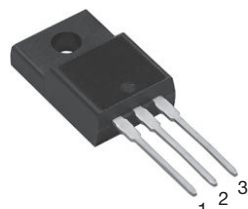
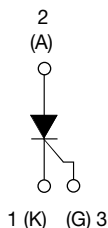




## Thyristor High Voltage, Phase Control SCR, 25 A



TO-220AB FULL-PAK



## FEATURES

- Designed and qualified for industrial level
- Fully isolated package ( $V_{INS} = 2500 V_{RMS}$ )
- UL E78996 approved
- 125 °C max. operating junction temperature
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

## APPLICATIONS

- Typical usage is in input rectification crowbar (soft start) and AC switch in motor control, UPS, welding, and battery charge

## DESCRIPTION

The VS-25TTS...FP... high voltage series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications. The glass passivation technology used has reliable operation up to 125 °C junction temperature.

## PRODUCT SUMMARY

|                   |                  |
|-------------------|------------------|
| Package           | TO-220AB FP      |
| Diode variation   | Single SCR       |
| $I_{T(AV)}$       | 16 A             |
| $V_{DRM}/V_{RRM}$ | 800 V, 1200 V    |
| $V_{TM}$          | 1.25 V           |
| $I_{GT}$          | 45 mA            |
| $T_J$             | -40 °C to 125 °C |

## OUTPUT CURRENT IN TYPICAL APPLICATIONS

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

## MAJOR RATINGS AND CHARACTERISTICS

| PARAMETER         | TEST CONDITIONS     | VALUES     | UNITS      |
|-------------------|---------------------|------------|------------|
| $I_{T(AV)}$       | Sinusoidal waveform | 16         | A          |
| $I_{RMS}$         |                     | 25         |            |
| $V_{RRM}/V_{DRM}$ |                     | 800/1200   | V          |
| $I_{TSM}$         |                     | 350        | A          |
| $V_T$             | 16 A, $T_J = 25$ °C | 1.25       | V          |
| $dV/dt$           |                     | 500        | V/ $\mu$ s |
| $dI/dt$           |                     | 150        | A/ $\mu$ s |
| $T_J$             |                     | -40 to 125 | °C         |

## VOLTAGE RATINGS

| PART NUMBER                      | $V_{RRM}$ , MAXIMUM PEAK<br>REVERSE VOLTAGE<br>V | $V_{DRM}$ , MAXIMUM PEAK<br>DIRECT VOLTAGE<br>V | $I_{RRM}/I_{DRM}$<br>AT 125 °C<br>mA |
|----------------------------------|--------------------------------------------------|-------------------------------------------------|--------------------------------------|
| VS-25TTS08FPPbF, VS-25TTS08FP-M3 | 800                                              | 800                                             | 10                                   |
| VS-25TTS12FPPbF, VS-25TTS12FP-M3 | 1200                                             | 1200                                            |                                      |



| ABSOLUTE MAXIMUM RATINGS                              |                 |                                                                                                     |        |      |               |
|-------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------|--------|------|---------------|
| PARAMETER                                             | SYMBOL          | TEST CONDITIONS                                                                                     | VALUES |      | UNITS         |
|                                                       |                 |                                                                                                     | TYP.   | MAX. |               |
| Maximum average on-state current                      | $I_{T(AV)}$     | $T_C = 51\text{ }^{\circ}\text{C}$ , 180° conduction half sine wave                                 | 16     |      | A             |
| Maximum RMS on-state current                          | $I_{RMS}$       |                                                                                                     | 25     |      |               |
| Maximum peak, one-cycle, non-repetitive surge current | $I_{TSM}$       | 10 ms sine pulse, rated $V_{RRM}$ applied                                                           | 300    |      |               |
|                                                       |                 | 10 ms sine pulse, no voltage reapplied                                                              | 350    |      |               |
| Maximum $I^2t$ for fusing                             | $I^2t$          | 10 ms sine pulse, rated $V_{RRM}$ applied                                                           | 450    |      | $A^2s$        |
|                                                       |                 | 10 ms sine pulse, no voltage reapplied                                                              | 630    |      |               |
| Maximum $I^2\sqrt{t}$ for fusing                      | $I^2\sqrt{t}$   | $t = 0.1\text{ ms to } 10\text{ ms}$ , no voltage reapplied                                         | 6300   |      | $A^2\sqrt{s}$ |
| Maximum on-state voltage drop                         | $V_{TM}$        | 16 A, $T_J = 25\text{ }^{\circ}\text{C}$                                                            | 1.25   |      | V             |
| On-state slope resistance                             | $r_t$           | $T_J = 125\text{ }^{\circ}\text{C}$                                                                 | 12.0   |      | $m\Omega$     |
| Threshold voltage                                     | $V_{T(TO)}$     |                                                                                                     | 1.0    |      | V             |
| Maximum reverse and direct leakage current            | $I_{RM}/I_{DM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                                  | 0.5    |      | mA            |
|                                                       |                 | $T_J = 125\text{ }^{\circ}\text{C}$                                                                 | 10     |      |               |
| Holding current                                       | $I_H$           | Anode supply = 6 V, resistive load, initial $I_T = 1\text{ A}$ , $T_J = 25\text{ }^{\circ}\text{C}$ | -      | 150  |               |
| Maximum latching current                              | $I_L$           | Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$                              | 200    |      |               |
| Maximum rate of rise of off-state voltage             | $dV/dt$         | $T_J = T_J\text{ max.}$ , linear to 80 %, $V_{DRM} = R_g - k = \text{Open}$                         | 500    |      | $V/\mu s$     |
| Maximum rate of rise of turned-on current             | $dI/dt$         |                                                                                                     | 150    |      | $A/\mu s$     |

| TRIGGERING                                  |             |                                                                         |        |  |       |
|---------------------------------------------|-------------|-------------------------------------------------------------------------|--------|--|-------|
| PARAMETER                                   | SYMBOL      | TEST CONDITIONS                                                         | VALUES |  | UNITS |
| Maximum peak gate power                     | $P_{GM}$    |                                                                         | 8.0    |  | W     |
| Maximum average gate power                  | $P_{G(AV)}$ |                                                                         | 2.0    |  |       |
| Maximum peak positive gate current          | $+I_{GM}$   |                                                                         | 1.5    |  | A     |
| Maximum peak negative gate voltage          | $-V_{GM}$   |                                                                         | 10     |  | V     |
| Maximum required DC gate current to trigger | $I_{GT}$    | Anode supply = 6 V, resistive load, $T_J = -10\text{ }^{\circ}\text{C}$ | 60     |  | mA    |
|                                             |             | Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$  | 45     |  |       |
|                                             |             | Anode supply = 6 V, resistive load, $T_J = 125\text{ }^{\circ}\text{C}$ | 20     |  |       |
| Maximum required DC gate voltage to trigger | $V_{GT}$    | Anode supply = 6 V, resistive load, $T_J = -10\text{ }^{\circ}\text{C}$ | 2.5    |  | V     |
|                                             |             | Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$  | 2.0    |  |       |
|                                             |             | Anode supply = 6 V, resistive load, $T_J = 125\text{ }^{\circ}\text{C}$ | 1.0    |  |       |
| Maximum DC gate voltage not to trigger      | $V_{GD}$    | $T_J = 125\text{ }^{\circ}\text{C}$ , $V_{DRM} = \text{Rated value}$    | 0.25   |  | mA    |
| Maximum DC gate current not to trigger      | $I_{GD}$    |                                                                         | 2.0    |  |       |

| SWITCHING                     |          |                                     |        |  |         |
|-------------------------------|----------|-------------------------------------|--------|--|---------|
| PARAMETER                     | SYMBOL   | TEST CONDITIONS                     | VALUES |  | UNITS   |
| Typical turn-on time          | $t_{gt}$ | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.9    |  | $\mu s$ |
| Typical reverse recovery time | $t_{rr}$ | $T_J = 125\text{ }^{\circ}\text{C}$ | 4      |  |         |
| Typical turn-off time         | $t_q$    |                                     | 110    |  |         |



| THERMAL AND MECHANICAL SPECIFICATIONS           |                                   |                                      |            |                        |
|-------------------------------------------------|-----------------------------------|--------------------------------------|------------|------------------------|
| PARAMETER                                       | SYMBOL                            | TEST CONDITIONS                      | VALUES     | UNITS                  |
| Maximum junction and storage temperature range  | T <sub>J</sub> , T <sub>Stg</sub> |                                      | -40 to 125 | °C                     |
| Maximum thermal resistance, junction to case    | R <sub>thJC</sub>                 | DC operation                         | 2.5        | °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                                 |                                   |                                      | 6 (5)      | kgf · cm<br>(lbf · in) |
|                                                 |                                   |                                      | 12 (10)    |                        |
| Marking device                                  |                                   | Case style TO-220AB FULL-PAK (94/V0) | 25TTS08FP  |                        |
|                                                 |                                   |                                      | 25TTS12FP  |                        |

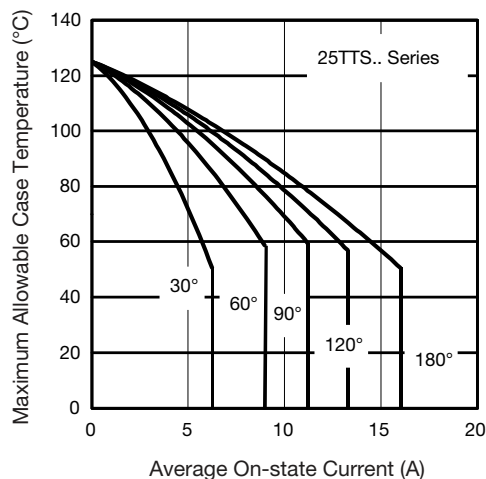


Fig. 1 - Current Rating Characteristics

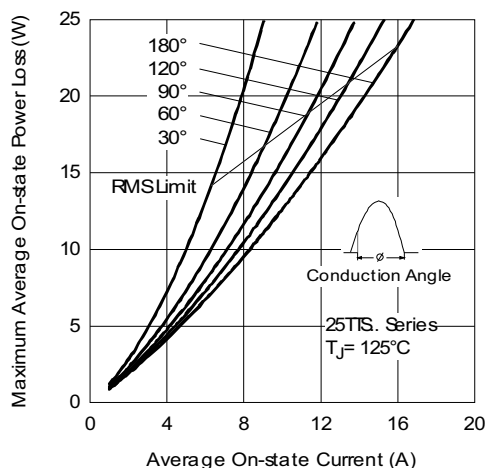


Fig. 3 - On-State Power Loss Characteristics

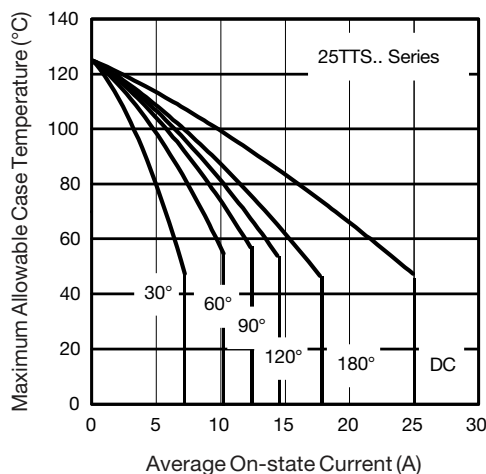


Fig. 2 - Current Rating Characteristics

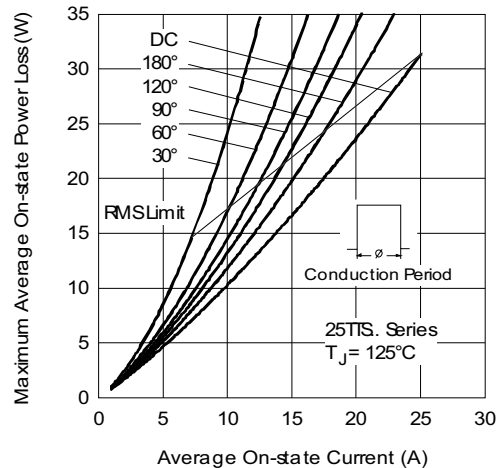


Fig. 4 - On-State Power Loss Characteristics

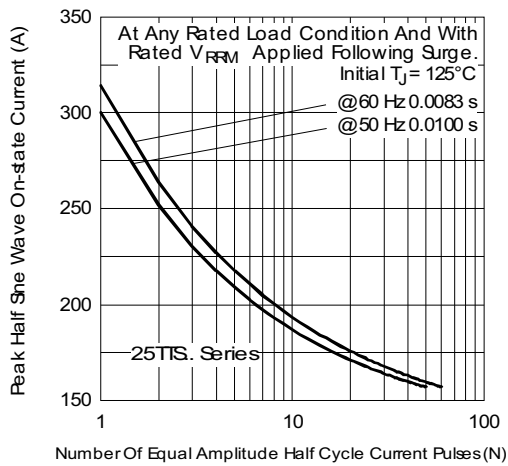


Fig. 5 - Maximum Non-Repetitive Surge Current

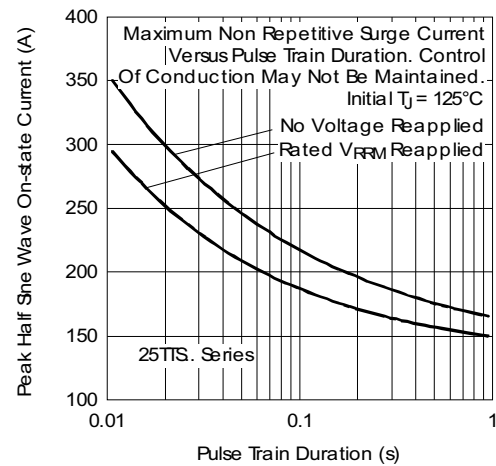


Fig. 6 - Maximum Non-Repetitive Surge Current

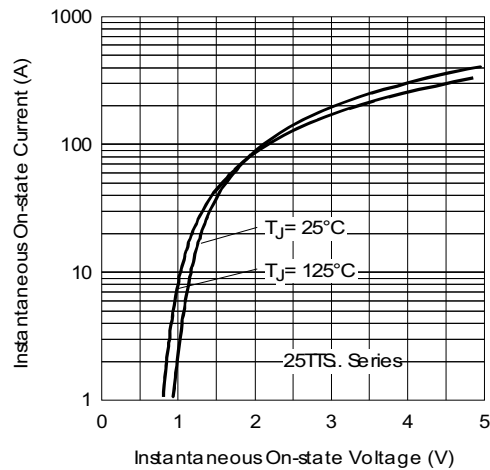


Fig. 7 - On-State Voltage Drop Characteristics

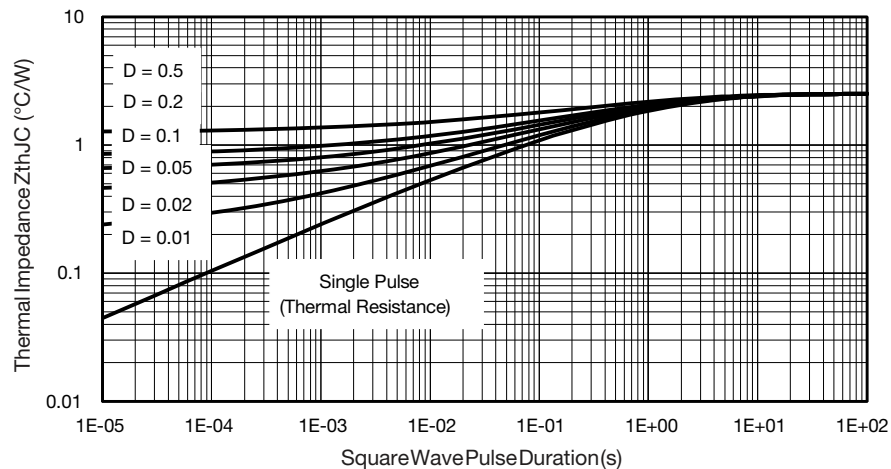


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

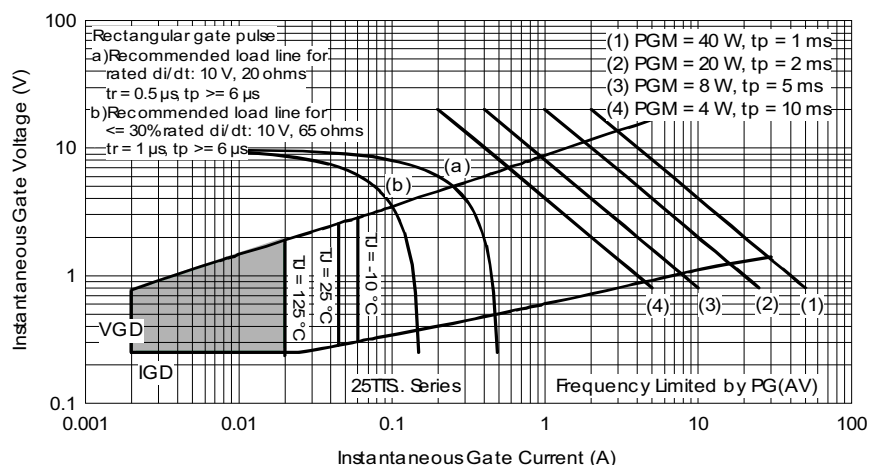


Fig. 9 - Gate Characteristics

## ORDERING INFORMATION TABLE

| Device code | VS- | 25 | T | T | S | 12 | FP | PbF |
|-------------|-----|----|---|---|---|----|----|-----|
|             | 1   | 2  | 3 | 4 | 5 | 6  | 7  | 8   |

- 1** - Vishay Semiconductors product
- 2** - Current rating (25 = 25 A)
- 3** - Circuit configuration:  
T = Single thyristor
- 4** - Package:  
T = TO-220AB
- 5** - Type of silicon:  
Standard recovery rectifier
- 6** - Voltage code x 100 =  $V_{RRM}$  — 08 = 800 V  
12 = 1200 V
- 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)

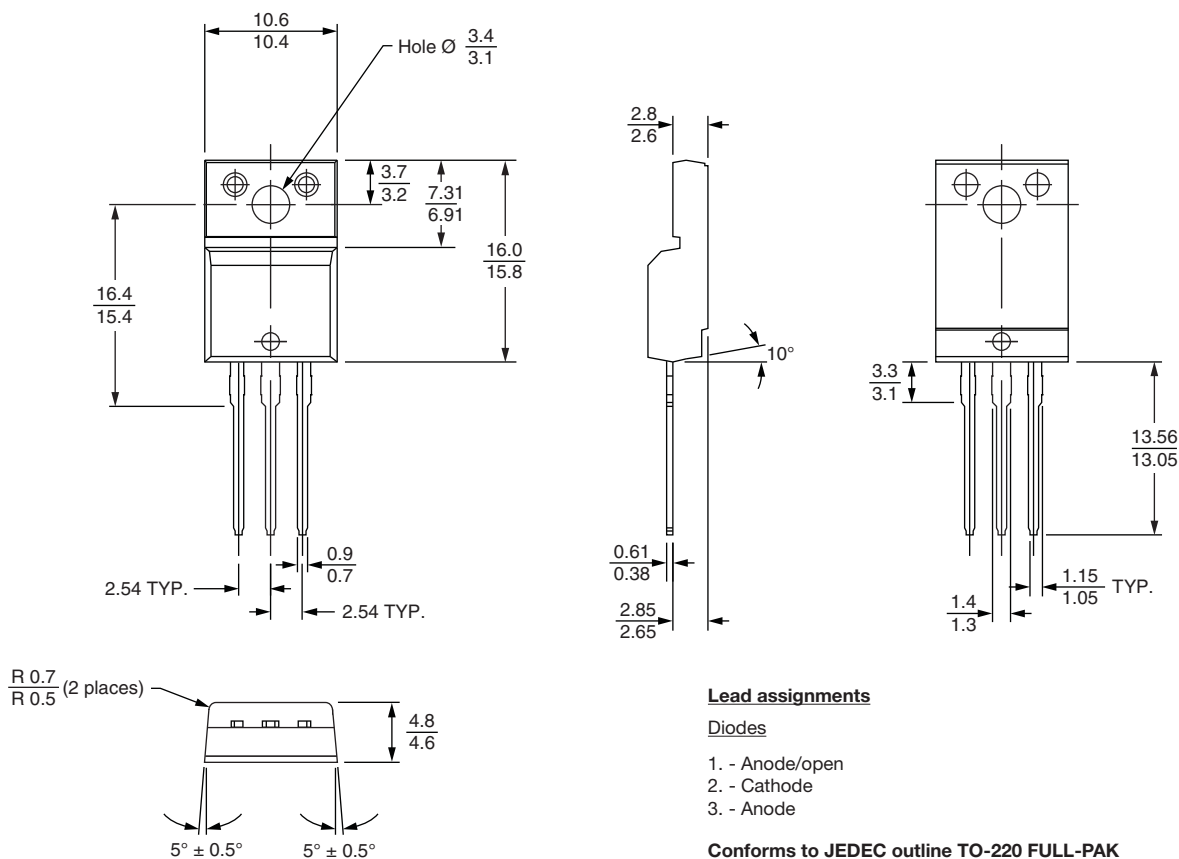
| PREFERRED P/N   | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION    |
|-----------------|------------------|------------------------|--------------------------|
| VS-25TTS08FPPbF | 50               | 1000                   | Antistatic plastic tubes |
| VS-25TTS08FP-M3 | 50               | 1000                   | Antistatic plastic tubes |
| VS-25TTS12FPPbF | 50               | 1000                   | Antistatic plastic tubes |
| VS-25TTS12FP-M3 | 50               | 1000                   | Antistatic plastic tubes |

## LINKS TO RELATED DOCUMENTS

|                          |              |                                                                        |
|--------------------------|--------------|------------------------------------------------------------------------|
| Dimensions               |              | <a href="http://www.vishay.com/doc?95072">www.vishay.com/doc?95072</a> |
| Part marking information | TO-220FP PbF | <a href="http://www.vishay.com/doc?95069">www.vishay.com/doc?95069</a> |
|                          | TO-220FP -M3 | <a href="http://www.vishay.com/doc?95456">www.vishay.com/doc?95456</a> |



## DIMENSIONS in millimeters



### Lead assignments

#### Diodes

1. - Anode/open
2. - Cathode
3. - Anode

Conforms to JEDEC outline TO-220 FULL-PAK



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