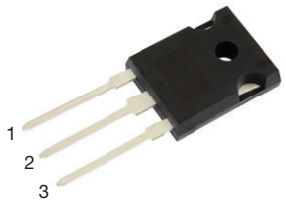
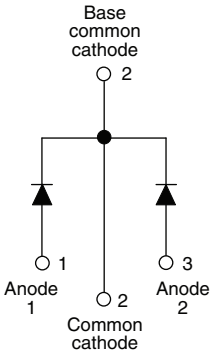
# Ultrafast Soft Recovery Diode, 2 x 15 A FRED Pt® Gen 4




TO-247AD 3L




## 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
- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE

| PRODUCT SUMMARY | |
|---|---|
| Package | TO-247AD 3L |
| $I_{F(AV)}$ | 2 x 15 A |
| $V_R$ | 600 V |
| $V_F$ at $I_F$ | 1.12 V |
| $t_{rr}$ typ. | See Recovery table |
| $T_J$ max. | 175 °C |
| Diode variation | Single die |

## 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 power 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 | $I_{F(AV)}$ | $T_C$ = 146 °C | 15 | A |
| Non-repetitive peak surge current, per leg | $I_{FSM}$ | $T_C$ = 25 °C, $t_p$ = 8.3 ms, half sine wave | 200 | |
| 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 µA | 600 | - | - | V |
| Forward voltage | $V_F$ | $I_F$ = 15 A | - | 1.32 | 1.55 | |
| | | $I_F$ = 30 A | - | 1.53 | - | |
| | | $I_F$ = 15 A, $T_J$ = 125 °C | - | 1.17 | - | |
| | | $I_F$ = 30 A, $T_J$ = 125 °C | - | 1.42 | - | |
| | | $I_F$ = 15 A, $T_J$ = 150 °C | - | 1.12 | 1.28 | |
| | | $I_F$ = 30 A, $T_J$ = 150 °C | - | 1.38 | - | |
| Reverse leakage current | $I_R$ | $V_R$ = $V_R$ rated | - | - | 15 | µA |
| | | $T_J$ = 125 °C, $V_R$ = $V_R$ rated | - | - | 500 | |
| Junction capacitance | $C_T$ | $V_R$ = 600 V | - | 16 | - | pF |

| DYNAMIC RECOVERY CHARACTERISTICS ($T_J$ = 25 °C unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time | $t_{rr}$ | $T_J$ = 25 °C | $I_F$ = 15 A<br>$dI_F/dt$ = 1000 A/µs<br>$V_R$ = 400 V | - | 60 | - | ns |
| | | $T_J$ = 125 °C | | - | 83 | - | |
| Peak recovery current | $I_{RRM}$ | $T_J$ = 25 °C | | - | 13 | - | A |
| | | $T_J$ = 125 °C | | - | 21 | - | |
| Reverse recovery charge | $Q_{rr}$ | $T_J$ = 25 °C | | - | 500 | - | nC |
| | | $T_J$ = 125 °C | | - | 1100 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Thermal resistance, junction to case | $R_{thJC}$ | | - | - | 1.4 | °C/W |
| Thermal resistance, case to heat sink | $R_{thCS}$ | | - | 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 3L | C4PU3006LH | | | |

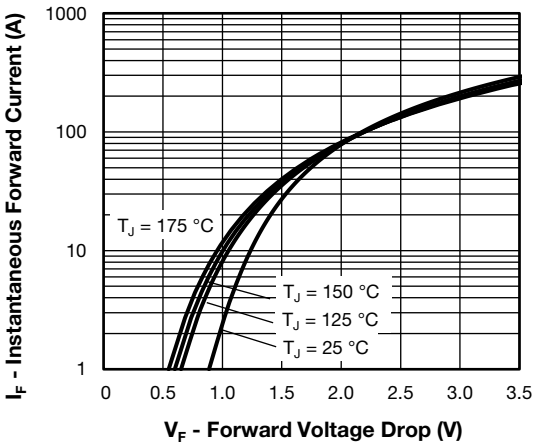



Fig. 1 - Typical Forward Voltage Drop Characteristics

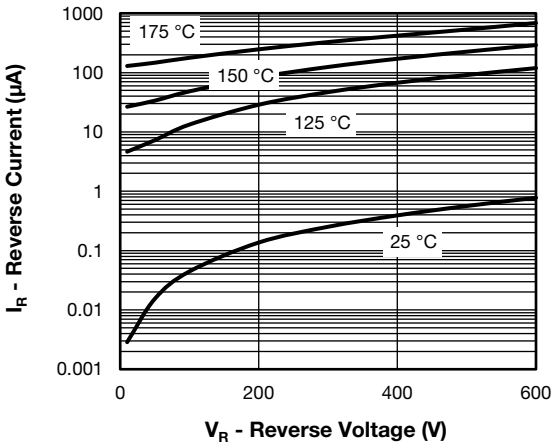



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

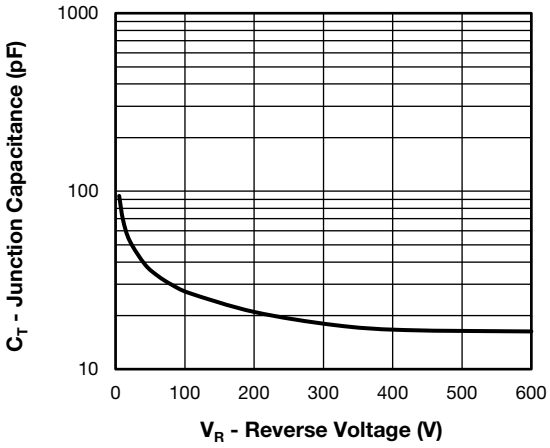



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

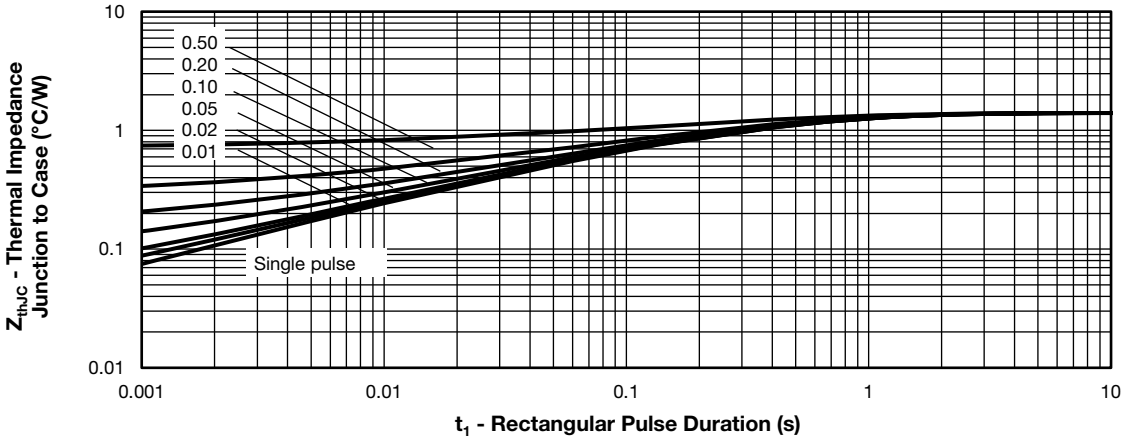



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics

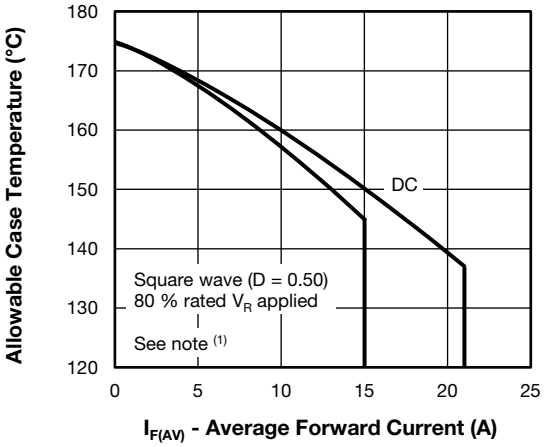



Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

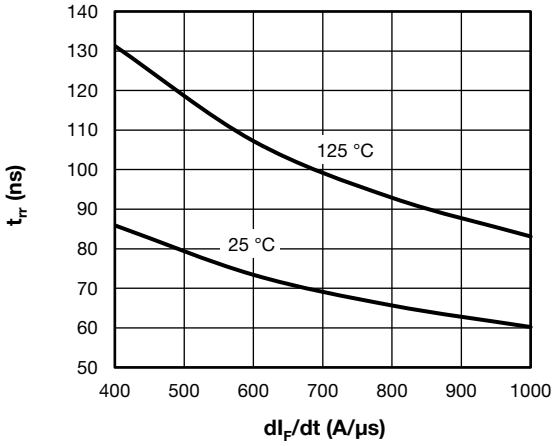



Fig. 7 - Typical Reverse Recovery Time vs. $dI_F/dt$

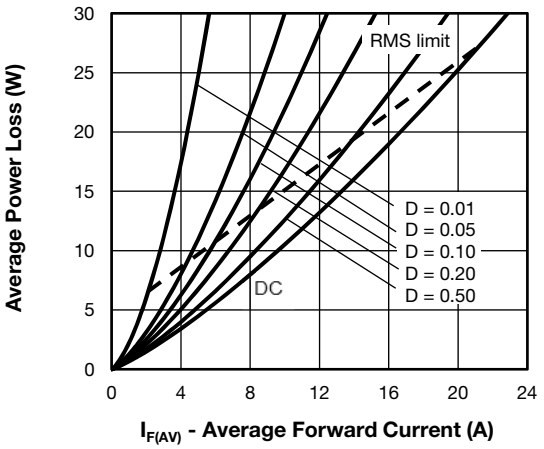



Fig. 6 - Forward Power Loss Characteristics

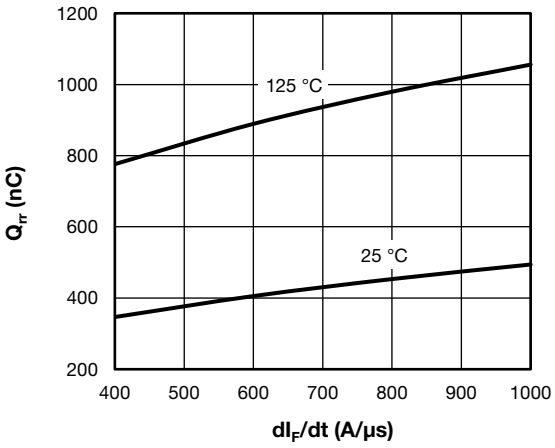



Fig. 8 - Typical Stored Charge vs. $dI_F/dt$

**Note**

(1) Formula used: $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$;
Pd = 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 $V_R$

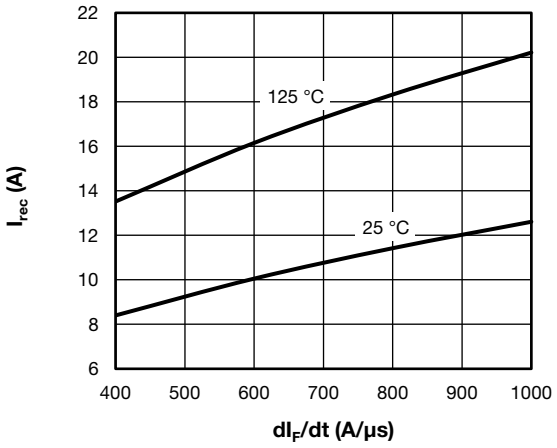



Fig. 9 - Typical Reverse Current vs. $dI_F/dt$

## ORDERING INFORMATION TABLE

| Device code | VS- | C | 4 | P | U | 30 | 06 | L | H | N3 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

1 - Vishay Semiconductors product

2 - Circuit configuration:
C = common diode

3 - FRED Pt Gen 4

4 - P = TO-247 package

5 - Process type:
U = ultrafast recovery

6 - Current rating (30 = 2 x 15 A)

7 - Voltage rating (06 = 600 V)

8 - Package: L = long lead

9 - H = AEC-Q101 qualified

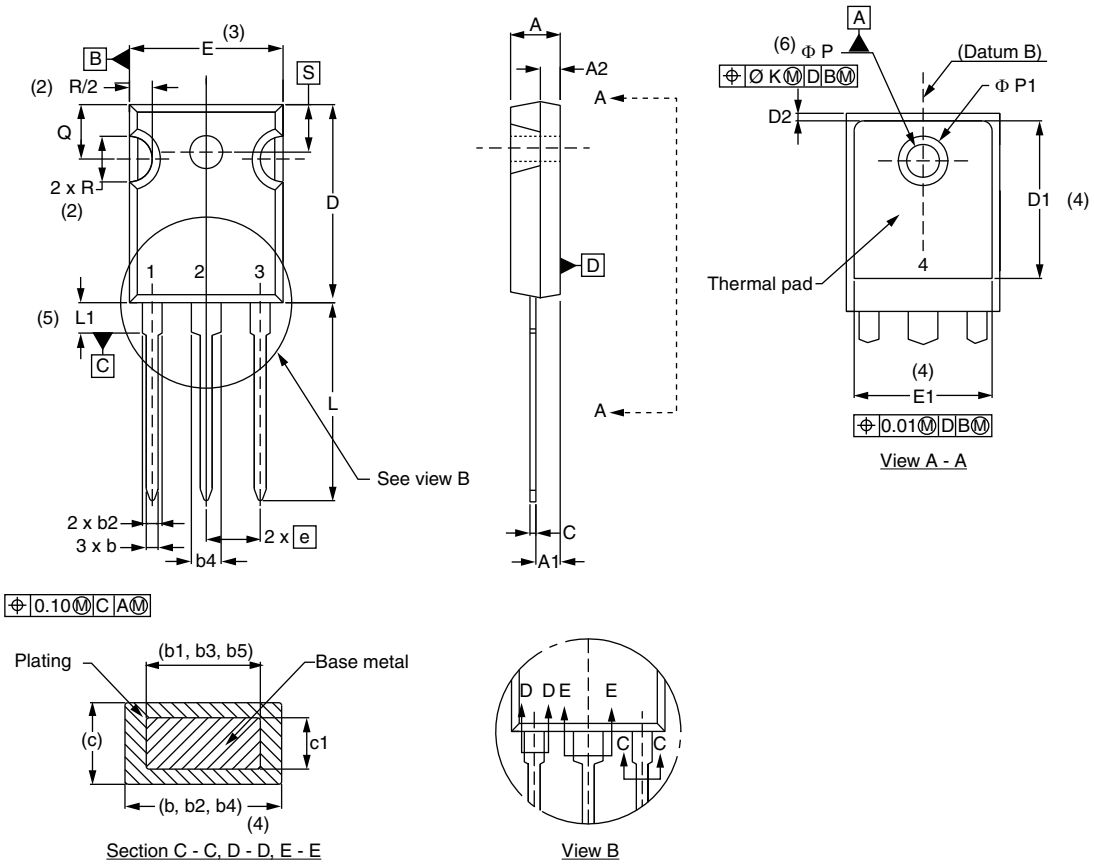
10 - Environmental digit:
N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free

| **ORDERING INFORMATION** (Example) | | | |
|---|---|---|---|
| **PREFERRED P/N** | **QUANTITY PER TUBE** | **MINIMUM ORDER QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-C4PU3006LHN3 | 25 | 500 | Antistatic plastic tube |

| **LINKS TO RELATED DOCUMENTS** | | |
|---|---|---|
| Dimensions | TO-247AD 3L | www.vishay.com/doc?95626 |
| Part marking information | TO-247AD 3L | www.vishay.com/doc?95007 |

# TO-247AD 3L

**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 | |
| b4 | 2.59 | 3.43 | 0.102 | 0.135 | |
| b5 | 2.59 | 3.38 | 0.102 | 0.133 | |
| 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 |

| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| D2 | 0.51 | 1.30 | 0.020 | 0.051 | |
| E | 15.29 | 15.87 | 0.602 | 0.625 | 3 |
| E1 | 13.46 | - | 0.53 | - | |
| e | 5.46 BSC | | 0.215 BSC | | |
| Ø K | 0.254 | | 0.010 | | |
| L | 19.81 | 20.32 | 0.780 | 0.800 | |
| L1 | 3.71 | 4.29 | 0.146 | 0.169 | |
| Ø P | 3.56 | 3.66 | 0.14 | 0.144 | |
| Ø 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**

(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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