	N2T
3640	.18 µF	1.5 kV	N2T
6560	.20 µF	2.0 kV	N2T

Presidio offers a product line dedicated to pulse discharge capacitors for munitions, ordinance, and oil well completion. We provide a variety of dielectrics, voltages, and case size configurations.

As an added safety feature, our caps can be ordered with bleed resistors that operate up to the 250°C range. Lead frames are also available for board flex compliance.

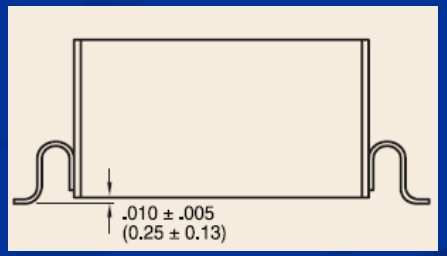
Presidio's engineering team can assist you in designing the best parts for your application and energy requirements. Contact Presidio for more information about these products.

Capacitors for POWER SUPPLIES Applications – DC/DC AC/DC



SCREENING CHOICES for SPACE

- SEE Screening table
- What is required is:
  - Group A per MIL-PRF-123 which is much more stringent than Group A per Mil-PRF-55681
  - Group B which includes 1000h life test.
  - A space qualified family of parts typically has also passed a 4000h life qualification test as well.
- The main space specifications for ceramic chip caps are
  - NASA dwg S311P829
  - MIL-PRF-123 *(Old historical spec, 0805 is the smallest size, 50V is the lowest voltage available)*
- For ceramic stacks, MIL-PRF-49470 T level remain the reference
  - We offer all the sizes and values on the spec., including NPO stack. We are QPL for most parts.
  - We offer X7R dielectric screened per T49470
  - 49479 offers 6 sizes only
  - We offer intermediate sizes and voltages screened similar T49470
  - We offer S lead style screened per T49470
  - *We do not offer M level stacks for space applications*



- For Radial Leaded, MIL-PRF-49467 is the reference
  - Group A and B – 600 to 6000V
  - We offer intermediate sizes and voltages screened per M49467

SELECTING parts for Engineering Units with a "PATH to FLIGHT"

- Critical to select a part that can be screened for space applications

- There many advantage to contact Presidio early on in your design phase:
  - 1- Space and Hi-Rel is our specialty
  - 2- We are easy to reach and responsive
  - 3- We can suggest alternative part numbers that will better match your schedule or Alternative Screening that can better match your dead-line.
  - 4- We can help you optimize the volume available on your boards. We have many sizes available including special ones with NO NRE and similar unit price.
  - 5 - Same with the voltage. If you are working with 28V, we can offer 56 or 63 V rating for instance to give you at least 50% voltage derating but we can offer significantly more cap with a 63V rating versus a 100V rating.

PRESIDIO COMPONENTS CERAMIC CHIP CAPACITORS TYPICAL SCREENING (NO SCD REQUIRED)

NOT TO BE SHARED WITHOUT WRITTEN AUTHORIZATION FROM PRESIDIO COMPONENTS, INC.

DISCLAIMER: THE INFORMATION IN THIS TABLE IS NOT GUARANTEED TO BE 100% CORRECT. PLEASE CHECK RELEVANT SPECIFICATION.

	SCREENING TESTS	Commercial		HR	CR	MIL-PRF-55681 CDR (Established Reliability)	DLA DWGS (1)	HR #55681AC Group A & Group C	NASA EEE-INST-002 Level 2 HR #N2 (2)		SR	SR #MB	SR #M123A or SR #M123B	SR #S311A or SR #S311B	TOR COMPLIANT NASA DWG S311-P-829	MIL-PRF-123 Dwg 06019	NASA EEE-INST-002 Level 1 SR #N1 (2)		MIL-PRF-32535 M Level	MIL-PRF-32535 T Level	SCREENING TESTS *For MIL-PRF-32535 only*
BASIC TESTING	**Capacitance** - All parts are tested at 25°C and 1VACRMS.	100%		100%	100%	100%	100%	100%	100%		100%	100%	100%	100%	100%	100%	100%		100%	100%	**Capacitance** - All parts are tested at 25°C and 1VACRMS.
	Dissipation Factor	100%		100%	100%	100%	100%	100%	100%		100%	100%	100%	100%	100%	100%	100%		100%	100%	**Dissipation Factor**
	Dielectric Withstanding Voltage (DWV) All parts are tested at 2.5X rated voltage up to 200V.	100%		100%	100%	100%	100%	100%	100%		100%	100%	100%	100%	100%	100%	100%		100%	100%	**Dielectric Withstanding Voltage (DWV)** All parts are tested at 2.5 X rated voltage up to 200V.
	Insulation Resistance (IR at 25°C) Tested at 25°C and rated voltage. Minimum IR: 100,000 Megohms or 1,000 Megohm-Microfarads.	100%		100%	100%	100%	100%	100%	100%		100%	100%	100%	100%	100%	100%	100%		100%	100%	**Insulation Resistance (IR at 25°C)** Tested at 25°C and rated voltage. Minimum IR: 100,000 Megohms or 1,000 Megohm-Microfarads.
	Insulation Resistance (IR at 125°C) Tested at 125°C and rated voltage. The minimum IR: 10,000 Megohms or 100 Megohm-Microfarads.	NO		NO	NO	PPM SAMPLE	PPM SAMPLE	PPM SAMPLE	NO		100%	100%	100%	100%	100%	100%	100%		100%	100%	**Insulation Resistance (IR at 125°C)** Tested at 125°C and rated voltage. The minimum IR: 10,000 Megohms or **50** Megohm-Microfarads.
	Solderability for SnPn Termination (4% Pb minimum). **Wirebonding Test for Gold termination** *Not Necessarily required but performed by Presidio*	YES		YES	YES	YES	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES		YES Part of Group A	YES Part of Group A	**Solderability** (For D,R & Z Terminations - SnPb **Bond Strength** (Wire) for G & V Terminations - Au **Shear Stress** (Termination M only) - AgPd
	Ultrasonic Examination 0201 parts are tested with real time X-Ray.	NO	IN PROCESS	NO	NO	NO	NO	NO	NO	IN PROCESS	OPTIONAL	NO	100% (Code A) None (Code B)	100% (Code A) None (Code B)	100%	100%	NO		100%	100%	**Ultrasonic Examination** -- IN PROCESS CONTROL for 0402 & 0603 Case Codes. Real time X-Ray for Case Code 0201.
	Visual Inspection — IN PROCESS CONTROL	Samples		Samples	Samples	100%	Samples	100%	100%		100%	100%	100%	100%	100%	100%	100%		100%	100%	**Visual Inspection** — IN PROCESS CONTROL
ENVIRONMENTAL TESTING and RELIABILITY SCREENING	**Thermal Shock (20 Cycles)**	NO	GROUP A Per MIL-PRF-55681	NO	NO	Periodic Testing (5 cycles)	NO	NO	YES 5 Cycles	GROUP A Per MIL-PRF-123	YES	YES	YES	YES	YES	YES	YES	GROUP A Per MIL-PRF-32535	NO	YES	**Thermal Shock (20 Cycles)**
																			NO	100% size 0805 or higher	**Ultrasonic Examination** 100% Ultrasonic Screening.
	Voltage Conditioning (100%) at 125°C 2 X rated voltage up to 200V 1.2 X rated voltage for 500V 1 X rated voltage for 1000V and above	NO		8 Hrs. Minimum	100 Hrs.	100 Hrs.	100 Hrs.	100 Hrs.	96 Hrs.		168 H Min. with 0.1% or 1 pcs. in the last 48 Hrs.	168 H Min. with 0.1% or 1 pcs. in the last 48 Hrs.	168 H Min. with 0.1% or 1 pcs. in the last 48 Hrs.	168 H Min. with 0.1% or 1 pcs. in the last 48 Hrs.	168 H Min. with 0.1% or 1 pcs. in the last 48 Hrs.	168 H Min. with 0.1% or 1 pcs. in the last 48 Hrs.	160 Hrs.		100 H Min..	169 H Min. with **0.2**% or 1 pcs. in the last 48 Hrs.	**Voltage Conditioning (100%) at 125°C** 2 X rated voltage up to 200V.
	Percent Defective Allowed (PDA)	NO		8%	8%	8%	8%	8%	10%		5%	5%	5%	5%	5%	3%	5%		8%	5%	**Percent Defective Allowed (PDA)**
	Destructive Physical Analysis per EIA RS469 - Sample size is per MIL-PRF-123.	NO		NO	YES	Periodic Testing	NO	NO	YES		YES	YES	YES	YES	YES	YES	YES		NO	YES	**Destructive Physical Analysis** per ECIA EIA/ECA-469.
	Visual Inspection — A 100% inspection is performed IAW MIL-PRF-123 Appendix B.	Samples		Samples	Samples	100%	Samples	100%	100%		100%	100%	100%	100%	100%	100%	100%		100% visual 20 samples 0 failure	100% visual 20 samples 0 failure	**Visual Inspection** - Appendix B.
	Mechanical Inspection (Dimensions) Level 1 AQL 1% in accordance with MIL-PRF-123.	YES		YES	YES	YES	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES				**Mechanical Inspection** - Appendix B.
	Thermal Shock (Cycles before Life Test) A sample is pulled from each lot.	NO	GROUP C Per MIL-PRF-55681	NO	NO	Periodic Testing 5 cycles	OPTIONAL	5 cycles only	NO	GROUP B Per MIL-PRF-123	OPTIONAL	NO	100 cycles	100 cycles	100 cycles	100 cycles	NO	GROUP B Per MIL-PRF-32535	5 cycles only	100 cyles	**Thermal Shock (100 Cycles Before Life Test)** A sample is pulled from each lot.
	LOT Life Test at 125°C 2 X rated voltage up to 200V 1.2 X rated voltage for 500V 1 X rated voltage for 1000V and above	NO		NO	NO	Periodic Testing	OPTIONAL 2000 Hrs. 25 pcs. **0 rejects allowed**	2000 Hrs. 25 pcs. **0 rejects allowed**	1000 Hrs. 22 pcs. 1 reject allowed		OPTIONAL	NO	1000 Hrs. 25 or 80 or 125 pcs. 0/1/2 rejects allowed	1000 Hrs. 45 or 125 pcs. **0 rejects allowed**	1000 Hrs. 45 or 125 pcs. **0 rejects allowed**	1000 Hrs. 25, 80 or 125 pcs. 0/1/2 rejects allowed	2000 Hrs. 22 pcs. **0 rejects allowed**		Periodic Testing Only 16 or 32 pcs. **0 rejects allowed**	1000 Hrs. 32 pcs. / 0 rejects or 125 pcs. 1 reject allowed	**LOT Life Test at 125°C** 2 X rated voltage up to 200V.
	QUALIFICATION Life Test at 125°C 2 X rated voltage up to 200V 1.2 X rated voltage for 500V 1 X rated voltage for 1000V and above	NO		NO	NO	14375 pcs. 2000h 0 failures allowed S level	N/A	N/A	N/A		N/A	N/A	Not required If wanted 4000 Hrs. 123 pcs. 1 reject allowed	Not required If wanted 4000 Hrs. 45 or 125 pcs. **0 rejects allowed**	**4000** Hrs. 45 or 125 pcs. **0 rejects allowed**	**4000** Hrs. 123 pcs. 1 reject allowed	N/A		N/A	**4000** Hrs. 123 pcs 1 reject allowed	**QUALIFICATION Life Test at 125°C** 2 X rated voltage up to 200V.
	Humidity Steady State Low Voltage 12 pcs sample per lot - 85°C/85% humidity - 240 H	NO		NO	NO	Periodic Testing	OPTIONAL	YES	YES		OPTIONAL	YES	YES	YES	YES	YES	YES		Periodic Testing Only	YES	**Temperature Humidity Bias (Rated Voltage)** 12 pcs sample per lot - 85°C/85% humidity - 96 H.
	Voltage Temperature Limit — VTC (when applicable).	NO		NO	NO	Periodic Testing	OPTIONAL 12 pcs.	YES (when applicable)	6 pcs. (when applicable)		12 pcs. (when applicable)	N/A	12 pcs. (when applicable)	12 pcs. (when applicable)	NPO only	12 pcs.	12 pcs. (when applicable)		Periodic Testing Only	12 pcs (when applicable)	**Voltage Temperature Limit** — VTC (when applicable).
	Moisture Resistance 22 days - 90% relative Humidity - 20 cycles from 25°C to 65°C with 10 cycles with rated voltage or 50V which ever is greater.	NO		NO	NO	Periodic Testing	OPTIONAL	YES Size 0805 / 0612 and larger	YES Size 0805 / 0612 and larger		Optional - Size 0805 / 0612 and larger	NO	NO	Optional - Size 0805 / 0612 and larger	YES - Size 0805 / 0612 and larger	YES	YES - Size 0805 / 0612 and larger		NO	NO	**Moisture Resistance** 22 days - 90% relative Humidity - 20 cycles from 25°C to 65°C with 10 cycles with rated voltage or 50V which ever is greater
																			Periodic Testing Only	YES	**Dielectric Voltage Breakdown** (12 pcs) - Failure shall occur at greater than 6X rated voltage or 1,200V whichever is less.
	Terminal Strength	NO		NO	NO	NO	OPTIONAL 0805 and larger	NO	NO	GROUP C Per MIL-PRF-123	OPTIONAL 0805 and larger	OPTIONAL 0805 and larger	OPTIONAL 0805 and larger	OPTIONAL 0805 and larger	OPTIONAL 0805 and larger	OPTIONAL 0805 and larger	NO	GROUP C Per MIL-PRF-32535	N/A	N/A	**Terminal Strength**
	Solderability For SnPn Termination (4% Pb minimum).	NO		NO	NO	YES	NO	YES	YES		OPTIONAL	OPTIONAL	OPTIONAL	OPTIONAL	YES	OPTIONAL	YES		Part of Group A	Part of Group A	**Solderability** For SnPn Termination (4% Pb minimum).
																			Periodic	Periodic	**Board Flex** (12 pcs.) **Shear Test** (12 pcs.)
	Resistance to Soldering Heat	NO		NO	NO	NO	NO	NO	YES		OPTIONAL	OPTIONAL	OPTIONAL	OPTIONAL	OPTIONAL	OPTIONAL	YES		Periodic	Periodic	**Resistance to Soldering Heat** (6 pcs.)
	RECOMMENDED FOR SPACE FLIGHT	NO		NO	NO	YES Qualified	OK with Group C	YES	YES		YES with Group B	NO	YES	YES	YES Qualified	YES Qualified	YES		NO	YES	**RECOMMENDED FOR SPACE FLIGHT**

(1) DLA DWG # (case size): 03028 (0603) - 03029 (0402) - 05001 (0805) - 05002 (0603) - 05003 (0402) - 05006 (0805) - 05007 (1206) - 14004 (0306) - 14005 (0508)

(2) Several exceptions are required for the EEE-INST-002 drawing; see back of page

File: Chip Caps Typical Screening w 32535 10-10-19

NASA S311P829

GSFC Identifier	Ultrasonic Examination (replaces dash character)	Size Code	Dielectric Type	Capacitance (pF)	Tolerance 1/	Voltage (Vdc)	Termination	Packaging/Marking 2/
G311P829	A = 100%	A = 0402	N = NPO	XXX Nominal capacitance value in pF: First two digits are significant and last digit specifies the number of zeros to follow. When nominal value is <10 pF, the letter "R" is used to indicate the decimal point; succeeding digit(s) are	A = +/- 0.05pF	1 = 25V	P = PdAg alloy	1 = 7" T/R, unmarked capacitors
		B = 0403	X = X7R		B = +/- 0.10pF	2 = 50V	N = Ni-Sn/Pb Plated	2 = 7" T/R, marked capacitors
		C = 0504			C = +/- 0.25pF	3 = 100V	G = Ag-Ni-Au plated	3 = Waffle Pack, unmarked capacitors
		D = 0603			D = +/- 0.50pF	4 = 5V	H = Gold, Thick Film	4 = Waffle Pack, marked capacitors
		E = 0805			F = +/- 1%	5 = 10V		
		F = 1206			G =+/- 2%	6 = 16V		
		G = 1209			J = +/- 5%	7 = 6.3V		
		H = 1725			K =+/- 10%			
		J = 2225			L = +20% / -10%			

- G311P829 is our most popular specification for space chip capacitors
- 0402 X7R 0.1uF 10V is very popular (G311P829AAX104K5N1)
- This series can help supply chain a lot (especially if it on the BOM)

SMPS Stacked Capacitors

- Hi-Rel, Industrial
- Many sizes available
- Many voltages (5KV+)
- Low Profile
- High Frequency
- Interdigitated (Low ESL)
- M and T level per MIL-PRF-49470

We are expert at offering the max cap possible in your available volume. All intermediate sizes and voltages can be screened per T 49470 (NO NRE, similar V/mil & price)

PRESIDIO COMPONENTS, INC.

SPACE LEVEL CERAMIC STACK CAPACITORS STANDARD SCREENING

(NO SCD REQUIRED)

TOR COMPLIANT

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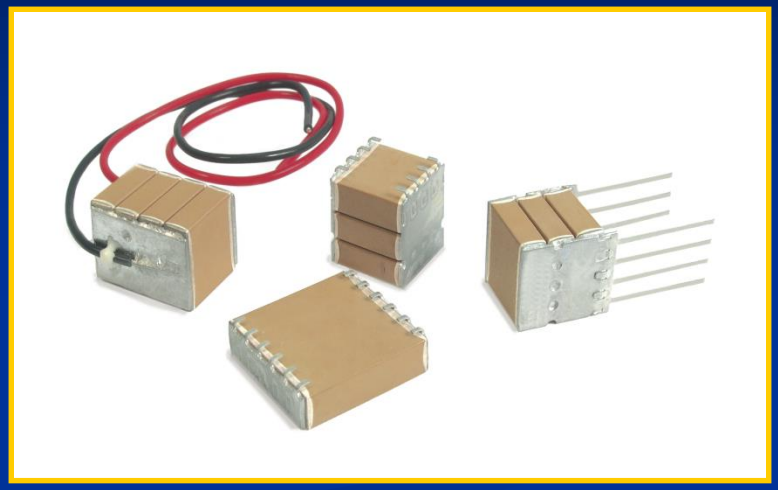
PLEASE CHECK RELEVANT SPECIFICATION.

	SCREENING MIL SPEC or PREFIX Screening Level or Suffix Codes TESTS		MIL-PRF-49470		Commercial	HR	SR	SR
					S	HRS	SRS	SRS
			M Level	T Level	(Blank)	(Blank)	(Blank)	#T49470 Same Test Routine as MIL-PRF-49470 Different Voltages such as 75V, 150V, 300V Different Dielectric such as X7R Different Sizes or Lead Frames such as S-Leads
BASIC TESTING	**Capacitance** All parts are tested at 25°C and 1VACRMS.		100%	100%	100%	100%	100%	100%
	Dissipation Factor (DF)		100%	100%	100%	100%	100%	100%
	Dielectric Withstanding Voltage (DWV) All parts are tested at 2.5 X rated voltage up to 200V.		100%	100%	100%	100%	100%	100%
	Insulation Resistance (IR at 25ºC) All parts are tested at 25°C and rated voltage. The minimum IR required is 100,000 Megohms or 1,000 Megohm-Microfarads.		100%	100%	100%	100%	100%	100%
	Insulation Resistance (IR at 125°C) All parts are tested at 125°C and rated voltage. The minimum IR required is 10,000 Megohms or 100 Megohm-Microfarads.		100%	100%	NO	NO	100%	100%
ENVIRONMENTAL TESTING and RELIABILITY SCREENING	**Non-Destructive Internal Examination** **Ultrasonic Examination** (CHIPS)	IN-PROCESS INSPECTION	NO	100%	NO	NO	OPTIONAL	100%
	Destructive Physical Analysis: DPA - CHIPS		NO	YES	NO	NO	YES	YES
	In-Process Visual Examination (Chips and Stacks)		100%	100%	100%	100%	100%	100%
	Thermal Shock Before Voltage Conditioning	GROUP A Per MIL-PRF-49470	5 cycles 100%	20 cycles 100%	NO	NO	20 cycles or per SCD 100%	20 cycles 100%
	Voltage Conditioning (100%) at 125°C 2 X rated voltage up to 200V 1.2 X rated voltage for 500V 1 X rated voltage for 1000V and above		96 Hrs.	168 Hrs. Min. with 0.5 to 1% or 1 pcs. in the last 48 Hrs.	NO	8 Hrs. Min.	168 Hrs. Min. with 0.5 to 1% or 1 pcs. in the last 48 Hrs. or per SCD	168 H Min. with 0.5 to 1%% or 1 pcs. in the last 48 Hrs.
	Percent Defective Allowed (PDA)		10%	5% for Case Code 4 & 5, 8% for other Case Codes	8%	8%	5% for Case Code 4 & 5, 8% for other Case Codes	5% for Case Code 4 & 5 8% for other Case Codes
	Visual and Mechanical Examination: Material, physical dimensions, interface requirements, marking, workmanship.		YES	YES	YES	YES	YES	YES
	Solderability		YES	YES	YES	YES	YES	YES
	Destructive Physical Analysis (DPA - STACKS)		NO	YES 3 pcs.	NO	NO	OPTIONAL 3 pcs. or per SCD	YES 3 pcs.
	Voltage Temperature Limit, Resistance to Solvents, Immersion, & Terminal Strength	GROUP B Per MIL-PRF-49470	Periodic Testing	YES	NO	NO	YES	YES
	Resistance to Soldering Heat **Moisture Resistance**		Periodic Testing	YES	NO	NO	YES	YES
	Humidity Steady State Low Voltage 85°C/85% humidity - 240 H.		NO	YES 6 pieces	NO	NO	OPTIONAL	YES 6 pieces
	Thermal Shock Thermal shock cycles are performed before Life Test.		NO	100 cycles	NO	NO	Optional 100 cycles or per SCD	100 cycles
	LOT Life Test at 125°C 2 X rated voltage up to 200V 1.2 X rated voltage for 500V 1 X rated voltage for 1000V and above		Periodic Testing	1000 Hrs - 12 pcs. 1 reject allowed	NO	NO	Optional 1000 Hrs - 12 pcs. 1 reject allowed or per SCD	1000 Hrs - 12 pcs. 1 reject allowed
	QUALIFICATION Life Test at 125°C 2 X rated voltage up to 200V 1.2 X rated voltage for 500V 1 X rated voltage for 1000V and above		1000 Hrs 24 pcs. 1 reject allowed	4000 Hrs - 24 pcs. 1 reject allowed	N/A	N/A	Optional 4000 Hrs - 24 pcs. 1 reject allowed or per SCD	Optional 4000 Hrs - 24 pcs. 1 reject allowed
	RECOMMENDED FOR SPACE FLIGHT		NO	YES (Qualified)	NO	NO	YES with Group B	YES

S-Leaded Stacks

- Low: Standoff / Profile / Center of Gravity
- Excellent thermal coefficient of expansion compliance with board
- Can be per screened per T49470 for space

High Frequency/High Power
(N2200 dielectric)



Applications

- AC Line filtering
  110-130 Volts AC
- High power RF at high voltages 500 - + 5,000 v

Features

- Low DF (0.15% max)
- Low self-heating
- Low ESR over wide frequency range
- Stable capacitance vs. frequency
- High reliability - No aging rate

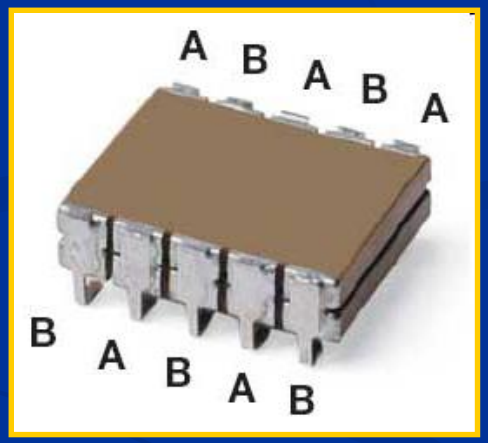
Interdigitated

Applications

- Output filtering in Switch Mode Power Supplies (SMPS)
- Applications that require higher self-resonant frequency than conventional SMPS capacitors
- Gives less noise on power supply output

Features

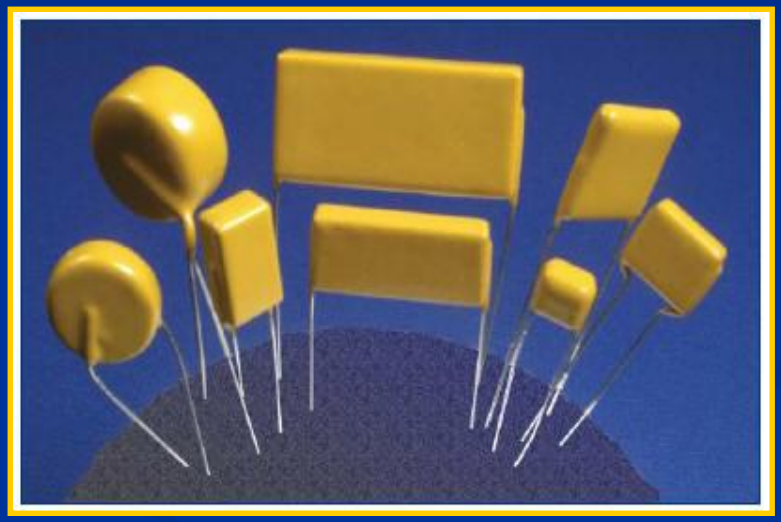
- Higher self-resonant frequency
- Lower inductance (ESL)
- Opposite polarity on each lead gives opposing magnetic fields, resulting in lower ESL while the capacitor is charging
- High capacitance
- Meets standard SMPS capacitor specifications



High Voltage Radial Leaded

Specifications:

- -55ºC to +125ºC
- High Temp to 250ºC available
- X7R, BX, NPO, N2T

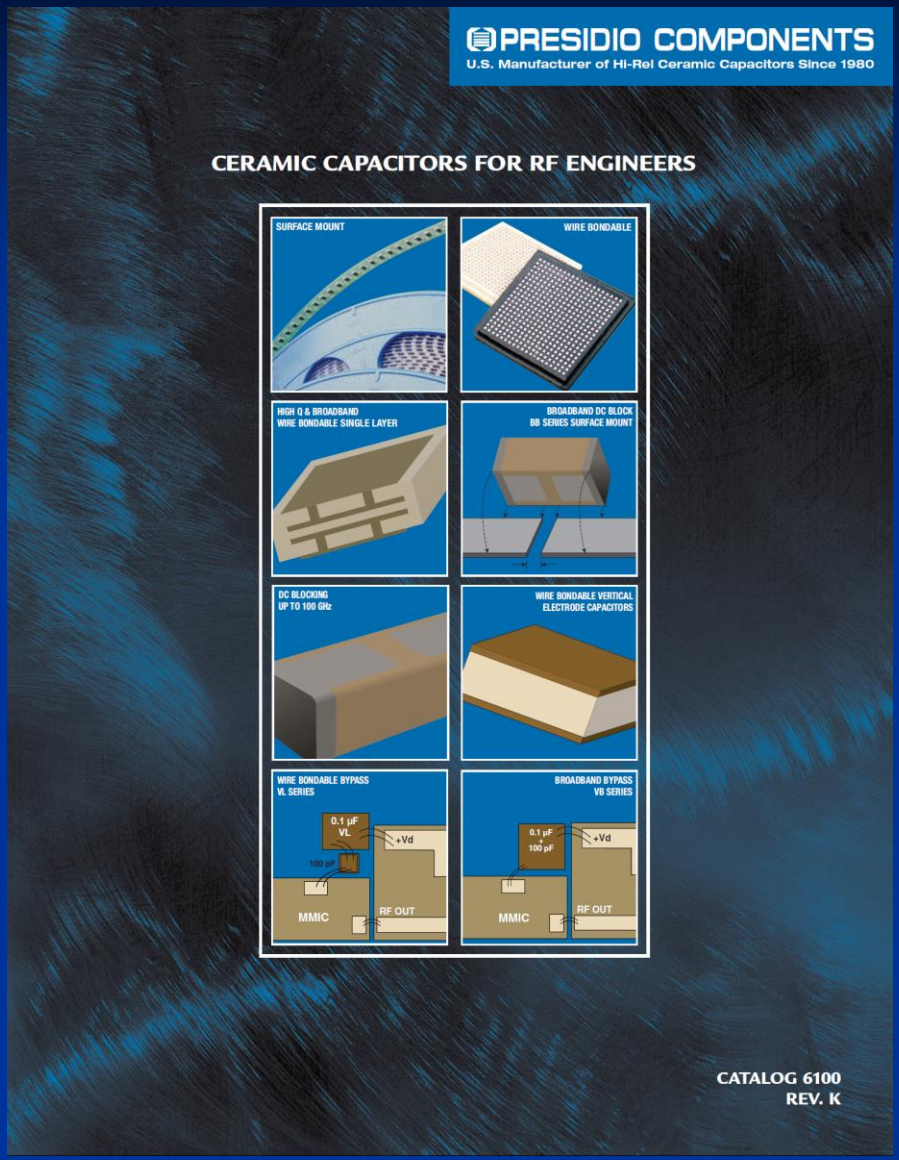


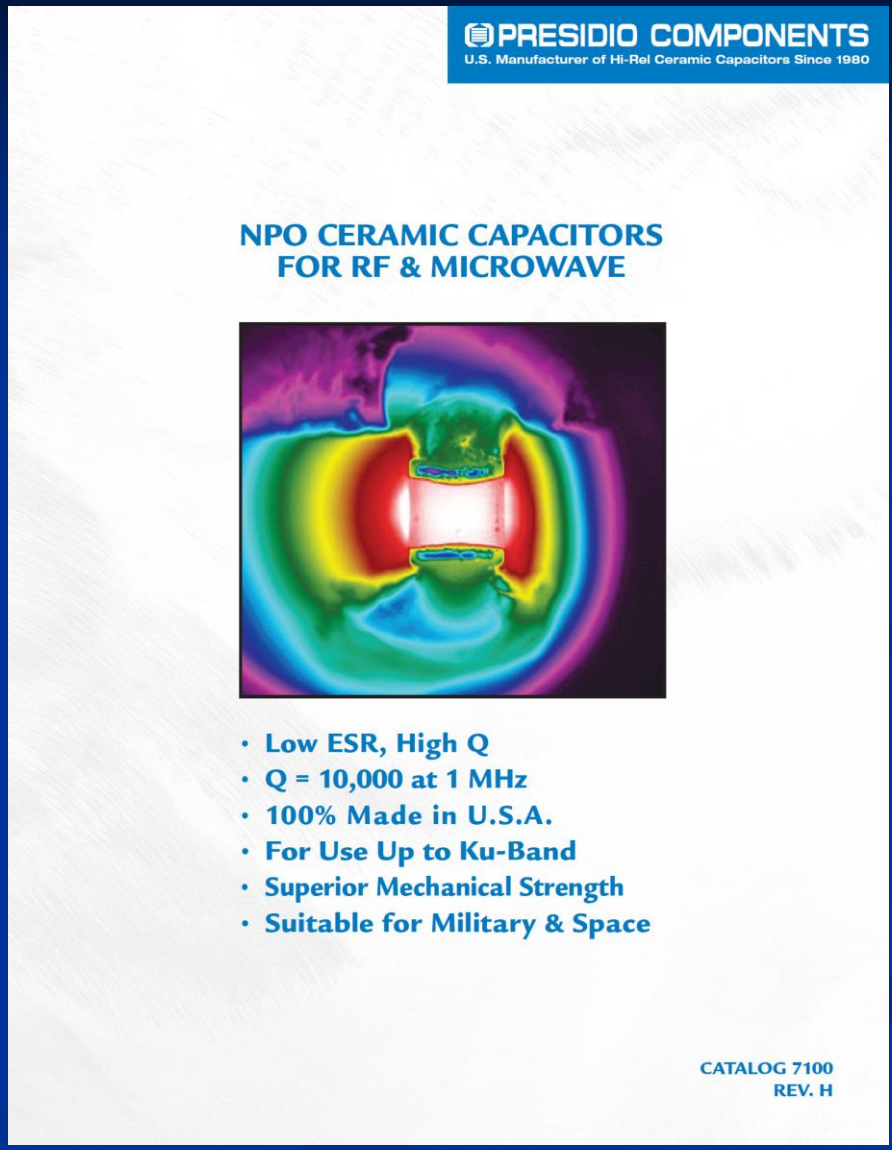
Capacitors for RF Applications

30 MHZ - VHF, ULF, L, S, C, Ku, K, Ka, V & W-Band - 110GHZ

- High Q NPO for RF & MICROWAVE
  - RF power
  - Filtering
- Wirebondable SINGLE LAYER
- Wirebondable Bypass for MMIC's
- Wirebondable BROABAND Bypass for MMIC's
- SMD BROADBAND DC Block (100+ GHz)

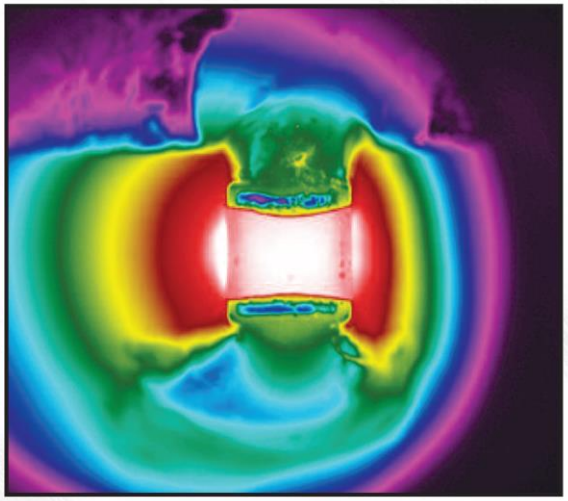
PRESIDIO RF & MICROWAVES CATALOGS





HiGH Q – NPO - RF Capacitors

NPO CERAMIC CAPACITORS FOR RF & MICROWAVE



- Low ESR, High Q
- Q = 10,000 at 1 MHz
- 100% Made in U.S.A.
- For Use Up to Ku-Band
- Superior Mechanical Strength
- Suitable for Military & Space

TYPICAL APPLICATIONS

Filter Capacitors

A filter design requires a specific capacitance value, cF, and at the upper end of the filter response, fF, the effective capacity must not exceed cF by more than a specified amount of delta C. Once cF is determined, case size, voltage rating and temperature characteristics can be selected.

DC Block and RF Bypass

The bandwidth over which the insertion loss meets specification is determined by the location of parallel resonances. Minimum insertion loss at the band center is achieved by choosing a capacitor whose lowest series resonance is approximately at this frequency. Low impedance is typically more important than the capacitance value.

Low Noise Applications

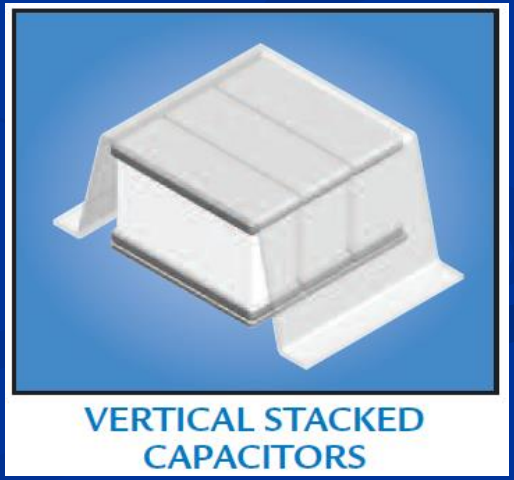
Dissipation loss is the consideration. ESR is very small at the series resonance, very large at the parallel resonance. The neighboring parallel resonances determine the bandwidth.

HiGH Q – NPO - RF Capacitors

- Last US manufacturer of High Q NPO caps

- Main sizes available and screenable for space
  - (0402, 0603, 0805, 0505, 1010, 0711, 2525, 3838)
  - ***Our High Q NPO is being used in space up to Ku-Band***
  - ***Very tight tolerances available***

- S2P files available, sample KIT available
- Dwg 06019 – porcelain 0505 for Space
- Dwg 06022 – porcelain 1010 for Space
- CDR 11,12, 13 & 14 qualified S level
- Voltage available to 7200V and above
- Contact factory for different sizes and voltages
- Stack capacitors available


VERTICAL STACKED CAPACITORS

High Q NPO for space = NASA S311P829

GSFC Identifier	Ultrasonic Examination (replaces dash character)	Size Code	Dielectric Type	Capacitance (pF)	Tolerance 1/	Voltage (Vdc)	Termination	Packaging/Marking 2/
G311P829	A = 100%	A = 0402	N = NPO	XXX Nominal capacitance value in pF: First two digits are significant and last digit specifies the number of zeros to follow. When nominal value is <10 pF, the letter "R" is used to indicate the decimal point; succeeding digit(s) are	A = +/- 0.05pF	1 = 25V	P = PdAg alloy	1 = 7" T/R, unmarked capacitors
		B = 0403	X = X7R		B = +/- 0.10pF	2 = 50V	N = Ni-Sn/Pb Plated	2 = 7" T/R, marked capacitors
		C = 0504			C = +/- 0.25pF	3 = 100V	G = Ag-Ni-Au plated	3 = Waffle Pack, unmarked capacitors
		D = 0603			D = +/- 0.50pF	4 = 5V	H = Gold, Thick Film	4 = Waffle Pack, marked capacitors
		E = 0805			F = +/- 1%	5 = 10V		
		F = 1206			G =+/- 2%	6 = 16V		
		G = 1209			J = +/- 5%	7 = 6.3V		
		H = 1725			K =+/- 10%			
		J = 2225			L = +20% / -10%			

- 0402 for space are available from 0.05 to 27pF and higher - 100V rating
- 0603 for space are available from 0.05 to 100pF and higher - 100V rating
- 0805 and other sizes are also available
- MIL-PRF-32535 in 0402 NPO starts at 10pF
- High Q NPO tight tolerances, ±0.05pF, ±0.1pF, ±1%

Wirebondable Single Layer Capacitors with buried electrodes

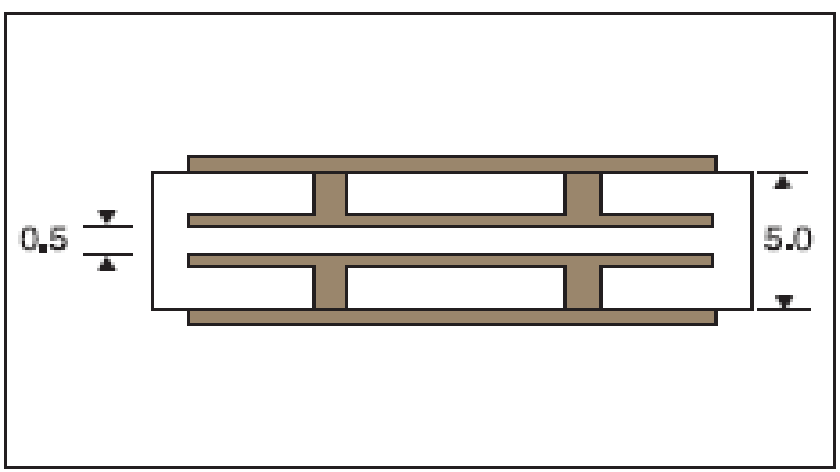


Fig. 1. Construction of Buried Electrodes

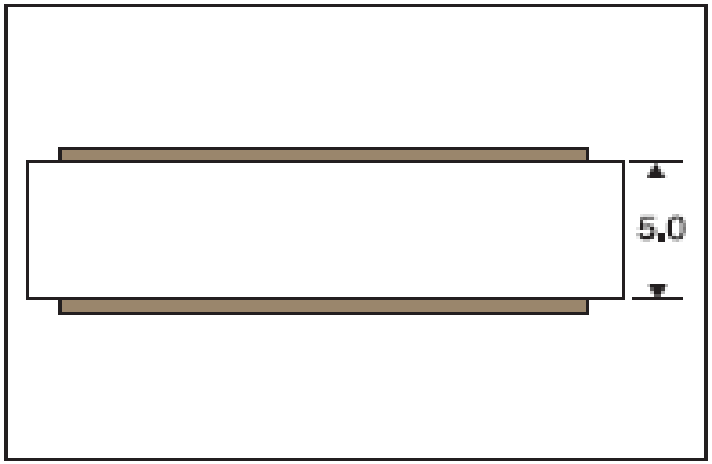


Fig. 2. Conventional Single Layer Capacitor

Kent Simulator up to 30 GHz

Free download available from our website

APPLICATIONS

- FILTER
- DC Block
- RF BYPASS
- MINIMUM LOSS, FINITE BAND COUPLING

PRESIDIO ADVANTAGES

- 10:1 advantage over conventional construction
- More bandwidth through increase capacitance
- More stable capacitance over temperature
- More capacitance per size for increased board density

Presidio wirebondable single layer selection

GLOBAL PART NUMBER EXAMPLE (How to Order)

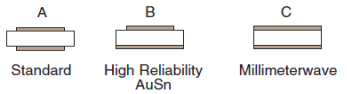
L	S	A	1010	B	101	M	G	H	5	C	—	*
Test Code	Product	Termination Configuration	Size (Pg. 5)	Dielectric	Capacitance Code	Capacitance Tolerance	Voltage	Termination	Packaging	RoHS Compliant	Hyphen Required	Design-In Code (See Page 14)

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 NPQ (pF)	INDUSTRIAL Test Code L NPO (pF)	INDUSTRIAL Test Code L BX (pF)	MILITARY Test Code M NPQ (pF)	MILITARY Test Code M NPO (pF)	MILITARY Test Code M BX (pF)	SPACE EM: Test Code N FM: Test Code K, A or B NPQ (pF)	SPACE EM: Test Code N FM: Test Code K, A or B NPO (pF)	SPACE EM: Test Code N FM: Test Code K, A or B 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	—	—	—
						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) ±	0.017 (0.432) ±	0.005 (0.127) ±	0.013	0.001	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

Termination Configuration Codes

Code	Description
A	Borders top and bottom
B	Borders top, full metalization at bottom
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 100 µin min. thickness	Au	Conductive Epoxy or AuSn

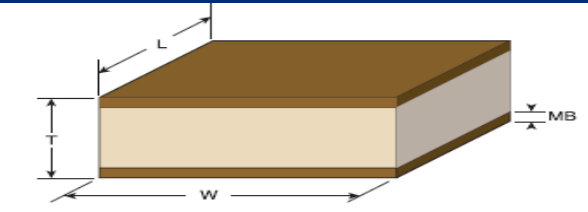
Packaging Codes

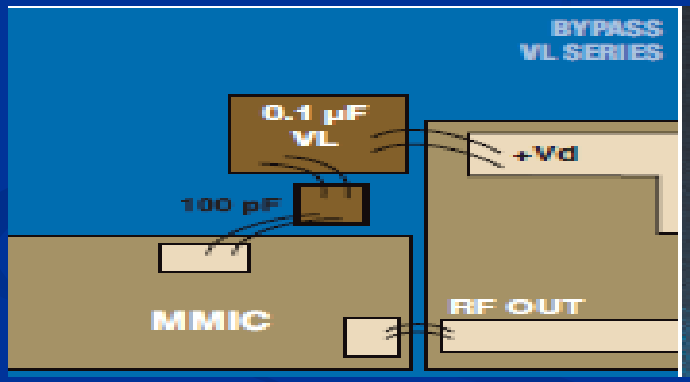
Code	Description
5	Waffle Pack, 400 max/waffle
F	Grip Ring, 6.0" diameter standard (low tack)

RoHS

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

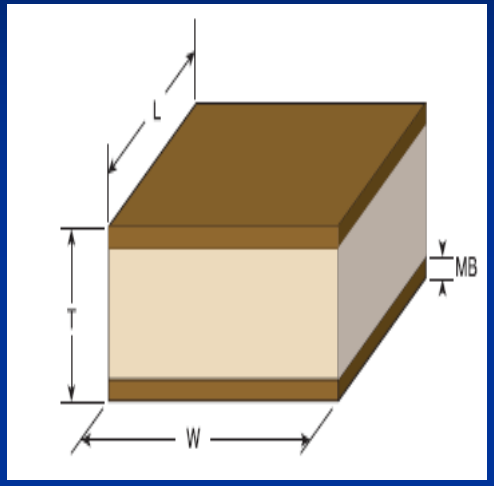
Wirebondable Bypass for MMIC's *(VL Series)*

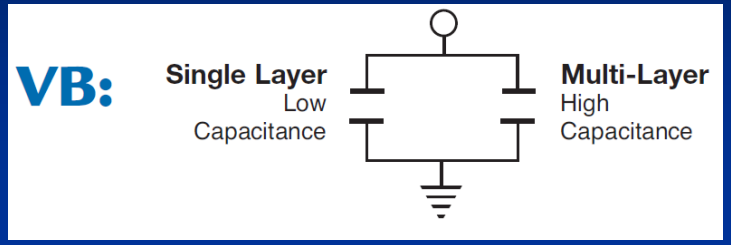


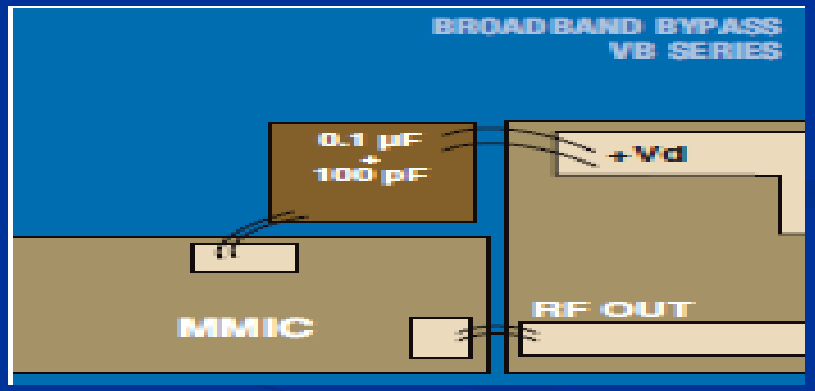


- Vertical layers (lower ESL)
- Low Profile
- 6.3 to 100V+
- Available for High Temp. environment (150°C+)
- Available for Space Applications

Wirebondable Integrated Broadband Bypass (VB Series)







- Vertical layers (lower ESL)
- Low Profile
- 6.3 to 100V +
- Use up to Millimeter Wave Frequencies
- Available for Space Applications

PRESIDIO WIREBONDABLE BYPASS CAPACITOR SELECTION

GLOBAL PART NUMBER EXAMPLE (How to Order)

M	VB	3030	X	103	M	G	H	5	C	1	*
Test Code	VB = Vertical Broadband VL = Vertical Layer	Size (Pg. 9)	Dielectric	Capacitance	Capacitance Tolerance	Voltage	Termination	Packaging	RoHS Compliant	VB – Special Code VL – Hyphen Required	Design-In Code (See Page 14)

SELECTION TABLE: VERTICAL ELECTRODE CAPACITORS — WIRE BONDABLE

Size Code	L inch (mm)	W inch (mm)	T Max. inch (mm)	MB Max. inch (mm)	Working Voltage (WVDC) Max.	Capacitance (pF)	INDUSTRIAL & MILITARY Test Code M X7R (pF)	INDUSTRIAL & MILITARY Test Code M Y5V (pF)	SPACE EM: Test Code N FM: Test Code K, C or S X7R (pF)	SPACE EM: Test Code N FM: Test Code K, C or S VB SERIES PART NUMBER	SPACE EM: Test Code N FM: Test Code K, C or S VL SERIES PART NUMBER	Performance Curves	S2P Files "VB"
2020	0.020 (0.508) ± 0.003 (0.076)	0.020 (0.508) ± 0.003 (0.076)	0.015 (0.381)	0.003 (0.076)	100	Max:	390				MVL2020X391M3H5C–*		
					50	Max:	1,000		1,000		MVL2020X102M2H5C–*		
					25	Max:	2,700				MVL2020X272M1H5C–*		
					16	Max:	5,100				MVL2020X512MGH5C–*		
					10	Max:	10,000				MVL2020X103MEH5C–*		
					6.3	Max:				LVB2020X103MC *5C1*			
2040	0.020 (0.508) ± 0.003 (0.076)	0.040 (1.016) ± 0.004 (0.102)	0.017 (0.432)	0.005 (0.127)	100	Max:	1,000		1,000	MVB2040X102M3 *5C1*	MVL2040X102M3H5C–*		
					50	Max:	2,200			MVB2040X222M2 *5C1*	MVL2040X222M2H5C–*		
					25	Max:	5,100			MVB2040X512M1 *5C1*	MVL2040X512M1H5C–*		
					16	Max:	10,000			MVB2040X103MG *5C1*	MVL2040X103MGH5C–*		
					10	Max:	22,000			MVB2040X223ME *5C1*	MVL2040X223MEH5C–*		
2741	0.027 (0.686) ± 0.004 (0.102)	0.041 (1.041) ± 0.004 (0.102)	.033 (0.838)	0.005 (0.127)	16	Max.	100,000			MVB2741X104MG *5C1*	MVL2741X104MGH5C–*		
3030	0.030 (0.762) ± 0.003 (0.076)	0.030 (0.762) ± 0.003 (0.076)	0.022 (0.559)	0.005 (0.127)	100	Max:	4,700			MVB3030X472M3 *5C1*	MVL3030X472M3H5C–*		
					50	Max:	10,000			MVB3030X103M2 *5C1*	MVL3030X103M2H5C–*		
					50	Max:			6,800		NVL3030X682M2H5N–*		
					25	Max:	15,000			MVB3030X153M1 *5C1*	MVL3030X153M1H5C–*		
					16	Max:	22,000			MVB3030X223MG *5C1*	MVL3030X223MGH5C–*		
					16	Nominal	10,000		10,000	MVB3030X103MG *5C1*	NVL3030X103MGH5N–*	PDF	WEB
					16	Max:		100,000			MVL3030Y104ZGH5C–*		
					10	Max:	43,000			MVB3030X433ME *5C1*	MVL3030X433MEH5C–*		

Capacitance Codes

First Two Digits = Significant figures of capacitance in picofarads

Third Digit = Additional number of zeros

Example:
- 100 = 10 pF
- 102 = 1,000 pF
- 104 = 100,000 pF

Working Voltage (See Page 9)

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

Termination

VL/VB	Description
H	99.8% Au Top and Bottom Suitable for Conductive Epoxy
U	100% Au Top and Bottom Oxide Free Surface Suitable for Conductive Epoxy
K	99.8% Au Top, PdAg Bottom Conductive Epoxy or Solder

100 Microinches minimum thickness on both sides

Capacitance Tolerance

Code	Tol.
M	± 20%
Z	-20%, +80% for all Y5V dielectric

Packaging

5 = Waffle Pack (standard)
F = Grip Ring, 6.0" diameter standard

RoHS

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

Special Code

VB Series: Single Layer Capacitance Value:
1 = 100 pF
3 = 1800 pF

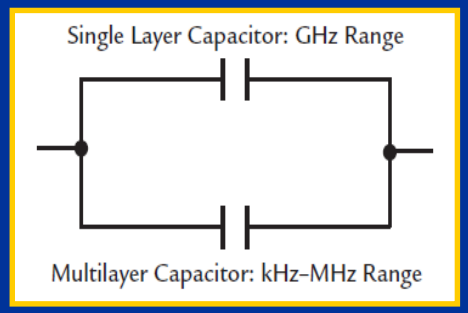
VL Series: Hyphen Required

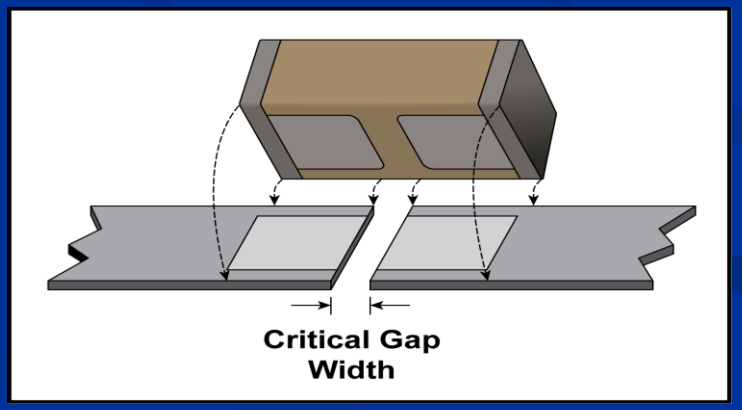
-3dB CUT OFF FREQUENCY	
pF	kHz
330,000	< 10
180,000	10
100,000	16
68,000	25
47,000	35
43,000	40
30,000	55
22,000	75
20,000	80
15,000	105
10,000	160
8,200	195
4,700	340

Best in Class SMD Broadband DC Block

(BB Series)

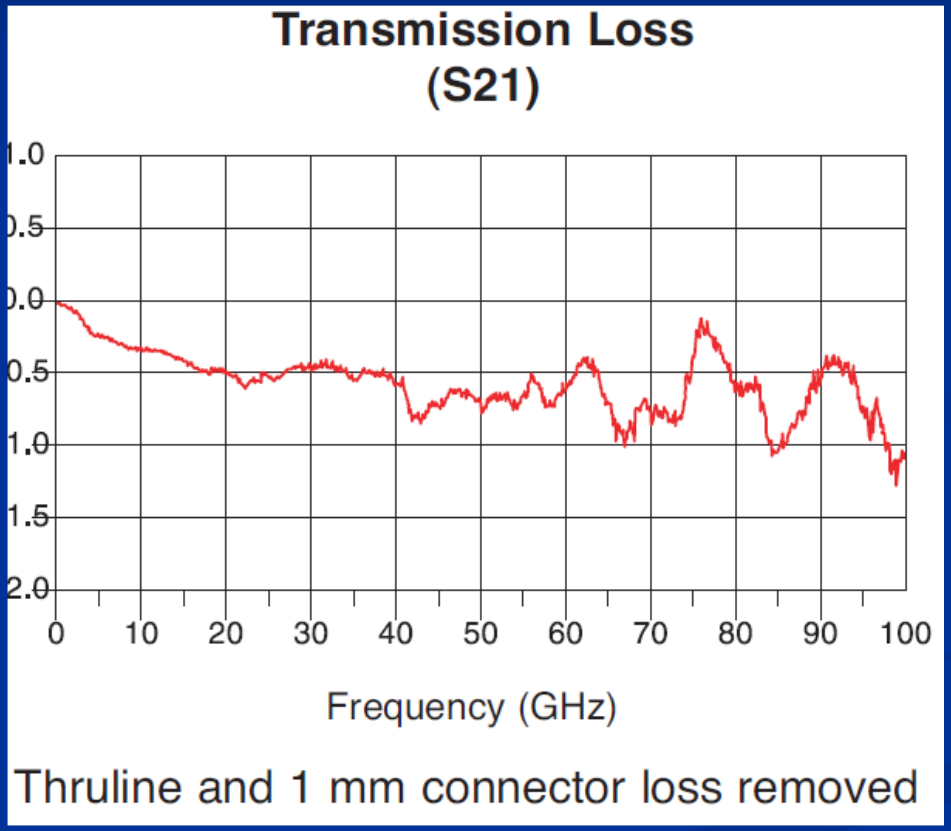
- Broadband DC Blocking up to 100 GHz +
- Resonant free at critical 1.6 to 1.8 GHz
- - 0.2 dB loss at 10 GHz, less than – 0.5 dB at 40 GHz
- Sizes from 0201 to 0805
- Free Equivalent Circuit Capacitor Model
- Available for Space Applications
- 10 to 100V +





Buried Broadband Capacitors
Performance Data

MBB0302X123MGP5N8* Measured



~<0.5 dB up to 40 GHz

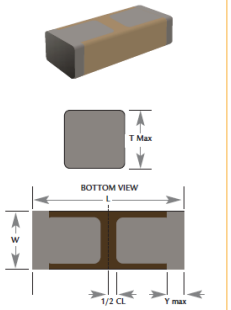
PRESIDIO SMD DC BLOCK CAPACITOR SELECTION

GLOBAL PART NUMBER EXAMPLE (How to Order)

M	BB	0502	X	104	M	G	P	5	C	8	*
Test Code	Product Code	Size (Pg. 13)	Dielectric	Capacitance	Capacitance Tolerance	Voltage	Termination	Packaging	RoHS Compliant	Special Code 2nd Cap Value	Design-In Code (See Page 14)

SELECTION TABLE: BURIED BROADBAND CAPACITORS — SURFACE MOUNT

Size Code	CERAMIC BODY DIMENSIONS W inch (mm)	L inch (mm)	T Max. inch (mm)	Y Max. inch (mm)	1/2 CL inch (mm)	Working Voltage (WVDC)	INDUSTRIAL Test Code L X7R (pF)	INDUSTRIAL & MILITARY Test Code M NPO (pF)	X7R (pF)	Y5V (pF)	SPACE EM: Test Code N FM: Test Code K, C or S X7R (pF)	Part Numbers	Performance Curves	Web Link
0201	0.012 (0.305) ± 0.002 (0.051)	0.025 (0.635) ± 0.004 (0.102)	0.018 (0.457)	0.008 (0.203)	0.0015 (0.038) ± 0.0005 (0.013)	10	10,000+82					LBB0201X103ME * * C8 *	PDF	WEB
						5					10,000+82	SBB0201X103MBN * N8*		
0302	0.020 (0.508) ± 0.002 (0.051)	0.031 (0.787) ± 0.004 (0.102)	0.020 (0.508)	0.008 (0.203)	0.00425 (0.108) ± 0.0015 (0.038)	50			3,900+82			MBB0302X392M2 * * C8 *		
						20	12,000+82					LBB0302X123MH * * C8 *		
						16			10,000+82			MBB0302X103MG * * C8 *		
						16			12,000+82			MBB0302X123MG * * C8 *	PDF	WEB
0402	0.023 (0.584) ± 0.003 (0.076)	0.045 (1.143) ± 0.004 (0.102)	0.032 (0.813)	0.008 (0.203)	0.0025 (0.064) ± 0.0010 (0.025)	75	20,000+82					LBB0402X203ML * * C8 *		
						16	100,000+82					LBB0402X104MG * * C8 *	PDF	WEB
						16			100,000+82			MBB0402X104MG * * N8 *		
						16					10,000+82	SBB0402X103MG * * N8 *		
						6.3					100,000+82	SBB0402X104MCN * N8 *		
						100			8,200+82			MBB0502X822M3 * * C8 *		



Capacitance Codes for Multilayer Capacitor

First Two Digits = Significant figures of capacitance in picofarads
Third Digit = Additional number of zeros
Example: 0R1 = 0.1 pF; 1R0 = 1.0 pF; 100 = 10 pF; 102 = 1,000 pF; 104 = 100,000 pF

Standard Capacitance Tolerance

Code	Tolerance
M	± 20%
Z	-20%, +80% for all Y5V Dielectric

Termination Codes

Code	RoHS Comp.	Typical Application	Termination Build up	Recommended Reflow Temp.
T	Yes	Solder Reflow	Palladium-Silver Nickel Barrier Plated 100% Tin	220°C to 260°C typical*
N	No	Solder Reflow	Palladium-Silver Nickel Barrier Plated 90/10 Tin Lead	220°C to 260°C typical*
P	Yes	Conductive Epoxy Non-Magnetic	Palladium-Silver	Cure Epoxy as per manufacturer's spec.

Other Terminations available. Please contact factory.

Working Voltage (See Page 13)

Code	WVDC	Code	WVDC
3	100	G	16
L	75	F	12
2	50	E	10
1	25	C	6.3
H	20	B	5

Packaging Codes

1 = Tape and Reel
5 = Waffle Pack

RoHS

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

Special Codes for Second Cap Value

Code	Nominal Capacitance
8	82 pF
2	220 pF
4	1 pF

Quality Control

100% Testing and Screening performed on the premises at our DLA approved test lab

- Life-Test 125°, 200°, 250°C+
- Voltage Conditioning (up to 10kV +)
- Moisture Resistance (85ºC/85%RH)
- Humidity, Steady-State, Low Voltage
- Ultra-Sonic Imaging (x4)
- Destructive Physical Analysis
- Scanning Electron Microscope
- X-Rays imaging
- Corona Testing (High Voltage)
- Pulse, AC Power
- Solderability
- Resistance for flexure stress
- Resistance to solder heat
- Thermal Shock/Temperature cycle
- Wire Bond Evaluation
- Termination Strength pull testing
- Prohibited Material Inspection (XRF)
- Visual inspection
- Voltage/Temperature limits
- Element Electrical (Cap, DF, DWV, IR & Hot IR)

Thank You for your interest In PRESIDIO products lines

We are here to help and we are planning to continue supporting our customers on the long run

CONTACTS:

AT THE San Diego PLANT

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