


SOT-227 Power Module

Single Switch - Power MOSFET, 270 A



SOT-227

FEATURES

- $I_D = 287\text{ A}$, $T_C = 25\text{ }^\circ\text{C}$
- ThunderFET power MOSFET
- Reduced switching and conduction losses
- Maximum $175\text{ }^\circ\text{C}$ junction temperature
- UL approved file E78996 
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

PRIMARY CHARACTERISTICS

| | |
|--------------|-------------------------------------|
| V_{DSS} | 200 V |
| $R_{DS(on)}$ | 3.3 m Ω |
| I_D | 219 A at $90\text{ }^\circ\text{C}$ |
| Type | Modules - MOSFET |
| Package | SOT-227 |

APPLICATIONS

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

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 $\leq 1\%$

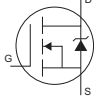
THERMAL - MECHANICAL SPECIFICATIONS

| 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 | - | - | 1.8 (15.9) | Nm (lbf. in) |
| Case style | | | SOT-227 | | | |

ELECTRICAL CHARACTERISTICS ($T_J = 25\text{ °C}$ unless otherwise specified)

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

SOURCE-DRAIN RATINGS AND CHARACTERISTICS ($T_J = 25\text{ °C}$ 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} | $I_S = 200\text{ A}$, $V_{GS} = 0\text{ V}$ | - | 0.93 | 1.23 | V |
| Reverse recovery time | t_{rr} | $T_J = 25\text{ °C}$, $I_F = I_S = 50\text{ A}$, $di/dt = 100\text{ A/μs}$, $V_R = 100\text{ V}$ | - | 210 | - | ns |
| Reverse recovery charge | Q_{rr} | | - | 1646 | - | nC |
| Reverse recovery current | I_{RM} | | - | 15.7 | - | A |

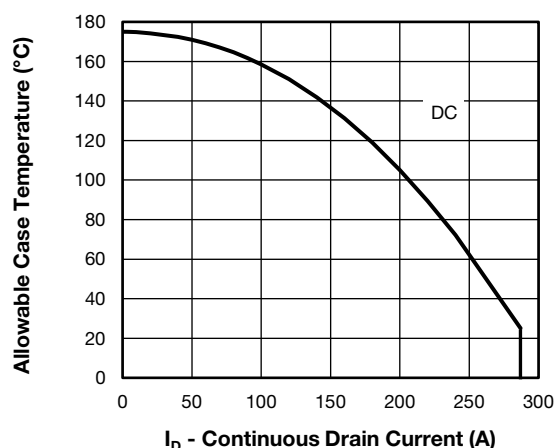


Fig. 1 - Maximum Continuous Drain Current vs. Case Temperature

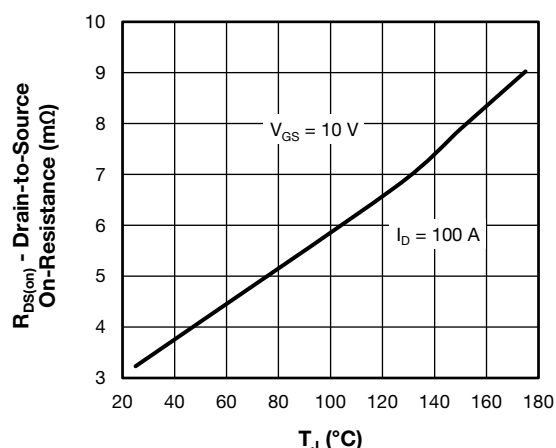


Fig. 4 - Typical Drain-to-Source On-Resistance vs. Temperature

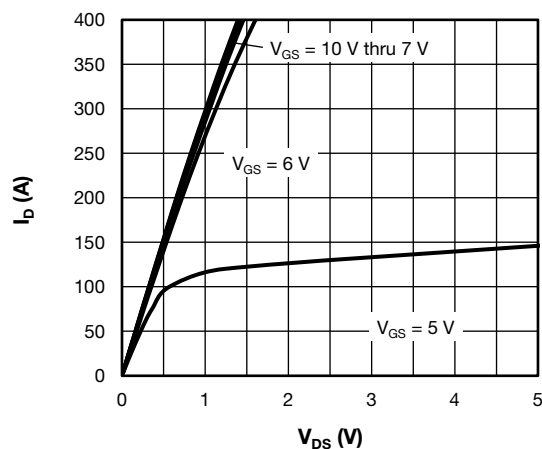
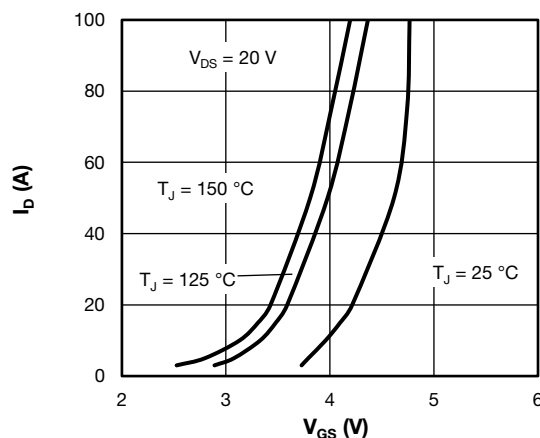

Fig. 2 - Typical Drain to Source Current Output Characteristics at $T_J = 125^\circ\text{C}$


Fig. 5 - Typical Transfer Characteristics

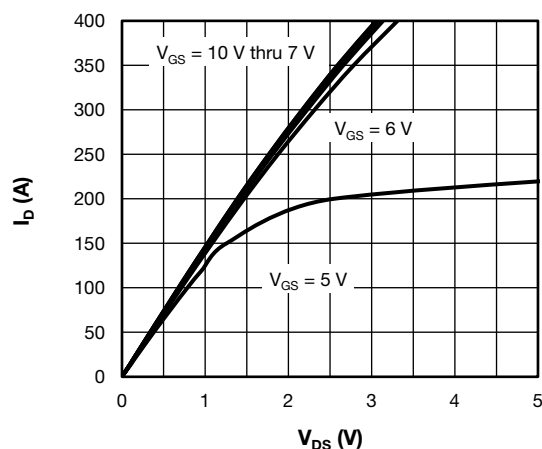
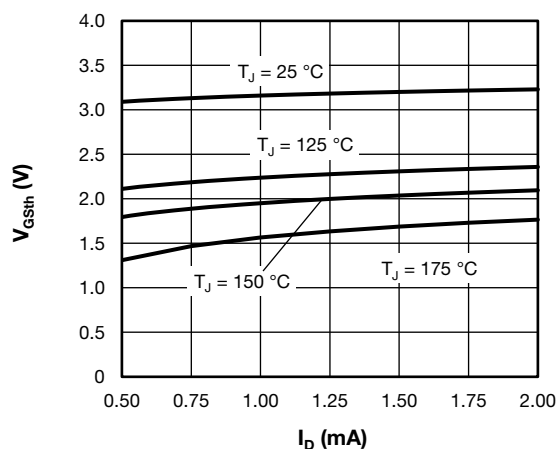

Fig. 3 - Typical Drain to Source Current Output Characteristics at $T_J = 125^\circ\text{C}$


Fig. 6 - Typical Gate Threshold Voltage Characteristics

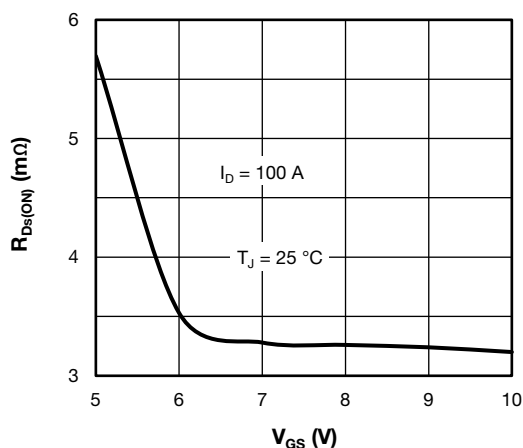


Fig. 7 - Typical Drain - State Resistance vs. Gate to Source Voltage

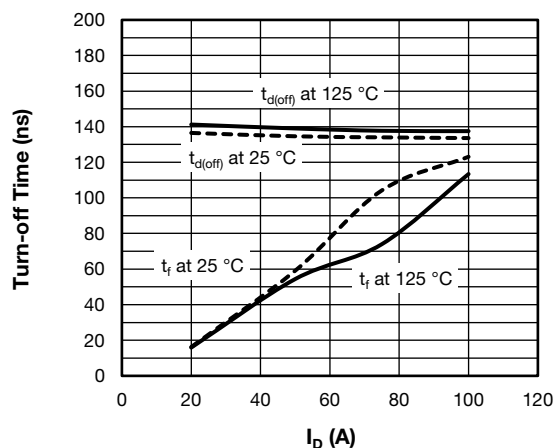
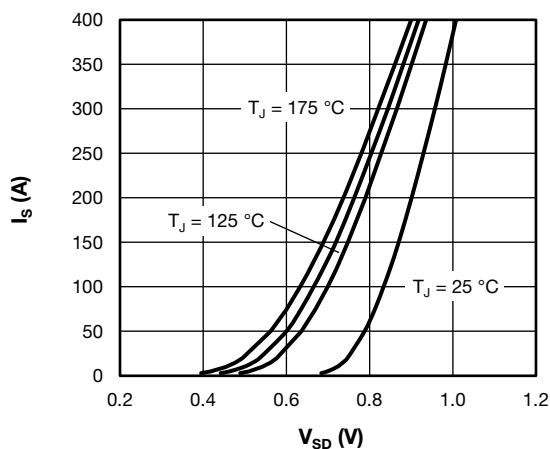

Fig. 10 - Typical Turn-Off Switching Time vs. I_D , $V_{DD} = 100$ V, $R_g = 1.0$ Ω , $V_{GS} = \pm 10$ V, $L = 500$ μH


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

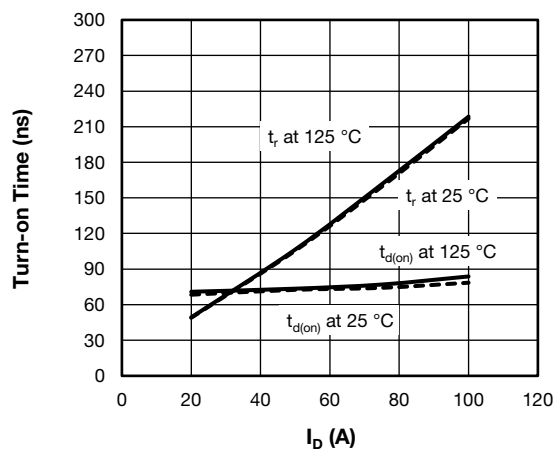
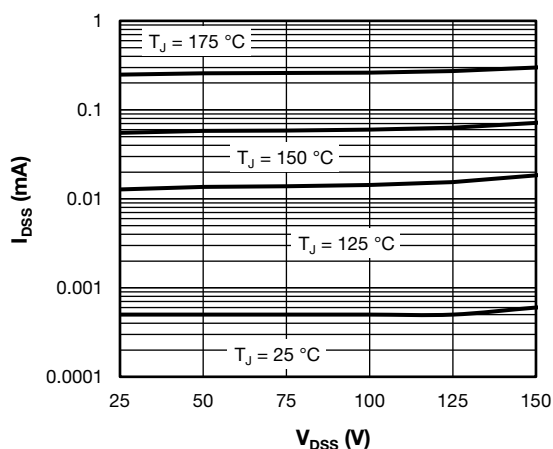

Fig. 11 - Typical Turn-On Switching Time vs. I_D , $V_{DD} = 100$ V, $R_g = 1.0$ Ω , $V_{GS} = \pm 10$ V, $L = 500$ μH


Fig. 9 - Typical Zero Gate Voltage Drain Current

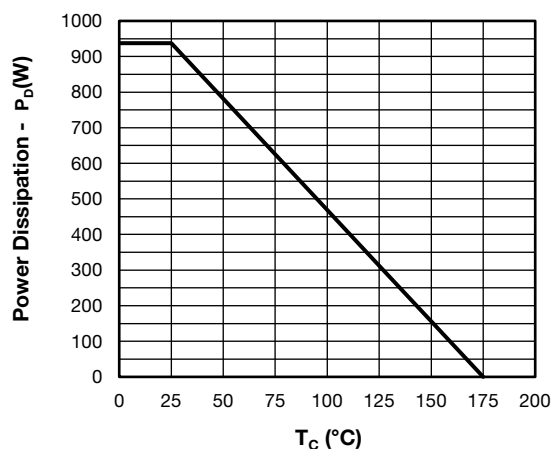


Fig. 12 - Power Dissipation Curve

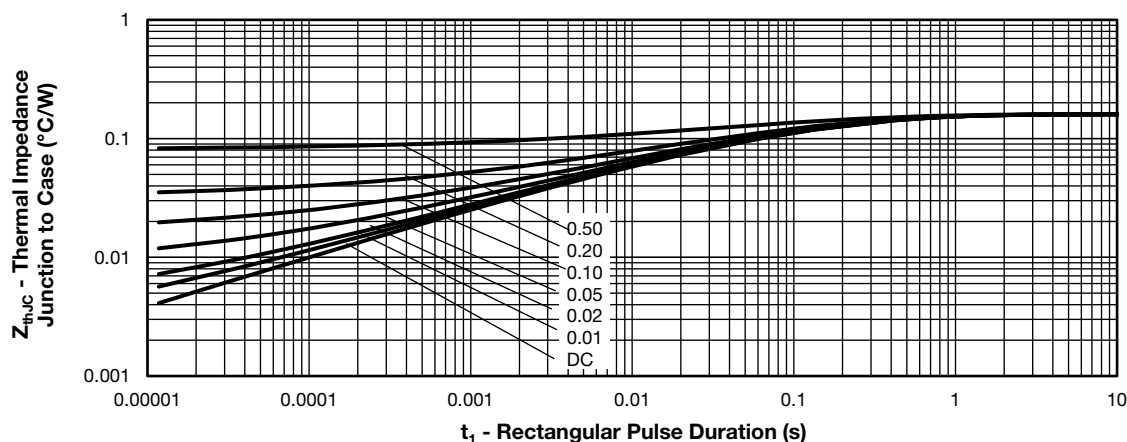


Fig. 13 - Maximum Thermal Impedance Junction-to-Case Characteristics

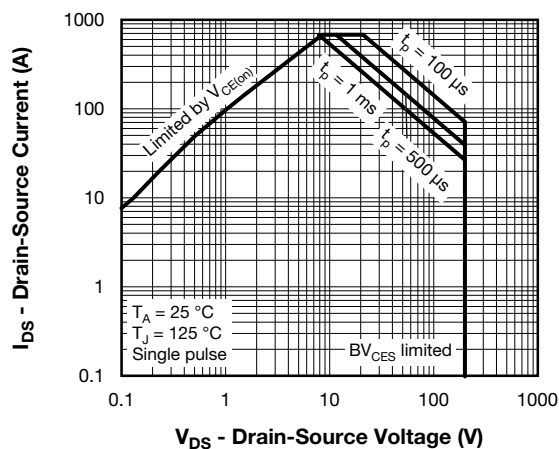
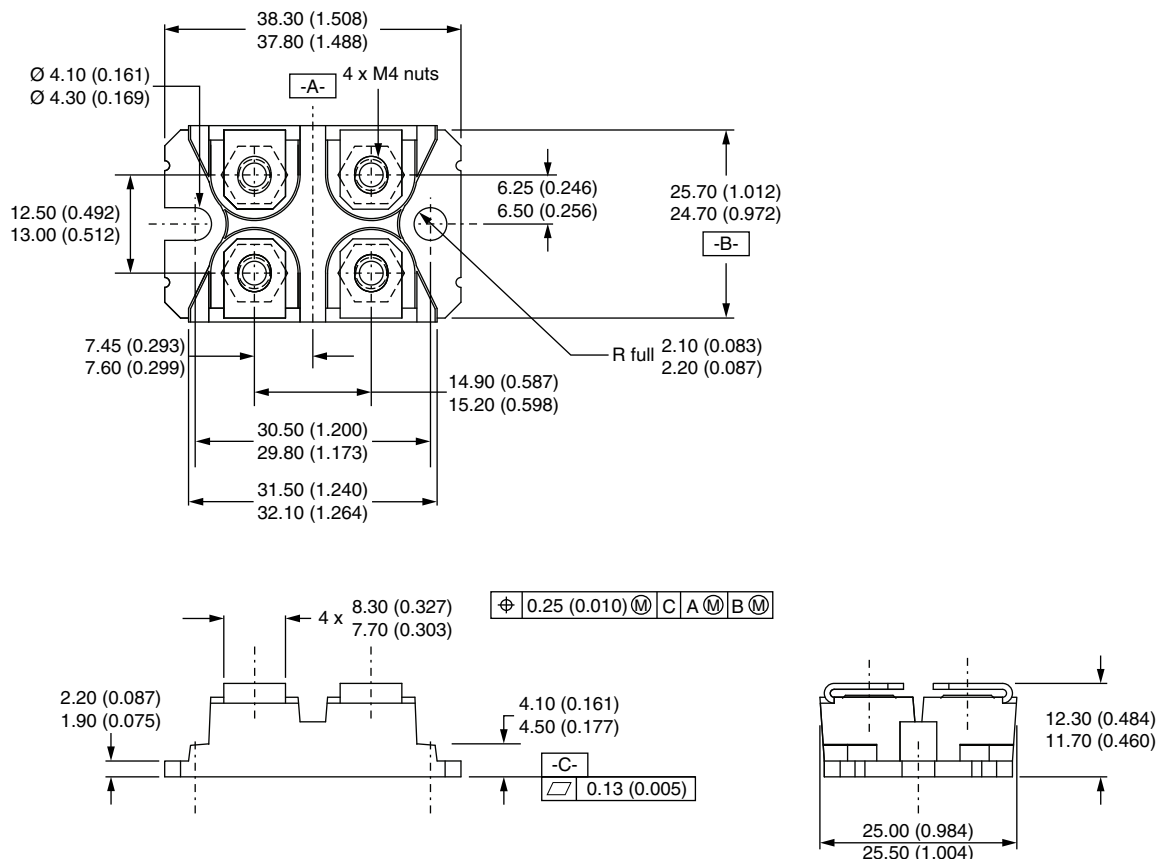


Fig. 14 - Safe Operating Area

ORDERING INFORMATION TABLE

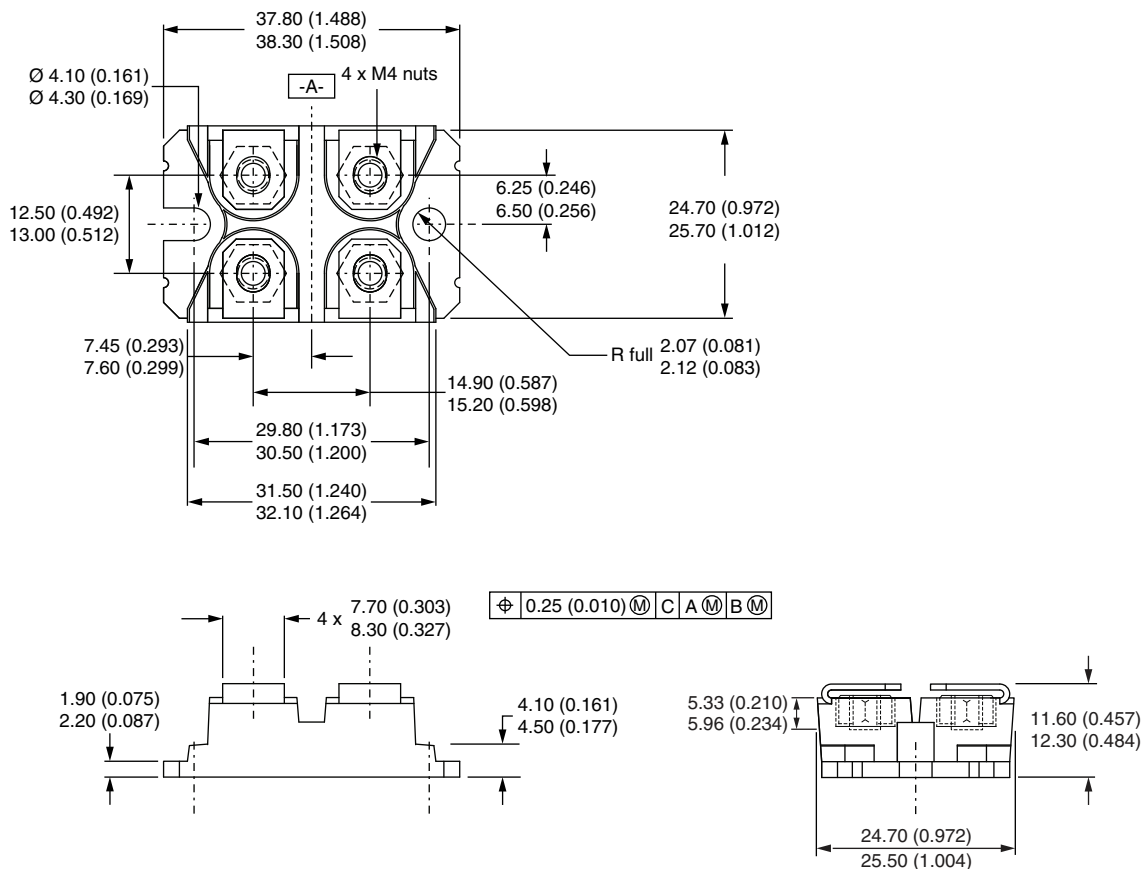
| Device code | VS- | F | C | 270 | S | A | 20 |
|-------------|-----|---|---|-----|---|---|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | - | Vishay Semiconductors product | | | | | |
| 2 | - | MOSFET module | | | | | |
| 3 | - | MOSFET die generation | | | | | |
| 4 | - | Current rating (270 = 270 A) | | | | | |
| 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


SOT-227 Generation 2

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter



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