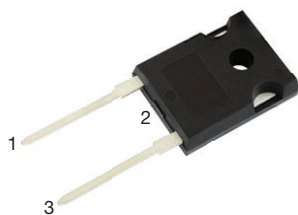
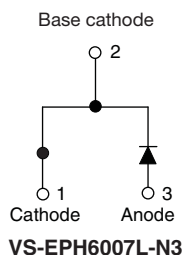


Hyperfast Rectifier, 60 A FRED Pt®



TO-247AD 2L



VS-EPH6007L-N3

FEATURES

- Low forward voltage drop
- Hyperfast soft recovery time
- 175 °C operating junction temperature
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

DESCRIPTION / APPLICATIONS

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

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.

These devices are intended for use in PFC Boost stage in the AC/DC section of SMPS, inverters or as freewheeling diodes.

The extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

PRIMARY CHARACTERISTICS

| | |
|-----------------------|-------------|
| $I_{F(AV)}$ | 60 A |
| V_R | 650 V |
| V_F at I_F | 1.4 V |
| t_{rr} typ. | 65 ns |
| T_J max. | 175 °C |
| Package | TO-247AD 2L |
| Circuit configuration | Single |

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | MAX. | UNITS |
|---|----------------|---|-------------|-------|
| Repetitive peak reverse voltage | V_{RRM} | | 650 | V |
| Average rectified forward current | $I_{F(AV)}$ | $T_C = 98\text{ °C}$ ($d = 0.50$) | 60 | A |
| Non-repetitive peak surge current | I_{FSM} | $T_C = 25\text{ °C}$, $t_p = 8.3\text{ ms}$; half sine wave | 520 | |
| Operating junction and storage temperatures | 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 | $I_R = 100\text{ }\mu\text{A}$ | 650 | - | - | V |
| Forward voltage | V_F | $I_F = 60\text{ A}$ | - | 1.8 | 2.2 | |
| | | $I_F = 60\text{ A}$, $T_J = 150\text{ °C}$ | - | 1.4 | 1.8 | |
| Reverse leakage current | I_R | $V_R = V_R$ rated | - | 0.02 | 30 | μA |
| | | $T_J = 150\text{ °C}$, $V_R = V_R$ rated | - | - | 300 | |
| Junction capacitance | C_T | $V_R = 650\text{ V}$ | - | 37 | - | 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} | $I_F = 1\text{ A}$, $dI_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | - | 44 | - | ns |
| | | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 65 | - | |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 94 | - | |
| Peak recovery current | I_{RRM} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 21 | - | A |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 40 | - | |
| Reverse recovery charge | Q_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 720 | - | nC |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 2300 | - | |

THERMAL - MECHANICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|--|-------------------|---|-------------|------|-------------|-----------------------------|
| Maximum junction and storage temperature range | T_J , T_{Stg} | | -55 | - | 175 | $^{\circ}\text{C}$ |
| Thermal resistance, junction to case | R_{thJC} | | - | - | 0.65 | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, case to heatsink | R_{thCS} | Mounting surface, flat, smooth, and greased | - | 0.5 | - | |
| Weight | | | - | 5.5 | - | g |
| | | | - | 0.2 | - | oz. |
| Mounting torque | | | 1.2 (10) | - | 2.4 (20) | kgf · cm (lbf · in) |
| Marking device | | Case style TO-247 2L | EPH6007L | | | |

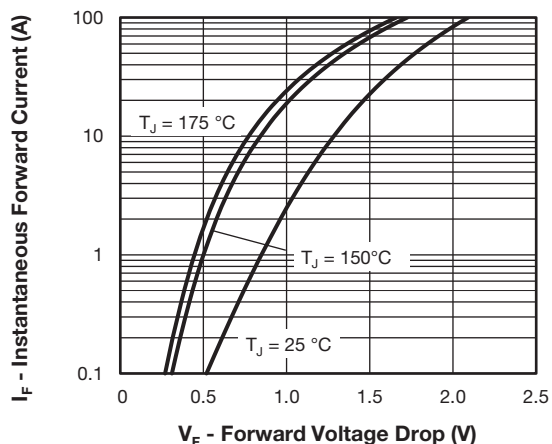


Fig. 1 - Typical Forward Voltage Drop Characteristics

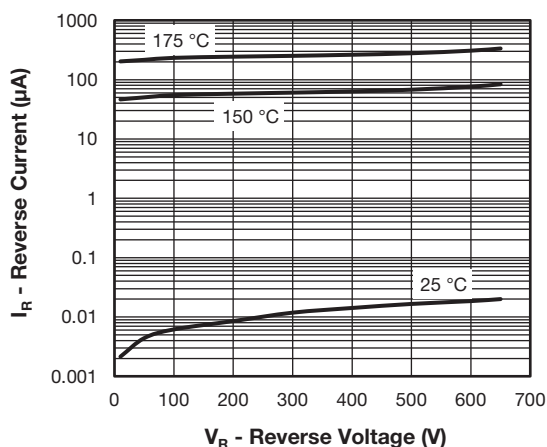


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

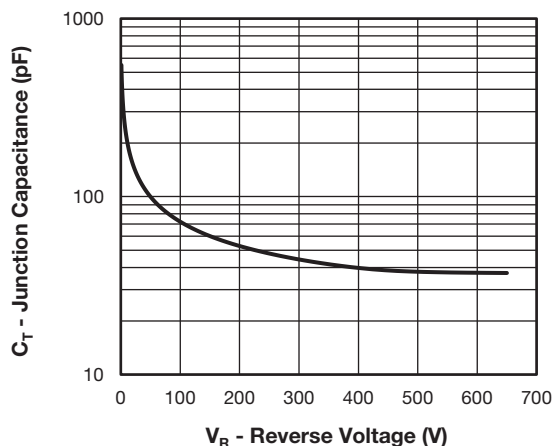


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

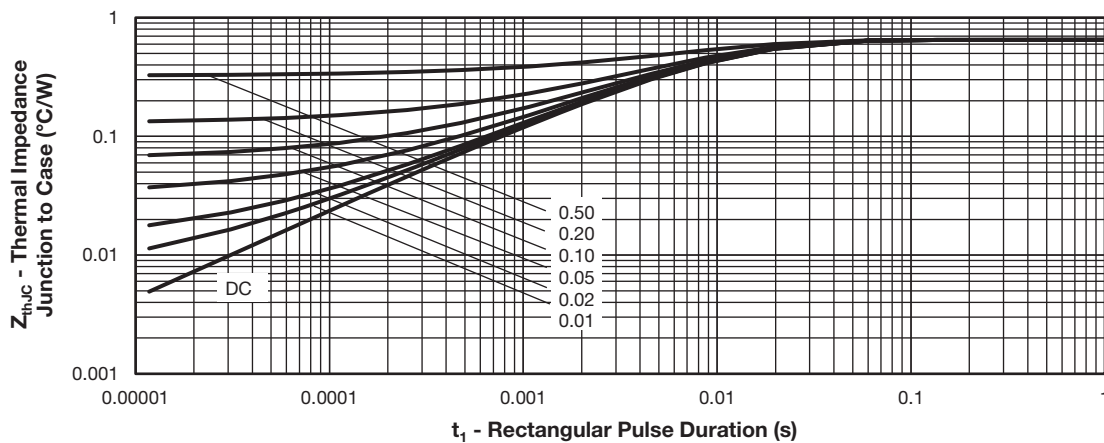


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

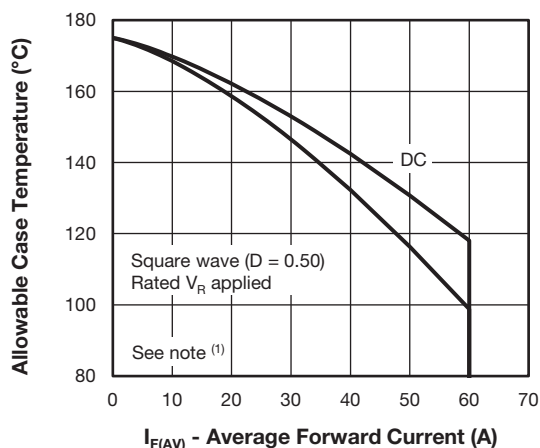


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

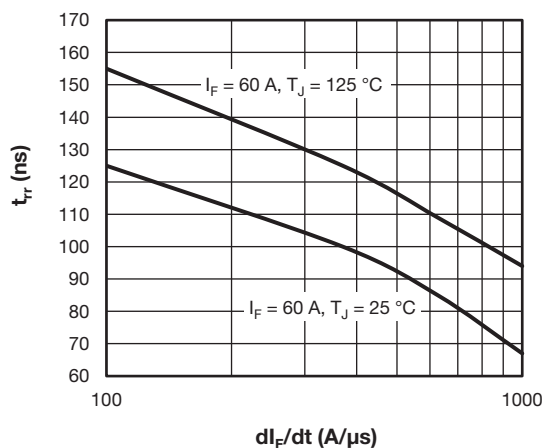


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

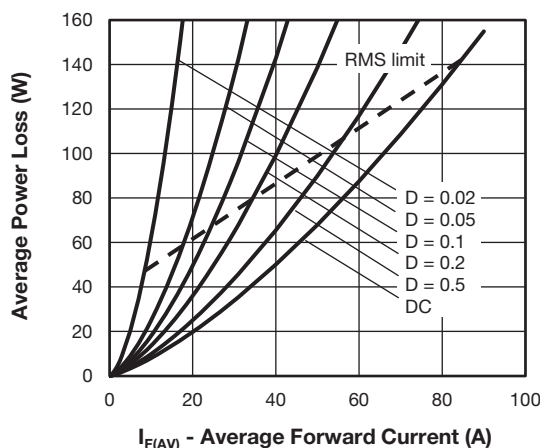


Fig. 6 - Forward Power Loss Characteristics

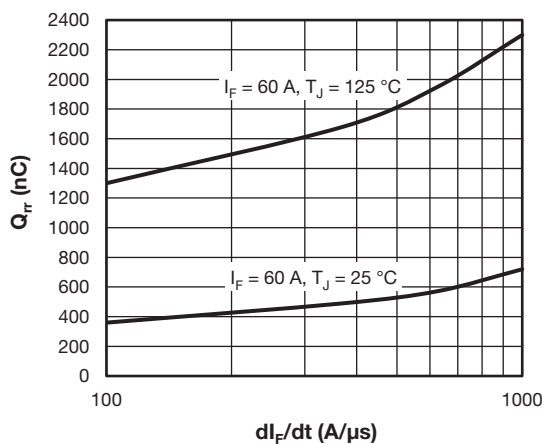
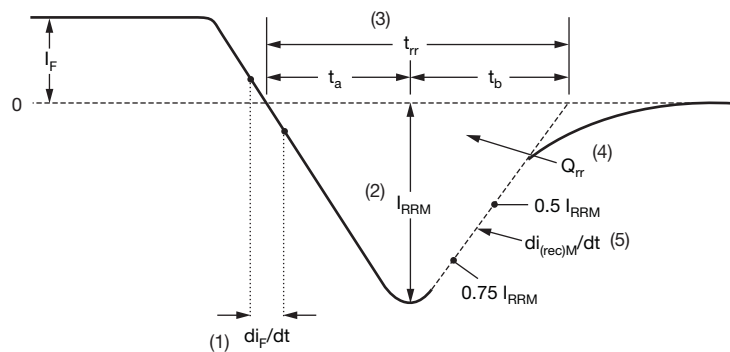


Fig. 8 - Typical Stored Charge vs. dI_F/dt



- (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 zero crossing point of negative going I_F to point where a line passing through $0.75 I_{RRM}$ and $0.50 I_{RRM}$ extrapolated to zero current.

- (4) Q_{rr} - area under curve defined by t_{rr} and I_{RRM}

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

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

Fig. 9 - Reverse Recovery Waveform and Definitions



ORDERING INFORMATION TABLE

| | | | | | | | | |
|-------------|---|---|---|---|----|----|---|-----|
| Device code | VS- | E | P | H | 60 | 07 | L | -N3 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | - Vishay Semiconductors product | | | | | | | |
| 2 | - E = single diode | | | | | | | |
| 3 | - P = TO-247 | | | | | | | |
| 4 | - H = hyperfast recovery time | | | | | | | |
| 5 | - Current code (60 = 60 A) | | | | | | | |
| 6 | - Voltage code (07 = 650 V) | | | | | | | |
| 7 | - L = long lead | | | | | | | |
| 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-EPH6007L-N3 | 25 | 500 | Antistatic plastic tube |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?95536 |
| Part marking information | www.vishay.com/doc?95648 |



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 | | |
| 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

- 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
- 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")
- 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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