



charcroft

ELECTRONICS

AGENDA



- Who We Are
- Our Full Range Magnetics Offering
- How We Do It
- Design Expertise
- Transformative Innovation
- Entrusted Customers



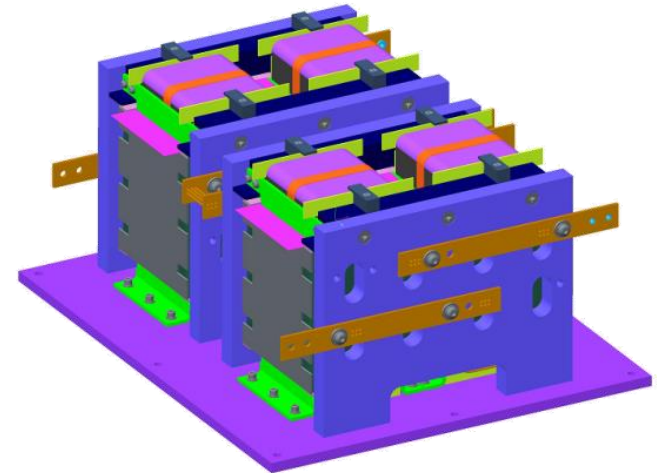
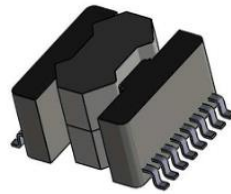
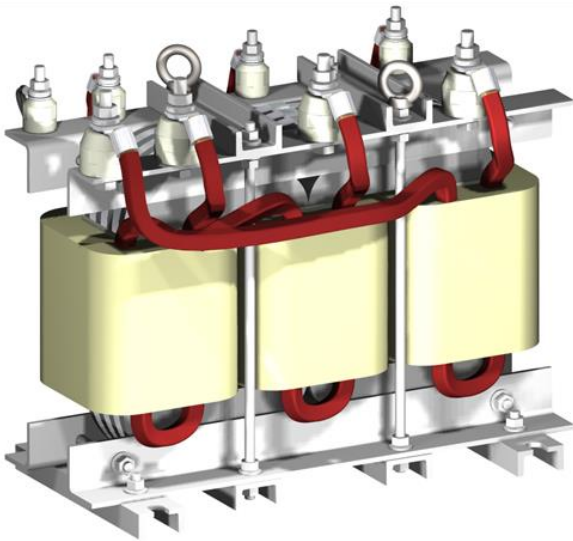


WHO WE ARE

TRANSFORMATIVE INNOVATION



Be the **Global Leader** in the **Custom Electromagnetic Components Industry** by leveraging the **Transformative Power of Innovation** to offer **Competitive Solutions** to our **Loyal Customers**





Initial part of the Roussel-Uclaf group in the 1960's

SOLID AND WET TANTALUM CAPACITORS



SIC Established 1921. Merged with Safco to become SIC-SAFCO in 1954

ELECTROLYTIC CAPACITORS



Established 1952

FILM & PAPER CAPACITORS, EMI CERAMIC FILTERS



Established 1965

**CERAMIC, FILM & MICA CAPACITORS, FILTERS
PRECISION POTENTIOMETERS, OPTICAL
ENCODERS, SLIP RINGS**



Established 1971

**CERAMIC CAPACITORS, CERAMIC MATERIALS
FREQUENCY TUNING COMPONENTS**



Established 1978

**HIGH-RELIABILITY MICRO/MINIATURE
MAGNETIC COMPONENTS**



Established 1977

**HIGH-POWER / HIGH-VOLTAGE MAGNETIC
COMPONENTS**



Established 1978

**ULTRA-HIGH POWER DENSITY MAGNETIC
COMPONENTS**



Established 1998

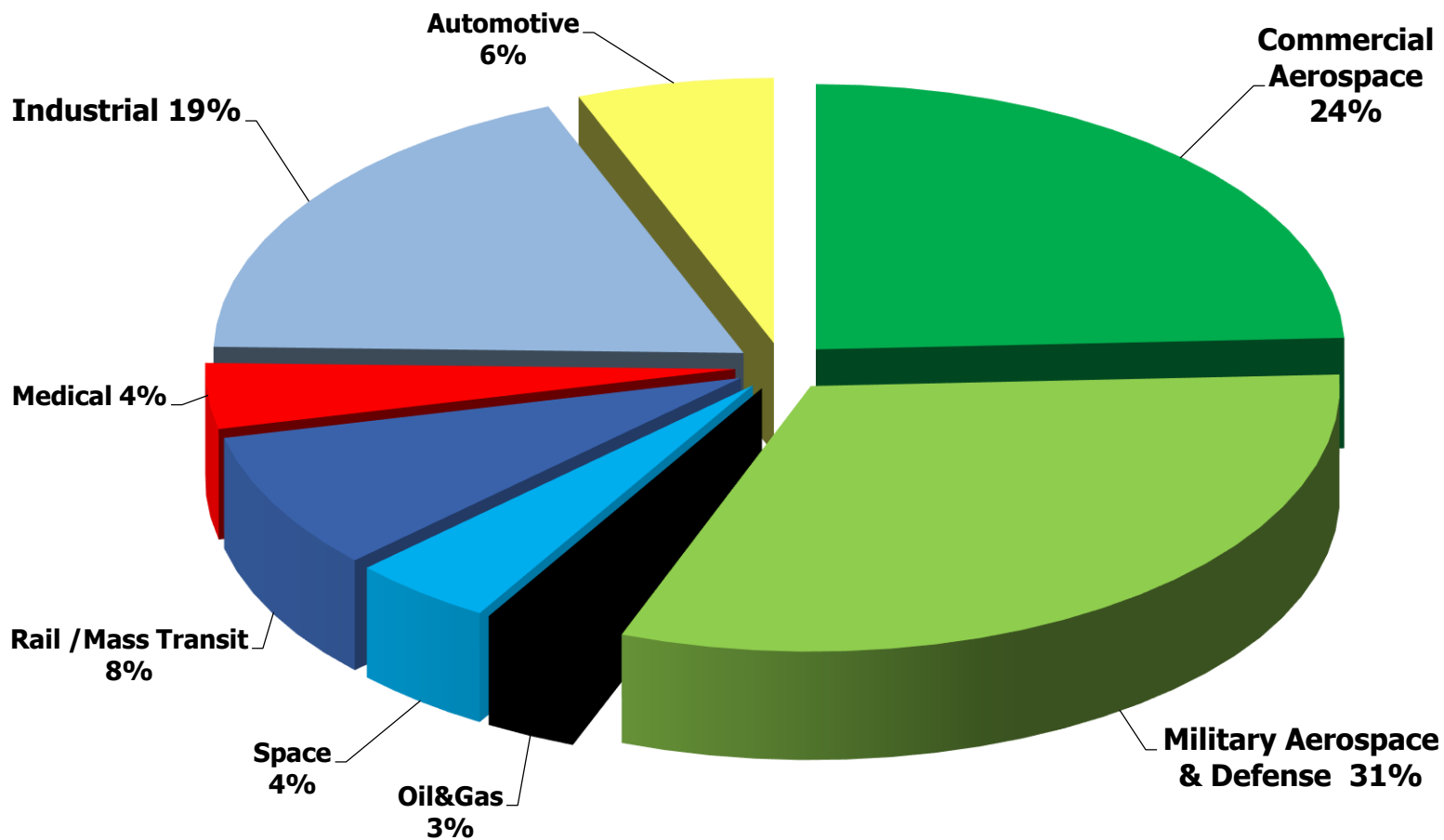
**ASSEMBLY OF ELECTRONIC & MAGNETIC
COMPONENTS & SUB-ASSEMBLIES**



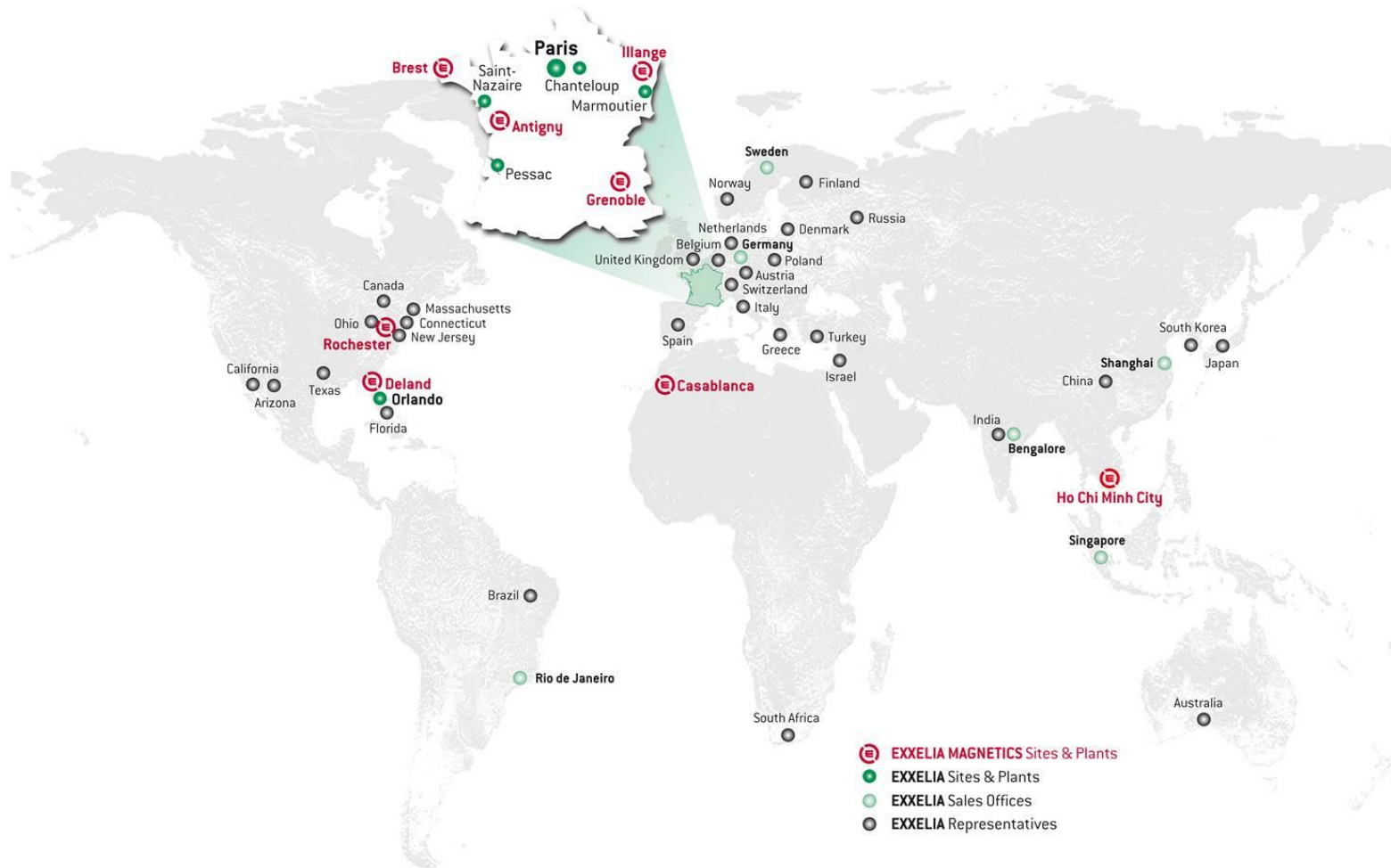
Established 2012

**MANUFACTURING OF INDUCTORS,
TRANSFORMERS & MAGNETIC COMPONENTS**

MARKETS



GLOBAL PRESENCE





	<i>Exxelia Microspire</i>	<i>Exxelia N'Ergy</i>	<i>Exxelia RAF Tabtronics</i>	<i>Exxelia Maroc</i>	<i>Exxelia Vietnam</i>
Headquarters	Illange, France	Antigny, France	Longwood, Florida, US	Casablanca, Morocco	Ho Chi Ming City, Vietnam
Manufacturing Sites	1	2	2	2	1
Employee Count	85	130	62	250	87
Engineering Support	15	16	6	4	2
Square Meters	1600	3000	4180	1300	1600
Quality System	EN9100C	EN9100C	AS9100C	EN9100C	EN9100C
Main Industry Certification	Space (QPL, EPPL)	Railways (NF45545)			
Special Processes certifications	IPC-610	IPC-610 IPC-620	J-STD-001 IPC-610 LMCO Soldering		

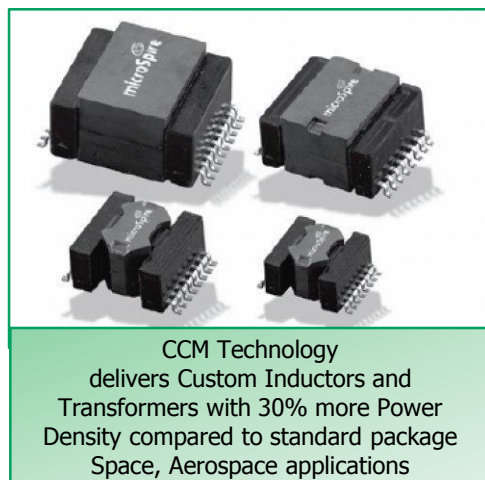


FULL RANGE MAGNETIC OFFERING

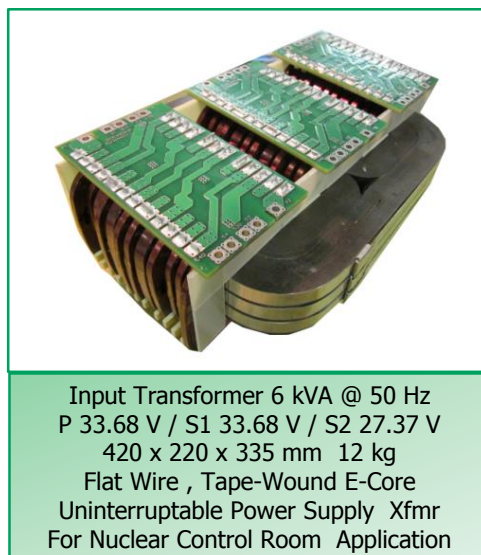
HIGH POWER DENSITY



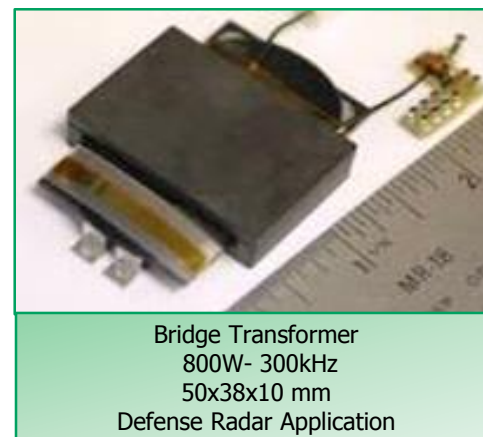
Ultra-high power density magnetic components for high-reliability applications in defense, space, aerospace, oil & gas, medical and specialty markets and applications.



CCM Technology
delivers Custom Inductors and
Transformers with 30% more Power
Density compared to standard package
Space, Aerospace applications



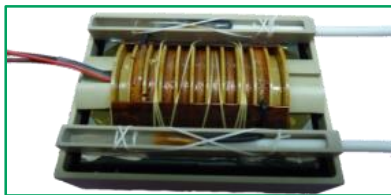
Input Transformer 6 kVA @ 50 Hz
P 33.68 V / S1 33.68 V / S2 27.37 V
420 x 220 x 335 mm 12 kg
Flat Wire , Tape-Wound E-Core
Uninterruptible Power Supply Xfmr
For Nuclear Control Room Application



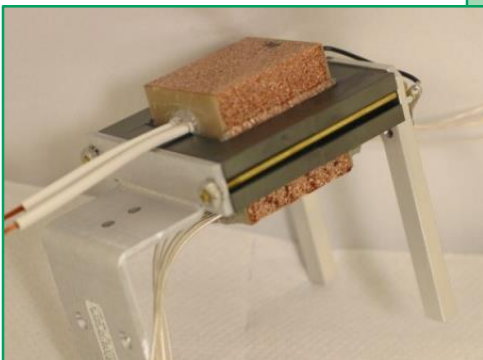
Bridge Transformer
800W- 300kHz
50x38x10 mm
Defense Radar Application

HIGH VOLTAGE / HIGH POWER

High-power and high-voltage power magnetics for heavy-duty mass-transit, railway and high-grade industrial applications.



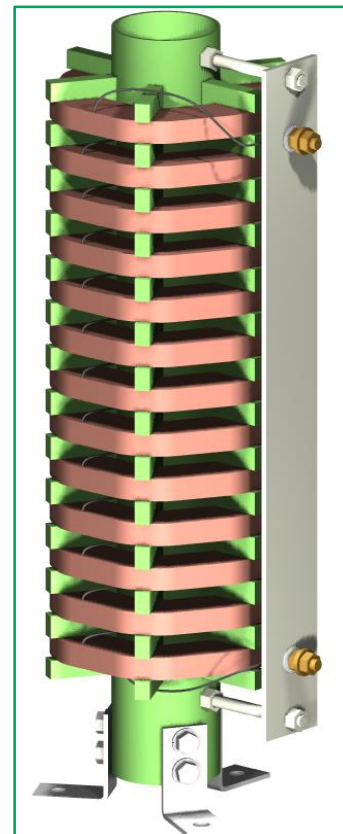
200 W High Voltage Transformer
5 kV DC DWV, +150 C
ETD59 Core Technology
Multi-Section Coil Form
90 x 70 x 45 mm



Traveling Wave Tube Power Transformer
for Commercial Satellite Communications;
DWV 15kV
102x127x63 mm
Space



3-Phase Transformer + Integrated
Inductor
115 kVA @ 50 Hz ($3 \times 1458V$ /
 $3 \times 400VY+N$)
590x425x1120 mm 520 kG
Aluminum Flat Wire w/ Nomex Wrap; SiFe
Lamination
Railway application

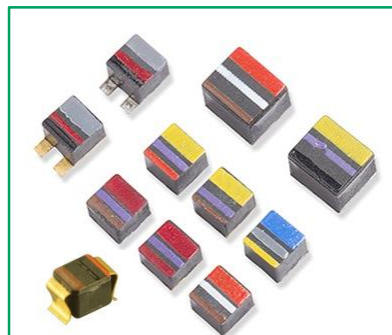


9 kV High Voltage Air
Inductor
50 mH, 5 A @ 5500 Hz
260 x 260 x 520 mm 10 kg
Ozone Water Treatment
Application

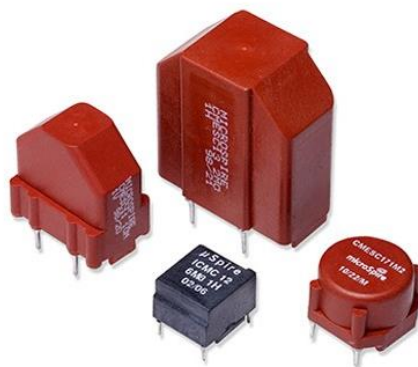
CATALOG PRODUCTS & TECHNOLOGIES



COTS catalog solutions for cost competitive high-reliability and commercial/industrial markets.



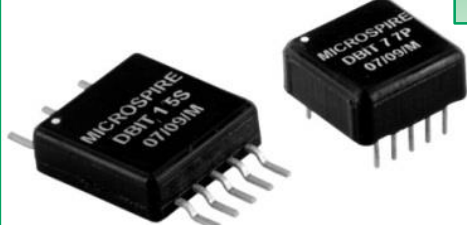
MPCI: Chip Inductors for
Space, Aerospace
HT Variant for Oil & Gas,



CMESC: Common Mode Chokes for
Industrial Applications



SESI: Low Profile Inductors (SMD)
CMC : SESI Common Mode Chokes for
Avionics & Space Applications



MIL-STD-1553 Serial Data Bus
Transformers for Space, Defense &
Aerospace Communications



Gate Drive Transformers for Space,
Defense & Aerospace Communications



CMC: Common Mode Chokes
using Toroidal
Transfer Technology for
Avionics & Space Applications



Overview of catalog products

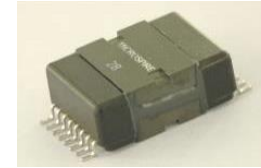
Standard Functions	Family	Characteristics	
Common mode chokes	CMC15	0,05 mH 6,7 A	3,6 mH 0,55 A
Common mode chokes	CMC18	0,05 mH 9,9 A	4,4 mH 0,9 A
Common mode chokes	CMC22	0,05 mH 14,3 A	3mH 1,9 A
SMD filtering chokes	SESI 9.1	0,6μH 6 A	700 μH 0,2 A
SMD filtering chokes	SESI 14	2,8 μH 5,1 A	260 μH 0,57 A
SMD filtering chokes	SESI 15	0,75 μH 14 A	800 μH 0,4A
SMD filtering chokes	SESI 18	4,2 μH 9,8 A	231μH 1,34 A
SMD filtering chokes	SESI 22	4,9 μH 17,7 A	1900 μH 0,8 A
SMD filtering chokes	SESI 32	4,7 μH 27 A	4700 μH 0,5 A
Current transformers	CT91	1/50, 1/100, 1/200	Up to 10,5 A
Gate Drive transformers	GDT91	1/1, 200 KHz	ET : 20 Vμs
	GDT15	1/1, 500KHz	ET : 60 Vμs

Overview of specific functions that can fit the SESI package

Specific functions
Common mode chokes
SMD filtering chokes
PFC chokes
Current transformers
Gate Drive transformers
Flyback transformers
Forward transformers
Push-Pull transformers
...



SESI TECHNOLOGY



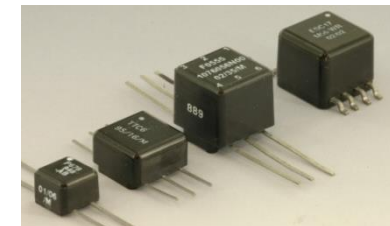
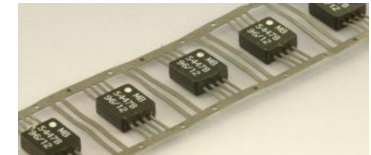
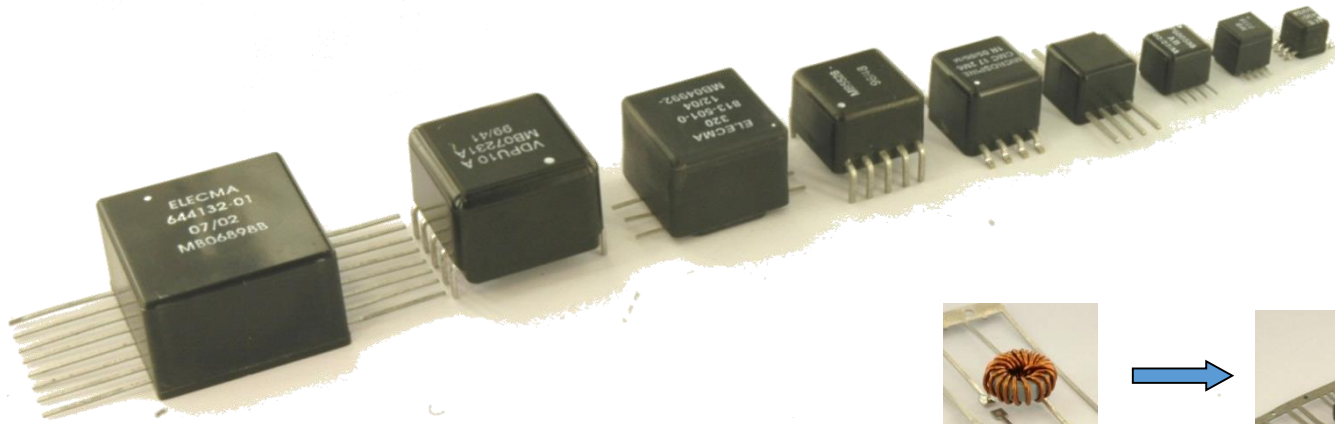
Features

- Technology qualified for severe environments /
Range of catalog products ESA qualified
- Transfer moulding using epoxy
- Ferrite core external assembling
- Low Height SMD packages delivered on tape-and-reels

Benefits

- Ideal for Space, Military , Aeronautics , and critical applications
- Good thermal dissipation, allow higher power density 20%
(RTh curves available per package , Iron and copper losses details available per Design)
- Protected winding : more robust design
- Constant characteristics (no mechanical stresses)
- Low Profile Component

TOROIDAL TRANSFER MOULDED TECHNOLOGY



Transfer Molded Technology

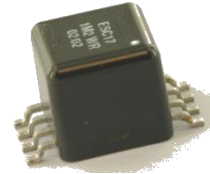
CATALOG PRODUCTS



Standard functions	Standard range	Characteristics	
Common mode chokes	CMC 14 , 17	140μH/7,2 A	69 mH /1,1 A
Common mode chokes	HCESC	15μH /2,5A	470μH/ 0,4A
Common mode chokes	DLEF42	-10dB @10MHz	-23 dB @ 100MHz
SMD filtering chokes	ESI 01, 07	0,42μH /2,9A	150μH/ 0,25A
Current Transformers	CT08	1/200	Up to 8 A
1553 bus Transformers	DBIT	-	-
Wide Band Transformers	WRFT	50Ω: 50Ω	50Ω: 800Ω

TOROIDAL TRANSFER MOULDED TECHNOLOGY

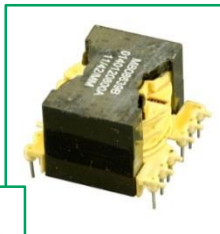
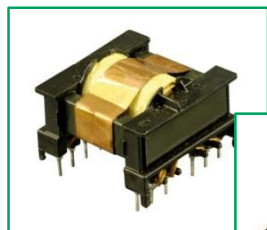
Specific functions
Common mode chokes
SMD filtering chokes
PFC chokes
Current transformers
Gate drive transformers
Flyback transformers
Forward transformers
Push-Pull transformers
...



COST-EFFECTIVE HIGH VOLUME



Commercial, industrial applications, produced in mid to high volumes in low-cost manufacturing locations.



Standard Linear Transformer packages
ETD, ER, EQ, RM



Primary Coil
38 x 22 x 24 (mm)
Automotive application



Current Sense Transformer
75 A / 45.4 mA @ 720 Hz
ø 26 x 13 mm 16 g Class H
Nanocrystalline Tape-wound Toroid
Aerospace Application



Low-cost High-volume Air Coil



Contactor Coil
ø 18 x 38 mm
80 g
Avionics



HOW WE DO IT



THREE WAYS OF WORKING

1. Design to Requirements:

- Understanding of customer's electrical, mechanical and environmental needs and degrees of freedom
- Commercial Considerations and Business Case
- Project Definition, Scope and Scale
- Exxelia Offer: Package and Electrical Parameters; Price Proposal

2. Build to Print:

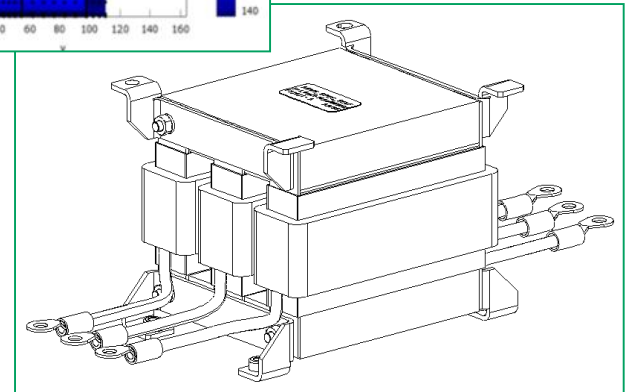
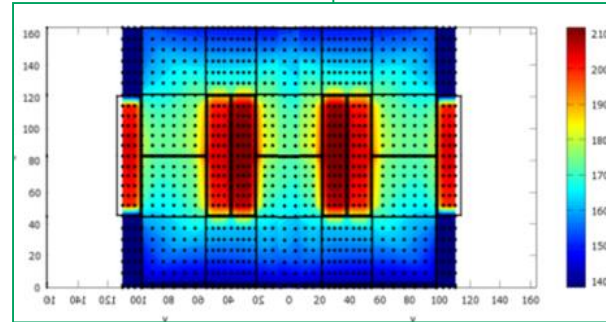
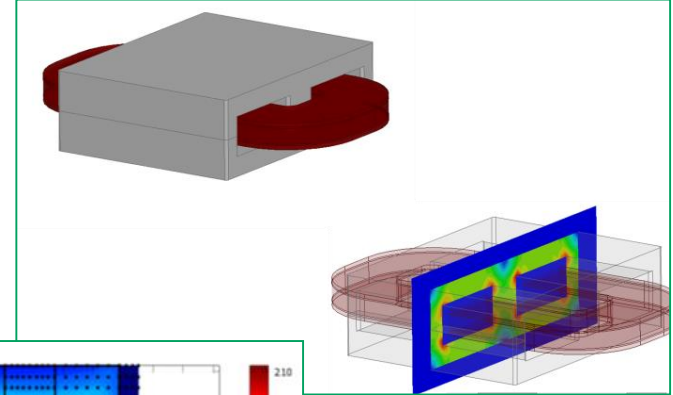
- Industrialisation based on customer supplied Bill of Materials and Specifications (Drawings, Process Details, etc.)

3. Catalog Offering:

- MPCI; SESI; CMC; Bus 1553 Transformers,

ADVANCED DEVELOPMENT PROCESS

- Application Circuit Modeling
Psim, LtSpice, EP* Software
- Comprehensive Experience and Database
> 100,000 diverse & custom configurations
- Advanced Magnetic Field & Thermal Modeling
(Maxwell, EP* Software)
- Design Tradeoff Evaluation
size vs. performance vs. cost
using Xcel , Mathcad, EP* Software
- 3D Mechanical CAD Modeling
- 3D Printing
- Technical File Sharing
- Advanced Test Methods Simulate Applications
- Dedicated Product Development Teams

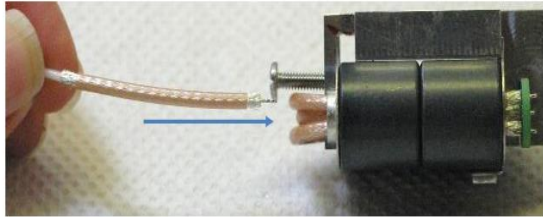


PRODUCT INDUSTRIALISATION



- Dedicated Project Manager
- Sophisticated, Detailed Process Documentation
- Defined and Controlled Tools, Molds and Special Processes
- Strategic Relationships with Key Suppliers enhance Exxelia Value Proposition
- Rigorous Specification of custom component materials
- Material Traceability
- First Articles (FAI)
- Review gates mitigate risk through product stages: Design > Prototype > FAI > (LRIP) > Full Rate Production
- FMEA upon request

 RAF TABTRONICS	548-5076	REV A	030-9545	NOTE: This process is a customer approved process and no changes or deviations from this procedure are to be made without engineering or customer approval.
SECTION 3		WINDING AND BOARD ASSEMBLY		



INSERT THE 2.50 COAX CABLE INTO THE CORE WITH THE SHORT STRIPPED END TOWARDS THE PWB. POSITION THE COAX CABLE BETWEEN THE FIRST AND SECOND WIND



EXIT THE WIRE THRU HOLE 1



 VERIFY THAT THE WHITE SLEEVING AND BRAID ARE FLUSH TO THE BOTTOM OF THE PWB



SPECIAL PROCESSES

	Gluing	Soldering	Impregnation	Pressure Polymerisation	Vacuum + Pressure Encapsulation	Transfer Molding	Gravity Potting
Harsh Environment	✓		✓		✓	✓	✓
High Voltage		✓	✓	✓	✓		
High Temperature	✓	✓	✓		✓	✓	✓
Mechanical Integrity	✓	✓	✓		✓	✓	✓
Dielectric withstanding			✓		✓	✓	
Thermal Transfer	✓		✓		✓	✓	✓
Thermal Stability	✓	✓	✓		✓	✓	
Outgassing	✓		✓		✓	✓	

HI-GRADE TEST CAPABILITY



AVAILABLE IN HOUSE:

- Partial Discharge (sensitivity 1 pC)
- High-Voltage (up to 100 kVac)
- Thermal Shock
- Burn-In

AVAILABLE by SUBCONTRACT:

- Shock
- Vibration
- Full Wave Lightning Impulse Test
- DPA



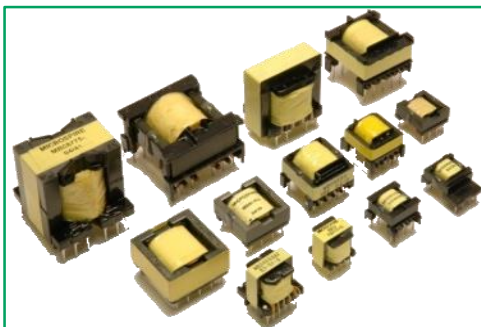


DESIGN EXPERTISE

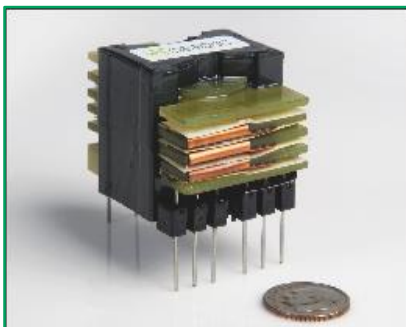
SWITCHING MAGNETICS



Power Transformers for Switch Mode Power Supply (SMPS) up to 400 kVA at frequency < 1 MHz: Flyback, Forward, Push-pull, and other specific architectures



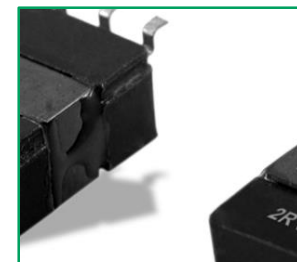
Custom Designs using Standard Packages (ETD, EFD, RM, etc.)



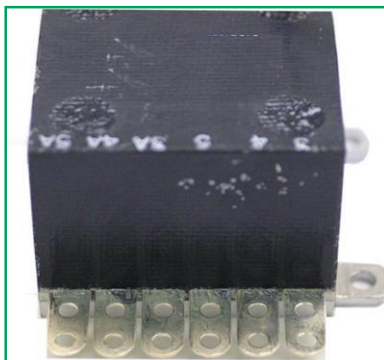
HXMT Optimized Transformer
Folded Cu Planar Technology
High-Efficiency Solar Array Inverter Application



Forward Converter Transformer
132 W @ 250 kHz
Planar PCB Technology
26 x 34 x 20 mm
Aerospace Application



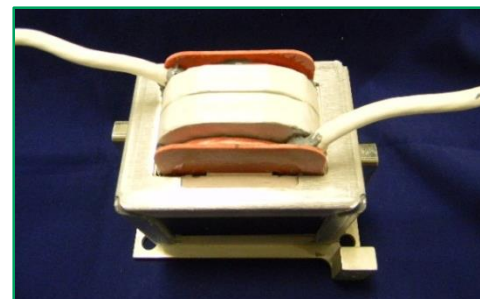
Discontinuous Flyback Transformer
9W @ 250kHz
SESI15 Technology
H < 7.9mm
Space Application



Bridge Transformer
5KW @100 kHz
Planar SMT, Custom Core
Extremely low leakage inductance
Defense Application



Dual Transformer w/ Pulsed Ventilation
Ferrite U126 Cu Foil Technology
125 kW @ 4 kHz 500 V / 940 V
1132 x 348 x 500 mm 190 kg
Railway Application



Bridge Transformer
15 KW @ 40 kHz
Litz Wire, Machined Cu Secondaries,
Custom E-Core
92 x 134 x 112 mm
Commercial Hybrid Bus Application

LINEAR MAGNETICS



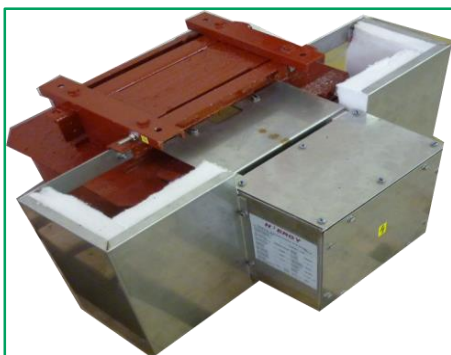
Linear Power Supply Magnetics



Twelve Pulse Autotransformer
200V/400V 2KVA @ 400Hz
Cu Magnet Wire, SiFe Laminations
125 x 70 x 88 mm – 1.7 kg
Avionic application



3 x inductances – 70 μ H
200 A @ 400 hz/ ripples 20 A @ 10 khz
Cu Foil winding, AMCC Core
500 x 150 x 200 mm - 24 kg
Ground Power for Aircraft



Transformer 10 KVA
400 V / 216 V @ 50 hz
650 x 510 x 390 mm 115 kg
Cu Magnet Wire, SiFe Laminations
Integrated Capacitor
Railways application



Autotransformer 22,5kVA
115V @ 400Hz
110x75x90 mm
Aluminum Foil ,
C-Core technology
Aerospace application
(thrust reverser)

FILTERING INDUCTORS

Common Mode Choke, Filtering, PFC chokes, up to 5000A, 16Hz to 1GHZ



Common Mode Choke 2 x 4 mH @ 10A
Potted Nanocrystalline Toroid (PU resin)
Operating temperature -45° C to
+100° C
33 x 33 x 26 mm
Aerospace



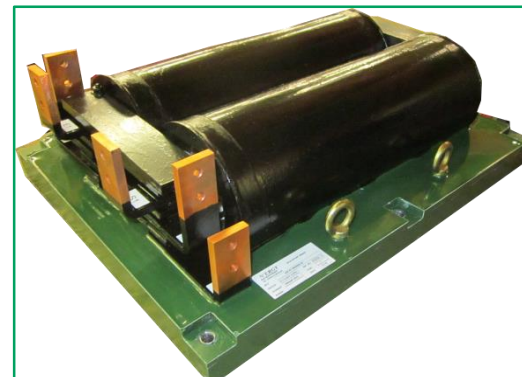
Power Coil
Ø 40 x 60 mm 0.1 kg
Helical Wound Air Coil
Automotive Application



SESI Technology: Low profile Inductors
and Common Mode Chokes
High Temperature variant available
Footprint starting at 9 x 9 mm
Space, Aerospace, Defense, Oil & Gas



High Current Inductor
Multi-filar Twisted Cu Windings
High Shock & Vibration Environment
Anodized Al Heatsinking Mounts
63 x 63 x 76 mm
Naval Defense Application



Inductor 3 x 5.5 mH
2.7 A @ 9 kHz / 580 A @ 50 Hz
510 x 500 x 360 mm 52 kg Class F
Cu Bar Windings, Nanocrystalline Toroid Stack
Test Bench Application

SENSING MAGNETICS



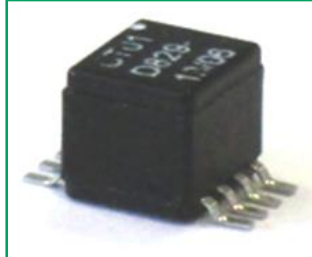
Current or Voltage Measurement Transformers - Phase and Amplitude
Accuracy down to 0.1%



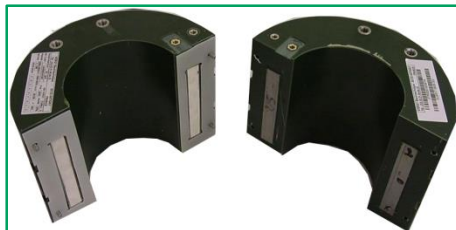
Current Transformer
260 A rms @ 400Hz
2% accuracy
Potted SiFe Toroid
36 x 15.5 x 36 mm
Civil Avionics



Current Transformer
1200 A @ 400 Hz
Defense Aircraft Radar
Proprietary winding core
optimization for min weight
21 x 21 x 39 (mm)



Current Measurement Transformer
Max current: 1.3 A rms 50:1 Ratio
60 to 200kHz
Transfer Molded Toroid
High Temperature +185° C
Very Compact size : 13 1x 8.5 x 8.5 mm
Application : Oil & Gas



Openable Current Transformer 10 VA
320 A @ 50 Hz 100:1 Ratio 5P8 Class F
Ø 200 x 360 mm 10 kg
Cu Magnet Wire, SiFe Core
Railway Application



Current Transformer
5 VA @ 16.66 HZ
Cu Magnet Wire., Double SiFe Core
P: 300 A
S1: 1 A 2.5VA CL 5P5
S2: 1 A 2.5VA CL 0.5
180 x 120 x 230 mm 15.2 kg
Railway Application

LIQUID COOLING

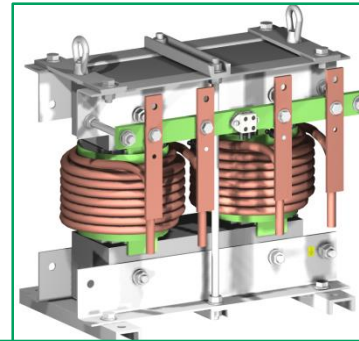
Volume and weight reduction, and improved heat dissipation using direct and indirect fluid cooling, or cold plate.



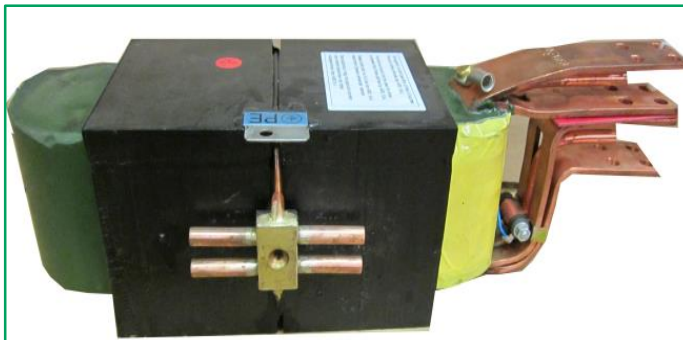
Transformer 120 KW @ 20 KHz
P: 720 V (Square) S: 1500 V (Square)
350 x 300 x 300 mm – 62 kg
Cu Band Winding, Ferrite U126 Core
Industrial Coating Machine Application



Transformer 2x75 KW @ 18 KHz
P: 678 V S: 800 V
350 x 300 x 300 mm – 62 kg
Cu Band Winding, Ferrite U126 Core
Industrial Coating Machine Applications



Inductor 0.82 mH
360 Adc: Ripple 144 A @ 300 Hz, 10 A @ 5KHz
350 x 260 x 440 mm – 70 kg
SiFe Core; Copper Tubing winding
Industrial Induction Heating application

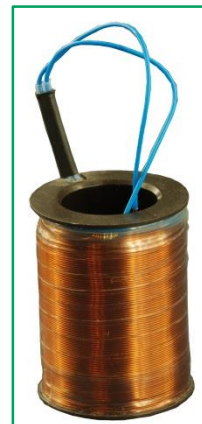
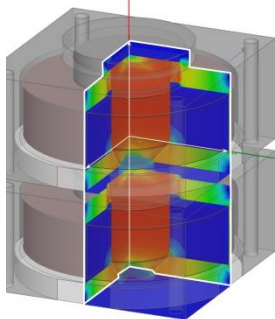


Transformer 23 KVA@ 50 Hz
P: 400 V S: 4.3 V / 18 000 A
310 x 130 x 140 mm – 20 kg
Cu Bar Windingsm SiFe Laminations
Industrial Welding Machine

ELECTROMAGNETS



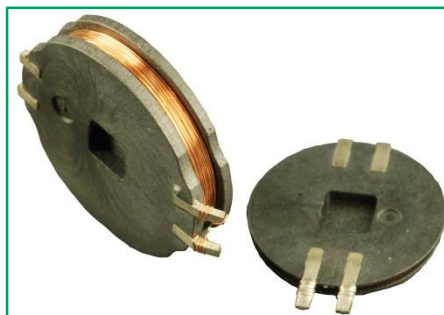
Bobbin for
Electromagnets/actuators



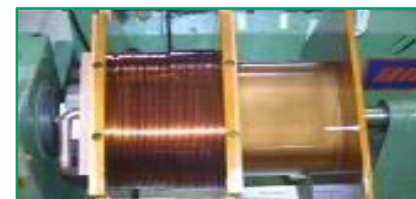
Bobbin (ex : for Bleed air system)
Copper wire
Aerospace



Bobbin for weaving machine
Industrial application



Bobbin for heater ignition
Industrial application



Large Electromagnet (Square Wire
on Copper Coil Form)

ROTORS & STATORS



Stator
Ø 90 * 60 mm
Aerospace



Stator for cooling/ fan systems (brake, calculator..)
Ø 80 * 80 mm
Operating Temperature up to 200° C
Aerospace





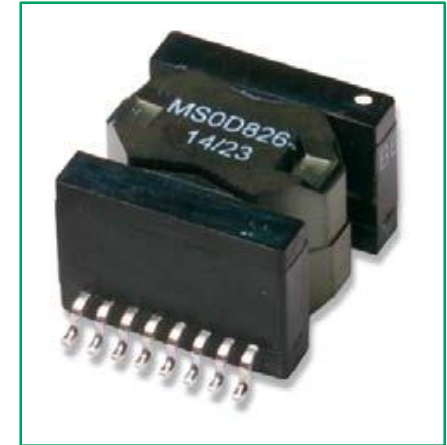
TRANSFORMATIVE INNOVATION

CCM: CHAMELEON CONCEPT MAGNETICS



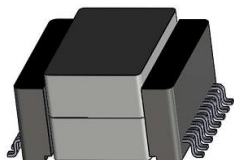
BENEFITS

- Five (5) standard yet flexible SMD packages
- Compatible with Vigon cleaning
- High Power Density
- Multiple outputs: Up to 2 x 10 pins
- Large Operating range: -55°C up to $+140^{\circ}\text{C}$
- Transfer molded technology
- Withstands high shock (100 G) and vibration (30 G)

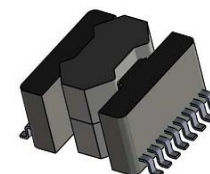




- Electrical data



	Inductor Range (I_{DC} + 20% ripple)			Transformer for SMPS*
CCM4	18mH/50mA	→	3μH/6A	Up to 18W
CCM5	29mH/80mA	→	4.2μH/8A	Up to 40W
CCM6	120mH/30mA	→	3μH/10A	Up to 50W
CCM20	240mH/30mA	→	2.6μH/21A	Up to 120W
CCM25	480mH/40mA	→	4μH/25A	Up to 150W



*based on a push pull architecture, at $f = 200\text{kHz}$ @85° C without cooling

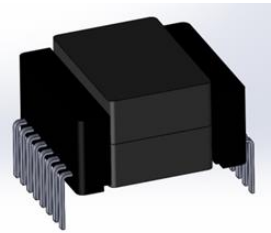
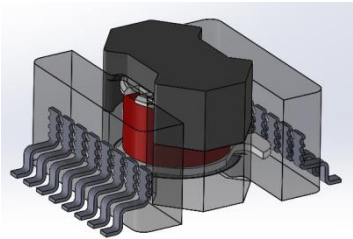
- Typical functions

Common mode chokes

Gate Drive transformers

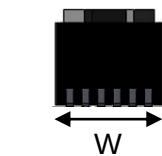
SMD filtering chokes	Flyback transformers
PFC chokes	Forward transformers
Current transformers	Push-Pull transformers ..

CCM Technology – Mechanical characteristics

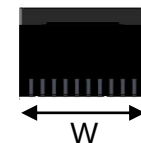


Casing	W (mm)	H (mm)	L (mm)	Pin number	Casing	Weight Max (g)
CCM4	13.3	11.0	21.3	6	A	5
CCM5	17.0	11.0	22.1	8	A	7
CCM6	18,4	13,0	24,1	8	A	12
CCM20	21.0	13.0	29.1	8	B	18
CCM25	25.6	16.5	36.0	10	B	45

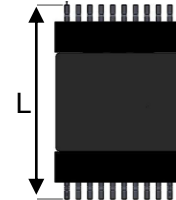
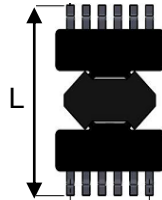
TH is possible for all casings
Upon request



A



B



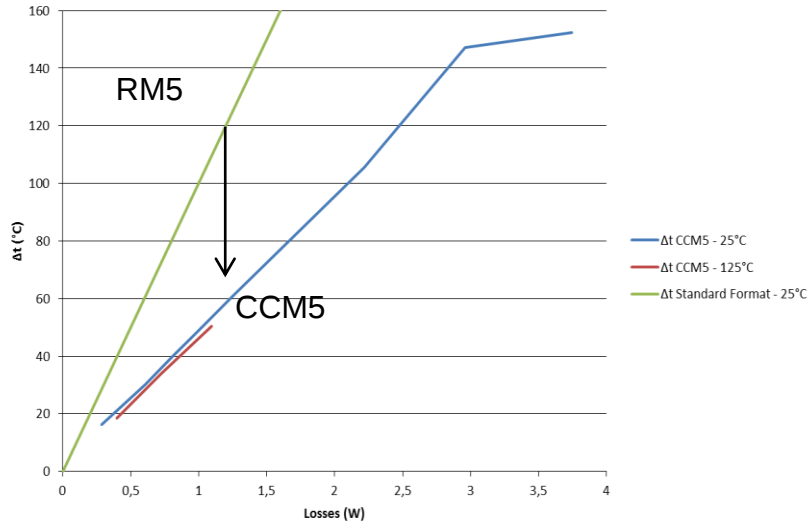
CCM

NEW !!

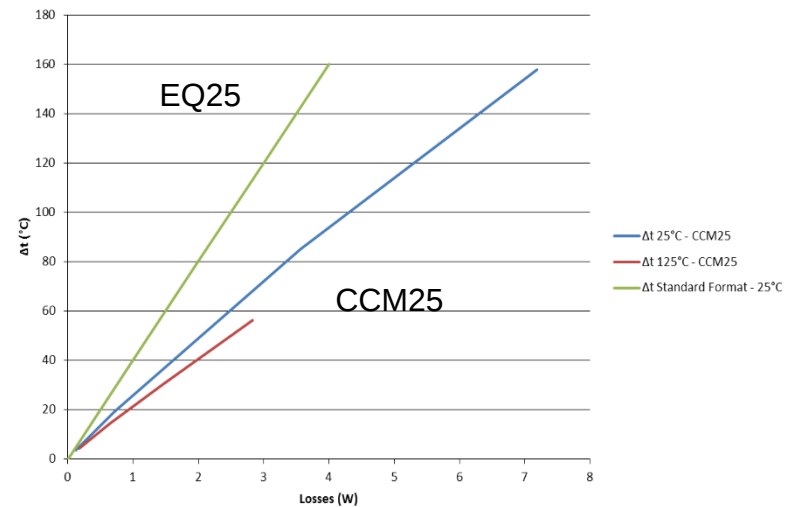
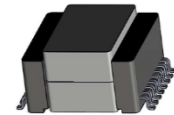


Comparison CCM vs standard technologies

Temperature Rise versus Power Losses /dissipation



50% Less Temperature rise for the CCM technology product compared to the standard technologies

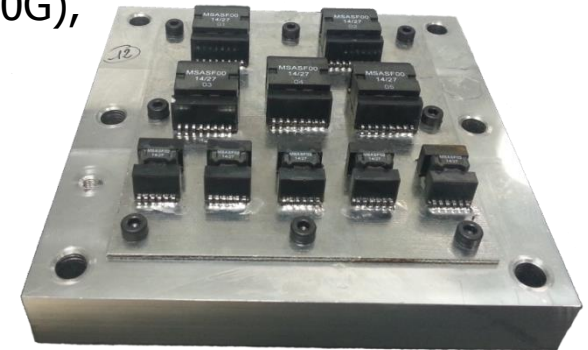


CCM Technology – Space Certification



Tests results

- Dielectric Testing up to 1500Vac
- Possibility to remove terminals
- Mechanical testing
 - Shock according to MIL STD 202 Method 213 (100G – 6ms)
 - Vibration according to MIL STD 202 Method 204 (30G),
- Life test 2000h



Planning :

Q2 2016 ESA certification

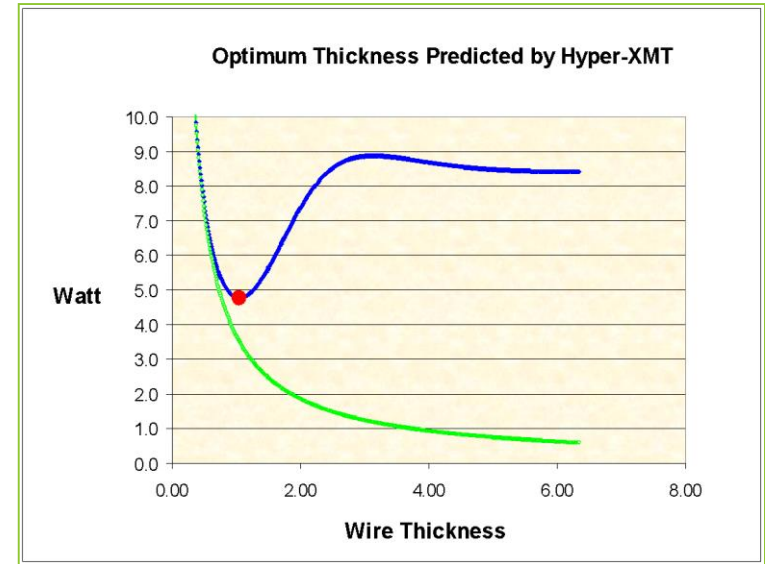
CCM4, CCM5, CCM6, CCM20, CCM25 successfully tested

HXMT: HYPER MAGNETIC TECHNOLOGY



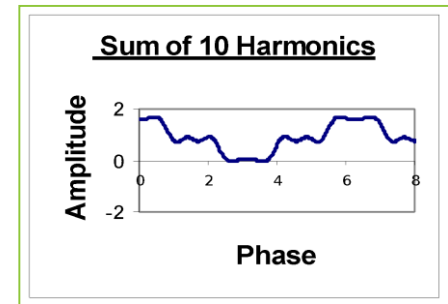
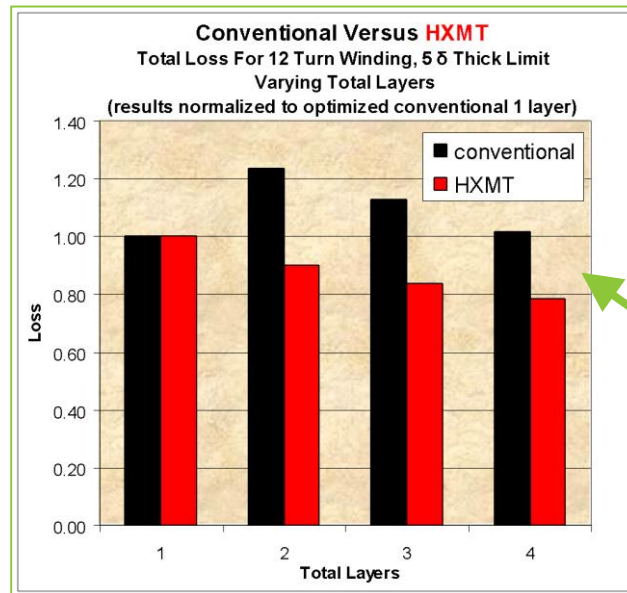
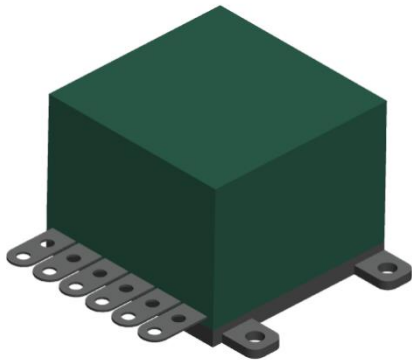
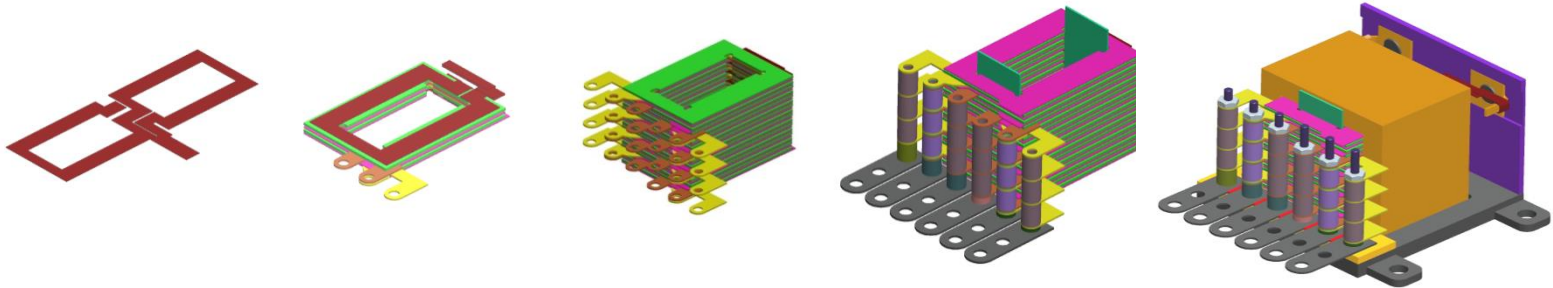
BENEFITS

- Provides layer by layer optimization, optimizes coil construction
- Yields optimal configuration to achieve desired functions
- Reduces lost energy within coils
- Transformers operate cooler & more efficiently
- Gives size, weight and cost reduction
- Is based on loss and energy solutions of the diffusion equation for generalized boundary conditions
- Finds hidden value in magnetic components



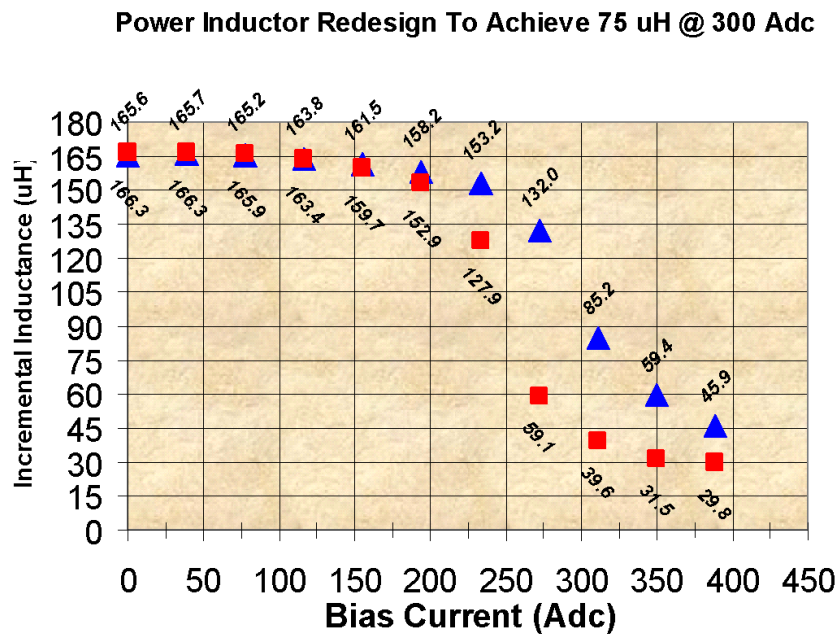
U.S. Patents: 7506280, 7885787, 7888931

HIGH GRADE OPTIMIZATION

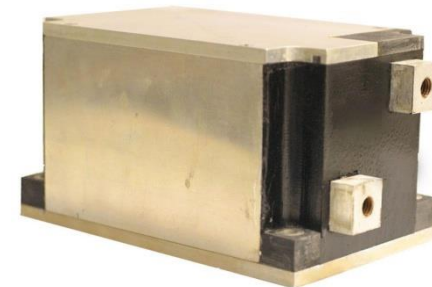
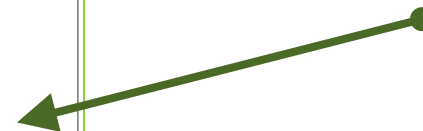


**22% Loss
Reduction**

HIGH GRADE ENCAPSULATION



+118% inductance increase within package constraints



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