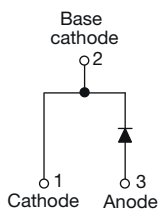


# Ultrafast Rectifier, 15 A FRED Pt®



TO-220AC 2L



## FEATURES

- Ultrafast and soft recovery time
- Optimized forward voltage drop
- 175 °C maximum operating junction temperature
- Polyimide passivation
- Rugged design
- Good thermal performance
- Meets JESD 201 class 1A whisker test
- 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

Ultrafast recovery rectifiers designed with optimized performance of forward voltage drop, recovery time, and soft recovery.

Polyimide passivated, planar structure, and the platinum doped life time control guarantee, ruggedness, reliability characteristics, and solid value position for efficiency and thermal performance.

These devices are intended for use in boost stage in the AC/DC section of SMPS, high frequency output rectification of battery charger, inverters of solar inverters, or as freewheeling diodes in motor drive.

## PRIMARY CHARACTERISTICS

|                          |             |
|--------------------------|-------------|
| $I_{F(AV)}$              | 15 A        |
| $V_R$                    | 1200 V      |
| $V_F$ at $I_F$ at 125 °C | 2.25 V      |
| $t_{rr}$                 | 44 ns       |
| $T_J$ max.               | 175 °C      |
| Package                  | TO-220AC 2L |
| Circuit configuration    | Single      |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                  | SYMBOL            | TEST CONDITIONS                                         | VALUES      | UNITS |
|--------------------------------------------|-------------------|---------------------------------------------------------|-------------|-------|
| Repetitive peak reverse voltage            | $V_{RRM}$         |                                                         | 1200        | V     |
| Average rectified forward current          | $I_{F(AV)}$       | $T_C = 115\text{ °C}$ , $D = 0.50$                      | 15          | A     |
| Non-repetitive peak surge current          | $I_{FSM}$         | $T_C = 25\text{ °C}$ , $t_p = 10\text{ ms}$ , sine wave | 150         |       |
| Repetitive peak forward current            | $I_{FRM}$         |                                                         | 30          |       |
| 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 | $V_{BR}$ , $V_R$ | $I_R = 250\text{ }\mu\text{A}$               | 1200 | -    | -    | V             |
| Forward voltage                     | $V_F$            | $I_F = 15\text{ A}$                          | -    | 2.3  | 2.78 |               |
|                                     |                  | $I_F = 15\text{ A}$ , $T_J = 125\text{ °C}$  | -    | 2.25 | 2.7  |               |
| Reverse leakage current             | $I_R$            | $V_R = V_R$ rated                            | -    | -    | 80   | $\mu\text{A}$ |
|                                     |                  | $T_J = 125\text{ °C}$ , $V_R = V_R$ rated    | -    | -    | 150  |               |
| Junction capacitance                | $C_T$            | $V_R = 200\text{ V}$                         | -    | 13   | -    | 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   | $t_{rr}$  | $I_F = 1.0\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ | -    | 44   | -    | ns    |
|                         |           | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 167  | -    |       |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 248  | -    |       |
| Peak recovery current   | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 6    | -    | A     |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 9    | -    |       |
|                         |           | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 507  | -    |       |
| Reverse recovery charge | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 1110 | -    | nC    |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 1110 | -    |       |

**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                                      | SYMBOL         | TEST CONDITIONS                             | MIN.         | TYP. | MAX.       | UNITS                       |
|------------------------------------------------|----------------|---------------------------------------------|--------------|------|------------|-----------------------------|
| Thermal resistance, junction to case           | $R_{thJC}$     |                                             | -            | 1.1  | 1.3        | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, junction to ambient        | $R_{thJA}$     | Typical socket mount                        | -            | 54   | 60         |                             |
| Thermal resistance, case to heat sink          | $R_{thCS}$     | Mounting surface, flat, smooth, and greased | -            | 0.2  | 0.4        |                             |
| Weight                                         |                |                                             | -            | 2    | -          | g                           |
| Mounting torque                                |                |                                             | 6.0<br>(5.0) | -    | 12<br>(10) | kgf · cm<br>(lbf · in)      |
| Marking device                                 |                | Case style: TO-220AC 2L                     | 15ETU12      |      |            |                             |
| Maximum junction and storage temperature range | $T_J, T_{Stg}$ |                                             | -55          | -    | 175        | $^{\circ}\text{C}$          |

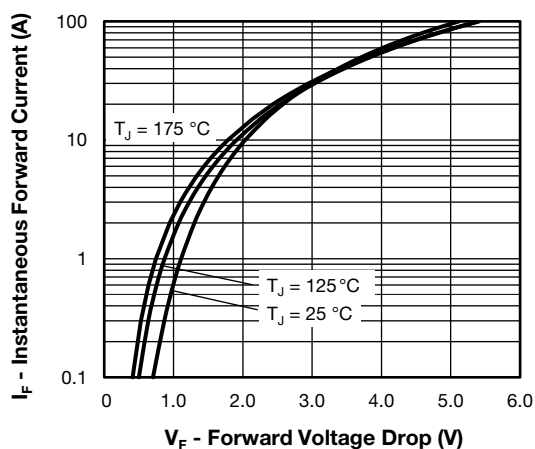


Fig. 1 - Typical Forward Voltage Drop Characteristics

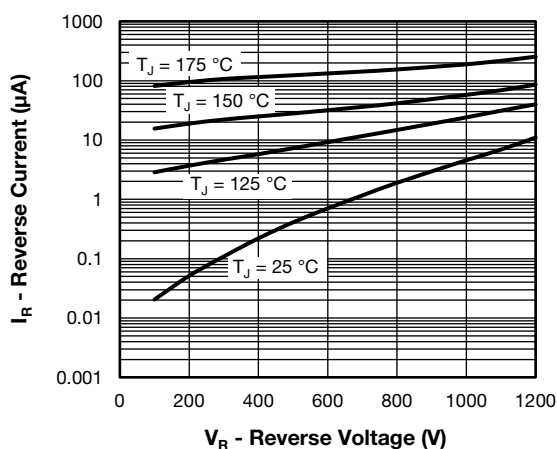


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

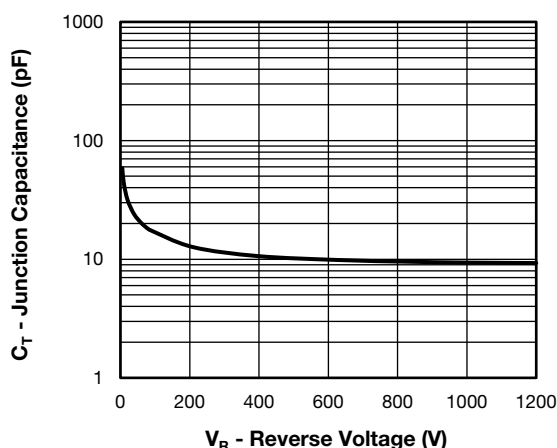


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

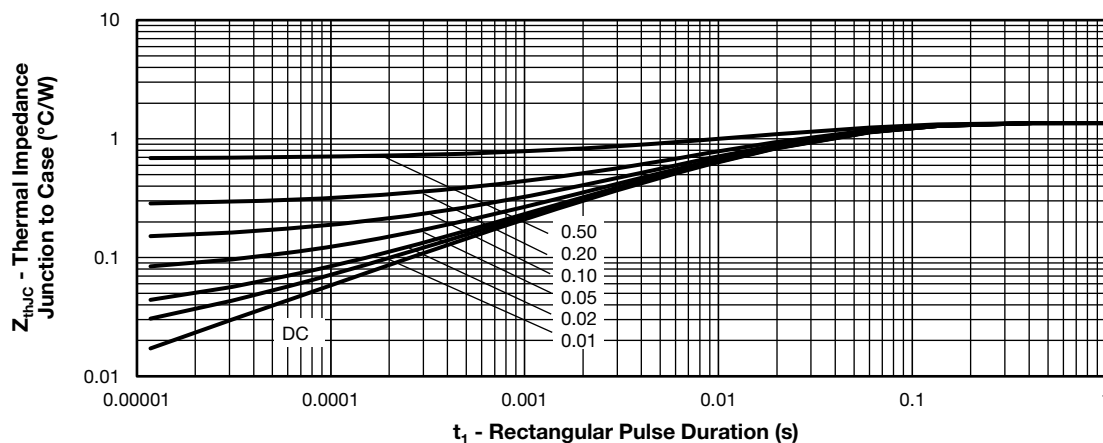


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

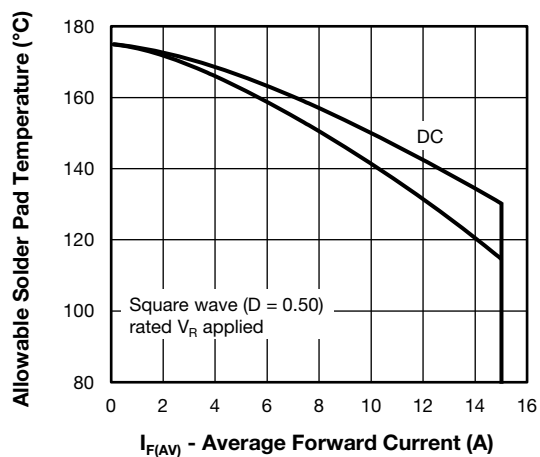


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

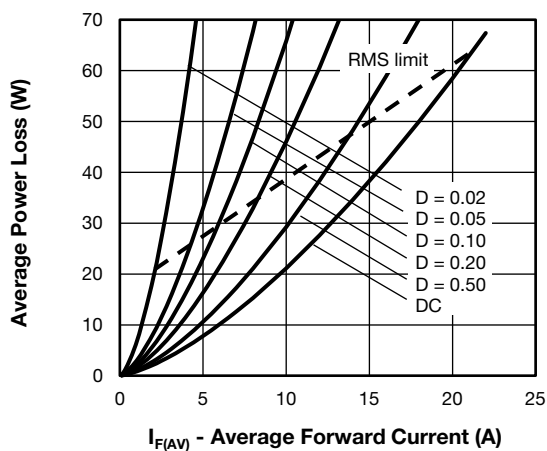


Fig. 6 - Forward Power Loss Characteristics

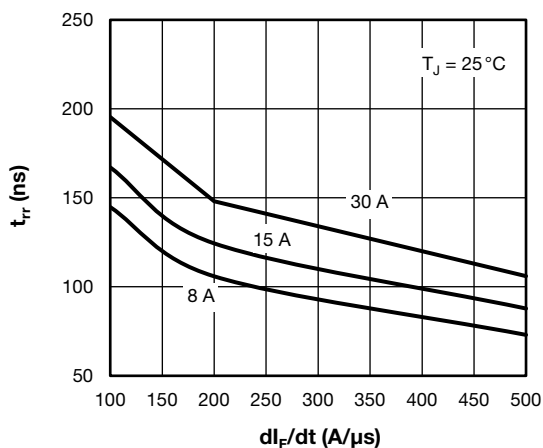


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

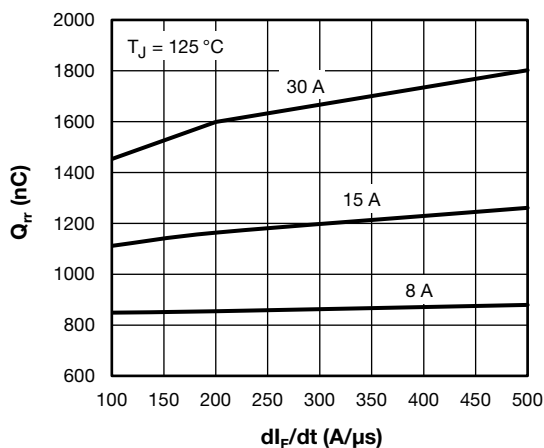


Fig. 10 - Typical Stored Charge vs.  $dI_F/dt$

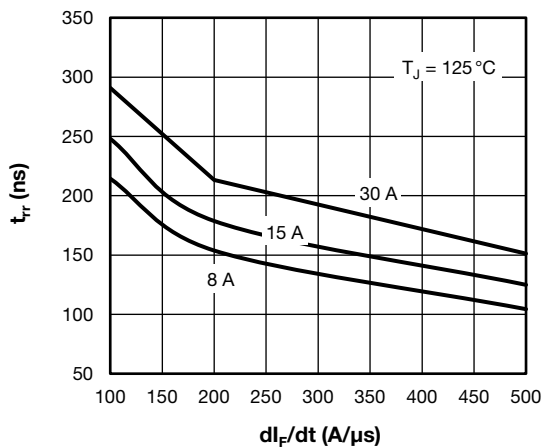


Fig. 8 - Typical Reverse Recovery Time vs.  $dI_F/dt$

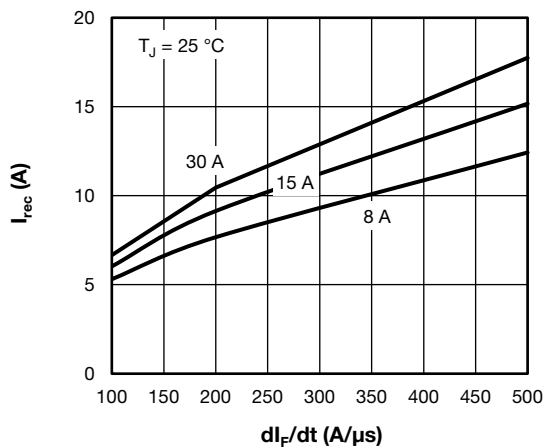


Fig. 11 - Typical Reverse Current vs.  $dI_F/dt$

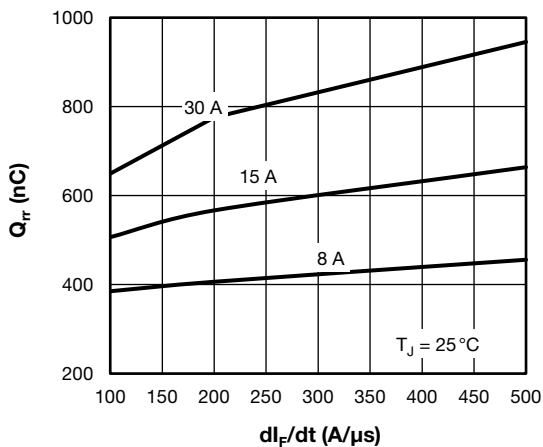


Fig. 9 - Typical Stored Charge vs.  $dI_F/dt$

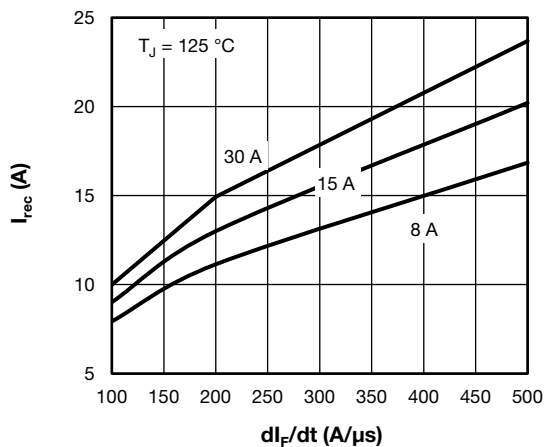


Fig. 12 - Typical Reverse Current vs.  $dI_F/dt$

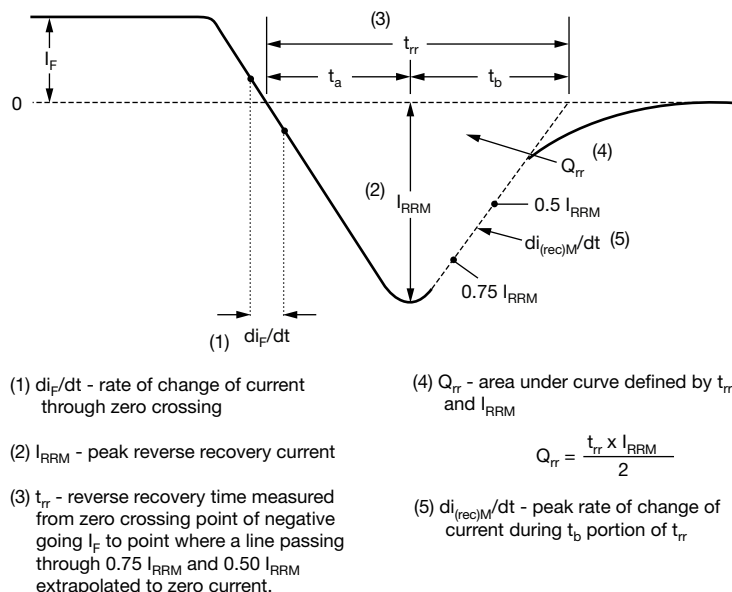


Fig. 13 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

| Device code | VS- | 15 | E | T | U | 12 | -M3 |
|-------------|-----|----|---|---|---|----|-----|
|             | 1   | 2  | 3 | 4 | 5 | 6  | 7   |

- 1** - Vishay Semiconductors product
- 2** - Current rating (15 = 15 A)
- 3** - E = single
- 4** - Package:  
T = TO-220AC 2L
- 5** - U = ultrafast recovery
- 6** - Voltage rating (12 = 1200 V)
- 7** - Environmental digit:  
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

| ORDERING INFORMATION (Example) |               |                          |
|--------------------------------|---------------|--------------------------|
| PREFERRED P/N                  | BASE QUANTITY | PACKAGING DESCRIPTION    |
| VS-15ETU12-M3                  | 50            | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?96156">www.vishay.com/doc?96156</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95391">www.vishay.com/doc?95391</a> |





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