



2019 Corporate Profile

Service is our passion

vision statement

**we aspire to be the preferred manufacturer of
the most innovative discrete semiconductors
in the industry**

core values

purpose

Customer satisfaction is our passion.

innovation

Overcome challenges through
creative solutions.

enthusiasm

The resolve to achieve excellence.

trust

Empower to succeed.

teamwork

Results through dynamic
collaboration.

heritage

Exceptional past,
exciting future.

CentralTM
Semiconductor Corp.

Discretes do MatterTM





- Established in 1974 with over 45 years of proven success
- Privately held, zero debt, continuously growing and profitable
- ISO9001-2015 certified: **Design and Manufacture of Discrete Semiconductors**
- World wide support for leading OEMs, ODMs and CMs
- Corporate Headquarters – Hauppauge, Long Island, NY

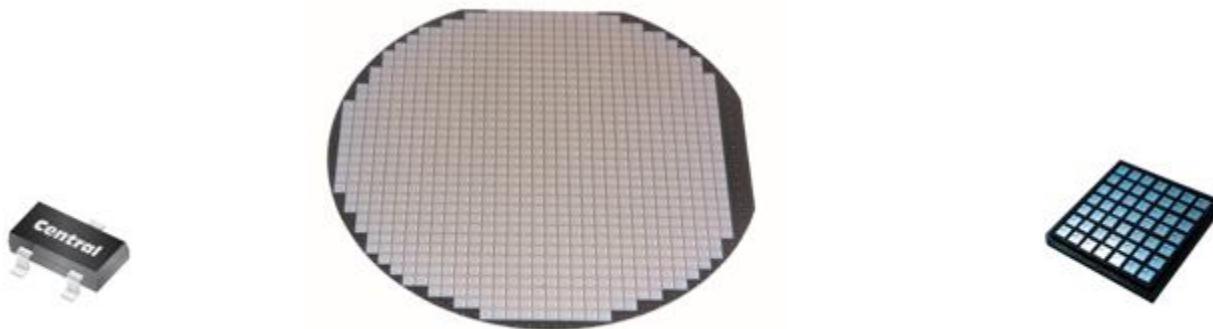


In the late 1970s Central recognized that there was unfulfilled demand for trailing edge semiconductors. Many manufacturers left a gap when they began discontinuing production of germanium devices in favor of silicon. Central stepped in to fill this void and continued making germanium devices until the late 1980s. Since then, Central has remained dedicated to manufacturing many other trailing edge devices in legacy packages. Trailing edge devices allow for the extended life of older, but still useful end products, while avoiding the expense of costly redesigns.



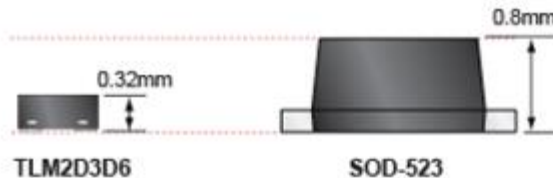


To address the growing demand for miniaturization in the 1980s, Central expanded its product families to include surface mount devices. Then in the 1990s, Central entered the hybrid market to fill another void in the market, and began selling its products in wafer and bare die form.



Central today... and into the future

Smaller, more flexible, and more entrepreneurial than higher volume manufacturers, Central Semiconductor has ensured its product portfolio has continued to evolve. With its unique combination of support for trailing edge technology, innovation, and services, Central continues to build its reputation for manufacturing the highest-quality devices, delivered on time, with outstanding service, at reasonable prices. Solving customers' most challenging problems is the key to mutual future success. **Central's mission and passion...complete customer satisfaction.**



Product portfolio

Broad range of devices

Small Signal Transistors

- Low $V_{CE(SAT)}$
- General Purpose Amplifier/Switch
- High Current/High Voltage
- Low Noise
- Darlington
- RF Oscillator
- Chopper

Bipolar Power Transistors

- Low $V_{CE(SAT)}$
- General Purpose Amplifier/Switch
- High/ Extremely High Voltage
- Darlington

Small Signal MOSFETs

- Single and Dual N-Channel & P-Channel Enhancement-mode
- MOSFET/Rectifier combinations

Diodes

- Fast Switching
- Schottky
- Low and Ultra Low Leakage
- Zener, and TC Zener
- Current Limiting
- Transient Voltage Suppressor (TVS)

Rectifiers

- Fast, SuperFast, UltraFast, and HyperFast Recovery
- Schottky
- Bridge
- General Purpose
- Silicon Carbide (Bare Die available)

Thyristors

- Triacs, Diacs, and SCRs

Multi Discrete Modules

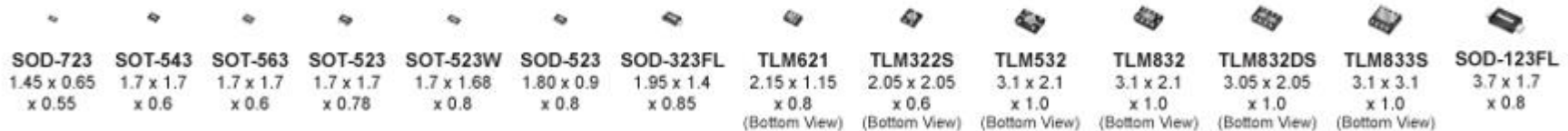
- MOSFET/ Schottky combinations
- Transistor/ Schottky combinations

From larger power packages to the industries smallest low power types, Central Semiconductor can satisfy any size requirement.

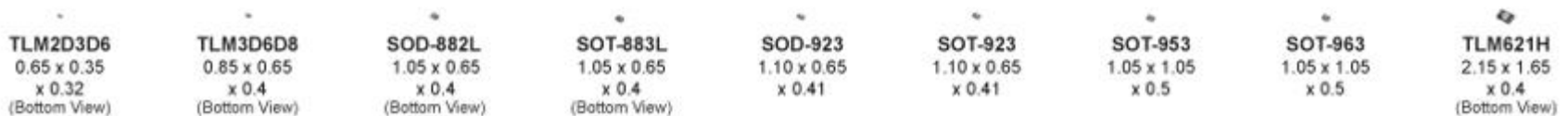
> 1.0mm Profile



< 1.0mm Profile



< 0.5mm Profile



Popular Through-hole packages (over 50 package types still supported)

Hermetically sealed metal can packages



TO-3



TO-66



TO-18



TO-39



TO-72

Axial leaded packages



DO-35



DO-41



GPR-1A



GPR-4AM

Epoxy molded packages



TO-92



TO-237



TO-220



TO-220FP



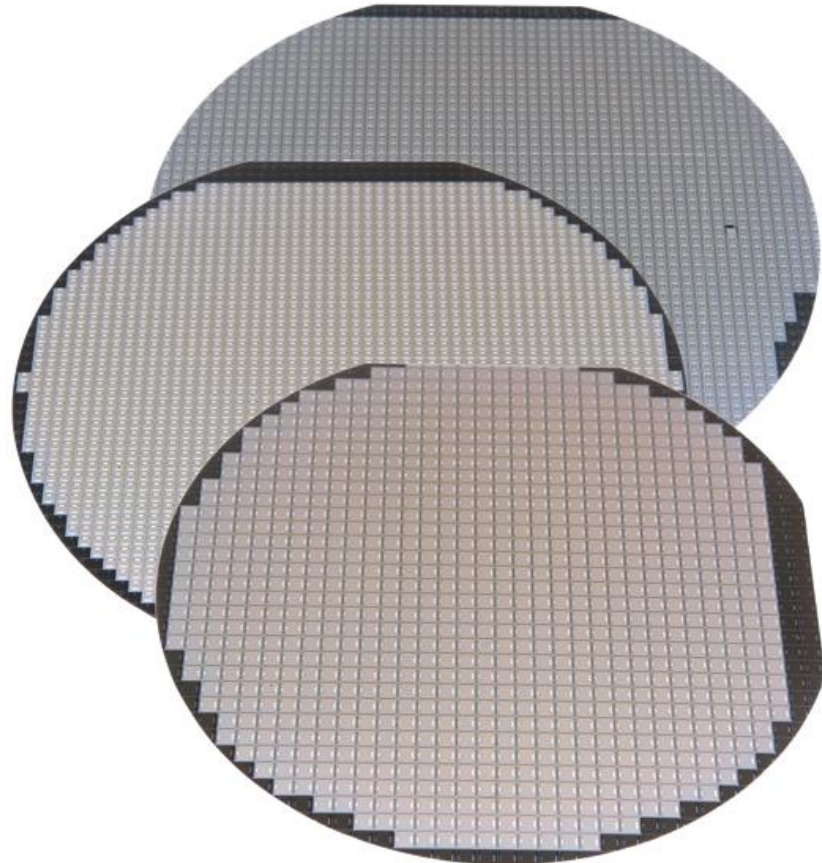
TO-202



TO-116

Bare Die for space constrained designs...

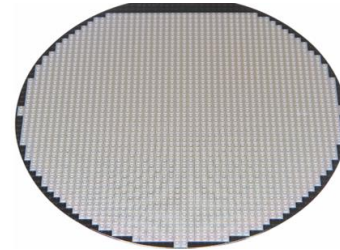
- Central provides many of its products in bare die for hybrid applications
- Device families include:
 - Small signal and power transistors
 - MOSFETs
 - Schottky diodes and rectifiers
 - Zener diodes
 - High speed switching diodes
 - Transient Voltage Suppressors
 - Silicon Carbide devices
 - Fast, UltraFast, SuperFast and HyperFast recovery rectifiers



Bare Die for space constrained designs...

Die is available in the following formats:

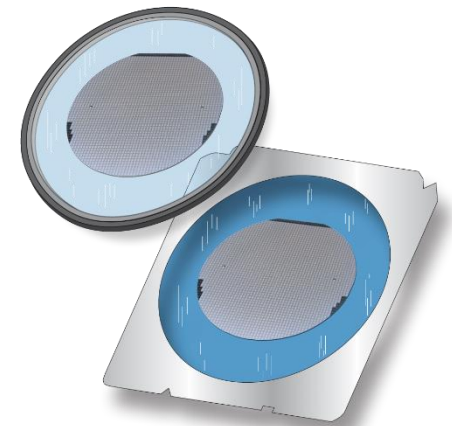
Full wafer – fully probed (rejects inked) [WN}



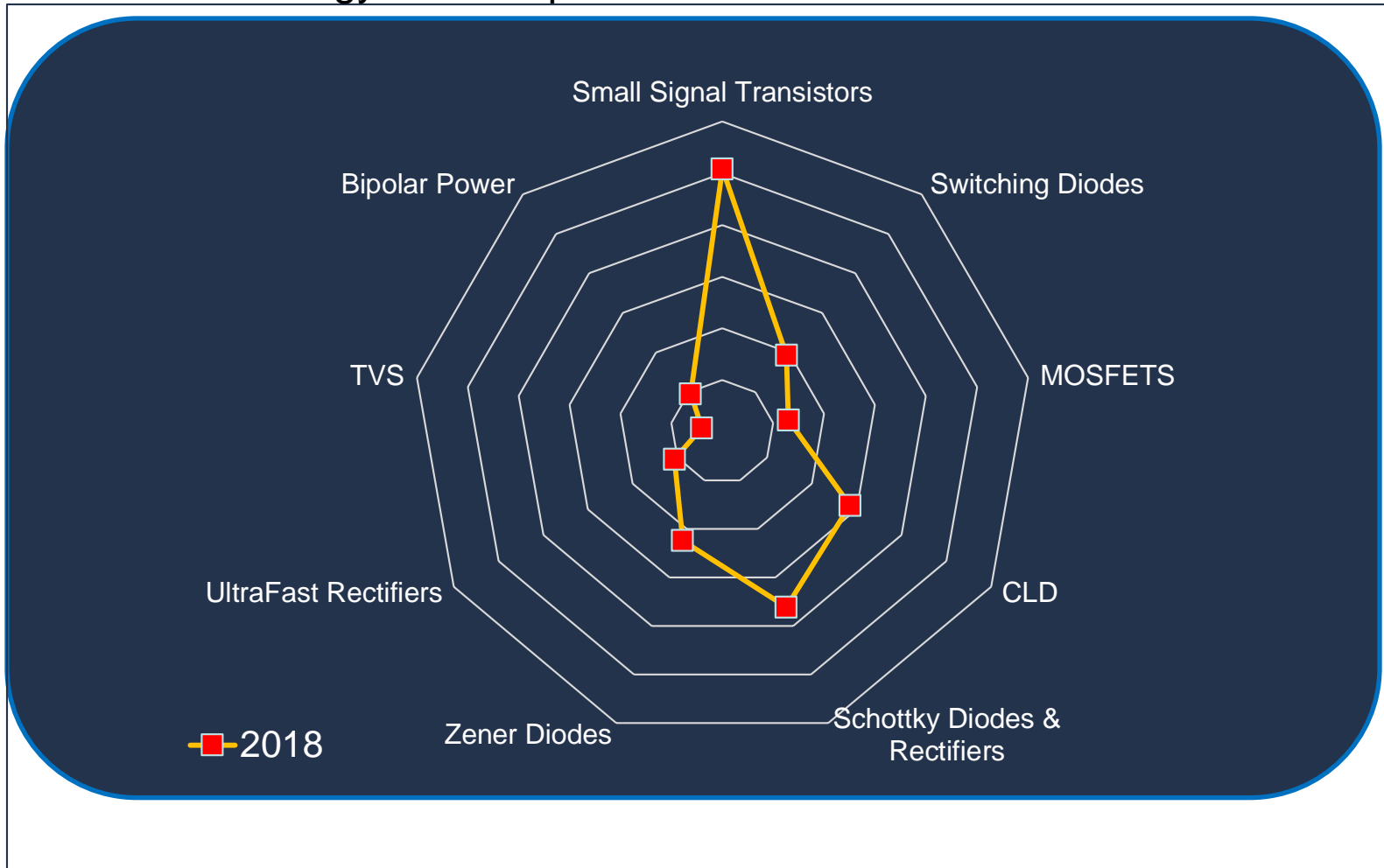
Waffle tray packs (100% accepted die) [CT, CM]



Wafer sawn on plastic ring (rejects inked) [WR, WS]



Product Technology Heat Map



2019 Top selling item highlights

Legacy Devices:

2N2222A
2N2907A
TIP36C
2N6027
2N6028
2N3866
2N878
2N6101
1N5303
1N5314

Legacy Devices:

2N2905A
2N3054
2N3440
2N6295
2N6301
CPR5U-040
2N2060M
1N5418-4L
2N918
2N5179

MOSFETs:

CMLDM8120G
CMKDM8005
CMLDM3737
CMUDM8005

Schottky Diodes:

CBRHDSH1-100
CMRSH-4DO
CTLSH01-30
CMPSH1-4

CLDs:

All CMJ Series

Switching Diodes:

CMPD4448
CMOD2004
CMXD2004SR

Strategic Initiatives





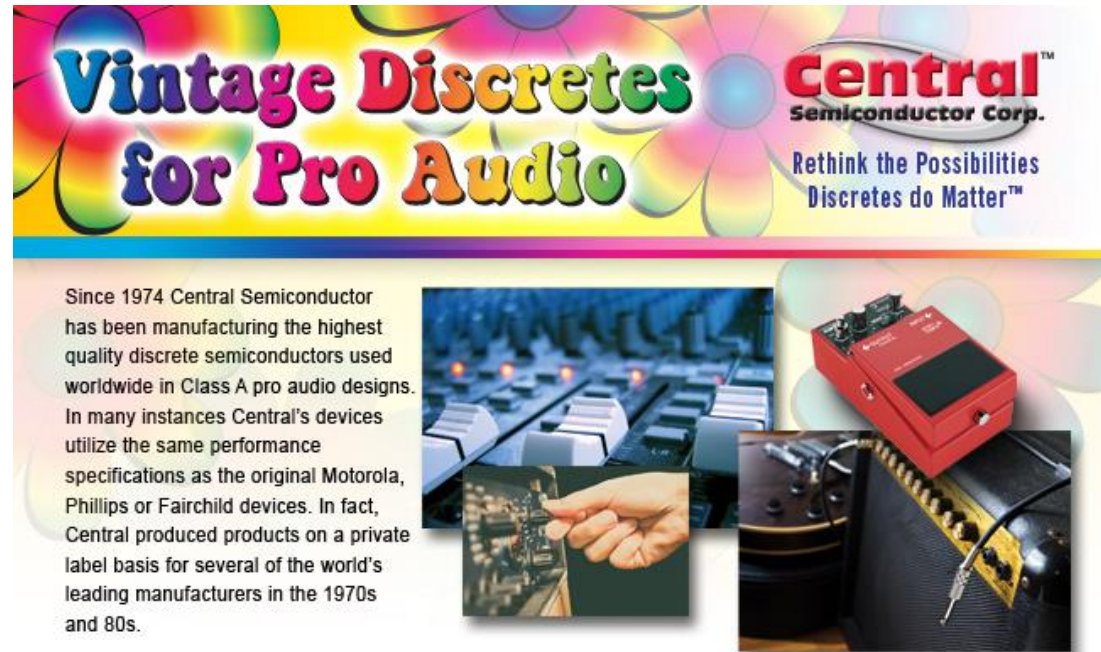
A Balanced Approach



Legacy




- Central continues to manufacture older technology devices to support extended product life cycles
- Over 3,000 legacy devices available
- Custom legacy device development possible



Vintage Discretes for Pro Audio

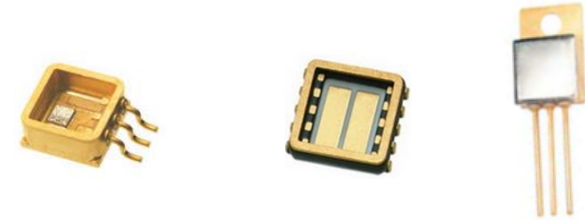
Central™ Semiconductor Corp.
Rethink the Possibilities
Discretes do Matter™

Since 1974 Central Semiconductor has been manufacturing the highest quality discrete semiconductors used worldwide in Class A pro audio designs. In many instances Central's devices utilize the same performance specifications as the original Motorola, Phillips or Fairchild devices. In fact, Central produced products on a private label basis for several of the world's leading manufacturers in the 1970s and 80s.



Central targets many market segments know for utilizing legacy devices

Innovative New Products



- **Leading edge devices**

EXAMPLES

- Low profile DFN Bridge Rectifiers (CBRDFSH Series)
- Low Capacitance TVS (CT)

- **Multi Discrete Modules™**



- Combining multiple discretes into a single package

- **Application-specific designs**

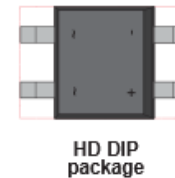
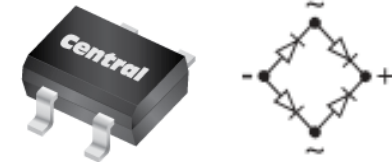


- Devices specifically designed for applications such as:
 - Power over Ethernet
 - Solid-state lighting

Innovative New Products

EXAMPLES

- CBRHDSH2-100: Application: PoE polarity protection
Requirement: 2A, 100V Schottky Bridge
Solution: New HD DIP device incorporates four Schottky rectifiers, saving 50% less board space than four individual SMA devices.
Turn around time: 6 -8 weeks



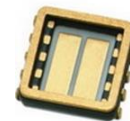
- CTLHR10-06: Application: Power Factor Correction for industrial motors
Requirement: 600V rectifier with faster reverse recovery speed than UltraFast (<25ns).
Solution: The CTLHR10-06 10A, 600V HyperFast rectifier in the low profile TLM364 package.
Turn around time: 8-10 weeks



Services

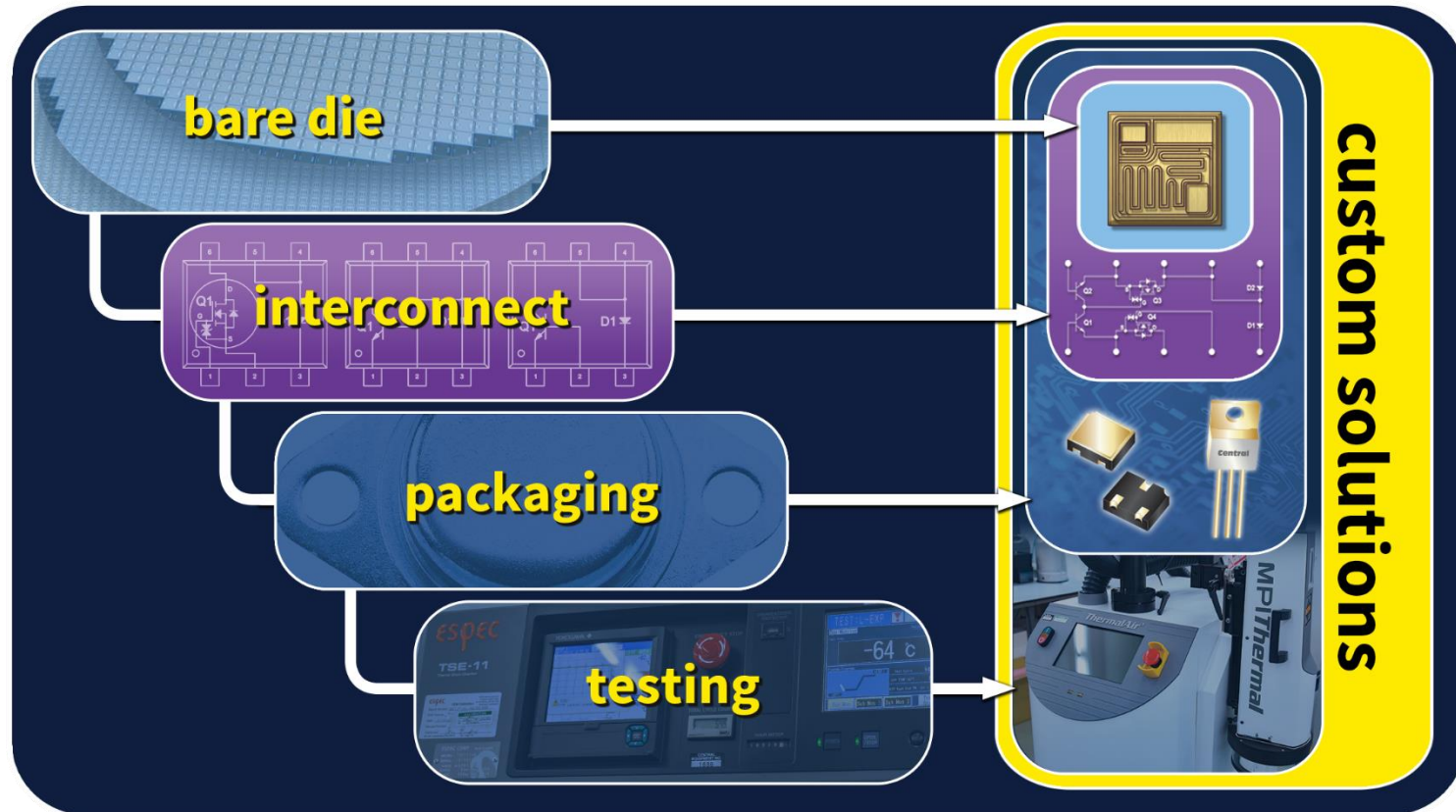


- Product services & vendor managed inventory (VMI)
- Parametric electrical screening
- Plating options for through-hole devices
- Custom device development
- Up-screening
- Super Industrial™ and Spacellite™



Services

Custom Device Development

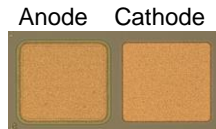


Services

Custom Device Development

✓ Bare Die

- Custom diffusion
- Special Metallization
- Lateral die development



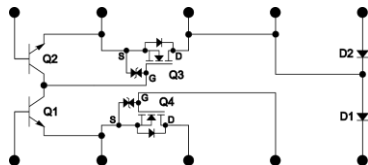
✓ Packaging

- Plastic or Hermetic packages
- Custom lead frames



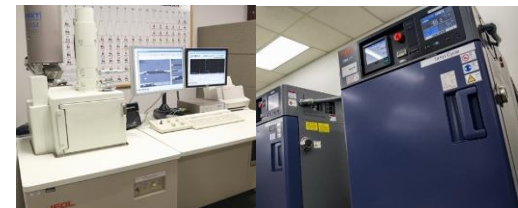
✓ Interconnect/assembly

- Gold wire bond
- Custom device integration
- MDM™ (Multi-discrete Modules)



✓ Testing

- JAN equivalent to
 - ✓ MIL-PRF-19500
 - ✓ MIL-PRF-38534
- Customer specific testing



Super Industrial™



Super Industrial™ solutions provide superior performance at extreme environmental conditions

Spacellite™



Spacellite™ solutions
Are designed to meet
Space level applications



Radiation testing by Troxel™ • Silicon expertise from Central™

A new Collaboration in Space



Services – Spacellite™

Space 2.0 – New Space



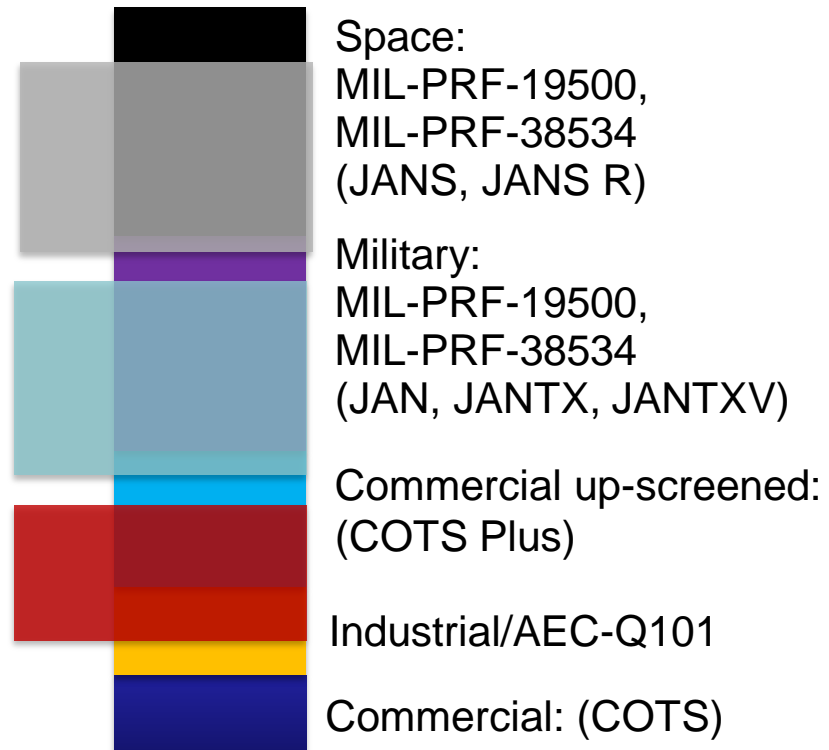
Central Semi Spacellite™

Spacellite-S,
Spacellite Ultra,
Spacellite +
Spacellite

Central Semi MIL Equivalent
(E, EX, EV, ES, H, HC, K, KC)



Central Semi Super Industrial™



Services – Below the sea to outer space

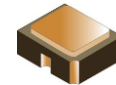


Services

Super Industrial™



- Designed to meet the rigorous environmental conditions standard Industrial products cannot meet.



Services applications



Example

Customer A:

Market: **Communications**

End Product: **Repeater**

Environment: **Cold temperature and high
underwater neutron interference**

Challenge: **Develop custom device**

Solutions:

1. Custom packaging
2. Custom interconnect
3. Enhanced operating parameters
4. Custom production level testing



bare die

packaging

interconnect

testing

Services applications



Example

Customer B:

Market: Alternative Energy

End Product: Smart Meter

Environment: Extreme moisture

Challenge: Eliminate failures due to operating environment

Solutions:

1. Silver removed from wafer
2. Enhanced interconnect
3. Perform life test to insure high MTBF.



bare die

packaging

interconnect

testing

Services applications

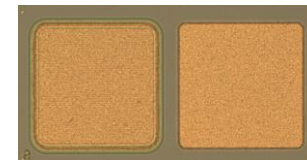


bare die

Custom bypass diode for the satellite solar panels.

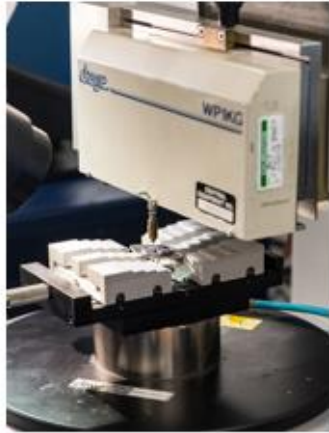
Central created lateral die.
Anode and Cathode on the same side

Anode Cathode



Services

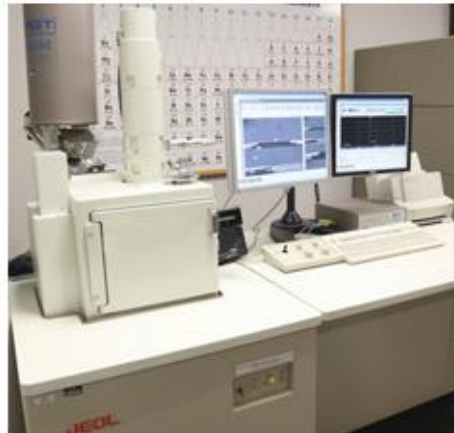
Expanding in-house up-screening



Wire pull/die shear



Tri-temp testing



SEM w/EDX



Temperature cycling



Atmospheric testing



HAST Testing
(Highly Accelerated Stress Test)



Fine leak Testing

Services

Expanding in-house up-screening



X-Ray



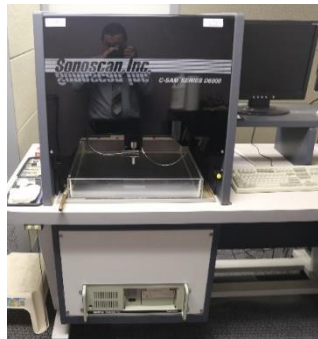
One Box test chambers



PIND Tester



multiple waveform surge tester



C-SAM



De-cap station

Services Up-screening (JAN/MIL equivalent)

MIL-PRF-38534 equivalent (Bare Die):

- ✓ Class H processed 100% in-house
- ✓ Customer Specific Testing possible
- ✓ Very fast turn-around time
- ✓ Class K screening also available

MIL-PRF-38534
Class H equivalent

MIL-PRF-19500 equivalent (Packaged and Bare Die):

- ✓ Packaged: E=JAN, EX=JANTX, EV=JANTXV, ES=JANS
- ✓ Bare Die: Class HC and KC
- ✓ Expanding in-house process and capabilities
- ✓ Increased number of external testing partners
- ✓ Focusing on Spacelite™ products

Customer specific screening:

- ✓ Approved via test plan or SCD

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Services

Spacellite™ Certification Plan

Test	Sample Size	Standard	Spacellite	Spacellite +	Spacellite Ultra
Number 1: Electrical Test (DC1, DC2, DC3) 25°C, -55°C, 125°C	100%		Per Device Datasheet	Per Device Datasheet	Per Device Datasheet
Number 2: X-Ray	-		Not Applicable	Not Applicable	Sample
Number 3: Temperature Cycling	100%	MIL-STD 883:	20 Cycles	20 Cycles	20 Cycles
		TM 1010 Condition B	(-55°C to +125°C)	(-55°C to +125°C)	(-55°C to +125°C)
Number 4: Electrical Test (DC4) 25°C	100%		Per Device Datasheet	Per Device Datasheet	Per Device Datasheet
Number 5: PIND	100%	MIL-STD 750:	Not Applicable	Not Applicable	Applicable
Hermetic Devices Only		2052 Condition A			
Number 6: HTRB	100%	MIL-STD 750: 1038, 1039, 1040, 1042	Not Applicable	48 hours for N-Type Device. 24 Hours for P-Type Devices.	48 hours for N-Type Device. 24 Hours for P-Type Devices.
Number 7A: Electrical Test (DC5) 25°C	100%		Per Device Datasheet	Per Device Datasheet	Per Device Datasheet
Number 7B: Delta Shift Calculations	100%		Per Specified Parameters on Device Datasheet	Per Specified Parameters on Device Datasheet	Per Specified Parameters on Device Datasheet
Number 7C: PDA Evaluation	100%		20% Allowable per Min/Max Limits of Device Datasheet	10% Allowable per Min/Max Limits of Device Datasheet	5% Allowable per Min/Max Limits of Device Datasheet



Services

Spacellite™ Certification Plan

Test	Sample Size	Standard	Spacellite	Spacellite +	Spacellite Ultra
Number 8: Burn-in	100%	MIL-STD 750: 1038, 1039, 1040, 1042	168 Hours	168 Hours	240 Hours
Number 9A: Electrical Test (DC6) 25°C	100%		Per Device Datasheet	Per Device Datasheet	Per Device Datasheet
Number 9B: Delta Shift Calculations	100%		Per Specified Parameters on Device Datasheet	Per Specified Parameters on Device Datasheet	Per Specified Parameters on Device Datasheet
Number 9C: PDA Evaluation	100%		20% Allowable per Min/Max Limits of Device Datasheet	10% Allowable per Min/Max Limits of Device Datasheet	5% Allowable per Min/Max Limits of Device Datasheet
Number 10A: Fine Leak	100%	MIL-STD 883:	Yes	Yes	Yes
Hermetic Devices Only		1014			
Number 10B: Gross Leak	100%	MIL-STD 750:	Yes	Yes	Yes
Hermetic Devices Only		1071			
Number 11: Final Electrical Test (DC7, DC8, DC9) 25°C, -55°C, 125°C	100%		Per Device Datasheet	Per Device Datasheet	Per Device Datasheet



Services

Spacellite™ Lot Qualification Plan

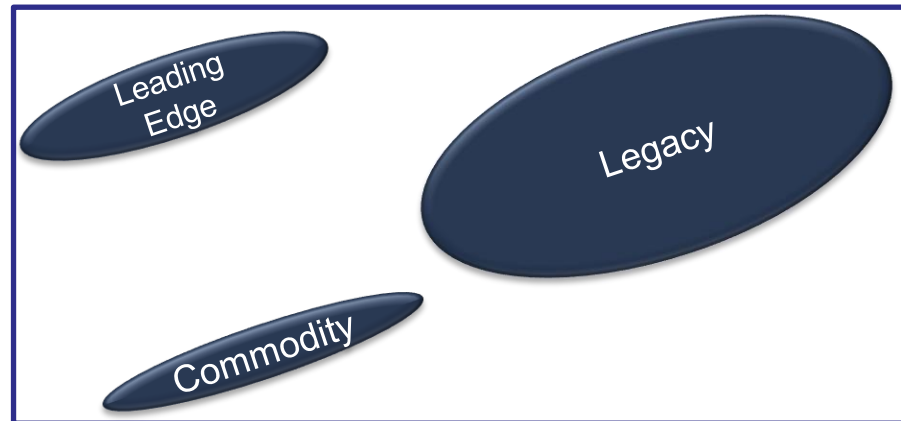
Process	Test Methods & Conditions	Sample Size (Failures)		
		Spacellite	Spacellite +	Spacellite Ultra
Group 1: Visual Inspection and Serialization	JESD22-B101, clause 6.0	17	32	32
Group 2: Radiation Analysis		1/	1/	1/
Group 3: Preconditioning of Non Hermetic Devices	Sequence: initial electrical test, visual inspection, temperature cycle, bake, moisture soak, reflow, flux soak, clean & dry, and final electrical test. JESD22-A113	17	32	32
Group 4: Electrical Test	Per Device Specification 25°C, -55°C, 125°C	17(0)	32(0)	32(0)
Group 5A: HTOL	MIL-STD 883: TM 1005 Condition D, 125°C	10 Devices, 200 Hours	22 Devices, 500 Hours	22 Devices, 1000 Hours
Group 5B: Post Electrical Test	Per Device Specification 25°C, -55°C, 125°C	10(0)	22(0)	22(0)
Group 6A: Temperature Cycling	MIL-STD 883: TM 1010 Condition B, -55 to 125°C	10 Devices, 100 Cycles	22 Devices, 200 Cycles	22 Devices, 500 Cycles
Group 6B: Post Electrical Test	Per Device Specification 25°C, -55°C, 125°C	10(0)	22(0)	22(0)
Number 7A-1 Highly Accelerated Stress Test Biased (HAST)	JESD22A-110, with continuous bias (96 Hours, 130°C, 85% RH) or (264 Hours, 110°C, 85% RH)	Not Applicable	Not Applicable	10
Number 7A-2 Highly Accelerated Stress Test Unbiased (UHAST)	JESD22A-118, Condition A (96 Hours, 130°C, 85% RH) or JESD22-A102 (96 Hours, 121°C, 100% RH, 15 psig)	7	10	Not Applicable
Group 7B: Post Electrical Test	Per Device Specification 25°C, -55°C, 125°C	7(0)	10(0)	10(0)

Services

Expanded capabilities



- The Past

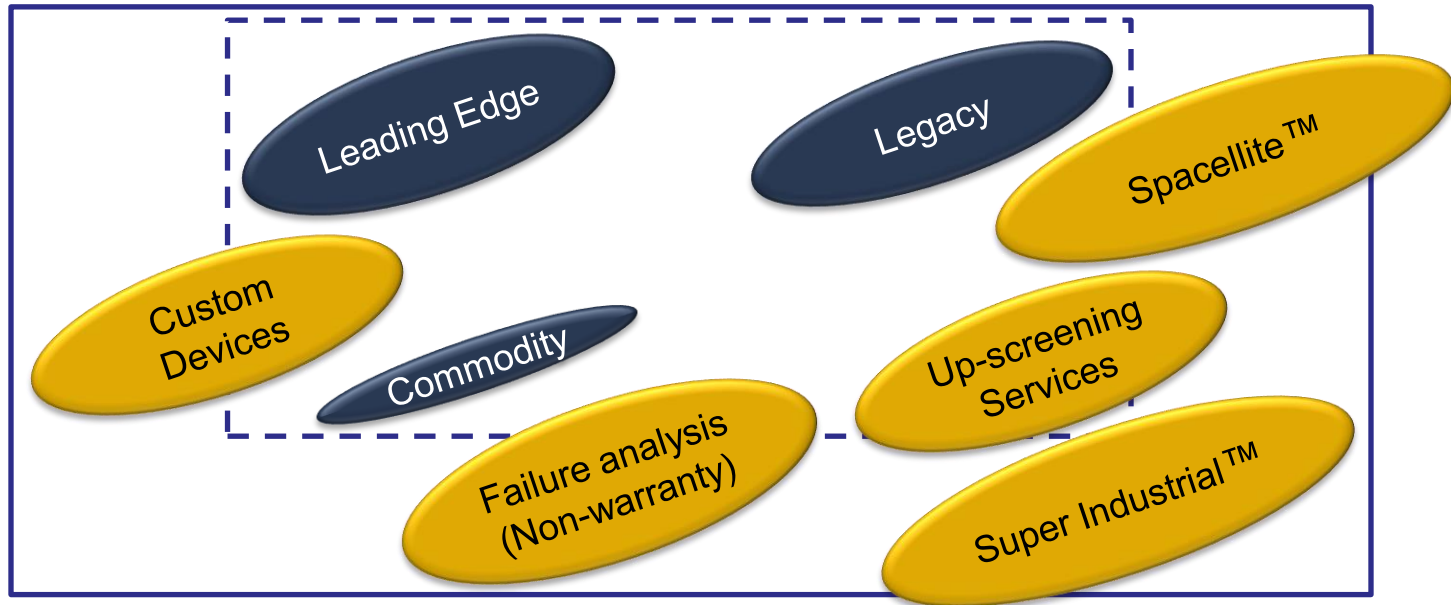


Services

Expanded capabilities



- The Future





End Applications

Solutions for today's latest products



Smart Phones

Power Source /Power Management

- MOSFETs
- Schottky diodes
- Small signal transistors
- Multi Discrete Modules

Audio

- High speed switching diodes
- Schottky diodes
- Small signal transistors

Display

- Schottky diodes



User Interface

- Uni-polar TVS
- ESD TVS
- TVS/Zener array
- High speed switching diodes

Data Port/USB

- ESD TVS
- TVS/Zener Array

RF Transmitter

- High speed switching diodes
- Small signal transistors
- MOSFETs
- Zener diodes

Tablets

Power Management

- MOSFETs
- Small signal transistors
- Schottky diodes
- Multi Discrete Modules
- Zener diodes
- TVS-Protection

Audio

- Small signal transistors
- Schottky diodes

Data Exchange (Wireless)

- ESD TVS
- TVS/Zener Array
- Diodes
- Schottky diodes



Camera Flash

- MOSFETs
- Schottky diodes
- Zener diodes

User Interface

- ESD TVS
- TVS/Zener Array

Data Exchange (Wired)

- ESD TVS
- TVS/Zener Array
- Diodes

Smart Meters

Voltage/Current Sense and Measurement

- Bridge rectifiers
- Schottky diodes
- Zener diodes
- Small signal diodes
- Current limiting diodes
- Bi-Directional TVS-Protection

Control Circuit

- MOSFETs
- Zener diodes
- Small signal transistors
- Current limiting diodes



Display Drive

- MOSFETs
- Small signal transistors
- Schottky diodes

Power Supply

- MOSFETs
- Schottky rectifiers
- UltraFast rectifiers
- Bi-Directional TVS-Protection

I/O Interface

- ESD TVS
- Schottky diodes
- Small signal diodes

Set Top Box

Power Management

- MOSFETs
- Bridge rectifiers – Full Wave
- Schottky rectifiers
- Zener diodes
- Small signal transistors
- TVS-Protection

Control Circuit

- MOSFETs
- Zener diodes
- Small signal transistors
- Current limiting diodes

Codec/Modem

- MOSFETs
- Diodes
- ESD TVS

Audio In/Out

- Diodes
- Zener diodes
- Small signal transistors



Display

- MOSFETs
- Small signal transistors
- Schottky diodes
- Zener diodes

Signal Output

- MOSFETs
- Small signal transistors
- Diodes
- Current Limiting diodes
- ESD Transient Voltage Suppressors

Signal Input

- MOSFETs
- Small signal transistors
- Diodes
- Zener diodes
- ESD Transient Voltage Suppressors

I/O Interface

- Uni-polar TVS
- ESD TVS
- TVS/Zener Array
- Low leakage diodes

Bluetooth Headset

Power Management

Battery Charger

- MOSFETs
- Schottky rectifiers
- Schottky diodes
- Zener diodes

DC-DC Converter

- MOSFETs
- Schottky rectifiers
- Schottky diodes
- Zener diodes



User Interface

- Uni-polar TVS
- ESD TVS
- TVS/Zener array

RF Transceiver

- ESD TVS
- Schottky diodes
- Diodes

Audio Processing, Codec/ DSP

- Diodes
- Schottky diodes
- ESD TVS

Glucose Meters

DC Power Source DC-DC Boost Converter

- MOSFETs
- Schottky diodes
- Zener diodes
- TVS-Protection



User Interface

- ESD TVS
- Multi Discrete Modules

Data Interface

- ESD TVS
- TVS/Zener Array

Timer Unit

- High speed switching diodes
- Schottky diodes
- Zener diodes

Sense & Measure

- High speed switching diodes
- Schottky diodes
- Zener diodes

Pulse Oximeter

Audio Amplification

- Small signal transistors
- Schottky diodes
- High speed switching diodes

2.5V / 3.3V

Boost/ Buck

DC-DC and

Battery Charger

- MOSFETs
- Small signal transistors
- Schottky diodes
- Multi Discrete Modules



I/O Interface

- TVS
- ESD TVS
- TVS/Zener Array
- Multi Discrete Modules

Display Drive

- Schottky Diodes
- MOSFETs
- High Speed Switching diodes

Sense / Detection

- High speed switching diodes
- Schottky diodes

Motor Control Systems

I/O Interface

- ESD TVS-Protection

Motor Driver

- MOSFETs

Power Factor Correction

- HyperFast rectifiers



Power Supply

Filter/Protection

- TVS

Full-wave Rectification

- Bridge rectifier

Switching

- Rectifiers

Output rectification

- Schottky rectifiers

Digital Cameras

Power Management

- MOSFETs
- Small signal transistors
- Schottky diodes
- Multi Discrete Modules
- Zener diodes
- TVS-Protection

Audio In/Out

- Small signal transistors
- Schottky diodes
- High Speed Switching diodes

Strobe

- UltraFast/ HyperFast rectifiers
- Schottky diodes



Display

- MOSFETs
- Schottky diodes
- High speed switching diodes

User Interface

- ESD TVS
- TVS/Zener Array

Auto Focus Motor

- MOSFETs
- Multi Discrete Modules

I/O USB, HDMI, Video

- ESD TVS
- TVS/Zener Array

Sales Operations

Global Sales Management Team

Al Simon
VP of WW Sales and
Marketing

Tom Donofrio
Director of Marketing
and Sales Operations



Antonio Bianchi
EMEA Country Manager

Timothy Wang
APAC Country Manager

Harry Tatelbaum
Area Sales Director – Western Region

Customer Relationship Team

Tom Donofrio - Director of Marketing and Sales Operations

Isabelle
Specht
Sr. CRM (Lead)

Renata
Ozga
Sr. CRM

Lori
Di Bartolo
CRM

Cathy
Bergin
CRM

Donna
Guidice
DRM

Franchised N.A. Distribution

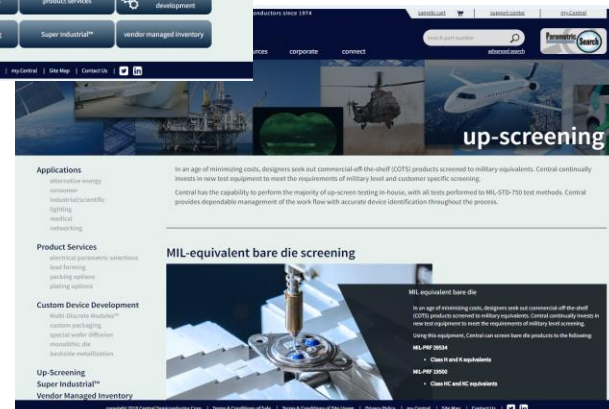
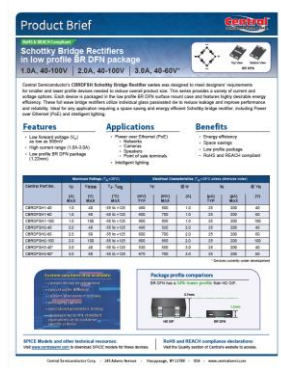
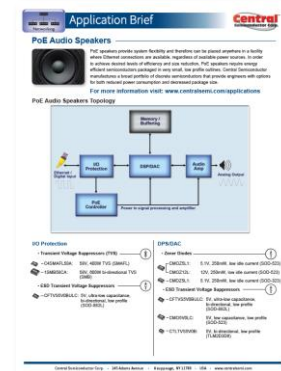
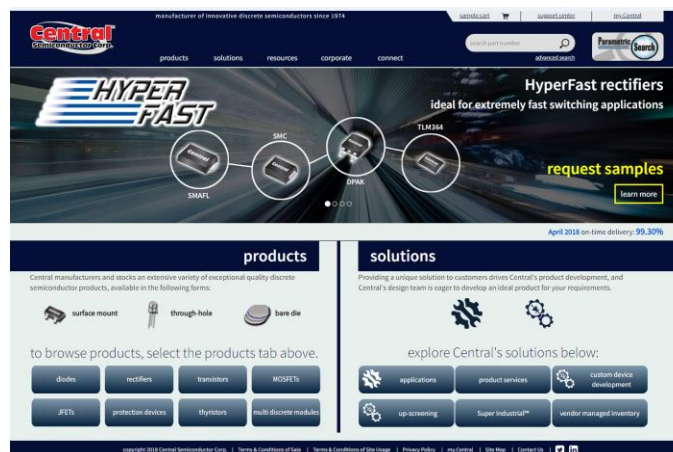


Marketing Support

Website resources

Product Information

- Datasheets
- Product Briefs
- Package Details
- Application Briefs
- SPICE Models
- Material Composition
- Analytical Test Reports
- Pb Free Solder flow
- Whitepapers
- ISO Certification
- PCN/PDN
- Reliability data
- RoHS/REACH Compliance
- Online – Product Quality Analysis



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2019

2019 Corporate Profile