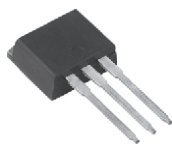
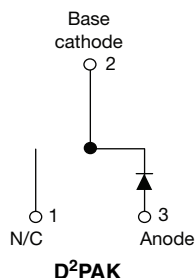


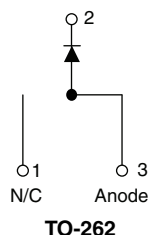
## Ultrafast Rectifier, 30 A FRED Pt®



VS-ETU3006SHM3



VS-ETU3006-1HM3



### FEATURES

- Low forward voltage drop
- Ultrafast recovery time
- 175 °C operating junction temperature
- 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](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

### DESCRIPTION/APPLICATIONS

Ultralow  $V_F$ , soft-switching ultrafast rectifiers optimized for Discontinuous (Critical) Mode (DCM) Power Factor Correction (PFC).

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

The device is also intended for use as a freewheeling diode in power supplies and other power switching applications.

### APPLICATIONS

AC/DC SMPS 70 W to 400 W

e.g. laptop and printer AC adaptors, desktop PC, TV and monitor, games units, and DVD AC/DC power supplies.

### PRODUCT SUMMARY

|                 |                                         |
|-----------------|-----------------------------------------|
| Package         | TO-263AB (D <sup>2</sup> PAK), TO-262AA |
| $I_{F(AV)}$     | 30 A                                    |
| $V_R$           | 600 V                                   |
| $V_F$ at $I_F$  | 2 V                                     |
| $t_{rr}$ (typ.) | 30 ns                                   |
| $T_J$ max.      | 175 °C                                  |
| Diode variation | Single die                              |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                   | SYMBOL         | TEST CONDITIONS       | MAX.       | UNITS |
|---------------------------------------------|----------------|-----------------------|------------|-------|
| Repetitive peak reverse voltage             | $V_{RRM}$      |                       | 600        | V     |
| Average rectified forward current           | $I_{F(AV)}$    | $T_C = 113\text{ °C}$ | 30         | A     |
| Non-repetitive peak surge current           | $I_{FSM}$      | $T_C = 25\text{ °C}$  | 200        |       |
| 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 | $V_{BR}, V_R$ | $I_R = 100\text{ }\mu\text{A}$               | 600  | -    | -    | V             |
| Forward voltage                     | $V_F$         | $I_F = 30\text{ A}$                          | -    | 1.4  | 2.0  |               |
|                                     |               | $I_F = 30\text{ A}, T_J = 150\text{ °C}$     | -    | 1.15 | 1.35 |               |
| Reverse leakage current             | $I_R$         | $V_R = V_R$ rated                            | -    | 0.02 | 30   | $\mu\text{A}$ |
|                                     |               | $T_J = 150\text{ °C}, V_R = V_R$ rated       | -    | 30   | 250  |               |
| Junction capacitance                | $C_T$         | $V_R = 600\text{ V}$                         | -    | 20   | -    | pF            |
| Series inductance                   | $L_S$         | Measured lead to lead 5 mm from package body | -    | 8.0  | -    | 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   | $t_{rr}$  | $I_F = 1\text{ A}$ , $dI_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ | -    | 30   | 45   | ns    |
|                         |           | $T_J = 25\text{ }^{\circ}\text{C}$                                             | -    | 45   | -    |       |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                            | -    | 100  | -    |       |
| Peak recovery current   | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                             | -    | 5.6  | -    | A     |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                            | -    | 10   | -    |       |
| Reverse recovery charge | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                             | -    | 127  | -    | nC    |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                            | -    | 580  | -    |       |

**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           | $R_{thJC}$        |                                            | -          | 0.95 | 1.4        | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, junction to ambient        | $R_{thJA}$        | Typical socket mount                       | -          | -    | 70         |                             |
| Thermal resistance, case to heatsink           | $R_{thCS}$        | Mounting surface, flat, smooth and greased | -          | 0.5  | -          |                             |
| Weight                                         |                   |                                            | -          | 2.0  | -          | g                           |
|                                                |                   |                                            | -          | 0.07 | -          | oz.                         |
| Mounting torque                                |                   |                                            | 6<br>(5)   | -    | 12<br>(10) | kgf · cm<br>(lbf · in)      |
| Marking device                                 |                   | Case style D <sup>2</sup> PAK modified     | ETU3006SH  |      |            |                             |
|                                                |                   | Case style TO-262                          | ETU3006-1H |      |            |                             |

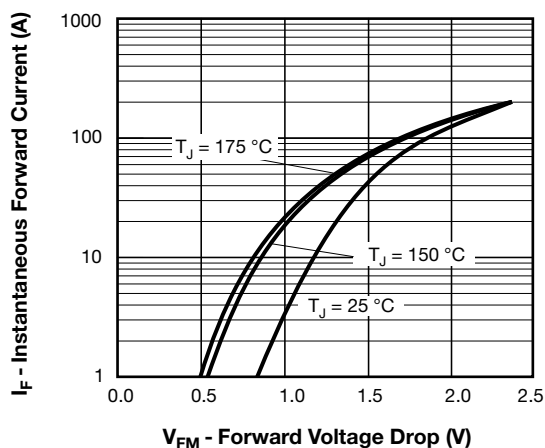


Fig. 1 - Typical Forward Voltage Drop Characteristics

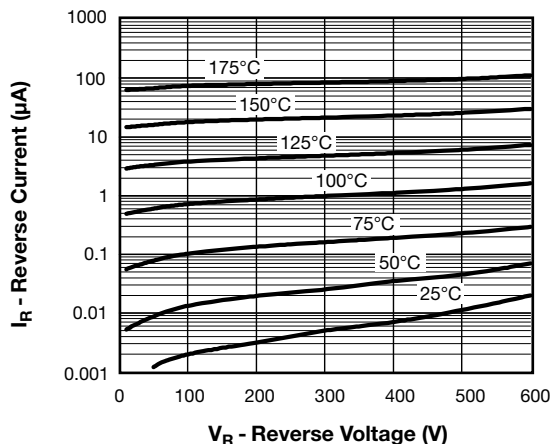


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

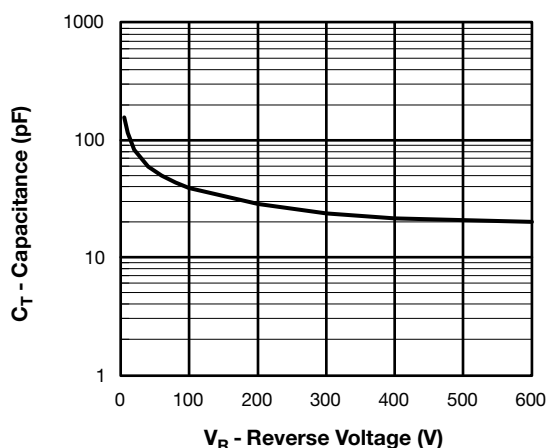


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

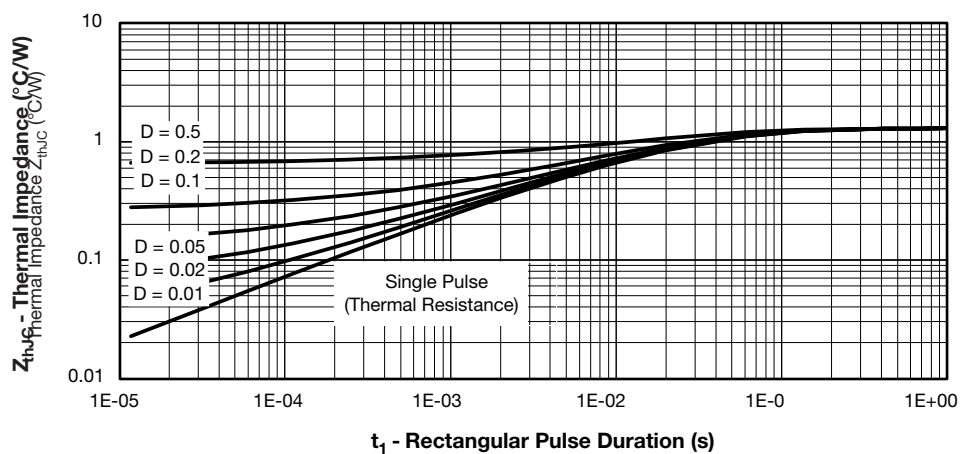


Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics

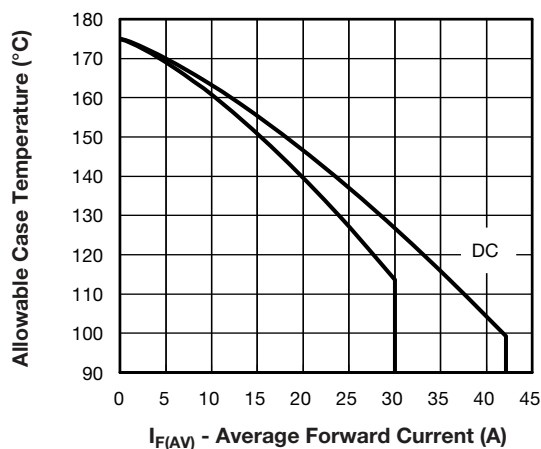


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

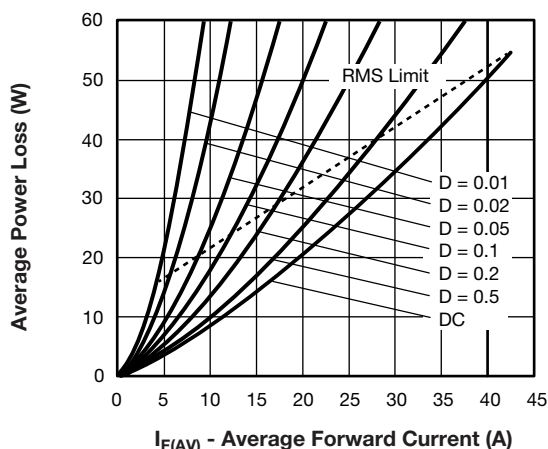


Fig. 6 - Forward Power Loss Characteristics

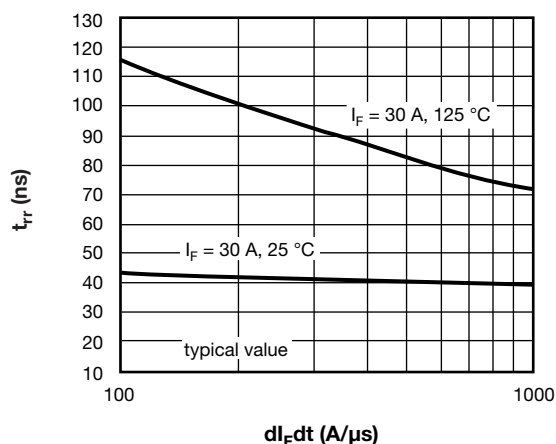
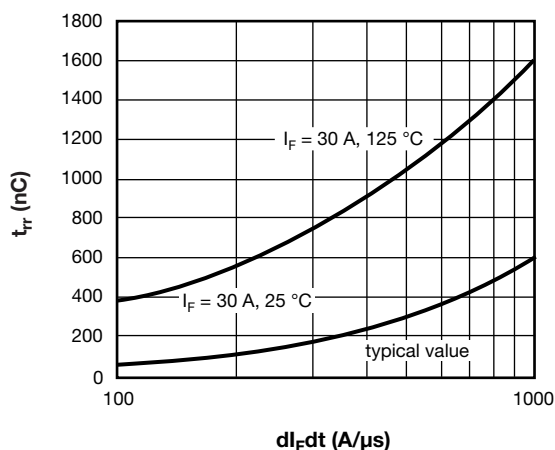
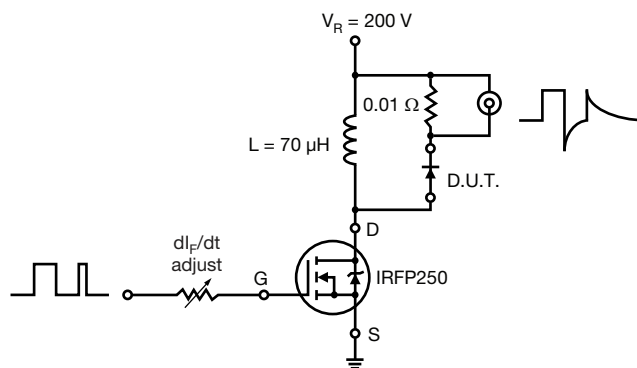

Fig. 7 - Typical Reverse Recovery vs.  $dI_F/dt$ 

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


Fig. 9 - Reverse Recovery Parameter Test Circuit

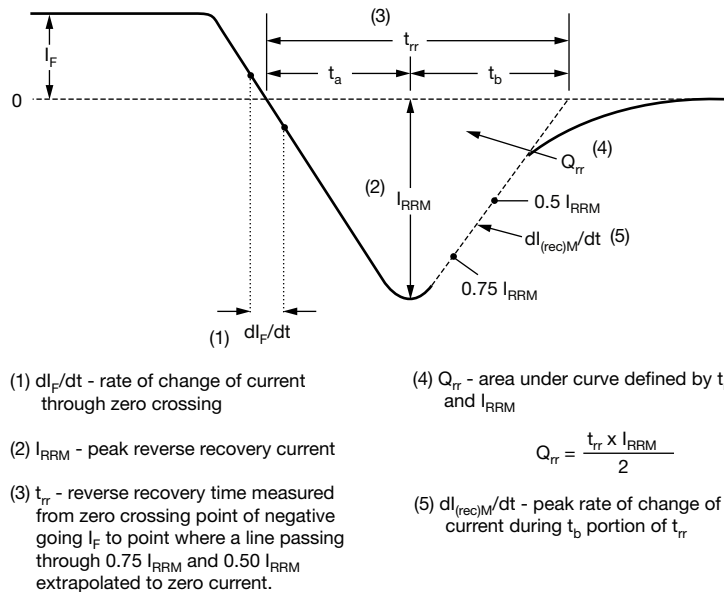


Fig. 10 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

|             |            |          |          |          |           |           |          |            |          |           |
|-------------|------------|----------|----------|----------|-----------|-----------|----------|------------|----------|-----------|
| Device code | <b>VS-</b> | <b>E</b> | <b>T</b> | <b>U</b> | <b>30</b> | <b>06</b> | <b>S</b> | <b>TRL</b> | <b>H</b> | <b>M3</b> |
|             | 1          | 2        | 3        | 4        | 5         | 6         | 7        | 8          | 9        | 10        |

- |           |   |                                                                                                                                                                  |
|-----------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b>  | - | Vishay Semiconductors product                                                                                                                                    |
| <b>2</b>  | - | Circuit configuration<br>E = Single diode                                                                                                                        |
| <b>3</b>  | - | T = TO-220                                                                                                                                                       |
| <b>4</b>  | - | U = Ultrafast recovery time                                                                                                                                      |
| <b>5</b>  | - | Current code (30 = 30 A)                                                                                                                                         |
| <b>6</b>  | - | Voltage code (06 = 600 V)                                                                                                                                        |
| <b>7</b>  | - | • S = D <sup>2</sup> PAK<br>• -1 = TO-262                                                                                                                        |
| <b>8</b>  | - | • None = Tube<br>• TRL = Tape and reel (left oriented, for D <sup>2</sup> PAK package)<br>• TRR = Tape and reel (right oriented, for D <sup>2</sup> PAK package) |
| <b>9</b>  | - | H = AEC-Q101 qualified                                                                                                                                           |
| <b>10</b> | - | Environmental digit:<br>-M3 = Halogen-free, RoHS compliant, and terminations lead (Pb)-free                                                                      |

**ORDERING INFORMATION** (Example)

| PREFERRED P/N     | QUANTITY PER TUBE | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
|-------------------|-------------------|------------------------|-------------------------|
| VS-ETU3006SHM3    | 50                | 1000                   | Antistatic plastic tube |
| VS-ETU3006-1HM3   | 50                | 1000                   | Antistatic plastic tube |
| VS-ETU3006STRRHM3 | 800               | 800                    | 13" diameter reel       |
| VS-ETU3006STRLHM3 | 800               | 800                    | 13" diameter reel       |

**LINKS TO RELATED DOCUMENTS**

|                          |                               |                                                                        |
|--------------------------|-------------------------------|------------------------------------------------------------------------|
| Dimensions               | TO-263AB (D <sup>2</sup> PAK) | <a href="http://www.vishay.com/doc?95046">www.vishay.com/doc?95046</a> |
|                          | TO-262AA                      | <a href="http://www.vishay.com/doc?95419">www.vishay.com/doc?95419</a> |
| Part marking information | TO-263AB (D <sup>2</sup> PAK) | <a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</a> |
|                          | TO-262AA                      | <a href="http://www.vishay.com/doc?95443">www.vishay.com/doc?95443</a> |
| Packaging information    | TO-263AB (D <sup>2</sup> PAK) | <a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a> |



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