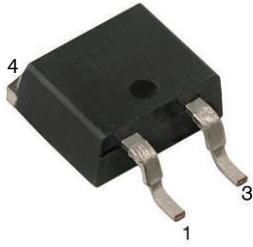
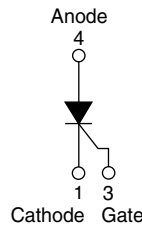


Thyristor, Surface-Mount, Phase Control SCR, 16 A


D²PAK 2L (TO-263AB 2L)

FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Designed and qualified according JEDEC®-JESD 47
- Meets JESD 201 class 2 whisker test
- Flexible solution for reliable AC power rectification
- Easy control peak current at charger power up to reduce passive / electromechanical components
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
 COMPLIANT
 HALOGEN
FREE
LINKS TO ADDITIONAL RESOURCES

APPLICATIONS

- On-board and off-board EV / HEV battery chargers
- Renewable energy inverters

DESCRIPTION

The VS-25TTS12S2L-M3 high voltage series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications.

MECHANICAL DATA

Case: D²PAK 2L (TO-263AB 2L)

Molding compound meets UL 94 V-0 flammability rating

Terminals: matte tin plated leads, solderable per J-STD-002

| PRIMARY CHARACTERISTICS | |
|-------------------------|------------------------|
| $I_{T(AV)}$ | 16 A |
| V_{DRM}/V_{RRM} | 1200 V |
| V_{TM} | 1.25 V |
| I_{GT} | 45 mA |
| T_J | -40 to +125 °C |
| Package | D²PAK 2L (TO-263AB 2L) |
| Circuit configuration | Single SCR |

| OUTPUT CURRENT IN TYPICAL APPLICATIONS | | | |
|--|---------------------|--------------------|-------|
| APPLICATIONS | SINGLE-PHASE BRIDGE | THREE-PHASE BRIDGE | UNITS |
| NEMA FR-4 or G10 glass fabric-based epoxy with 4 oz. (140 μm) copper | 3.5 | 5.5 | A |
| Aluminum IMS, $R_{thCA} = 15$ °C/W | 8.5 | 13.5 | |
| Aluminum IMS with heatsink, $R_{thCA} = 5$ °C/W | 16.5 | 25.0 | |

Note

- $T_A = 55$ °C, $T_J = 125$ °C, footprint 300 mm²

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|-----------------------------------|---------------------|-------------|-------|
| PARAMETER | TEST CONDITIONS | VALUES | UNITS |
| $I_{T(AV)}$ | Sinusoidal waveform | 16 | A |
| I_{RMS} | | 25 | |
| V_{RRM}/V_{DRM} | | 1200 | V |
| I_{TSM} | | 350 | A |
| V_T | 16 A, $T_J = 25$ °C | 1.25 | 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-25TTS12S2L-M3 | 1200 | 1200 | 10 |



| ABSOLUTE MAXIMUM RATINGS | | | | | | |
|---|-------------------|---|-----------------------------------|------|---------------|----|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | | UNITS | |
| | | | TYP. | MAX. | | |
| Maximum average on-state current | $I_{T(AV)}$ | $T_C = 93\text{ }^\circ\text{C}$, 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} | $V_R = \text{Rated } V_{RRM}/V_{DRM}$ | $T_J = 25\text{ }^\circ\text{C}$ | 0.5 | | mA |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | 10 | | |
| Holding current | I_H | VS-25TTS08, VS-25TTS12 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 | |
| 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 | μs |
| 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_J, T_{Stg} | | -40 to +125 | °C |
| Soldering temperature | T_S | For 10 s (1.6 mm from case) | 260 | |
| Maximum thermal resistance, junction to case | R_{thJC} | DC operation | 1.1 | °C/W |
| Typical thermal resistance, junction to ambient (PCB mount) | $R_{thJA}^{(1)}$ | | 40 | |
| Approximate weight | | | 2 | g |
| | | | 0.07 | oz. |
| Marking device | | Case style: 2L D ² PAK (2L TO-263AB) | 25TTS12S | |

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

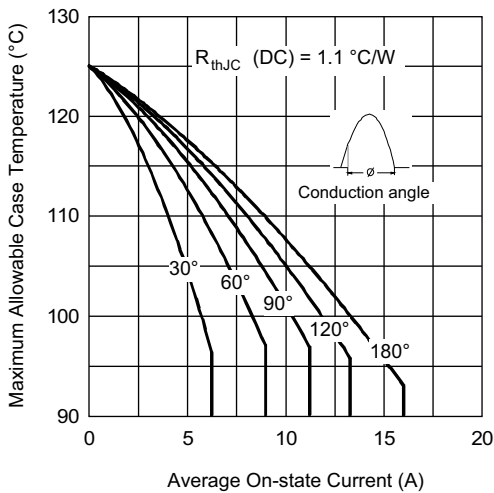


Fig. 1 - Current Rating Characteristics

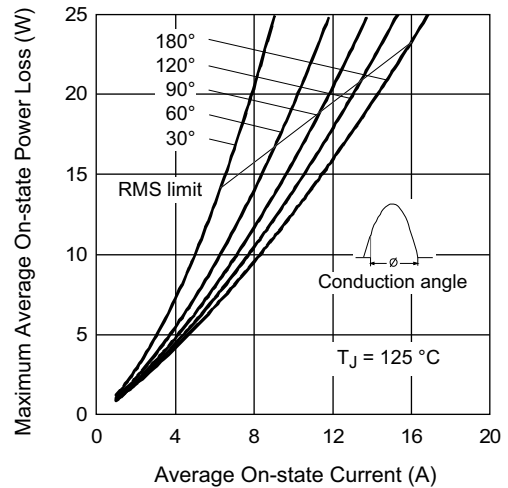


Fig. 3 - On-State Power Loss Characteristics

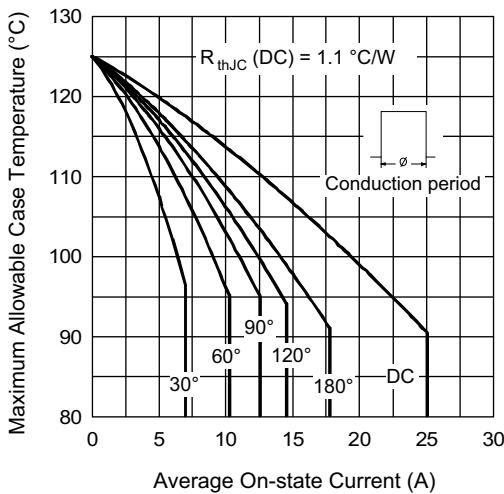


Fig. 2 - Current Rating Characteristics

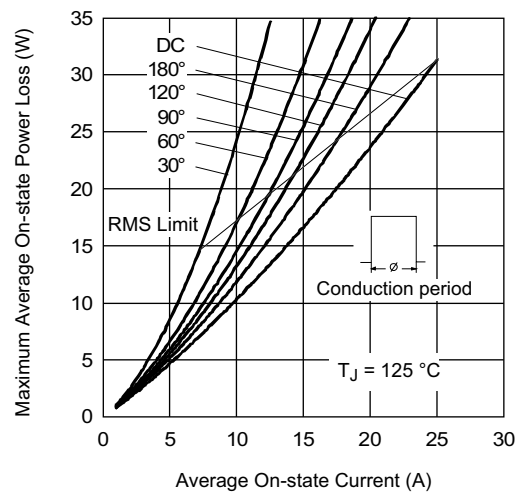


Fig. 4 - On-State Power Loss Characteristics

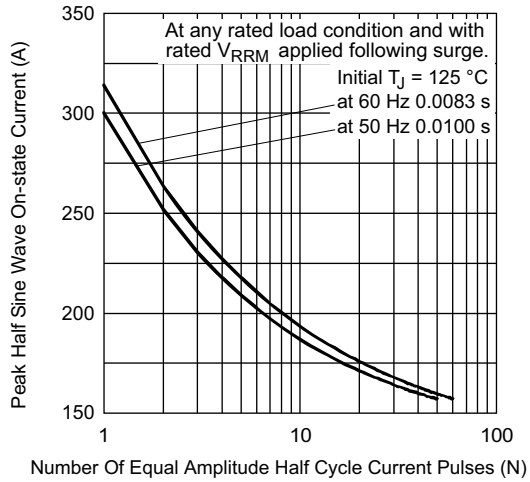


Fig. 5 - Maximum Non-Repetitive Surge Current

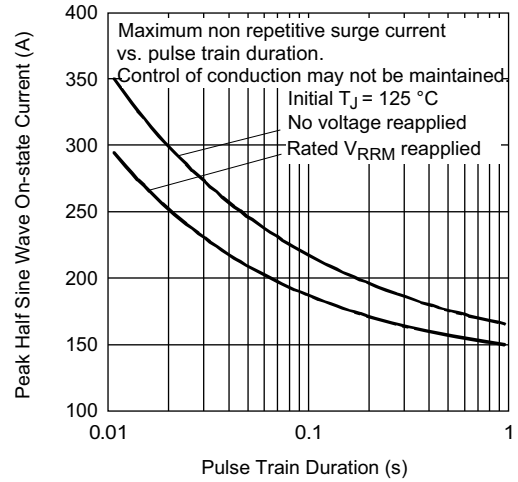


Fig. 6 - Maximum Non-Repetitive Surge Current

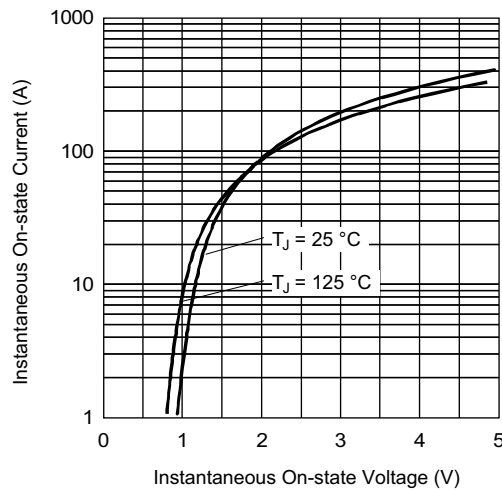


Fig. 7 - On-State Voltage Drop Characteristics

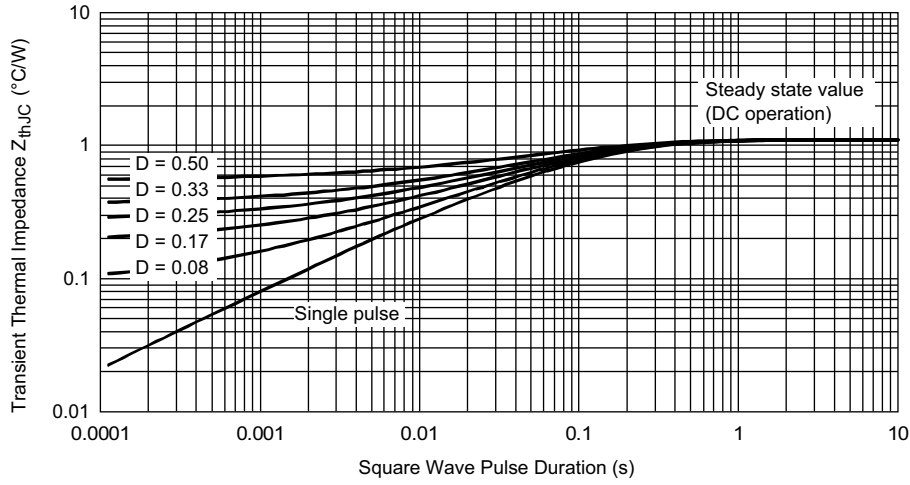


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

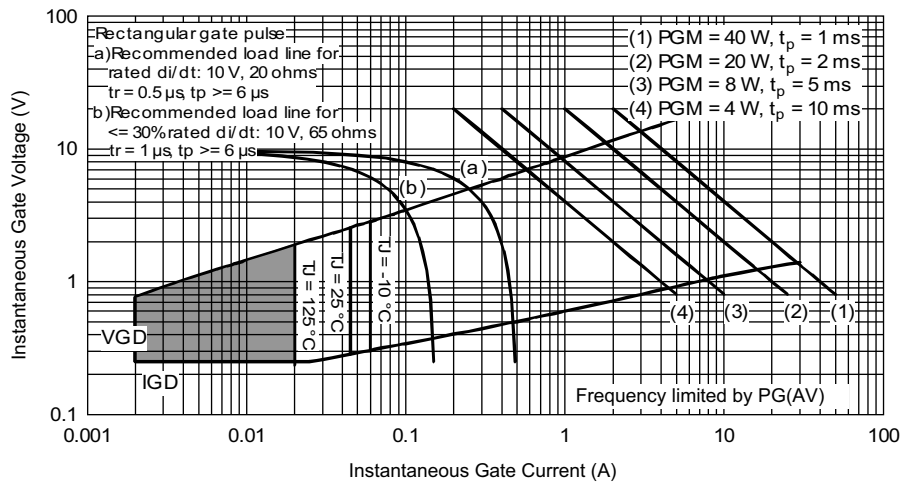
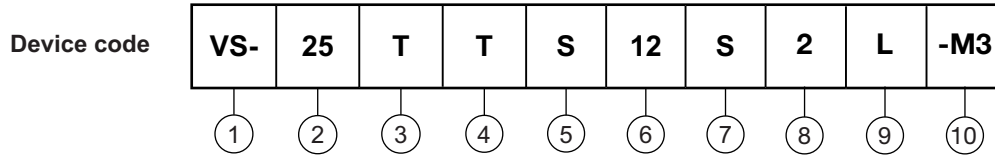


Fig. 9 - Gate Characteristics



ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (25 = 25 A)
- 3** - Circuit configuration:
T = single thyristor
- 4** - Package:
T = D²PAK (TO-263AB)
- 5** - Type of silicon:
S = standard recovery rectifier
- 6** - Voltage rating: voltage code x 100 = V_{RRM} ——— **12 = 1200 V**
- 7** - S = surface mountable
- 8** - 2 = true 2 pin D²PAK
- 9** - L = tape and reel (left oriented), for different orientation contact factory
- 10** - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| ORDERING INFORMATION (Example) | | | |
|--------------------------------|-------------------|------------------------|-----------------------|
| PREFERRED P/N | QUANTITY PER REEL | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-25TTS12S2L-M3 | 800 | 800 | 13" diameter reel |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?96683 |
| Part marking information | www.vishay.com/doc?96693 |
| Packaging information | www.vishay.com/doc?96317 |

D²PAK 2L (TO-263AB 2L)

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 | L3 | 0.25 BSC | | 0.010 BSC | | |
| c2 | 1.14 | 1.65 | 0.045 | 0.065 | | L4 | 4.78 | 5.28 | 0.188 | 0.208 | |
| D | 8.51 | 9.65 | 0.335 | 0.380 | 2 | | | | | | |

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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