


Insulated Ultrafast Rectifier Module, 170 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)
- Very 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

PRIMARY CHARACTERISTICS

| | |
|--|--------------------------|
| V_R | 600 V |
| $I_{F(AV)}$ per module at $T_C = 76\text{ °C}$ | 170 A |
| t_{rr} | 60 ns |
| Type | Modules - diode FRED Pt® |
| Package | SOT-227 |

DESCRIPTION / APPLICATIONS

The VS-UFB170FA60 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 | $T_C = 90\text{ °C}$ | 94 | A |
| Single pulse forward current per diode | I_{FSM} | $T_C = 25\text{ °C}$ | 850 | |
| Maximum power dissipation per module | P_D | $T_C = 90\text{ °C}$ | 233 | W |
| RMS isolation voltage | V_{ISOL} | Any terminal to case, $t = 1\text{ min}$ | 2500 | V |
| Operating junction and storage temperatures | T_J, T_{Stg} | | -55 to +175 | °C |

**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} | $I_R = 100\text{ }\mu\text{A}$ | 600 | - | - | |
| Forward voltage, per leg | V_{FM} | $I_F = 50\text{ A}$ | - | 1.02 | 1.19 | V |
| | | $I_F = 50\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$ | - | 0.87 | - | |
| | | $I_F = 100\text{ A}$ | - | 1.17 | 1.43 | |
| | | $I_F = 100\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$ | - | 1.03 | - | |
| Reverse leakage current, per leg | I_{RM} | $V_R = V_R\text{ rated}$ | - | 0.5 | 50 | μA |
| | | $T_J = 175\text{ }^{\circ}\text{C}, V_R = V_R\text{ rated}$ | - | 0.1 | 2 | mA |
| Junction capacitance, per leg | C_T | $V_R = 600\text{ V}$ | - | 43 | - | 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, per leg | t_{rr} | $T_J = 25\text{ }^{\circ}\text{C}, I_F = 1\text{ A } dI_F/dt = 200\text{ A}/\mu\text{s } V_R = 30\text{ V}$ | - | 60 | - | ns |
| | | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 170 | - | |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 270 | - | |
| Peak recovery current, per leg | I_{RRM} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 40 | - | A |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 54 | - | |
| Reverse recovery charge, per leg | Q_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 3.4 | - | μC |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 6.8 | - | |
| Reverse recovery time, per leg | t_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 220 | - | ns |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 300 | - | |
| Peak recovery current, per leg | I_{RRM} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 47 | - | A |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 61 | - | |
| Reverse recovery charge, per leg | Q_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 5.2 | - | μC |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 9.1 | - | |

THERMAL - MECHANICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|------------|-----------------------|---------|------|------------|-----------------------------|
| Junction to case, single leg conducting | R_{thJC} | | - | - | 0.73 | $^{\circ}\text{C}/\text{W}$ |
| Junction to case, both leg conducting | | | - | - | 0.365 | |
| Case to heatsink | R_{thCS} | Flat, greased surface | - | 0.10 | - | |
| 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 | | | |

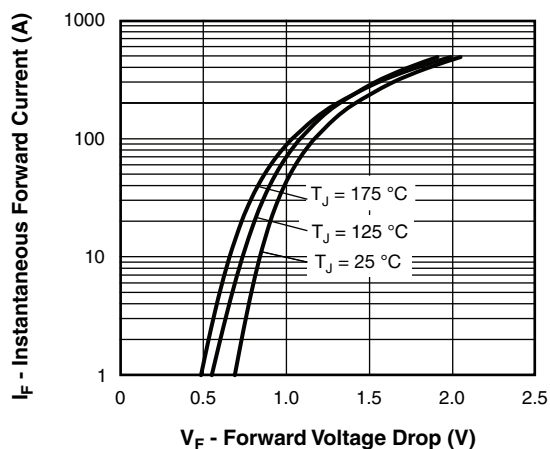


Fig. 1 - Typical Forward Voltage Drop Characteristics (Per Leg)

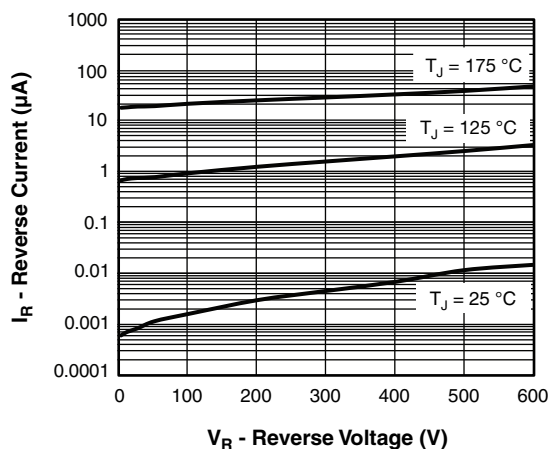


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)

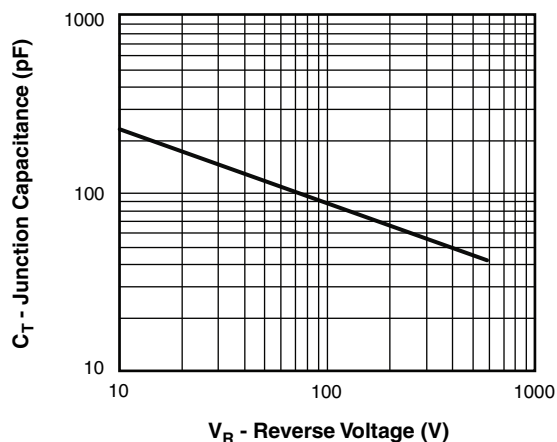
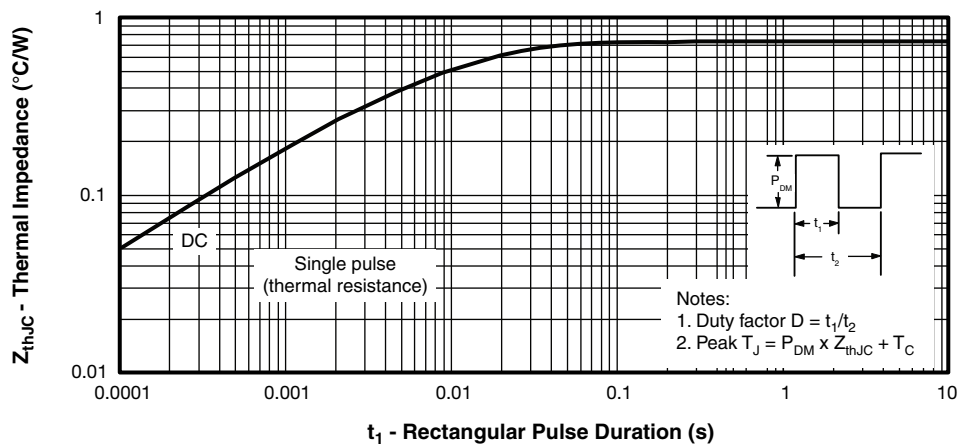


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)


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

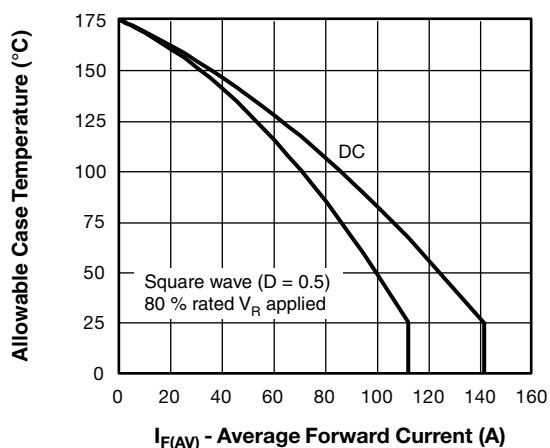


Fig. 5 - Allowable Case Temperature vs. Average Forward Current (Per Leg)

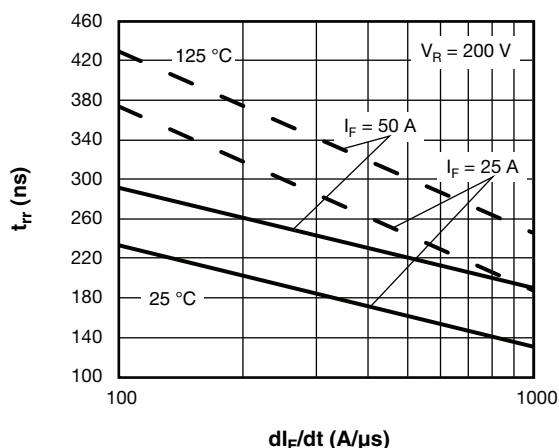


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt (Per Leg)

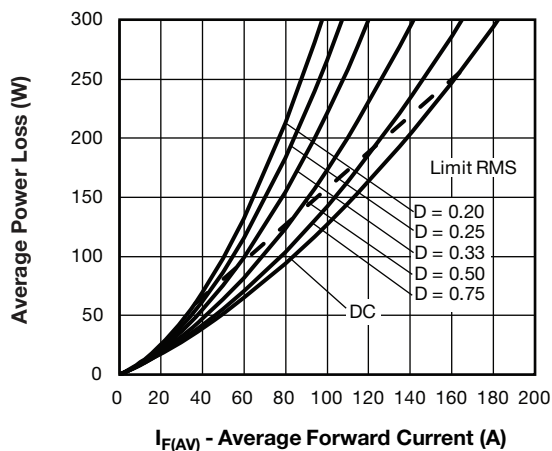


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

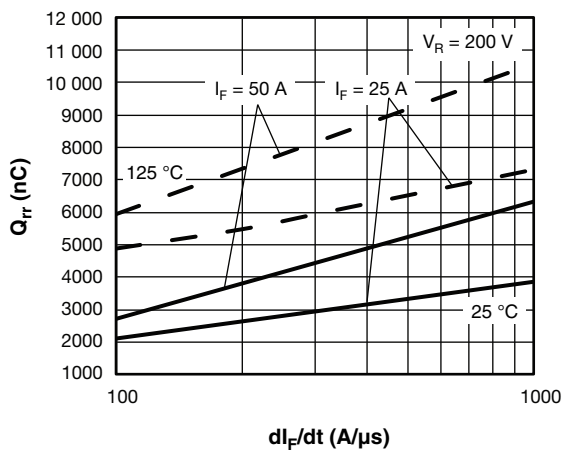


Fig. 8 - Typical Stored Charge vs. dI_F/dt (Per Leg)

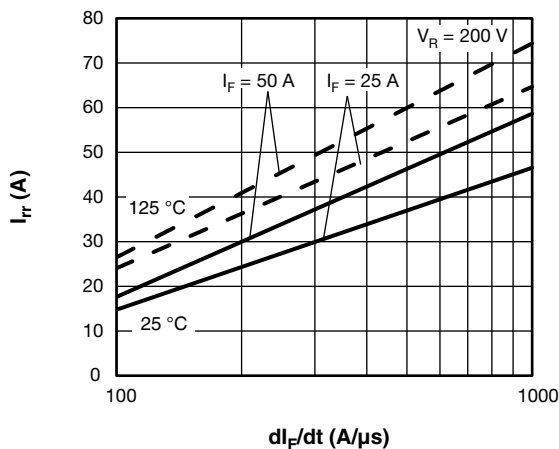


Fig. 9 - Typical Recovery Current vs. dI_F/dt (Per Leg)

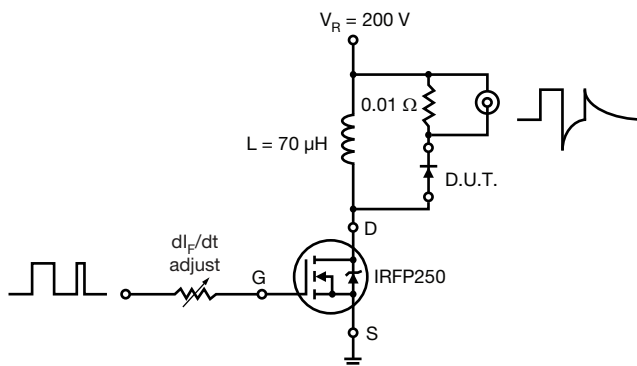


Fig. 10 - Reverse Recovery Parameter Test Circuit

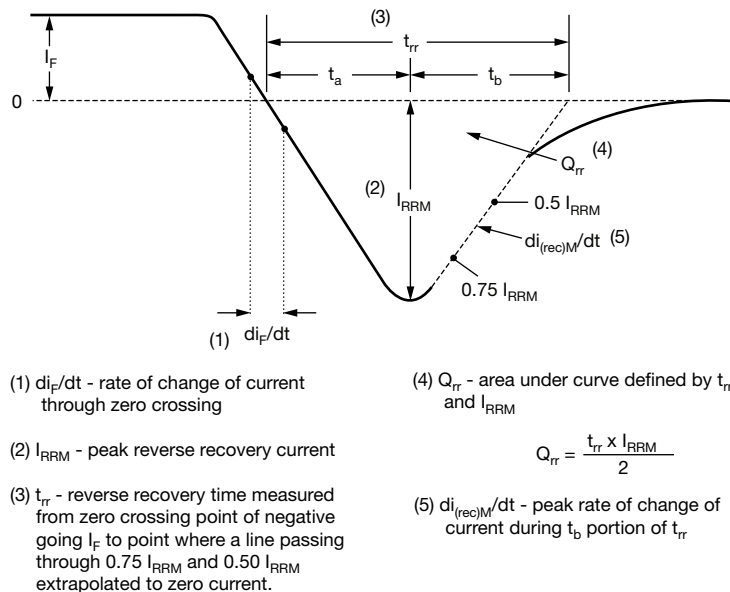
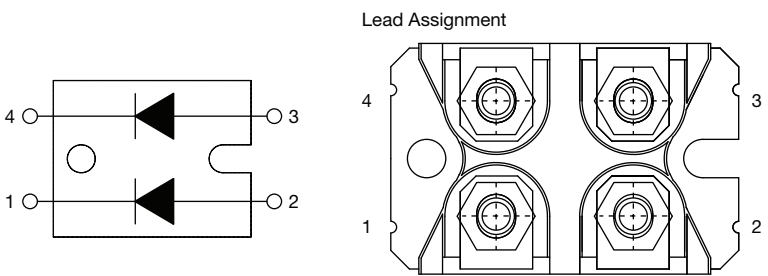


Fig. 11 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

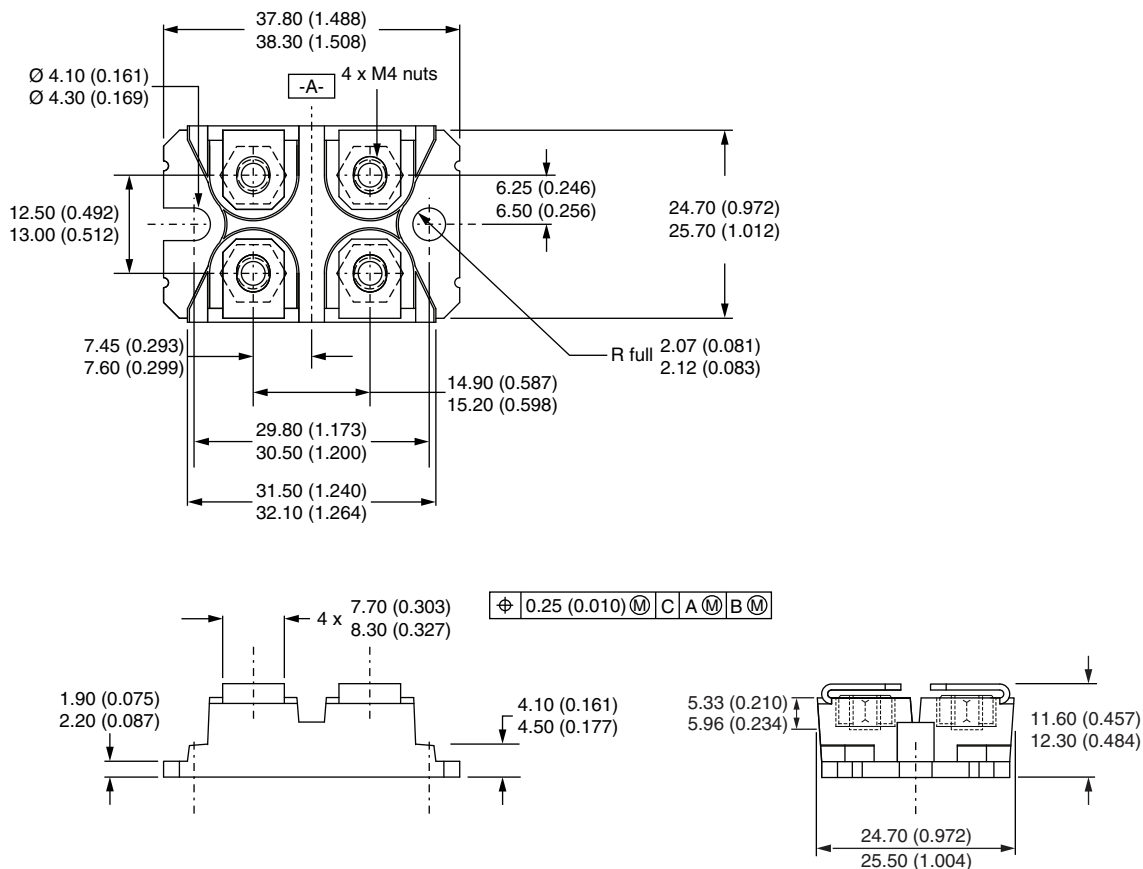
| Device code | VS- | UF | B | 170 | F | A | 60 |
|-------------|---|----|---|-----|---|---|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | - Vishay Semiconductors product | | | | | | |
| 2 | - Ultrafast rectifier | | | | | | |
| 3 | - Ultrafast FRED Pt [®] diffused | | | | | | |
| 4 | - Current rating (170 = 170 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 |  <p>The circuit diagram shows two diodes connected in parallel. The anodes are connected to pins 4 and 1, and the cathodes are connected to pins 3 and 2. The lead assignment drawing shows the physical package with pins 1, 2, 3, and 4 labeled.</p> |

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

SOT-227 Generation 2

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter



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