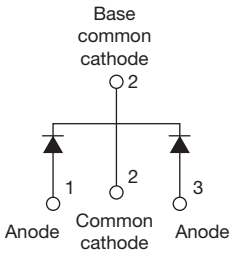
# Hyperfast Rectifier, 2 x 4 A FRED Pt®

D-PAK (TO-252AA)




## FEATURES

- Hyperfast recovery time
- 175 °C max. operating junction temperature
- Output rectification freewheeling
- Low forward voltage drop reduced $Q_{rr}$ and soft recovery
- Low leakage current
- AEC-Q101 qualified
- Meets JESD 201 class 1A whisker test
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

| PRODUCT SUMMARY | |
|---|---|
| Package | D-PAK (TO-252AA) |
| $I_{F(AV)}$ | 2 x 4 A |
| $V_R$ | 200 V |
| $V_F$ at $I_F$ | 0.95 V |
| $t_{rr}$ (typ.) | 23 ns |
| $T_J$ max. | 175 °C |
| Diode variation | Common cathode |

## DESCRIPTION/APPLICATIONS

State of the art hyperfast recovery rectifiers designed with optimized performance of forward voltage drop, hyperfast recovery time, and soft recovery.
The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.
These devices are intended for use in PFC boost stage in the AC/DC section of SMPS inverters or as freewheeling diodes. Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

| ABSOLUTE MAXIMUM RATINGS | | | | |
|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Peak repetitive reverse voltage | $V_{RRM}$ | | 200 | V |
| Average rectified forward current | $I_{F(AV)}$ | $T_C$ = 164 °C | 8 | A |
| Non-repetitive peak surge current per leg | $I_{FSM}$ | $T_J$ = 25 °C | 80 | |
| Operating junction and storage temperatures | $T_J$, $T_{Stg}$ | | - 65 to 175 | °C |

| ELECTRICAL SPECIFICATIONS ($T_J$ = 25 °C unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Breakdown voltage, blocking voltage | $V_{BR}$, $V_R$ | $I_R$ = 100 µA | 200 | - | - | V |
| Forward voltage per leg | $V_F$ | $I_F$ = 4 A | - | 0.87 | 0.95 | |
| | | $I_F$ = 8 A | - | 0.95 | 1.10 | |
| | | $I_F$ = 4 A, $T_J$ = 150 °C | - | 0.71 | 0.80 | |
| | | $I_F$ = 8 A, $T_J$ = 150 °C | - | 0.8 | 1.0 | |
| Reverse leakage current per leg | $I_R$ | $V_R$ = $V_R$ rated | - | - | 4 | µA |
| | | $T_J$ = 125 °C, $V_R$ = $V_R$ rated | - | - | 40 | |
| | | $T_J$ = 150 °C, $V_R$ = $V_R$ rated | - | - | 80 | |
| Junction capacitance per leg | $C_T$ | $V_R$ = 200 V | - | 17 | - | pF |
| Series inductance | $L_S$ | Measured lead to lead 5 mm from package body | - | 8 | - | nH |

| 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 A, $dI_F/dt$ = 100 A/µs, $V_R$ = 30 V | | - | 23 | 27 | ns |
| | | $T_J$ = 25 °C | $I_F$ = 4 A<br>$dI_F/dt$ = 200 A/µs<br>$V_R$ = 160 V | - | 20 | - | |
| | | $T_J$ = 125 °C | | - | 27 | - | |
| Peak recovery current | $I_{RRM}$ | $T_J$ = 25 °C | | - | 2 | - | A |
| | | $T_J$ = 125 °C | | - | 3.4 | - | |
| Reverse recovery charge | $Q_{rr}$ | $T_J$ = 25 °C | | - | 20 | - | nC |
| | | $T_J$ = 125 °C | | - | 46 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **MIN.** | **TYP.** | **MAX.** | **UNITS** |
| Maximum junction and storage temperature range | $T_J$, $T_{Stg}$ | | - 65 | - | 175 | °C |
| Thermal resistance, junction to case — per leg | $R_{thJC}$ | | - | 2.7 | 3.2 | °C/W |
| Thermal resistance, junction to case — per device | | | - | 1.35 | 1.6 | |
| Approximate weight | | | 0.3 | | | g |
| | | | 0.01 | | | oz. |
| Marking device | | Case style D-PAK | 8CWH02FNH | | | |

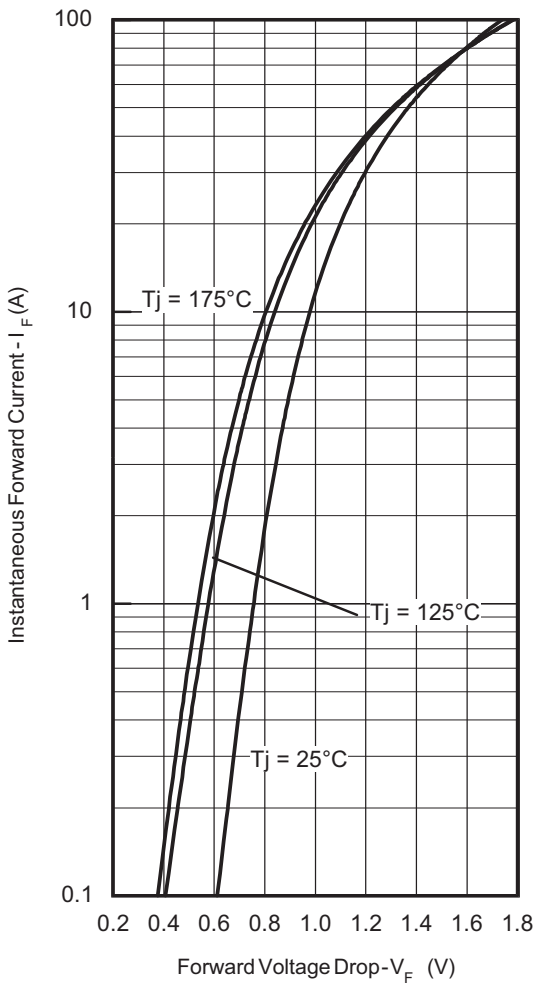



Fig. 1 - Typical Forward Voltage Drop Characteristics

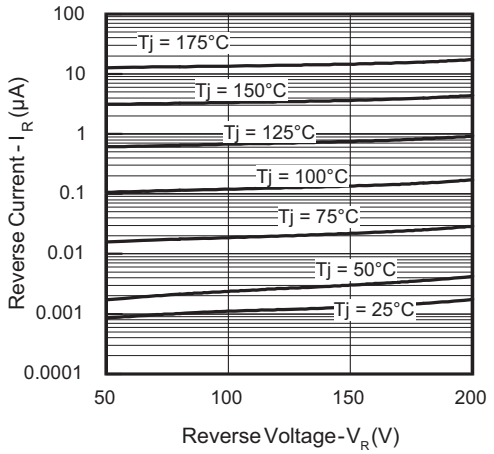



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

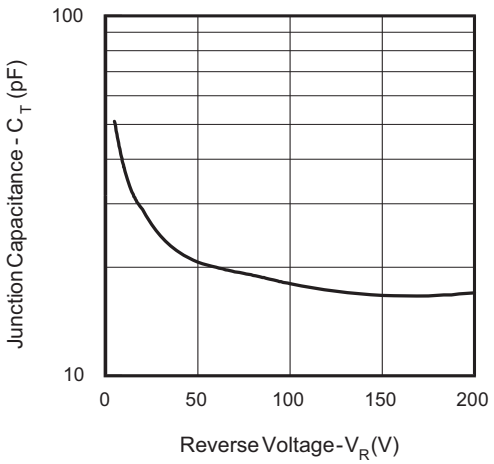



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

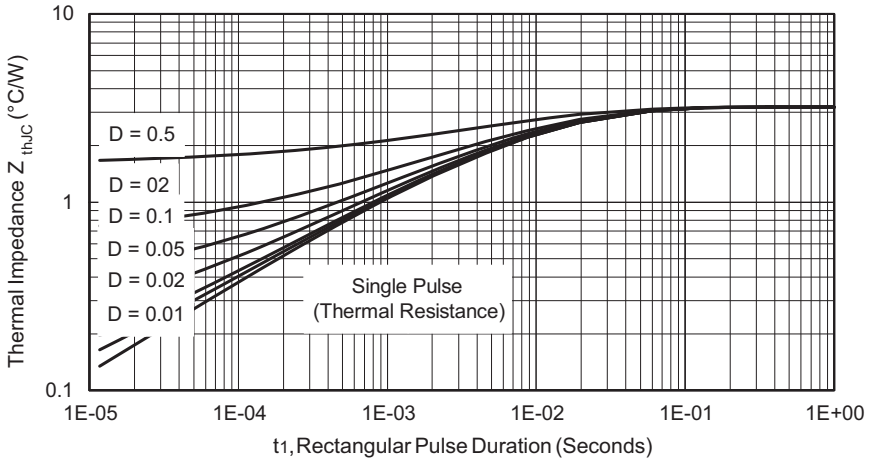



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics

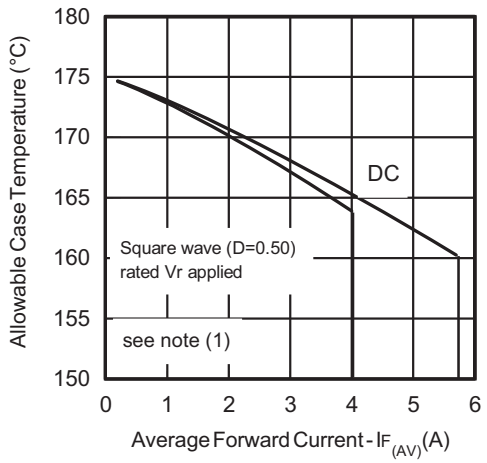



Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

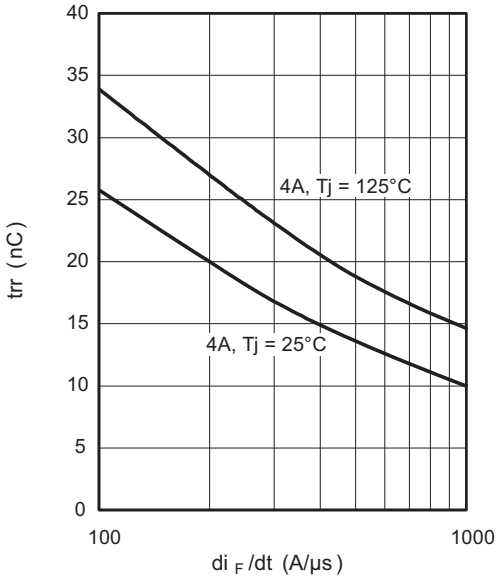



Fig. 7 - Typical Reverse Recovery Time vs. $dI_F/dt$

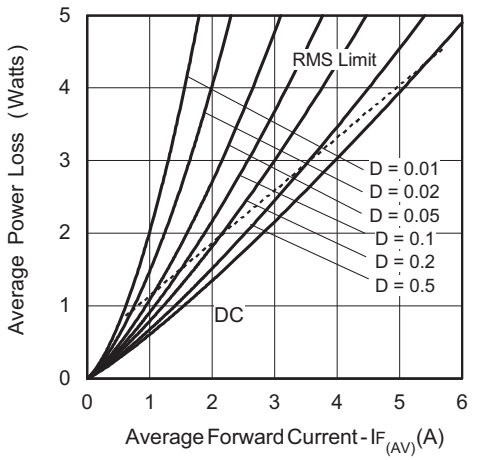



Fig. 6 - Forward Power Loss Characteristics

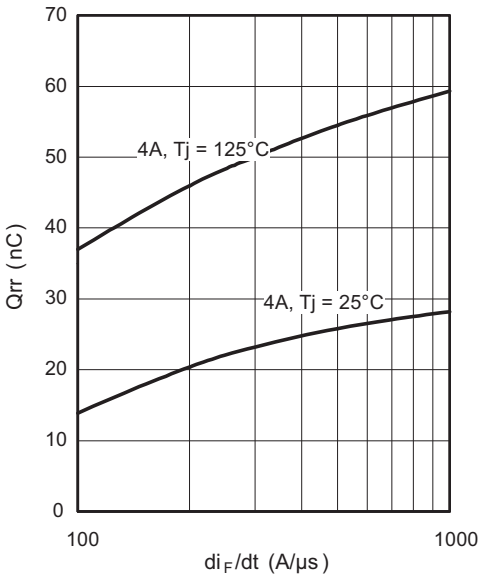



Fig. 8 - Typical Stored Charge vs. $dI_F/dt$

**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 $V_R$

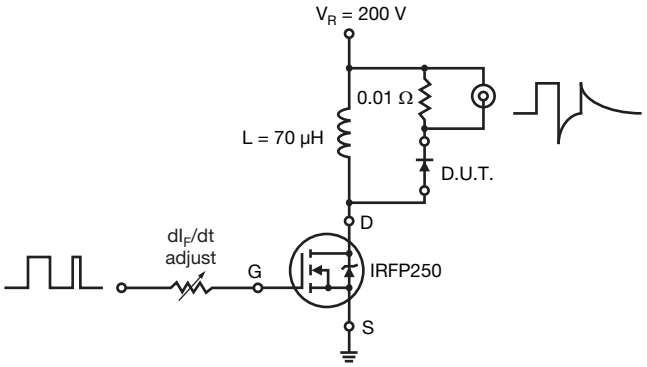
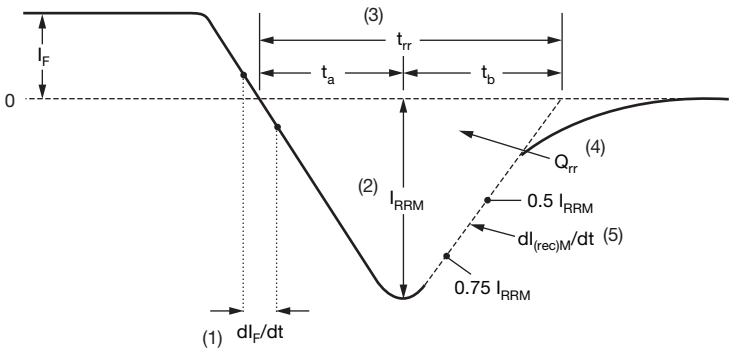



Fig. 9 - Reverse Recovery Parameter Test Circuit




(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 $I_{RRM}$

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

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

Fig. 10 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code

| VS- | 8 | C | W | H | 02 | FN | TRL | H | M3 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

1 - Vishay Semiconductors product
2 - Current rating (8 = 8 A)
3 - Circuit configuration:
C = Common cathode
4 - Package identifier:
W = D-PAK
5 - H = Hyperfast recovery
6 - Voltage rating (02 = 200 V)
7 - FN = TO-252AA
8 - • None = Tube
• TR = Tape and reel
• TRL = Tape and reel (left oriented)
• TRR = Tape and reel (right oriented)
9 - H = AEC-Q101 qualified
10 - Environmental digit:
M3 = Halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| **ORDERING INFORMATION** (Example) | | | |
|---|---|---|---|
| **PREFERRED P/N** | **QUANTITY PER T/R** | **MINIMUM ORDER QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-8CWH02FNHM3 | 75 | 3000 | Antistatic plastic tube |
| VS-8CWH02FNTRHM3 | 2000 | 2000 | 13" diameter reel |
| VS-8CWH02FNTRRHM3 | 3000 | 3000 | 13" diameter reel |
| VS-8CWH02FNTRLHM3 | 3000 | 3000 | 13" diameter reel |

| **LINKS TO RELATED DOCUMENTS** | |
|---|---|
| Dimensions | www.vishay.com/doc?95519 |
| Part marking information | www.vishay.com/doc?95518 |
| Packaging information | www.vishay.com/doc?95033 |

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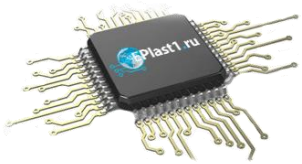


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