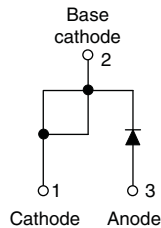




## High Voltage, Input Rectifier Diode, 20 A



TO-220 FULL-PAK



### FEATURES

- Very low forward voltage drop
- 150 °C max. operating junction temperature
- Designed and qualified according to JEDEC-JESD47
- Fully isolated package ( $V_{INS} = 2500 V_{RMS}$ )
- UL E78996 approved
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition (-M3 only)



**RoHS**  
COMPLIANT  
**HALOGEN**  
**FREE**  
Available

### PRODUCT SUMMARY

|                 |               |
|-----------------|---------------|
| Package         | TO-220FP      |
| $I_{F(AV)}$     | 20 A          |
| $V_R$           | 800 V, 1200 V |
| $V_F$ at $I_F$  | 1.1 V         |
| $I_{FSM}$       | 300 A         |
| $T_J$ max.      | 150 °C        |
| Diode variation | Single die    |

### APPLICATIONS

- Input rectification
- Vishay Semiconductors switches and output rectifiers which are available in identical package outlines

### DESCRIPTION

High voltage rectifiers optimized for very low forward voltage drop with moderate leakage.

These devices are intended for use in main rectification (single or three phase bridge).

### OUTPUT CURRENT IN TYPICAL APPLICATIONS

| APPLICATIONS                                                                                      | SINGLE-PHASE BRIDGE | THREE-PHASE BRIDGE | UNITS |
|---------------------------------------------------------------------------------------------------|---------------------|--------------------|-------|
| Capacitive input filter $T_A = 55\text{ °C}$ , $T_J = 125\text{ °C}$<br>common heatsink of 1 °C/W | 18                  | 22                 | A     |

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS            | VALUES      | UNITS |
|-------------|----------------------------|-------------|-------|
| $I_{F(AV)}$ | Sinusoidal waveform        | 20          | A     |
| $V_{RRM}$   | Range                      | 800/1200    | V     |
| $I_{FSM}$   |                            | 300         | A     |
| $V_F$       | 10 A, $T_J = 25\text{ °C}$ | 1.0         | V     |
| $T_J$       |                            | - 40 to 150 | °C    |

### VOLTAGE RATINGS

| PART NUMBER                      | $V_{RRM}$ , MAXIMUM<br>PEAK REVERSE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM NON-REPETITIVE<br>PEAK REVERSE VOLTAGE<br>V | $I_{RRM}$<br>AT 150 °C<br>mA |
|----------------------------------|--------------------------------------------------|-----------------------------------------------------------------|------------------------------|
| VS-20ETS08FPPbF, VS-20ETS08FP-M3 | 800                                              | 900                                                             | 1                            |
| VS-20ETS12FPPbF, VS-20ETS12FP-M3 | 1200                                             | 1300                                                            |                              |



| ABSOLUTE MAXIMUM RATINGS                            |               |                                                                     |        |                             |
|-----------------------------------------------------|---------------|---------------------------------------------------------------------|--------|-----------------------------|
| PARAMETER                                           | SYMBOL        | TEST CONDITIONS                                                     | VALUES | UNITS                       |
| Maximum average forward current                     | $I_{F(AV)}$   | $T_C = 51\text{ }^{\circ}\text{C}$ , 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                           | 250    |                             |
|                                                     |               | 10 ms sine pulse, no voltage reapplied                              | 300    |                             |
| Maximum $I^2t$ for fusing                           | $I^2t$        | 10 ms sine pulse, rated $V_{RRM}$ applied                           | 316    | $\text{A}^2\text{s}$        |
|                                                     |               | 10 ms sine pulse, no voltage reapplied                              | 442    |                             |
| Maximum $I^2\sqrt{t}$ for fusing                    | $I^2\sqrt{t}$ | $t = 0.1\text{ ms to }10\text{ ms}$ , no voltage reapplied          | 4420   | $\text{A}^2\sqrt{\text{s}}$ |

| ELECTRICAL SPECIFICATIONS       |             |                                          |        |                  |
|---------------------------------|-------------|------------------------------------------|--------|------------------|
| PARAMETER                       | SYMBOL      | TEST CONDITIONS                          | VALUES | UNITS            |
| Maximum forward voltage drop    | $V_{FM}$    | 20 A, $T_J = 25\text{ }^{\circ}\text{C}$ | 1.1    | V                |
| Forward slope resistance        | $r_t$       | $T_J = 150\text{ }^{\circ}\text{C}$      | 10.4   | $\text{m}\Omega$ |
| Threshold voltage               | $V_{F(TO)}$ |                                          | 0.85   | V                |
| Maximum reverse leakage current | $I_{RM}$    | $T_J = 25\text{ }^{\circ}\text{C}$       | 0.1    | mA               |
|                                 |             | $T_J = 150\text{ }^{\circ}\text{C}$      | 1.0    |                  |

| THERMAL - MECHANICAL SPECIFICATIONS             |                                   |                                      |             |                        |
|-------------------------------------------------|-----------------------------------|--------------------------------------|-------------|------------------------|
| PARAMETER                                       | SYMBOL                            | TEST CONDITIONS                      | VALUES      | UNITS                  |
| Maximum junction and storage temperature range  | T <sub>J</sub> , T <sub>Stg</sub> |                                      | - 40 to 150 | °C                     |
| Maximum thermal resistance, junction to case    | R <sub>thJC</sub>                 | DC operation                         | 2.8         | °C/W                   |
| Maximum thermal resistance, junction to ambient | R <sub>thJA</sub>                 |                                      | 62          |                        |
| Typical thermal resistance, case to heatsink    | R <sub>thCS</sub>                 | Mounting surface, smooth and greased | 0.5         |                        |
| Approximate weight                              |                                   |                                      | 2           | g                      |
|                                                 |                                   |                                      | 0.07        | oz.                    |
| Mounting torque                                 | minimum                           |                                      | 6.0 (5.0)   | kgf · cm<br>(lbf · in) |
|                                                 | maximum                           |                                      | 12 (10)     |                        |
| Marking device                                  |                                   | Case style TO-220 FULL-PAK (94/V0)   | 20ETS08FP   |                        |
|                                                 |                                   |                                      | 20ETS12FP   |                        |

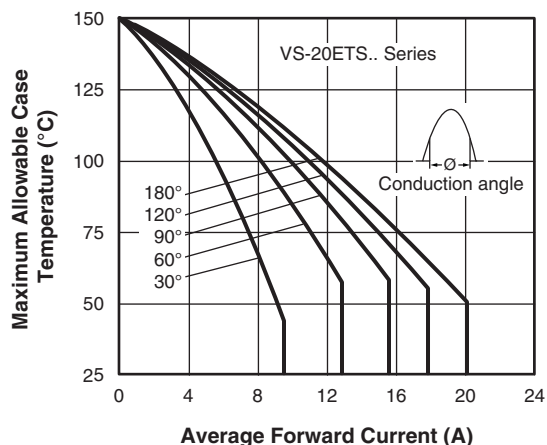


Fig. 1 - Current Rating Characteristics

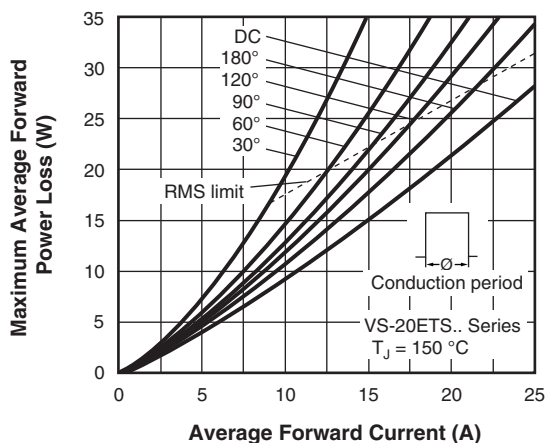


Fig. 4 - Forward Power Loss Characteristics

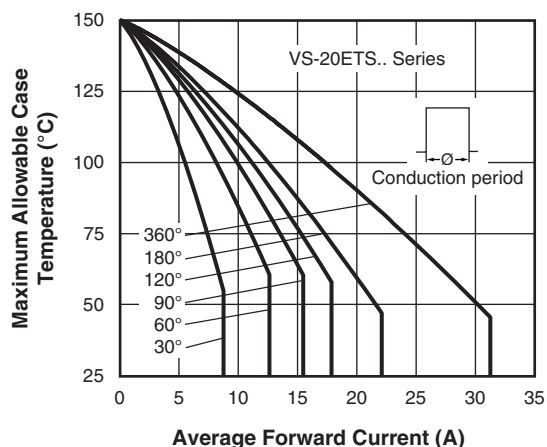


Fig. 2 - Current Rating Characteristics

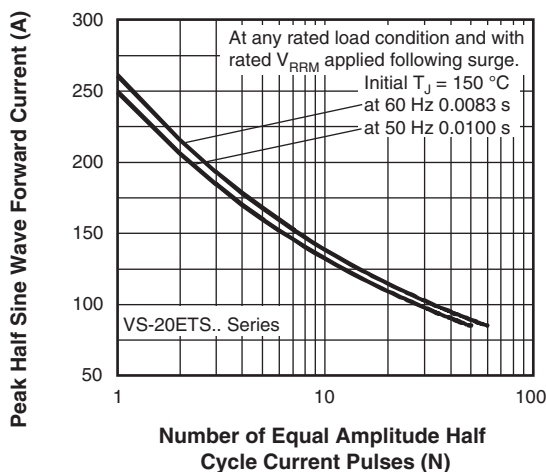


Fig. 5 - Maximum Non-Repetitive Surge Current

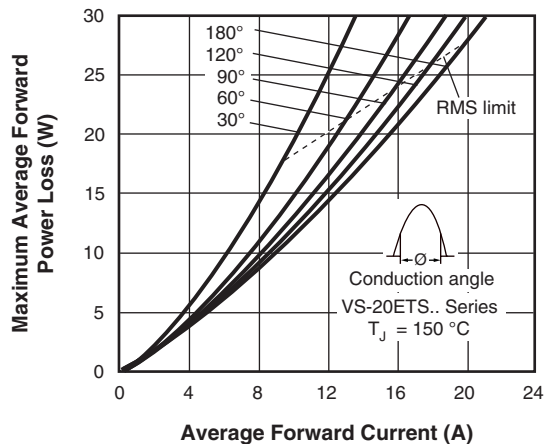


Fig. 3 - Forward Power Loss Characteristics

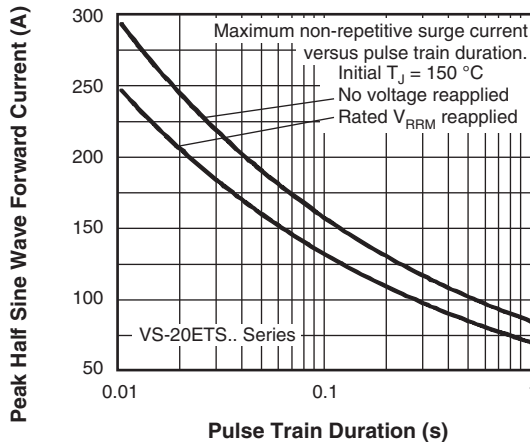


Fig. 6 - Maximum Non-Repetitive Surge Current

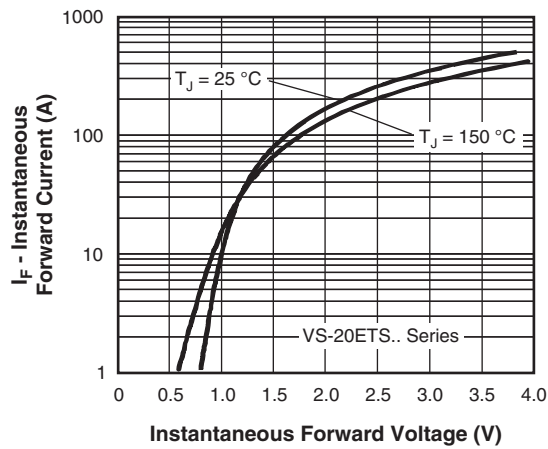


Fig. 7 - Forward Voltage Drop Characteristics

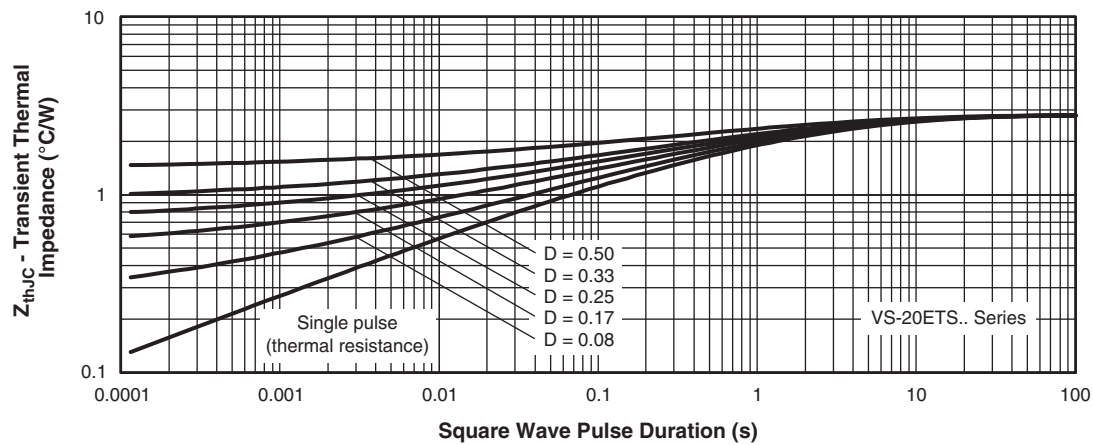


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics



## ORDERING INFORMATION TABLE

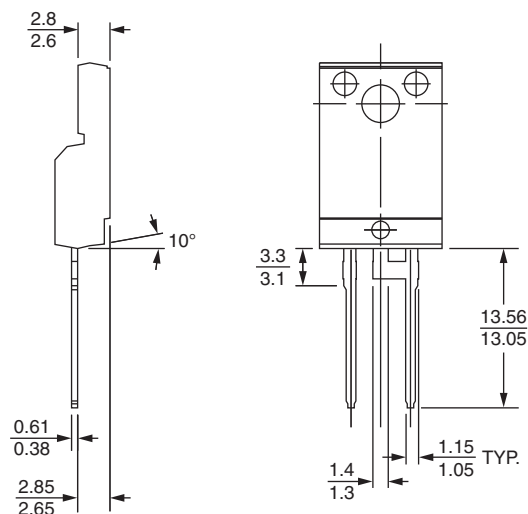
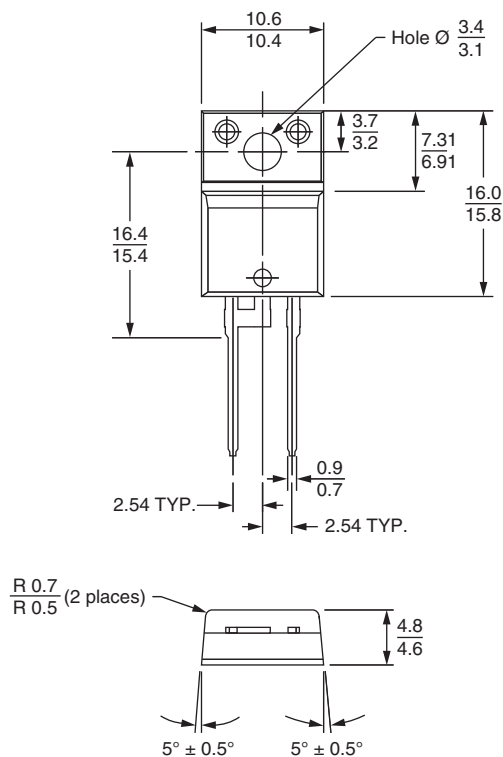
| Device code                                                        | VS-                             | 20 | E | T | S | 12 | FP | PbF |
|--------------------------------------------------------------------|---------------------------------|----|---|---|---|----|----|-----|
|                                                                    | 1                               | 2  | 3 | 4 | 5 | 6  | 7  | 8   |
| 1                                                                  | - Vishay Semiconductors product |    |   |   |   |    |    |     |
| 2                                                                  | - Current rating (20 = 20 A)    |    |   |   |   |    |    |     |
|                                                                    | - Circuit configuration:        |    |   |   |   |    |    |     |
| 3                                                                  | E = Single diode                |    |   |   |   |    |    |     |
|                                                                    | - Package:                      |    |   |   |   |    |    |     |
| 4                                                                  | T = TO-220                      |    |   |   |   |    |    |     |
|                                                                    | - Type of silicon:              |    |   |   |   |    |    |     |
| 5                                                                  | S = Standard recovery rectifier |    |   |   |   |    |    |     |
| 6                                                                  | - Voltage ratings               |    |   |   |   |    |    |     |
| 7                                                                  | - FULL-PAK                      |    |   |   |   |    |    |     |
| 8                                                                  | - Environmental digit:          |    |   |   |   |    |    |     |
| PbF = Lead (Pb)-free and RoHS compliant                            |                                 |    |   |   |   |    |    |     |
| -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-20ETS08FPPbF                | 50               | 1000                   | Antistatic plastic tubes |
| VS-20ETS08FP-M3                | 50               | 1000                   | Antistatic plastic tubes |
| VS-20ETS12FPPbF                | 50               | 1000                   | Antistatic plastic tubes |
| VS-20ETS12FP-M3                | 50               | 1000                   | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS |               |                                                                        |
|----------------------------|---------------|------------------------------------------------------------------------|
| Dimensions                 |               | <a href="http://www.vishay.com/doc?95005">www.vishay.com/doc?95005</a> |
| Part marking information   | TO-220 FP PbF | <a href="http://www.vishay.com/doc?95009">www.vishay.com/doc?95009</a> |
|                            | TO-220 FP -M3 | <a href="http://www.vishay.com/doc?95440">www.vishay.com/doc?95440</a> |



**DIMENSIONS** in millimeters



#### Lead assignments

##### Diodes

1 + 2 - Cathode  
3 - Anode

Conforms to JEDEC outline TO-220 FULL-PAK



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