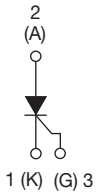
# Thyristor High Voltage, Phase Control SCR, 10 A

TO-220AB 3L




| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{T(AV)}$ | 6.5 A |
| $V_{DRM}/V_{RRM}$ | 800 V |
| $V_{TM}$ | 1.15 V |
| $I_{GT}$ | 15 mA |
| $T_J$ | -40 °C to 125 °C |
| Package | TO-220AB 3L |
| Circuit configuration | Single SCR |

## FEATURES

- Designed and qualified according to JEDEC®-JESD 47
- 125 °C max. operating junction temperature
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

## APPLICATIONS

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

## DESCRIPTION

The VS-10TTS08... 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.

| OUTPUT CURRENT IN TYPICAL APPLICATIONS | | | |
|---|---|---|---|
| APPLICATIONS | SINGLE-PHASE BRIDGE | THREE-PHASE BRIDGE | UNITS |
| Capacitive input filter<br>$T_A$ = 55 °C, $T_J$ = 125 °C,<br>common heatsink of 1 °C/W | 13.5 | 17 | A |

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|---|---|---|---|
| PARAMETER | TEST CONDITIONS | VALUES | UNITS |
| $I_{T(AV)}$ | Sinusoidal waveform | 6.5 | A |
| $I_{T(RMS)}$ | | 10 | |
| $V_{RRM}/V_{DRM}$ | | 800 | V |
| $I_{TSM}$ | | 110 | A |
| $V_T$ | 6.5 A, $T_J$ = 25 °C | 1.15 | 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-10TTS08-M3 | 800 | 800 | 1.0 |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| ABSOLUTE MAXIMUM RATINGS | | | | |
|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum average on-state current | $I_{T(AV)}$ | $T_C$ = 112 °C, 180° conduction half sine wave | 6.5 | A |
| Maximum RMS on-state current | $I_{T(RMS)}$ | | 10 | |
| 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 | $V_{TM}$ | 6.5 A, $T_J$ = 25 °C | 1.15 | V |
| On-state slope resistance | $r_t$ | $T_J$ = 125 °C | 17.3 | mΩ |
| Threshold voltage | $V_{T(TO)}$ | | 0.85 | 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 | |


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| 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 (lbf · in) |
| | maximum | | | 12 (10) | |
| Marking device | | | Case style TO-220AB 3L | 10TTS08 | |

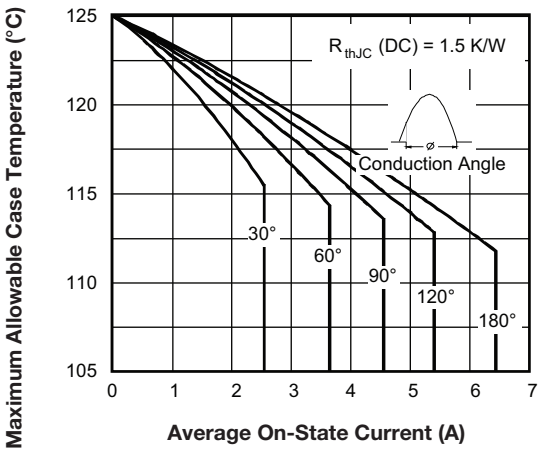


Fig. 1 - Current Rating Characteristics

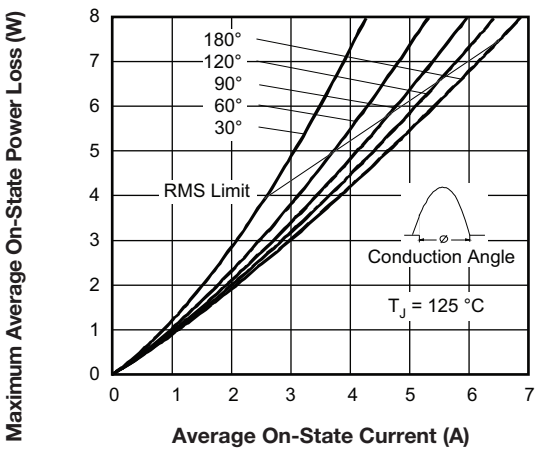


Fig. 3 - On-State Power Loss Characteristics

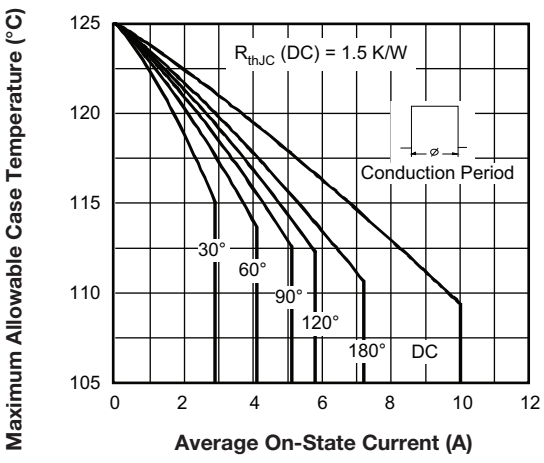


Fig. 2 - Current Rating Characteristic

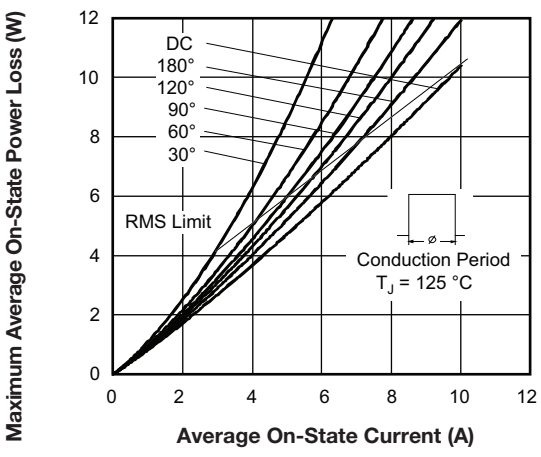


Fig. 4 - On-State Power Loss Characteristics


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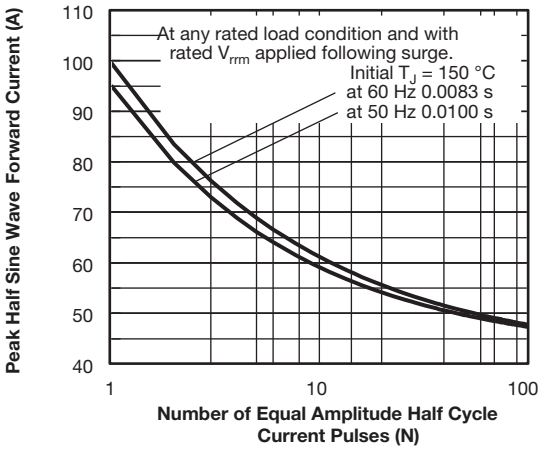


Fig. 5 - Maximum Non-Repetitive Surge Current

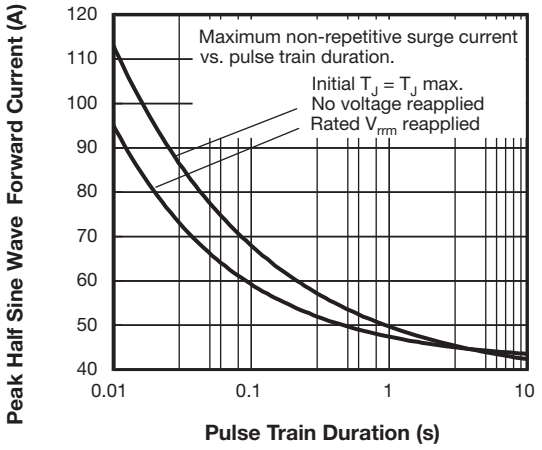


Fig. 6 - Maximum Non-Repetitive Surge Current

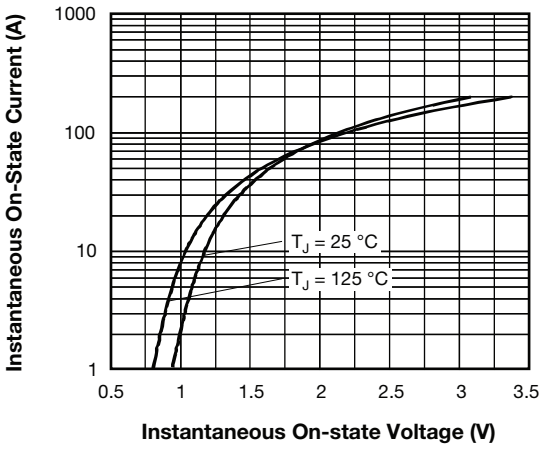


Fig. 7 - On-State Voltage Drop Characteristics

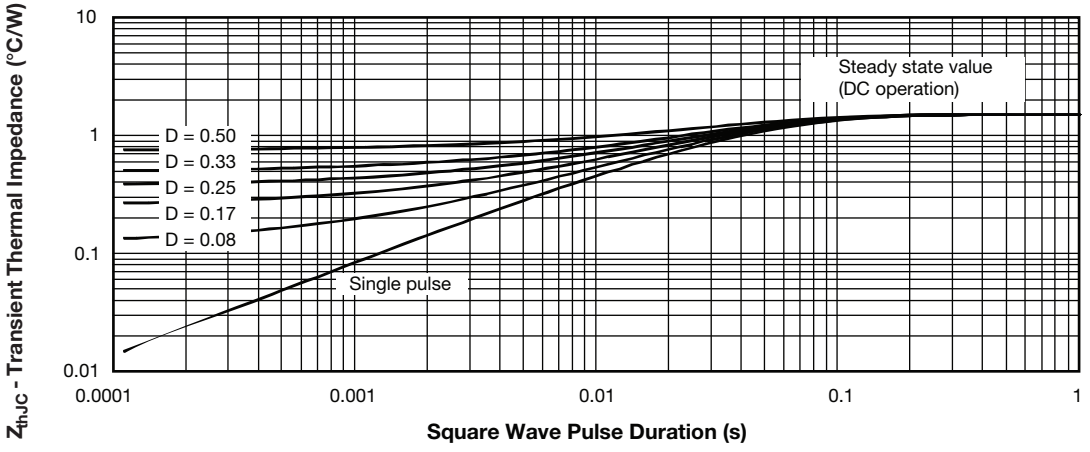


Fig. 8 - Thermal Impedance $Z_{thJC}$ Characteristics


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## ORDERING INFORMATION TABLE

| Device code | VS- | 10 | T | T | S | 08 | -M3 |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

1 - Vishay Semiconductors product
2 - Current rating
3 - Circuit configuration:
T = single thyristor
4 - Package:
T = TO-220AB
5 - Type of silicon:
S = converter grade
6 - Voltage code x 100 = $V_{RRM}$
7 - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| **ORDERING INFORMATION** (Example) | | |
|---|---|---|
| **PREFERRED P/N** | **BASE QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-10TTS08-M3 | 50 | Antistatic plastic tubes |

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


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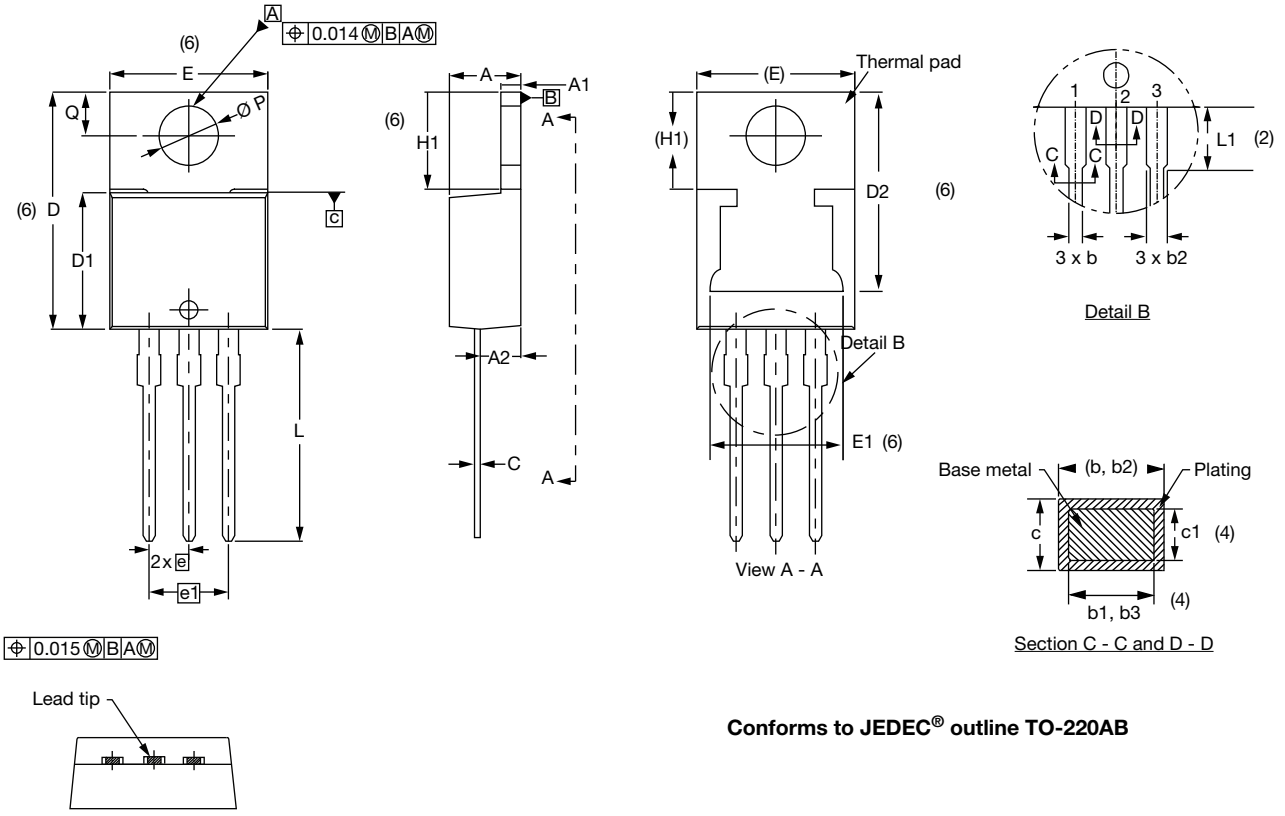
## TO-220AB 3L

**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 | |

| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| 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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