# Insulated Ultrafast Rectifier Module, 230 A

SOT-227

## FEATURES

- Two fully independent diodes
- Fully insulated package
- Ultrafast, soft reverse recovery, with high operation junction temperature ($T_J$ max. = 175 °C)
- Low forward voltage drop
- Optimized for power conversion: welding and industrial SMPS applications
- Easy to use and parallel
- Industry standard outline
- UL approved file E78996
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT

| PRIMARY CHARACTERISTICS | |
|---|---|
| $V_R$ | 600 V |
| $I_{F(AV)}$ per module at $T_C$ = 88 °C | 230 A |
| $t_{rr}$ | 43 ns |
| Type | Modules - diode FRED Pt® |
| Package | SOT-227 |

## DESCRIPTION / APPLICATIONS

The VS-UFB230FA60 insulated modules integrate two state of the art ultrafast recovery rectifiers in the compact, industry standard SOT-227 package. The diodes structure, and its life time control, provide an ultrasoft recovery current shape, together with the best overall performance, ruggedness and reliability characteristics.

These devices are thus intended for high frequency applications in which the switching energy is designed not to be predominant portion of the total energy, such as in the output rectification stage of welding machines, SMPS, DC/DC converters. Their extremely optimized stored charge and low recovery current reduce both over dissipation in the switching elements (and snubbers) and EMI/RFI.

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER | SYMBOL | TEST CONDITIONS | MAX. | UNITS |
|---|---|---|---|---|
| Cathode to anode voltage | $V_R$ | | 600 | V |
| Continuous forward current per diode | $I_F$ | $T_C$ = 85 °C | 141 | A |
| Single pulse forward current per diode | $I_{FSM}$ | $T_C$ = 25 °C | 1400 | |
| Maximum power dissipation per module | $P_D$ | $T_C$ = 85 °C | 416 | W |
| RMS isolation voltage | $V_{ISOL}$ | Any terminal to case, t = 1 min | 2500 | V |
| Operating junction and storage temperatures | $T_J$, $T_{Stg}$ | | -55 to +175 | °C |


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| ELECTRICAL SPECIFICATIONS PER DIODE ($T_J$ = 25 °C unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Cathode to anode breakdown voltage | $V_{BR}$ | $I_R$ = 100 μA | 600 | - | - | V |
| Forward voltage | $V_{FM}$ | $I_F$ = 100 A | - | 1.46 | 1.78 | |
| | | $I_F$ = 100 A, $T_J$ = 125 °C | - | 1.23 | 1.52 | |
| | | $I_F$ = 200 A | - | 1.70 | 2.05 | |
| | | $I_F$ = 200 A, $T_J$ = 125 °C | - | 1.50 | 1.78 | |
| Reverse leakage current | $I_{RM}$ | $V_R$ = $V_R$ rated | - | 0.1 | 50 | μA |
| | | $T_J$ = 175 °C, $V_R$ = $V_R$ rated | - | 0.30 | 2 | mA |
| Junction capacitance | $C_T$ | $V_R$ = 600 V | - | 77 | - | pF |

| DYNAMIC RECOVERY CHARACTERISTICS ($T_J$ = 25 °C unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time | $t_{rr}$ | $I_F$ = 1.0 A, $dI_F/dt$ = 200 A/μs, $V_R$ = 30 V | | - | 43 | - | ns |
| | | $T_J$ = 25 °C | $I_F$ = 50 A<br>$dI_F/dt$ = 200 A/μs<br>$V_R$ = 200 V | - | 83 | - | |
| | | $T_J$ = 125 °C | | - | 182 | - | |
| Peak recovery current | $I_{RRM}$ | $T_J$ = 25 °C | | - | 7 | - | A |
| | | $T_J$ = 125 °C | | - | 18 | - | |
| Reverse recovery charge | $Q_{rr}$ | $T_J$ = 25 °C | | - | 290 | - | nC |
| | | $T_J$ = 125 °C | | - | 1595 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Junction to case, single leg conducting | $R_{thJC}$ | | - | - | 0.43 | °C/W |
| Junction to case, both leg conducting | | | - | - | 0.215 | |
| Case to heatsink | $R_{thCS}$ | Flat, greased surface | - | 0.05 | - | |
| Weight | | | - | 30 | - | g |
| Mounting torque | | Torque to terminal | - | - | 1.1 (9.7) | Nm (lbf.in) |
| | | Torque to heatsink | - | - | 1.8 (15.9) | Nm (lbf.in) |
| Case style | | | SOT-227 | | | |


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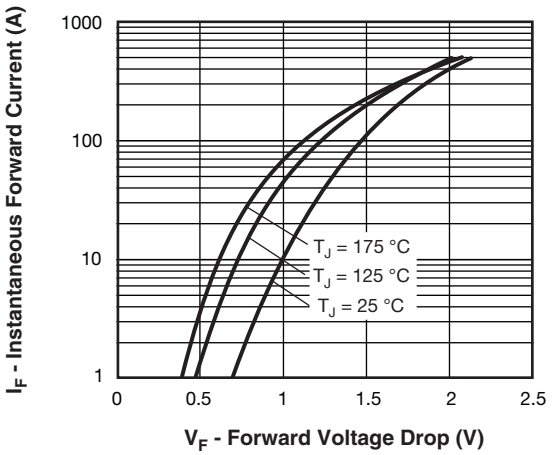


Fig. 1 - Typical Forward Voltage Drop Characteristics

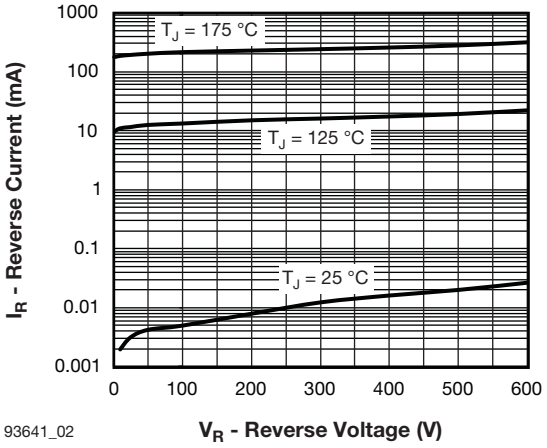


Fig. 2 - Typical Values of Reverse Current vs.Reverse Voltage

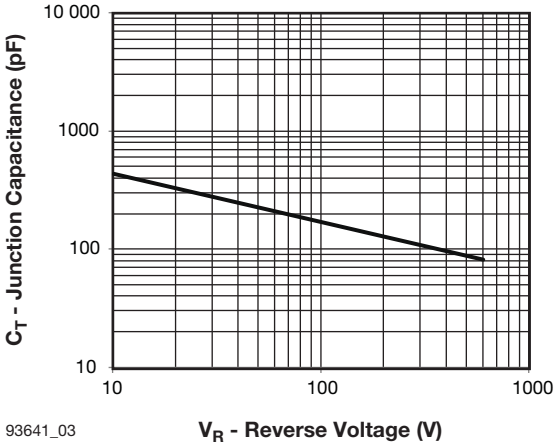


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

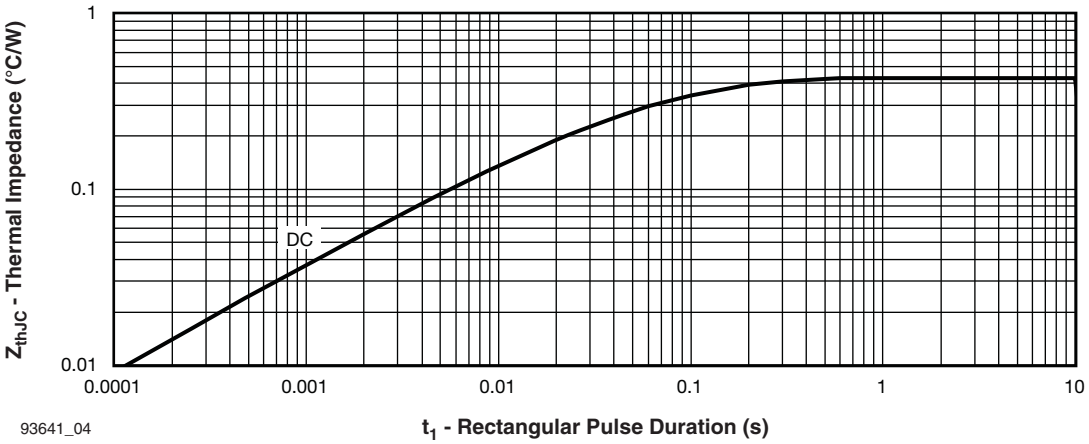


Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics


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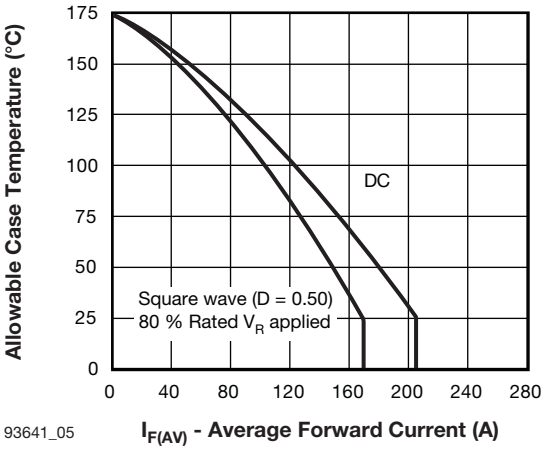


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

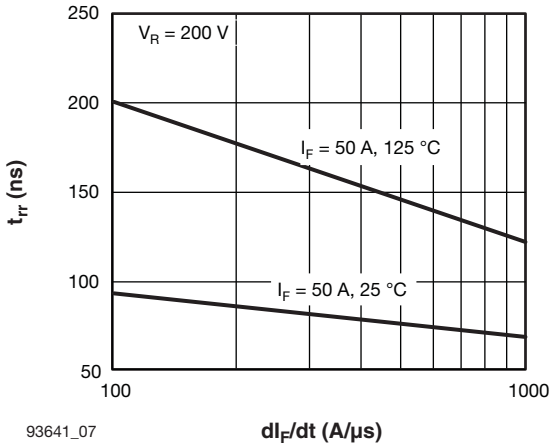


Fig. 7 - Typical Reverse Recovery Time vs. $dI_F/dt$

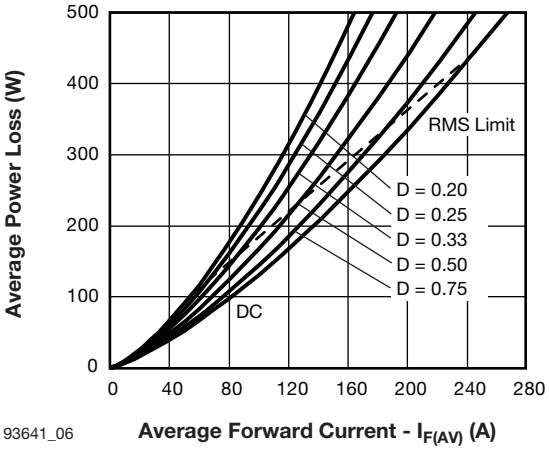


Fig. 6 - Forward Power Loss Characteristics

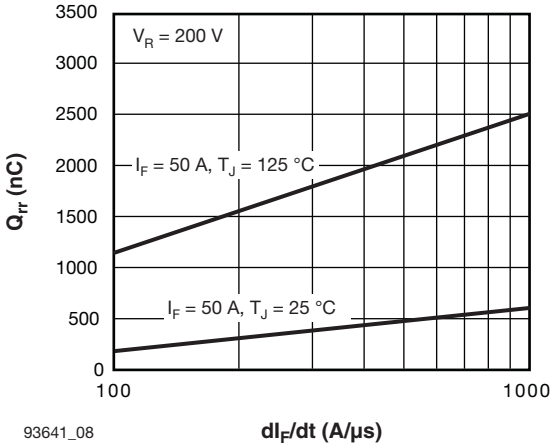


Fig. 8 - Typical Stored Charge vs. $dI_F/dt$

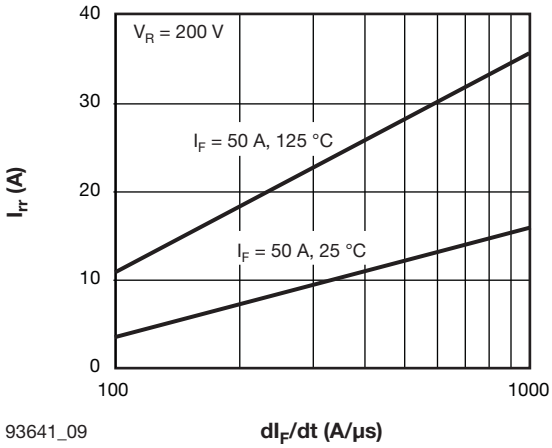


Fig. 9 - Typical $I_{rr}$ Diode vs. $dI_F/dt$

**Note**

(1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
Pd = forward power loss = $I_{F(AV)} \times V_{FM}$ at ($I_{F(AV)}/D$) (see fig. 6);
$Pd_{REV}$ = inverse power loss = $V_{R1} \times I_R$ (1 - D); $I_R$ at $V_{R1}$ = rated $V_R$


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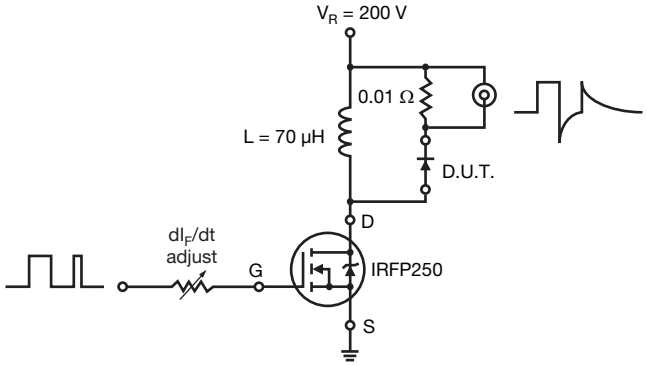
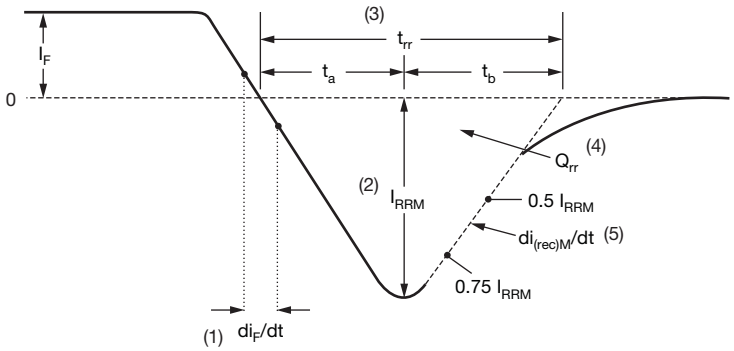



Fig. 10 - Reverse Recovery Parameter Test Circuit




(1) $di_F/dt$ - rate of change of current through zero crossing

(2) $I_{RRM}$ - peak reverse recovery current

(3) $t_{rr}$ - reverse recovery time measured from zero crossing point of negative going $I_F$ to point where a line passing through 0.75 $I_{RRM}$ and 0.50 $I_{RRM}$ extrapolated to zero current.

(4) $Q_{rr}$ - area under curve defined by $t_{rr}$ and $I_{RRM}$

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(5) $di_{(rec)M}/dt$ - peak rate of change of current during $t_b$ portion of $t_{rr}$

Fig. 11 - Reverse Recovery Waveform and Definitions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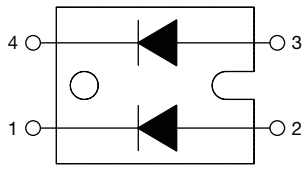
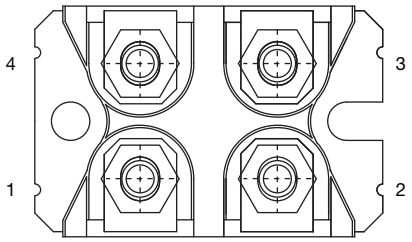
## ORDERING INFORMATION TABLE

| Device code | VS- | UF | B | 230 | F | A | 60 |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

1 - Vishay Semiconductors product
2 - Ultrafast rectifier
3 - Ultrafast Pt diffused
4 - Current rating (230 = 230 A)
5 - Circuit configuration (two separate diodes, parallel pin-out)
6 - Package indicator (SOT-227 standard insulated base)
7 - Voltage rating (60 = 600 V)

| CIRCUIT CONFIGURATION | | |
|---|---|---|
| **CIRCUIT** | **CIRCUIT CONFIGURATION CODE** | **CIRCUIT DRAWING** |
| Two separate diodes, parallel pin-out | F |   Lead Assignment   |

| LINKS TO RELATED DOCUMENTS | |
|---|---|
| Dimensions | www.vishay.com/doc?95423 |
| Packaging information | www.vishay.com/doc?95425 |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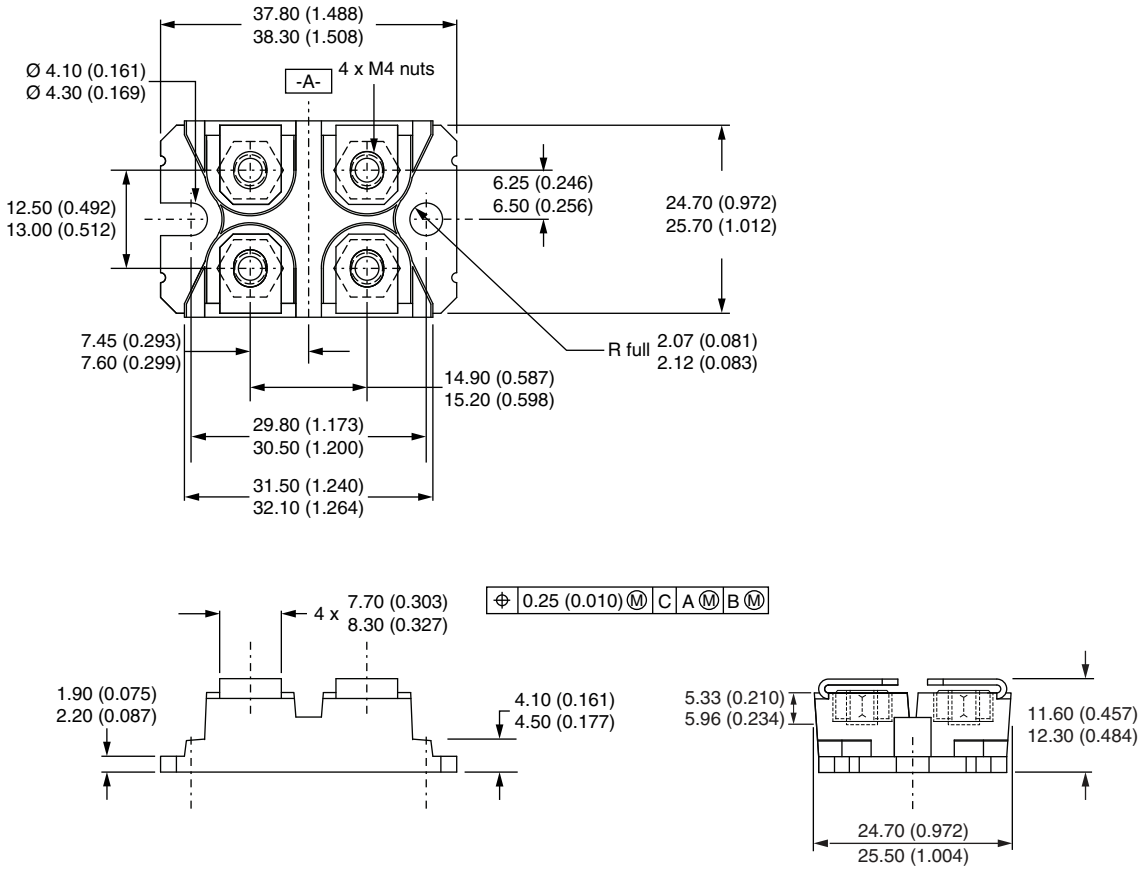
# SOT-227 Generation 2

**DIMENSIONS** in millimeters (inches)




**Note**

- Controlling dimension: millimeter



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