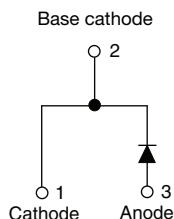
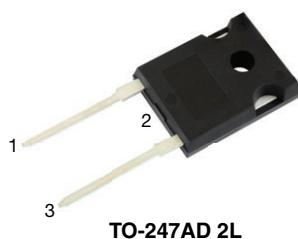


# Hyperfast Rectifier, 75 A FRED Pt® Gen 5



## FEATURES

- Hyperfast and optimized  $Q_{rr}$
- Best in class forward voltage drop and switching losses trade off
- Optimized for high speed operation
- 175 °C maximum operating junction temperature
- Polyimide passivation
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## LINKS TO ADDITIONAL RESOURCES



| PRIMARY CHARACTERISTICS  |             |
|--------------------------|-------------|
| $I_{F(AV)}$              | 75 A        |
| $V_R$                    | 1200 V      |
| $V_F$ at $I_F$ at 125 °C | 2.3 V       |
| $t_{rr}$                 | 32 ns       |
| $T_J$ max.               | 175 °C      |
| Package                  | TO-247AD 2L |
| Circuit configuration    | Single      |

## DESCRIPTION / APPLICATIONS

Featuring a unique combination of low conduction and switching losses, this rectifier is the right choice for high frequency converters, both soft switched / resonant. Specifically designed to improve efficiency of PFC and output rectification stages of EV / HEV battery charging stations, booster stage of solar inverters and UPS applications, these devices are perfectly matched to operate with MOSFETs or high speed IGBTs.

## MECHANICAL DATA

**Case:** TO-247AD 2L

Molding compound meets UL 94 V-0 flammability rating

**Terminals:** matte tin plated leads, solderable per J-STD-002

| ABSOLUTE MAXIMUM RATINGS                   |                   |                                                         |             |       |
|--------------------------------------------|-------------------|---------------------------------------------------------|-------------|-------|
| PARAMETER                                  | SYMBOL            | TEST CONDITIONS                                         | VALUES      | UNITS |
| Repetitive peak reverse voltage            | $V_{RRM}$         |                                                         | 1200        | V     |
| Average rectified forward current          | $I_{F(AV)}$       | $T_C = 90\text{ °C}$ , $D = 0.50$                       | 75          | A     |
| Non-repetitive peak surge current          | $I_{FSM}$         | $T_C = 45\text{ °C}$ , $t_p = 10\text{ ms}$ , sine wave | 395         |       |
| Repetitive peak forward current            | $I_{FRM}$         | $T_C = 90\text{ °C}$ , $D = 0.50$ , $f = 20\text{ kHz}$ | 150         |       |
| Operating junction and storage temperature | $T_J$ , $T_{Stg}$ |                                                         | -55 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                                          | $V_{BR}$ , $V_R$ | $I_R = 100\text{ }\mu\text{A}$              | 1200 | -    | -    | V             |
| Forward voltage                                                              | $V_F$            | $I_F = 75\text{ A}$                         | -    | 2.7  | 3.3  |               |
|                                                                              |                  | $I_F = 75\text{ A}$ , $T_J = 125\text{ °C}$ | -    | 2.3  | -    |               |
| Reverse leakage current                                                      | $I_R$            | $V_R = V_R$ rated                           | -    | -    | 50   | $\mu\text{A}$ |
|                                                                              |                  | $T_J = 125\text{ °C}$ , $V_R = V_R$ rated   | -    | -    | 500  |               |
| Junction capacitance                                                         | $C_T$            | $V_R = 200\text{ V}$                        | -    | 36   | -    | pF            |
| Series inductance                                                            | $L_S$            | Measured to lead 5 mm from package body     | -    | 8    | -    | 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                                                                             | $t_{rr}$  | $I_F = 1.0\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ | -    | 32   | -    | ns    |
|                                                                                                   |           | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 140  | -    |       |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 200  | -    |       |
| Peak recovery current                                                                             | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 18   | -    | A     |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 35   | -    |       |
| Reverse recovery charge                                                                           | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 1100 | -    | nC    |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 3550 | -    |       |
| Reverse recovery time                                                                             | $t_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 100  | -    | ns    |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 154  | -    |       |
| Peak recovery current                                                                             | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 31   | -    | A     |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 58   | -    |       |
| Reverse recovery charge                                                                           | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 1820 | -    | nC    |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 5300 | -    |       |

| THERMAL - MECHANICAL SPECIFICATIONS            |                   |                         |              |      |            |                             |
|------------------------------------------------|-------------------|-------------------------|--------------|------|------------|-----------------------------|
| PARAMETER                                      | SYMBOL            | TEST CONDITIONS         | MIN.         | TYP. | MAX.       | UNITS                       |
| Thermal resistance, junction-to-case           | $R_{thJC}$        |                         | -            | -    | 0.36       | $^{\circ}\text{C}/\text{W}$ |
| Weight                                         |                   |                         | -            | 5.5  | -          | g                           |
|                                                |                   |                         | -            | 0.2  | -          | oz.                         |
| Mounting torque                                |                   |                         | 6.0<br>(5.0) | -    | 12<br>(10) | kgf · cm<br>(lbf · in)      |
| Maximum junction and storage temperature range | $T_J$ , $T_{Stg}$ |                         | -55          | -    | 175        | $^{\circ}\text{C}$          |
| Marking device                                 |                   | Case style: TO-247AD 2L | E5PX7512L    |      |            |                             |

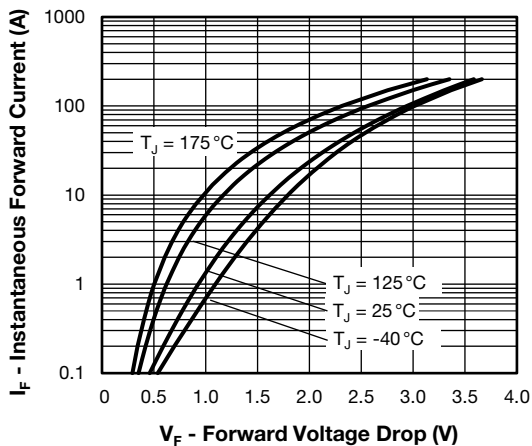


Fig. 1 - Forward Voltage Drop Characteristics

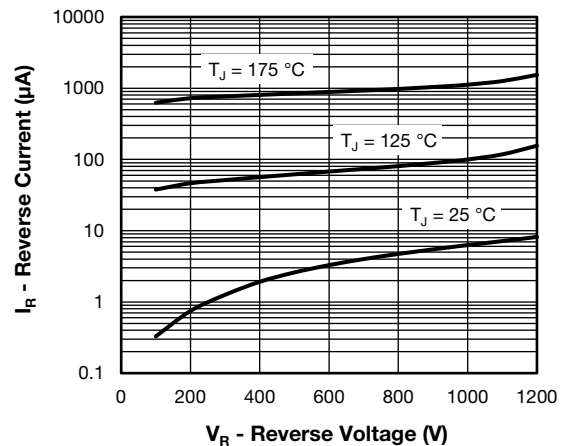


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

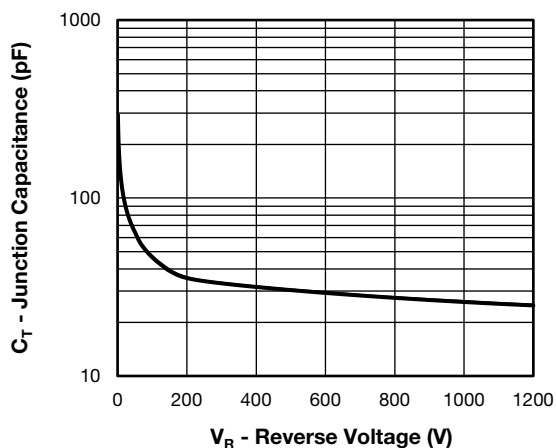


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

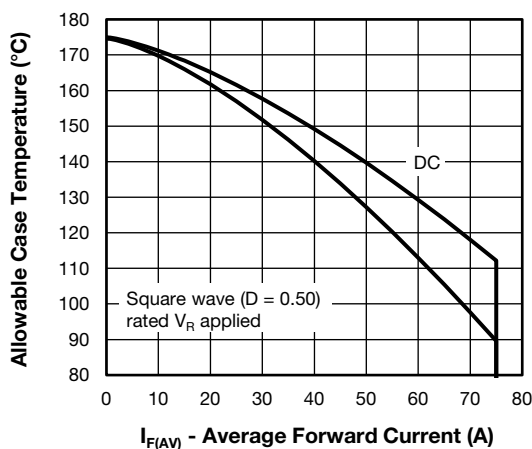


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

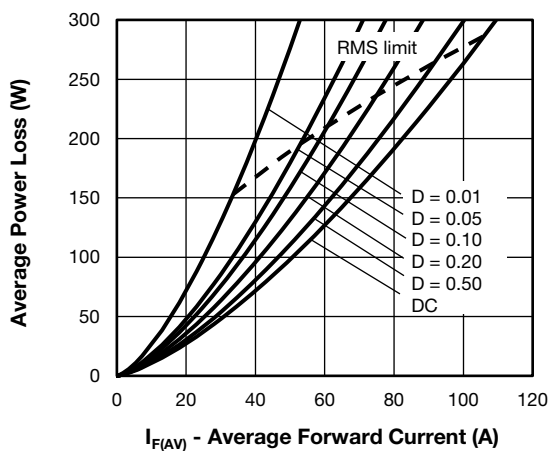


Fig. 5 - Forward Power Loss Characteristics

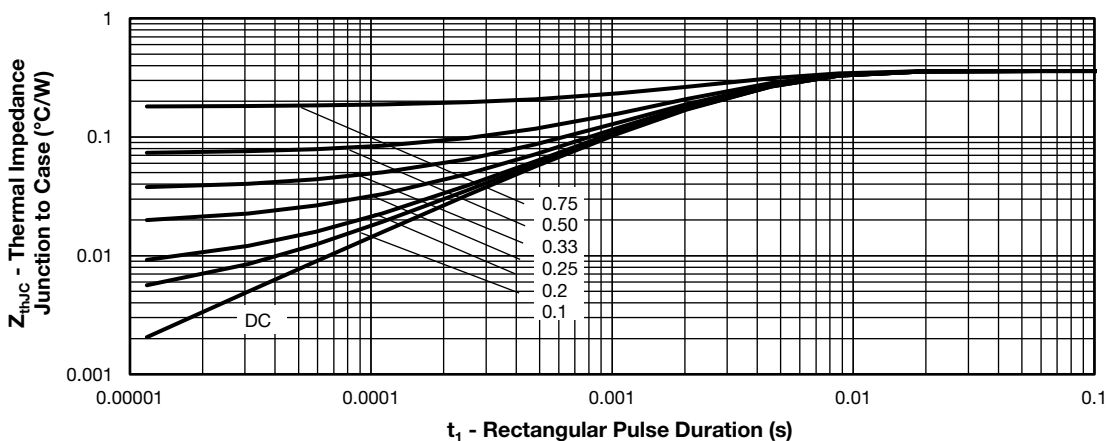
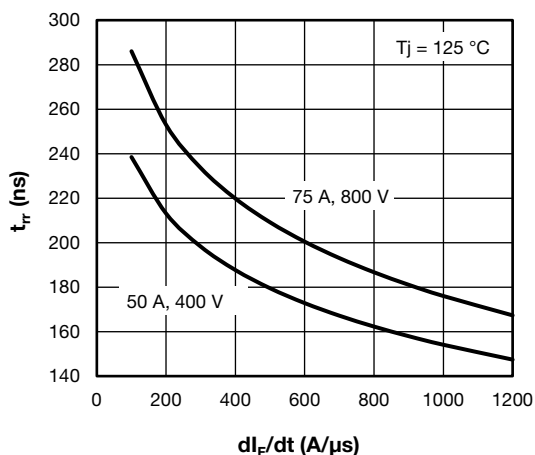
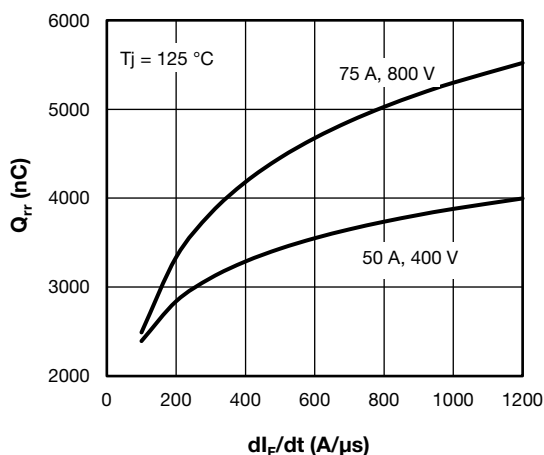
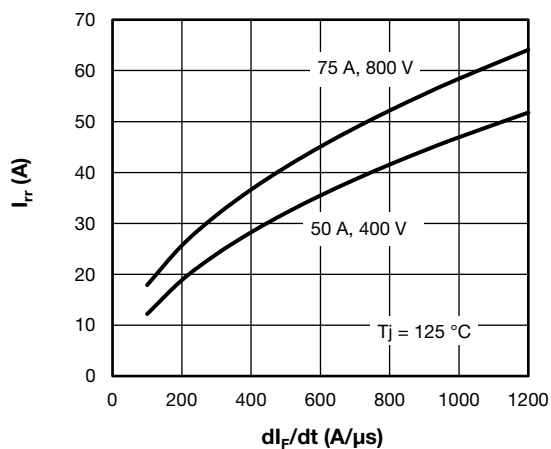


Fig. 6 - Transient Thermal Impedance, Junction to Case


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

Fig. 8 - Typical Reverse Recovery Charge vs.  $dI_F/dt$ 

Fig. 9 - Typical Reverse Recovery Current vs.  $dI_F/dt$

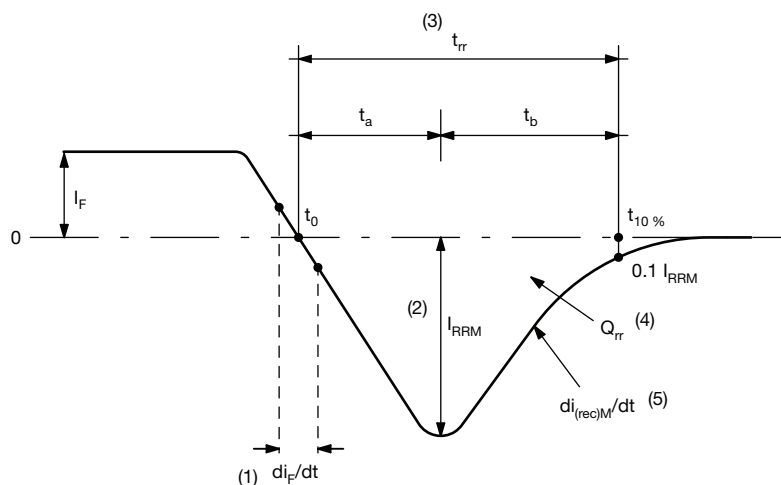


Fig. 10 - Reverse Recovery Waveform and Definitions

**Notes**

- (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  $t_0$ , crossing point of negative going  $I_F$ , to point  $t_{10\%}$ ,  $0.1 I_{RRM}$
- (4)  $Q_{rr}$  - area under curve defined by  $t_0$  and  $t_{10\%}$

$$Q_{rr} = \int_{t_0}^{t_{10\%}} I(t) dt$$

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

**ORDERING INFORMATION TABLE**

| Device code | VS-                                                                                   | E | 5 | P | X | 75 | 12 | L | N3 |
|-------------|---------------------------------------------------------------------------------------|---|---|---|---|----|----|---|----|
|             | 1                                                                                     | 2 | 3 | 4 | 5 | 6  | 7  | 8 | 9  |
| 1           | Vishay Semiconductors product                                                         |   |   |   |   |    |    |   |    |
| 2           | Circuit configuration:<br>E = single diode, 2 pins                                    |   |   |   |   |    |    |   |    |
| 3           | FRED Pt Gen 5                                                                         |   |   |   |   |    |    |   |    |
| 4           | P = TO-247 package                                                                    |   |   |   |   |    |    |   |    |
| 5           | Process type:<br>X = hyperfast recovery                                               |   |   |   |   |    |    |   |    |
| 6           | Current rating (75 = 75 A)                                                            |   |   |   |   |    |    |   |    |
| 7           | Voltage rating (12 = 1200 V)                                                          |   |   |   |   |    |    |   |    |
| 8           | L = long lead                                                                         |   |   |   |   |    |    |   |    |
| 9           | Environmental digit:<br>N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free |   |   |   |   |    |    |   |    |

**ORDERING INFORMATION (Example)**

| PREFERRED P/N   | QUANTITY PER TUBE | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
|-----------------|-------------------|------------------------|-------------------------|
| VS-E5PX7512L-N3 | 25                | 500                    | Antistatic plastic tube |

**LINKS TO RELATED DOCUMENTS**

|                          |                                                                        |
|--------------------------|------------------------------------------------------------------------|
| Dimensions               | <a href="http://www.vishay.com/doc?95536">www.vishay.com/doc?95536</a> |
| Part marking information | <a href="http://www.vishay.com/doc?95648">www.vishay.com/doc?95648</a> |



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