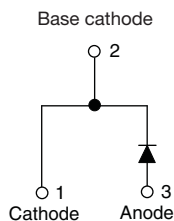
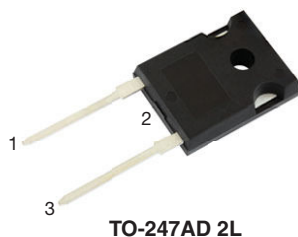


# Ultrafast Rectifier, 30 A FRED Pt®



## FEATURES

- Ultrafast and soft recovery
- Optimized forward voltage drop
- 175 °C maximum operating junction temperature
- Polyimide passivation
- Rugged design
- Good thermal performance
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

## PRIMARY CHARACTERISTICS

|                          |             |
|--------------------------|-------------|
| $I_{F(AV)}$              | 30 A        |
| $V_R$                    | 1200 V      |
| $V_F$ at $I_F$ at 125 °C | 2.05 V      |
| $t_{rr}$                 | 49 ns       |
| $T_J$ max.               | 175 °C      |
| Package                  | TO-247AD 2L |
| Circuit configuration    | Single      |

## 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 proposition 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 for solar inverters, or as freewheeling diodes in motor drive.

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                  | SYMBOL            | TEST CONDITIONS                                         | VALUES      | UNITS |
|--------------------------------------------|-------------------|---------------------------------------------------------|-------------|-------|
| Repetitive peak reverse voltage            | $V_{RRM}$         |                                                         | 1200        | V     |
| Average rectified forward current          | $I_{F(AV)}$       | $T_C = 135\text{ °C}$ , $D = 0.50$                      | 30          | A     |
| Non-repetitive peak surge current          | $I_{FSM}$         | $T_C = 25\text{ °C}$ , $t_p = 10\text{ ms}$ , sine wave | 300         |       |
| Repetitive peak forward current            | $I_{FRM}$         |                                                         | 60          |       |
| 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 | $V_{BR}$ , $V_R$ | $I_R = 500\text{ }\mu\text{A}$              | 1200 | -    | -    | V             |
| Forward voltage                     | $V_F$            | $I_F = 30\text{ A}$                         | -    | 2.15 | 2.68 |               |
|                                     |                  | $I_F = 30\text{ A}$ , $T_J = 125\text{ °C}$ | -    | 2.05 | 2.45 |               |
| Reverse leakage current             | $I_R$            | $V_R = V_R$ rated                           | -    | -    | 145  | $\mu\text{A}$ |
|                                     |                  | $T_J = 125\text{ °C}$ , $V_R = V_R$ rated   | -    | -    | 320  |               |
| Junction capacitance                | $C_T$            | $V_R = 200\text{ V}$                        | -    | 29   | -    | 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                                                                             | $t_{rr}$  | $I_F = 1.0\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ | -    | 49   | -    | ns    |
|                                                                                                   |           | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 220  | -    |       |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 356  | -    |       |
| Peak recovery current                                                                             | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 8.2  | -    | A     |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 13.3 | -    |       |
| Reverse recovery charge                                                                           | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 900  | -    | nC    |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 2388 | -    |       |

| THERMAL - MECHANICAL SPECIFICATIONS            |                   |                                             |              |      |            |                             |
|------------------------------------------------|-------------------|---------------------------------------------|--------------|------|------------|-----------------------------|
| PARAMETER                                      | SYMBOL            | TEST CONDITIONS                             | MIN.         | TYP. | MAX.       | UNITS                       |
| Thermal resistance, junction to case           | $R_{thJC}$        |                                             | -            | 0.35 | 0.42       | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, junction to ambient        | $R_{thJA}$        | Typical socket mount                        | -            | 30   | 33         |                             |
| Thermal resistance, case to heat sink          | $R_{thCS}$        | Mounting surface, flat, smooth, and greased | -            | 0.25 | 0.4        |                             |
| Weight                                         |                   |                                             | -            | 0.2  | -          | g                           |
|                                                |                   |                                             | -            | 0.07 | -          | 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                     | 30EPU12L     |      |            |                             |

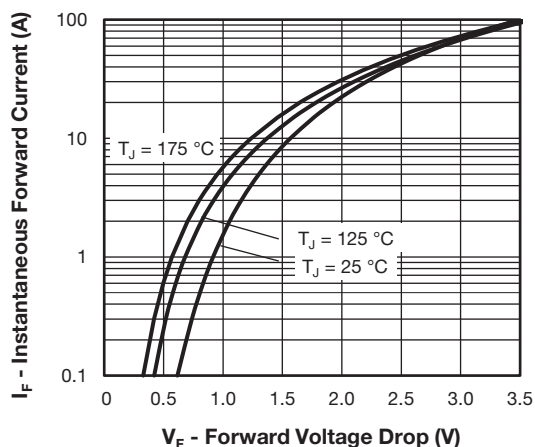


Fig. 1 - Typical Forward Voltage Drop Characteristics

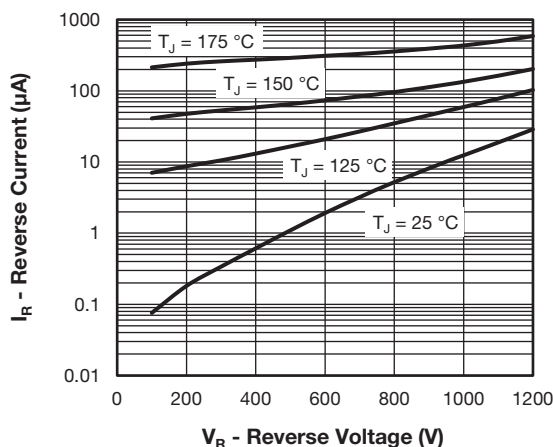


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

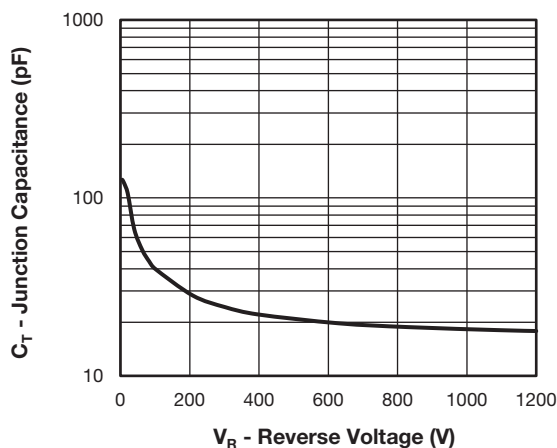


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

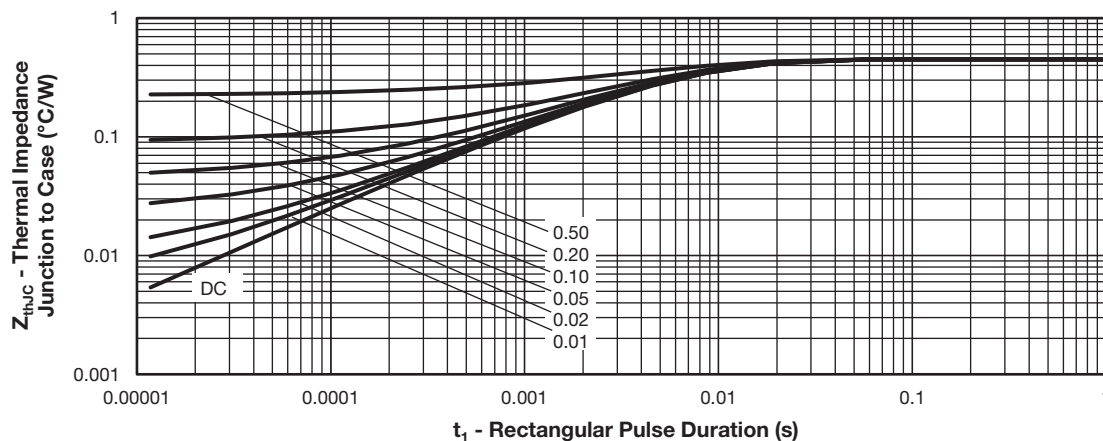


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

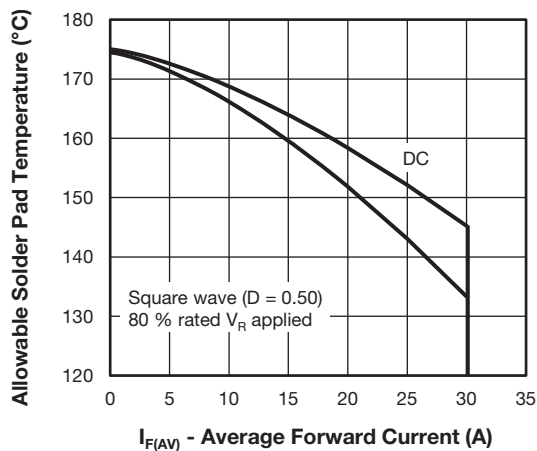


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

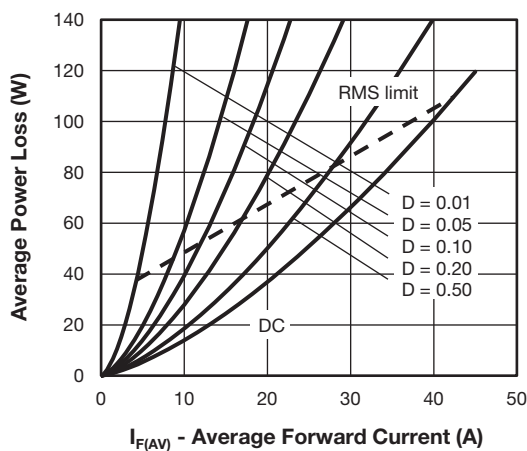
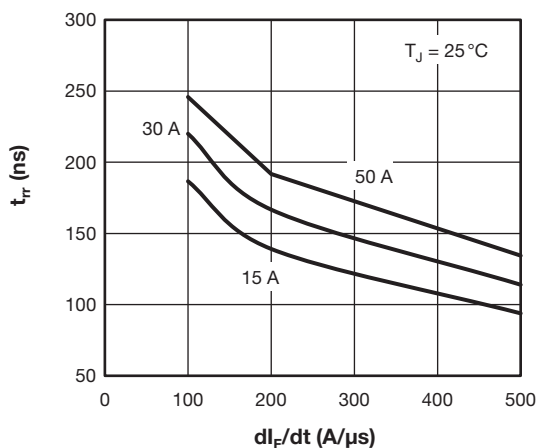
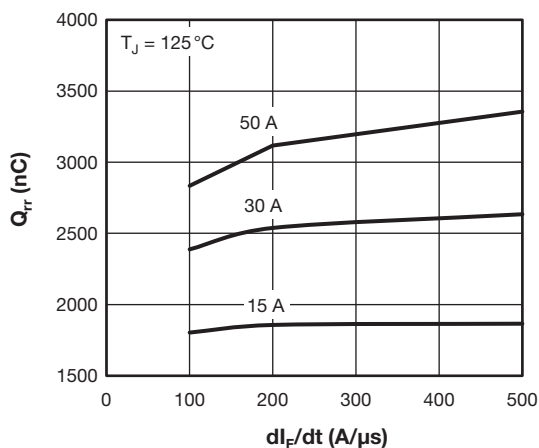
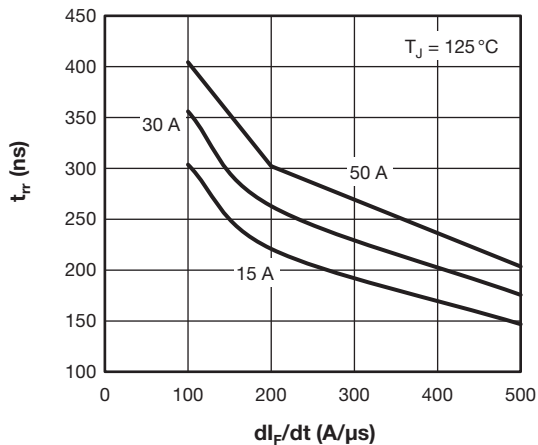
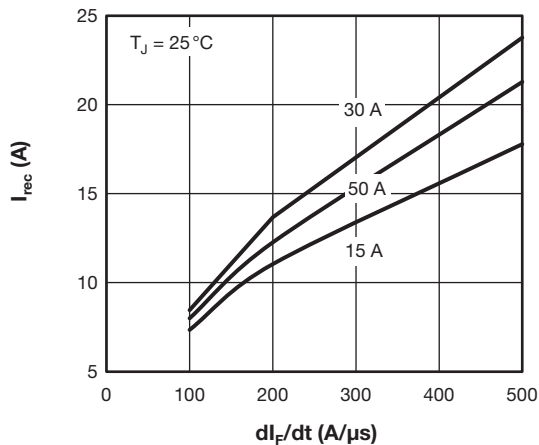
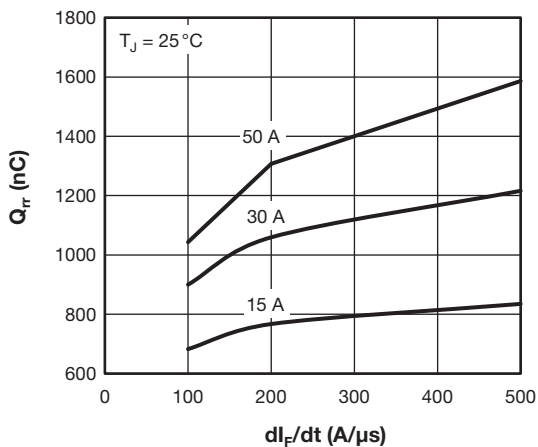
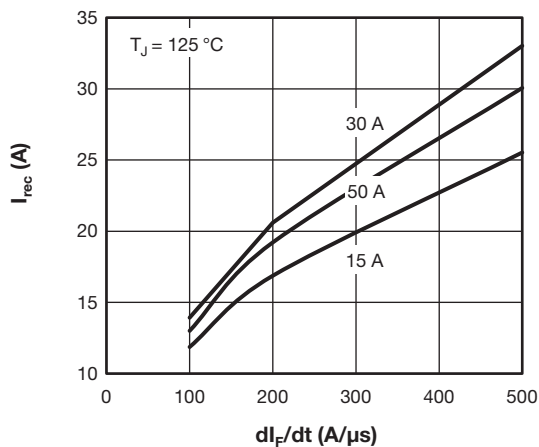


Fig. 6 - Forward Power Loss Characteristics


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.  $dI_F/dt$

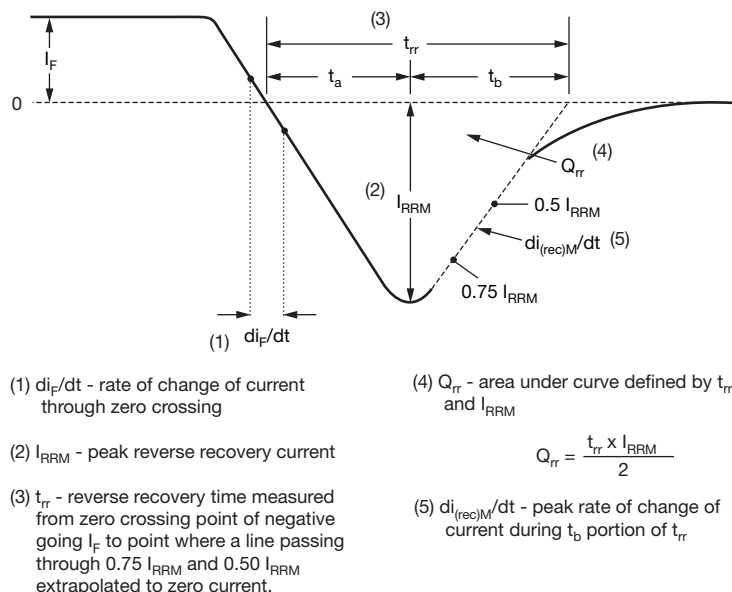


Fig. 13 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

| Device code | VS- | 30 | E | P | U | 12 | L | -N3 |
|-------------|-----|----|---|---|---|----|---|-----|
|             | 1   | 2  | 3 | 4 | 5 | 6  | 7 | 8   |

- 1** - Vishay Semiconductors product
- 2** - Current rating (30 = 30 A)
- 3** - Circuit configuration: E = single diode
- 4** - P = TO-247 package
- 5** - Process type:  
U = ultrafast recovery
- 6** - Voltage rating (12 = 1200 V)
- 7** - L = long leads
- 8** - Environmental digit:  
-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-30EPU12L-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> |



### TO-247AD 2L

**DIMENSIONS** in millimeters and inches



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.65        | 5.31  | 0.183  | 0.209 |       |
| A1     | 2.21        | 2.59  | 0.087  | 0.102 |       |
| A2     | 1.50        | 2.49  | 0.059  | 0.098 |       |
| b      | 0.99        | 1.40  | 0.039  | 0.055 |       |
| b1     | 0.99        | 1.35  | 0.039  | 0.053 |       |
| b2     | 1.65        | 2.39  | 0.065  | 0.094 |       |
| b3     | 1.65        | 2.34  | 0.065  | 0.092 |       |
| c      | 0.38        | 0.89  | 0.015  | 0.035 |       |
| c1     | 0.38        | 0.84  | 0.015  | 0.033 |       |
| D      | 19.71       | 20.70 | 0.776  | 0.815 | 3     |
| D1     | 13.08       | -     | 0.515  | -     | 4     |
| D2     | 0.51        | 1.35  | 0.020  | 0.053 |       |

| SYMBOL           | MILLIMETERS |       | INCHES    |       | NOTES |
|------------------|-------------|-------|-----------|-------|-------|
|                  | MIN.        | MAX.  | MIN.      | MAX.  |       |
| E                | 15.29       | 15.87 | 0.602     | 0.625 | 3     |
| E1               | 13.46       | -     | 0.53      | -     |       |
| e                | 5.46 BSC    |       | 0.215 BSC |       |       |
| $\varnothing K$  | 0.254       |       | 0.010     |       |       |
| L                | 19.81       | 20.32 | 0.780     | 0.800 |       |
| L1               | 3.71        | 4.29  | 0.146     | 0.169 |       |
| $\varnothing P$  | 3.56        | 3.66  | 0.14      | 0.144 |       |
| $\varnothing P1$ | -           | 6.98  | -         | 0.275 |       |
| Q                | 5.31        | 5.69  | 0.209     | 0.224 |       |
| R                | 4.52        | 5.49  | 0.178     | 0.216 |       |
| S                | 5.51 BSC    |       | 0.217 BSC |       |       |

#### Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Contour of slot optional
- Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- Thermal pad contour optional with dimensions D1 and E1
- Lead finish uncontrolled in L1
- $\varnothing P$  to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4



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