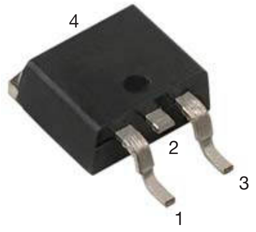
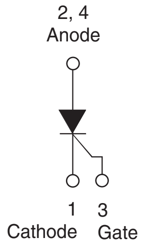
# Thyristor Surface Mount, Phase Control SCR, 8 A



**TO-263AB (D²PAK)**



## FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Designed and qualified according JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS
COMPLIANT
HALOGEN
FREE

## APPLICATIONS

- Input rectification and crow-bar (soft start)
- Vishay input diodes, switches and output rectifiers which are available in identical package outlines

## DESCRIPTION

The VS-12TTS08SPbF 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-263AB (D²PAK) |
| Diode variation | Single SCR |
| $I_{T(AV)}$ | 8 A |
| $V_{DRM}/V_{RRM}$ | 800 V |
| $V_{TM}$ | 1.2 V |
| $I_{GT}$ | 15 mA |
| $T_J$ | -40 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 | 13.5 | 17 | A |

### MAJOR RATINGS AND CHARACTERISTICS

| PARAMETER | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|
| $I_{T(AV)}$ | Sinusoidal waveform | 8 | A |
| $I_{T(RMS)}$ | | 12.5 | |
| $V_{RRM}/V_{DRM}$ | | 800 | V |
| $I_{TSM}$ | | 110 | A |
| $V_T$ | 8 A, $T_J$ = 25 °C | 1.2 | V |
| dV/dt | | 150 | V/µs |
| dI/dt | | 100 | A/µs |
| $T_J$ | Range | -40 to +125 | °C |

### VOLTAGE RATINGS

| PART NUMBER | $V_{RRM}$, MAXIMUM PEAK REVERSE VOLTAGE V | $V_{DRM}$, MAXIMUM PEAK DIRECT VOLTAGE V | $I_{RRM}/I_{DRM}$ AT 125 °C mA |
|---|---|---|---|
| VS-12TTS08SPbF | 800 | 800 | 1.0 |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|
| Maximum average on-state current | $I_{T(AV)}$ | $T_C$ = 108 °C, 180° conduction, half sine wave | 8 | A |
| Maximum RMS on-state current | $I_{T(RMS)}$ | | 12.5 | |
| Maximum peak one-cycle non-repetitive surge current | $I_{TSM}$ | 10 ms sine pulse, rated $V_{RRM}$ applied, $T_J$ = 125 °C | 95 | |
| | | 10 ms sine pulse, no voltage reapplied, $T_J$ = 125 °C | 110 | |
| Maximum $I^2t$ for fusing | $I^2t$ | 10 ms sine pulse, rated $V_{RRM}$ applied, $T_J$ = 125 °C | 45 | $A^2s$ |
| | | 10 ms sine pulse, no voltage reapplied, $T_J$ = 125 °C | 64 | |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | t = 0.1 ms to 10 ms, no voltage reapplied, $T_J$ = 125 °C | 640 | $A^2\sqrt{s}$ |
| Maximum on-state voltage drop | $V_{TM}$ | 8 A, $T_J$ = 25 °C | 1.2 | V |
| On-state slope resistance | $r_t$ | $T_J$ = 125 °C | 16.2 | mΩ |
| Threshold voltage | $V_{T(TO)}$ | | 0.87 | V |
| Maximum reverse and direct leakage current | $I_{RM}/I_{DM}$ | $T_J$ = 25 °C, $V_R$ = Rated $V_{RRM}/V_{DRM}$ | 0.05 | mA |
| | | $T_J$ = 125 °C | 1.0 | |
| Typical holding current | $I_H$ | Anode supply = 6 V, resistive load, initial $I_T$ = 1 A, $T_J$ = 25 °C | 30 | |
| Maximum latching current | $I_L$ | Anode supply = 6 V, resistive load, $T_J$ = 25 °C | 50 | |
| Maximum rate of rise of off-state voltage | dV/dt | $T_J$ = $T_J$ max., linear to 80 %, $V_{DRM}$ = $R_g$ - k = Open | 150 | V/µs |
| Maximum rate of rise of turned-on current | dI/dt | | 100 | A/µs |

## 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, $T_J$ = - 65 °C | 20 | mA |
| | | Anode supply = 6 V, resistive load, $T_J$ = 25 °C | 15 | |
| | | Anode supply = 6 V, resistive load, $T_J$ = 125 °C | 10 | |
| Maximum required DC gate voltage to trigger | $V_{GT}$ | Anode supply = 6 V, resistive load, $T_J$ = - 65 °C | 1.2 | V |
| | | Anode supply = 6 V, resistive load, $T_J$ = 25 °C | 1 | |
| | | Anode supply = 6 V, resistive load, $T_J$ = 125 °C | 0.7 | |
| Maximum DC gate voltage not to trigger | $V_{GD}$ | $T_J$ = 125 °C, $V_{DRM}$ = Rated value | 0.2 | |
| Maximum DC gate current not to trigger | $I_{GD}$ | | 0.1 | mA |

## SWITCHING

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|
| Typical turn-on time | $t_{gt}$ | $T_J$ = 25 °C | 0.8 | µs |
| Typical reverse recovery time | $t_{rr}$ | $T_J$ = 125 °C | 3 | |
| Typical turn-off time | $t_q$ | | 100 | |

| THERMAL AND MECHANICAL SPECIFICATIONS | | | | | |
|---|---|---|---|---|---|
| **PARAMETER** | | **SYMBOL** | **TEST CONDITIONS** | **VALUES** | **UNITS** |
| Maximum junction and storage temperature range | | $T_J$, $T_{Stg}$ | | -40 to +125 | °C |
| Maximum thermal resistance, junction to case | | $R_{thJC}$ | DC operation | 1.5 | °C/W |
| Maximum thermal resistance, junction to ambient | | $R_{thJA}$ | | 62 | |
| Typical thermal resistance, case to heatsink | | $R_{thCS}$ | Mounting surface, smooth and greased | 0.5 | |
| Approximate weight | | | | 2 | g |
| | | | | 0.07 | oz. |
| Mounting torque | minimum | | | 6 (5) | kgf · cm<br>(lbf · in) |
| | maximum | | | 12 (10) | |
| Marking device | | | Case style D²PAK (SMD-220) | 12TTS08S | |

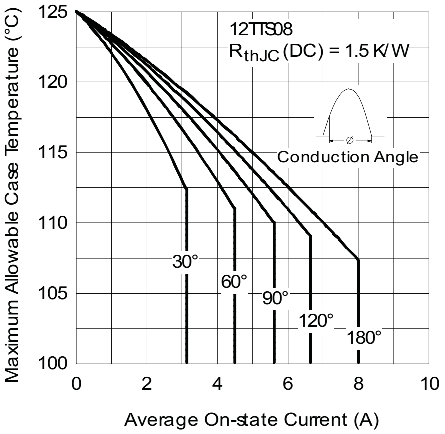


Fig. 1 - Current Rating Characteristics

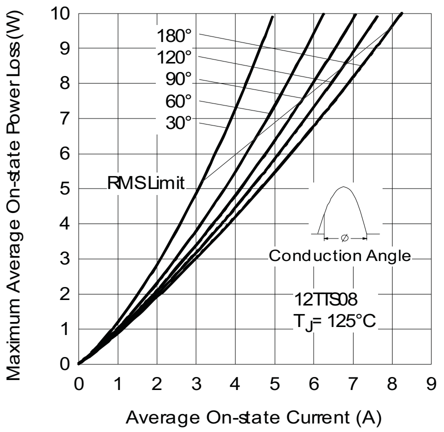


Fig. 3 - On-State Power Loss Characteristics

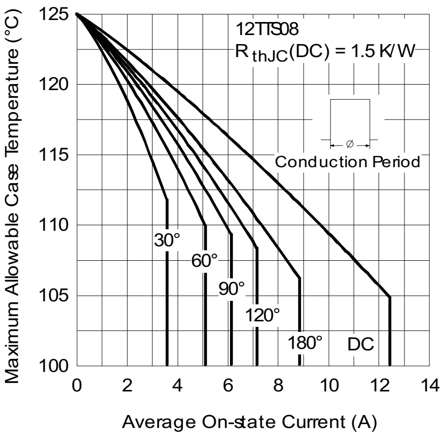


Fig. 2 - Current Rating Characteristics

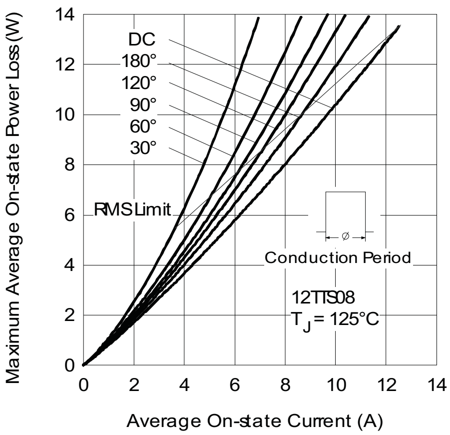


Fig. 4 - On-State Power Loss Characteristics

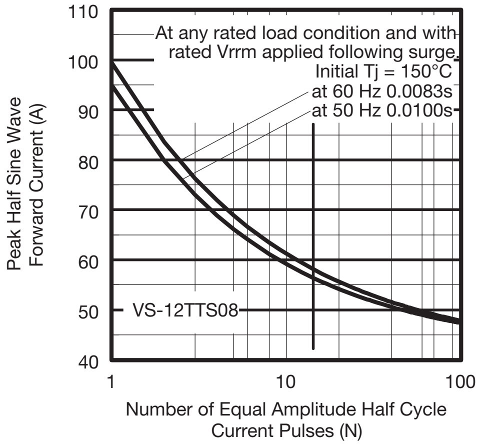


Fig. 5 - Maximum Non-Repetitive Surge Current

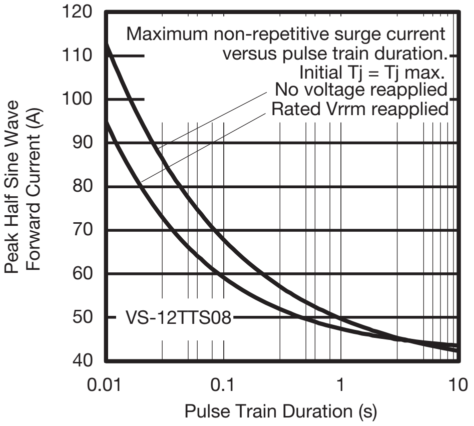


Fig. 6 - Maximum Non-Repetitive Surge Current

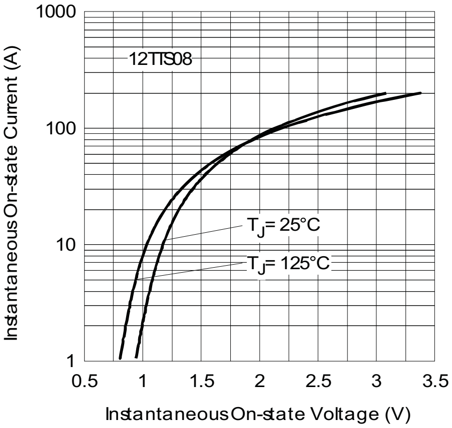


Fig. 7 - On-State Voltage Drop Characteristics

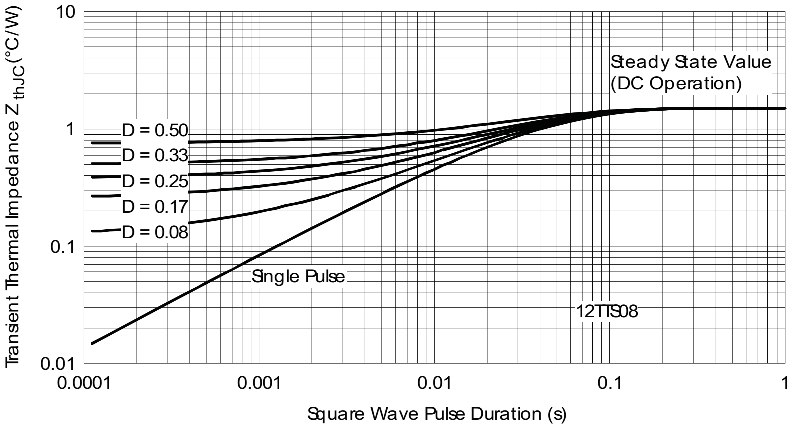


Fig. 8 - Thermal Impedance $Z_{thJC}$ Characteristics

## ORDERING INFORMATION TABLE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Device code** | **VS-** | **12** | **T** | **T** | **S** | **08** | **S** | **TRL** | **PbF** |
| | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |

**1** - Vishay Semiconductors product

**2** - Current rating (12.5 A)

**3** - Circuit configuration:
T = single thyristor

**4** - Package:
T = TO-220AC

**5** - Type of silicon:
S = standard recovery rectifier

**6** - Voltage rating (08 = 800 V)

**7** - S = TO-220 D$^2$PAK (SMD-220) version

**8** -
- None = tube
- TRL = tape and reel (left oriented)
- TRR = tape and reel (right oriented)

**9** - PbF = lead (Pb)-free

**ORDERING INFORMATION** (Example)

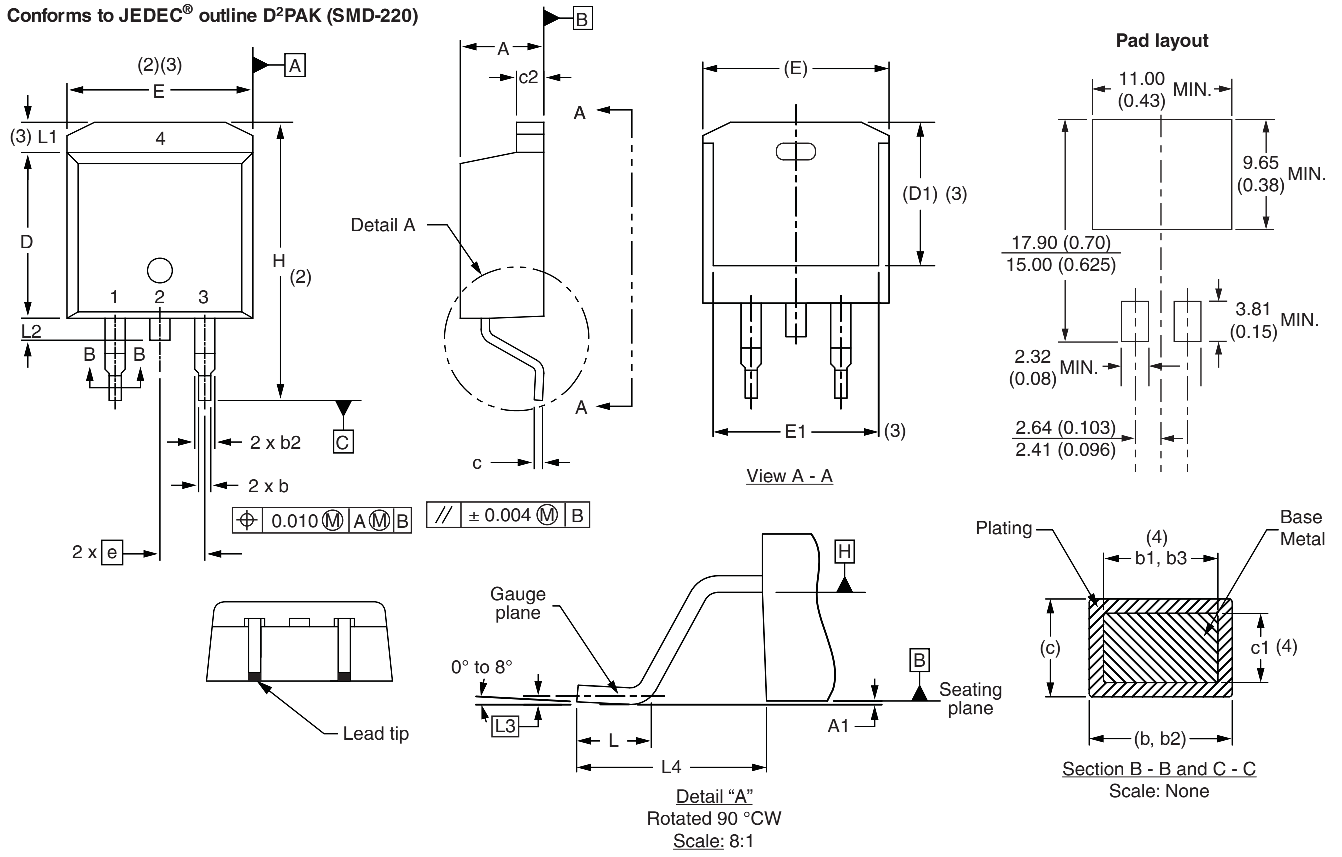
| PREFERRED P/N | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
|---|---|---|---|
| VS-12TTS08SPbF | 50 | 1000 | Antistatic plastic tubes |
| VS-12TTS08STRRPbF | 800 | 800 | 13" diameter reel |
| VS-12TTS08STRLPbF | 800 | 800 | 13" diameter reel |

| LINKS TO RELATED DOCUMENTS | |
|---|---|
| Dimensions | www.vishay.com/doc?95046 |
| Part marking information | www.vishay.com/doc?95054 |
| Packaging information | www.vishay.com/doc?95032 |

# D$^2$PAK

## **DIMENSIONS** in millimeters and inches

**Conforms to JEDEC® outline D$^2$PAK (SMD-220)**



Detail "A"
Rotated 90 °CW
Scale: 8:1

Section B - B and C - C
Scale: None

| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 4.06 | 4.83 | 0.160 | 0.190 | |
| A1 | 0.00 | 0.254 | 0.000 | 0.010 | |
| b | 0.51 | 0.99 | 0.020 | 0.039 | |
| b1 | 0.51 | 0.89 | 0.020 | 0.035 | 4 |
| b2 | 1.14 | 1.78 | 0.045 | 0.070 | |
| b3 | 1.14 | 1.73 | 0.045 | 0.068 | 4 |
| c | 0.38 | 0.74 | 0.015 | 0.029 | |
| c1 | 0.38 | 0.58 | 0.015 | 0.023 | 4 |
| c2 | 1.14 | 1.65 | 0.045 | 0.065 | |
| D | 8.51 | 9.65 | 0.335 | 0.380 | 2 |
| D1 | 6.86 | 8.00 | 0.270 | 0.315 | 3 |
| E | 9.65 | 10.67 | 0.380 | 0.420 | 2, 3 |
| E1 | 7.90 | 8.80 | 0.311 | 0.346 | 3 |
| e | 2.54 BSC | | 0.100 BSC | | |
| H | 14.61 | 15.88 | 0.575 | 0.625 | |
| L | 1.78 | 2.79 | 0.070 | 0.110 | |
| L1 | - | 1.65 | - | 0.066 | 3 |
| L2 | 1.27 | 1.78 | 0.050 | 0.070 | |
| L3 | 0.25 BSC | | 0.010 BSC | | |
| L4 | 4.78 | 5.28 | 0.188 | 0.208 | |

**Notes**

(1) Dimensioning and tolerancing per ASME Y14.5 M-1994

(2) Dimension D 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 outmost extremes of the plastic body

(3) Thermal pad contour optional within dimension E, L1, D1 and E1

(4) Dimension b1 and c1 apply to base metal only

(5) Datum A and B to be determined at datum plane H

(6) Controlling dimension: inch

(7) Outline conforms to JEDEC® outline TO-263AB

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