## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---|---|---|---|---|---|
| Maximum average on-state current | $I_{T(AV)}$ | $T_C$ = 93 °C, 180° conduction half sine wave | | 25 | A |
| Maximum RMS on-state current | $I_{RMS}$ | | | 40 | |
| 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 to 10 ms, no voltage reapplied | | 6300 | $A^2\sqrt{s}$ |
| Maximum on-state voltage | $V_{TM}$ | 80 A, $T_J$ = 25 °C | | 1.6 | V |
| Low level value of on-state slope resistance | $r_t$ | $T_J$ = 140 °C | | 11.4 | mΩ |
| Low level value of threshold voltage | $V_{T(TO)}$ | | | 0.96 | V |
| Maximum reverse and direct leakage current | $I_{RRM}/I_{DRM}$ | $T_J$ = 25 °C | $V_R$ = Rated $V_{RRM}/V_{DRM}$ | 0.5 | mA |
| | | $T_J$ = 140 °C | | 12 | |
| Holding current | $I_H$ | Anode supply = 6 V, resistive load, initial $I_T$ = 1 A, $T_J$ = 25 °C | | 100 | |
| Maximum latching current | $I_L$ | Anode supply = 6 V, resistive load, $T_J$ = 25 °C | | 200 | |
| Maximum rate of rise of off-state voltage | dV/dt | $T_J$ = $T_J$ max., linear to 80 °C, $V_{DRM}$ = $R_g$ - k = Open | | 500 | V/µs |
| Maximum rate of rise of turned-on current | dI/dt | | | 150 | 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, $T_J$ = 25 °C | 35 | mA |
| Maximum required DC gate voltage to trigger | $V_{GT}$ | Anode supply = 6 V, resistive load, $T_J$ = 25 °C | 1.3 | V |
| Maximum DC gate voltage not to trigger | $V_{GD}$ | $T_J$ = 140 °C, $V_{DRM}$ = Rated value | 0.2 | |
| Maximum DC gate current not to trigger | $I_{GD}$ | | 1.5 | mA |

## SWITCHING

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|
| Typical turn-on time | $t_{gt}$ | $T_J$ = 25 °C | 0.9 | µs |
| Typical reverse recovery time | $t_{rr}$ | $T_J$ = 140 °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 | | $T_J$, $T_{Stg}$ | | - 40 to 140 | °C |
| Maximum thermal resistance, junction to case | | $R_{thJC}$ | DC operation | 0.8 | °C/W |
| Maximum thermal resistance, junction to ambient | | $R_{thJA}$ | | 60 | |
| 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 | 40TTS12 | |

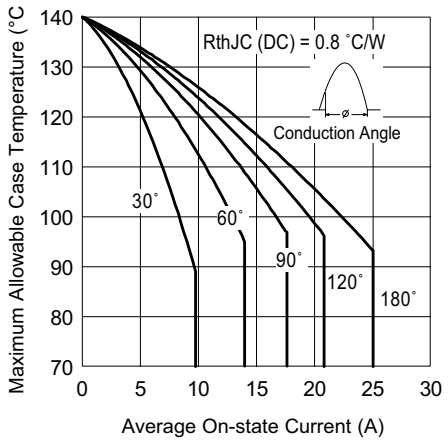



Fig. 1 - Current Rating Characteristics

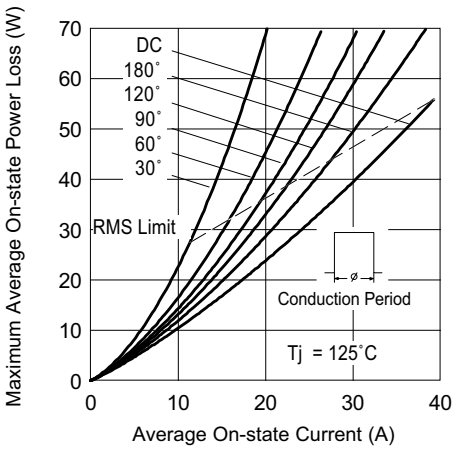



Fig. 4 - On-State Power Loss Characteristics

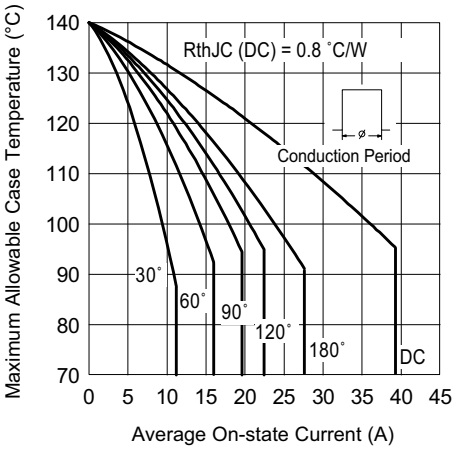



Fig. 2 - Current Rating Characteristics

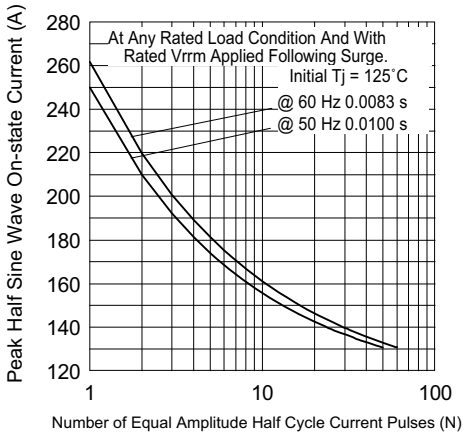



Fig. 5 - Maximum Non-Repetitive Surge Current

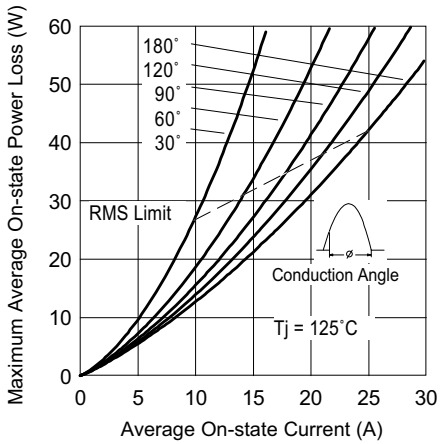



Fig. 3 - On-State Power Loss Characteristics

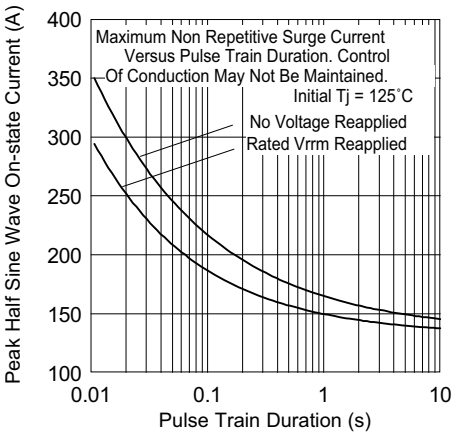



Fig. 6 - Maximum Non-Repetitive Surge Current

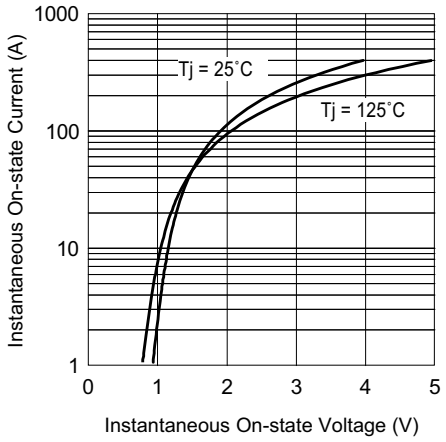



Fig. 7 - On-State Voltage Drop Characteristics

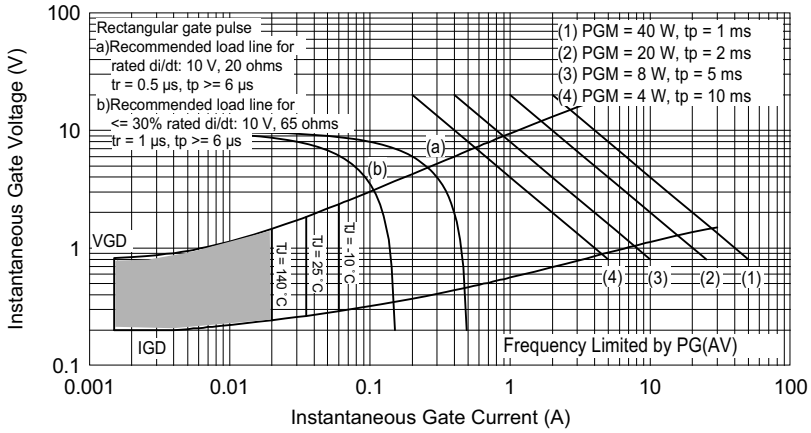



Fig. 8 - Gate Characteristics

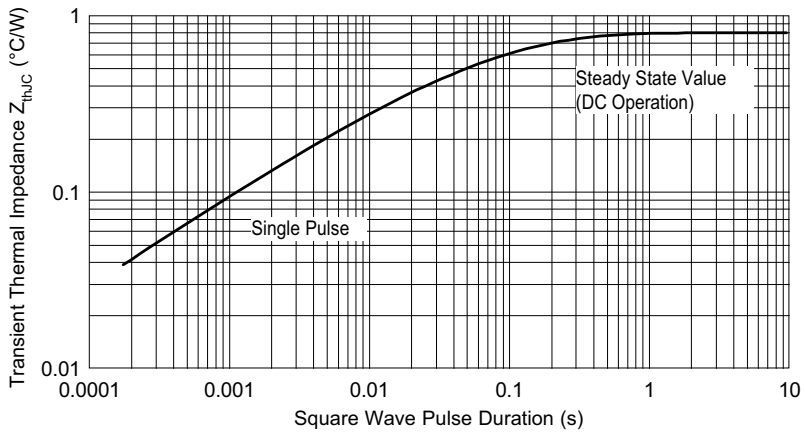
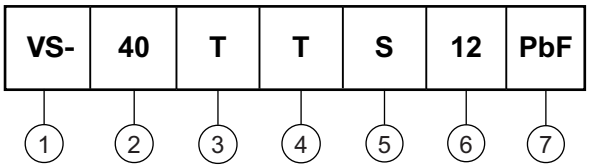



Fig. 9 - Thermal Impedance $Z_{thJC}$ Characteristics

## ORDERING INFORMATION TABLE

Device code



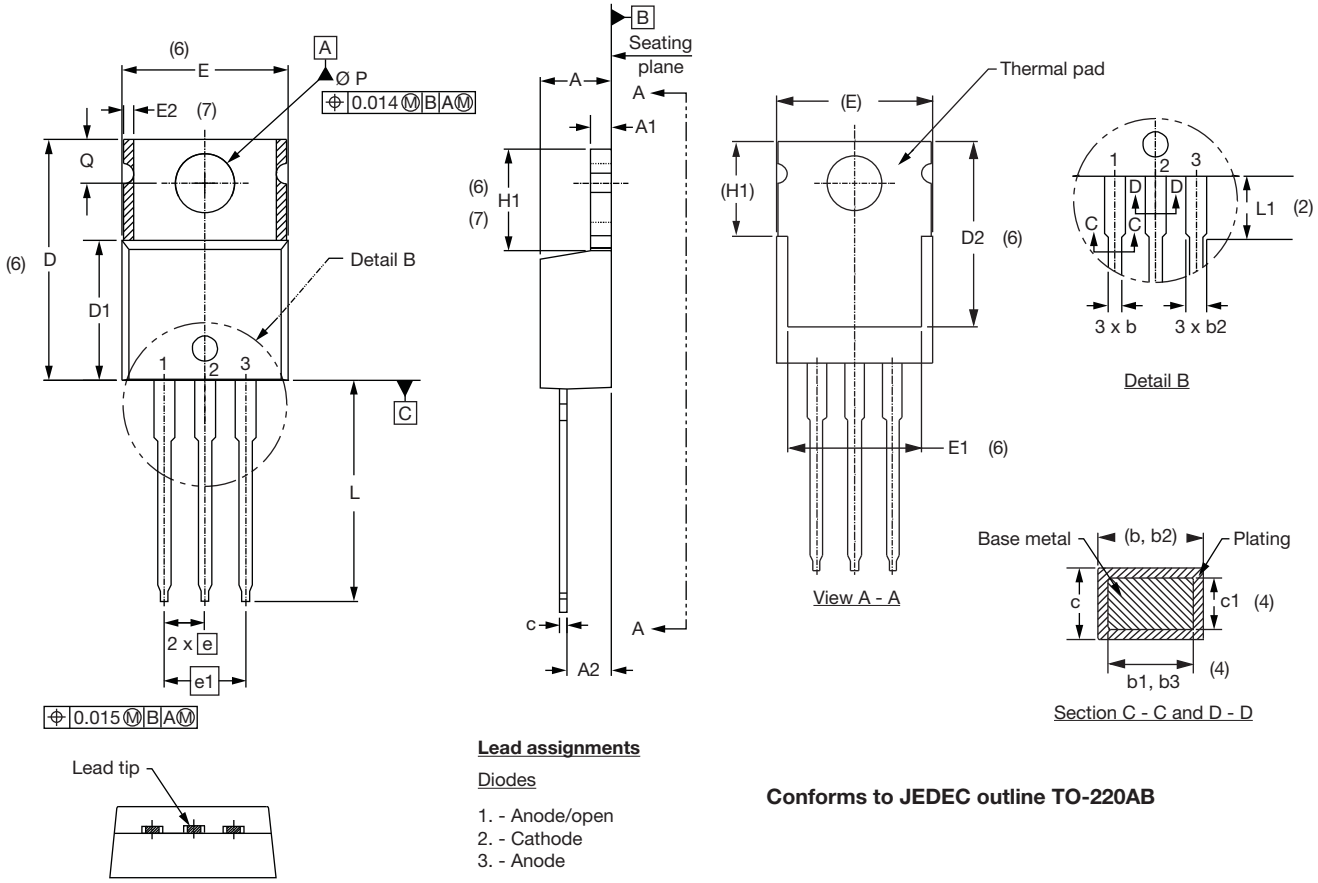

1 - Vishay Semiconductors product
2 - Current rating, RMS value
3 - Circuit configuration:
T = Single thyristor
4 - Package:
T = TO-220
5 - Type of silicon:
S = Standard recovery rectifier
6 - Voltage rating (12 = 1200 V)
7 - Environmental digit:
PbF = Lead (Pb)-free and RoHS compliant
-M3 = Halogen-free, RoHS compliant, and terminations lead (Pb)-free

| **ORDERING INFORMATION** (Example) | | | |
|---|---|---|---|
| **PREFERRED P/N** | **QUANTITY PER T/R** | **MINIMUM ORDER QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-40TTS12PbF | 50 | 1000 | Antistatic plastic tubes |
| VS-40TTS12-M3 | 50 | 1000 | Antistatic plastic tubes |

| **LINKS TO RELATED DOCUMENTS** | | |
|---|---|---|
| Dimensions | | www.vishay.com/doc?95222 |
| Part marking information | TO-220AB PbF | www.vishay.com/doc?95225 |
| | TO-220AB -M3 | www.vishay.com/doc?95028 |

# TO-220AB

**DIMENSIONS** in millimeters and inches




Lead tip



**Lead assignments**

Diodes

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

**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 | 2.56 | 2.92 | 0.101 | 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 | 15.25 | 0.585 | 0.600 | 3 |
| D1 | 8.38 | 9.02 | 0.330 | 0.355 | |
| D2 | 11.68 | 12.88 | 0.460 | 0.507 | 6 |

| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| E | 10.11 | 10.51 | 0.398 | 0.414 | 3, 6 |
| E1 | 6.86 | 8.89 | 0.270 | 0.350 | 6 |
| E2 | - | 0.76 | - | 0.030 | 7 |
| 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, 7 |
| L | 13.52 | 14.02 | 0.532 | 0.552 | |
| L1 | 3.32 | 3.82 | 0.131 | 0.150 | 2 |
| Ø P | 3.54 | 3.73 | 0.139 | 0.147 | |
| Q | 2.60 | 3.00 | 0.102 | 0.118 | |
| θ | 90° to 93° | | 90° to 93° | | |

**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) Dimensions E2 x H1 define a zone where stamping and singulation irregularities are allowed
(8) Outline conforms to JEDEC TO-220, except A2 (maximum) and D2 (minimum) where dimensions are derived from the actual package outline

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