


## SOT-227 Power Module Single Switch - Power MOSFET, 400 A



SOT-227

**FEATURES**

- $I_D = 400\text{ A}$ ,  $T_C = 25\text{ °C}$
- ThunderFET Power MOSFET
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- Reduced switching and conduction losses
- Ultra low gate charge ( $Q_g$ )
- Maximum 175 °C junction temperature
- UL approved file E78996 
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

**PRIMARY CHARACTERISTICS**

$V_{DSS}$	150 V
$R_{DS(on)}$ at 200 A	1.93 m $\Omega$
$I_D$	300 A at 90 °C
Type	Modules - MOSFET
Package	SOT-227

**APPLICATIONS**

- DC/DC conversions
- Motor drives
- DC/AC inverter
- Power supplies
- Uninterruptible power supplies
- AC/DC switch-mode power supplies

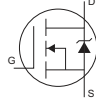
**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
<b>MOSFET</b>				
Drain to source voltage	$V_{DSS}$		150	V
Continuous drain current, $V_{GS}$ at 10 V	$I_D$	$T_C = 25\text{ °C}$	400	A
		$T_C = 90\text{ °C}$	300	
Pulsed drain current	$I_{DM}^{(1)}$		860	
Power dissipation	$P_D$	$T_C = 25\text{ °C}$	909	W
Gate to source voltage	$V_{GS}$		$\pm 20$	V
Single pulse avalanche current	$E_{AS}$		720	J
Avalanche current	$I_{AS}$	$T_C = 25\text{ °C}$ , $L = 10\text{ mH}$ , $V_{GS} = 10\text{ V}$	120	A
<b>MODULE</b>				
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, $t = 1\text{ min}$	2500	V

**Note**
<sup>(1)</sup> Limited at max. junction temperature

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	$R_{thJC}$	-	-	0.165	°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 ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Drain to source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}$ , $I_D = 500\text{ }\mu\text{A}$	150	-	-	V
Breakdown voltage temperature coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1.0\text{ mA}$	-	9.0	-	mV/°C
Static drain to source on-resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 200\text{ A}$	-	1.93	2.75	mΩ
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 1.0\text{ mA}$	1.80	3.46	5.4	V
Temperature coefficient of threshold voltage	$\Delta V_{GE(th)}/\Delta T_J$	$V_{DS} = V_{GS}$ , $I_D = 1.0\text{ mA}$ ( $25\text{ }^\circ\text{C}$ to $125\text{ }^\circ\text{C}$ )	-	9.6	-	mV/°C
Forward transconductance	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 100\text{ A}$ , $V_{GS} = 10\text{ V}$	-	200	-	S
Drain to source leakage current	$I_{DSS}$	$V_{DS} = 150\text{ V}$ , $V_{GS} = 0\text{ V}$	-	0.5	10.0	μA
		$V_{DS} = 150\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$	-	19	-	
Gate to source leakage	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}$	-	-	± 200	nA
Total gate charge	$Q_g$	$I_D = 250\text{ A}$ $V_{DS} = 75\text{ V}$ $V_{GS} = 10\text{ V}$	-	250	-	nC
Gate to source charge	$Q_{gs}$		-	79	-	
Gate to drain ("Miller") charge	$Q_{gd}$		-	82	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 75\text{ V}$ $I_D = 100\text{ A}$ $R_g = 1\text{ }\Omega$ $V_{GS} = 10\text{ V}$	-	139	-	ns
Rise time	$t_r$		-	285	-	
Turn-off delay time	$t_{d(off)}$		-	120	-	
Fall time	$t_f$		-	142	-	
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ $V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$	-	13.7	-	nF
Output capacitance	$C_{oss}$		-	2.2	-	
Reverse transfer capacitance	$C_{rss}$		-	0.104	-	

SOURCE-DRAIN RATINGS AND CHARACTERISTICS ( $T_J = 25\text{ }^\circ\text{C}$ 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 	-	-	476	A
Pulsed source current (body diode)	$I_{SM}$		-	-	850	
Diode forward voltage	$V_{SD}$	$I_S = 250\text{ A}$ , $V_{GS} = 0\text{ V}$	-	0.95	-	V
Reverse recovery time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_F = I_S = 50\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 50\text{ V}$	-	171	-	ns
Reverse recovery charge	$Q_{rr}$		-	1032	-	nC
Reverse recovery current	$I_{RM}$		-	12	-	A

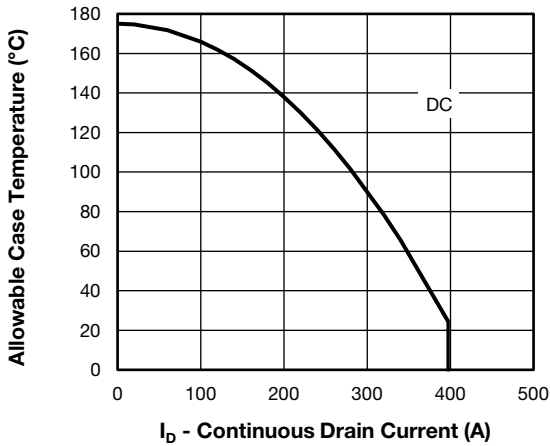


Fig. 1 - Maximum Continuous Drain Current vs. Case Temperature

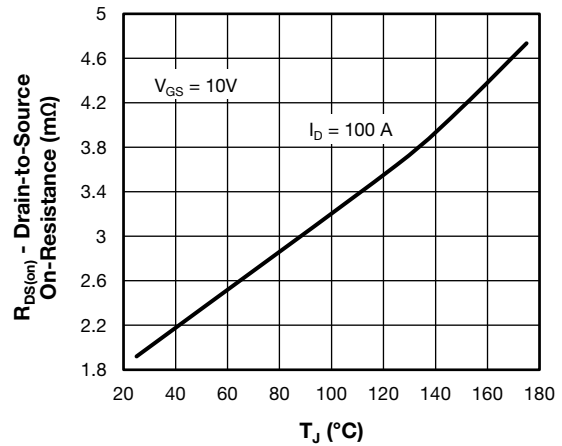


Fig. 4 - Typical Drain-to-Source On-Resistance vs. Temperature

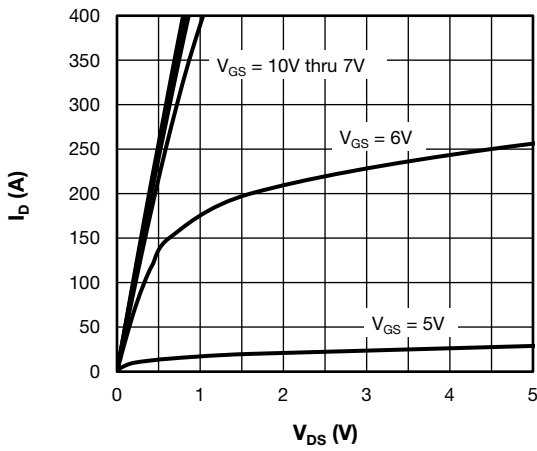


Fig. 2 - Typical Drain to Source Current Output Characteristics at  $T_J = 25\text{ }^\circ\text{C}$

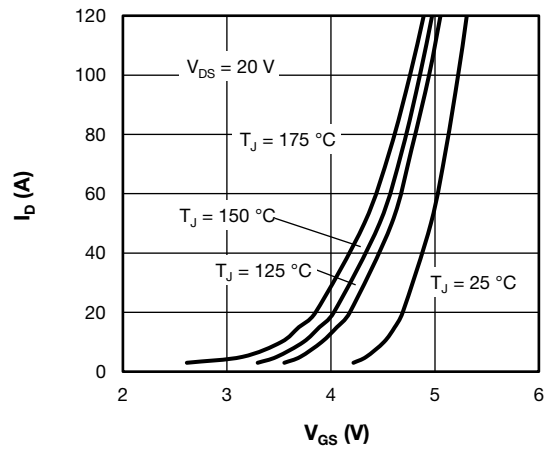


Fig. 5 - Typical Transfer Characteristics

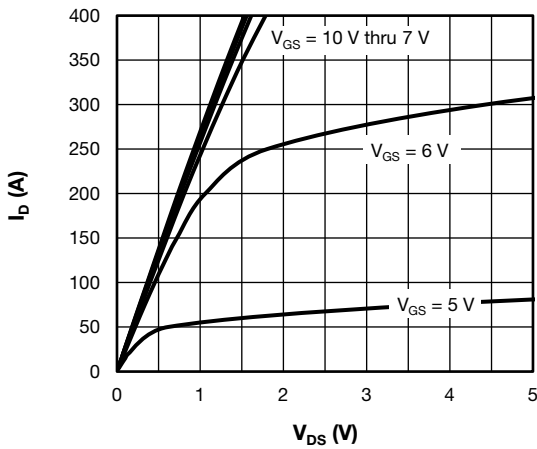


Fig. 3 - Typical Drain to Source Current Output Characteristics at  $T_J = 125\text{ }^\circ\text{C}$

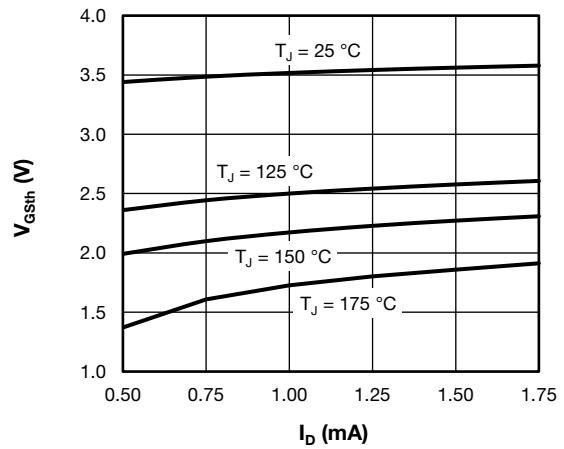


Fig. 6 - Typical Gate Threshold Voltage Characteristics

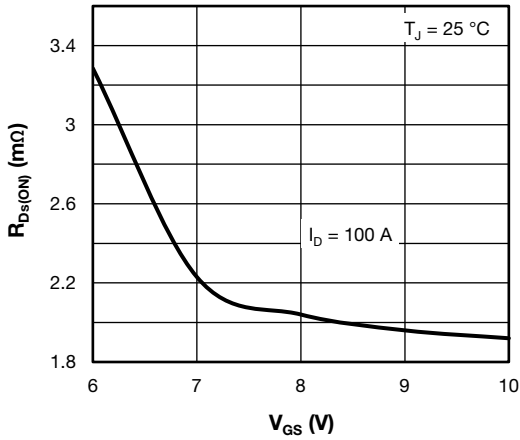


Fig. 7 - Typical Drain - State Resistance vs. Gate to Source Voltage

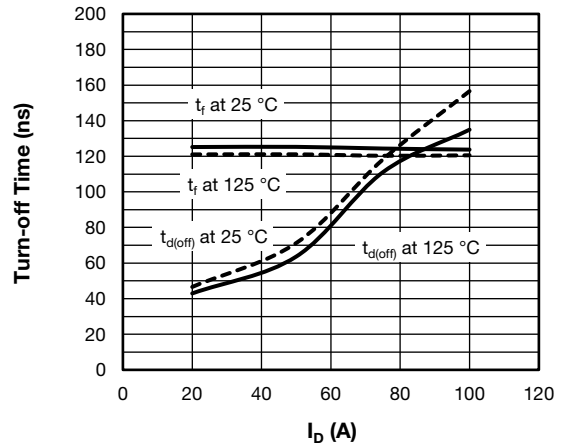


Fig. 10 - Typical Turn-off Switching Time vs.  $I_D$

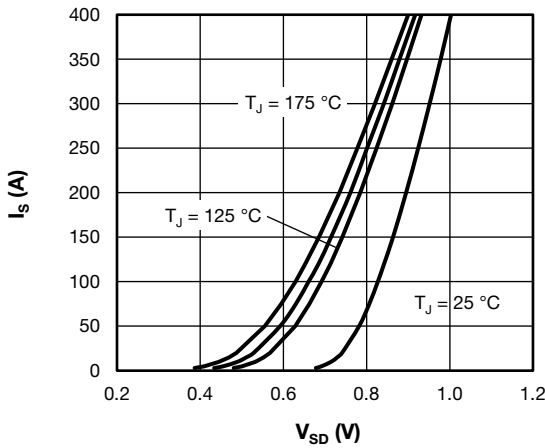


Fig. 8 - Typical Body Diode Source-to-Drain Current Characteristics

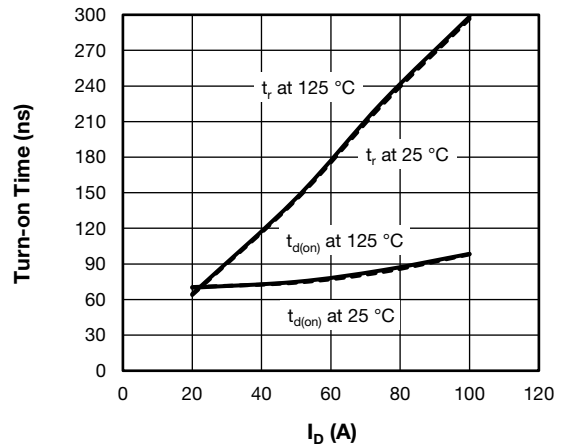


Fig. 11 - Typical Turn-on Switching Time vs.  $I_D$

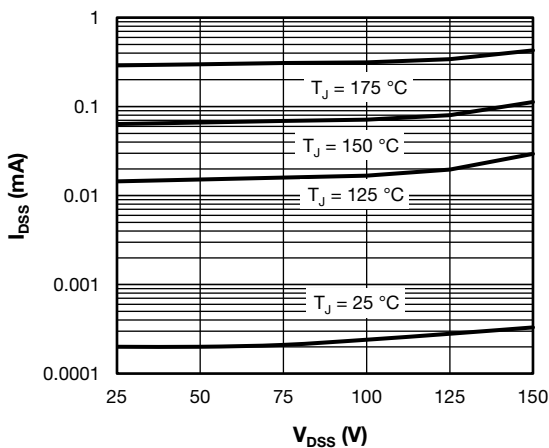


Fig. 9 - Typical Zero Gate Voltage Drain Current

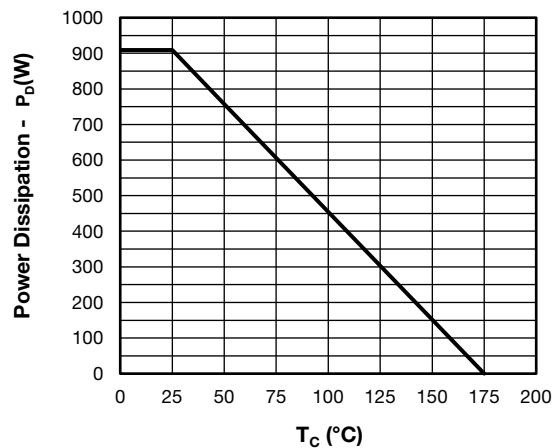


Fig. 12 - Power Dissipation Curve

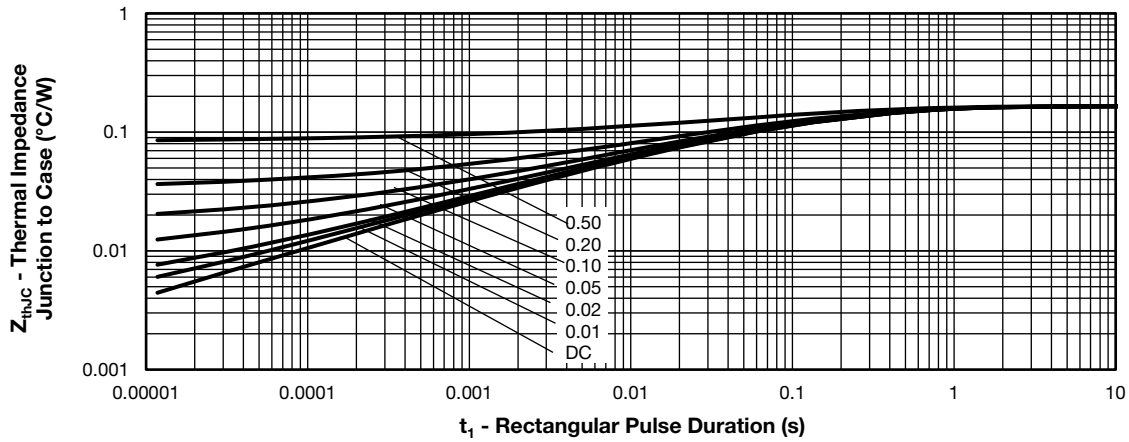


Fig. 13 - Maximum Thermal Impedance Junction-to-Case Characteristics

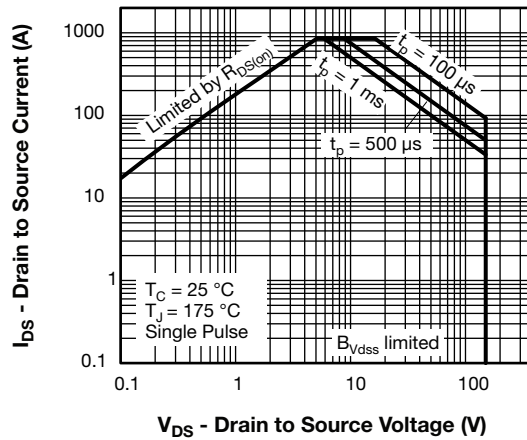


Fig. 14 - Safe Operating Area

**ORDERING INFORMATION TABLE**

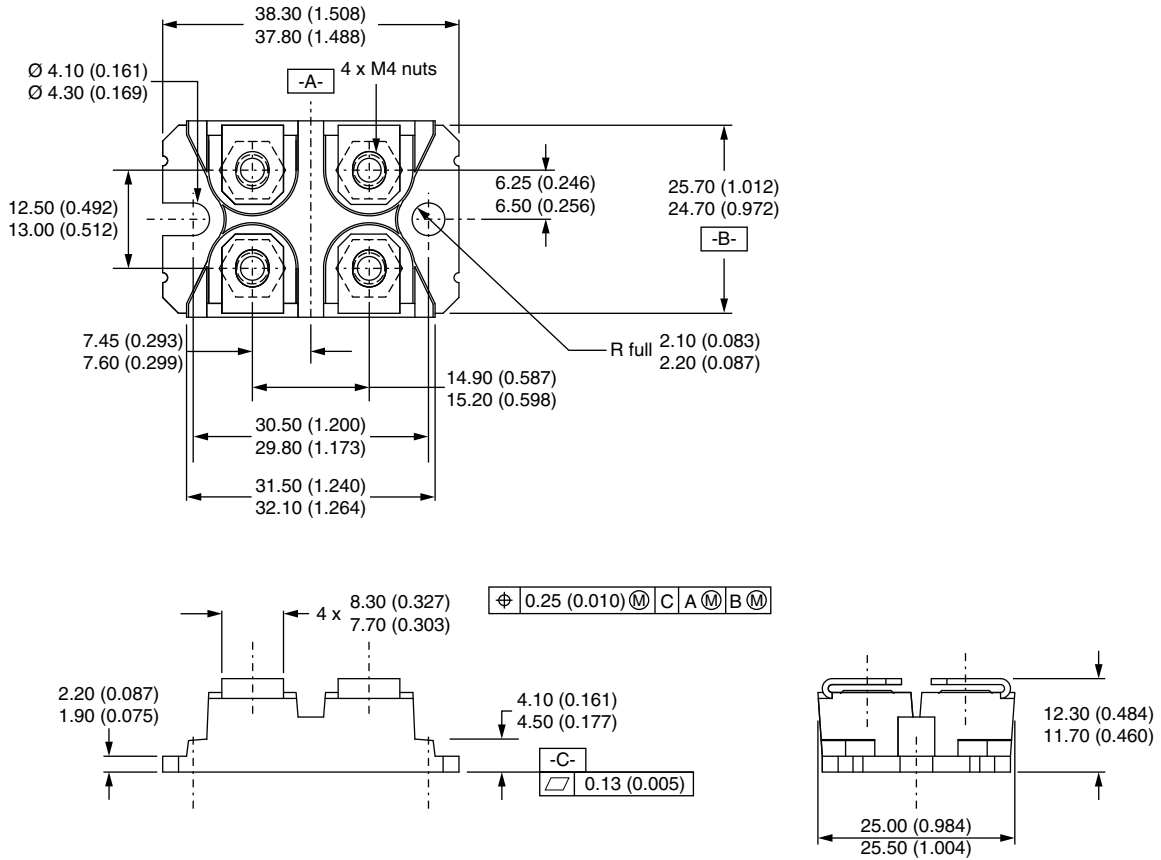
Device code	<b>VS-</b>	<b>F</b>	<b>C</b>	<b>420</b>	<b>S</b>	<b>A</b>	<b>15</b>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

- 1** - Vishay Semiconductors product
- 2** - MOSFET module
- 3** - MOSFET die generation
- 4** - Current rating (420 = 420 A)
- 5** - Circuit configuration (S = single switch)
- 6** - Package indicator (SOT-227)
- 7** - Voltage rating (15 = 150 V)

CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Single switch	S	<p>The circuit drawing for the 'Single switch' configuration (code S) consists of three parts:</p> <ul style="list-style-type: none"> <li><b>Schematic:</b> A circular schematic showing a diode with its cathode to the left and anode to the right, and a transistor with its emitter to the left and collector to the right. The diode's anode is connected to the transistor's emitter. Labels include 'D (3)' for the diode, 'G (2)' for the gate, and 'S (1-4)' for the switch terminals.</li> <li><b>Lead Assignment:</b> A diagram of the device package showing four leads labeled 1, 2, 3, and 4. Lead 1 is labeled (S), lead 2 is (G), lead 3 is (D), and lead 4 is (S).</li> <li><b>Circuit Diagram:</b> A detailed schematic showing the internal connections between the diode and transistor. The diode's anode is connected to the transistor's emitter. The gate is connected to the diode's cathode. The collector is connected to the diode's anode. The terminals are labeled 3 (D), 2 (G), 4 (S), and 1 (S).</li> </ul>



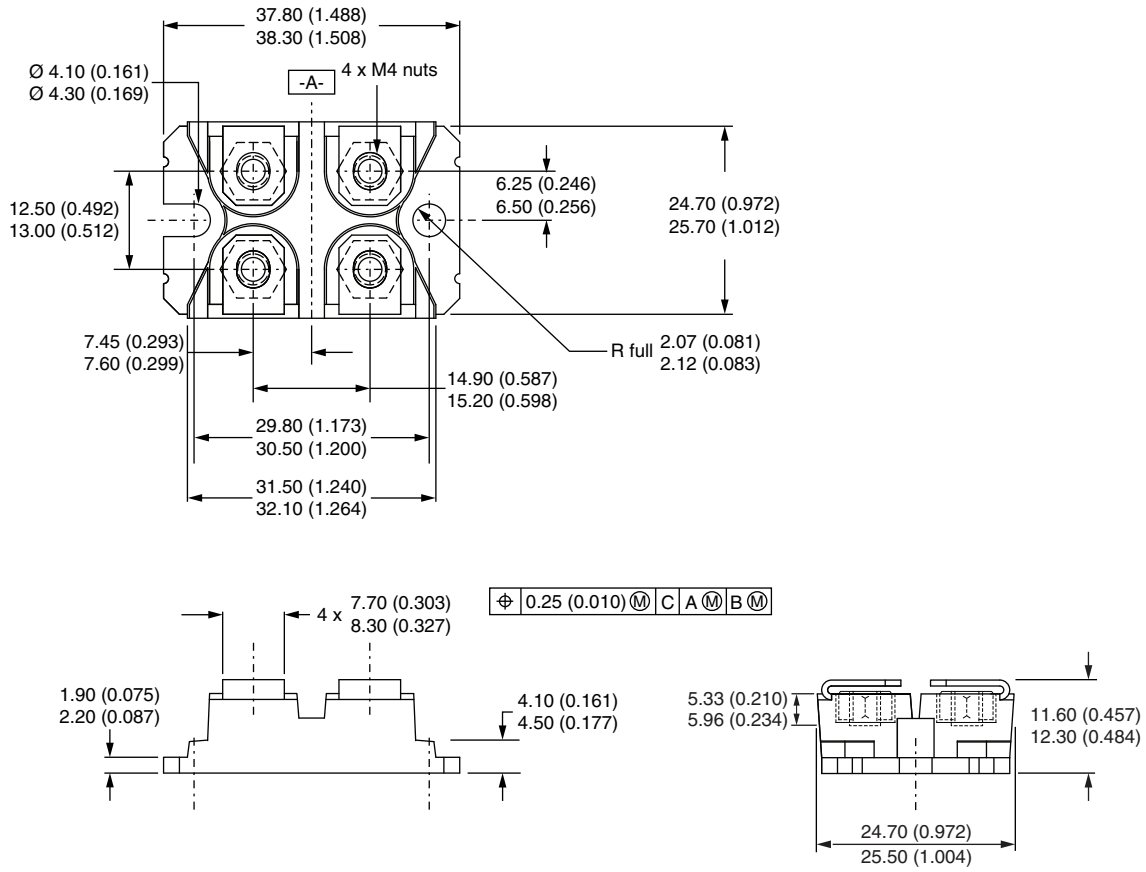
**DIMENSIONS** in millimeters





# SOT-227 Generation 2

**DIMENSIONS** in millimeters (inches)



**Note**

- Controlling dimension: millimeter





## **Disclaimer**

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