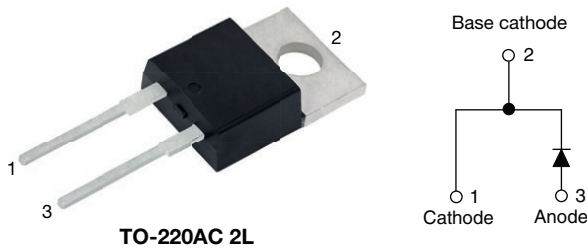


Hyperfast Rectifier, 30 A FRED Pt® G5


TO-220AC 2L

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



| PRIMARY CHARACTERISTICS | |
|--------------------------|-------------|
| $I_{F(AV)}$ | 30 A |
| V_R | 1200 V |
| V_F at I_F at 125 °C | 1.7 V |
| t_{rr} | 32 ns |
| T_J max. | 175 °C |
| Package | TO-220AC 2L |
| Circuit configuration | Single |

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-220AC 2L

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 | V_{RRM} | | 1200 | V |
| Average rectified forward current | $I_{F(AV)}$ | $T_C = 96\text{ °C}$, $D = 0.50$ | 30 | A |
| Non-repetitive peak surge current | I_{FSM} | $T_C = 45\text{ °C}$, $t_p = 10\text{ ms}$, sine wave | 240 | |
| Repetitive peak forward current | I_{FRM} | $T_C = 96\text{ °C}$, $D = 0.50$, $f = 20\text{ kHz}$ | 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 | $I_R = 100\text{ }\mu\text{A}$ | 1200 | - | - | V |
| Forward voltage | V_F | $I_F = 30\text{ A}$ $I_F = 30\text{ A}$, $T_J = 125\text{ °C}$ | - | 1.9 1.7 | - - | |
| Reverse leakage current | I_R | $V_R = V_R$ rated $T_J = 125\text{ °C}$, $V_R = V_R$ rated | - | - | 50 500 | μA |
| Junction capacitance | C_T | $V_R = 200\text{ V}$ | - | 17 | - | pF |
| Series inductance | L_S | Measured to lead 5 mm from package body | - | 8 | - | nH |



| DYNAMIC RECOVERY CHARACTERISTICS (T _J = 25 °C unless otherwise specified) | | | | | | |
|--|------------------|---|------|------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time | t _{rr} | I _F = 1.0 A, di _F /dt = 100 A/μs, V _R = 30 V | - | 32 | 58 | ns |
| | | T _J = 25 °C | - | 113 | - | |
| | | T _J = 125 °C | - | 175 | - | |
| Peak recovery current | I _{RRM} | T _J = 25 °C | - | 17 | - | A |
| | | T _J = 125 °C | - | 24 | - | |
| Reverse recovery charge | Q _{rr} | T _J = 25 °C | - | 850 | - | nC |
| | | T _J = 125 °C | - | 2150 | - | |
| Reverse recovery time | t _{rr} | T _J = 25 °C | - | 85 | - | ns |
| | | T _J = 125 °C | - | 132 | - | |
| Peak recovery current | I _{RRM} | T _J = 25 °C | - | 30 | - | A |
| | | T _J = 125 °C | - | 43 | - | |
| Reverse recovery charge | Q _{rr} | T _J = 25 °C | - | 1350 | - | nC |
| | | T _J = 125 °C | - | 3215 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|--|-----------------------------------|------------------------|--------------|------|------------|------------------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Thermal resistance, junction-to-case | R _{thJC} | | - | - | 1.1 | °C/W |
| Weight | | | - | 2.0 | - | 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 | °C |
| Marking device | | Case style TO-220AC 2L | E5TH3012 | | | |

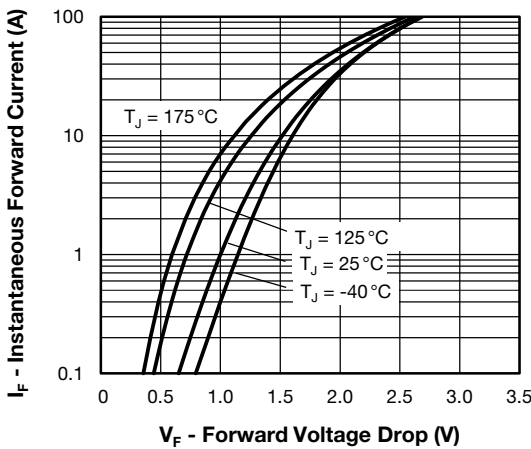


Fig. 1 - Typical Forward Voltage Drop Characteristics

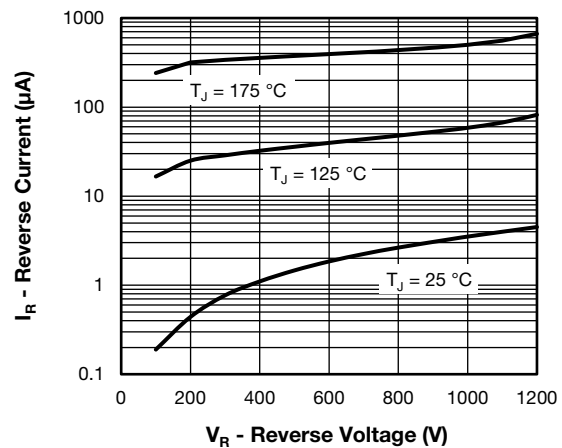


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

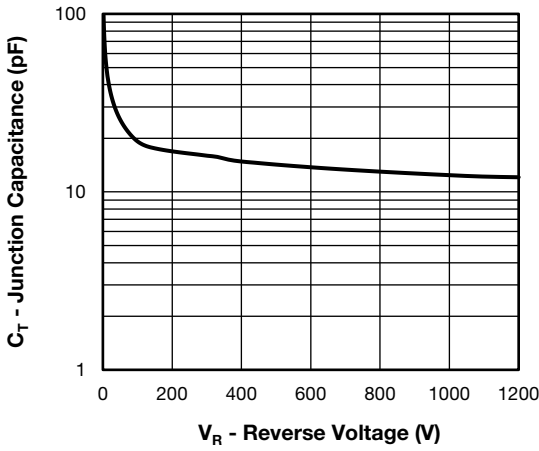


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

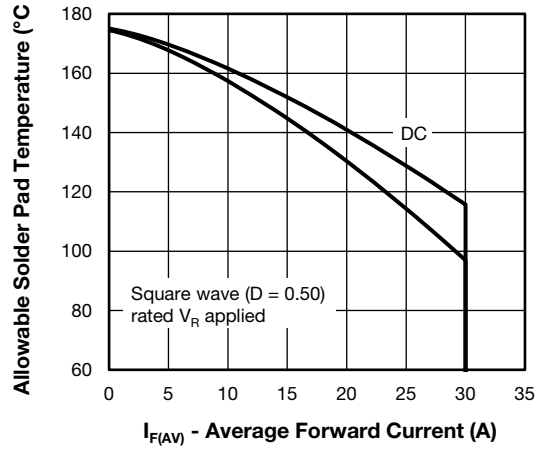


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

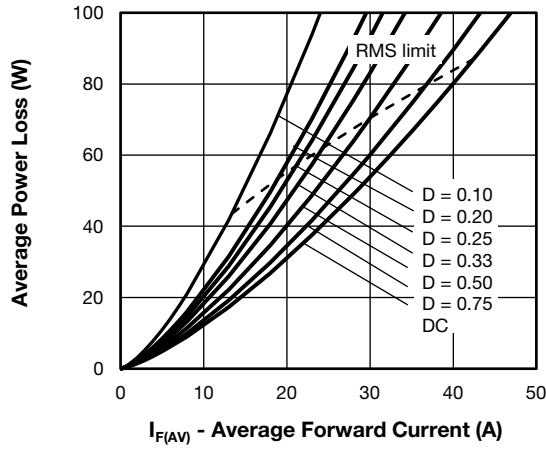


Fig. 5 - Forward Power Loss Characteristics

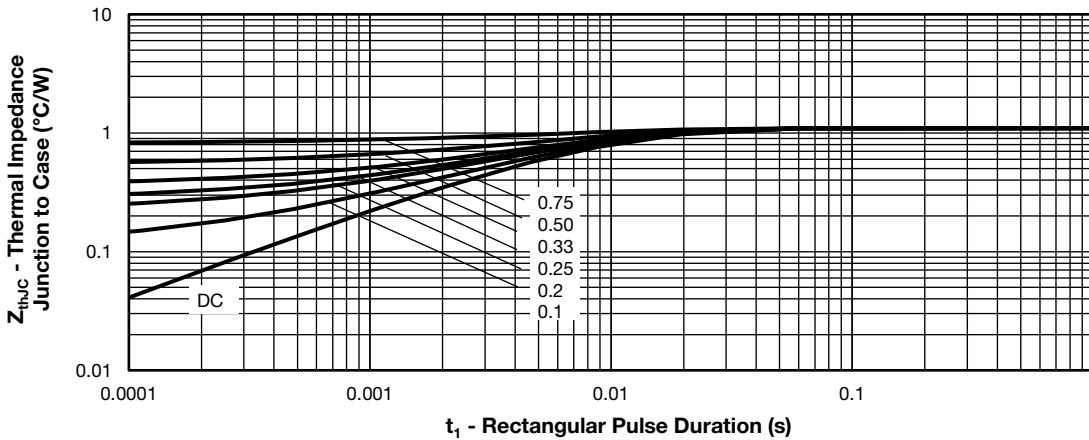


Fig. 6 - Thermal Impedance Z_{thJC} Characteristics

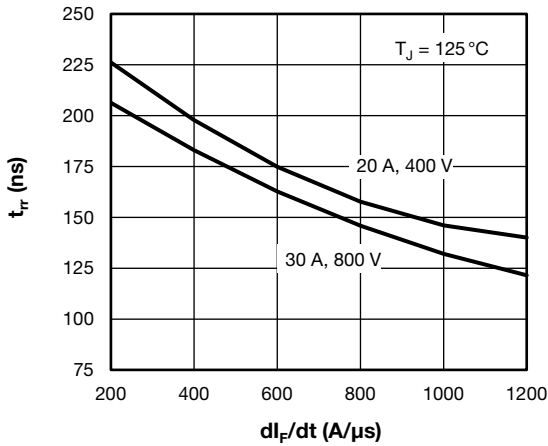


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

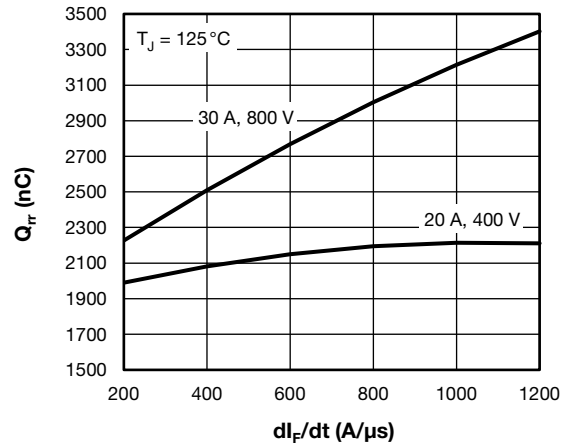


Fig. 8 - Typical Stored Charge vs. dI_F/dt

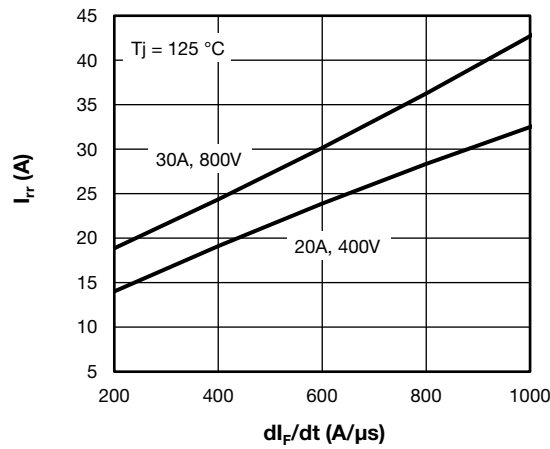


Fig. 9 - Typical Recovery Current vs. dI_F/dt

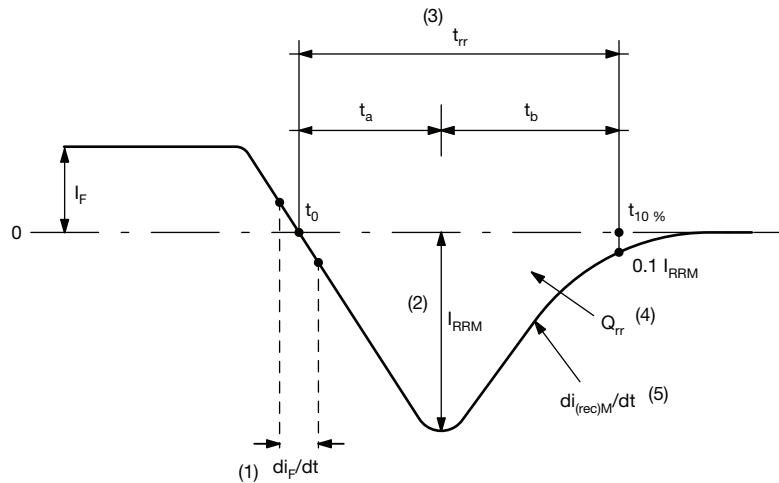


Fig. 10 - Reverse Recovery Waveform and Definitions

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

ORDERING INFORMATION TABLE

| | | | | | | | | |
|-------------|------------|----------|----------|----------|----------|-----------|-----------|------------|
| Device code | VS- | E | 5 | T | H | 30 | 12 | -M3 |
| | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ |

- 1** - Vishay Semiconductors product
- 2** - E = single diode
- 3** - 5 = FRED generation 5
- 4** - Package: T = TO-220AC 2L
- 5** - H = hyperfast recovery
- 6** - Current rating (30 = 30 A)
- 7** - Voltage rating (12 = 1200 V)
- 8** - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

| ORDERING INFORMATION (Example) | | |
|--------------------------------|---------------|--------------------------|
| PREFERRED P/N | BASE QUANTITY | PACKAGING DESCRIPTION |
| VS-E5TH3012-M3 | 50 | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?96156 |
| Part marking information | www.vishay.com/doc?95391 |
| SPICE Model | www.vishay.com/doc?96926 |



TO-220AB 3L

DIMENSIONS in millimeters and inches



Conforms to JEDEC® outline TO-220AB

| SYMBOL | MILLIMETERS | | INCHES | | NOTES | SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|--------|-------|-------|--------|-------------|-------|--------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | | | MIN. | MAX. | MIN. | MAX. | |
| A | 4.25 | 4.65 | 0.167 | 0.183 | | D2 | 11.68 | 13.30 | 0.460 | 0.524 | 6, 7 |
| A1 | 1.14 | 1.40 | 0.045 | 0.055 | | E | 10.11 | 10.51 | 0.398 | 0.414 | 3, 6 |
| A2 | 2.50 | 2.92 | 0.098 | 0.115 | | E1 | 6.86 | 8.89 | 0.270 | 0.350 | 6 |
| b | 0.69 | 1.01 | 0.027 | 0.040 | | e | 2.41 | 2.67 | 0.095 | 0.105 | |
| b1 | 0.38 | 0.97 | 0.015 | 0.038 | 4 | e1 | 4.88 | 5.28 | 0.192 | 0.208 | |
| b2 | 1.20 | 1.73 | 0.047 | 0.068 | | H1 | 6.09 | 6.48 | 0.240 | 0.255 | 6 |
| b3 | 1.14 | 1.73 | 0.045 | 0.068 | 4 | L | 13.52 | 14.02 | 0.532 | 0.552 | |
| c | 0.36 | 0.61 | 0.014 | 0.024 | | L1 | 3.32 | 3.82 | 0.131 | 0.150 | 2 |
| c1 | 0.36 | 0.56 | 0.014 | 0.022 | 4 | ∅ P | 3.54 | 3.91 | 0.139 | 0.154 | |
| D | 14.85 | 15.35 | 0.585 | 0.604 | 3 | Q | 2.60 | 3.00 | 0.102 | 0.118 | |
| D1 | 8.38 | 9.02 | 0.330 | 0.355 | | | | | | | |

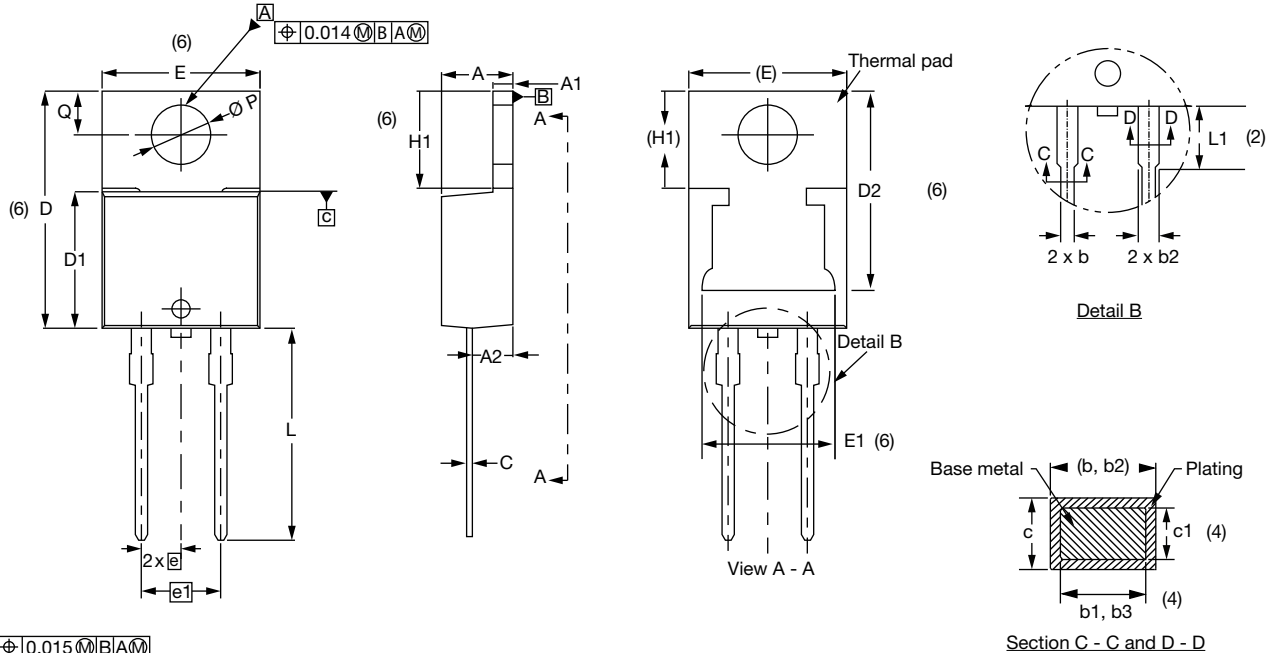
Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1, and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Dimension b1, b3, and c1 apply to base metal only
- (5) Controlling dimensions: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2, and E1
- (7) Outline conforms to JEDEC® TO-220, except D2



TO-220AC 2L

DIMENSIONS in millimeters and inches



Conforms to JEDEC® outline TO-220AC

| SYMBOL | MILLIMETERS | | INCHES | | NOTES | SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|--------|-------|-------|--------|-------------|-------|--------|-------|-------|
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