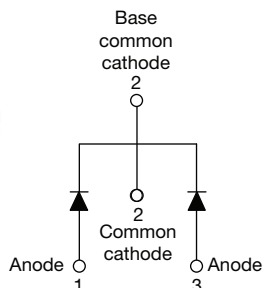


Ultrafast Rectifier, 10 A FRED Pt®


TO-220AB 3L


FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Low leakage current
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

DESCRIPTION / APPLICATIONS

VS-MUR.. series are the state of the art ultrafast recovery rectifiers specifically designed with optimized performance of forward voltage drop and ultrafast recovery time.

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 the output rectification stage of SMPS, UPS, DC/DC converters as well as freewheeling diode in low voltage inverters and chopper motor drives.

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

PRIMARY CHARACTERISTICS

| | |
|-----------------------|--------------------|
| $I_{F(AV)}$ | 2 x 5 A |
| V_R | 200 V |
| V_F at I_F | 0.87 V |
| t_{rr} typ. | See Recovery table |
| T_J max. | 175 °C |
| Package | TO-220AB 3L |
| Circuit configuration | Common cathode |

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | MAX. | UNITS |
|---|----------------|---|-------------|-------|
| Peak repetitive reverse voltage | V_{RRM} | | 200 | V |
| Average rectified forward current | $I_{F(AV)}$ | per leg | 5 | A |
| total device | | Rated V_R , $T_C = 149$ °C | 10 | |
| Non-repetitive peak surge current per leg | I_{FSM} | | 50 | |
| Peak repetitive forward current per leg | I_{FM} | Rated V_R , square wave, 20 kHz $T_C = 149$ °C | 10 | |
| Operating junction and storage temperatures | T_J, T_{Stg} | | -65 to +175 | °C |

ELECTRICAL SPECIFICATIONS PER LEG ($T_J = 25$ °C unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|-------------------------------------|---------------|--|------|------|------|---------|
| Breakdown voltage, blocking voltage | V_{BR}, V_R | $I_R = 100$ μ A | 200 | - | - | V |
| Forward voltage | V_F | $I_F = 5$ A, $T_J = 125$ °C | - | 0.87 | 0.99 | |
| | | $I_F = 10$ A, $T_J = 125$ °C | - | 1.02 | 1.20 | |
| | | $I_F = 10$ A | - | 1.12 | 1.25 | |
| Reverse leakage current | I_R | $V_R = V_R$ rated | - | - | 10 | μ A |
| | | $T_J = 150$ °C, $V_R = V_R$ rated | - | - | 250 | |
| Junction capacitance | C_T | $V_R = 200$ V | - | 8 | - | 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} | $I_F = 1.0\text{ A}$, $dI_F/dt = 50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | - | - | 35 | ns |
| | | $I_F = 0.5\text{ A}$, $I_R = 1.0\text{ A}$, $I_{REC} = 0.25\text{ A}$ | - | - | 25 | |
| | | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 24 | - | |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 35 | - | |
| Peak recovery current | I_{RRM} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 3.3 | - | A |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 5.0 | - | |
| Reverse recovery charge | Q_{rr} | $T_J = 25\text{ }^{\circ}\text{C}$ | - | 33 | - | nC |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | - | 76 | - | |

THERMAL MECHANICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|-------------------|---|--------------|------|------------|-----------------------------|
| Maximum junction and storage temperature range | T_J , T_{Stg} | | -65 | - | 175 | $^{\circ}\text{C}$ |
| Thermal resistance, junction to case per leg | R_{thJC} | | - | - | 5 | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, junction to ambient per leg | R_{thJA} | | - | - | 50 | |
| Thermal resistance, case to heatsink | R_{thCS} | Mounting surface, flat, smooth, and greased | - | 0.5 | - | |
| Weight | | | - | 2.0 | - | g |
| | | | - | 0.07 | - | oz. |
| Mounting torque | | | 6.0 (5.0) | - | 12 (10) | kgf · cm (lbf · in) |
| Marking device | | Case style TO-220AB 3L | MUR1020CT | | | |

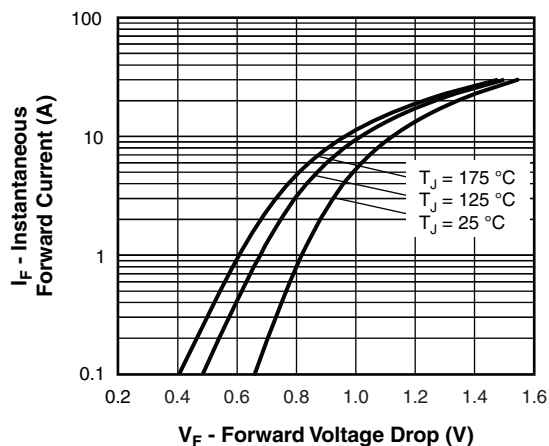


Fig. 1 - Typical Forward Voltage Drop Characteristics

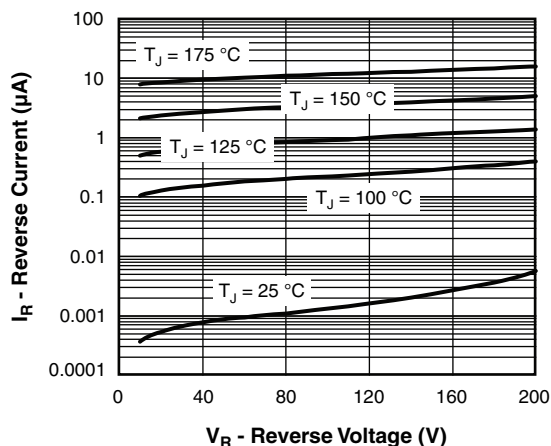


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

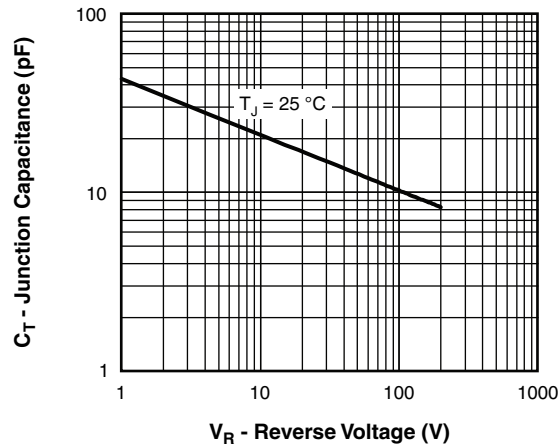


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

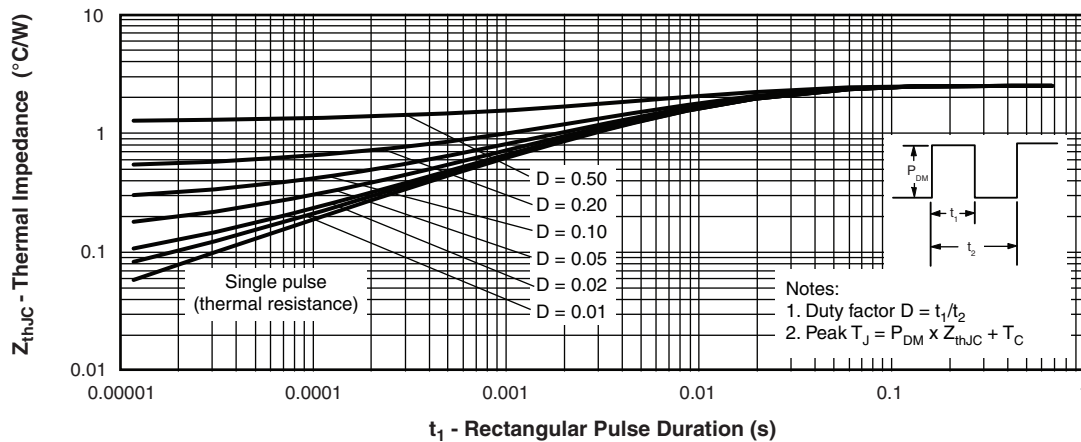
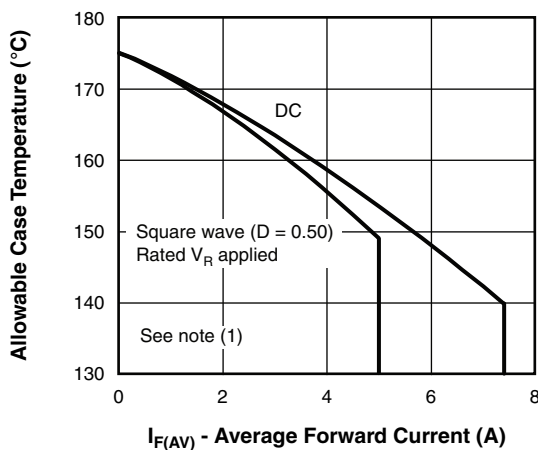

Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics


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

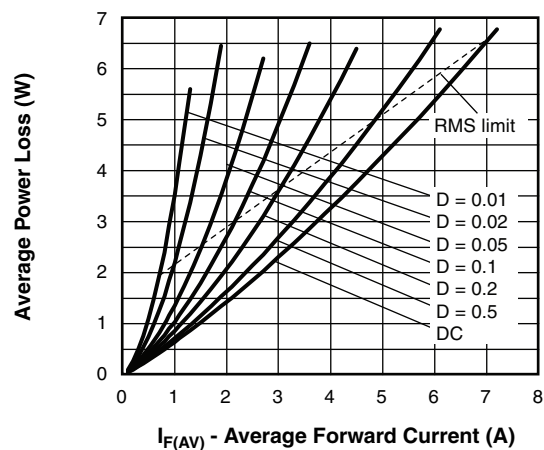


Fig. 6 - Forward Power Loss Characteristics

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. 6);
 P_{dREV} = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = Rated V_R

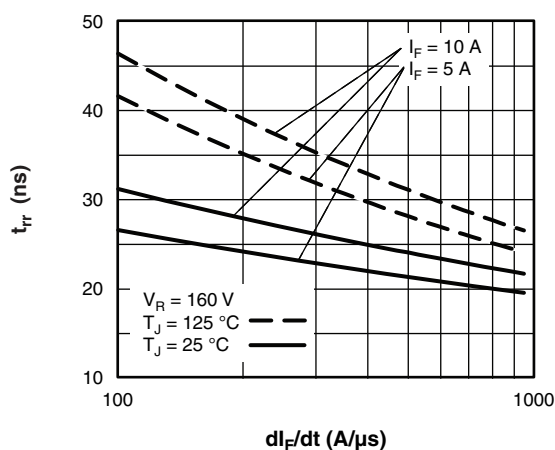
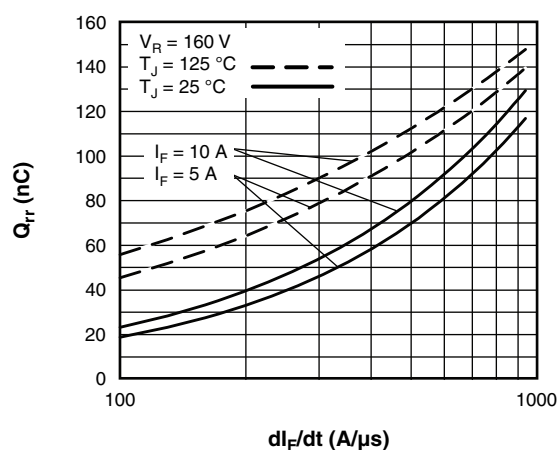
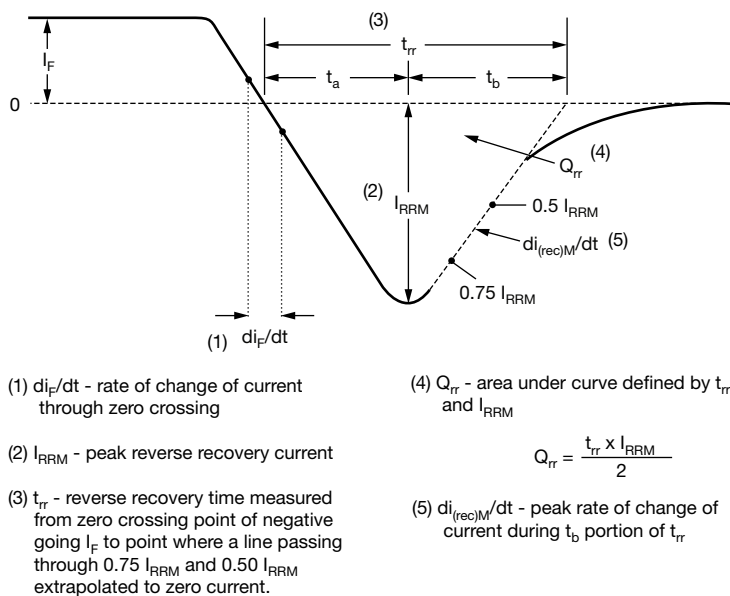

Fig. 7 - Typical Reverse Recovery Time vs. di_F/dt

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


Fig. 9 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

| | | | | | | |
|--------------------|------------|------------|-----------|-----------|-----------|------------|
| Device code | VS- | MUR | 10 | 20 | CT | -M3 |
| | 1 | 2 | 3 | 4 | 5 | 6 |

- 1 - Vishay Semiconductors product
- 2 - Ultrafast MUR series
- 3 - Current rating (10 = 10 A)
- 4 - Voltage rating (20 = 200 V)
- 5 - CT = center tap (dual) 3L TO-220AB, D²PAK (TO-263AB), TO-262AA
- 6 - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

ORDERING INFORMATION (Example)

| PREFERRED P/N | BASE QUANTITY | PACKAGING DESCRIPTION |
|-----------------|---------------|--------------------------|
| VS-MUR1020CT-M3 | 50 | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?96154 |
| Part marking information | www.vishay.com/doc?95028 |



TO-220AB 3L

DIMENSIONS in millimeters and inches



Conforms to JEDEC® outline TO-220AB

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

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



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