# SOT-227 Power Module
# Single Switch - Power MOSFET, 270 A

SOT-227

## FEATURES

- $I_D$ = 287 A, $T_C$ = 25 °C
- ThunderFET power MOSFET
- Reduced switching and conduction losses
- Maximum 175 °C junction temperature
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

## APPLICATIONS

- DC/DC conversions
- Motor drives switch
- DC/AC inverter
- Power supplies
  - Uninterruptible power supplies
  - AC/DC switchmode power supplies
  - Solar micro inverter

| PRIMARY CHARACTERISTICS | |
|---|---|
| $V_{DSS}$ | 200 V |
| $R_{DS(on)}$ | 3.3 mΩ |
| $I_D$ | 219 A at 90 °C |
| Type | Modules - MOSFET |
| Package | SOT-227 |

| ABSOLUTE MAXIMUM RATINGS | | | | |
|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **MAX.** | **UNITS** |
| **MOSFET** | | | | |
| Drain to source voltage | $V_{DSS}$ | | 200 | V |
| Continuous drain current, $V_{GS\ at}$ 10 V | $I_D$ | $T_C$ = 25 °C | 287 | A |
| | | $T_C$ = 90 °C | 219 | |
| Pulsed drain current | $I_{DM}$ (1) | | 680 | |
| Power dissipation | $P_D$ | $T_C$ = 25 °C | 937 | W |
| Gate to source voltage | $V_{GS}$ | | ± 20 | V |
| Single pulse avalanche energy (2) | $E_{AS}$ | $T_C$ = 25 °C, L = 0.1 mH, $V_{GS}$ = 10 V | 650 | mJ |
| Avalanche current | $I_{AS}$ | | 180 | A |
| **MODULE** | | | | |
| Operating junction temperature range | $T_J$ | | -55 to +175 | °C |
| Operating storage temperature range | $T_{Stg}$ | | -40 to +150 | |
| Insulation voltage (RMS) | $V_{ISOL}$ | Any terminal to case, t = 1 min | 2500 | V |

**Notes**

(1) Limited at max. junction temperature

(2) Duty cycle ≤ 1 %

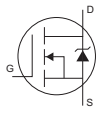
## THERMAL - MECHANICAL SPECIFICATIONS

| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|---|
| Operating junction temperature range | | $T_J$ | | -55 | - | 175 | °C |
| Operating storage temperature range | | $T_{Stg}$ | | -40 | - | 150 | |
| Junction to case | MOSFET | $R_{thJC}$ | | - | - | 0.16 | °C/W |
| Case to heatsink | Module | $R_{thCS}$ | Flat, greased surface | - | 0.1 | - | |
| Weight | | | | - | 30 | - | g |
| Mounting torque | | | Torque to terminal | - | - | 1.1 (9.7) | Nm (lbf. in) |
| | | | Torque to heatsink | - | - | 1.3 (11.5) | Nm (lbf. in) |
| Case style | | | | SOT-227 | | | |

## ELECTRICAL CHARACTERISTICS ($T_J$ = 25 °C unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Drain to source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 1.0 mA | 200 | - | - | V |
| Breakdown voltage temperature coefficient | $\Delta V_{(BR)DSS}/\Delta T_J$ | Reference to 25 °C, $I_D$ = 1.0 mA | - | 0.16 | - | V/°C |
| Static drain to source on-resistance | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 200 A | - | 3.3 | 4.7 | mΩ |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 1.0 mA | 1.8 | 3.16 | 4.3 | V |
| Forward transconductance | $g_{fs}$ | $V_{DS}$ = 15 V, $I_D$ = 100 A, $V_{GS}$ = 10 V | - | 270 | - | S |
| Drain to source leakage current | $I_{DSS}$ | $V_{DS}$ = 200 V, $V_{GS}$ = 0 V | - | 0.5 | 10 | µA |
| | | $V_{DS}$ = 200 V, $V_{GS}$ = 0 V, $T_J$ = 150 °C | - | 160 | - | |
| Gate to source leakage | $I_{GSS}$ | $V_{GS}$ = ± 20 V | - | - | ± 200 | nA |
| Total gate charge | $Q_g$ | $I_D$ = 120 A<br>$V_{DS}$ = 100 V<br>$V_{GS}$ = 10 V | - | 250 | - | nC |
| Gate to source charge | $Q_{gs}$ | | - | 68 | - | |
| Gate to drain ("Miller") charge | $Q_{gd}$ | | - | 70 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$ = 100 V<br>$I_D$ = 100 A<br>$R_g$ = 1 Ω<br>$V_{GS}$ = 10 V | - | 76 | - | ns |
| Rise time | $t_r$ | | - | 212 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 134 | - | |
| Fall time | $t_f$ | | - | 118 | - | |
| Input capacitance | $C_{iss}$ | $V_{GS}$ = 0 V<br>$V_{DS}$ = 100 V<br>f = 1 MHz | - | 16.5 | - | nF |
| Output capacitance | $C_{oss}$ | | - | 1.0 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 0.8 | - | |
| Temperature coefficient of threshold voltage | $\Delta V_{GE(th)}/\Delta T_J$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 1.0 mA (25 °C to 125 °C) | - | 9.2 | - | mV/° |

## SOURCE-DRAIN RATINGS AND CHARACTERISTICS ($T_J$ = 25 °C unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Continuous source current (body diode) | $I_S$ | MOSFET symbol showing the integral reverse p-n junction diode  | - | - | 287 | A |
| Pulsed source current (body diode) | $I_{SM}$ | | - | - | 680 | |
| Diode forward voltage | $V_{SD}$ | $I_S$ = 200 A, $V_{GS}$ = 0 V | - | 0.93 | 1.23 | V |
| Reverse recovery time | $t_{rr}$ | $T_J$ = 25 °C, $I_F$ = $I_S$ = 50 A,<br>dI/dt = 100 A/µs, $V_R$ = 100 V | - | 210 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 1646 | - | nC |
| Reverse recovery current | $I_{RM}$ | | - | 15.7 | - | A |

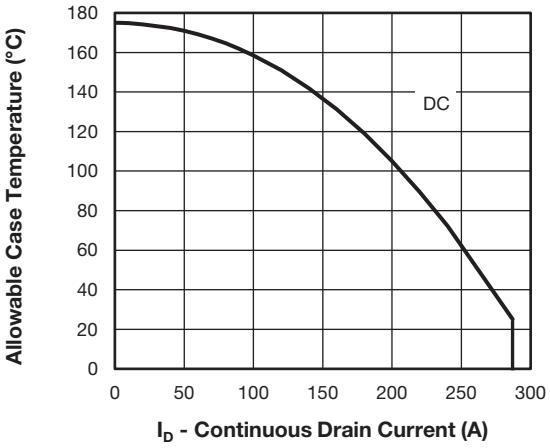



Fig. 1 - Maximum Continuous Drain Current vs. Case Temperature

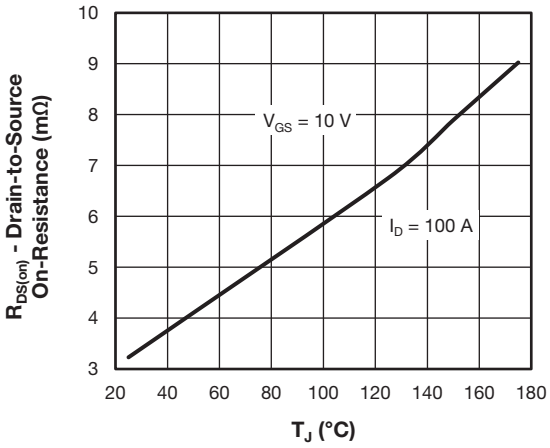



Fig. 4 - Typical Drain-to-Source On-Resistance vs. Temperature

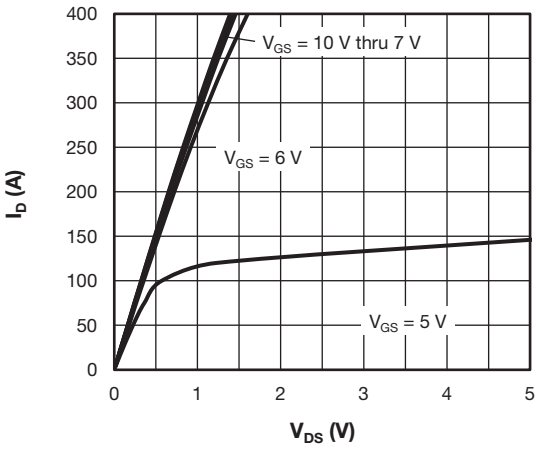



Fig. 2 - Typical Drain to Source Current Output Characteristics at $T_J$ = 125°C

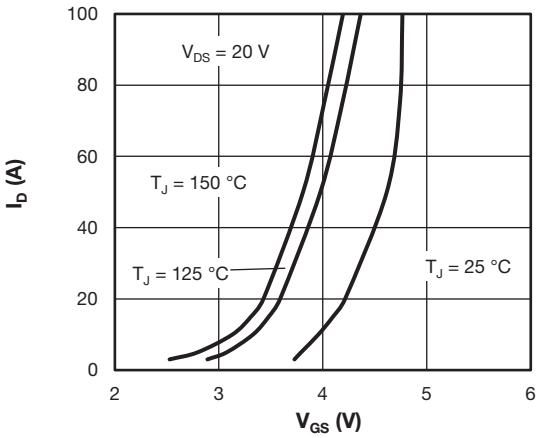



Fig. 5 - Typical Transfer Characteristics

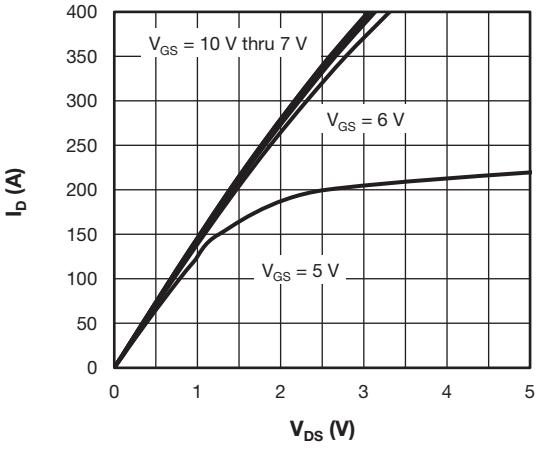



Fig. 3 - Typical Drain to Source Current Output Characteristics at $T_J$ = 125°C

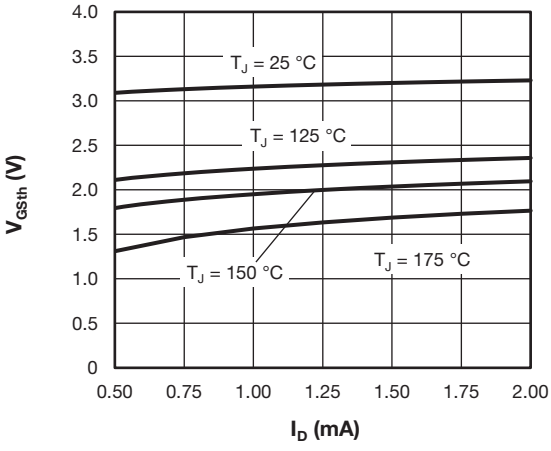



Fig. 6 - Typical Gate Threshold Voltage Characteristics

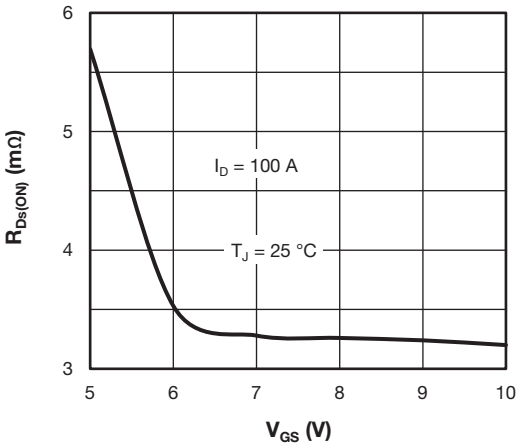



Fig. 7 - Typical Drain - State Resistance vs. Gate to Source Voltage

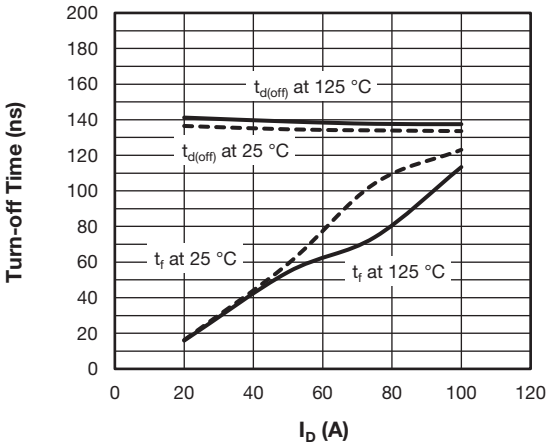



Fig. 10 - Typical Turn-Off Switching Time vs. $I_D$, $V_{DD}$ = 100 V, $R_g$ = 1.0 Ω, $V_{GS}$ = ± 10 V, L = 500 µH

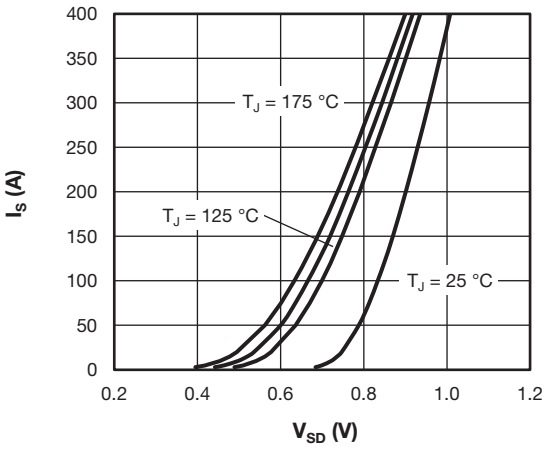



Fig. 8 - Typical Body Diode Source-to-Drain Current Characteristics

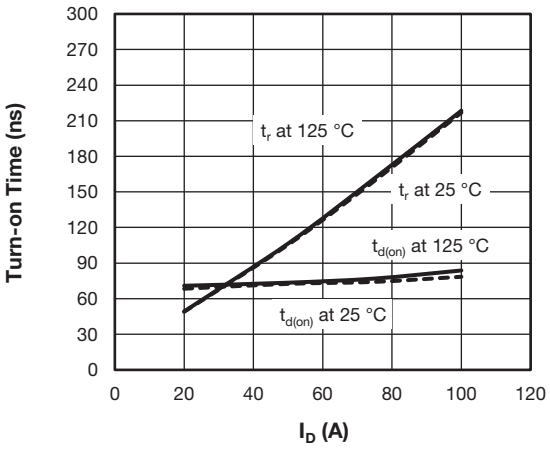



Fig. 11 - Typical Turn-On Switching Time vs. $I_D$, $V_{DD}$ = 100 V, $R_g$ = 1.0 Ω, $V_{GS}$ = ± 10 V, L = 500 µH

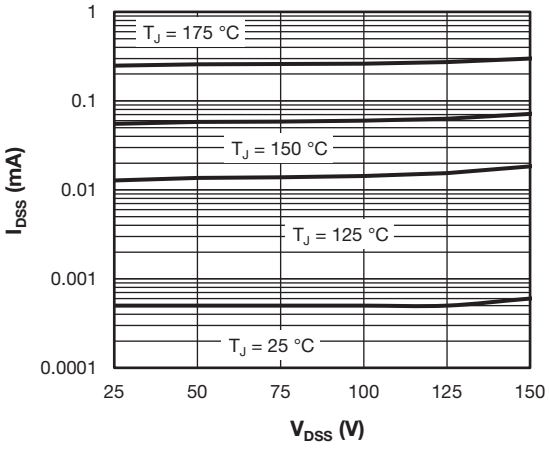



Fig. 9 - Typical Zero Gate Voltage Drain Current

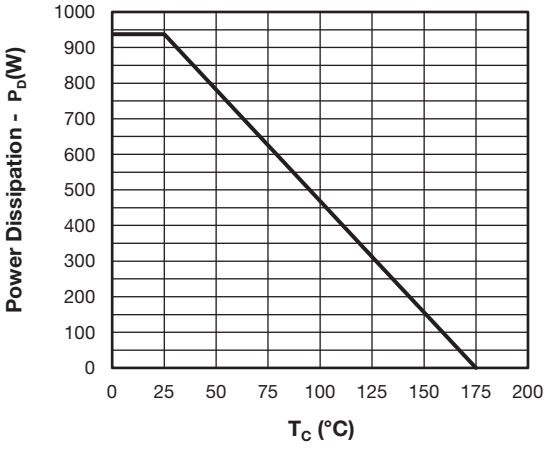



Fig. 12 - Power Dissipation Curve

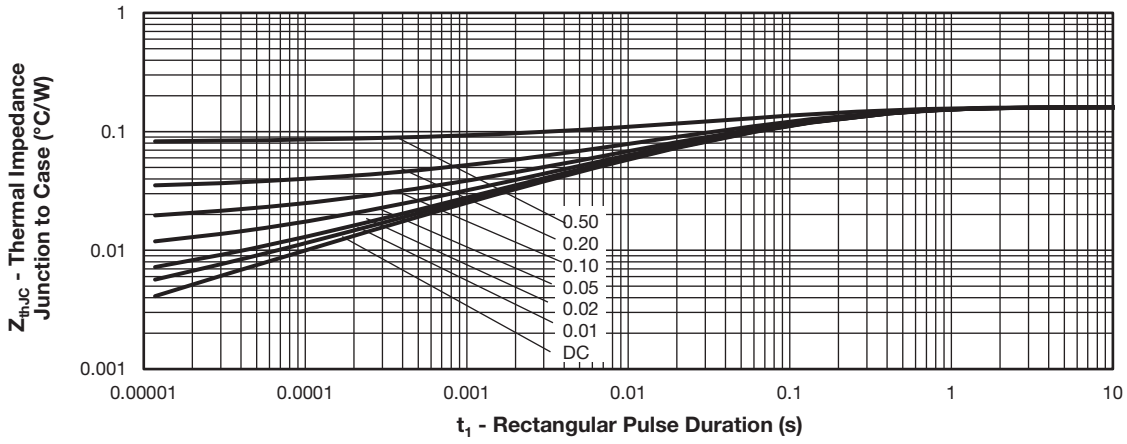



Fig. 13 - Maximum Thermal Impedance Junction-to-Case Characteristics

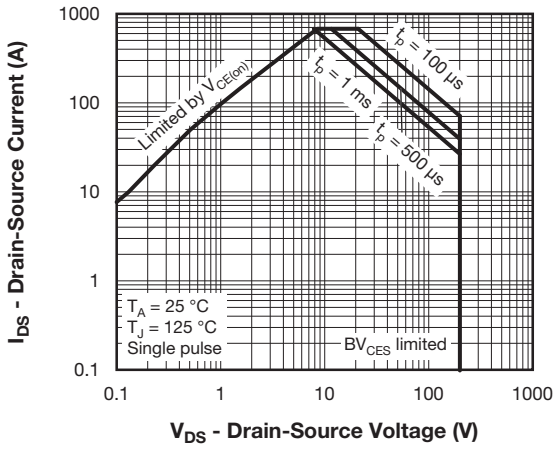


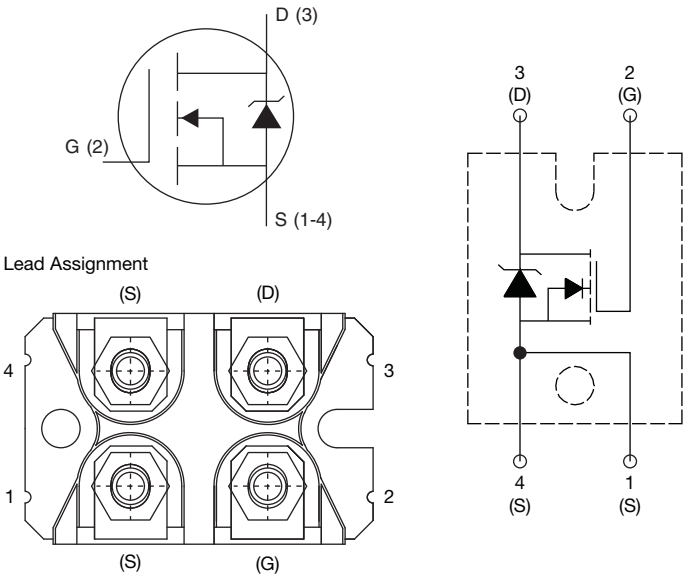

Fig. 14 - Safe Operating Area

## ORDERING INFORMATION TABLE

**Device code**

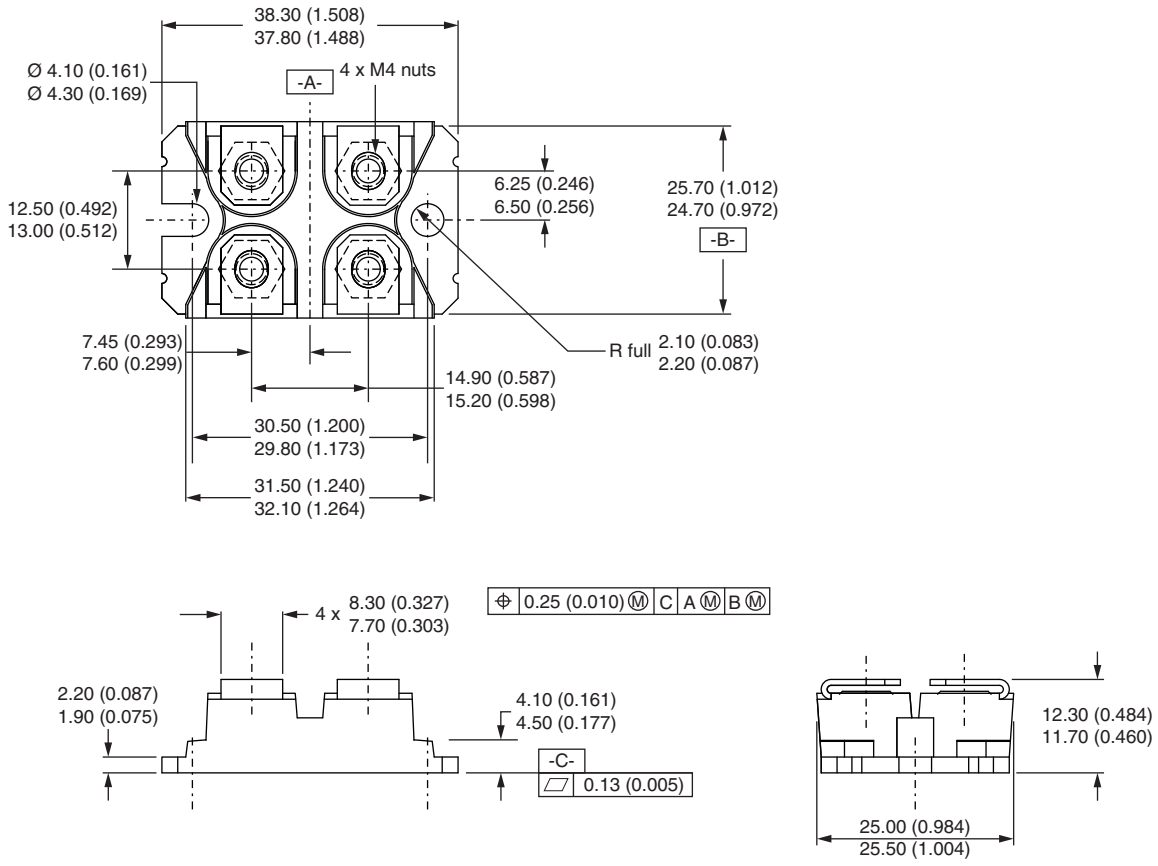
| VS- | F | C | 270 | S | A | 20 |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | |
|---|---|---|
| 1 | - | Vishay Semiconductors product |
| 2 | - | MOSFET module |
| 3 | - | MOSFET die generation |
| 4 | - | Current rating (270 = 270 A) |
| 5 | - | Circuit configuration (S = single switch) |
| 6 | - | Package indicator (SOT-227) |
| 7 | - | Voltage rating (20 = 200 V) |

| CIRCUIT CONFIGURATION | | |
|---|---|---|
| **CIRCUIT** | **CIRCUIT CONFIGURATION CODE** | **CIRCUIT DRAWING** |
| Single switch | S |  |



**DIMENSIONS** in millimeters



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