

Insulated Ultrafast Rectifier Module, 280 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



RoHS
COMPLIANT

| PRODUCT SUMMARY | |
|---|--------------------------|
| V_R | 400 V |
| $I_{F(AV)}$ per module at $T_C = 90$ °C | 280 A |
| t_{rr} | 40 ns |
| Type | Modules - Diode FRED Pt® |
| Package | SOT-227 |

DESCRIPTION

The VS-UFB280FA40 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 | | 400 | V |
| Continuous forward current per diode | $I_F^{(1)}$ | $T_C = 90$ °C | 170 | A |
| Single pulse forward current per diode | I_{FSM} | $T_C = 25$ °C | 1300 | |
| Maximum power dissipation per module | P_D | $T_C = 90$ °C | 395 | W |
| RMS isolation voltage | V_{ISOL} | Any terminal to case, $t = 1$ minute | 2500 | V |
| Operating junction and storage temperatures | T_J, T_{Stg} | | - 55 to 175 | °C |

Note

⁽¹⁾ Maximum continuous forward current must be limited to 100 A to do not exceed the maximum temperature of power terminals.



| ELECTRICAL SPECIFICATIONS PER DIODE ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified) | | | | | | |
|--|----------|---|------|------|------|---------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Cathode to anode breakdown voltage | V_{BR} | $I_R = 100\text{ }\mu\text{A}$ | 400 | - | - | V |
| Forward voltage | V_{FM} | $I_F = 100\text{ A}$ | - | 1.06 | 1.24 | |
| | | $I_F = 100\text{ A}, T_J = 175\text{ }^\circ\text{C}$ | - | 0.85 | 0.95 | |
| Reverse leakage current | I_{RM} | $V_R = V_R\text{ rated}$ | - | 1.3 | 50 | μA |
| | | $T_J = 175\text{ }^\circ\text{C}, V_R = V_R\text{ rated}$ | - | 0.36 | 4 | mA |
| Junction capacitance | C_T | $V_R = 400\text{ V}$ | - | 100 | - | pF |

| DYNAMIC RECOVERY CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified) | | | | | | |
|---|-----------|---|------|------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time | t_{rr} | $I_F = 1.0\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}, V_R = 30\text{ V}$ | - | 40 | - | ns |
| | | $T_J = 25\text{ }^\circ\text{C}$ | - | 93 | - | |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 172 | - | |
| Peak recovery current | I_{RRM} | $T_J = 25\text{ }^\circ\text{C}$ | - | 10.5 | - | A |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 20.2 | - | |
| Reverse recovery charge | Q_{rr} | $T_J = 25\text{ }^\circ\text{C}$ | - | 490 | - | nC |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 1740 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|---|------------|-----------------------|---------|-------|------|---------------------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Junction to case, single leg conducting | R_{thJC} | | - | - | 0.43 | $^\circ\text{C}/\text{W}$ |
| Junction to case, both leg conducting | | - | - | 0.215 | | |
| Case to heatsink | R_{thCS} | Flat, greased surface | - | 0.05 | - | |
| Weight | | | - | 30 | - | g |
| Mounting torque | | | - | 1.3 | - | Nm |
| Case style | | | SOT-227 | | | |

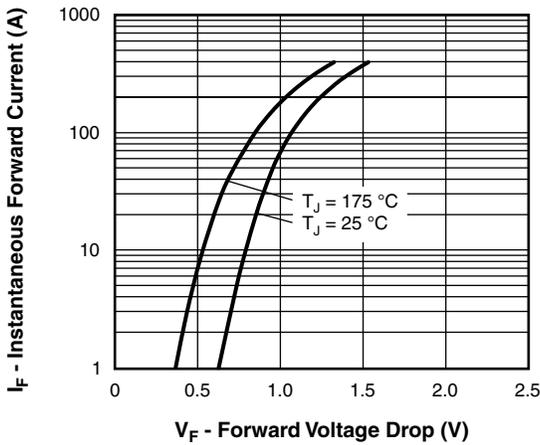


Fig. 1 - Typical Forward Voltage Drop Characteristics (Per Leg)

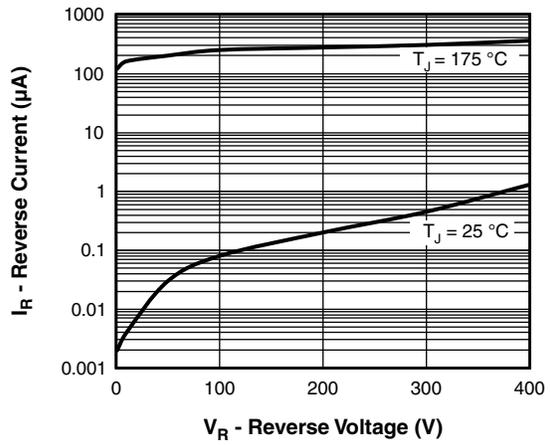


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

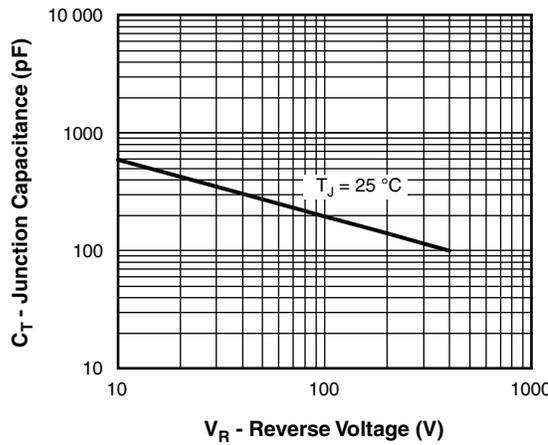


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

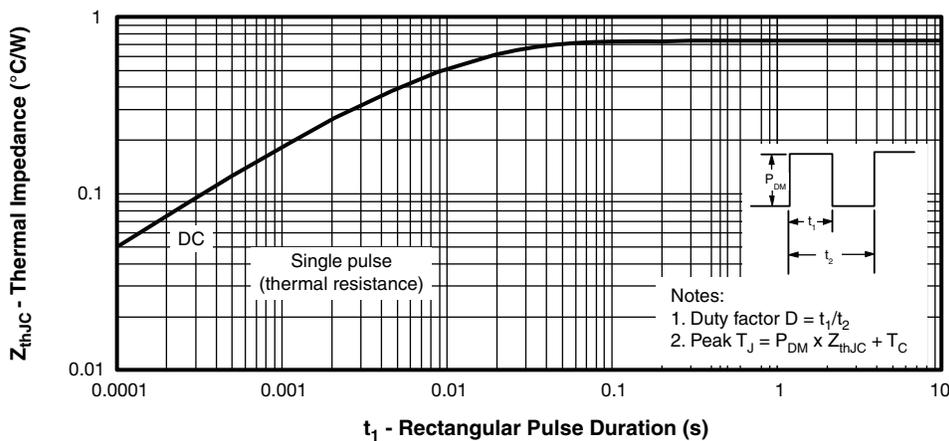


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

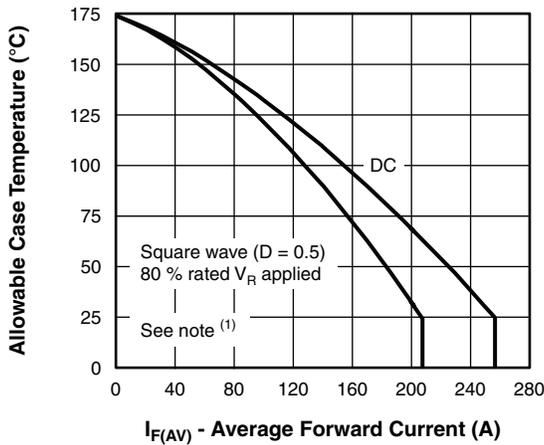


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

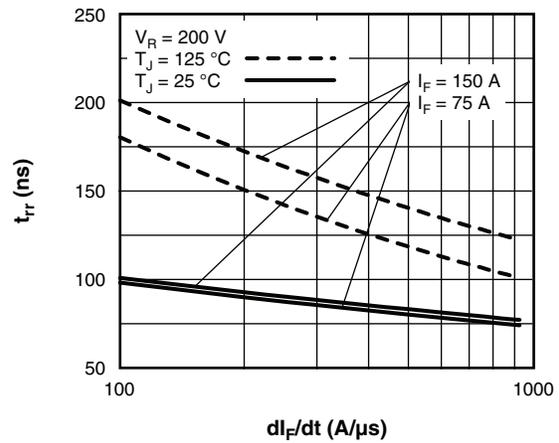


Fig. 7 - Typical Reverse Recovery Time vs. di_F/dt

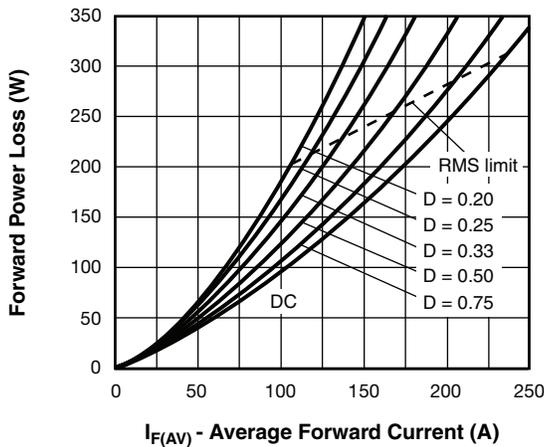


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

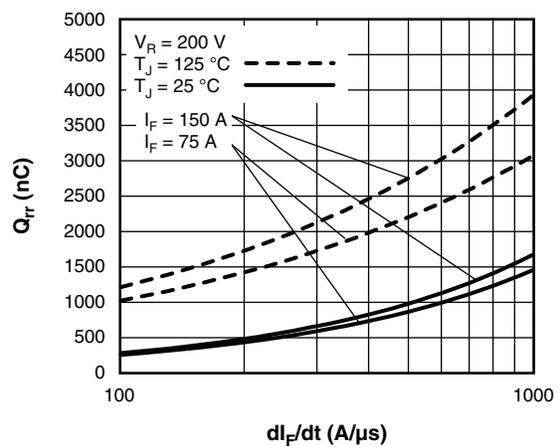


Fig. 8 - Typical Stored Charge vs. di_F/dt

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 $V_{R1} = 80\%$ rated V_R

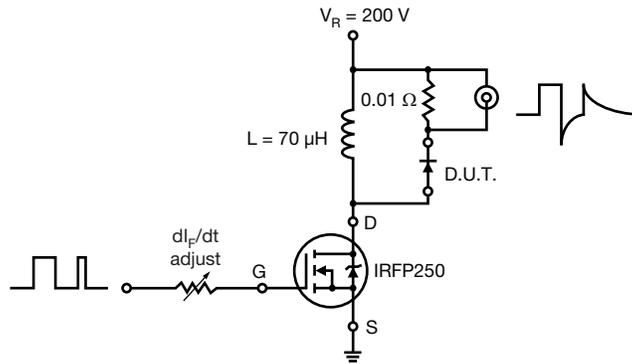
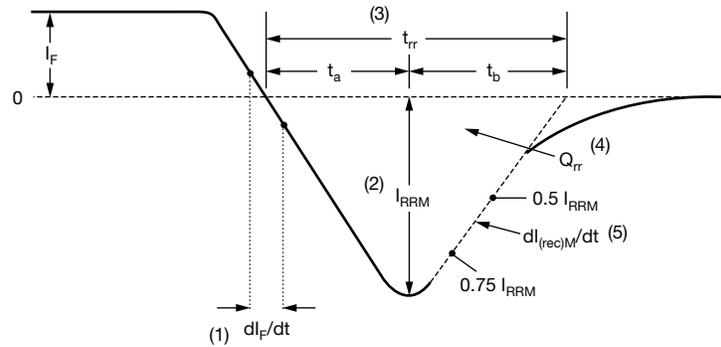


Fig. 9 - Reverse Recovery Parameter Test Circuit



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

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

Fig. 10 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

| | | | | | | | |
|-------------|------------|-----------|----------|------------|----------|----------|-----------|
| Device code | VS- | UF | B | 280 | F | A | 40 |
| | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |

- 1** - Vishay Semiconductors product
- 2** - Ultrafast rectifier
- 3** - Ultrafast Pt diffused
- 4** - Current rating (280 = 280 A)
- 5** - Circuit configuration (2 separate diodes, parallel pin-out)
- 6** - Package indicator (SOT-227 standard isolated base)
- 7** - Voltage rating (40 = 400 V)

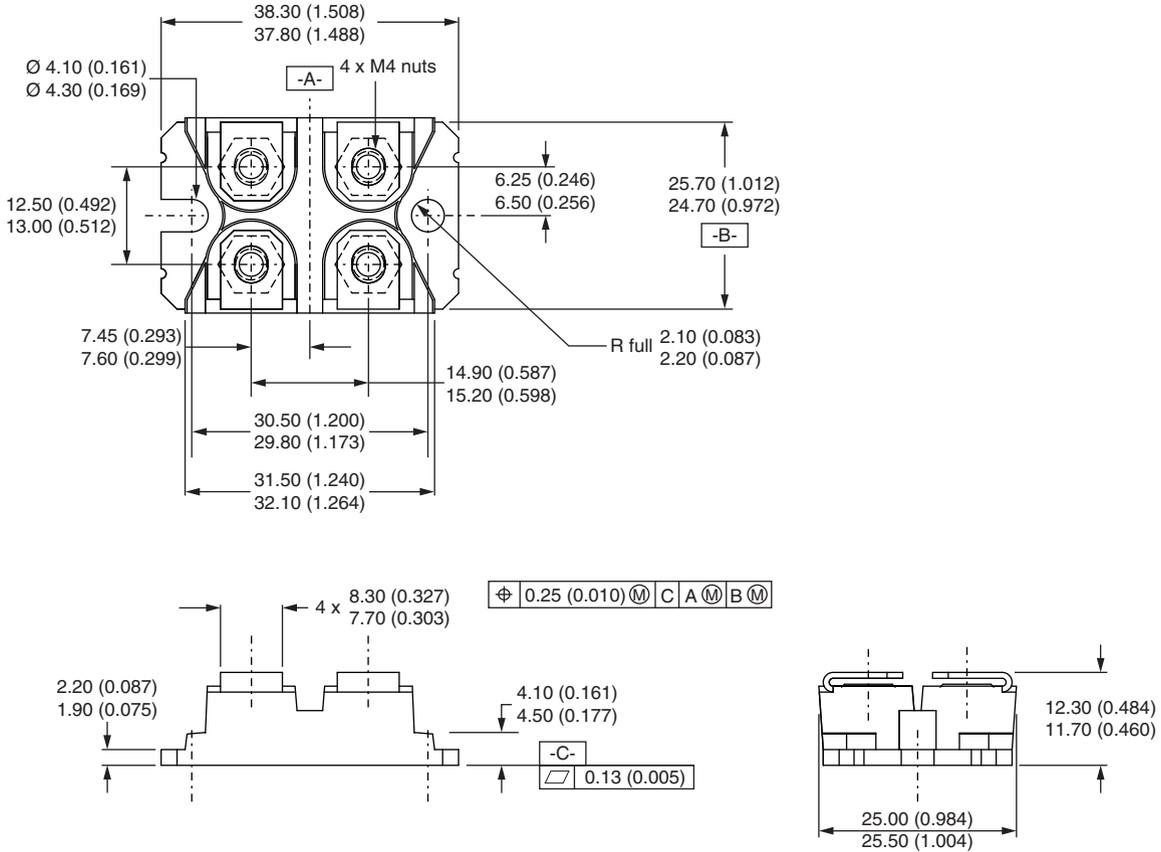
| CIRCUIT CONFIGURATION | | |
|-------------------------------------|----------------------------|-----------------|
| CIRCUIT | CIRCUIT CONFIGURATION CODE | CIRCUIT DRAWING |
| 2 separate diodes, parallel pin-out | F | |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?95423 |
| Packaging information | www.vishay.com/doc?95425 |



SOT-227 Generation II

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter



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