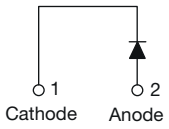
## Fast Soft Recovery Rectifier Diode, 20 A


TO-220 FullPAK 2L




### FEATURES

- Glass passivated pellet chip junction
- 150 °C max. operation junction temperature
- Designed and qualified according to JEDEC®-JESD 47
- Fully isolated package ($V_{INS}$ = 2500 $V_{RMS}$)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{F(AV)}$ | 20 A |
| $V_R$ | 1000 V, 1200 V |
| $V_F$ at $I_F$ | 1.31 V |
| $I_{FSM}$ | 320 A |
| $t_{rr}$ | 95 ns |
| $T_J$ max. | 150 °C |
| Snap factor | 0.6 |
| Package | TO-220 FullPAK 2L |
| Circuit configuration | Single |

### APPLICATIONS

These devices are intended for use in output rectification and freewheeling in inverters, choppers and converters as well as in input rectification where severe restrictions on conducted EMI should be met.

### DESCRIPTION

The VS-20ETF...FP... fast soft recovery rectifier series has been optimized for combined short reverse recovery time and low forward voltage drop.

The glass passivation ensures stable reliable operation in the most severe temperature and power cycling conditions.

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|---|---|---|---|
| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
| $V_{RRM}$ | | 1000, 1200 | V |
| $I_{F(AV)}$ | Sinusoidal waveform | 20 | A |
| $I_{FSM}$ | | 320 | |
| $t_{rr}$ | 1 A, 100 A/µs | 95 | ns |
| $V_F$ | 20 A, $T_J$ = 25 °C | 1.31 | V |
| $T_J$ | Range | -40 to +150 | °C |

| VOLTAGE RATINGS | | | |
|---|---|---|---|
| PART NUMBER | $V_{RRM}$, MAXIMUM PEAK REVERSE VOLTAGE V | $V_{RSM}$, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V | $I_{RRM}$ AT 150 °C mA |
| VS-20ETF10FP-M3 | 1000 | 1100 | 6 |
| VS-20ETF12FP-M3 | 1200 | 1300 | |

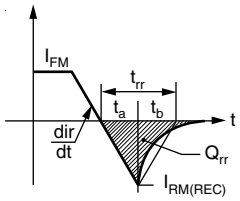
## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|
| Maximum average forward current | $I_{F(AV)}$ | $T_C$ = 50 °C, 180° conduction half sine wave | 20 | A |
| Maximum peak one cycle non-repetitive surge current | $I_{FSM}$ | 10 ms sine pulse, rated $V_{RRM}$ applied | 270 | A |
| | | 10 ms sine pulse, no voltage reapplied | 320 | A |
| Maximum $I^2t$ for fusing | $I^2t$ | 10 ms sine pulse, rated $V_{RRM}$ applied | 365 | $A^2s$ |
| | | 10 ms sine pulse, no voltage reapplied | 515 | $A^2s$ |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | t = 0.1 ms to 10 ms, no voltage reapplied | 5150 | $A^2\sqrt{s}$ |

## ELECTRICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---|---|---|---|---|---|
| Maximum forward voltage drop | $V_{FM}$ | 20 A, $T_J$ = 25 °C | | 1.31 | V |
| Forward slope resistance | $r_t$ | $T_J$ = 150 °C | | 11.88 | mΩ |
| Threshold voltage | $V_{F(TO)}$ | | | 0.93 | V |
| Maximum reverse leakage current | $I_{RM}$ | $T_J$ = 25 °C | $V_R$ = Rated $V_{RRM}$ | 0.1 | mA |
| | | $T_J$ = 150 °C | | 6 | mA |

## RECOVERY CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS | |
|---|---|---|---|---|---|
| Reverse recovery time | $t_{rr}$ | $I_F$ at 20 $A_{pk}$ 25 A/µs 25 °C | 400 | ns |  |
| Reverse recovery current | $I_{rr}$ | | 6.1 | A | |
| Reverse recovery charge | $Q_{rr}$ | | 1.7 | µC | |
| Snap factor | S | Typical | 0.6 | | |



## THERMAL - MECHANICAL SPECIFICATIONS

| PARAMETER | | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|---|
| Maximum junction and storage temperature range | | $T_J$, $T_{Stg}$ | | -40 to +150 | °C |
| Maximum thermal resistance, junction to case | | $R_{thJC}$ | DC operation | 2.5 | °C/W |
| Maximum thermal resistance, junction to ambient | | $R_{thJA}$ | | 62 | °C/W |
| Typical thermal resistance, case to heatsink | | $R_{thCS}$ | Mounting surface, smooth, and greased | 0.5 | °C/W |
| Approximate weight | | | | 2 | g |
| | | | | 0.07 | oz. |
| Mounting torque | minimum | | | 6 (5) | kgf · cm (lbf · in) |
| | maximum | | | 12 (10) | kgf · cm (lbf · in) |
| Marking device | | | Case style TO-220 FullPAK 2L | 20ETF10FP 20ETF12FP | |

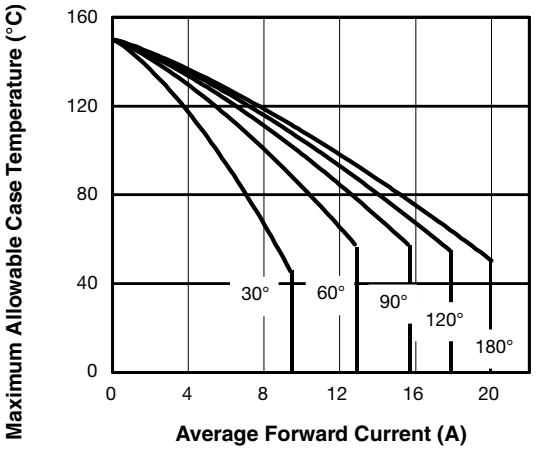



Fig. 1 - Current Rating Characteristics

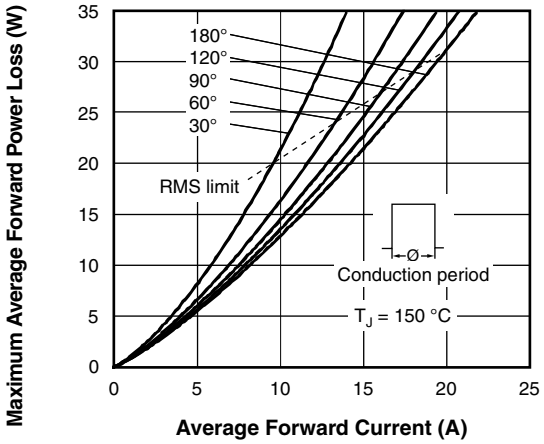



Fig. 4 - Forward Power Loss Characteristics

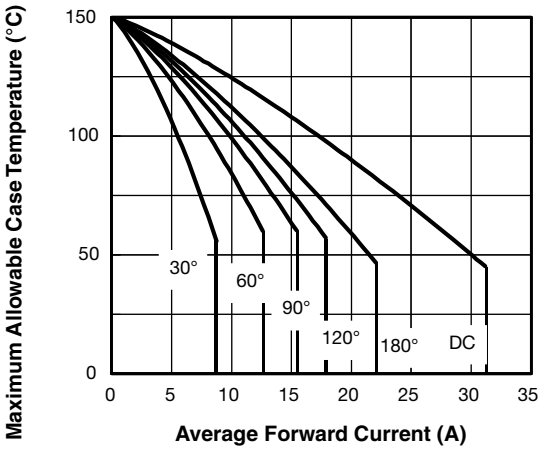



Fig. 2 - Current Rating Characteristics

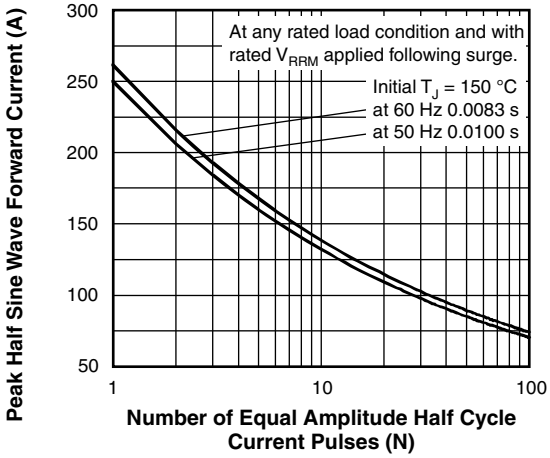



Fig. 5 - Maximum Non-Repetitive Surge Current

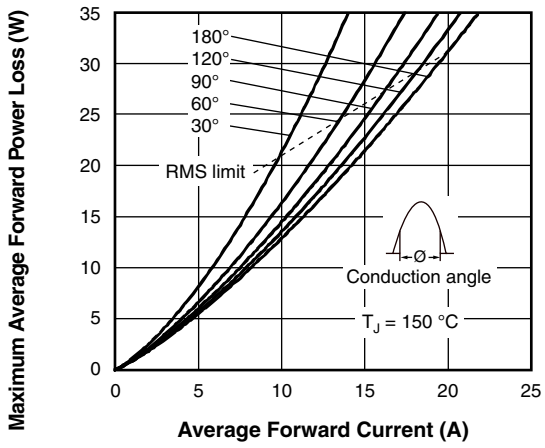



Fig. 3 - Forward Power Loss Characteristics

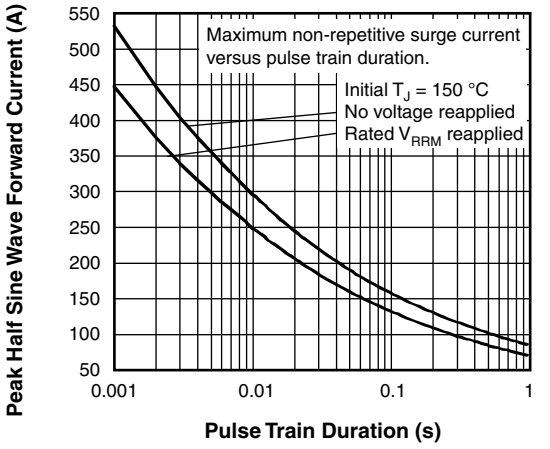



Fig. 6 - Maximum Non-Repetitive Surge Current

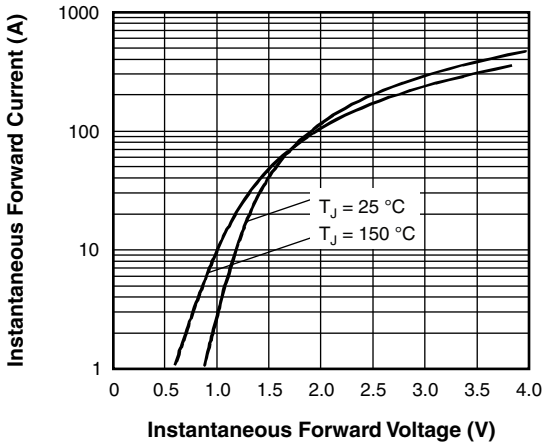



Fig. 7 - Forward Voltage Drop Characteristics

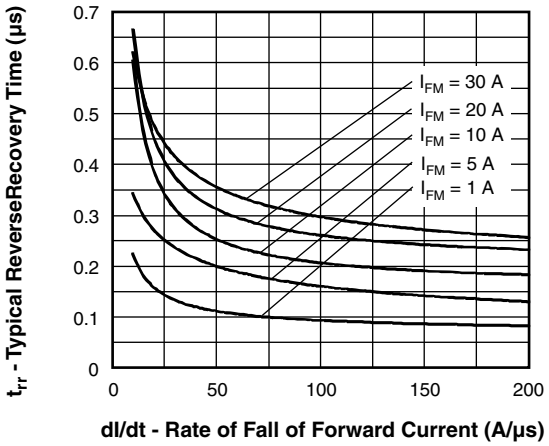



Fig. 8 - Recovery Time Characteristics, $T_J$ = 25 °C

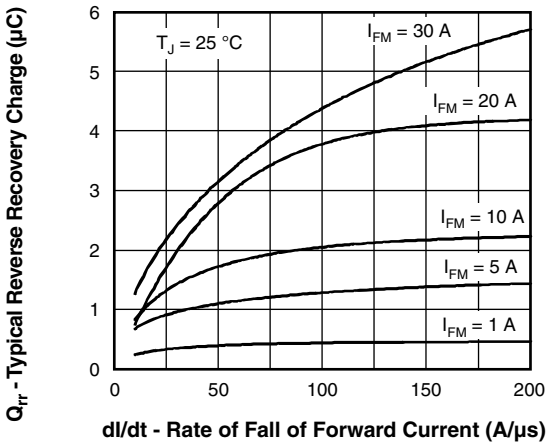



Fig. 10 - Recovery Charge Characteristics, $T_J$ = 25 °C

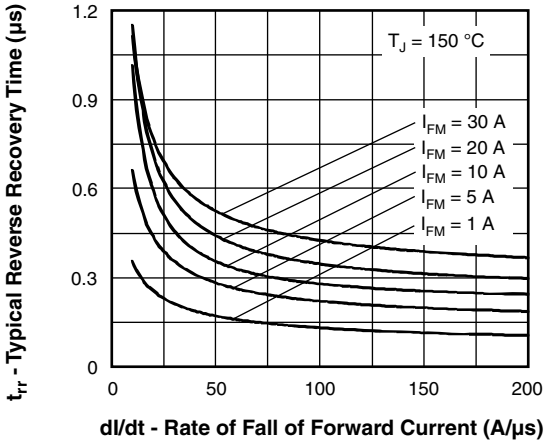



Fig. 9 - Recovery Time Characteristics, $T_J$ = 150 °C

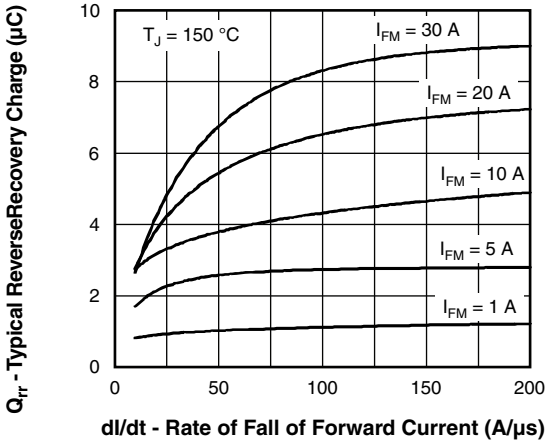



Fig. 11 - Recovery Charge Characteristics, $T_J$ = 150 °C

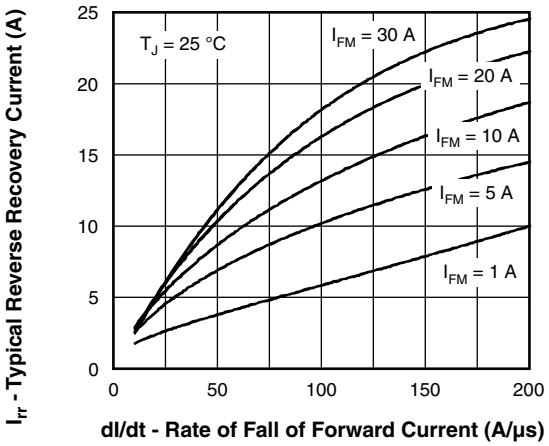



Fig. 12 - Recovery Current Characteristics, $T_J$ = 25 °C

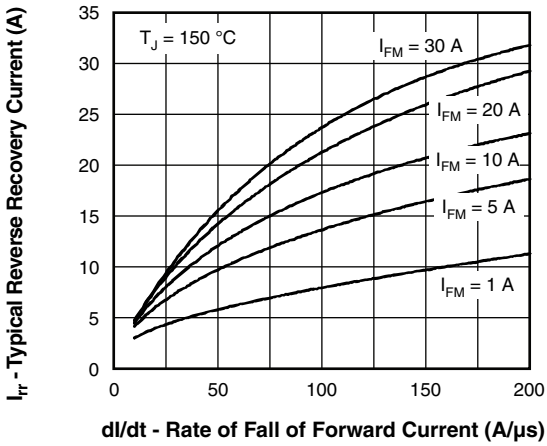



Fig. 13 - Recovery Current Characteristics, $T_J$ = 150 °C

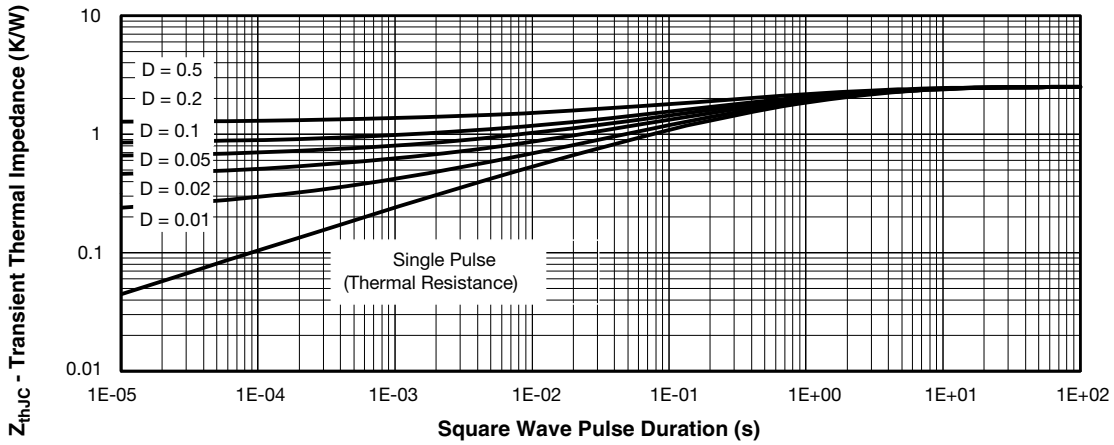



Fig. 14 - Thermal Impedance $Z_{thJC}$ Characteristics

## ORDERING INFORMATION TABLE

Device code

| VS- | 20 | E | T | F | 12 | FP | -M3 |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

1 - Vishay Semiconductors product

2 - Current rating (20 = 20 A)

3 - Circuit configuration:
E = single diode

4 - Package:
T = TO-220

5 - Type of silicon:
F = fast soft recovery rectifier

6 - Voltage code x 100 = $V_{RRM}$ (10 = 1000 V, 12 = 1200 V)

7 - FullPAK

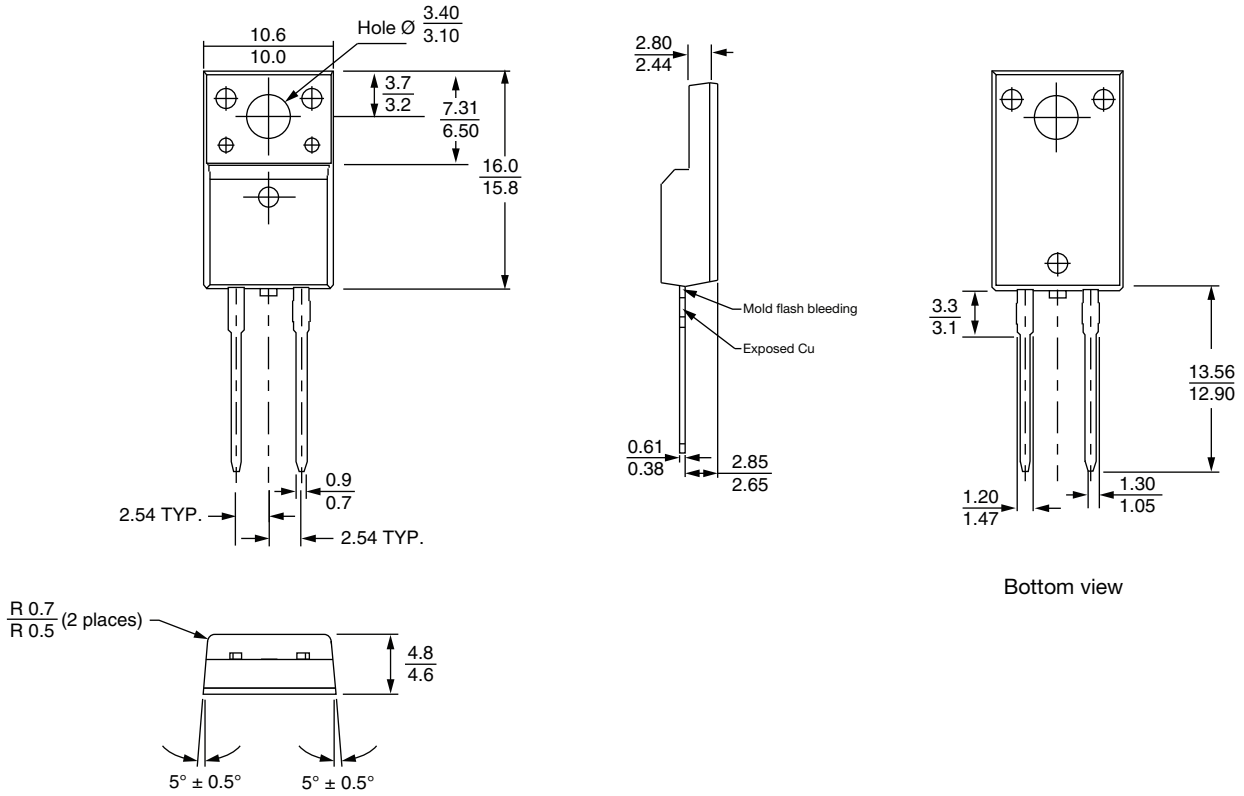
8 - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| **ORDERING INFORMATION** (Example) | | | |
|---|---|---|---|
| **PREFERRED P/N** | **QUANTITY PER T/R** | **MINIMUM ORDER QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-20ETF10FP-M3 | 50 | 1000 | Antistatic plastic tubes |
| VS-20ETF12FP-M3 | 50 | 1000 | Antistatic plastic tubes |

| **LINKS TO RELATED DOCUMENTS** | |
|---|---|
| Dimensions | www.vishay.com/doc?96157 |
| Part marking information | www.vishay.com/doc?95392 |

# 2L TO-220 FullPAK

**DIMENSIONS** in millimeters



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