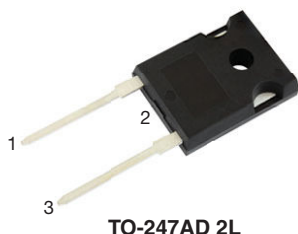
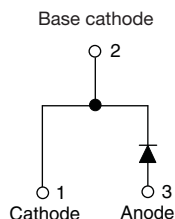


## Ultrafast Soft Recovery Diode, 30 A FRED Pt® Gen 4



TO-247AD 2L



### FEATURES

- Gen 4 FRED Pt® technology
- Low  $I_{RRM}$  and reverse recovery charge
- Very low forward voltage drop
- Polyimide passivated chip for high reliability standard
- 175 °C operating junction temperature
- 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               |
| $V_R$                 | 600 V              |
| $V_F$ at $I_F$        | 1.19 V             |
| $t_{rr}$ typ.         | see Recovery table |
| $T_J$ max.            | 175 °C             |
| Package               | TO-247AD 2L        |
| Circuit configuration | Single             |

### DESCRIPTION

Gen 4 Fred technology, state of the art, ultralow  $V_F$ , soft switching optimized for Discontinuous (Critical) Mode (DCM) and IGBT F/W diode.

The minimized conduction loss, 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                              | MAX.        | UNITS |
|--------------------------------------------|----------------|----------------------------------------------|-------------|-------|
| Peak repetitive reverse voltage            | $V_{RRM}$      |                                              | 600         | V     |
| Average rectified forward current          | $I_{F(AV)}$    | $T_C = 131$ °C                               | 30          | A     |
| Non-repetitive peak surge current          | $I_{FSM}$      | $T_C = 25$ °C, $t_p = 8.3$ ms half sine wave | 240         |       |
| Operating junction and storage temperature | $T_J, T_{Stg}$ |                                              | -55 to +175 | °C    |

### ELECTRICAL SPECIFICATIONS ( $T_J = 25$ °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                     | $V_F$         | $I_F = 30$ A                      | -    | 1.36 | 1.6  |         |
|                                     |               | $I_F = 60$ A                      | -    | 1.6  | -    |         |
|                                     |               | $I_F = 30$ A, $T_J = 125$ °C      | -    | 1.23 | -    |         |
|                                     |               | $I_F = 60$ A, $T_J = 125$ °C      | -    | 1.5  | -    |         |
|                                     |               | $I_F = 30$ A, $T_J = 150$ °C      | -    | 1.19 | 1.35 |         |
|                                     |               | $I_F = 60$ A, $T_J = 150$ °C      | -    | 1.48 | -    |         |
| Reverse leakage current             | $I_R$         | $V_R = V_R$ rated                 | -    | -    | 50   | $\mu$ A |
|                                     |               | $T_J = 125$ °C, $V_R = V_R$ rated | -    | -    | 500  |         |
| Junction capacitance                | $C_T$         | $V_R = 600$ V                     | -    | 18.3 | -    | pF      |



| DYNAMIC RECOVERY CHARACTERISTICS ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified) |           |                                     |                                                                                      |      |      |            |
|---------------------------------------------------------------------------------------------------|-----------|-------------------------------------|--------------------------------------------------------------------------------------|------|------|------------|
| PARAMETER                                                                                         | SYMBOL    | TEST CONDITIONS                     |                                                                                      | MIN. | TYP. | MAX. UNITS |
| Reverse recovery time                                                                             | $t_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$  | $I_F = 30\text{ A}$<br>$dI_F/dt = 1000\text{ A}/\mu\text{s}$<br>$V_R = 400\text{ V}$ | -    | 65   | - ns       |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$ |                                                                                      | -    | 90   | -          |
| Peak recovery current                                                                             | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$  |                                                                                      | -    | 18   | - A        |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$ |                                                                                      | -    | 32   | -          |
| Reverse recovery charge                                                                           | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$  |                                                                                      | -    | 850  | - nC       |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$ |                                                                                      | -    | 1850 | -          |

| THERMAL - MECHANICAL SPECIFICATIONS     |            |                        |            |      |            |                             |
|-----------------------------------------|------------|------------------------|------------|------|------------|-----------------------------|
| PARAMETER                               | SYMBOL     | TEST CONDITIONS        | MIN.       | TYP. | MAX.       | UNITS                       |
| Thermal resistance, junction to case    | $R_{thJC}$ |                        | -          | -    | 0.9        | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, junction to ambient | $R_{thJA}$ | Typical socket mount   | -          | -    | 40         |                             |
| Thermal resistance, case to heatsink    | $R_{thCS}$ |                        | -          | 0.4  | -          |                             |
| Weight                                  |            |                        | -          | 6.0  | -          | g                           |
|                                         |            |                        | -          | 0.21 | -          | oz.                         |
| Mounting torque                         |            |                        | 6.0<br>(5) | -    | 12<br>(10) | kgf · cm<br>(lbf · in)      |
| Marking device                          |            | Case style TO-247AD 2L | E4PU3006L  |      |            |                             |

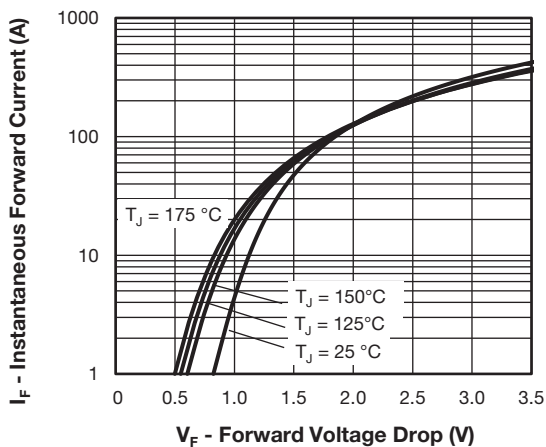


Fig. 1 - Typical Forward Voltage Drop Characteristics

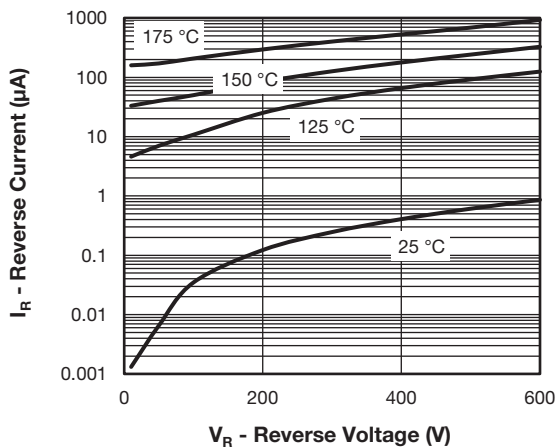


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

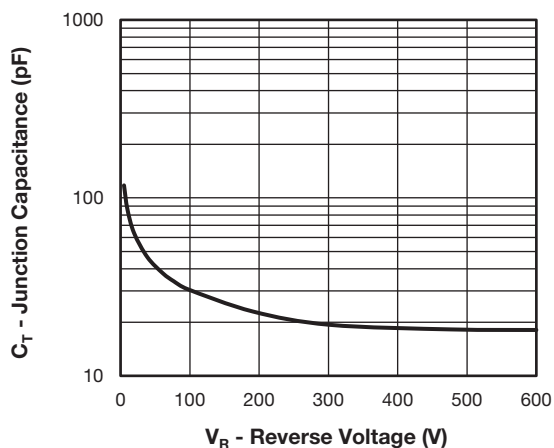


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

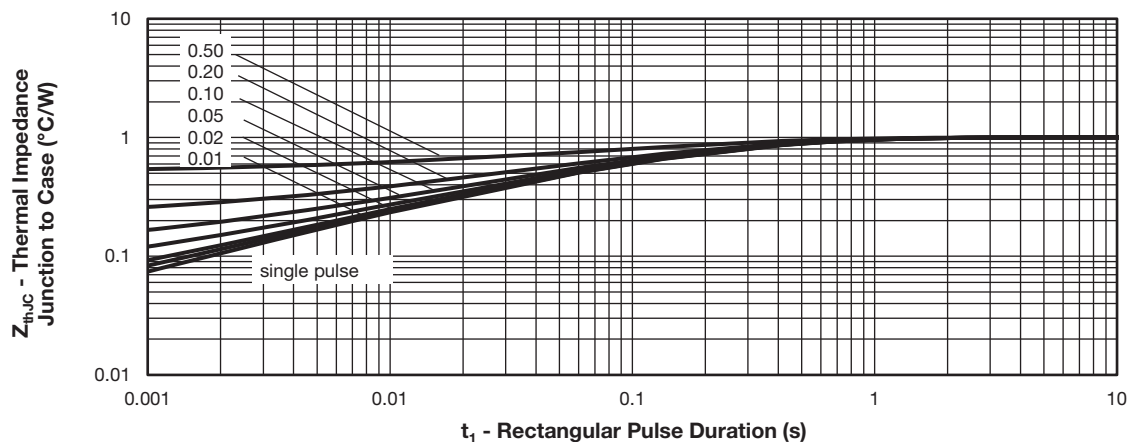
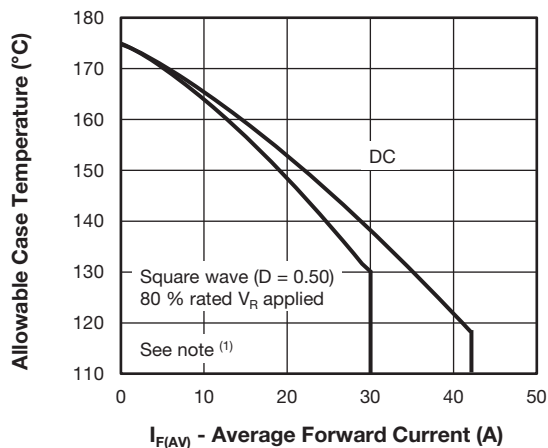

Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics


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

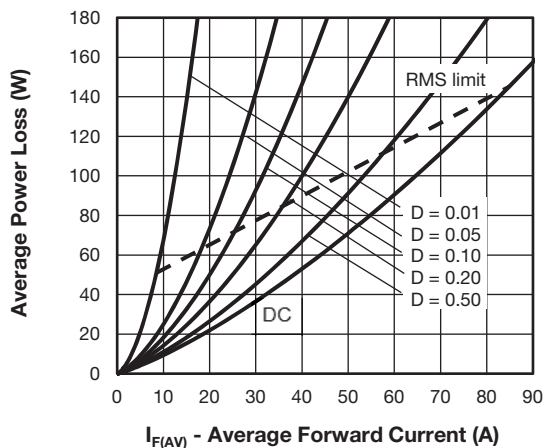
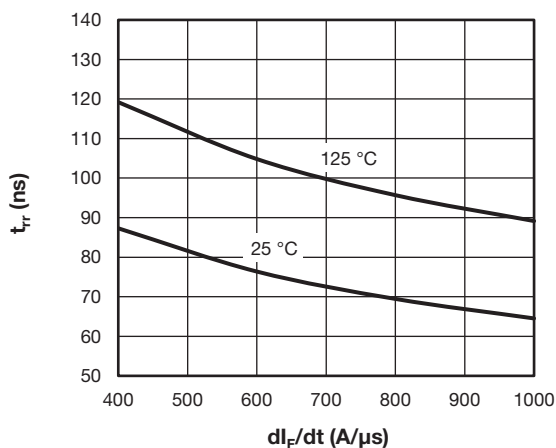
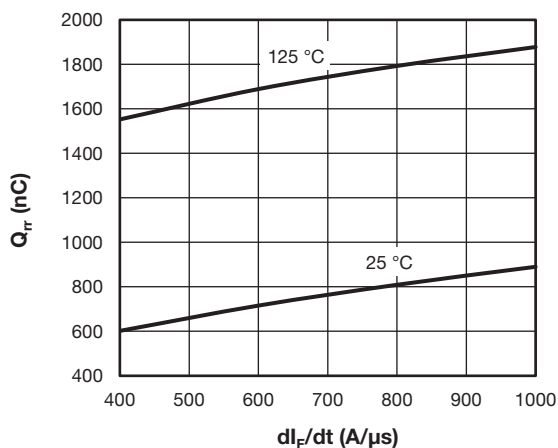
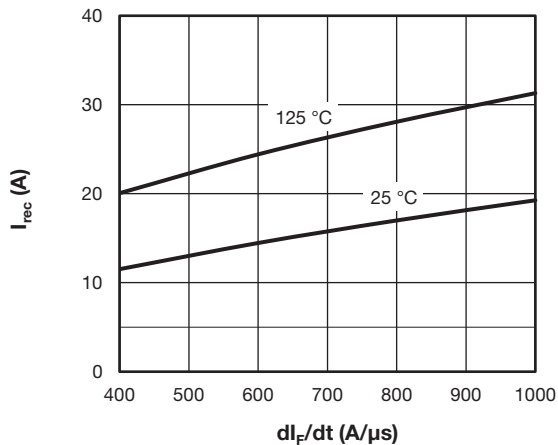


Fig. 6 - Forward Power Loss Characteristics

#### Note

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see Fig.5)  
 $P_{dREV}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_R$  = rated  $V_R$


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

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

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

**ORDERING INFORMATION TABLE**

|             |            |          |          |          |          |           |           |          |            |
|-------------|------------|----------|----------|----------|----------|-----------|-----------|----------|------------|
| Device code | <b>VS-</b> | <b>E</b> | <b>4</b> | <b>P</b> | <b>U</b> | <b>30</b> | <b>06</b> | <b>L</b> | <b>-N3</b> |
|             | 1          | 2        | 3        | 4        | 5        | 6         | 7         | 8        | 9          |

- |          |   |                                                                                        |
|----------|---|----------------------------------------------------------------------------------------|
| <b>1</b> | - | Vishay Semiconductors product                                                          |
| <b>2</b> | - | Circuit configuration:<br>E = single diode                                             |
| <b>3</b> | - | FRED Pt Gen 4                                                                          |
| <b>4</b> | - | P = TO-247 package                                                                     |
| <b>5</b> | - | Process type:<br>U = ultrafast recovery                                                |
| <b>6</b> | - | Current rating (30 = 30 A)                                                             |
| <b>7</b> | - | Voltage rating (06 = 600 V)                                                            |
| <b>8</b> | - | Package: L = long lead                                                                 |
| <b>9</b> | - | Environmental digit:<br>-N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free |

**ORDERING INFORMATION** (Example)

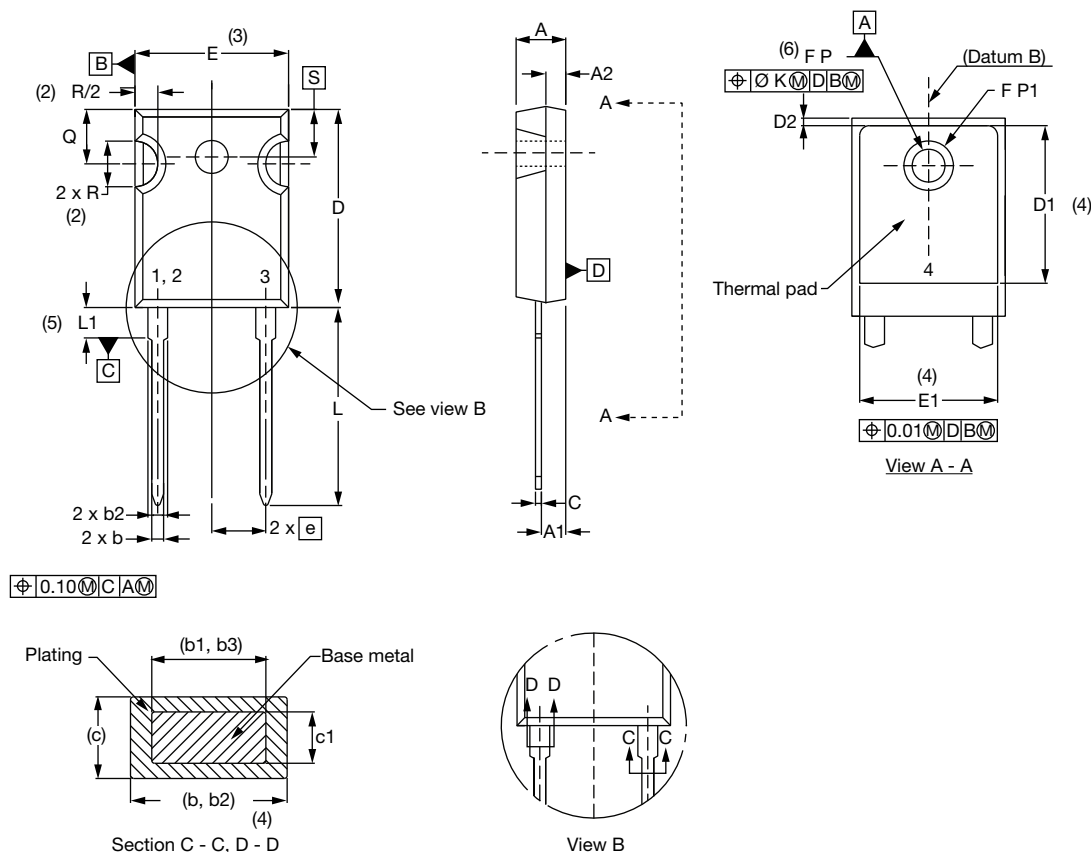
| PREFERRED P/N   | QUANTITY PER TUBE | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
|-----------------|-------------------|------------------------|-------------------------|
| VS-E4PU3006L-N3 | 25                | 500                    | Antistatic plastic tube |

**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 |   | SYMBOL   | MILLIMETERS |           | INCHES    |       | NOTES |
|--------|-------------|-------|--------|-------|-------|---|----------|-------------|-----------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |   |          | MIN.        | MAX.      |           |       |       |
| A      | 4.65        | 5.31  | 0.183  | 0.209 |       |   | E        | 15.29       | 15.87     | 0.602     | 0.625 | 3     |
| A1     | 2.21        | 2.59  | 0.087  | 0.102 |       |   | E1       | 13.46       | -         | 0.53      | -     |       |
| A2     | 1.50        | 2.49  | 0.059  | 0.098 |       |   | e        | 5.46 BSC    |           | 0.215 BSC |       |       |
| b      | 0.99        | 1.40  | 0.039  | 0.055 |       |   | Ø K      | 0.254       |           | 0.010     |       |       |
| b1     | 0.99        | 1.35  | 0.039  | 0.053 |       |   | L        | 19.81       | 20.32     | 0.780     | 0.800 |       |
| b2     | 1.65        | 2.39  | 0.065  | 0.094 |       |   | L1       | 3.71        | 4.29      | 0.146     | 0.169 |       |
| b3     | 1.65        | 2.34  | 0.065  | 0.092 |       |   | Ø P      | 3.56        | 3.66      | 0.14      | 0.144 |       |
| c      | 0.38        | 0.89  | 0.015  | 0.035 |       |   | Ø P1     | -           | 6.98      | -         | 0.275 |       |
| c1     | 0.38        | 0.84  | 0.015  | 0.033 |       | Q | 5.31     | 5.69        | 0.209     | 0.224     |       |       |
| D      | 19.71       | 20.70 | 0.776  | 0.815 | 3     | R | 4.52     | 5.49        | 0.178     | 0.216     |       |       |
| D1     | 13.08       | -     | 0.515  | -     | 4     | S | 5.51 BSC |             | 0.217 BSC |           |       |       |
| D2     | 0.51        | 1.35  | 0.020  | 0.053 |       |   |          |             |           |           |       |       |

## Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6) Ø 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")
- (7) 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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