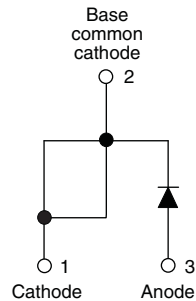


Hyperfast Rectifier, 30 A FRED Pt®



TO-247AC modified



FEATURES

- Hyperfast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Low leakage current
- Single diode device
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912



| PRODUCT SUMMARY | |
|-----------------|----------------------------|
| Package | TO-247AC modified (2 pins) |
| $I_{F(AV)}$ | 30 A |
| V_R | 600 V |
| V_F at I_F | 1.34 V |
| t_r typ. | See Recovery table |
| T_J max. | 175 °C |
| Diode variation | Single die |

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} | | 600 | V |
| Average rectified forward current | $I_{F(AV)}$ | $T_C = 116\text{ °C}$ | 30 | A |
| Non-repetitive peak surge current | I_{FSM} | $T_J = 25\text{ °C}$ | 300 | |
| Operating junction and storage temperatures | T_J, T_{Stg} | | -65 to +175 | °C |

| ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ °C}$ unless otherwise specified) | | | | | | |
|--|---------------|--|------|------|------|---------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Breakdown voltage, blocking voltage | V_{BR}, V_R | $I_R = 100\ \mu A$ | 600 | - | - | V |
| Forward voltage | V_F | $I_F = 30\text{ A}$ | - | 2.0 | 2.6 | |
| | | $I_F = 30\text{ A}, T_J = 150\text{ °C}$ | - | 1.34 | 1.75 | |
| Reverse leakage current | I_R | $V_R = V_R$ rated | - | 0.3 | 50 | μA |
| | | $T_J = 150\text{ °C}, V_R = V_R$ rated | - | 60 | 500 | |
| Junction capacitance | C_T | $V_R = 600\text{ V}$ | - | 33 | - | pF |
| Series inductance | L_S | Measured lead to lead 5 mm from package body | - | 3.5 | - | nH |



| 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} | $I_F = 1.0\text{ A}$, $di_F/dt = 50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | - | 28 | 35 | ns |
| | | $T_J = 25\text{ }^\circ\text{C}$ | - | 31 | - | |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 77 | - | |
| Peak recovery current | I_{RRM} | $T_J = 25\text{ }^\circ\text{C}$ | - | 3.5 | - | A |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 7.7 | - | |
| Reverse recovery charge | Q_{rr} | $T_J = 25\text{ }^\circ\text{C}$ | - | 65 | - | nC |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 345 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|---|----------------|--|--------------|------|------------|---------------------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Maximum junction and storage temperature range | T_J, T_{Stg} | | -65 | - | 175 | $^\circ\text{C}$ |
| Thermal resistance, junction to case per leg | R_{thJC} | | - | 0.5 | 0.9 | $^\circ\text{C}/\text{W}$ |
| Thermal resistance, junction to ambient per leg | R_{thJA} | Typical socket mount | - | - | 70 | |
| Thermal resistance, case to heatsink | R_{thCS} | Mounting surface, flat, smooth and greased | - | 0.4 | - | |
| Weight | | | - | 6.0 | - | g |
| | | | - | 0.22 | - | oz. |
| Mounting torque | | | 6.0 (5.0) | - | 12 (10) | kgf · cm (lbf · in) |
| Marking device | | Case style TO-247AC modified | 30EPH06 | | | |

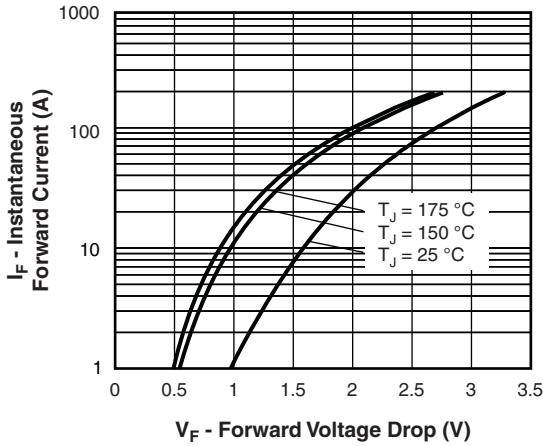


Fig. 1 - Typical Forward Voltage Drop Characteristics

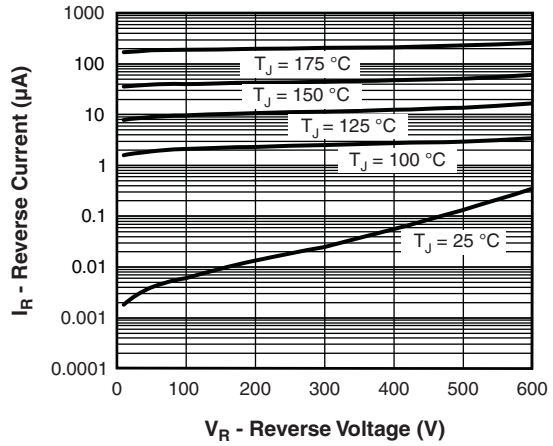


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

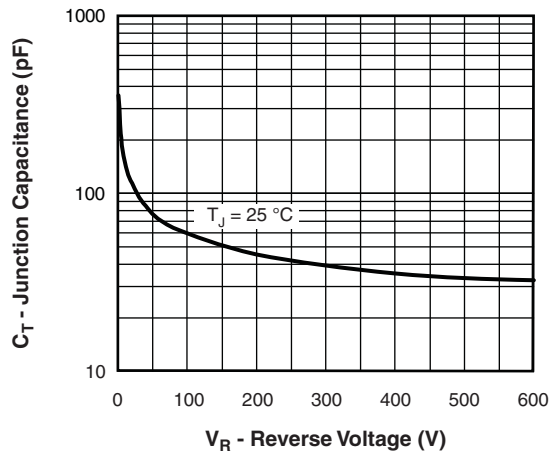


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

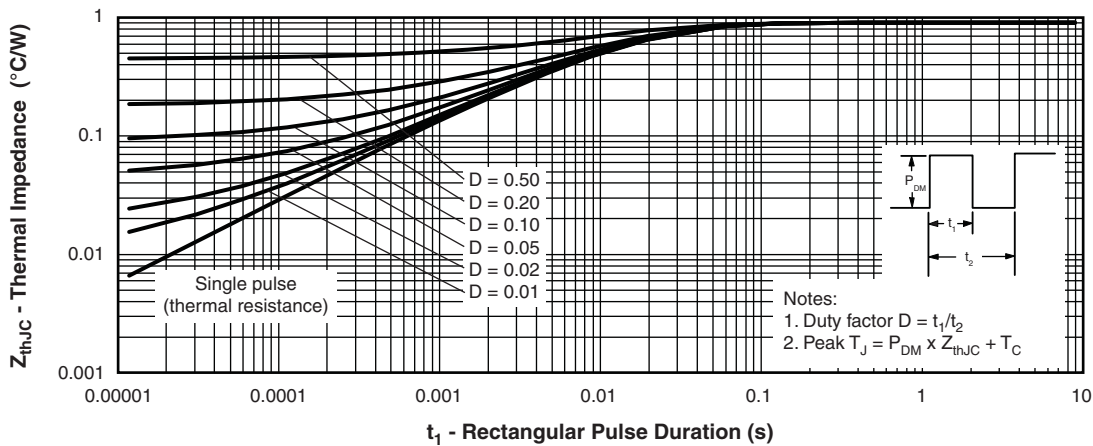


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

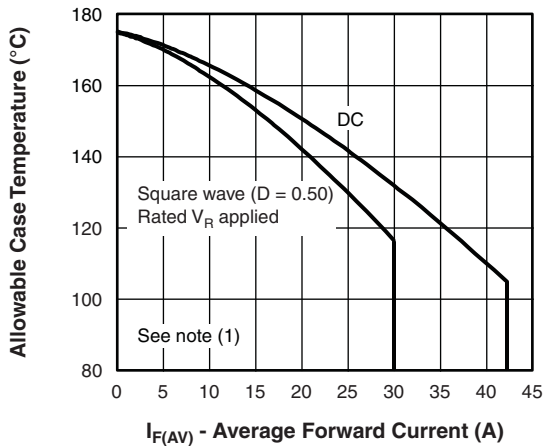


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

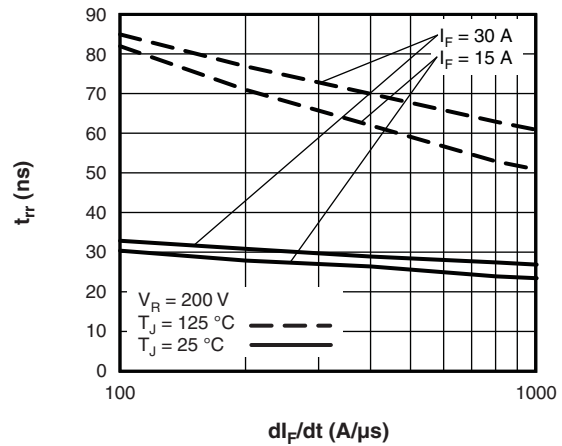


Fig. 7 - Typical Reverse Recovery Time vs. di_F/dt

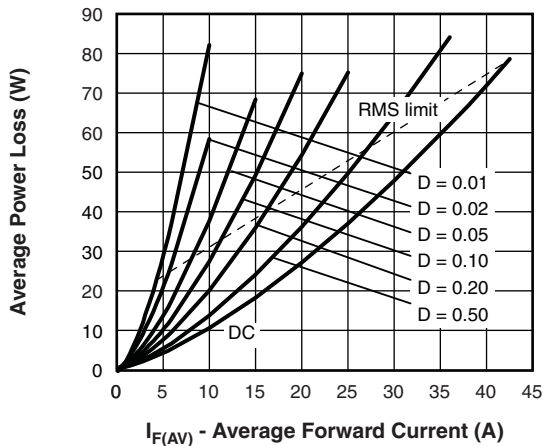


Fig. 6 - Forward Power Loss Characteristics

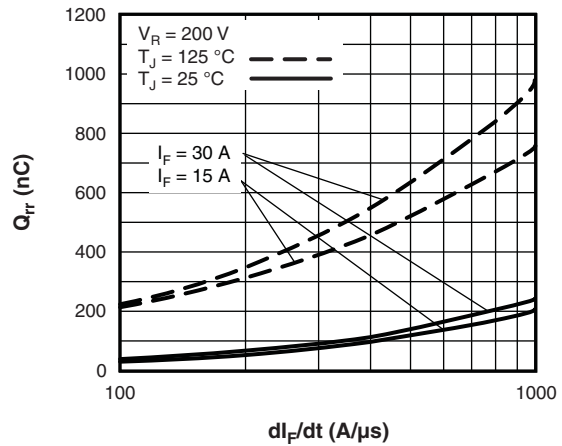


Fig. 8 - Typical Stored Charge vs. di_F/dt

Note

- (1) Formula used: $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$;
- P_d = Forward power loss = $I_{F(AV)} \times V_{FM}$ at $(I_{F(AV)}/D)$ (see fig. 6);
- $P_{d_{REV}}$ = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = Rated V_R

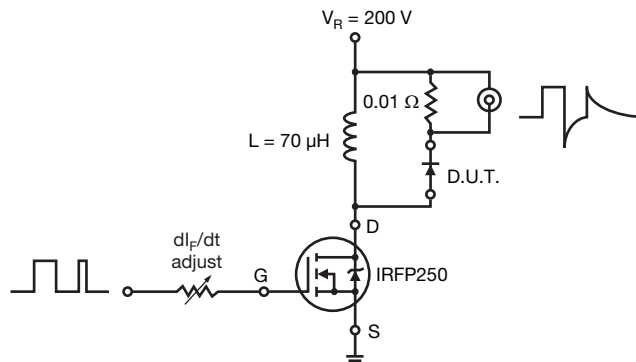
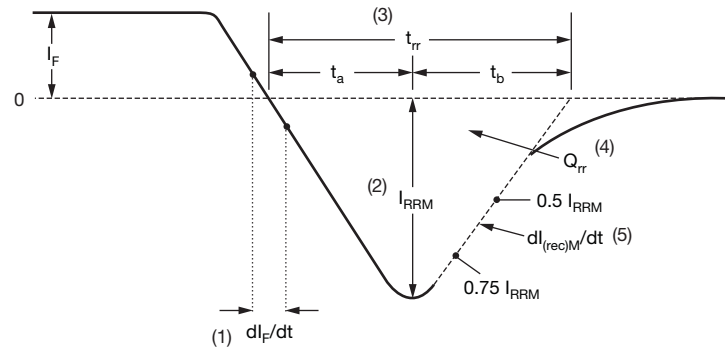


Fig. 9 - Reverse Recovery Parameter Test Circuit



(1) di_F/dt - rate of change of current through zero crossing

(4) Q_{rr} - area under curve defined by t_{rr} and I_{RRM}

(2) I_{RRM} - peak reverse recovery current

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

(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.

(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- | 30 | E | P | H | 06 | PbF |
| | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |

- 1** - Vishay Semiconductors product
- 2** - Current rating (30 = 30 A)
- 3** - Circuit configuration:
E = single diode
- 4** - Package:
P = TO-247AC modified
- 5** - H = hyperfast recovery
- 6** - Voltage rating (06 = 600 V)
- 7** - Environmental digit:
PbF = lead (Pb)-free and RoHS-compliant
-N3 = halogen-free, RoHS-compliant and totally lead (Pb)-free

| ORDERING INFORMATION (Example) | | | |
|--------------------------------|------------------|------------------------|-------------------------|
| PREFERRED P/N | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-30EPH06PbF | 25 | 500 | Antistatic plastic tube |
| VS-30EPH06-N3 | 25 | 500 | Antistatic plastic tube |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?95541 |
| Part marking information | TO-247AC modified PbF www.vishay.com/doc?95255 |
| | TO-247AC modified -N3 www.vishay.com/doc?95442 |



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