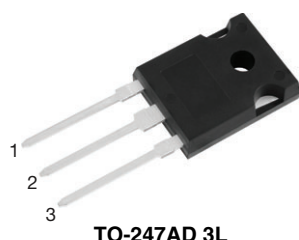
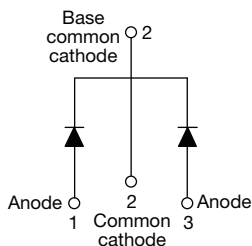


Hyperfast Rectifier, 2 x 15 A FRED Pt® G5



TO-247AD 3L



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



RoHS
COMPLIANT
HALOGEN
FREE

LINKS TO ADDITIONAL RESOURCES



3D Models



Application Notes

| PRIMARY CHARACTERISTICS | |
|--------------------------|----------------|
| $I_{F(AV)}$, per leg | 15 A |
| V_R | 1200 V |
| V_F at I_F at 125 °C | 1.7 V |
| t_{rr} | 37 ns |
| T_J max. | 175 °C |
| Package | TO-247AD 3L |
| Circuit configuration | Common cathode |

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 3L

Molding compound meets UL 94 V-0 flammability rating

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

Polarity: as per marking device details

| ABSOLUTE MAXIMUM RATINGS | | | | |
|--|-------------------|--|-------------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Repetitive peak reverse voltage, per leg | V_{RRM} | | 1200 | V |
| Average rectified forward current, per leg | $I_{F(AV)}$ | $T_C = 122\text{ °C}$, $D = 0.50$ | 15 | A |
| Repetitive peak forward current, per leg | I_{FRM} | $T_C = 122\text{ °C}$, $D = 0.50$, $f = 20\text{ kHz}$ | 30 | |
| Non-repetitive peak surge current, per leg | I_{FSM} | $T_C = 45\text{ °C}$, $t_p = 10\text{ ms}$, sine wave | 125 | |
| 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, per leg | V_{BR} , V_R | $I_R = 100\text{ }\mu\text{A}$ | 1200 | - | - | V |
| Forward voltage, per leg | V_F | $I_F = 15\text{ A}$ | - | 1.9 | 2.5 | |
| | | $I_F = 15\text{ A}$, $T_J = 125\text{ °C}$ | - | 1.7 | - | |
| Reverse leakage current, per leg | I_R | $V_R = V_R$ rated | - | - | 50 | μA |
| | | $T_J = 125\text{ °C}$, $V_R = V_R$ rated | - | - | 500 | |
| Junction capacitance, per leg | C_T | $V_R = 200\text{ V}$ | - | 10 | - | pF |
| Series inductance, per leg | 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, per leg | t_{rr} | $I_F = 1.0\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | - | 37 | 50 | ns |
| | | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 95 | - | |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 146 | - | |
| Peak recovery current, per leg | I_{RRM} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 14 | - | A |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 19 | - | |
| Reverse recovery charge, per leg | Q_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 545 | - | nC |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 1200 | - | |
| Reverse recovery time, per leg | t_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 75.5 | - | ns |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 100 | - | |
| Peak recovery current, per leg | I_{RRM} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 23 | - | A |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 35 | - | |
| Reverse recovery charge, per leg | Q_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 935 | - | nC |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 1985 | - | |

THERMAL - MECHANICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|--|-------------------|------------------------|--------------|------|------------|-----------------------------|
| Thermal resistance, junction-to-case, per leg | R_{thJC} | | - | - | 1.4 | $^{\circ}\text{C}/\text{W}$ |
| Weight | | | - | 6.0 | - | g |
| Mounting torque | | | 6.0 (5.0) | - | 12 (10) | kgf · cm (lbf · in) |
| Maximum junction and storage temperature range | T_J , T_{Stg} | | -55 | - | 175 | $^{\circ}\text{C}$ |
| Marking device | | Case style TO-247AD 3L | C5PH3012L | | | |

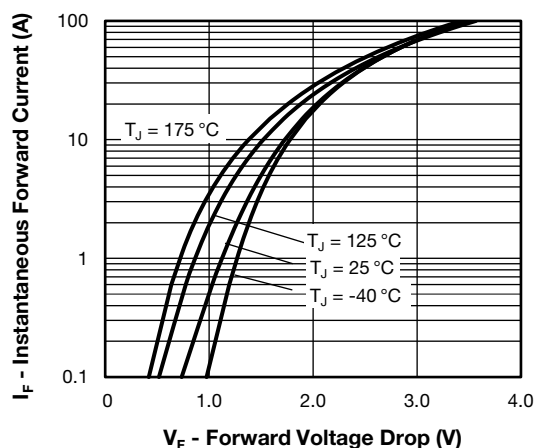


Fig. 1 - Forward Voltage Drop Characteristics, Per Leg

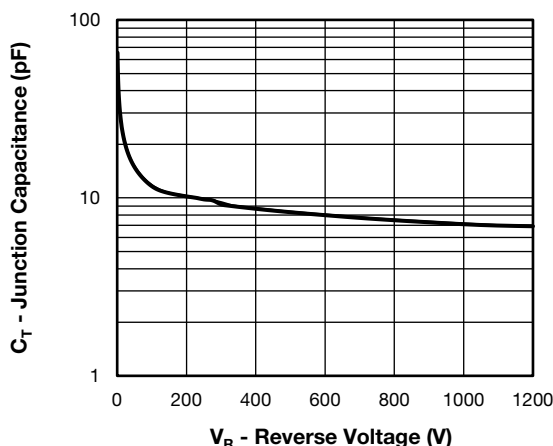


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, Per Leg

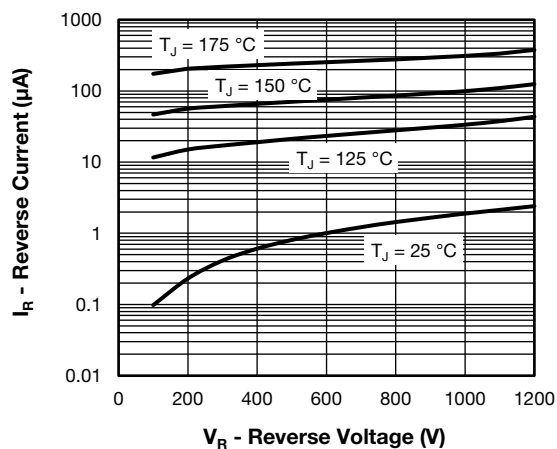


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage, Per Leg

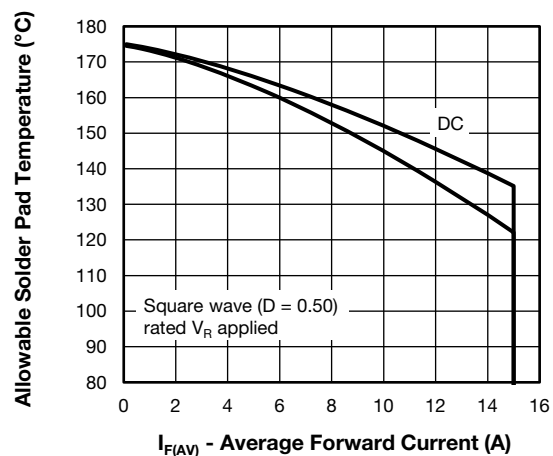


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current, Per Leg

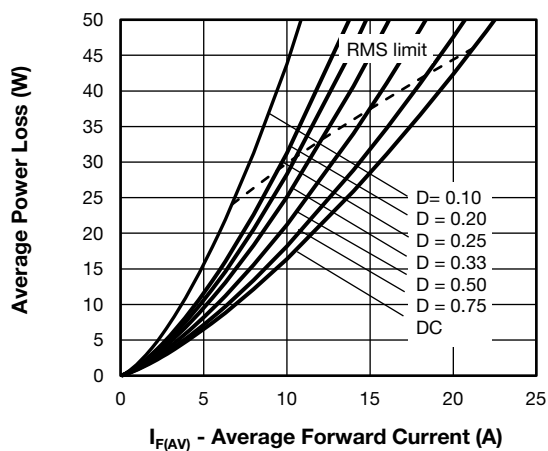


Fig. 5 - Forward Power Loss Characteristics, Per Leg

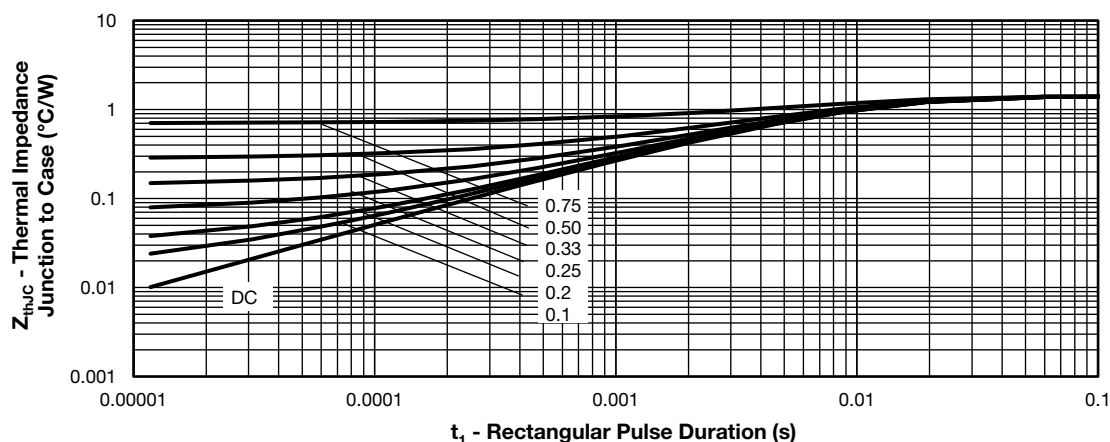
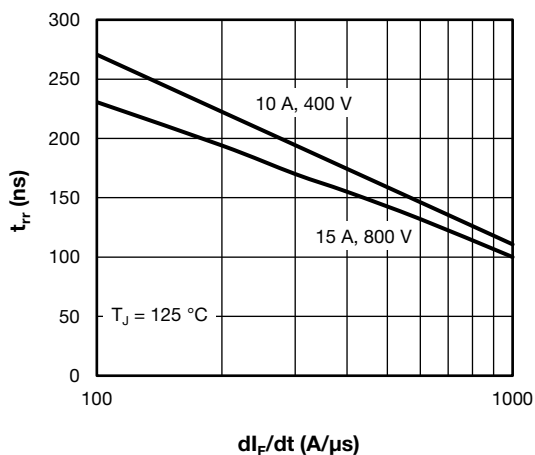
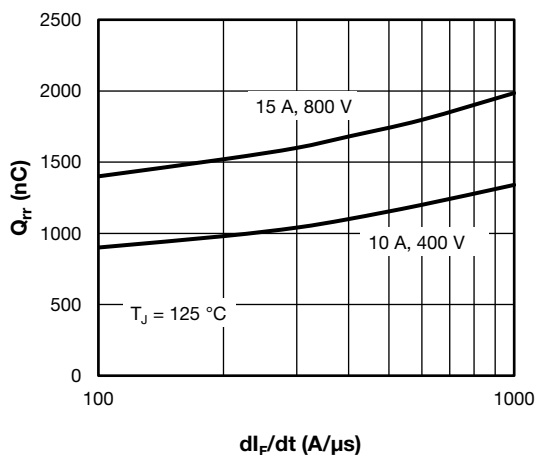
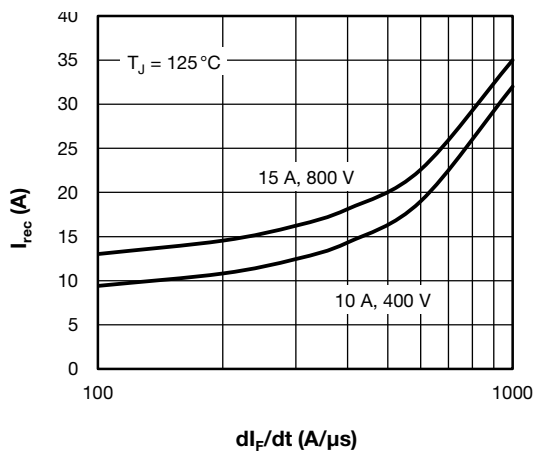


Fig. 6 - Transient Thermal Impedance, Junction to Case, Per Leg


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt , Per Leg

Fig. 8 - Typical Stored Charge vs. dI_F/dt , Per Leg

Fig. 9 - Typical Recovery Current vs. dI_F/dt , Per Leg

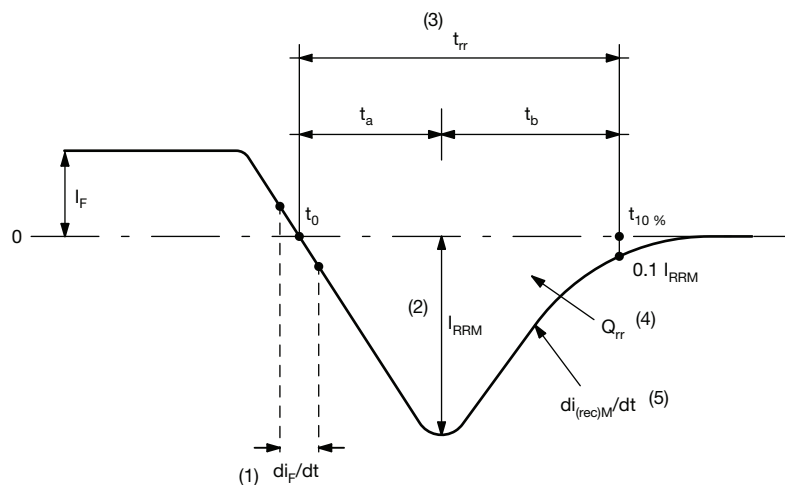


Fig. 10 - Reverse Recovery Waveform and Definitions

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

ORDERING INFORMATION TABLE

| Device code | VS- | C | 5 | P | H | 30 | 12 | L | -N3 |
|-------------|-----|---|---|---|---|----|----|---|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

- 1 - Vishay Semiconductors product
- 2 - C = common cathode
- 3 - 5 = FRED generation 5
- 4 - Package: P = TO-247AD 3L
- 5 - H = hyperfast recovery
- 6 - Current rating (30 = 30 A)
- 7 - Voltage rating (12 = 1200 V)
- 8 - L = long lead
- 9 - 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-C5PH3012L-M3 | 25 | 500 | Antistatic plastic tube |

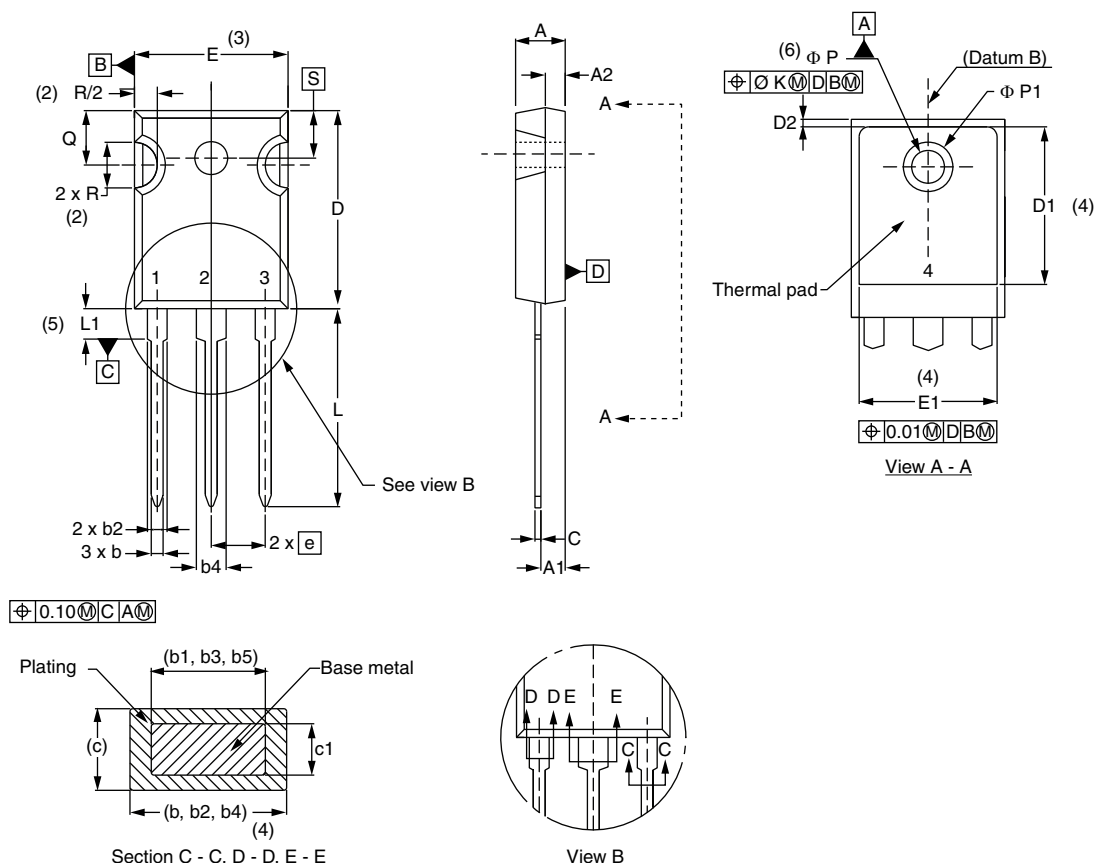
LINKS TO RELATED DOCUMENTS

| | |
|--------------------------|--|
| Dimensions | www.vishay.com/doc?95626 |
| Part marking information | 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 | | |
| ϕK | 0.254 | | 0.010 | | |
| L | 19.81 | 20.32 | 0.780 | 0.800 | |
| L1 | 3.71 | 4.29 | 0.146 | 0.169 | |
| ϕP | 3.56 | 3.66 | 0.14 | 0.144 | |
| $\phi P1$ | - | 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
- ϕP 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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