

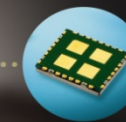
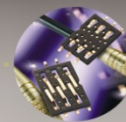
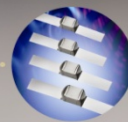


A KYOCERA GROUP COMPANY

TANTALUM CAPACITORS for EUROPEAN AEROSPACE

ESCCON

17th March 2011



A Kyocera Group Company

Tomáš Zedníček
Technical Marketing Group
AVX Czech Republic
Tantalum Division

- COMMERCIAL PRODUCT STRUCTURE**
- APPLICATION HIGHLIGHTS**
- ESCC / MIL / COTS+ TANTALUM CAPACITORS**
- EUROPEAN SPACE QUALIFICATION & DEVELOPMENT**



A KYOCERA GROUP COMPANY

PRODUCT LINECARD

CERAMIC CAPACITORS



Surface Mount Multilayer Ceramic Capacitors

Automotive	HICV
MIL/Cos+Space	High Temperature
CDR/High Reliability	Array
Flexform®	Tip and Ring
Flexlead™	Low Distortion
UltraThin	Gold Terminated
Tin/Lead	Tin/Lead w/ Flexform®



Switch Mode Power Supply Capacitors (SMPS)

MIL/Space	High Temp
Leadless	High Voltage
TurboCap™	



Leaded Multilayer Ceramic Capacitors

Axial	High Voltage
Radial	MIL/Space/High Reliability
2-Pin Dip	



High Voltage

Surface Mount	Flexform®
Leadless	MIL

Glass Capacitor

LOW INDUCTANCE / SIGNAL INTEGRITY



Reverse Geometry

Interdigitated

Ultra Low Inductance

CoreCap® Hybrid Niobium Oxide - MLCC

Low Inductance Array

TANTALUM CAPACITORS



Surface Mount Tantalum Capacitors

Low ESR	High Temp (THL)
CWR	Established Reliability
Polymer	TAOnicrochip®
Fused	Tin/Lead



Leaded Tantalum Capacitors

Wet Tantalum
Radial Leaded



Niobium Oxide / OxiCap®

Low ESR
COTS Plus
Multinode

RF PRODUCTS



Inductors – Thin-Film

Filters

Band Pass	Custom
Low Pass	EM

Passive Miniaturized Components



Couplers

3dB	3dB 90°
High Directivity	Splitter/Combiner



Capacitors

Microwave	Medium Power
Single Layer	Tight Tolerance/Thin-Film
High Power	RF Capacitors
Broadband	DC Block

ENERGY HARVESTING



Film Capacitors

Surface Mount Film Capacitors
Medium Power Film
High Power Film



Ceramic Capacitors

Molded Ceramic
Stacked Ceramic



Tantalum Capacitors

Multi-Anode (low ESR)
Stacked Capacitors



Pulse Power Supercap

BestCap®

CIRCUIT PROTECTION



MOV Transient Voltage Suppressors

Varistors
Multi-element Varistors
Varistor Feedthroughs
Application Specific Varistors



AntennaGuard

High Temperature
USB Series
CAN Series
RadioGuard
Automotive Series
Capguard
Medium Power Varistors



Thermistors

Negative Temperature Compensation
Leaded



Surface Mount

Fuses – Thin-Film

CONNECTORS



LED/Solid State Lighting

Wire to Board
Board to Board
End Cap



Board to Board

DIN 41612 2-Piece
Compression Low Profile 1-Piece
Microflex/Fine Pitch 2-Piece



FFC/FPC

ZIF/LIF



Automotive

Custom connectors/modules
Press-fit
Insulation Displacement



Portable Devices

Battery
SIM
Memory Products
Speaker/Microphone
I/O

FILTERS



EM Filters

Surface Mount
High Current
Bulkhead
MIL/Space



Noise Filters

Low Pass Filters

Ceramic Filters

SAW Filters

Filtered Arrays

Optical Low Pass

PIEZOELECTRIC DEVICES



Telephone Ringer/External Drive

External Drive/Self-Oscillating

Shock Sensor

Actuator

TIMING PRODUCTS



Oscillators

Crystals

Resonators

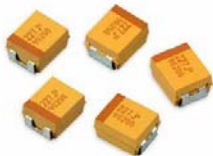
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LEADING PASSIVE COMPONENT SUPPLIER



A KYOCERA GROUP COMPANY



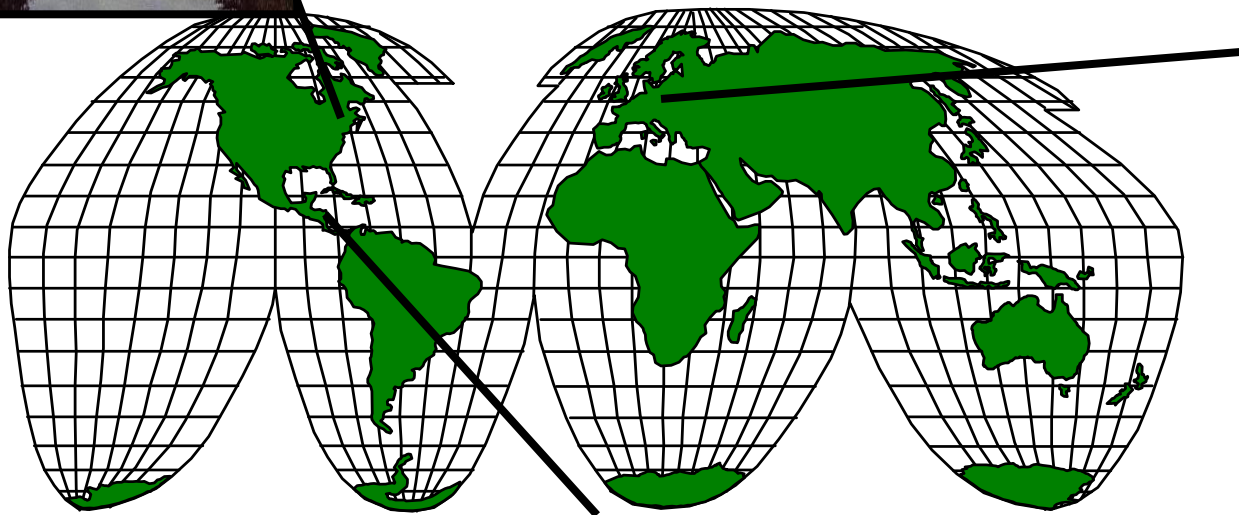
TANTALUM DIVISION

Tantalum and NbO Capacitors



MIL products
**Biddeford
USA**

No.1 Tantalum Supplier
Market Share > 27%



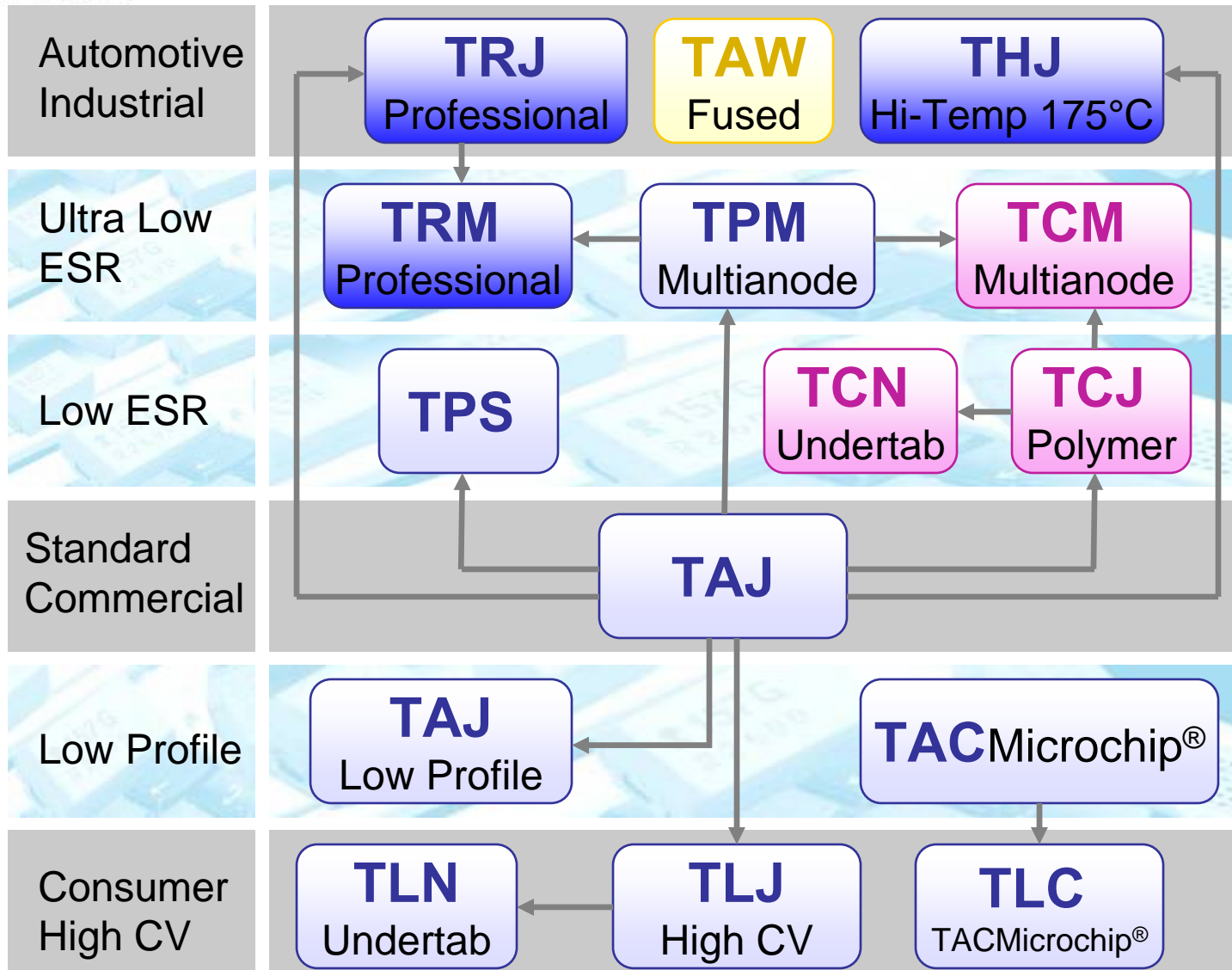
**Lanskroun
Czech Rep.**

**El Salvador
Salvador**
consumer products



High-End Consumer
ESA products
R&D

Tantalum



COMMERCIAL vs PROFESSIONAL

Tantalum Capacitors

- THJ, TRJ high reliability professional / automotive series
 - Improved reliability to 0.5%/1kHrs

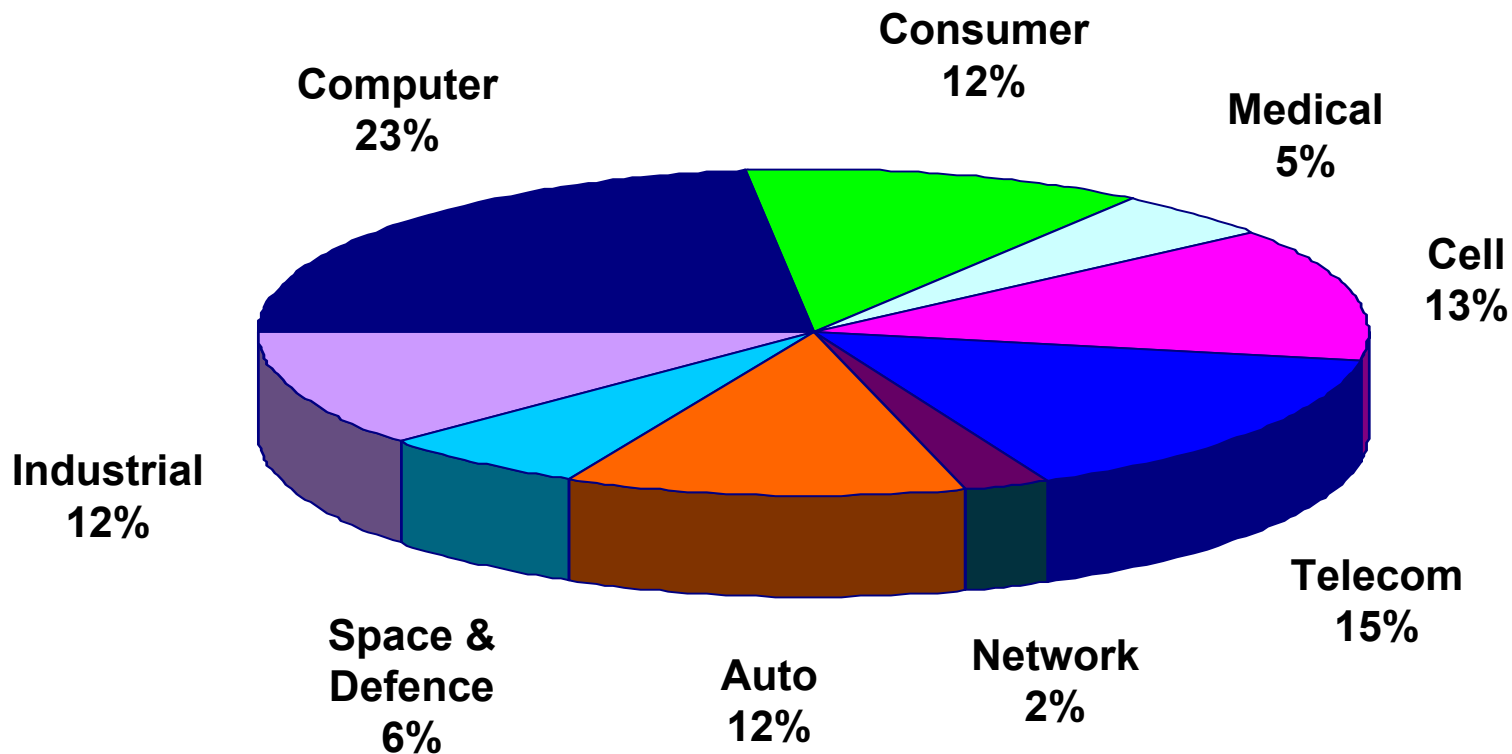
	Commercial	Automotive
Design	Commercial design rules that are less restrictive and do not attempt to account for the harsher environment of automotive.	Restrictive design rules that take the harsher environment of automotive into consideration. One example is an established minimum formation ratio of 3.0
Lot Acceptance	Uses commercial EIA standard	Exception limit controls in place. Rework control limits. Maverick lot prevention controls
Quality Control	Visual Check 0.25% AQL, Electrical 0.25% AQL	Visual Check 0.1%AQL , Electrical 0.1% AQL, (Zero Sampling Plan – A0/R1), Reflow test min 200pcs/Lot
In line verification and test	2 x dynamic surges; minimum burn-in conditions 105C/RV	min 2 x 'hard' dynamic surges ; min burn-in conditions 125C/RV ; temperature cycling



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TANTALUM APPLICATION

End Market Shares





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TANTALUM APPLICATION

CONSUMER DEVICES

LCD/PDP TVs



Cellular phones and other hand held devices



Notebooks



Mobile electronics(Audio/Video)



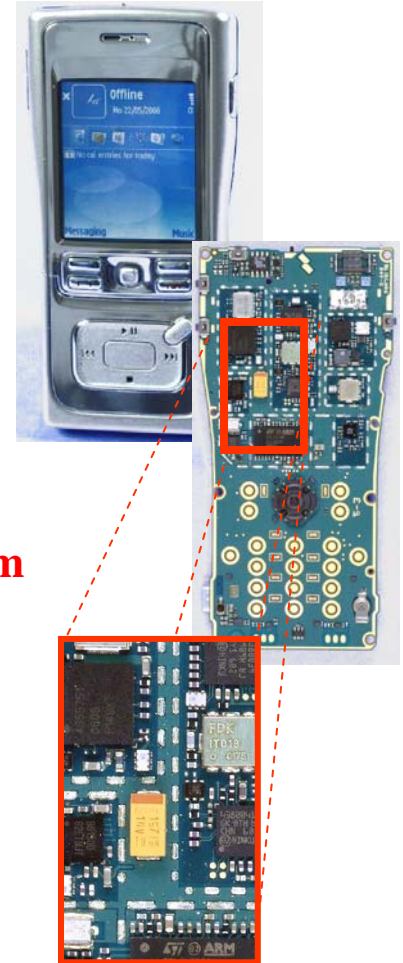
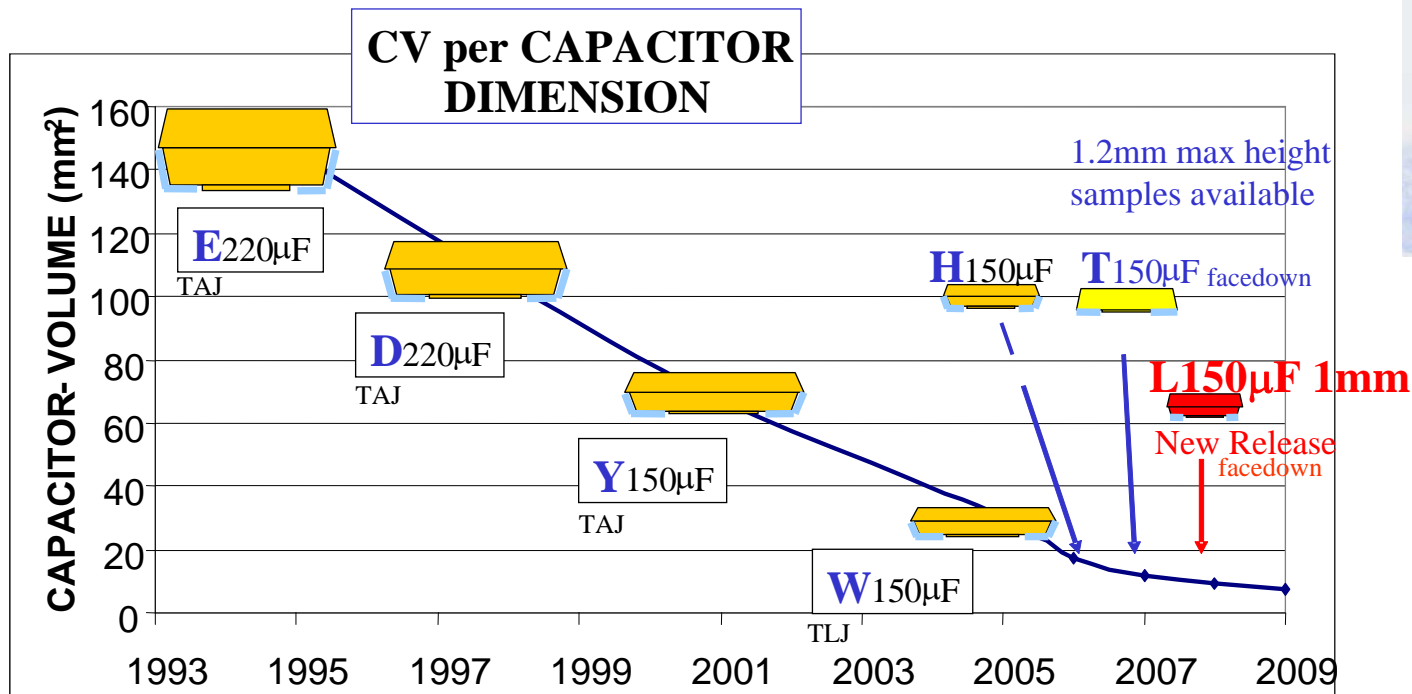
Entertainment systems



TANTALUM CAPACITORS

IN MOBILE PHONES

majority of mobile phones are using tantalum capacitor in power management systems



- downsizing and miniaturization are key drivers
- upcoming new “facedown” designs reduce the height to **less than 1mm**
- the capacitor volume reduced by **more than one decade** during past 15 years



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TANTALUM APPLICATION

AUTOMOTIVE APPLICATIONS

Tantalum Capacitors meet specific requirements for **reliability, vibration resistance** and **high cost versus performance** value



Tire Pressure Monitoring System



Tantalum Capacitor

Core Electronics

Increased Power Train, Body & Safety Electronics

Tire Pressure Monitor

RF receive / Transmit

Ultrasonic Park Assist

Ultrasonic Sensor, DSP, Audible Alarm

Head Up Display

Infra-Red Camera, DSP, LCD display

Night Vision Display

Infra-Red Camera, DSP, LCD display

Adaptive Cruise Control

Millimeter Radar Send & Detect, DSP, Coupled ECU

Lane Detector

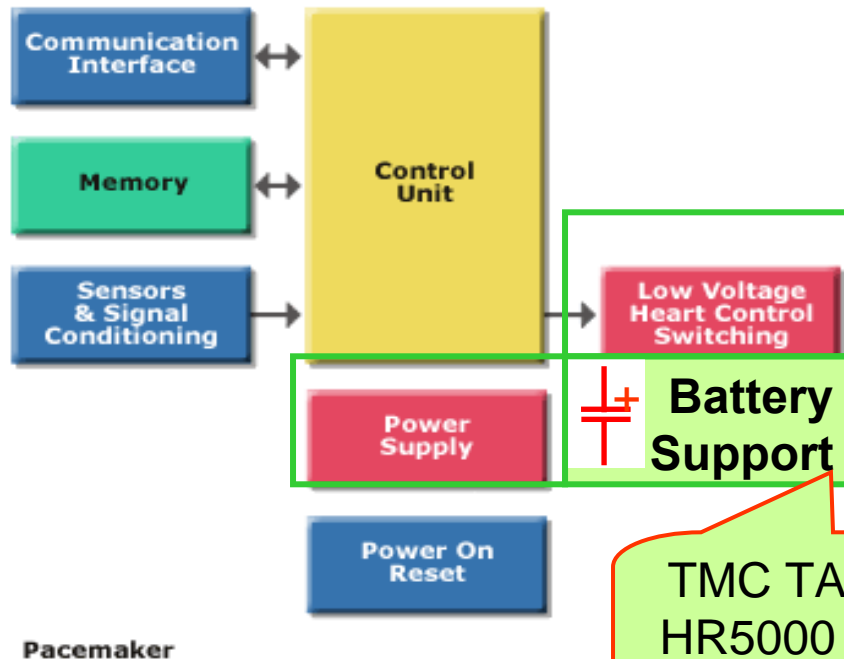
Digital Optical Camera, DSP, Audible Alarm



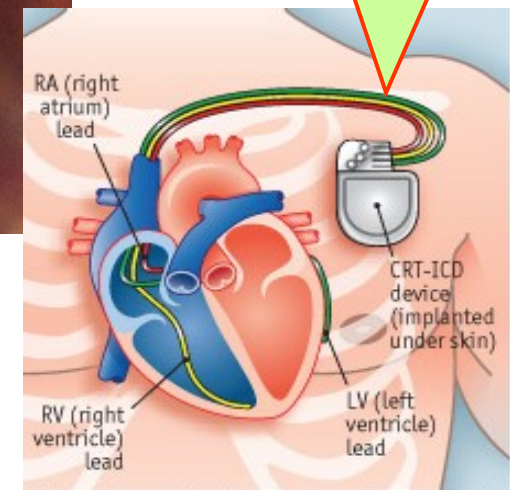
TANTALUM APPLICATION

MEDICAL APPLICATIONS

Implantable – Pacemakers, Defibrillators



Miniaturization



TMC TACmicrochip
HR5000 implantable
life support

References: Medtronic, Microsystems Engineering, Guidant

More than half a million pacemakers and defibrillators
implanted each year!!!

TANTALUM APPLICATION

OIL DRILLING

Oil Exploration Challenges

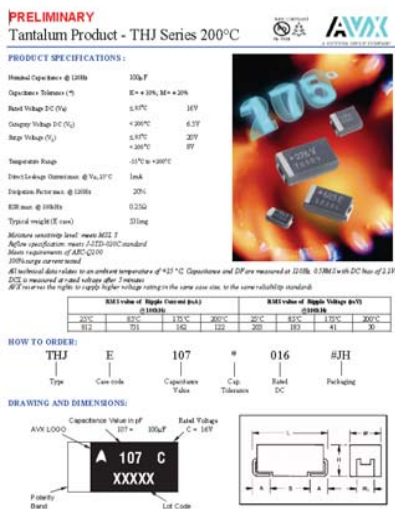
- Deeper Sea Exploration
- New Measures
- Deeper Drilling
- New Drill & Sensor Technology

**200°C
Temperature**



200°C Tantalum Capacitors

- Drill head / sensor application
- 3.3 and 5V rail application
- 200°C 1000 hrs life time
- 220μF and 100μF E case



... samples available

**New released
E 100/16, E 220/10**



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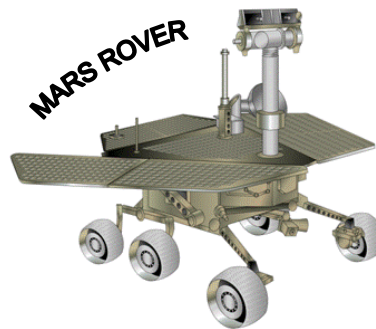
TANTALUM DIVISION

Tantalum Capacitors in Aerospace Applications

ESA/NASA
co-operation



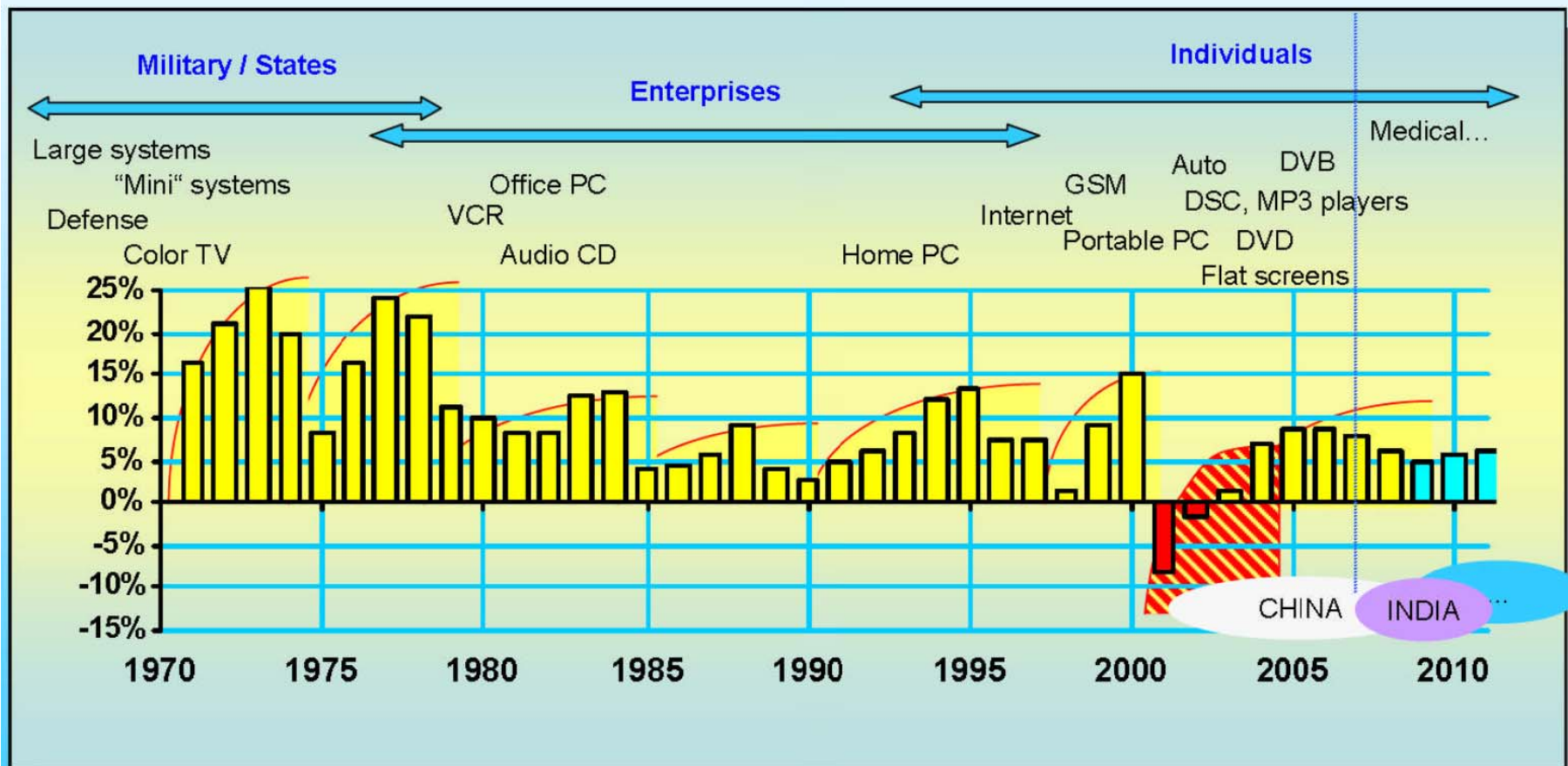
Tantalum Capacitors meet requirements of space applications for **top reliability in small & light capacitors**



SIGNIFICANT PAYLOAD REDUCTION
new generation of tantalum Hi-Rel capacitors provide higher capacitance & **lower ESR in smaller size** = lighter design



Growth cycles of the electronics industry 1970-2011



Source: DECISION



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Eu vs US Standardization Grades

Tantalum Capacitors

European Standardization Based

ESCC 3012 – ESA QPL products

ESA EPPL (no tantalum at present)

CECC 30801 005
CECC 30801 011 (CTC4)
CECC 30201-032 (leaded Ta)

CECC Avionics & Industrial IQC

US Standardization Based

CWR09 MIL group family
CWR 11
CWR 15 (microchip)
CWR 19 (ext. range)
CWR 29 (low ESR)

DSCC 95158
DSCC 07016 (Hi-Rel, low ESR, ext. range)
DSCC 04053 (fused)
DSCC 93026 (wet)

COTS+
COTS+ Aerospace - SRC9000



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Hi Rel Test Level Comparison

Tantalum Capacitors

Group A testing comparison							
TEST	AVX COTSplus	MIL PRF 55365 QPL		AVX SRC9000 Space Level	ESCC3012		
		"std" MIL	New "T" level		LAT 1	LAT 2	LAT 3
AVX series	TBJ/TBM/TAZ	CWR09,11,15,19,29	CWR09,11,15,19,29	TBJ/TBM/TAZ	TAJ-ESA	TAJ-ESA	TAJ-ESA
Burn-in 168hrs					Y	Y	Y
100% Reflow	Y	Y	Y	Y	Y	Y	
Vibration		qualification only	qualification only		Y		
Adhesion (shear) & Shock					Y		
100% Thermal Shock	Y	Y	Y	Y	Y		
Climatique Sequence					Y		
Operating Life		group C & qual only	group C & qual only	**	Y	Y	
100% Weibull	Optional	Mandatory	Mandatory - level C	Mandatory-level C			
100% Surge Current	Optional	Optional	Mandatory - level C	Mandatory - level B or C	*	*	*
100% Electrical Testing	Custom test limits available	To specification limits only	+3 sigma limits	+3 sigma limits or custom	Y	Y	Y
100% Visual & Mechanical	Y	Y	Y	Y	Y	Y	Y
Simulated mounting, rework and accelerated life				Y	Y	Y	
Solderability Test	Optional - 75% Coverage	Mandatory - 90% Coverage	Mandatory - 90% Coverage	Mandatory - 90% Coverage	Y	Y	Y
100% X-Ray			Y	Y	level B	level B	level B
DPA - 1580 Destructive Physical Analysis			Y	Y			
Surge Voltage		qual only	qual only	Y	Y	Y	Y
Hot DC Leakage				Y			
Temperature Stability	Optional	Mandatory	Mandatory	Mandatory	Y	Y	Y

**COTS Plus has all
tests as options**

**MIL doesn't allow custom
test, but new "T" Level
has X-Ray & DPA**

**SRC9000 has all MIL "T" level
AND additional Function Test,
hot DCL, Surge Voltage as
standard.**

**ESCC offer
additional extensive
tests**

European Projects - Qualification

TES Low ESR QPL and European COTS+

Low ESR Single & Multinode technology

For High Power / Payload Weight Reduction

1] low ESR tantalum capacitor ESCC QPL

Evaluation & Qualification Started

at AVX (Cz) and EGGO (Cz) testhouse

Complete Date: Sep 2012

2] low ESR tantalum European COTS+

Based on Professional TRJ/TRM series

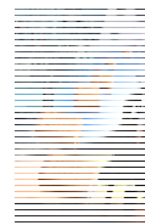
+ ESCC LAT Testing

Intended to propose for the next EPPL

(Astrium, Ruag, SSTL expressed interest)

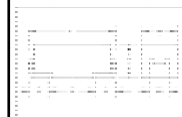
TES Low ESR European COTS+ Series

Low ESR Tantalum Chip Capacitor



- Manufactured in EU, ESA qualified plant
- Improved reliability design
- Robust against higher thermo-mechanical stresses during assembly process
- CV range: 0.10 - 470µF / 6.3 - 35V
- 5 case sizes available
- low ESR designed parts
- multinode D and E case included

CASE DIMENSIONS: millimeters (inches)



Code	EIA Code	EIA Metric	L50.20 (0.008)	W+0.20 (0.008)	H+0.20 (0.008)	W1.50.20 (0.008)	A+0.30 (0.012)	S Min.
A	1206	3216-18	3.20 (0.126)	1.60 (0.063)	1.60 (0.063)	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)
B	1210	3528-21	3.50 (0.138)	2.80 (0.110)	1.90 (0.075)	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)
C	2312	6032-28	6.00 (0.236)	3.20 (0.126)	2.80 (0.102)	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)
D	2917	7343-51	7.30 (0.287)	4.30 (0.169)	2.90 (0.114)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
E	2917	7343-43	7.30 (0.287)	4.30 (0.169)	4.10 (0.162)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)

W1 dimension applies to the termination width for A dimensional area only.

HOW TO ORDER (tentative)

TES Detail Spec	D Case	226 Cap	K Tol	035 Volt	R Packaging	C ESR level	0 LAT	B Testing Level	H Termination Finish	0 Surge Option	0 DPA	0 FCSI	0 Qualification
TES = tantalum low ESR COTS+			K=10% M=20%		X=4" R=7" E=bulk	C=standard L=mirror multi U=multinode	0=N/A 1=LAT1 2=LAT2 3=LAT3	B=level B (Xray) C=level C	H=SnPb R=Sn matte tin A=Gold	0=N/A 1=current surge 850	0=N/A 1=Yes	0=COTS+ 1=ESCC QPL	

TECHNICAL SPECIFICATIONS

Technical Data:	All technical data relate to an ambient temperature of +25°C						
Capacitance Range:	1µF to 470µF						
Capacitance Tolerance:	±10%; ±20%						
Leakage Current DCL:	0.0075CV						
Rated Voltage (V _R)	≤ +85°C:	6.3	10	16	20	25	35
Category Voltage (V _C)	≤ +125°C:	4	7	10	13	17	23
Surge Voltage (V _S)	≤ +85°C:	8	13	20	26	32	46
Surge Voltage (V _S)	≤ +125°C:	5	8	13	16	20	28
Temperature Range:	-55°C to +125°C						
Termination Finished:	SnPb Plating (standard), Gold and Sn Plating upon request						

European Projects - Development

Low ESR Hermetically Sealed Polymer Tantalum Capacitor

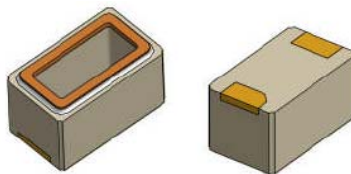
Tantalum Capacitor with Polymer 2nd electrode

Pro: low ESR, reduced ignition

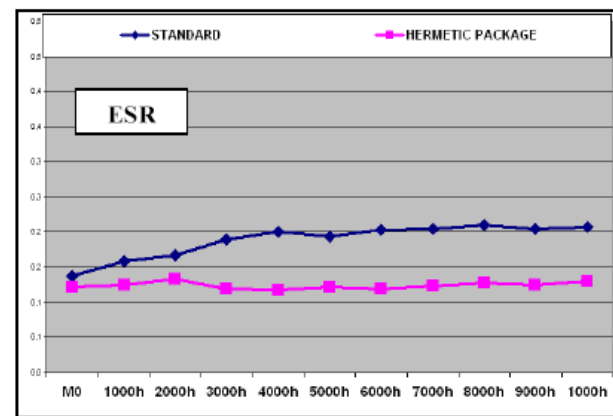
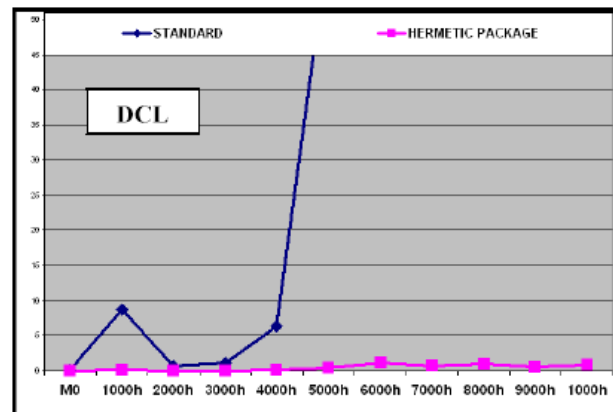
Con: reliability limited by humidity impact and oxygen atmosphere



HERMETIC PACKAGE SOLVES THE ISSUES



- Part of Czech Incentive Program
- Completion of Development Stage: 2012



European Projects - AVX New Proposal

Rf ThinFilm Products Range

Accu-P® Thin Film Capacitors	0201/ 0402 / 0603 / 0805 / 1210
Accu-L® Thin Film Inductors	0402LGA/ 0603 / 0805
TF Directional Couplers/3dB 90°Couplers	CP0402LGA/CP0603LGA/0603/0805/
ITF Harmonic Low Pass/Band Pass Filters	0402LGA /0603 LGA / 0805
ACCU-GUARD® SMD Thin Film Fuses	0402LGA ,0603,0805,1206,0612

Production moved recently to Czech Republic (ESA member)

– front end still in Israel, middle and end processes in Czech

- potential for European Space evaluation, EPPL in case of interest



**THANK YOU FOR
YOUR ATTENTION**