

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 $\leq 1\%$

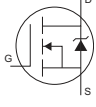
THERMAL - MECHANICAL SPECIFICATIONS

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

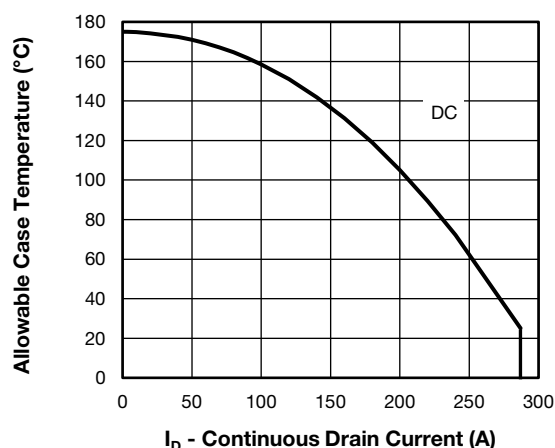


Fig. 1 - Maximum Continuous Drain Current vs. Case Temperature

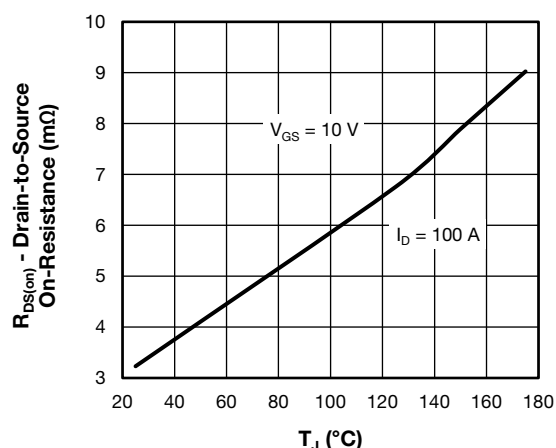


Fig. 4 - Typical Drain-to-Source On-Resistance vs. Temperature

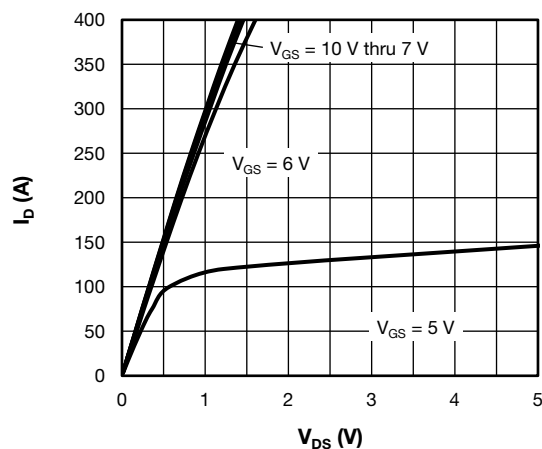
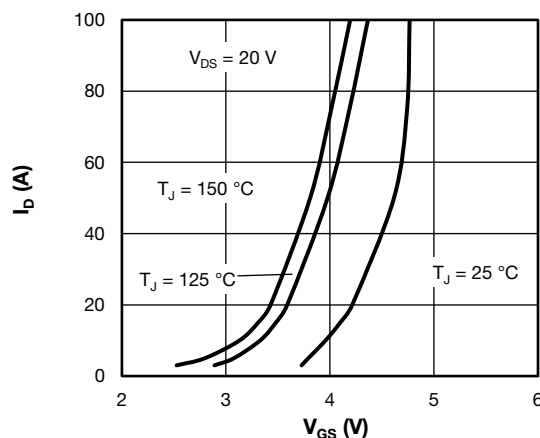

Fig. 2 - Typical Drain to Source Current Output Characteristics at $T_J = 125^\circ\text{C}$


Fig. 5 - Typical Transfer Characteristics

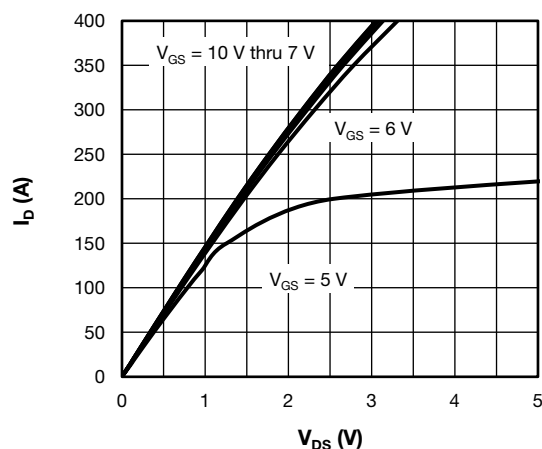
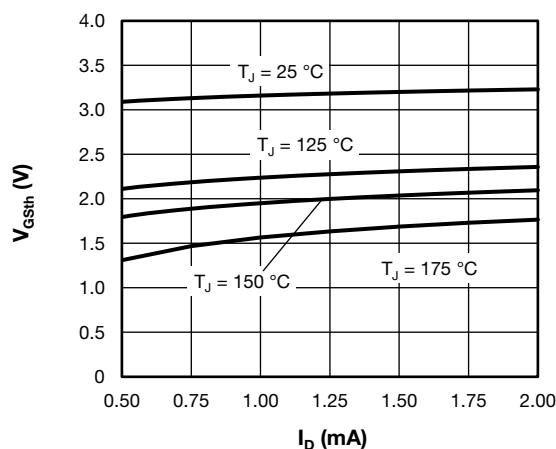

Fig. 3 - Typical Drain to Source Current Output Characteristics at $T_J = 125^\circ\text{C}$


Fig. 6 - Typical Gate Threshold Voltage Characteristics

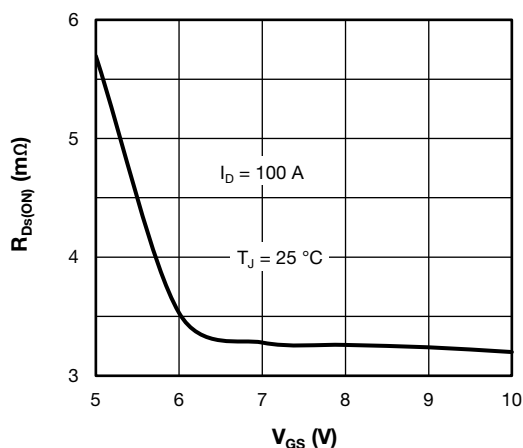


Fig. 7 - Typical Drain - State Resistance vs. Gate to Source Voltage

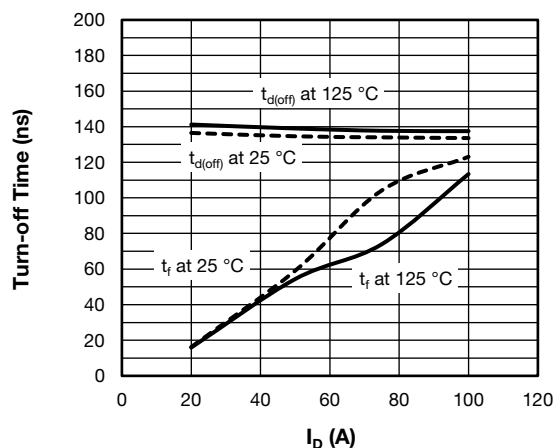
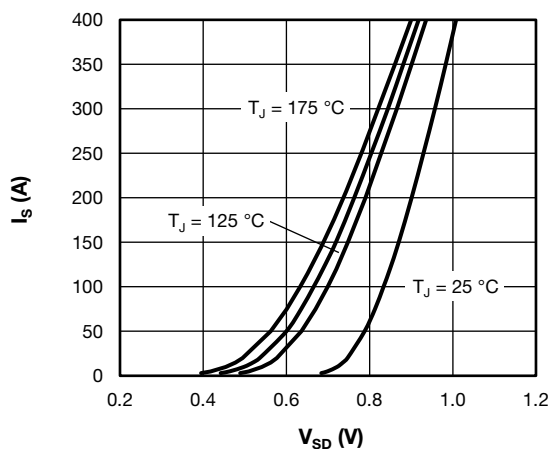

Fig. 10 - Typical Turn-Off Switching Time vs. I_D , $V_{DD} = 100$ V, $R_g = 1.0$ Ω , $V_{GS} = \pm 10$ V, $L = 500$ μH


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

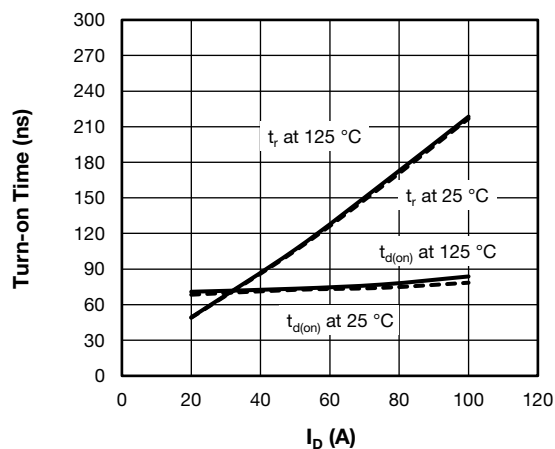
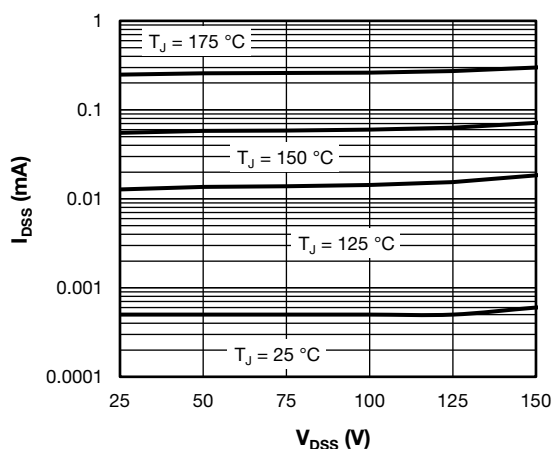

Fig. 11 - Typical Turn-On Switching Time vs. I_D , $V_{DD} = 100$ V, $R_g = 1.0$ Ω , $V_{GS} = \pm 10$ V, $L = 500$ μH


Fig. 9 - Typical Zero Gate Voltage Drain Current

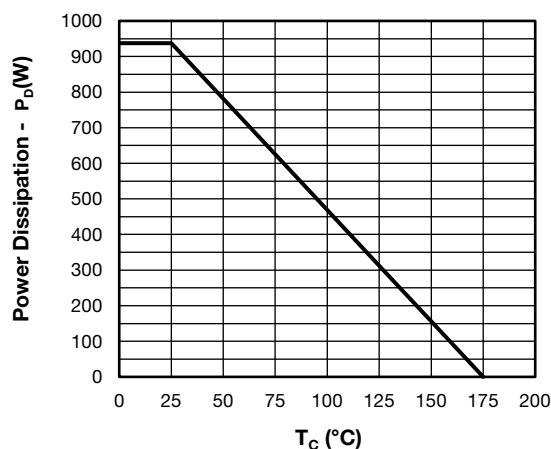


Fig. 12 - Power Dissipation Curve

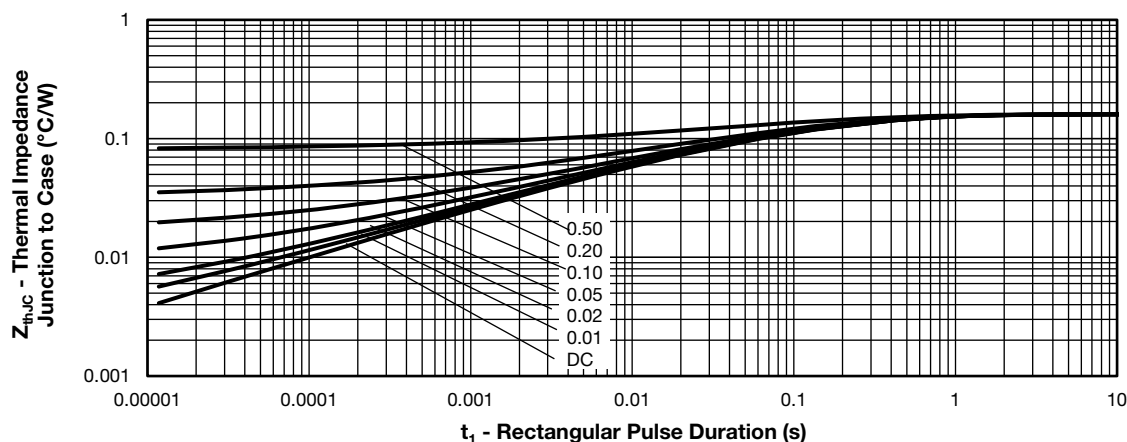


Fig. 13 - Maximum Thermal Impedance Junction-to-Case Characteristics

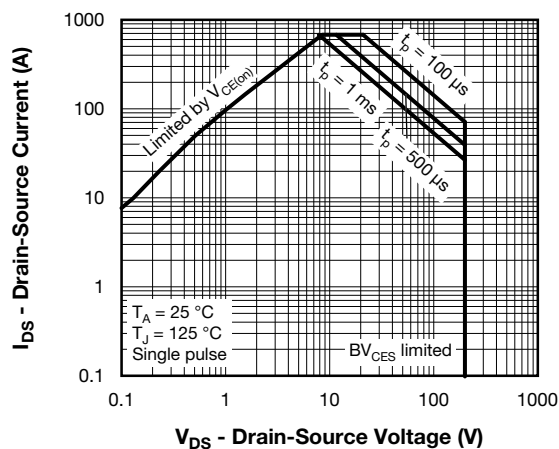


Fig. 14 - Safe Operating Area

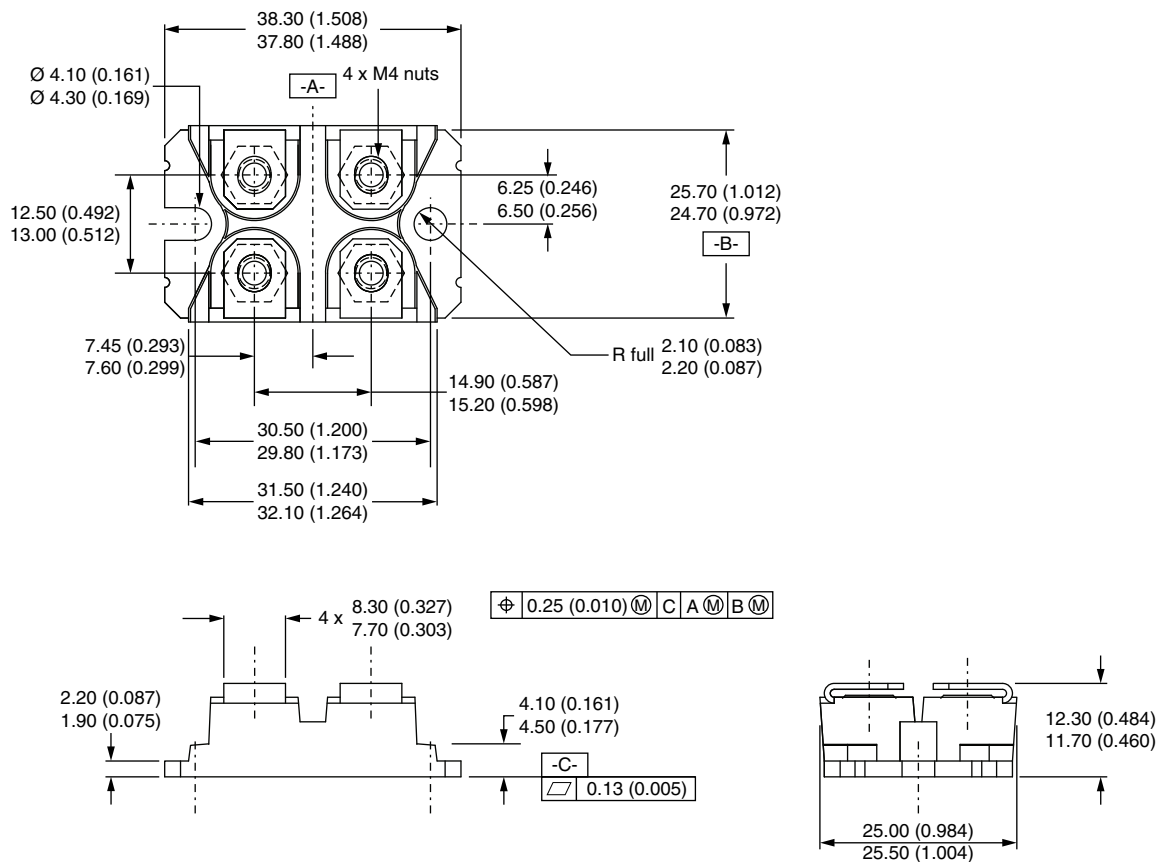
ORDERING INFORMATION TABLE

Device code

VS-	F	C	270	S	A	20
①	②	③	④	⑤	⑥	⑦

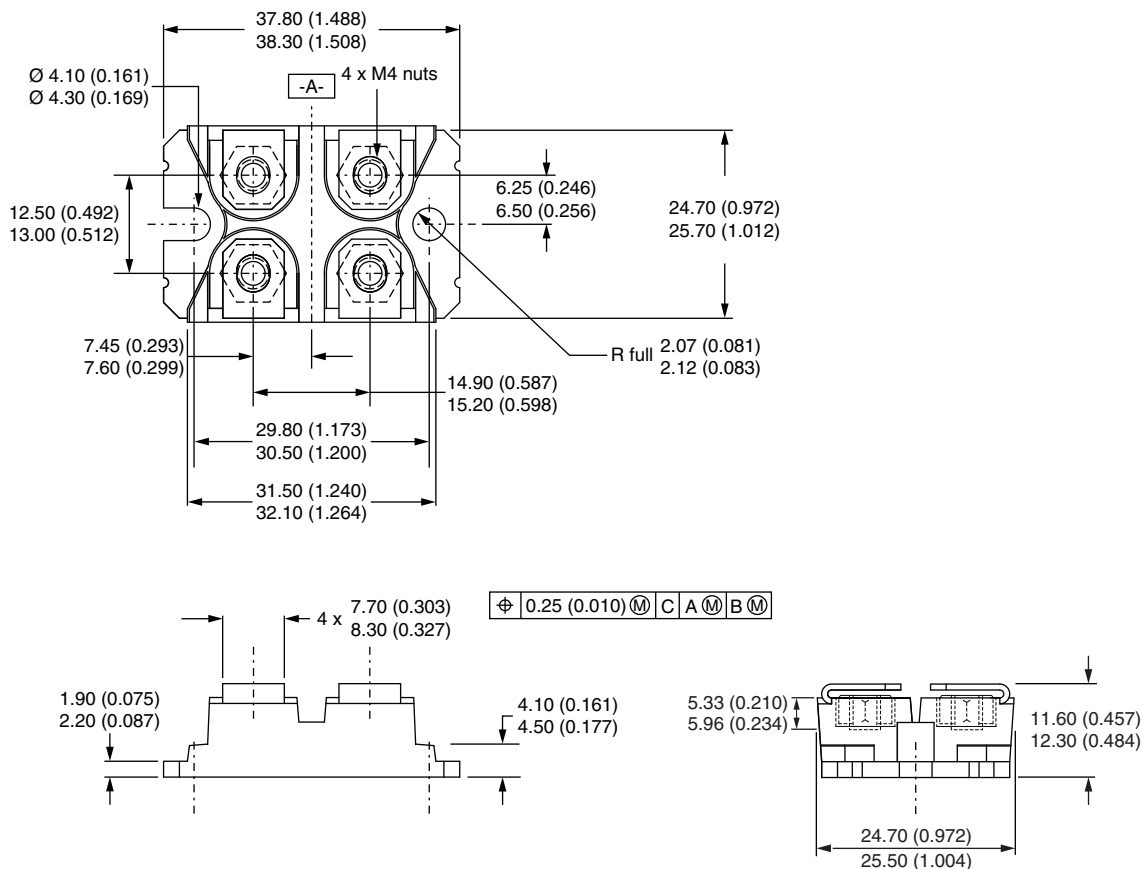
- 1** - Vishay Semiconductors product
- 2** - MOSFET module
- 3** - MOSFET die generation
- 4** - Current rating (270 = 270 A)
- 5** - Circuit configuration (S = single switch)
- 6** - Package indicator (SOT-227)
- 7** - Voltage rating (20 = 200 V)

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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