

FRED Pt® Gen 4 Doubler Ultrafast Diode, 500 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 | 500 A at 55 °C |
| t_{rr} at 25 °C | 104 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 | $T_C = 25\text{ °C}$ | 772 | A |
| | | $T_C = 90\text{ °C}$ | 519 | |
| 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 | $T_C = 25\text{ °C}$ | 1363 | W |
| | | $T_C = 90\text{ °C}$ | 772 | |
| 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} | $I_F = 250\text{ A}$ | - | 1.25 | - | |
| | | $I_F = 500\text{ A}$ | - | 1.45 | 1.66 | |
| | | $I_F = 250\text{ A}$, $T_J = 150\text{ °C}$ | - | 1.06 | - | |
| | | $I_F = 500\text{ A}$, $T_J = 150\text{ °C}$ | - | 1.35 | - | |
| Reverse leakage current | I_{RM} | $V_R = 600\text{ V}$ | - | 10 | - | μA |
| | | $T_J = 150\text{ °C}$, $V_R = 600\text{ V}$ | - | 2.5 | - | 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} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 104 | - | ns |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 193 | - | |
| Peak recovery current | I_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 59 | - | A |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 122 | - | |
| Reverse recovery charge | Q_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 3.5 | - | μC |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 13.8 | - | |

THERMAL - MECHANICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|--|------------|---|-----------|-------|
| Maximum thermal resistance, junction to case per leg | R_{thJC} | DC operation | 0.11 | 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 | |

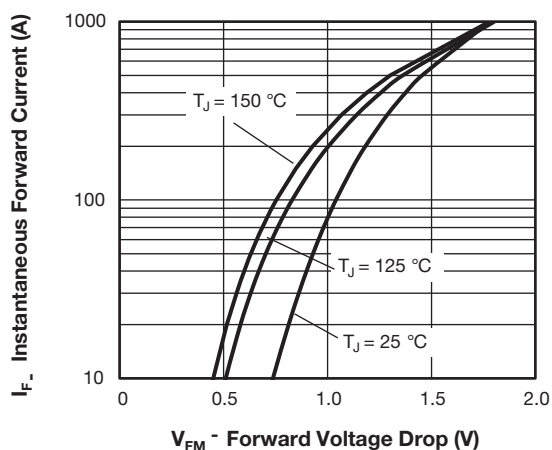


Fig. 1 - Typical Forward Voltage Drop Characteristics

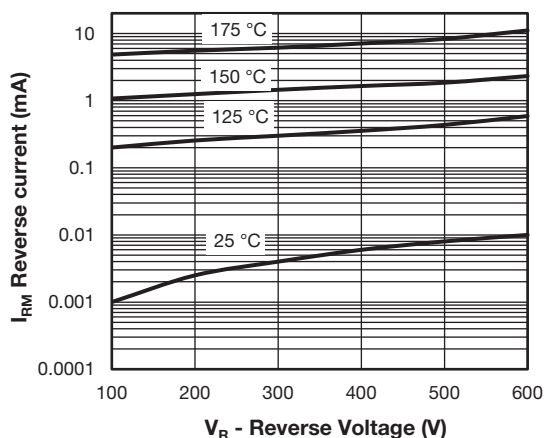


Fig. 2 - Typical Value of Reverse Current vs. Reverse Voltage

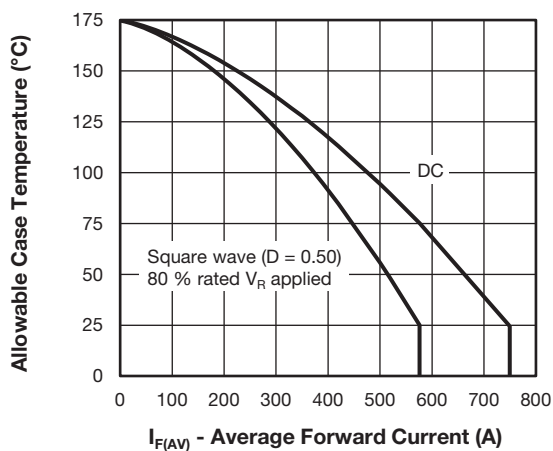


Fig. 3 - Maximum Allowable Case Temperature vs. Average Forward Current

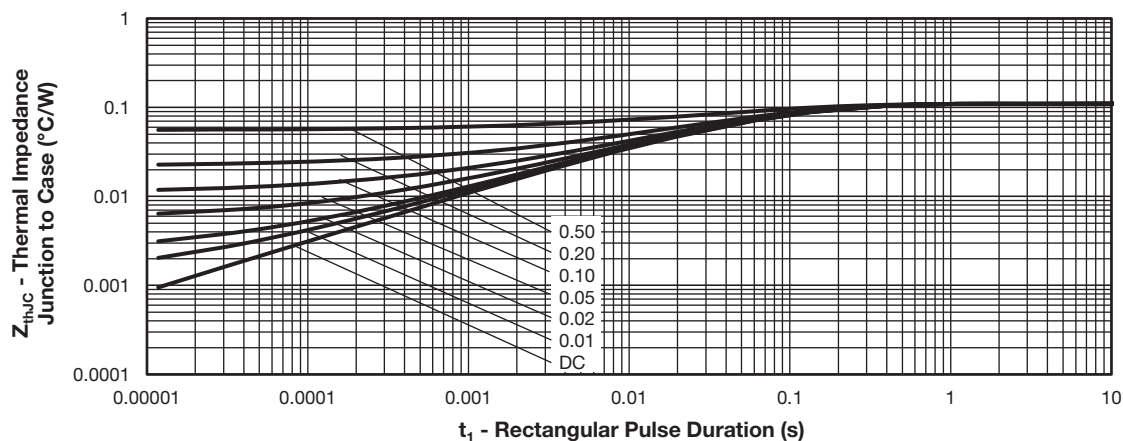


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

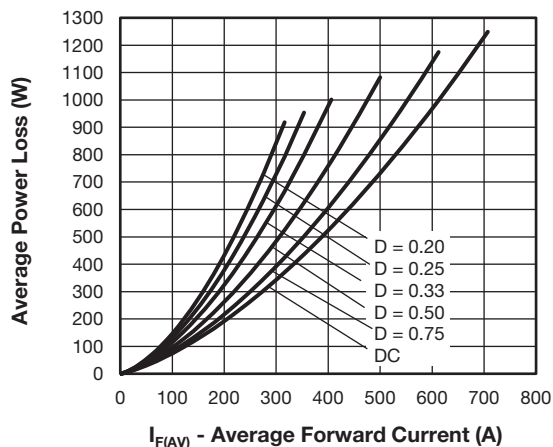


Fig. 5 - Forward Power Loss Characteristics

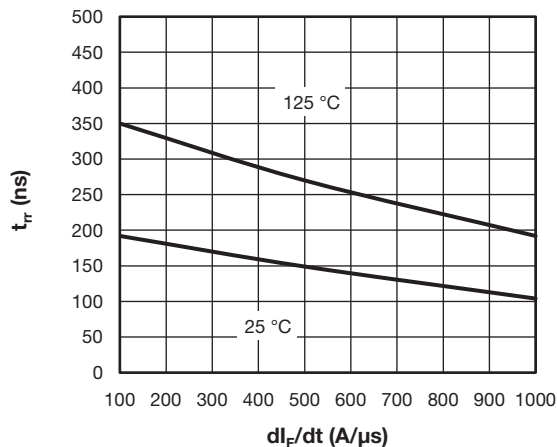


Fig. 6 - Typical Reverse Recovery Time vs. dI_F/dt
 $I_{FM} = 150\text{ A}$, $V_R = 300\text{ V}$

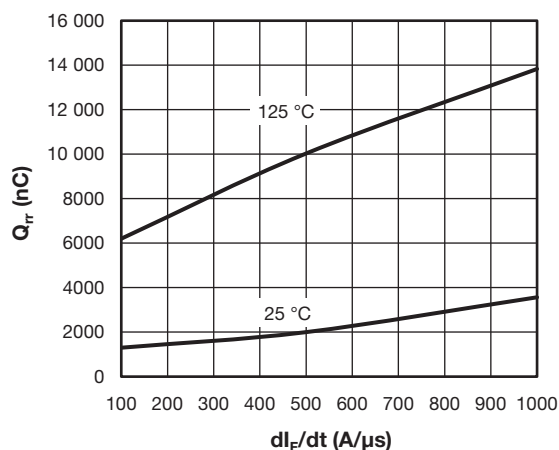


Fig. 7 - Typical Reverse Recovery Charge vs. dI_F/dt
 $I_{FM} = 150\text{ A}$, $V_R = 300\text{ V}$

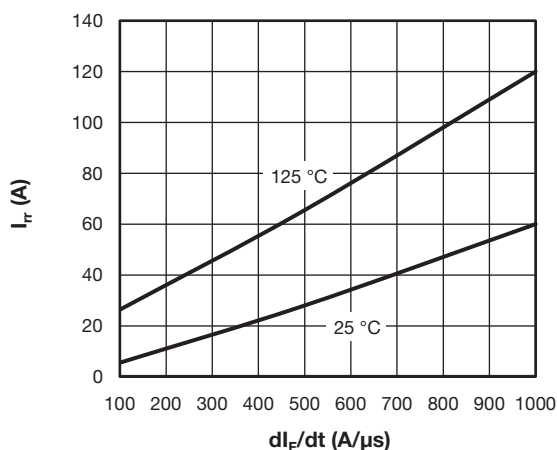
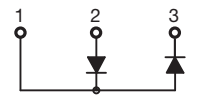


Fig. 8 - Typical Reverse Recovery Current vs. dI_F/dt
 $I_{FM} = 150\text{ A}$, $V_R = 300\text{ V}$

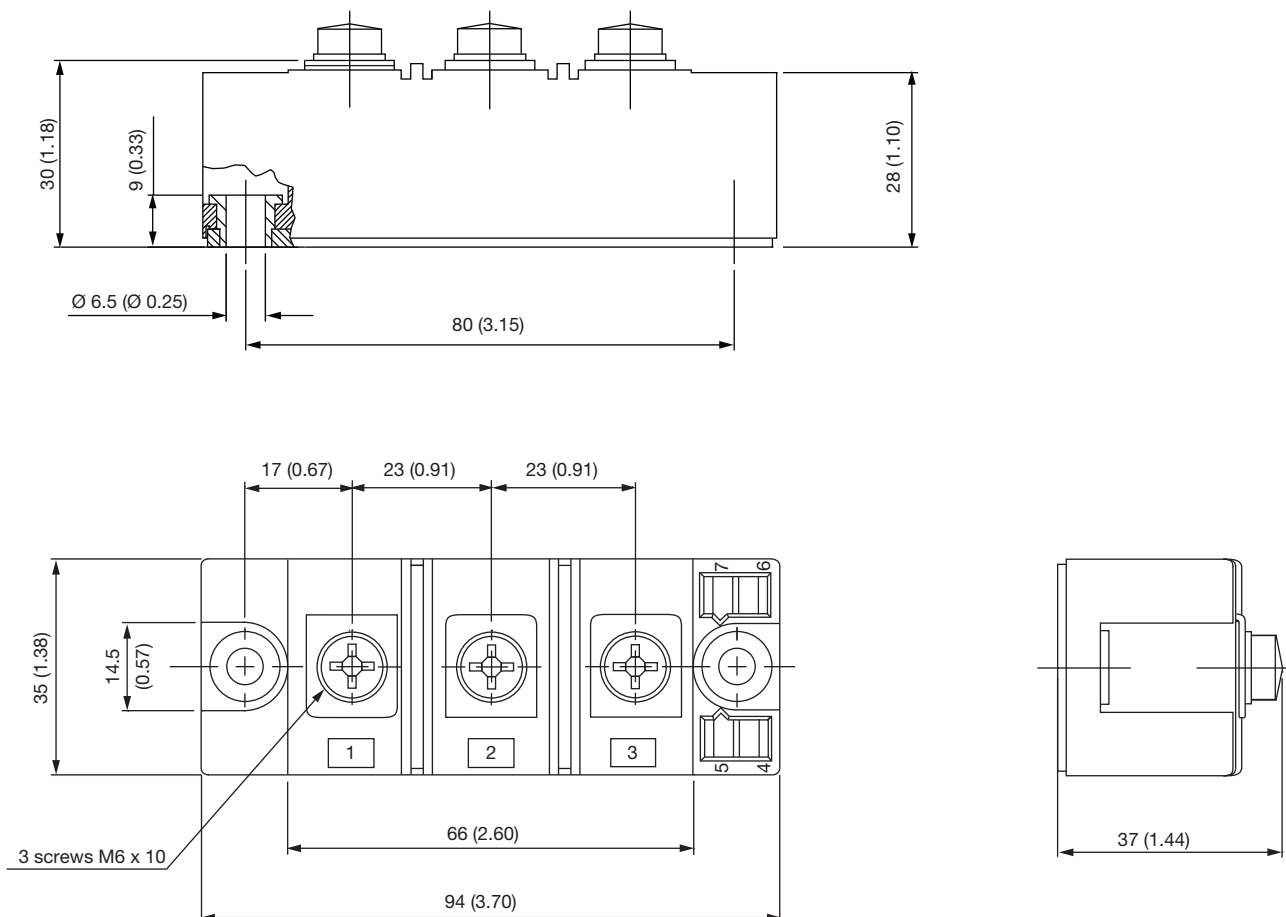
ORDERING INFORMATION TABLE

| Device code | VS-VS | KD | F | 500 | 06 | PbF |
|-------------|-------|----|---|-----|----|-----|
| | 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 (500 = 500 A)
- 5** - Voltage rating (06 = 600 V)
- 6** - PbF = lead (Pb)-free

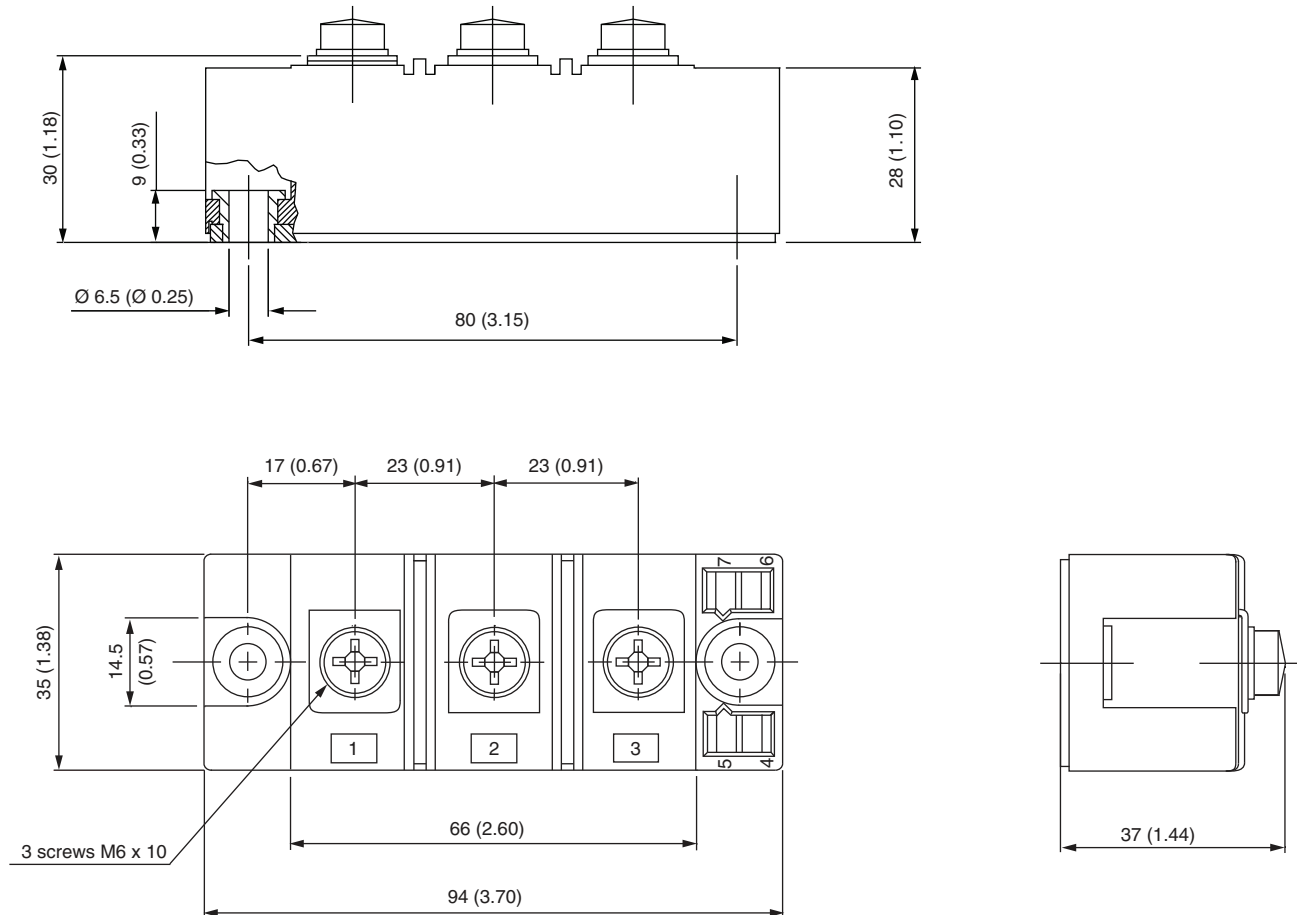
| CIRCUIT CONFIGURATION | | |
|-----------------------|----------------------------|---|
| CIRCUIT | CIRCUIT CONFIGURATION CODE | CIRCUIT DRAWING |
| Diode doubler circuit | KD | <p>KD reversed polarity</p>  |

DIMENSIONS in millimeters (inches)



INT-A-PAK DBC

DIMENSIONS in millimeters (inches)





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