



PRESIDIO COMPONENTS, INC.

# **PME CAPACITORS**

## **Extended Range For**

# **SPACE APPLICATIONS**

# **NASA SPEC S311-P-829**

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# WHY A NEW SPEC.?

## NEED FOR:

### **A.** LIGHTER/SMALLER CAPS

(0402 min. versus 0805 min. Planning 0201 for 2014)

### **B.** LOWER VOLTAGE

(5 V min. versus 50 V min.)

### **C.** LOW INDUCTANCE

(reverse geometry)

### **D.** MORE CAPACITANCE per case size



	0402	0403	0504	0603	0805	1206	1209	1712	1725	2225	DT
10 Volt	0.01			0.22	1	1.8	2.7	4.7			0.3
16 Volt	0.0068	0.022	0.082	0.1	0.22	0.39	0.68	1.2	3.3	3.9	0.4
25 Volt	0.0047	0.015	0.047	0.027	0.1	0.27	0.47	1	2.2	3.3	0.8
50 Volt	0.0039	0.012	0.039	0.022	0.1	0.22	0.39	0.68	1.8	2.2	0.8
100 Volt	0.0012	0.0022	0.0068	0.0033	0.022	0.1	0.15	0.27	0.68	1	1

**S-311-P-829 OFFERS MUCH WIDER RANGE OF PARTS  
THAN MIL-PRF-123**



**1980**

1209  
MIL-123

## SMALLER CASE SIZES EVOLUTION OF 0.1 $\mu$ F for SPACE

**2003**

0805  
Presidio SCD

**2006**

0603  
NASA SCD

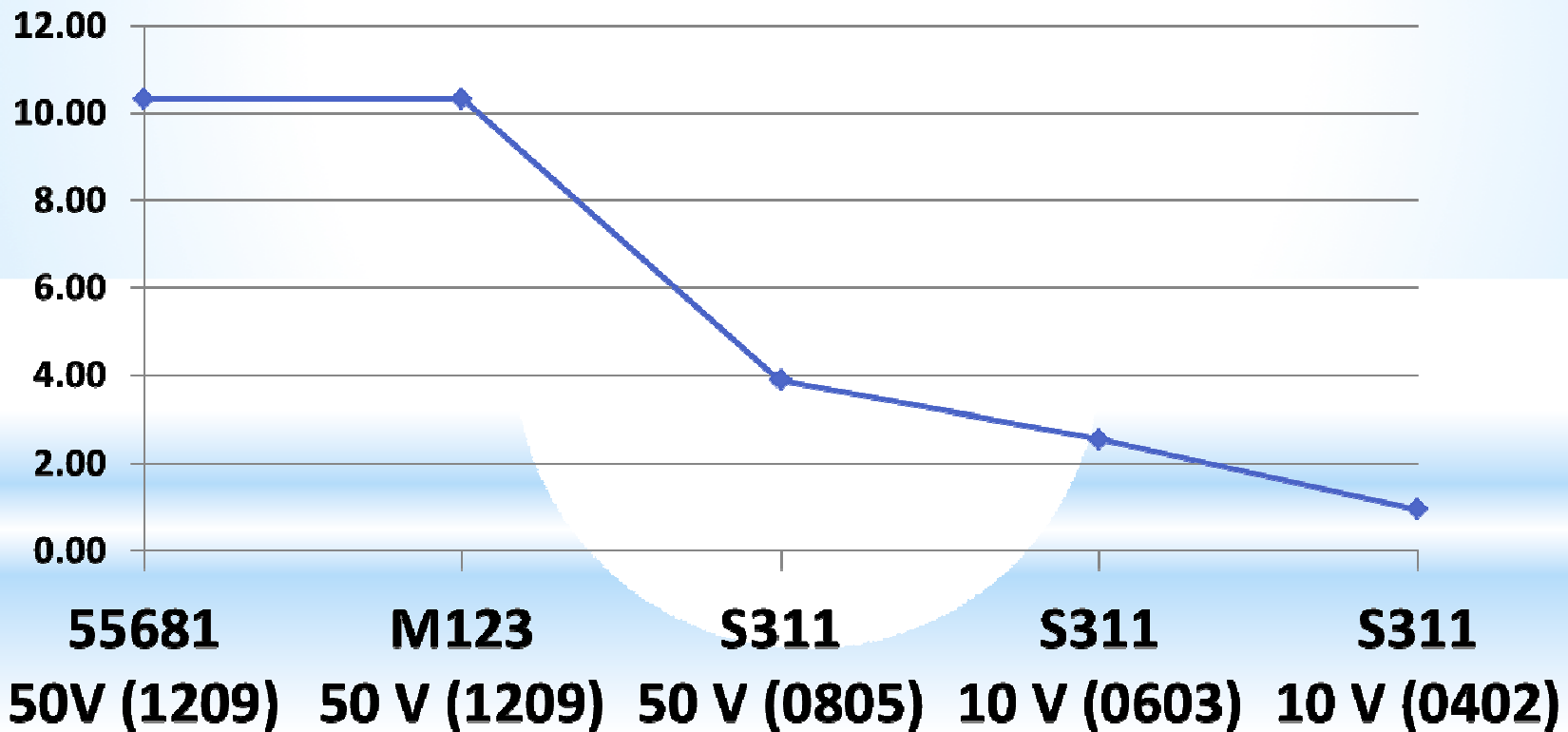
**2014**

0402  
NASA S-311



# SMALLER CASE SIZES

(mm<sup>2</sup>) REDUCTION IN AREA  
(Capacitor + Mounting pads) for 0.1  $\mu$ F



## SPACE QUALIFIED PARTS

- 1) R&D on PME is active
- 2) We can go **thin** with PME  
Space: 7.5  $\mu\text{m}$  – Commercial: 2  $\mu\text{m}$
- 3) We can test small parts (0201)
- 4) No compromise on the screening  
*(Tougher than MIL-PRF-123)*

**TOR COMPLIANT**



## R & D on PME is ACTIVE

- We are working with our suppliers which in many cases also supply the BME capacitor industry to improve dielectrics, grain size, metal powders, purity.
- Internally we are continuously optimizing our processes, design, tape casting, terminations, reduction of defects



## MORE CAPACITANCE

I. DIFFERENT DIELECTRIC  
*HIGHER K - X7R versus BX*

II. THINNER LAYERS  
7.5  $\mu\text{m}$  AVAILABLE FOR SPACE APPS





# Dielectrics: Characteristics

	<b>X7R</b>	<b>BX</b>	<b>NPO/BP</b>
<b>K (typical)</b>	4000	2200	90
<b>Q (typical)</b>	60	100	1000
<b>TC (-55/+125 °C)</b>	±15% max.	±15% max.	±30 ppm/°C

	LAYERS	DT (inches)	Grains per Layer
G311P829BRX475L5N1	100	.0005	>10



## LOWER VOLTAGES

- MOST CIRCUITS WORK AT VERY LOW VOLTAGES
- NO NEED FOR THE 50 V min. OF M123
- 5, 6.3, 10, 16 and 25 V AVAILABLE WITH S311



## LOW INDUCTANCE CASE SIZES for HIGH FREQUENCY APPLICATIONS

- NO REVERSE GEOMETRY  
AVAILABLE WITH **M123**
  
- 0306, 0508, 0612 AND 0912  
HAVE BEEN ADDED TO **S311.**



## We can go thin with PME (0.3 mil or 7.5 $\mu\text{m}$ )

- M123 specifies 0.8 mil minimum but in practice the layers are much thicker (1.2 mils min)
- Started 10 years ago with a true 0.8 mil (0805 - 0.1  $\mu\text{F}$  – 25 V)
- Currently – 0.3 mil (0805 - 1  $\mu\text{F}$  – 10V)



# NO SILVER MIGRATION ISSUE WITH LOW VOLTAGE LIFE TEST

TEST PERFORMED: 0603, X7R, 0.1 uF, 5V, Tin-Lead

- 1.5 V
- 4000 H
- 1300 pcs
- 125 °c
- 0 failure

**NO EVIDENCE OF SILVER MIGRATION WITH THIN LAYER PME**



# WE CAN TEST SMALL CASE SIZE DOWN TO 0201

THE FOLLOWING SCREENING IS ROUTINELY PERFORMED ON 0201:

- ULTRASONIC SCANNING
- VOLTAGE CONDITIONING
- LIFE TEST

**We are working on adding 0201 0.01 $\mu$ F 10V to  
the S311 drawing**



# NO COMPROMISE ON SCREENING TOUGHER TESTING than MIL-PRF-123

QUALIFICATION: more stringent than M123

(125 PC/4000 hr life test/0 Failures)

LOT TESTS:

**Group A**: (same as M123) PDA final 48 h Presidio counts all hard electrical failures towards final 48 hour & overall PDA

**Group B** Life Test Sample Size Based on Dielectric Thickness

**ZERO FAILURES ALLOWED IN LIFE TEST**

**TOR COMPLIANT**



For ALL our G311 parts from 2010 to 2013

OPERATING TEMPERATURE	50 °C	85 °C	105 °C	125 °C
OPERATING VOLTAGE	50% OF RATED	50% OF RATED	50% OF RATED	RATED
ACCELERATED HOURS	2.5 TRILLION	100.98 BILLION	15.98 BILLION	317 MILLION
FIT/FAILURE RATE	<.0004	<.01	<.06	S LEVEL