The Capacitance Company

KEMET

CHARGED.™

Capacitor Consortium Meeting

CU-ICAR

January 21, 2009

Outline

- **KEMET Background**

- **Some New Products**
  - Film and Electrolytic Capacitors for Green applications
  - Low Inductance Ta-Polymer For Decoupling Applications
  - High Voltage Tantalum-Polymer for Power Supply
  - 200°C Ceramics for Extreme Environments

KEMET Milestones

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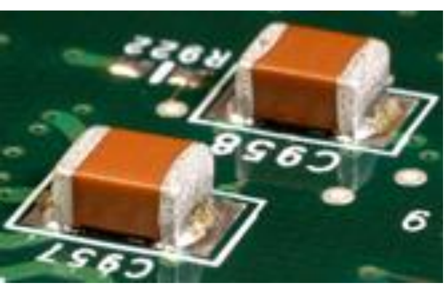


2007 **Arcotronics acquisition**

2007 **Evox Rifa acquisition**

2006 **EPCOS tantalum business acquisition**

2004 **TS16949 Certification**

2001 **First Solid Aluminum Capacitors (AO-CAP)**

1997 **First Organic Polymer Capacitors (KO-CAP)**

1997 **QS-9000 Certification**

1992 **KEMET went public**

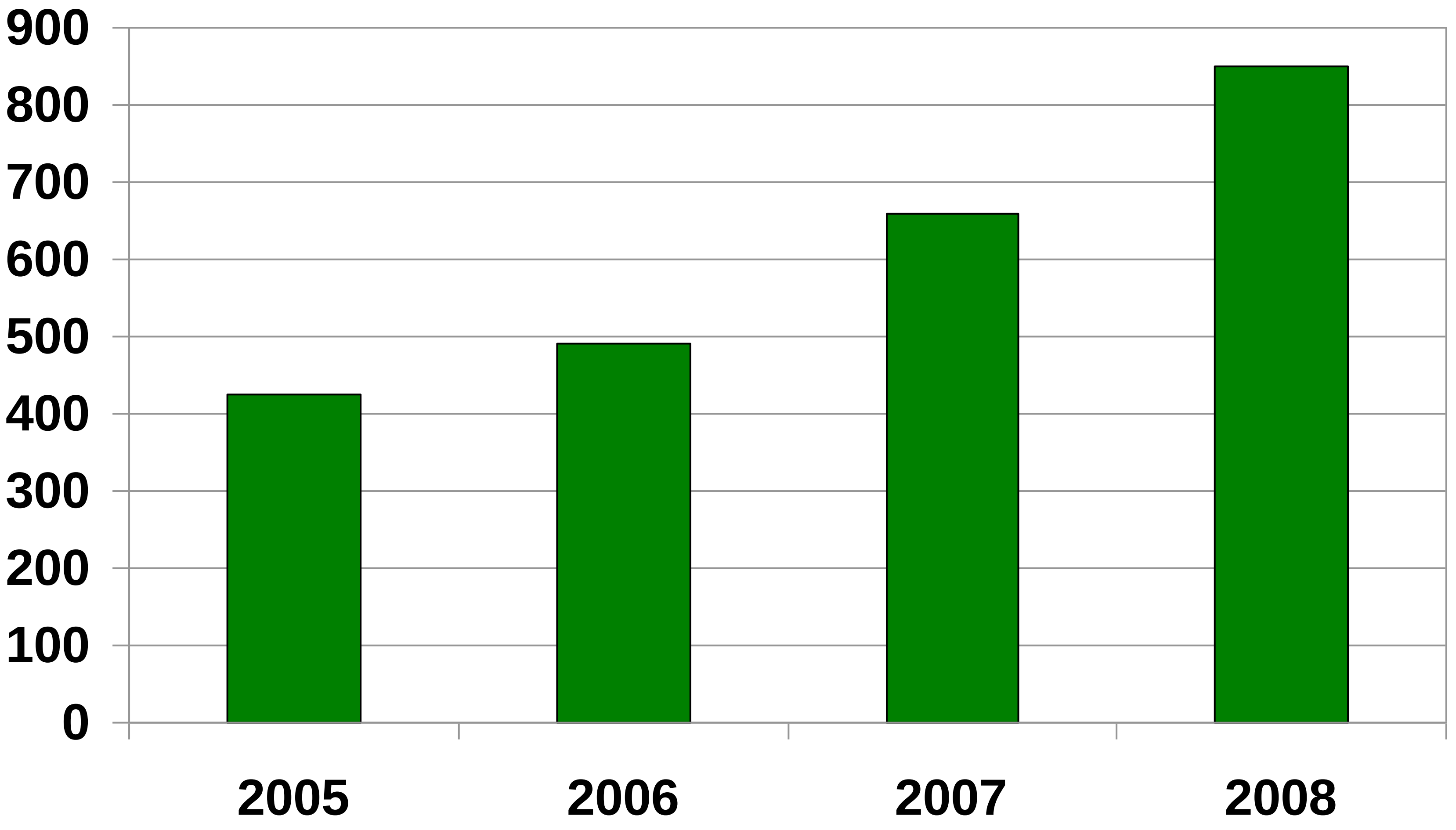
1987 **KEMET Electronics Corporation was formed by a management LBO**

1950's **Transistors and solid tantalum capacitors were invented by Bell Labs**

1930 **KEMET began manufacturing barium-aluminum alloy getters for use in vacuum tubes**

1919 **KEMET Laboratories was founded by Union Carbide**

Sales
($ Millions)



Worldwide Locations

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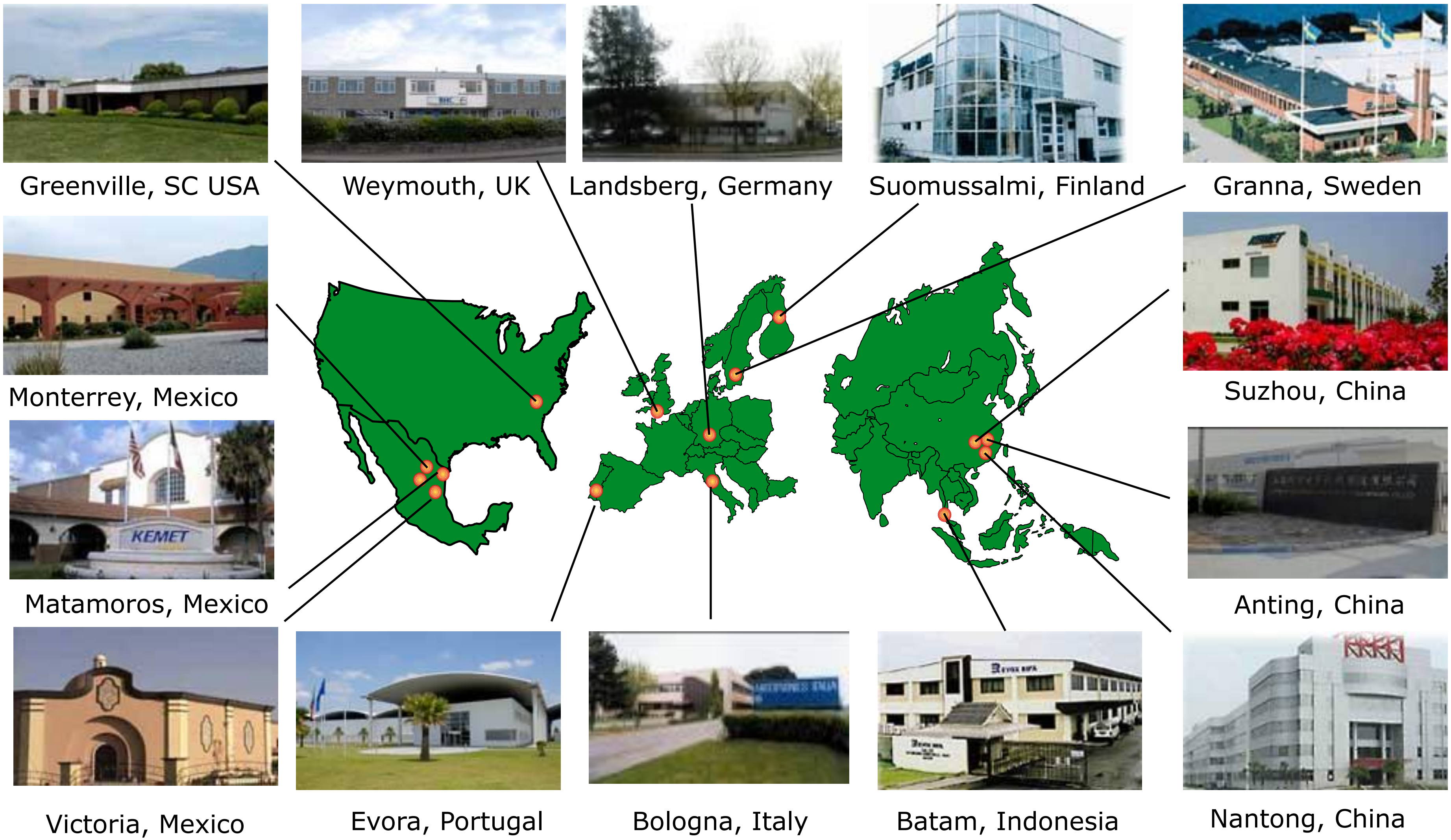

Balanced Business Mix:
Market Segments and Products

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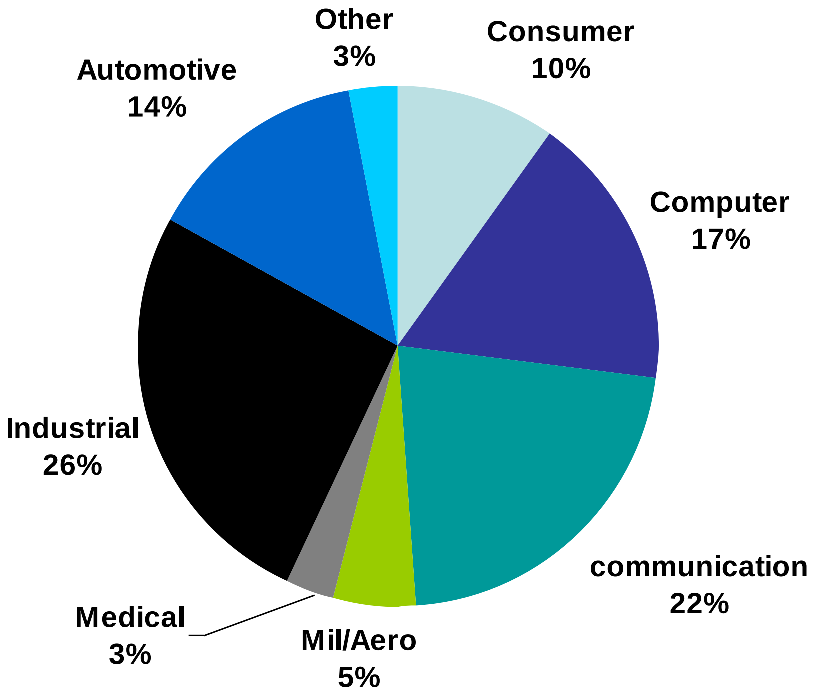
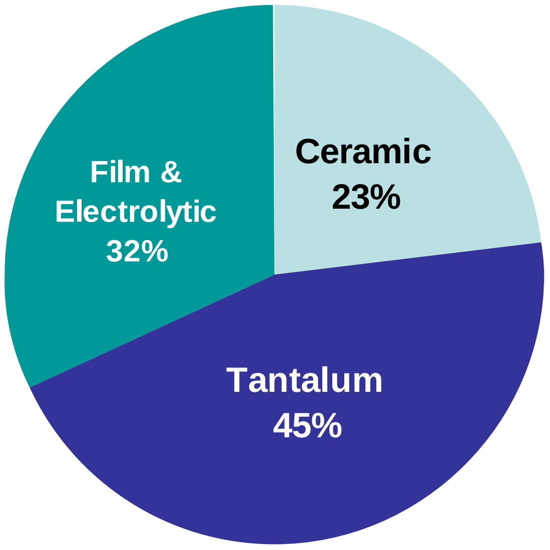
End Markets



September 30, 2008

Product Lines



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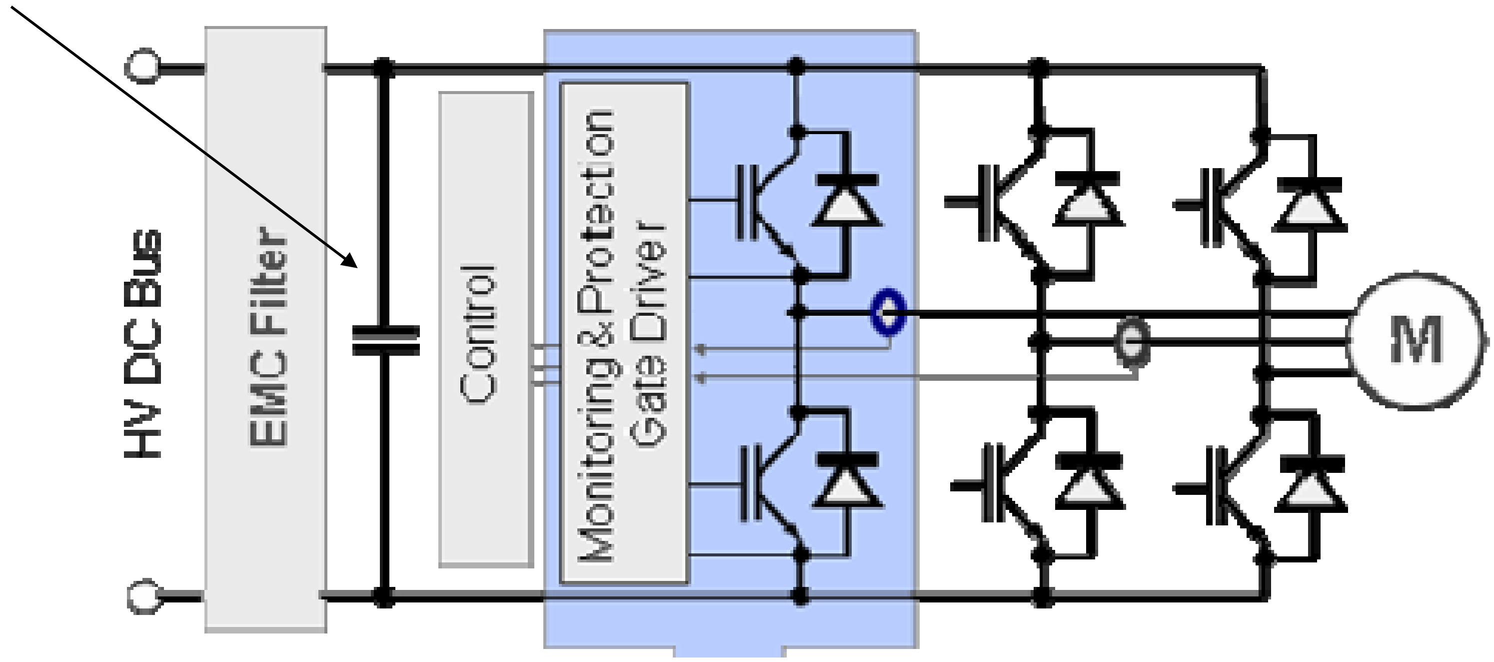
Green Energy Applications

DC-Link Capacitor



Power Capacitors for Green Applications
DC-Link and AC Filter

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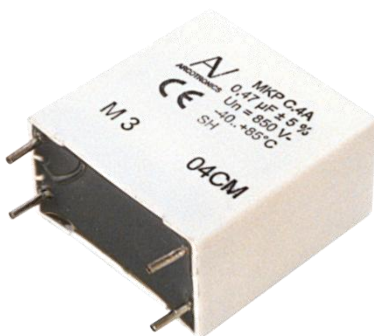
Small Film	Electrolytic	Large Brick Film
		

Small Film

For low power application.

PCB mounting

FOR SOLAR POWER

(several parallel in a bank)

Electrolytic

For medium/high power application.

For modular solution

FOR INDUSTRIAL OR WIND POWER

Large Brick Film

For medium/high power application.

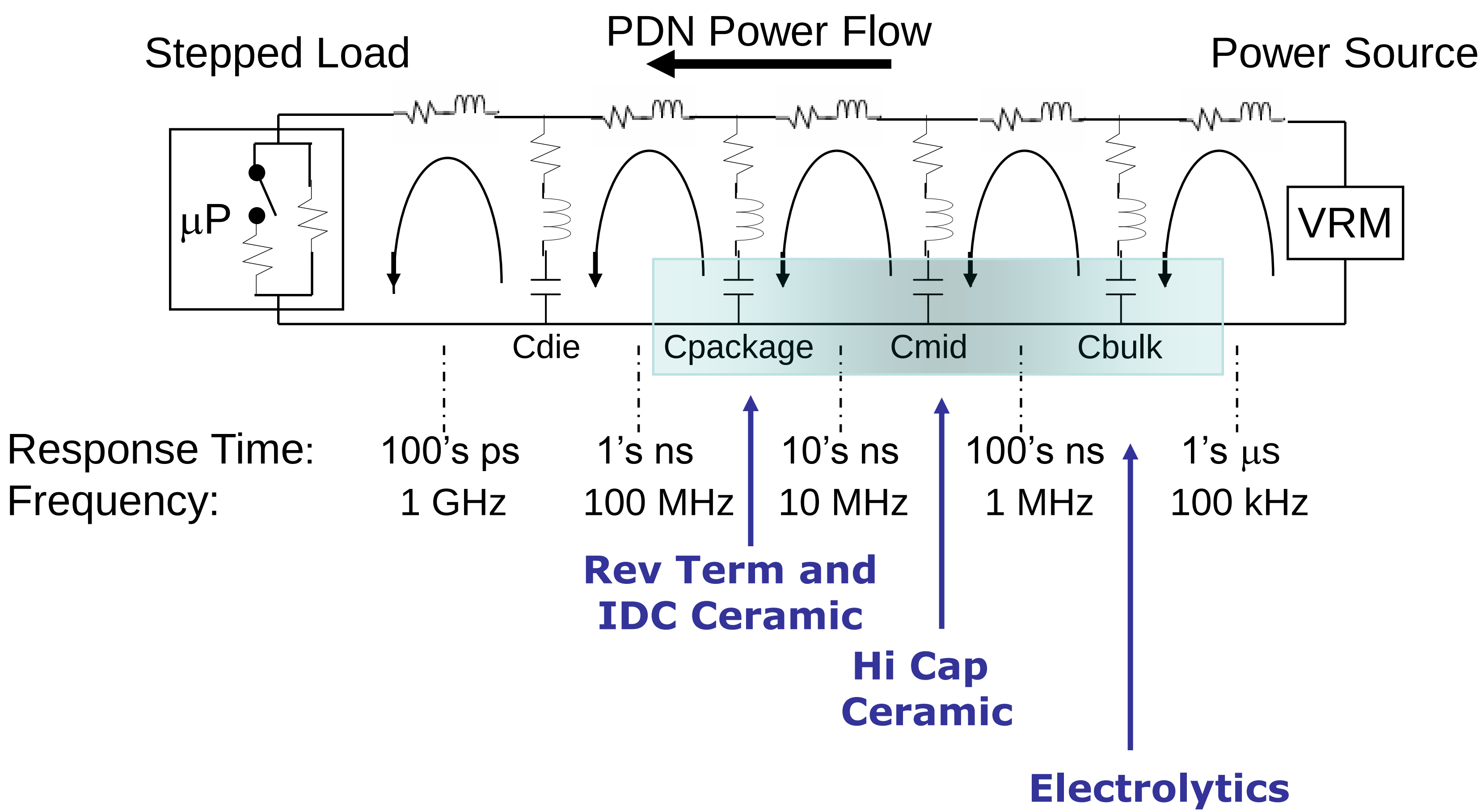
FOR HYBRID

AUTOMOBILE

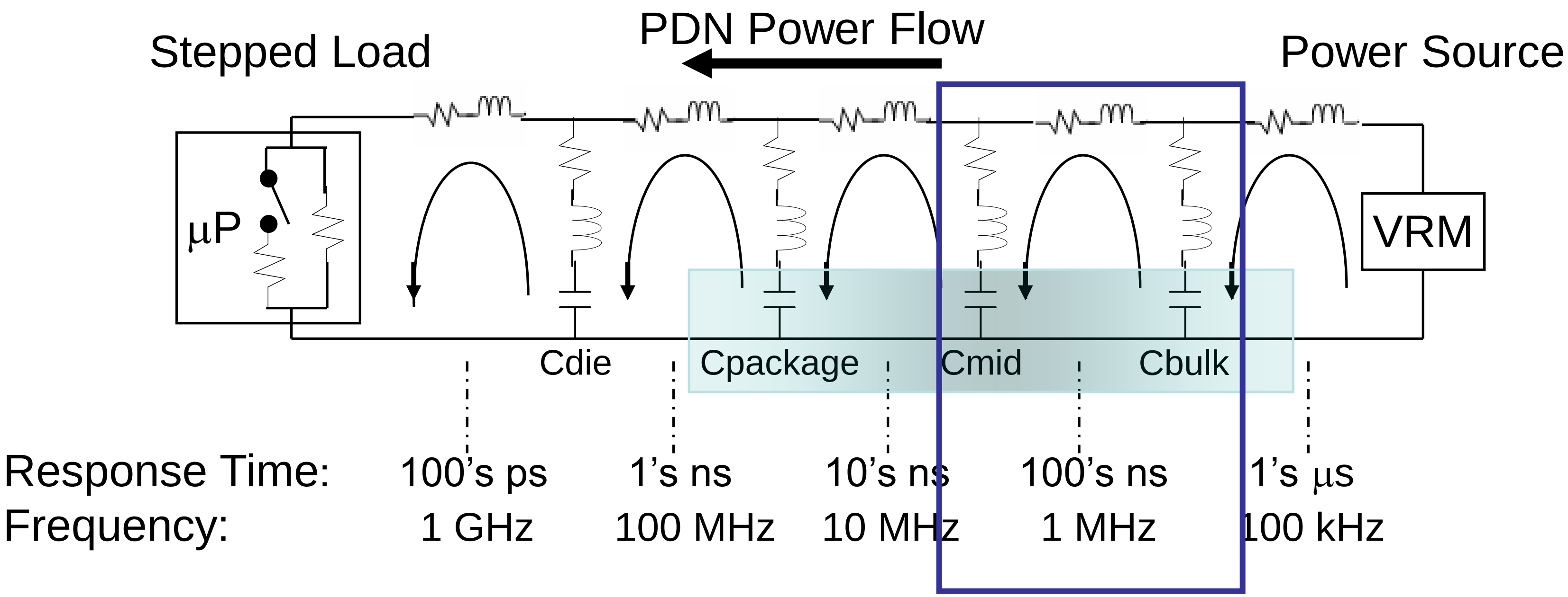
AND

INDUSTRIAL POWER

µP Power Distribution Networks



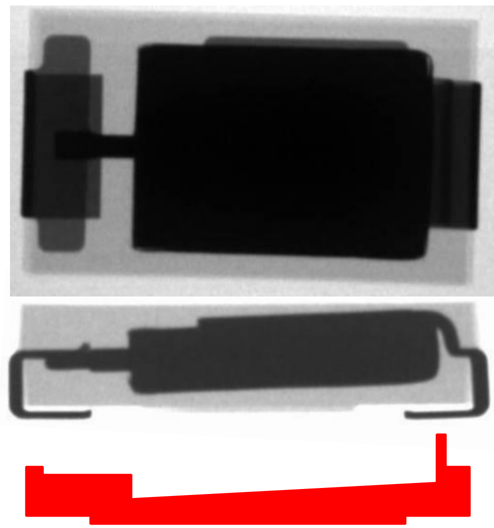
µP Power Distribution Networks



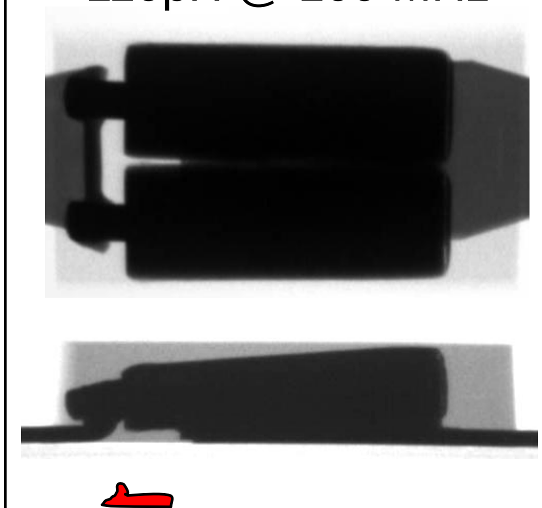
Low ESL
Polymer Electrolytic

Comparison of Standard and Low ESL Construction

KEMET T520V
~1250pH @ 100 MHz

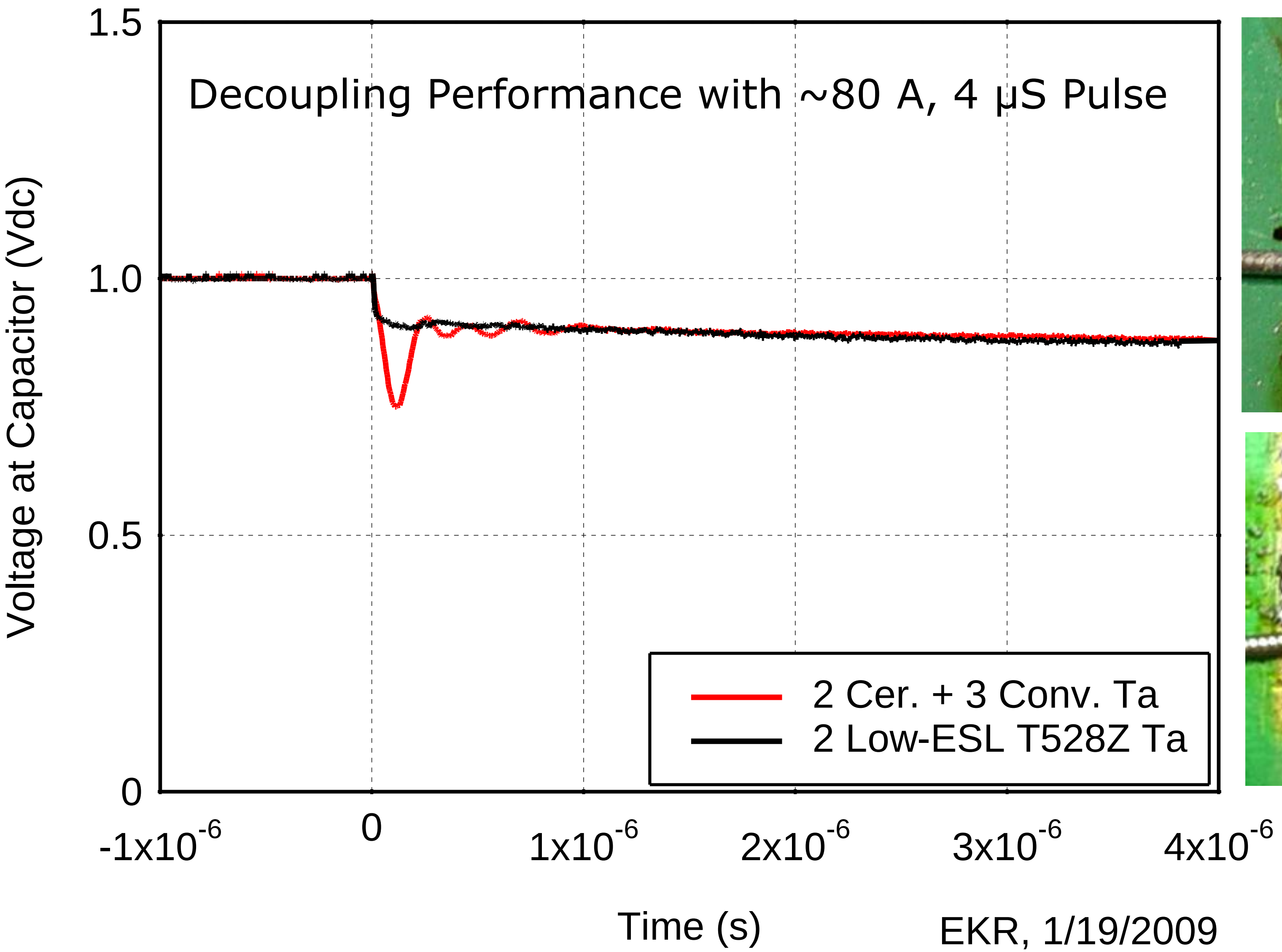


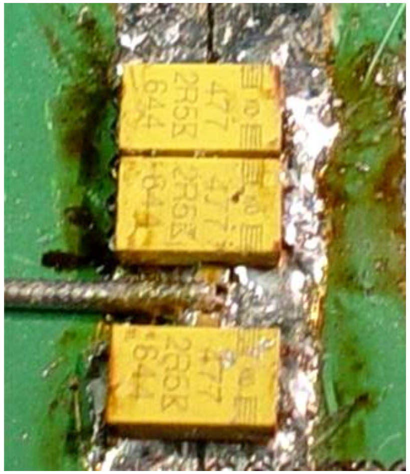
KEMET T528Z
~110pH @ 100 MHz



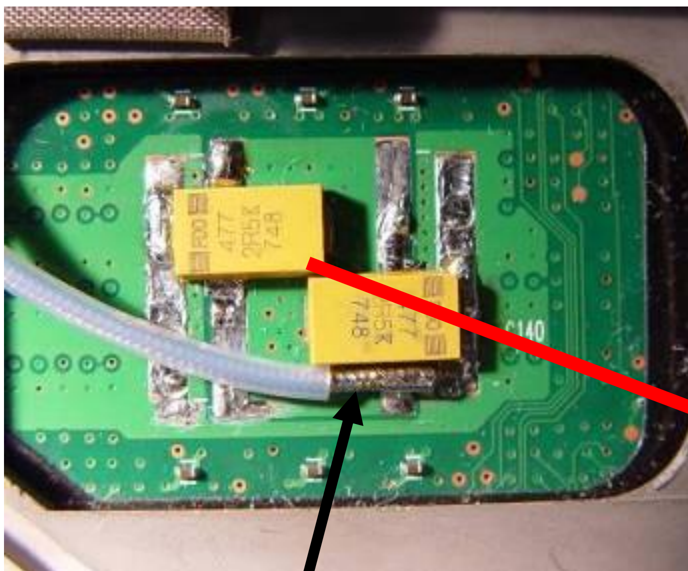
ESL is driven by loop area defined by the HF current path above the circuit board plane

Comparison of Standard and Low ESL Solutions





KEMET T528Z in Laptop with No Bulk Ceramics



Voltage Probe

Progress in Tantalum Capacitors

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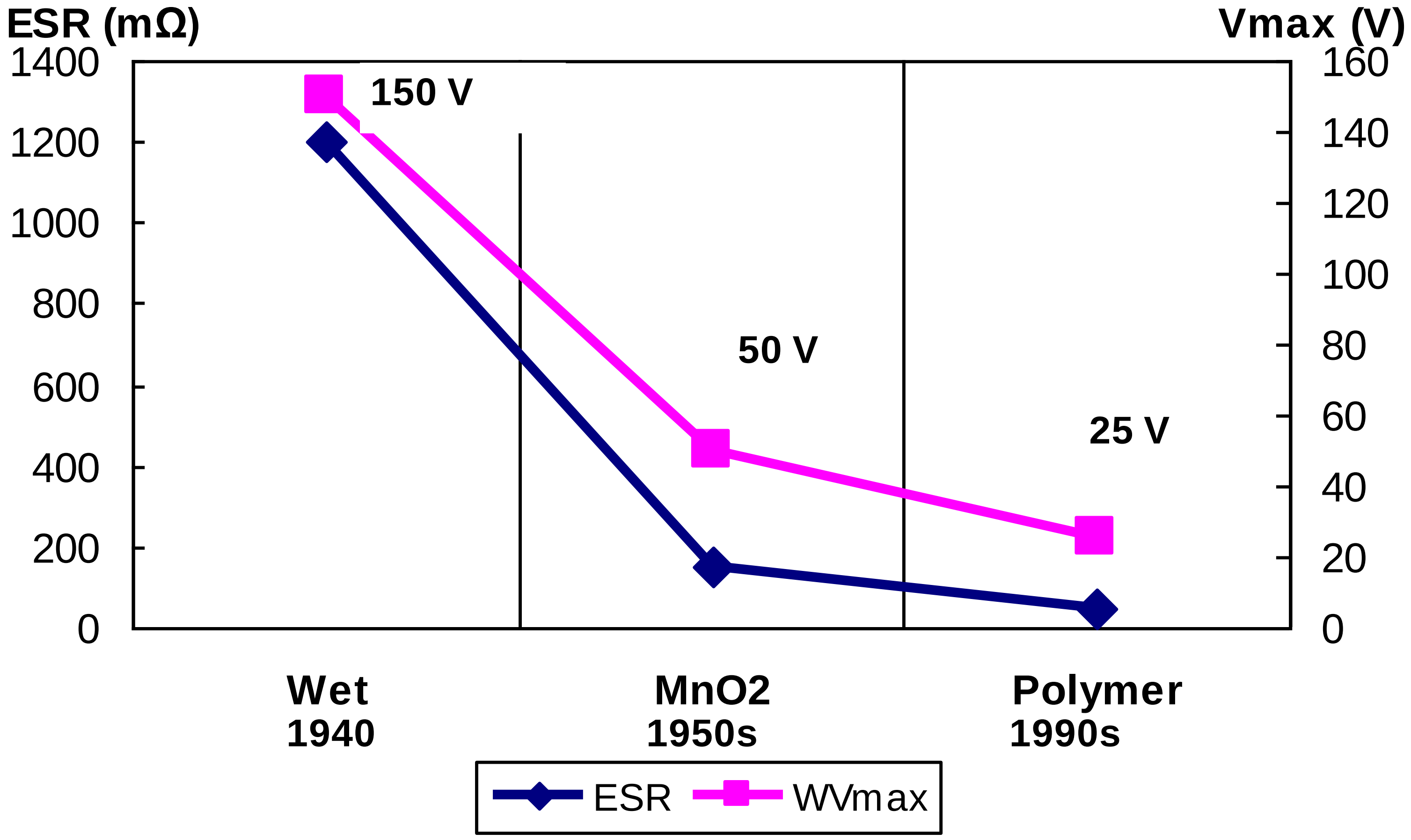

D-case

Breakdown Voltage

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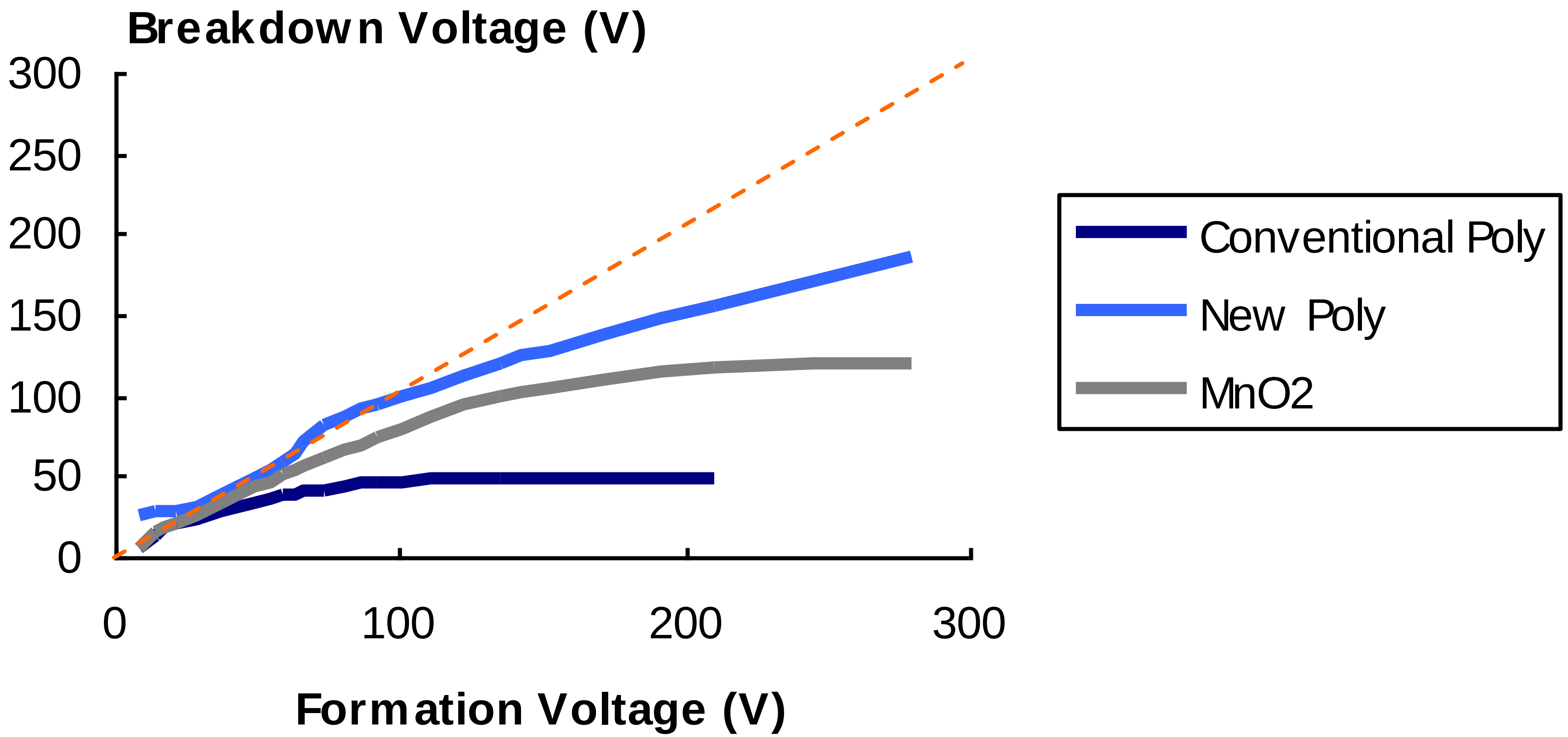

KO High Voltage Product Development

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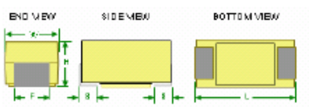
KEMET WORLD

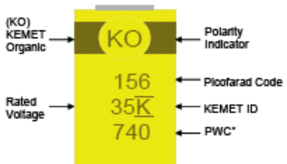
KEMET Introduces the First 35 Volt Rated Polymer Tantalum Capacitor

Component Dimensions and Case Codes



Case Codes		Component Dimensions (mm)				
KEMET	EIA	L	W	H	F ± 0.1	S ± 0.3
V	7343-20	7.3±0.3	4.3±0.3	1.9 max	2.4	1.3

Component Marking



* 740 = 40th week of 2007

Explanation of Part Number

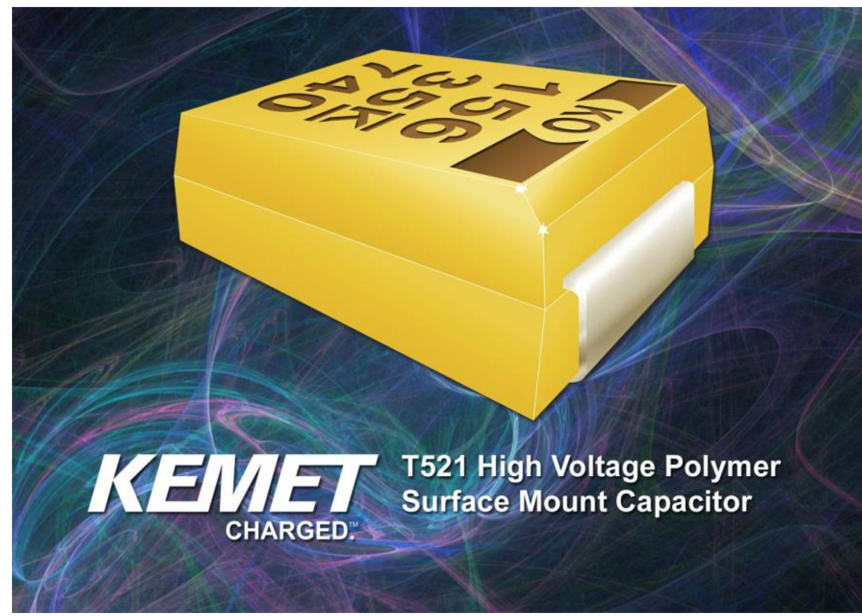
T521	V	156	M	035	A	T	E125
Series	Case Code	Capacitance	Capacitance Tolerance (M=20%)	Voltage	Failure Rate (A=Not Applicable)	Termination Material T = 100% Sn (H = 90%Sn/10%Pb)	Maximum ESR Limit E125=125mΩ

Part Number Specification

KEMET Part Number	KEMET Part Number	Cap (µF)	Voltage	DCL VR (µA)	DF 120Hz (%)	ESR 100KHz (mΩ)	Maximum allowable ripple current (mArms) 100kHz*	MSL Reflow Temp ≤260°C
T521V156M035A(1)E125	V/7343-20	15	35	52.5	10	125	1200.0	3.0

(1) To complete KEMET Part Number, insert letter designation for lead frame material

*100KHz to 500KHz, 45 C



Clemson-KEMET Joint Research

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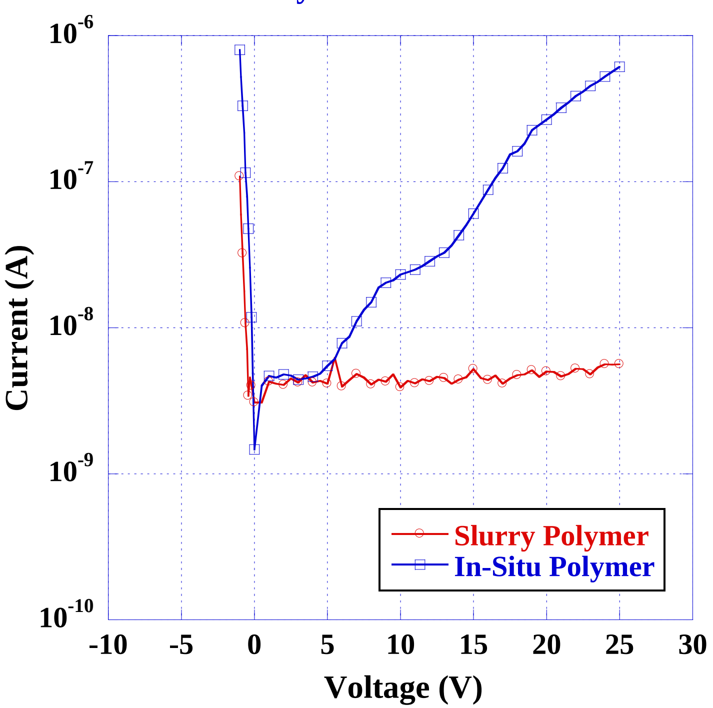
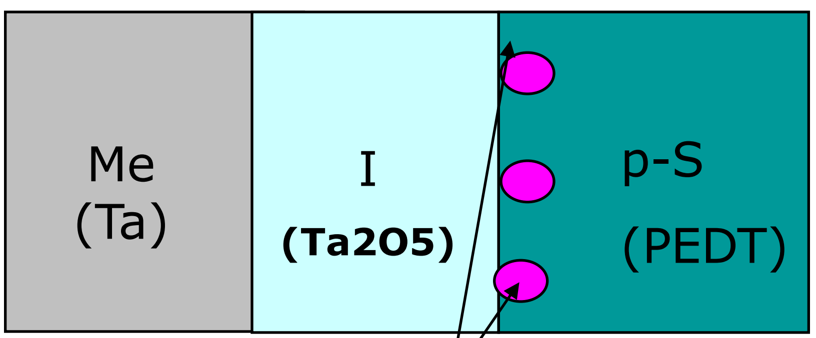
Slurry & In-Situ Polymer I-V @ T = 300K
Delay Time = 65 seconds



•**Local charge forms in In-situ polymer on its interface with Ta Oxide during polymerization reaction, pinning the barrier on IS interface.**

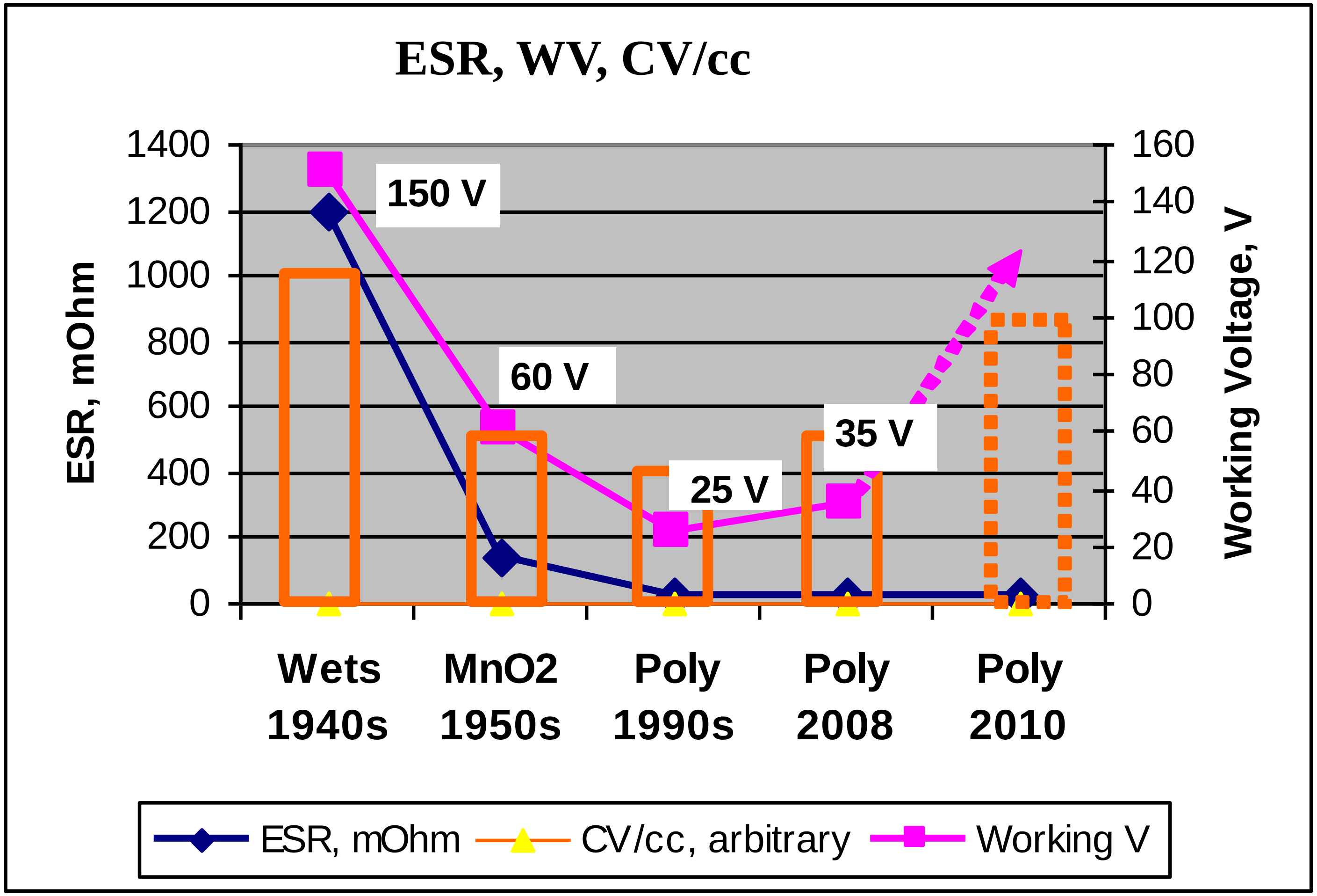
•**In case of Slurry, the barrier on I/S interface is <u>not</u> pinned, it increases with voltage, which results in low current and Hi BDV at normal polarity.**

MIS Model (Al-SiO_2-Si)

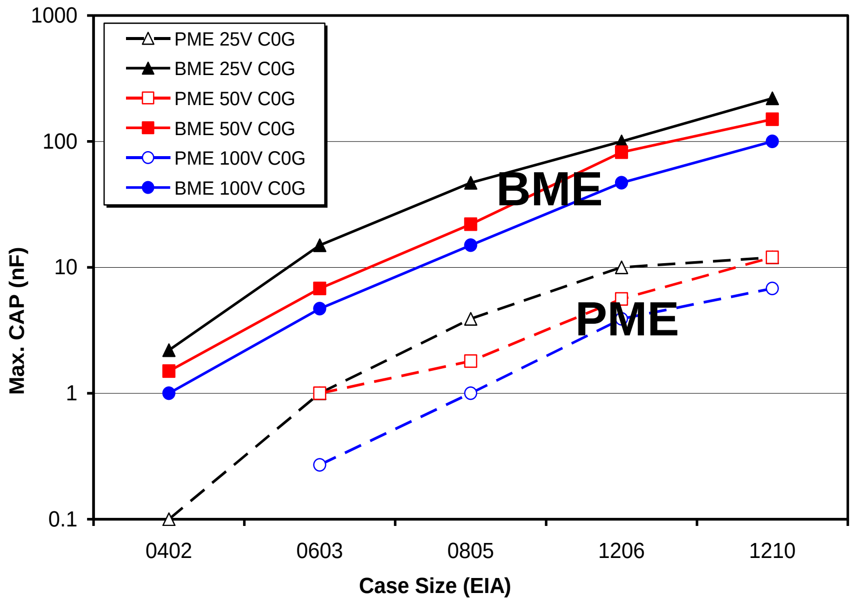


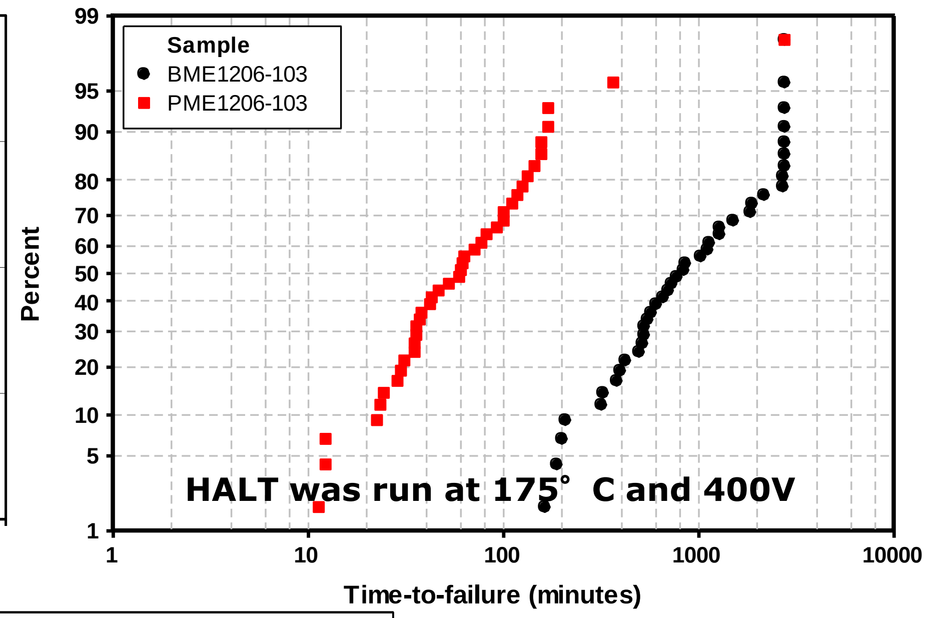
Surface charge on I/S interface with In-situ Poly

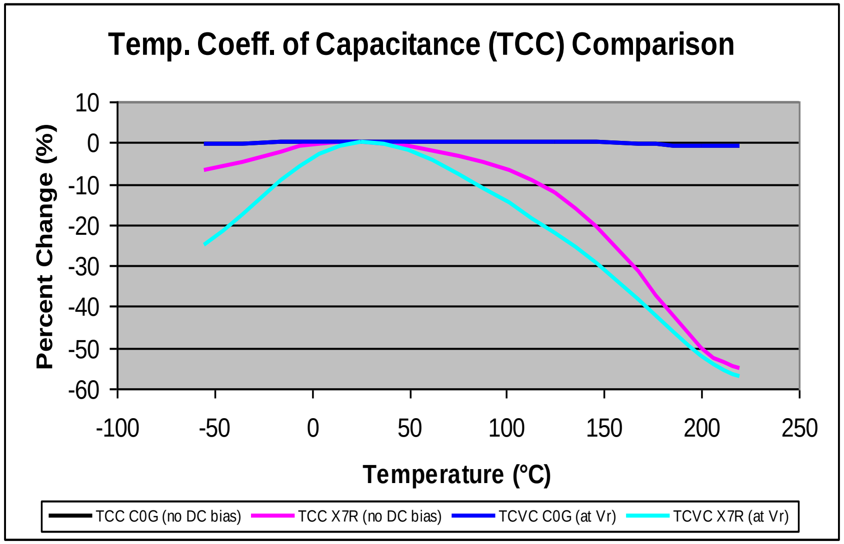
Future Possibilities



KEMET's new BME-C0G







High Temperature MLCC Offering

Characteristic	KEMET C0G	Industry 200°C X7R
Capacitance/Voltage Ratings	◉	◉
TCC (Temperature Stability)	☑	◉
VCC (Voltage Stability)	☑	◉
Aging Rate	☑	◉
Piezoelectric Effects	☑	◉
ESR/Q Factor Stability	☑	◉
Insulation Resistance Stability	☑	◉

High Temperature (200°C) Product Line

Description

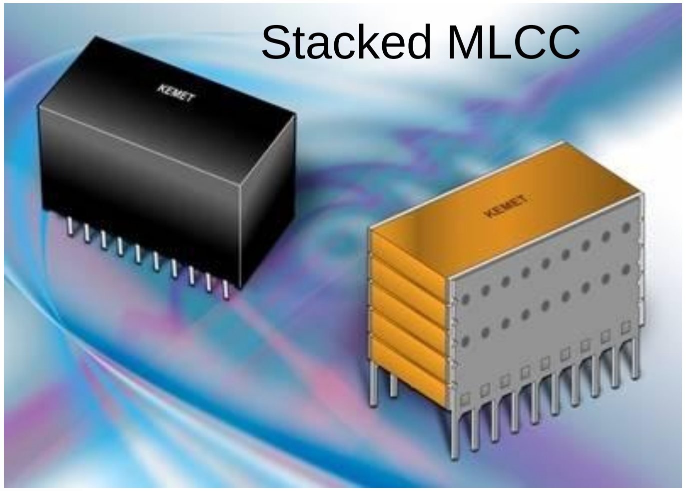
- Surface Mount MLCC’s and stacked capacitors capable of 200°C applications
- Surface mount chips with reliable BME C0G & PME X7R dielectrics featuring world class TCVC characteristics and high reliability.
- C0G SMD’s that exceed X7R max cap at application temperatures.
- Sn plating for excellent solderability.

Applications:

- Bypass, filtering, decoupling capacitors

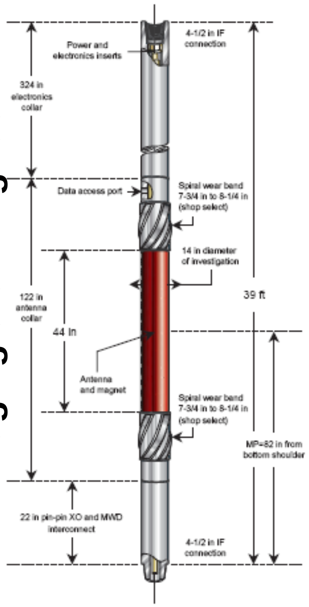
Markets

- Downhole Drilling
- Defense and Aerospace



Stacked MLCC

Single Chip MLCC



Imaging & drilling tool