

# END OF LIFE/DMS SOLUTIONS

SSDI offers end of life / DMS solutions to replace products from most manufacturers including Motorola, Texas Instruments, Microsemi, International Rectifier, Semtech, Siliconix, etc.

JFETs | NPN / PNP Small Signal Switching Diodes | NPN / PNP Power Transistors  
Rectifiers | High Voltage Bridges & Assemblies | Full Wave, Centertap, & 3Φ Rectifier Bridges  
Zeners | TVS | Thyristors | PUTs | UJT's | Triacs



SOLID STATE DEVICES, INC.  
ISO 9001 & AS9100 Certified  
JANS Certified Manufacturer

Solid State Devices, Inc. (SSDI) has delivered high reliability, hermetic power semiconductors, modules, and assemblies to the aerospace and defense industries for over 50 years. Besides its wide range of standard products, SSDI's engineering and manufacturing capabilities allow it to deliver unique products in accordance with SSDI or customer source control drawings. SSDI offers end of life / DMS solutions to replace products from most manufacturers including Motorola, Texas Instruments, Microsemi, International Rectifier, Semtech, Siliconix, etc. **Contact SSDI at (562) 404-4474 or [ssdi@ssdi-power.com](mailto:ssdi@ssdi-power.com) for more information and / or sample requests.**



End of Life / DMS Solutions

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Note: TX, TXV, and S-level screening available for all devices. Screening based on MIL-PRF-19500. Screening flows available on request.

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**Warnings**  
Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact SSDI.

SSDI components may be used in life-support devices or systems only with the express written approval of SSDI. Failure of such components can be reasonably expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intentionally implanted in a human body, or used to support and/or maintain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

## OVERVIEW OF IN-HOUSE CAPABILITIES

### ▪ Obsolescence & Sustainment Support

- Large inventory of die and raw materials
- Strong relationships with world-class die foundries
- Purchase end of life die stock for long term commitment to programs
- Full traceability
- Strong anti-counterfeit program

### ▪ Manufacturing

- In-house machine shop
- Large inventory of obsolete "DO" and "TO" package styles

### ▪ 2 JANS Certified Facilities in La Mirada, California

### ▪ Design

- Product development
- Build to SCDs / data sheets
- Reverse engineering

### ▪ JANS Qualified Wafer Fab

### ▪ Testing

- TX, TXV, & S level screening based on MIL-PRF-19500
- MIL-STD-883
- MIL-STD-750
- MIL-STD-202
- ESA / SCC-5000 (equivalent)
- MIL-M-38510

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## END OF LIFE / DMS SOLUTIONS

OBSOLESCENCE & SUSTAINMENT SUPPORT

- Rectifiers
- Schottkys
- Zeners & TVS
- Bipolar Transistors
  - Small Signal
  - Medium Signal
  - Power
- Darlingtons
- Linear Voltage Regulators
- JFETs
- MOSFETs & IGBTs
- Thyristors / SCRs
- Unijunction Transistors & PUTS
- High Power Rectifiers
  - DO-9
  - Hockey Pucks
- High Voltage Assemblies
- RF Devices

## STANDARD SEMICONDUCTORS

THE PRODUCT OFFERING OF MOST SUPPLIERS IS LIMITED TO THIS RANGE

### ▪ Power Discrete Products

- Rectifiers
- Schottkys
- SiC Schottkys
- MOSFETs
- IGBTs
- Bipolar Transistors
- Thyristors / SCRs
- Zeners & TVS

### ▪ Power Module Products

- Power Modules
- DC-DC Converters
- Hybrids

### ▪ High Voltage Products

- High Voltage Rectifiers
- High Voltage Bridges and Assemblies
- High Voltage Power Modules and Supplies

### ▪ PIN Diodes

- Radiation Detectors
- RF Power Switching & Attenuator

### ▪ Control Products

- Voltage Regulators
- MOSFETs / IGBTs

## NEW, INNOVATIVE SOLUTIONS

SUPERIOR PERFORMANCE & RELIABILITY

- GaN Power FETs
- 2 kV MOSFETs
- Low RDS(ON) MOSFETs
- SSR5822S.22T
- 300 Volt Schottkys
- 100 A, 100 V Schottkys
- Centertap Schottkys
- 1200 Volt SiC Schottkys
- JANS1N7068 Series
- 1N8257 Series
- SDR310 / SDR610
- SDR20MF Series
- SPD1520HF / SPA648 & SPA649
- SDR626CT/CA Series

## SOLUTIONS FOR SUSTAINMENT / DMS

### ▪ DIE BANK / RAW MATERIAL INVENTORIES

- Utilize OEM die / materials
- Actively pursue relationships and purchases of key inventories
- Over 10,000,000 obsolete semiconductor die in environmentally controlled inventory
- Over 4,000,000 obsolete semiconductor components in environmentally controlled inventory

### ▪ SUBSTITUTE DIE / PACKAGE

- Utilize knowledge of device performance, design and application to select and qualify suitable replacements of original products

### ▪ RE-DESIGN / RE-MANUFACTURE

- Utilize knowledge of device performance, design and application with semiconductor design expertise and strong foundry relationships

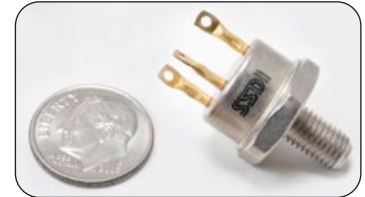
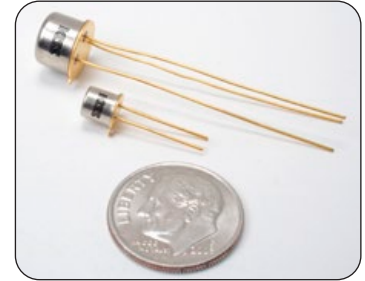
### ▪ INSERTION OF NEW / IMPROVED TECHNOLOGIES

- Utilize new technologies modified for form, fit and function
- Solve reliability and performance problems of old designs

### ▪ DESIGN AND FOUNDRY OPERATIONS

### ▪ ANALYSIS AND ELEMENT EVALUATION

- MIL-PRF-19500 JANHC / JANKC
- MIL-PRF-38534
- Radiation Testing



## KEY ADVANTAGES OF SSDI'S SUSTAINMENT SUPPORT

### ▪ WIDE RANGE OF DATA SHEETS AVAILABLE INCLUDING QPL PRODUCTS

### ▪ BUILD TO SOURCE CONTROL DRAWINGS (SCDS)

### ▪ ABLE TO BUILD REPLACEMENTS FOR COMPETITOR'S PRODUCTS - often providing higher density and / or high performance versions

### ▪ ENGINEERING / MANUFACTURING / QUALITY REVIEW

(initial discussion and assessment to determine how SSDI can best fulfill customers' product needs)

- Major / minor electrical parameters: options to upgrade performance
- Testing and screening requirements
- Packaging options: modifications to meet mechanical requirements

### ▪ PACKAGE / TOOLING

- Large inventory of obsolete "DO" and "TO" package styles
- Custom component subcontractor base
- In-house machine shop for tooling and short-run package manufacturing
- Package manufacturing / ceramic to metal brazing / hermetic assemblies

### ▪ SAMPLES AVAILABLE FOR MOST PRODUCTS

### ▪ READ & RECORD DATA AND QCI DATA (PROVIDED WHERE AVAILABLE)

### ▪ UNIQUELY POSITIONED TO ACCOMMODATE SMALL QUANTITY ORDERS

### ▪ MATERIAL LOT TRACEABILITY

### ▪ STRONG ANTI-COUNTERFEIT PROGRAM



## JFETS

## SFU290 - SFU291 Series

## 4 W, 30 V N-CHANNEL JFET

## FEATURES

- Low ON resistance: 3 - 7  $\Omega$  max
- Fast switching speed: 15 nsec max
- Available in hermetically sealed, surface mount power package (SMD.22) for applications requiring high power dissipation up to 4 W
- Replacement for U290 & U291
- TX, TXV, and S level screening available

## SFF4859 - SFF4861 Series

## 1.8 W, 30 V N-CHANNEL JFET

## FEATURES

- Low ON resistance: 25 - 60  $\Omega$  max
- Fast switching speed: 25 - 100 nsec max
- Hermetically sealed package
- Replacement for 2N4859 - 2N4861 (MIL-PRF-19500/385J)
- TX, TXV, and S level screening available

## SFF5564 - SFF5566 Series

## 650 MW, 40 V N-CHANNEL JFET MATCHED PAIRS

## FEATURES

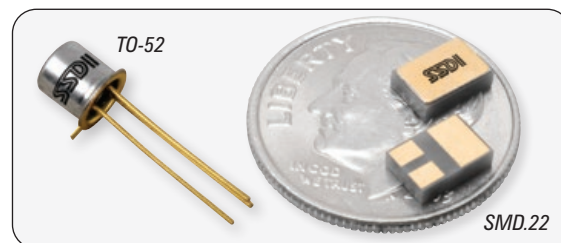
- High slew rate
- Low offset & drift voltage
- Low gate leakage: 3 pA
- Low noise: 12 nV/ $\sqrt{\text{Hz}}$  @ 10Hz
- Good CMMR: 76 dB
- Minimal parasitics
- Replacement for 2N5564 - 2N5566
- TX, TXV, and S level screening available

## BENEFITS

- Tight differential match vs. current
- Improved op-amp speed, settling time accuracy
- Minimum input error / trimming requirement
- Insignificant signal loss / error voltage
- High system sensitivity
- Minimum error with large input signal
- Maximum high frequency performance

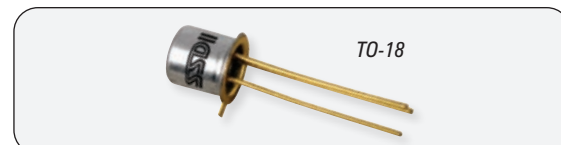
## ADDITIONAL JFET REPLACEMENT PRODUCTS

SSDI Part Number	Industry Part Number	Slash Sheet	Description	$I_D$ (mA)	$BV_{DSS}$ (V)	$RDS_{ON}$ ( $\Omega$ )	$P_D$ (W)	Package
SFF2609	2N2609	296	P-Channel	10	30	-	0.3	TO-18
SFF3821 - SFF3822	2N3821 - 2N3822	375	N-Channel	10	50	-	0.3	TO-72
SFF5545 - SFF5547	2N5545 - 2N5547	430	Dual N-Channel	30	50	-	0.4	TO-71
SFF5114 - SFF5116	2N5114 - 2N5116	476	P-Channel	50	30	75 - 150	0.5	TO-18



## APPLICATIONS

- Low ON resistance analog / digital switches
- Choppers



## APPLICATIONS

- Low ON resistance analog switches
- Choppers
- Commutators



## APPLICATIONS

- Wideband differential amps
- High-speed, temp compensated, single ended input amps
- High-speed comparators
- Impedance converters
- Matched switches

## MOSFETS

### SFF6661/39

0.86 A, 90 V, 4  $\Omega$  N-CHANNEL MOSFET

#### FEATURES

- Rugged construction
- Low  $R_{DS(ON)}$  and high transconductance
- Fast recovery and superior dv/dt performance
- Increased reverse energy capability
- Low input and transfer capacitance for easy paralleling

- Hermetically sealed package
- Very fast switching speed
- TX, TXV, and S level screening available
- Replacement for 2N6661



## BIPOLAR TRANSISTORS

### SFT10015

50 A, 400 V NPN DARLINGTON TRANSISTOR

#### FEATURES

- BVCEO 400 volts
- Low saturation voltage: 2.1 V typ @ 50 A
- 200°C operating temperature
- Hermetically sealed, isolated package
- TX, TXV, and S level screening available
- Direct replacement of Motorola MJ10015
- Designed for high voltage, high speed, power switching in inductive circuits where fall time is critical

#### APPLICATIONS

- Switching regulators
- Inverters
- Solenoid and relay drives
- Motor controls
- Deflection circuits

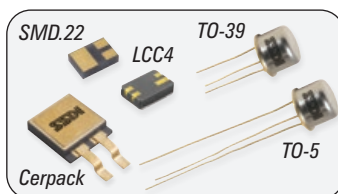


### SFT5013 & SFT5014 Series

0.5 A, 800 V - 900 V NPN TRANSISTOR

#### FEATURES

- BVCE0 900 volts
- Low saturation voltage: 0.07 V typ @ 20 mA
- Low leakage at high temperature
- High gain, low saturation
- 200°C operating, gold eutectic die attach
- 2N5010 thru 2N5012 also available - contact factory
- Designed for complementary use with SFT5094 & SFT5096
- TX, TXV, and S level screening available

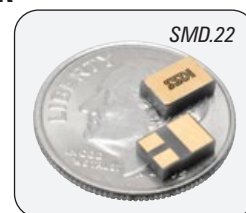


### SFT4407

2 A, 60 V PNP TRANSISTOR

#### FEATURES

- Very small footprint: SMD.22
- Radiation tolerant
- Fast switching
- High frequency
- Low saturation voltage: 170 mV typical @ 150 mA
- Alternative to 2N3765, 2N4406, and 2N4407
- TX, TXV, and S level screening available

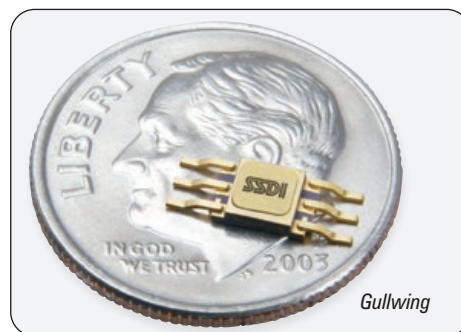


## GULLWING: SMALL SIGNAL PACKAGING OPTION

1 X GULLWING = 2 X TO-18, TO-46, TO-5, OR CERSOT (UB PACKAGES)

#### FEATURES

- Space qualified
- Hermetically sealed dual device, small package size / weight for optimal board use
- Replaces two TO-18 packages for a savings of 75% board space using dual packages
- Flexible leads provide stress relief
- Package allows for easy inspection
- Available with small signal diodes, MOSFETs, and JFETs
- Matched or complementary pairs available
- TX, TXV, and S level screening available



SSDI Part Number	Replacement for:	Description
SFF4393A2GW	-	50 mA, 40 V Dual N-Channel JFET Transistor
SFF7002KA2GW	-	300 mA, 50 V, 2 $\Omega$ Dual N-Channel Logic Level TrenchFET MOSFET
SFT22907GW	2N2222AU (NPN) & 2N2907AU (PNP)	600 mA, 60 V NPN & PNP Transistor
SFT390604A2	2N3906AU (PNP) & 2N3904AU (NPN)	800 mA, 75 V NPN & PNP Transistor
SFT2369A2	2N2369AU	100 mA, 15 V Dual NPN Transistor

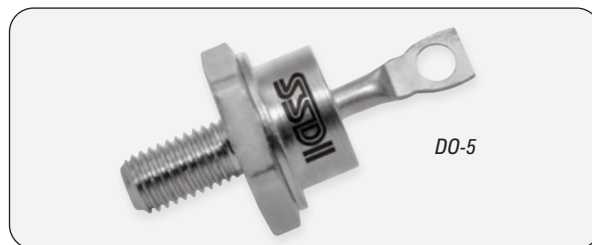
## RECTIFIERS

### SDR803 - SDR817 Series

100 A, 50 V - 1100 V, 50 nsec ULTRAFAST RECOVERY, HIGH VOLTAGE POWER RECTIFIER

#### FEATURES

- Low forward voltage drop: 1 - 1.9 V
- Low reverse leakage current: 100  $\mu$ A @ 25°C, rated  $V_R$
- Single chip construction
- PIV to 1100 volts
- Hermetically sealed
- For high efficiency applications
- TX, TXV, and S level screening available

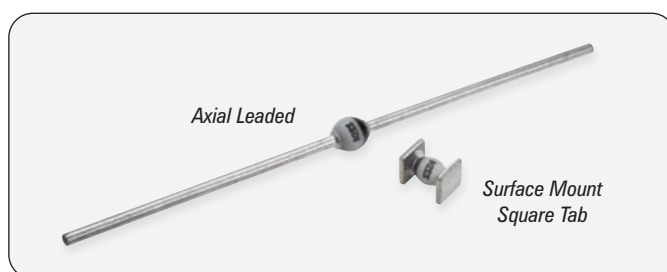


### SDR1P - SDR1W Series

1 A, 1300 V - 1800 V, 70 nsec ULTRAFAST RECOVERY, HIGH VOLTAGE RECTIFIER

#### FEATURES

- Single chip construction
- PIV to 1800 volts
- Low reverse leakage current: 5  $\mu$ A @ 25°C, rated  $V_R$
- Hermetically sealed
- For high efficiency applications
- Available in axial and surface mount versions
- Metallurgically bonded
- TX, TXV, and S level screening available



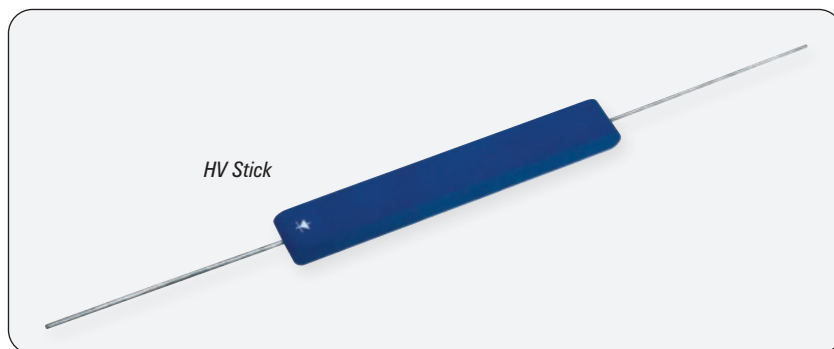
## HIGH VOLTAGE ULTRAFAST RECTIFIER ASSEMBLY

### SDA2500UF - SDA25000UF Series

0.5 W, 2.5 kV - 25 kV HIGH VOLTAGE STICK

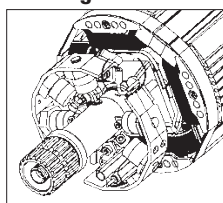
#### FEATURES

- Average output current: 0.5 A
- 2,500 to 25,000 V blocking voltage
- Ultrafast recovery: 80 nsec maximum
- Low reverse leakage current: 2  $\mu$ A @ 25°C, rated  $V_R$
- Corona free construction
- Hermetically sealed distretes
- Superior thermal shock resistance
- TX, TXV, and S level screening available

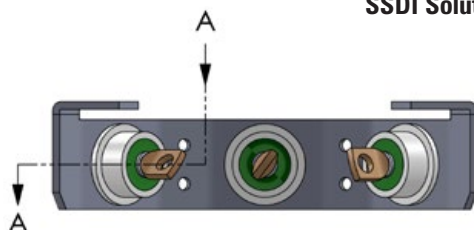


## SOLUTION TO RESOLVE MECHANICAL AND OBSOLESCENCE CONCERNS

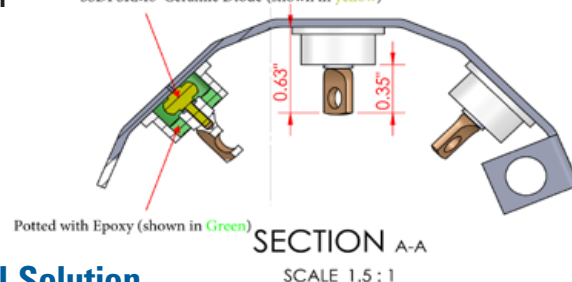
Original SCD



SSDI Solution

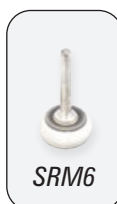


SSDI SRM6 Ceramic Diode (shown in yellow)



#### Original Part

- DO-5 diode reinforced with epoxy to stiffen the fragile terminal and riveted to a bracket
- Customer concerns are diode obsolescence and clearance above the terminal



#### SSDI Solution

- Use rugged SRM6 diode encased in epoxy so the terminal is inherently strong and use solder in lieu of rivet
- This design approach will produce a low profile assembly to fix the clearance issue, reduce weight and make manufacturing easier

Zeners	
Power Rating	Voltage Range
250 mW - 400 mW	2.4 V - 43 V
500 mW - 800 mW	2.4 V - 200 V
1 W	6.8 V - 200 V
1.5 W	3.3 V - 510 V
3 W - 4 W	6.8 V - 510 V
5 W	6.8 V - 390 V
6 W - 10 W	7.5 V - 270 V

## AVAILABLE PACKAGES:

- Axial / SM / SMS
- Ministud
- Stud Mount: DO-4 & DO-5
- Button
- Assemblies

## ZENERS

### SZ25A2.4 - SZ25A43 Series

0.25 W - 0.4 W, 2.4 V - 43 V ZENER DIODES

#### FEATURES

- Hermetically sealed in glass
- Axial lead rated at 0.25 W
- Surface mount rated at 0.4 W
- Available in axial, round tab surface mount, and square tab surface mount versions
- Available in 10% and 5% tolerances - contact factory for other voltage tolerances
- TX, TXV, and S level screening available

### SZ6A7.5 - SZ6A270 Series

6 - 10 W, 7.5 V - 270 V ZENER DIODES

#### FEATURES

- Hermetically sealed in glass
- Axial lead rated at 6 W
- Stud Mount Rated at 8 W
- Surface Mount Rated at 10 W
- Available in 10% and 5% tolerances - contact factory for other voltage tolerances

## TVS

### STA15K7.5P - STA15K100P Series

15 kW, 7.5 V - 100 V UNIDIRECTIONAL TVS ASSEMBLY

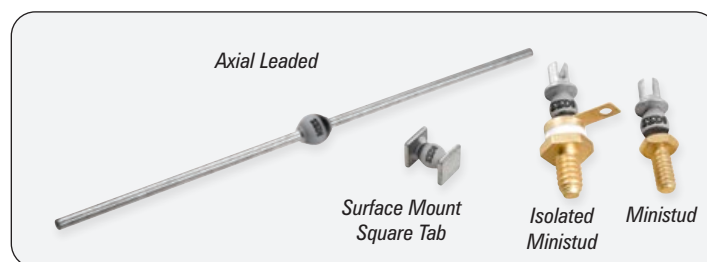
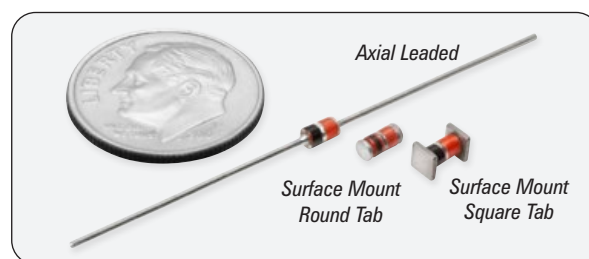
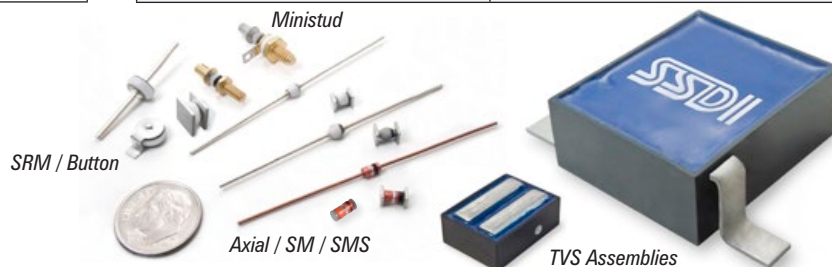
#### FEATURES

- Smaller than 704-15K35 and 704-15K36T types
- Hermetically sealed
- Meets all environmental requirements of MIL-PRF-19500
- Custom configurations available
- TX and TXV level screening available

#### APPLICATIONS

- Protection of voltage sensitive components
- Protection against power interruption
- Lightning protection

TVS	
Power Rating	Voltage Range
150 W	7.5 V - 510 V
500 W	7.5 V - 510 V
1000 W	7.5 V - 510 V
1500 W	6.7 V - 270 V
5 kW	6.7 V - 110 V
6 kW	200 V - 800 V
15 kW	7.9 V - 100 V
60 kW	7.9 V - 100 V





## THYRISTORS

- 40+ years of heritage
- < 1 to 175+ amps, up to 1600 volts
- Faster tq versions of standard parts available
- Glass passivated die
- Surface mount and TO-25X versions of standard parts available
- TX, TXV, and S level screening available

### SFS3027 - SFS3029 Series

0.5 A, 30 V - 100 V S

#### FEATURES

- Passivated planar construction
- Low on-state voltage and fast switching
- Hermetically sealed surface mount power package
- Replacement for 2N3027 - 2N3029 Series

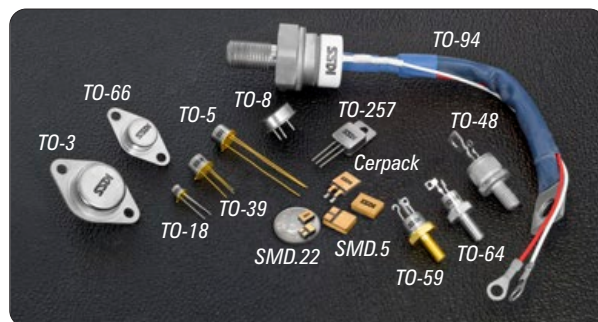


### SFS2510 - SFS2540 Series

25 A, 100 V - 400 V FAST SWITCHING SCR

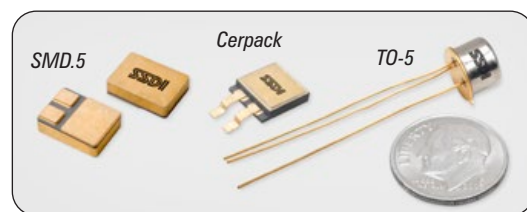
#### FEATURES

- Low-level gate characteristics
- $I_{GT} = 200 \mu A$  max @ 25°C
- Low holding current  $I_H = 1 \text{ mA}$  max @ 25°C
- Anode common to case
- Hermetically sealed
- TX, TXV, and S level screening available



### SFS07050 - SFS07400 Series

7 A, 50 V - 400 V SCR

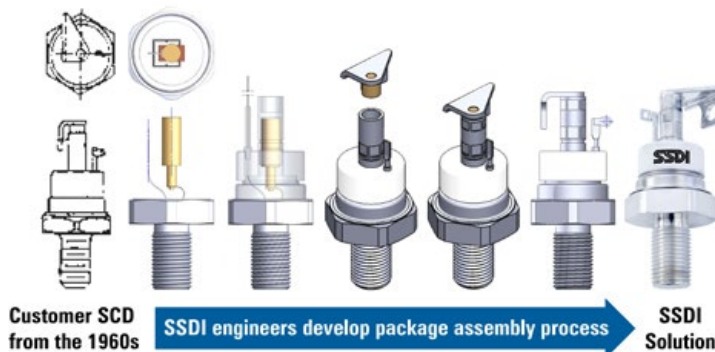


#### FEATURES

- Low-level gate characteristics
- $I_{GT} = 20 \mu A$  typ @ 25°C
- Low holding current  $I_H = 1.25 \text{ mA}$  typ @ 25°C
- Anode common to case
- Hermetically sealed
- TX, TXV, and S level screening available

## SSDI DELIVERS LEGACY MILITARY THYRISTOR DEVICE IN TO-83 PACKAGE

- SSDI's customer was having difficulty procuring a small quantity of thyristor devices in the TO-83 package in accordance with an SCD originally generated in the 1960s
- Die was selected from SSDI's vast die bank to meet the electrical specifications of the customer's SCD
- SSDI's engineers developed assembly process to build TO-83 package
- Unlike other manufacturers, SSDI is able to accommodate smaller minimum order quantities - SSDI relies on its strong relationships with die foundries and parts suppliers to facilitate small production runs

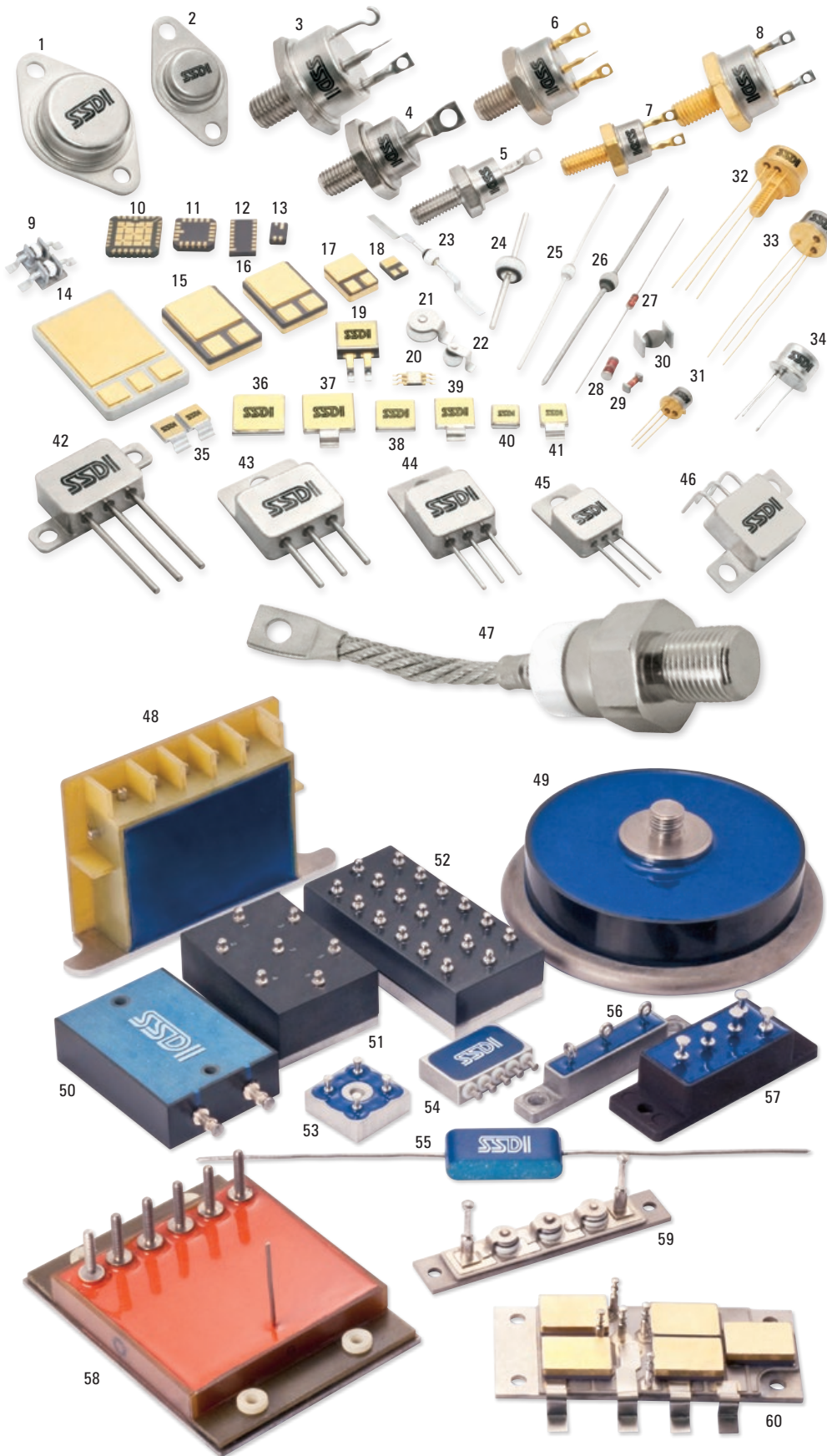


## PROGRAMMABLE / NON-PROGRAMMABLE UNIJUNCTION TRANSISTORS

Part Number	$I_T$ (ARMS) (A)	$V_{AK}/V_{GA}/V_{GKS}$ (V)	$V_{GKR}$ (V)	$V_F$ (V)	$I_P$ ( $\mu A$ ) <sup>2/</sup>	$I_V$ ( $\mu A$ ) <sup>2/</sup>	$V_0$ min (V)	$I_{TSM}$ (A)	$t_r$ (ns)	Package	Cross Reference Part Number
SFS6027	0.15 <sup>1/</sup>	40	5	1.5	2	50	6	5	80	TO-18	2N6027
SFS6028	0.15 <sup>1/</sup>	40	5	1.5	0.15	25	6	5	80	TO-18	2N6028
SFS056A	0.175 <sup>1/</sup>	70	5 <sup>5/</sup>	1.4	0.06 <sup>3/</sup>	1 <sup>4/</sup>	6	3	80	TO-18	BRY56A
SFS6116	0.3	40	5	1.5	2	50	6	5	80	TO-18	2N6116
SFS6117	0.3	40	5	1.5	0.3	50	6	5	80	TO-18	2N6117
SFS6118	0.3	40	5	1.5	0.15	25	6	5	80	TO-18	2N6118
SFS6137	0.3	40	5	1	2	50	9	5	80	TO-18	2N6137
SFS6138	0.3	100	5	1	2	50	9	5	80	TO-18	2N6138

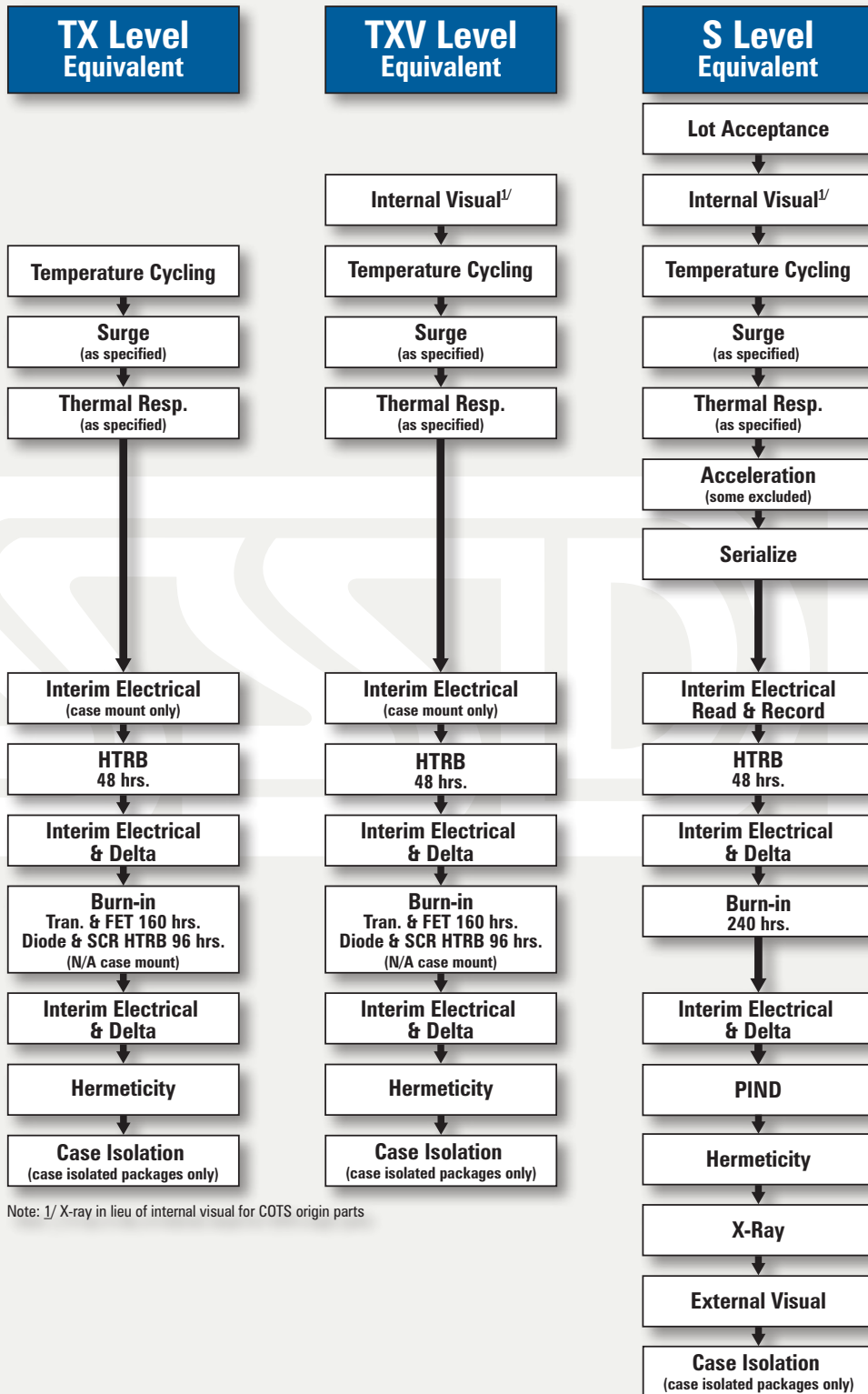
<sup>1/</sup> DC   <sup>2/</sup>  $R_g = 1 \text{ M}$    <sup>3/</sup>  $R_g = 100 \text{ k}$    <sup>4/</sup>  $R_g = 100 \text{ k}$ , min limit   <sup>5/</sup> Contact factory

# Examples of Hermetic Packaging



1. TO-3
2. TO-66
3. TO-63
4. DO-5
5. DO-4
6. TO-61 (3 terminals)
7. TO-59
8. TO-61 (2 terminals)
9. SPA648
10. LCC28
11. LCC20
12. LCC16
13. LCC4
14. Milpack 3
15. SMD2
16. SMD1
17. SMD.5
18. SMD.22
19. Cerpack
20. Gullwing
21. SRM Button Tab
22. SRL Button Tab
22. SRM Surface Mount Square Tab (SMS)
23. Flat Leads
24. SRM Axial
25. 1N7068 Axial
26. Frit Glass Axial
27. Glass Sleeve Axial
28. Glass Sleeve Surface Mount Round Tab (SM)
29. Glass Sleeve Surface Mount Square Tab (SMS)
30. Frit Glass Surface Mount Square Tab (SMS)
31. TO-52
32. TO-82
33. TO-5
34. TO-39
35. Sedpack CT1 Front Mount
36. Sedpack 3
37. Sedpack 3 With Lead
38. Sedpack 2
39. Sedpack 2 With Lead
40. Sedpack 1
41. Sedpack 1 With Lead
42. TO-259
43. TO-258
44. TO-254
45. TO-257
46. TO-254Z
47. DO-9
48. SDA475 HV Multiplier Rectifier Stack
49. SDAD103 Stackable HV Rectifier
50. STA60 HV Bidirectional TVS
51. SPA516 Dual Single Phase Bridge Assembly
52. SPX2091 HV Rectifier Bridge Stack
53. SDA267 Single Phase Bridge Rectifier Assembly
54. SDA669T Three Phase Bridge Rectifier Assembly
55. HV Stick
56. SDA380 Centertap Rectifier
57. SDA167 Three Phase Bridge Rectifier Assembly
58. SPMQ461 IGBT Power Module
59. SPMR494 Battery Charge Power Module
60. Battery Bypass Power Module

## Solid State Devices Screening Per MIL-PRF-19500 Guidelines\*

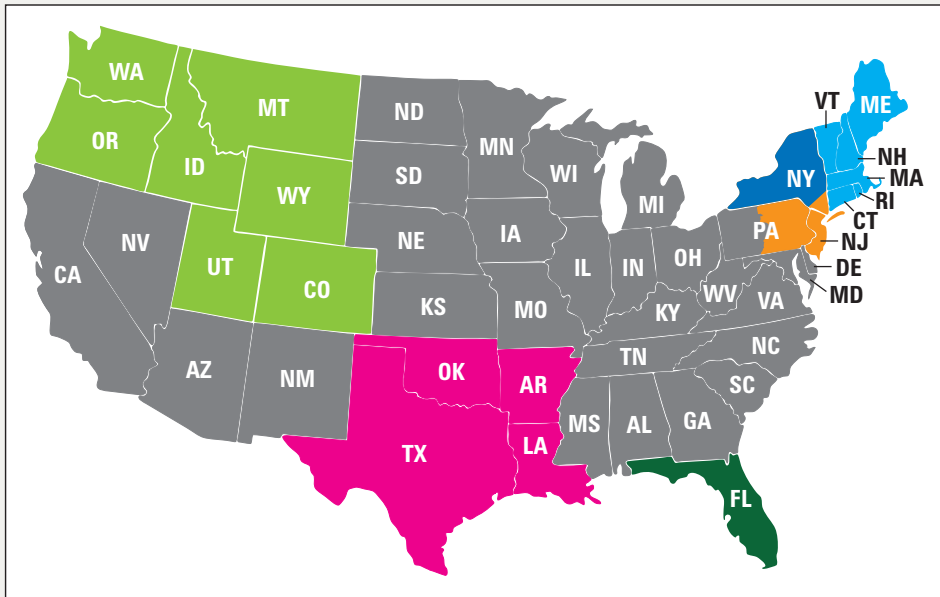


**\*Specific Product Types May Have Alternate Screening Flows**

Contact your local SSDI Representative or contact the factory directly at (562) 404-4474.

Email: [ssdi@ssdi-power.com](mailto:ssdi@ssdi-power.com)

## Domestic Sales Representatives



### Micro Technology Group (CT, ME, MA, NH, RI, VT)

450 Chauncy St., Ste. 3  
Mansfield, MA 02048  
Phone: 508-337-3388  
Website: [www.m-t-g.com](http://www.m-t-g.com)  
[sales@mtgelectronics.com](mailto:sales@mtgelectronics.com)

### Zimmerman Sales (Upstate NY)

111 Marsh Rd. Office Bldg.  
Pittsford, NY 14534  
Phone: 585-381-3186  
Website: [www.zimmermansales.com](http://www.zimmermansales.com)  
[sales@zimmermansales.com](mailto:sales@zimmermansales.com)

### Tekmar Sales, Inc. (S. NJ, E. PA)

10 Saddle Brook Court  
Dix Hills, NY 11746  
Phone: 631-254-9026  
Website: [www.tekmarsales.com](http://www.tekmarsales.com)

### Straube Associates

(CO, UT, ID, MT, WY, WA, OR)  
13401 W. 43rd Dr., Ste. 13,  
Golden, CO 80403  
Phone: 303-426-0890  
Website: [straubecompanies.com](http://straubecompanies.com)  
[main@straubecompanies.com](mailto:main@straubecompanies.com)

### CentraMark Technical Sales Associates

(TX, OK, AR, LA)  
1705 Analog Dr.  
Richardson, TX 75081-1944  
Phone: 972-414-8188  
Website: [cmatex.com](http://cmatex.com)

### FLA. Technology Sales, Inc. (FL)

Phone: 407-421-2366  
eFax: 734-939-4411  
Email: [terry@flatechnology.com](mailto:terry@flatechnology.com)

## International Sales Representatives

### Johnson Group Services (JGS) (United Kingdom, Ireland)

The Ryder Cloisters, 36, Evelyn Rd.  
Dunstable, Bedfordshire LU5 4NG  
United Kingdom  
Phone: +44 (0) 1582 603439  
[dvjohnson@ssdi-power.co.uk](mailto:dvjohnson@ssdi-power.co.uk)

### MES Manz Electronic Systeme OHG (Germany / Austria)

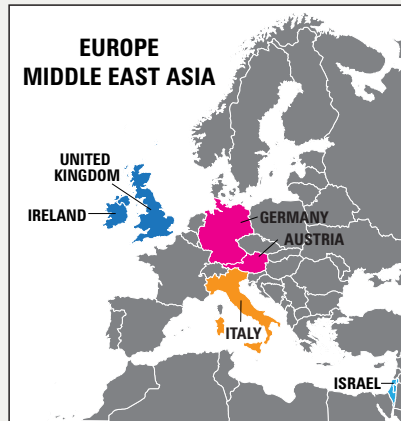
Hauptstrasse 46/1  
D-74369 Löchgau, Germany  
Phone: +49-7143-4031-0  
Website: [www.manz-electronic.de](http://www.manz-electronic.de)  
[rainer.manz@manz-electronic.de](mailto:rainer.manz@manz-electronic.de)

### Milano Brothers (Italy)

Via Enrico Fermi 79, 00146 Roma, Italy  
Phone: +39.338.49.69.298  
[perugia@milanobro.com](mailto:perugia@milanobro.com)  
USA Office: 380 SW 12th Ave.  
Deerfield Beach, FL 33442  
Phone: 954-420-5000

### FMS Aerospace Ltd. (Israel)

12 Kehilat Venezia Street  
Tel-Aviv 69400, Israel  
Phone: 972-3-6094977  
[tal@fmsaerospace.com](mailto:tal@fmsaerospace.com)



### EUROPE MIDDLE EAST ASIA



### EAST ASIA SOUTH ASIA

### Rironic Electronic Tech. Co., Ltd (China)

9th Floor, D Block, He Sheng Jing Guang Ctr.  
No. 11, Tang Yan Road, Yan Ta District  
XI'AN City, Shaan'Xi Province, China  
Phone: +86-029-88377000  
Website: [www.rironic.com](http://www.rironic.com)  
[steven\\_zhang@rironic.com](mailto:steven_zhang@rironic.com)

### Sojitz Aerospace (Japan)

Marunouchi Trust Tower Main  
4th Floor, 8-3 Marunouchi 1-chome,  
Chiyoda-Ku, Tokyo, Japan 100-0005  
Phone: +81-(0)3-6870-7221  
[kodama-koyo@sojitz-aero.com](mailto:kodama-koyo@sojitz-aero.com)

### Irys Electronics Engineering Services Pvt Ltd. (India)

261/2 Plot 4 & 5, Silver Oak Park  
Baner Rd, Pune 411045, Maharashtra, India  
Phone: 91 20 2729 1836  
[irys.india@iryselectronics.com](mailto:irys.india@iryselectronics.com)



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14701 Firestone Blvd., La Mirada, CA 90638 | (562) 404 - 4474 | [www.ssdi-power.com](http://www.ssdi-power.com)