

FRED Pt® Gen 4 Doubler Ultrafast Diode, 600 A (INT-A-PAK Power Modules)


INT-A-PAK

FEATURES

- Gen 4 FRED Pt® dices technology
- Ultrasoft reverse recovery characteristics
- Low I_{RRM} and reverse recovery charge
- Very low forward voltage drop
- 175 °C operating junction temperature
- UL approved file E78996 for application with maximum case temperature up to 140 °C
- Large creepage distances
- 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 |
| $I_{F(AV)}$ at T_C | 600 A at 25 °C |
| t_{rr} at 25 °C | 150 ns |
| Type | Modules - diode, FRED Pt® |
| Package | INT-A-PAK |
| Circuit configuration | Diode doubler circuit |

DESCRIPTION

Gen 4 FRED Pt technology, state of the art, ultra low V_F , soft switching optimized for IGBT F/W diode.

The minimized conduction loss, optimized storage charge, and low recovery current, minimized the switching losses and reduce the over dissipation in the switching element and snubbers.

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | MAX. | UNITS |
|--------------------------------------|-----------|---|-------------|-------|
| Cathode to anode voltage | V_R | | 600 | V |
| Continuous forward current | I_F | $T_C = 25\text{ °C}$ | 771 | A |
| | | $T_C = 63\text{ °C}$ | 640 | |
| Single pulse forward current | I_{FSM} | $t_p = 10\text{ ms}$, 50 Hz, sine half wave, initial $T_J = 175\text{ °C}$ | 4140 | |
| Maximum power dissipation | P_D | $T_C = 25\text{ °C}$ | 1923 | W |
| | | $T_C = 90\text{ °C}$ | 1090 | |
| Operating junction temperature range | T_J | | -40 to +175 | °C |
| Storage temperature range | T_{Stg} | | -40 to +150 | |
| RMS insulation voltage | V_{INS} | 50 Hz, circuit to base, all terminals shorted, $t = 1\text{ s}$ | 3500 | V |

ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ °C}$ unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|------------------------------------|----------|--|------|-------|------|---------------|
| Cathode to anode breakdown voltage | V_{BR} | $I_R = 500\text{ }\mu\text{A}$ | 600 | - | - | V |
| Forward voltage drop | V_{FM} | $I_F = 300\text{ A}$ | - | 1.305 | - | |
| | | $I_F = 600\text{ A}$ | - | 1.60 | 1.77 | |
| | | $I_F = 300\text{ A}$, $T_J = 150\text{ °C}$ | - | 1.08 | - | |
| | | $I_F = 600\text{ A}$, $T_J = 150\text{ °C}$ | - | 1.47 | - | |
| Reverse leakage current | I_{RM} | $V_R = 600\text{ V}$ | - | 13 | - | μA |
| | | $T_J = 150\text{ °C}$, $V_R = 600\text{ V}$ | - | 3.2 | - | mA |

**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} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 150 | - | ns |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 310 | - | |
| Peak recovery current | I_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 14 | - | A |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 33 | - | |
| Reverse recovery charge | Q_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 1.65 | - | μC |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 7.03 | - | |

THERMAL - MECHANICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|--|------------|--|-----------|-------|
| Maximum thermal resistance, junction to case per leg | R_{thJC} | DC operation | 0.088 | K/W |
| Typical thermal resistance, case to heat sink | R_{thCS} | Mounting surface, flat, smooth and greased | 0.035 | |
| Mounting torque $\pm 10\%$ to heat sink busbar | | A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow the spread of the compound. | 4 to 6 | Nm |
| Approximate weight | | | 200 | g |
| | | | 7.1 | oz. |
| Case style | | | INT-A-PAK | |

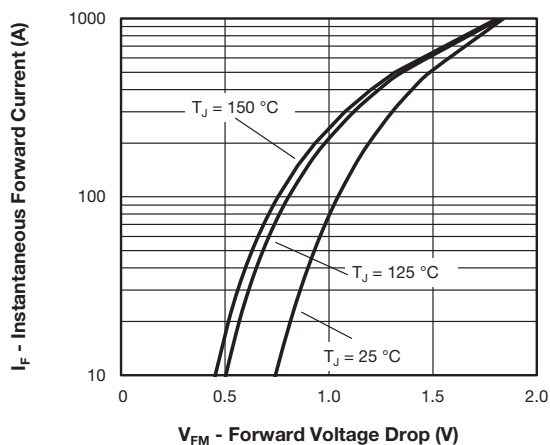


Fig. 1 - Typical Forward Voltage Drop Characteristics

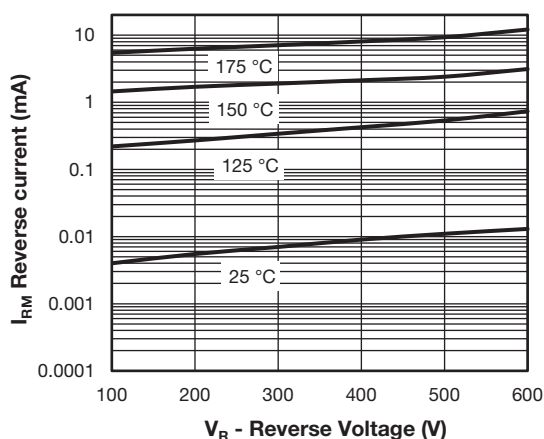


Fig. 2 - Typical Value of Reverse Current vs. Reverse Voltage

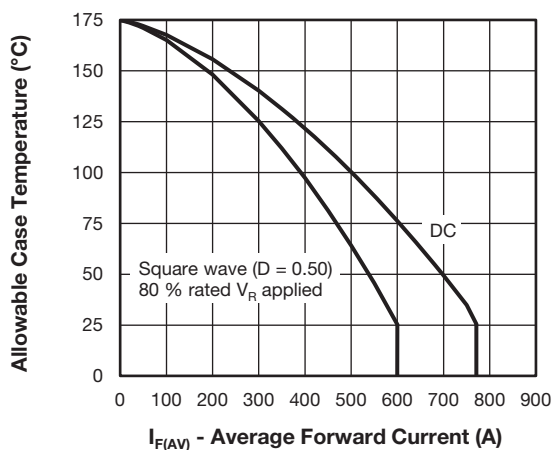


Fig. 3 - Maximum Allowable Case Temperature vs. Average Forward Current

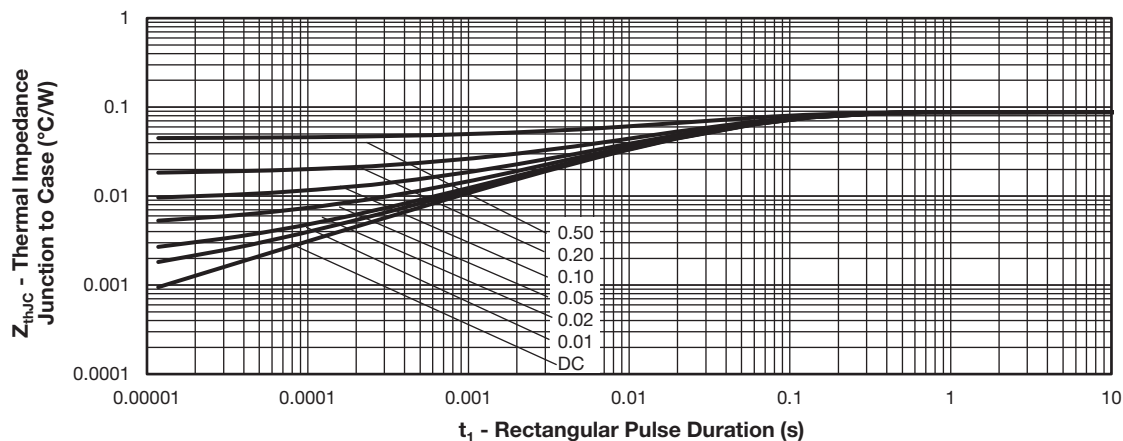
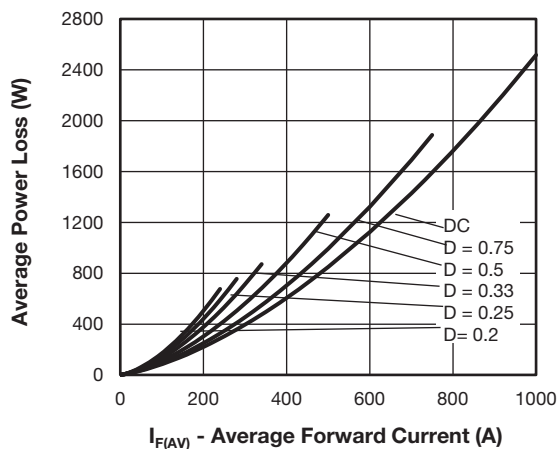
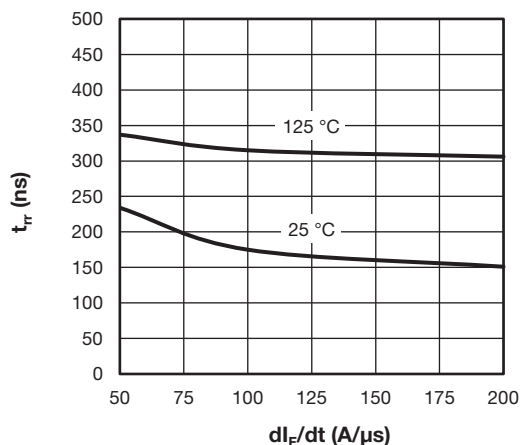

Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics


Fig. 5 - Forward Power Loss Characteristics


Fig. 6 - Typical Reverse Recovery Time vs. dI_F/dt
 $I_{FM} = 150 \text{ A}$, $V_R = 400 \text{ V}$

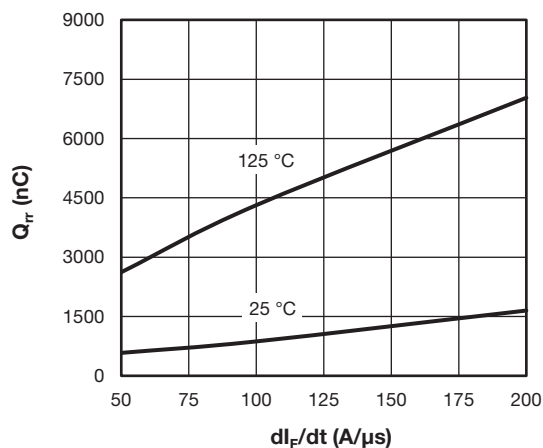


Fig. 7 - Typical Reverse Recovery Charge vs. dI_F/dt
 $I_{FM} = 150\text{ A}$, $V_R = 400\text{ V}$

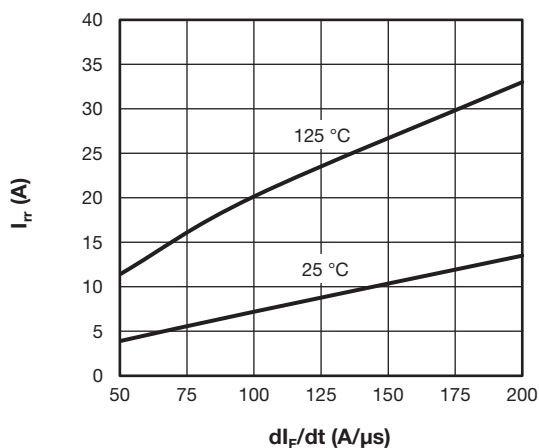
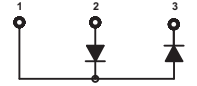


Fig. 8 - Typical Reverse Recovery Current vs. dI_F/dt
 $I_{FM} = 150\text{ A}$, $V_R = 400\text{ V}$

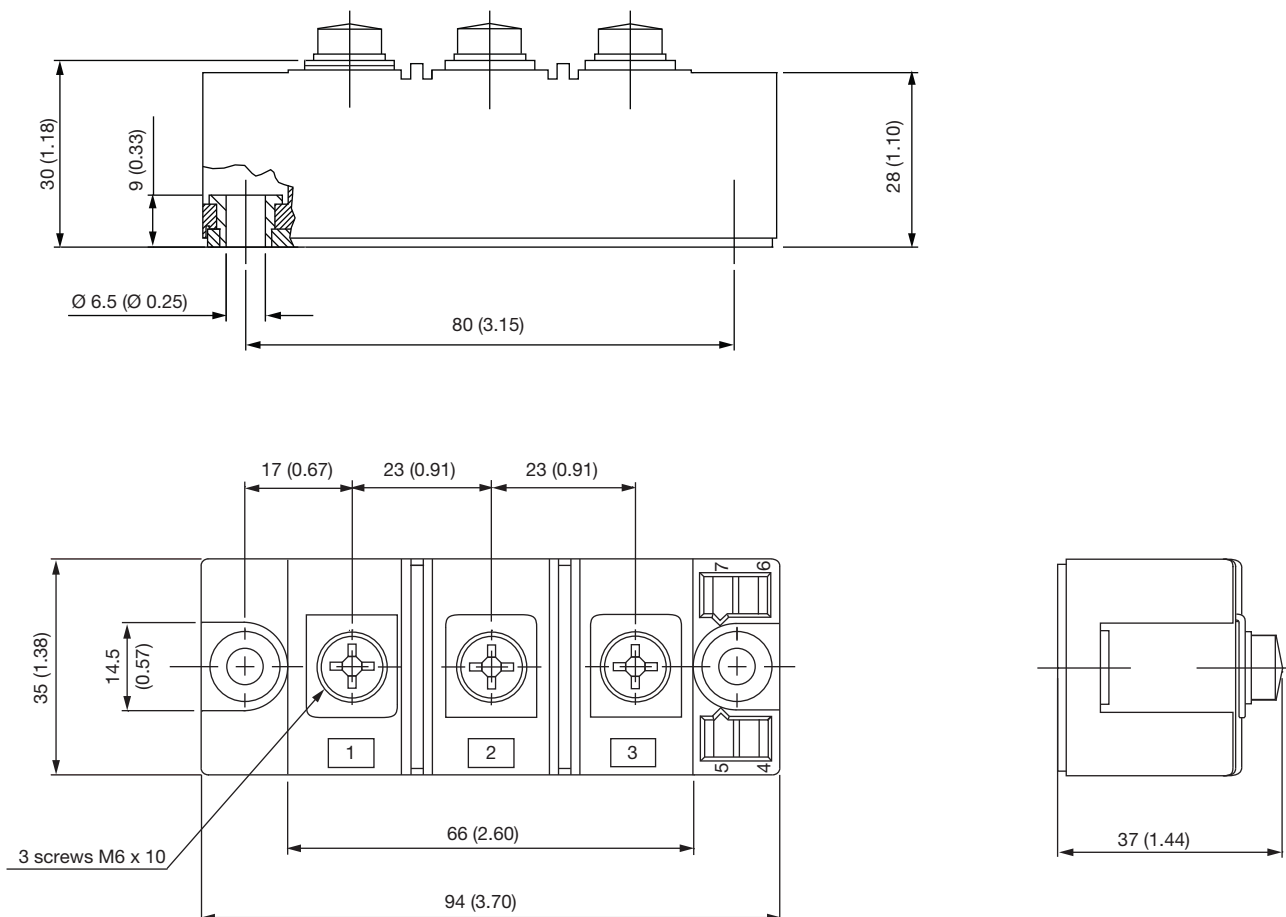
ORDERING INFORMATION TABLE

| Device code | VS-VS | KD | F | 600 | 06 | PbF |
|-------------|-------|----|---|-----|----|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | 1 | 2 | 3 | 4 | 5 | 6 |

- 1 - Vishay Semiconductors product
- 2 - Circuit configuration: KD = doubler circuit
- 3 - F = FRED Pt[®] ultrafast diode
- 4 - Current rating (600 = 600 A)
- 5 - Voltage rating (06 = 600 V)
- 6 - PbF = lead (Pb)-free

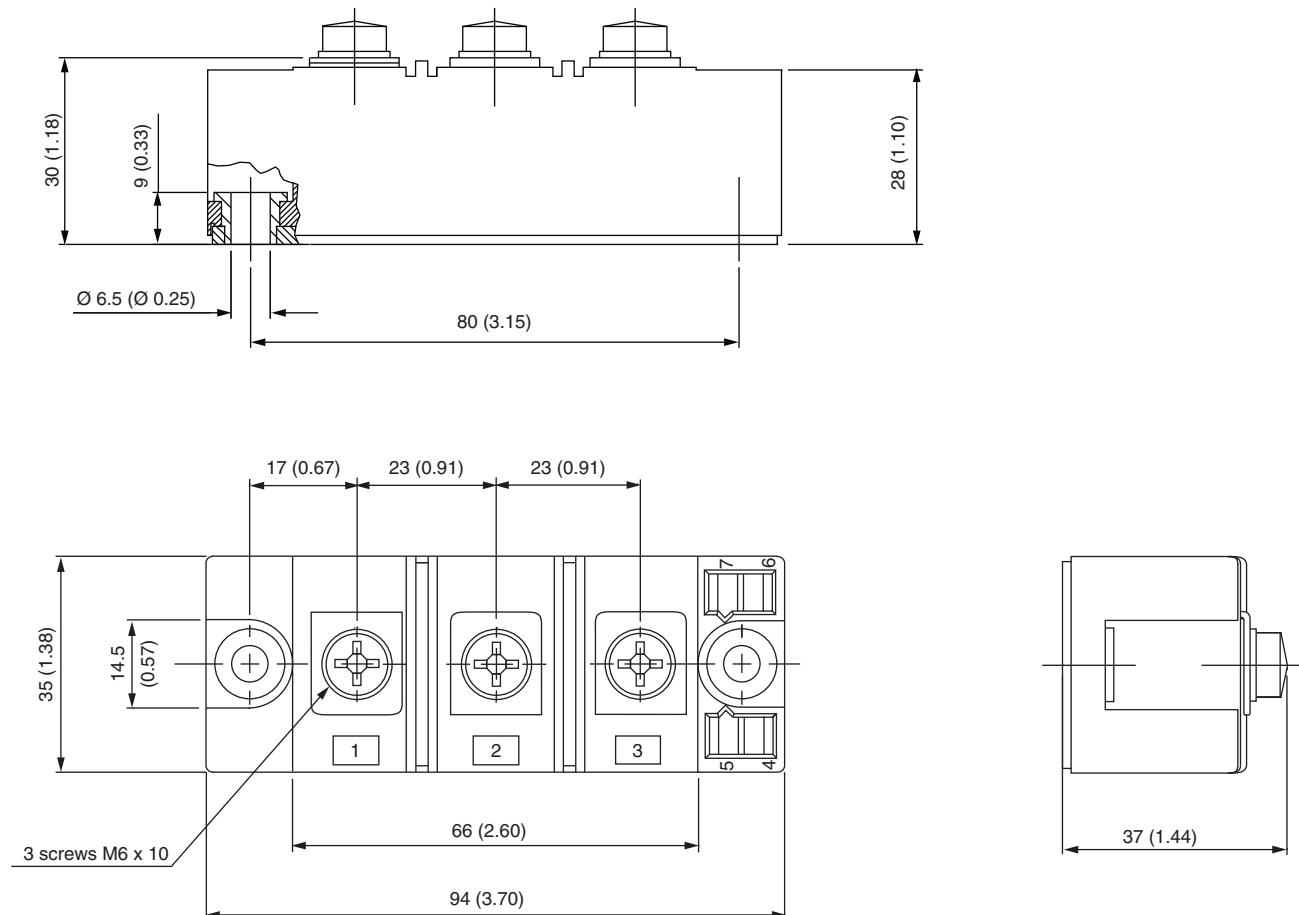
| CIRCUIT CONFIGURATION | | |
|-----------------------|----------------------------|---|
| CIRCUIT | CIRCUIT CONFIGURATION CODE | CIRCUIT DRAWING |
| Diode doubler circuit | KD | <p>KD reversed polarity</p>  |

DIMENSIONS in millimeters (inches)



INT-A-PAK DBC

DIMENSIONS in millimeters (inches)





Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.