



POWER & MICROWAVE
TECHNOLOGIES

DISRUPTIVE TECHNOLOGIES TO GLOBAL MARKETS

RF & Microwave / Power Energy / Industrial

rellpower.com



**Richardson
Electronics**

POWER & MICROWAVE
TECHNOLOGIES

RELLPOWER.COM

BRINGING DISRUPTIVE TECHNOLOGY TO GLOBAL MARKETS

**Founded
in 1947**

Global network: 60 sales offices / 4 distribution hubs

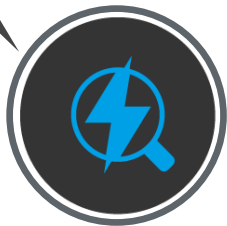
ISO 9001:2008 Certified

>400 employees: >50% in sales, engineering, product management

Rich, unique history of engineering, manufacturing and distributing

BRINGING DISRUPTIVE TECHNOLOGY TO GLOBAL MARKETS

DEMAND CREATION BUSINESS MODEL



IDENTIFY & SELL
DISRUPTIVE
TECHNOLOGIES

INTRODUCE NEW
PRODUCTS TO THE
MARKET

DEVELOP SOLUTIONS
FOR OUR CUSTOMERS

PROVIDE
EXCEPTIONAL GLOBAL
SUPPORT

Our Line Card

Richardson Electronics
POWER & MICROWAVE TECHNOLOGIES
RELLPOWER.COM

Power & Microwave Technologies Global Partners

RF & MICROWAVE AND POWER ELECTRONICS COMPONENTS

RF & MICROWAVE

POWER SEMICONDUCTORS

PASSIVES

ELECTRON TUBES AND COMPONENTS

RICHARDSON ELECTRONICS, LTD. | 800.348.5180 | 430.208.2200 | RELPOWER.COM

	Semiconductor Diodes	Semiconductor ICs	Semiconductor Modules	RF Connectors / Cables	RF Test & Measurement	Electrolytic Capacitors	Film / High Voltage / Oil-Filled Capacitors	Power & Microwave Ceramic Capacitors	Ultracapacitors & Solutions	Vacuum Capacitors & Relays	Electromechanical	Frequency Control	Passive Devices	Value-Added & System Solutions	RF & Microwave Connector/Assembly	Thermal Management
3Rwave					*								*	*		
Amotech													*	*		
Anaren			*										*	*		
Anokiwave	*															
Applied Power Systems		*								*	*			*		*
Bonitron									*					*		
CeramTec								*								
Cooling Source																*
Cornell Dubilier						*	*									
CSR Times Electric	*		*				*				*		*	*		
Dynawave			*												*	
Exxelia						*	*	*					*			
FTCAP						*	*									
Global Power	*		*													
High Energy Corp.							*	*								
Infiniti Microwave			*		*											
IOXUS									*							
Jennings									*							
Junkosha				*												
LCorn				*	*											
LS Mtron								*						*		
MACOM		*	*					*			*	*	*	*		
National Electronics	*	*	*			*	*			*			*	*	*	
OHMITE										*			*	*		
QORVO	*	*	*					*				*	*	*		
SHX					*								*	*	*	
Starpower	*		*													
Tecate									*					*		
Tuyue				*										*	*	
USCi	*		*													
Vishay						*	*									
WanTCom		*		*												

DISRUPTIVE TECHNOLOGIES TO GLOBAL MARKETS



- Leading technology in High Powered IGBT (Modules 650-3300V & Discrete), MOSFETs, Bipolar & SiC Modules
- Research & Development in Nuremberg Germany with manufacturing located in Jiaxing China. 3 operational fabs and New facility opened in Shanghai for focus on the EV market.
- Heavy investments in R&D and development of new technologies—including “Sintering” and new die bonding.
- Becoming 100% independent supplier. Star Power has control of own IGBT Chip Technology
- Reliability, cost and lead time surpasses the competition with new chip technology.
- <http://www.starpowereurope.com/en>



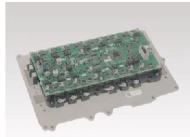
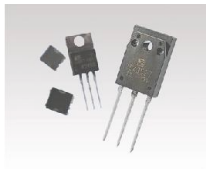
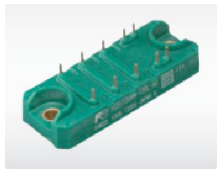
DISRUPTIVE TECHNOLOGIES TO GLOBAL MARKETS



Richardson Electronics

POWER & MICROWAVE
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FE Fuji Electric *Innovating Energy Technology*



Fuji Electric is a global manufacturer of Power Semiconductor products offering Industrial IGBT Power modules, High Power IGBT modules, Intelligent Power Modules, SiC devices (Hybrid & Full SiC), Discrete Rectifier Diodes, Discrete MOSFET & IGBT devices.

- IGBT Modules- 10A-3600A 600V-3300V several topologies and packages
 - Gen 6 and Gen 7 X series now available
 - GEN 7 Reduces power dissipation, Achieves equipment size reduction, Contributes to improving equipment reliability
 - IPM's 600-1200V, 25A-400A
- SiC Modules- Hybrid (SiC SBD) 600-1700V, 35A-1200A
All SiC (SiC MOSFET & SiC Schottky Diode) 1200V, 25A-400A
- Discrete IGBT's-600-1200V, 15A-75A
- Super Junction MOSFET- 600-650V, 25-380mohm
- Schottky Barrier Diodes- 650-1200V, 10A-50A
- https://americas.fujielectric.com/fecoa_products/igbt/

DISRUPTIVE TECHNOLOGIES TO GLOBAL MARKETS



- Specializes in the development of high efficiency Silicon Carbide (SiC) devices & foundry services
- Standard SiC products: 650V – 1200V Schottky Diodes, JFETS and Cascodes
- **Schottky Diodes-** 4-100A 650-1200V Best in class, **Cascodes-** 20-100mOhm 650-1200V Use of existing gate driver, Best in performance (Low Vf, Qrr & switching energy), Reliability (No SiC Gate oxide, No SiC body diode, 5V Threshold voltage) and Cost (lowest RDS, on in industry)
- Disruptive SiC device & process IP. 14 issued patents including foundational IP relating to particular devices made with SiC
- Fabless, with 2 external fabs running 4" & 6" wafer lines
- Gen 3 (6 inch wafer) now available for sampling
- Best in class performance at a competitive cost from stock!
- Affordable increased power efficiency in key markets that will drive the new and greener economy
- www.unitedsic.com

DISRUPTIVE TECHNOLOGIES TO GLOBAL MARKETS

MSpower

MS POWER GmbH



- MS Power GmbH, headquartered in Eschborn, Germany, is a leading manufacture of Bipolar semiconductor products. The current portfolio of products mainly covers the range of Bi-Polar semiconductor chips and discrete in forms of Stud Screw Fit Diodes/Thyristors (SCR), Capsule Devices and Modules.
- Diodes- 6A-6400A up to 7kV; Thyristors- 16A-5000A up to 6.5kV; Diode Modules-25A-1000A up to 6kV; SCR & SCR/Diode Modules- 25A-800A up to 4400V
- Capabilities include; Wafer fab in-house chip production, Packaging fab with word class soldering technology (vacuum soldering) and best in class high power testing center
- Full line of Distributed Gate Thyristors for Induction Heating applications.
- Modules offered in both soldered and compression bonded technologies
- Cost competitive and available from stock
- www.mspowergroup.com

DISRUPTIVE TECHNOLOGIES TO GLOBAL MARKETS



- 35 years of experience in manufacturing high quality Screw terminal and snap type aluminum electrolytic capacitors & DC Link Film capacitors for low and medium/high frequencies.
- Long life 85° & 105°Celsius Snap and Screw terminal electrolytic capacitors
 - 20,000 hours at rated condition
 - **600V** screw terminal electrolytic available 1500-6800uF!
 - Fully vertically integrated
 - Custom designs
 - Kendeil have developed software models to provide fast accurate life predictions for any given operating condition
- Short delivery time (3-5 weeks) vs the competition of 12+ weeks
- Satma, an etching facility, is solely owned by Kendeil. Having the etching capability for anode foil gives Kendeil the ability to control the complete process of manufacturing these capacitors. In return, the customer receives **a cost effective, long life and exceptionally reliable product.**
- www.kendeil.com



DISRUPTIVE TECHNOLOGIES TO GLOBAL MARKETS



POWER & MICROWAVE
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As the largest power capacitor company in North America, we offer one of the world's largest selection of aluminum electrolytic capacitors, mica capacitors, AC film capacitors, and DC film capacitors.



- Aluminum Electrolytic Capacitors-
 - Screw & snap in, Flat pack, Plug in radial, Axial, Radial, SMT
 - For DC link, Pulse, DC output filtering
- DC Film Capacitors-
 - DC Link, Bus & Board Mount
 - Snubber & Pulse Discharge
 - Custom Sizes and Terminations
 - For DC Link, Filter and RC Network applications
- AC Film Capacitors
 - Oil Filled Metal Case
 - Axial Wrap & Fill
 - Radial Box & Dipped
 - For Single & Three Phase PFC, AC Output, Harmonic Filter, Motor Run
- Low cost manufacturing in Mexicali Mexico
- Leading technical support for all the above products
- No other company is willing to do as many custom applications
- Superior Technology, Exceptional Service, Outstanding Value
- www.cde.com

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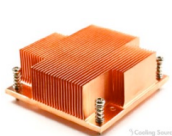
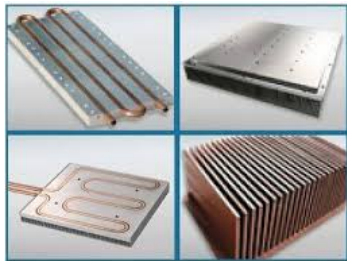
- New-generation Ultra-Capacitor storage devices feature high power, high energy, reliability and long life, which enables use in a variety of applications such as back-up power, auxiliary power, instantaneous power and peak power compensation. Full line of cells and standard modules.

- Rated voltage: now, up to **3.0 V** cells
- Increased Energy Density
- Lower ESR
- Superior power & reliability versus competitive technologies
- Environmentally friendly
- Cost competitive, cells and modules from stock
- www.ultracapacitor.co.kr:8001

DISRUPTIVE TECHNOLOGIES TO GLOBAL MARKETS



Quality Thermal Design Solutions



Whether you need a pre-manufactured heatsink with its own specific offerings, or whether you need a fully customized heatsink manufactured from a material and finish of your choice, Cooling Source, Inc. & Richardson Electronics will work with you to determine and deliver your needs. Our thermal analysis will help you optimize your heatsink, saving you time, effort and money.

- Products include; extrusion, bonded fin, skived fin, folded fin, cold plates, heat pipe, board level, fans & blowers, interface material
- Thermal analysis using CFD modeling & rapid prototyping available
- Manufacturing in Asia and USA to serve the global industry
- All Cooling Source facilities are ISO 9001:2015 registered
- High quality and competitive global market pricing
- www.coolingsources.com

DISRUPTIVE TECHNOLOGIES TO GLOBAL MARKETS



Richardson Electronics' National brand leverages our expertise and experience to provide customers with exactly what they need when it comes to industrial components, including SCR and rectifier discrete and modules, as well as passive components. We are committed to delivering high-quality, cost-effective component solutions that meet our customers' power conversion requirements.

Products include;

- Phase & Distributed Gate SCR's
- Standard & Fast Recovery Rectifiers
- Clamp Compression Systems
- Firing Cards
- Electrolytic, Film & Ultra-Capacitors

Superior Reliability, Competitive Cost and Available from Stock