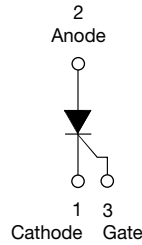




Thyristor High Voltage, Surface Mountable Phase Control SCR, 16 A



TO-263AB (D²PAK)



FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Designed and qualified according JEDEC-JESD47
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition



RoHS COMPLIANT HALOGEN FREE

| PRODUCT SUMMARY | |
|-------------------|-------------------|
| Package | TO-263AB (D²PAK) |
| Diode variation | Single SCR |
| $I_{T(AV)}$ | 10 A |
| V_{DRM}/V_{RRM} | 800 V, 1200 V |
| V_{TM} | 1.4 V |
| I_{GT} | 60 mA |
| T_J | - 40 °C to 125 °C |

APPLICATIONS

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

DESCRIPTION

The VS-16TTS..SPbF 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 |
| NEMA FR-4 or G-10 glass fabric-based epoxy with 4 oz. (140 μm) copper | 2.5 | 3.5 | A |
| Aluminum IMS, $R_{thCA} = 15 \text{ °C/W}$ | 6.3 | 9.5 | |
| Aluminum IMS with heatsink, $R_{thCA} = 5 \text{ °C/W}$ | 14.0 | 18.5 | |

Note

- $T_A = 55 \text{ °C}$, $T_J = 125 \text{ °C}$, footprint 300 mm²

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|-----------------------------------|-----------------------------|-------------|-------|
| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
| $I_{T(AV)}$ | Sinusoidal waveform | 10 | A |
| I_{RMS} | | 16 | |
| V_{RRM}/V_{DRM} | | 800/1200 | V |
| I_{TSM} | | 200 | A |
| V_T | 10 A, $T_J = 25 \text{ °C}$ | 1.4 | V |
| dV/dt | | 500 | V/μs |
| dI/dt | | 150 | A/μs |
| T_J | | - 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-16TTS08SPbF | 800 | 800 | 10 |
| VS-16TTS12SPbF | 1200 | 1200 | |



| ABSOLUTE MAXIMUM RATINGS | | | | | | |
|---|-----------------|--|-----------------------------------|------|---------------|----|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | | UNITS | |
| | | | TYP. | MAX. | | |
| Maximum average on-state current | $I_{T(AV)}$ | $T_C = 98\text{ }^\circ\text{C}$, 180° conduction, half sine wave | 10 | | A | |
| Maximum RMS on-state current | I_{RMS} | | 16 | | | |
| Maximum peak, one-cycle, non-repetitive surge current | I_{TSM} | 10 ms sine pulse, rated V_{RRM} applied | 170 | | | |
| | | 10 ms sine pulse, no voltage reapplied | 200 | | | |
| Maximum I^2t for fusing | I^2t | 10 ms sine pulse, rated V_{RRM} applied | 144 | | A^2s | |
| | | 10 ms sine pulse, no voltage reapplied | 200 | | | |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | $t = 0.1\text{ ms to }10\text{ ms}$, no voltage reapplied | 2000 | | $A^2\sqrt{s}$ | |
| Maximum on-state voltage drop | V_{TM} | 10 A, $T_J = 25\text{ }^\circ\text{C}$ | 1.4 | | V | |
| On-state slope resistance | r_t | $T_J = 125\text{ }^\circ\text{C}$ | 24.0 | | $m\Omega$ | |
| Threshold voltage | $V_{T(TO)}$ | | 1.1 | | V | |
| Maximum reverse and direct leakage current | I_{RM}/I_{DM} | $V_R = \text{Rated } V_{RRM}/V_{DRM}$ | $T_J = 25\text{ }^\circ\text{C}$ | 0.5 | | mA |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | 10 | | |
| Holding current | I_H | Anode supply = 6 V, resistive load, initial $I_T = 1\text{ A}$ | - | 100 | | |
| Maximum latching current | I_L | Anode supply = 6 V, resistive load | 200 | | | |
| Maximum rate of rise of off-state voltage | dV/dt | | 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, $T_J = -10\text{ }^\circ\text{C}$ | 90 | mA | |
| | | Anode supply = 6 V, resistive load, $T_J = 25\text{ }^\circ\text{C}$ | 60 | | |
| | | Anode supply = 6 V, resistive load, $T_J = 125\text{ }^\circ\text{C}$ | 35 | | |
| Maximum required DC gate voltage to trigger | V_{GT} | Anode supply = 6 V, resistive load, $T_J = -10\text{ }^\circ\text{C}$ | 3.0 | 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 | | |
| Maximum DC gate current not to trigger | I_{GD} | | 2.0 | | mA |

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

| THERMAL - MECHANICAL SPECIFICATIONS | | | | |
|---|----------------|---|-------------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum junction and storage temperature range | T_J, T_{Stg} | | - 40 to 125 | °C |
| Soldering temperature | T_S | For 10 s (1.6 mm from case) | 240 | |
| Maximum thermal resistance, junction to case | R_{thJC} | DC operation | 1.3 | °C/W |
| Typical thermal resistance, junction to ambient | R_{thJA} | PCB mount (1) | 40 | |
| Approximate weight | | | 2 | g |
| | | | 0.07 | oz. |
| Marking device | | Case style D ² PAK (SMD-220) | 16TTS08S | |
| | | | 16TTS12S | |

Note

- (1) When mounted on 1" square (650 mm²) PCB of FR-4 or G-10 material 4 oz. (140 μm) copper 40 °C/W. For recommended footprint and soldering techniques refer to application note #AN-994.

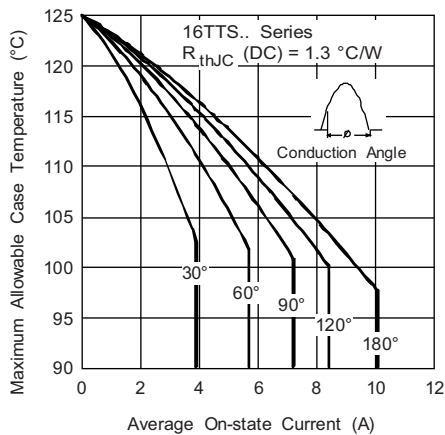


Fig. 1 - Current Rating Characteristics

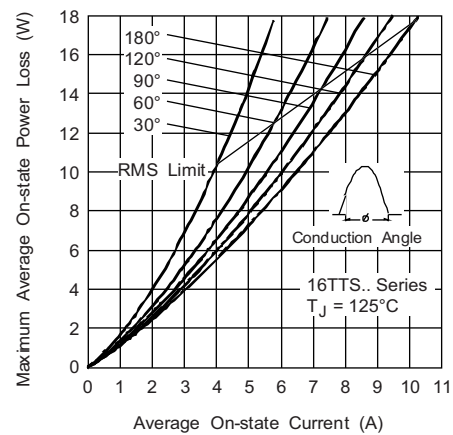


Fig. 3 - On-State Power Loss Characteristics

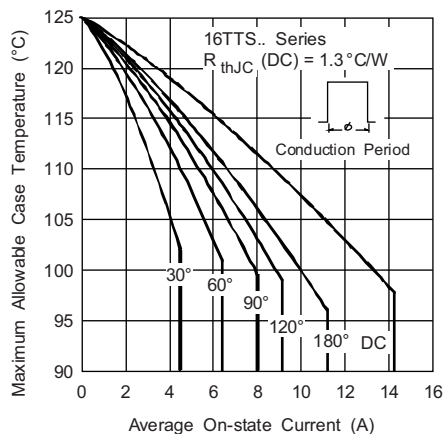


Fig. 2 - Current Rating Characteristics

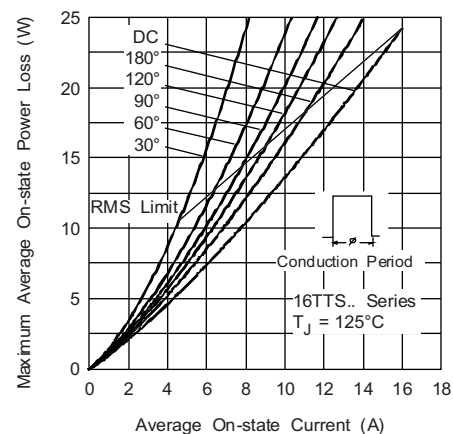


Fig. 4 - On-State Power Loss Characteristics

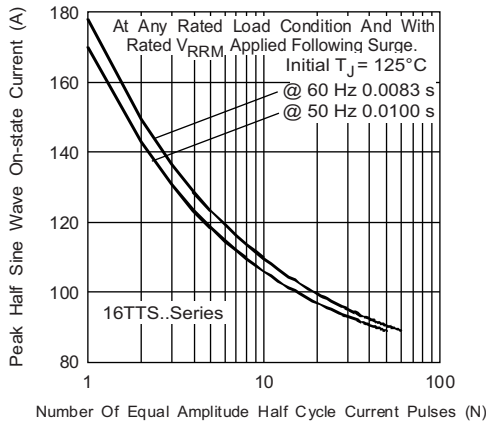


Fig. 5 - Maximum Non-Repetitive Surge Current

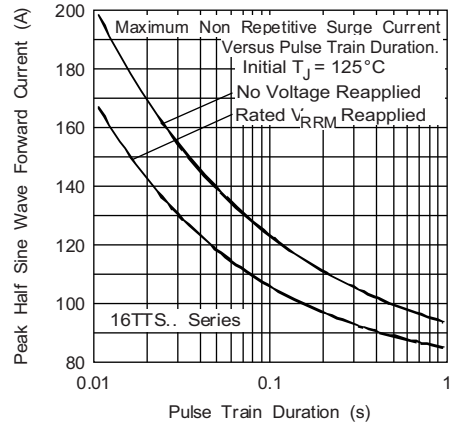


Fig. 6 - Maximum Non-Repetitive Surge Current

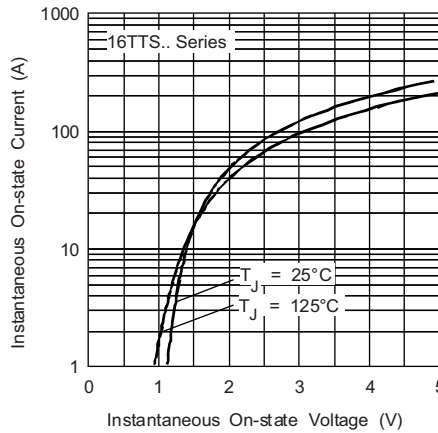


Fig. 7 - On-State Voltage Drop Characteristics

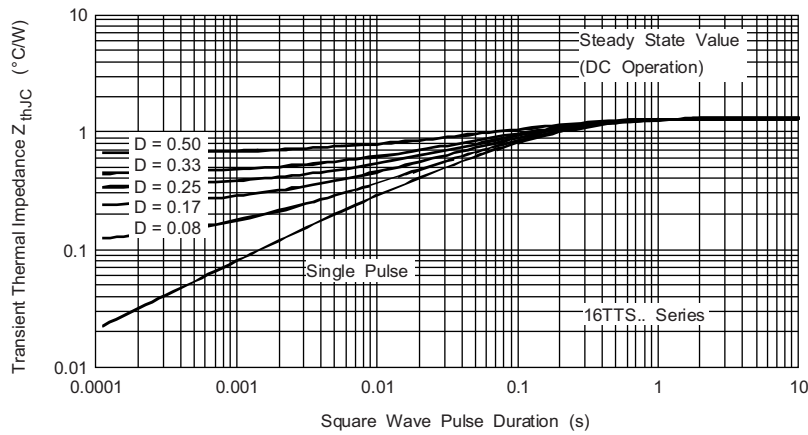


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

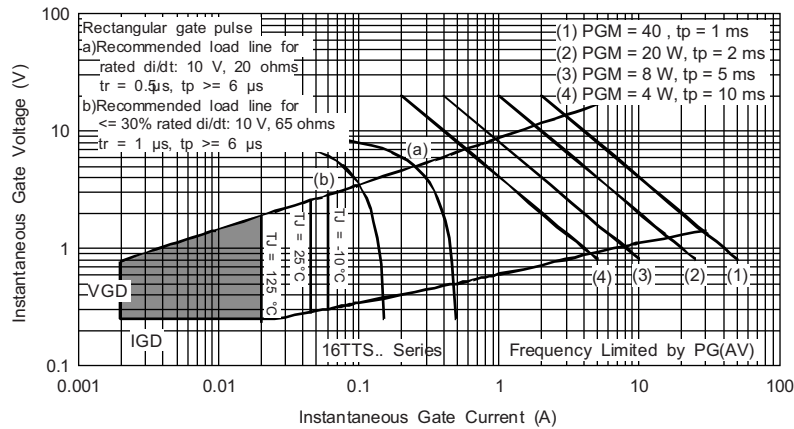


Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

| | | | | | | | | | |
|-------------|------------|-----------|----------|----------|----------|-----------|----------|------------|------------|
| Device code | VS- | 16 | T | T | S | 12 | S | TRL | PbF |
| | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |

- 1** - Vishay Semiconductors product
- 2** - Current rating
- 3** - Circuit configuration:
T = Single thyristor
- 4** - Package:
T = TO-220AC
- 5** - Type of silicon:
S = Standard recovery rectifier
- 6** - Voltage rating: Voltage code x 100 = V_{RRM}

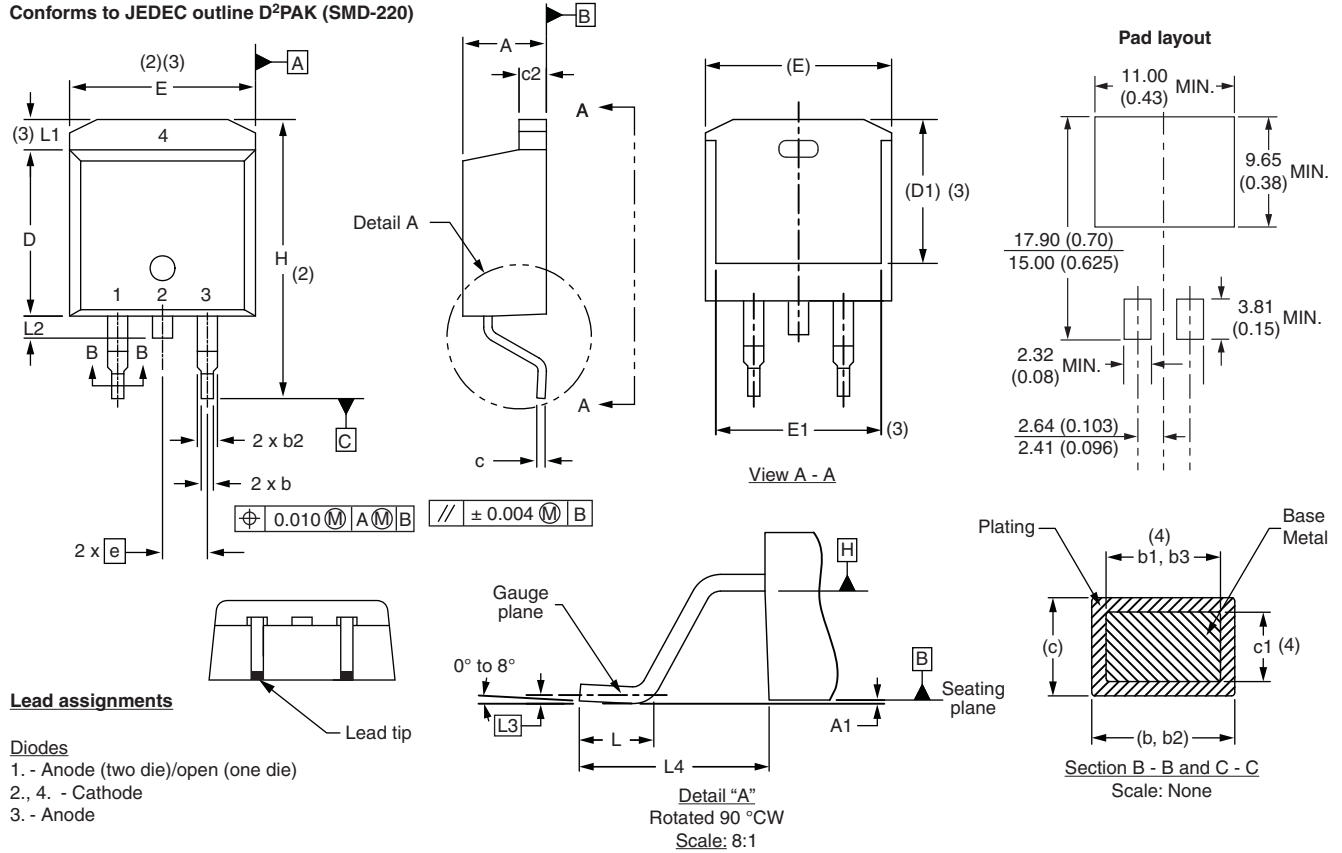
| |
|-------------|
| 08 = 800 V |
| 12 = 1200 V |
- 7** - S = D²PAK version
- 8** -
 - None = Tube
 - TRL = Tape and reel (left oriented)
 - TRR = Tape and reel (right oriented)
- 9** - PbF = Lead (Pb)-free and RoHS compliant

| 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 |

D²PAK

DIMENSIONS in millimeters and inches

Conforms to JEDEC outline D²PAK (SMD-220)



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

Notes

- Dimensioning and tolerancing per ASME Y14.5 M-1994
- 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
- Thermal pad contour optional within dimension E, L1, D1 and E1
- Dimension b1 and c1 apply to base metal only
- Datum A and B to be determined at datum plane H
- Controlling dimension: inch
- Outline conforms to JEDEC outline TO-263AB



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