

## Power MOSFET, 190 A


**SOT-227**

**RoHS  
COMPLIANT**

### FEATURES

- Fully isolated package
- Very low on-resistance
- Fully avalanche rated
- Dynamic dV/dt rating
- Low drain to case capacitance
- Low internal inductance
- Optimized for SMPS applications
- Easy to use and parallel
- Industry standard outline
- Designed and qualified for industrial level
- UL approved file E78996
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

PRODUCT SUMMARY	
$V_{DSS}$	100 V
$I_D$ DC	190 A
$R_{DS(on)}$	0.0065 $\Omega$
Type	Modules - MOSFET
Package	SOT-227

### DESCRIPTION

High current density power MOSFETs are paralleled into a compact, high power module providing the best combination of switching, ruggedized device design, very low on-resistance and cost effectiveness.

The isolated SOT-227 package is preferred for all commercial-industrial applications at power dissipation levels to approximately higher than 500 W. The low thermal resistance and easy connection to the SOT-227 package contribute to its universal acceptance throughout the industry.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Continuous drain current at $V_{GS}$ 10 V	$I_D$	$T_C = 40\text{ }^\circ\text{C}$	190	A
		$T_C = 100\text{ }^\circ\text{C}$	130	
Pulsed drain current	$I_{DM}$		720	
Power dissipation	$P_D$	$T_C = 25\text{ }^\circ\text{C}$	568	W
Linear derating factor			2.7	W/ $^\circ\text{C}$
Gate to source voltage	$V_{GS}$		$\pm 20$	V
Single pulse avalanche energy	$E_{AS}$ <sup>(2)</sup>		700	mJ
Avalanche current	$I_{AR}$ <sup>(1)</sup>		180	A
Repetitive avalanche energy	$E_{AR}$ <sup>(1)</sup>		48	mJ
Peak diode recovery dV/dt	dV/dt <sup>(3)</sup>		5.7	V/ns
Operating junction and storage temperature range	$T_J, T_{Stg}$		-55 to +150	$^\circ\text{C}$
Insulation withstand voltage (AC-RMS)	$V_{ISO}$		2.5	kV
Mounting torque		M4 screw	1.3	Nm

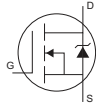
#### Notes

- (1) Repetitive rating; pulse width limited by maximum junction temperature.
- (2) Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 43\text{ }\mu\text{H}$ ,  $R_g = 25\text{ }\Omega$ ,  $I_{AS} = 180\text{ A}$ .
- (3)  $I_{SD} \leq 180\text{ A}$ ,  $dI/dt \leq 83\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150\text{ }^\circ\text{C}$ .



THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Junction and storage temperature range	$T_J, T_{Stg}$		- 55	-	150	°C
Junction to case	$R_{thJC}$		-	-	0.22	°C/W
Case to heatsink	$R_{thCS}$	Flat, greased surface	-	0.05	-	
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 ( $T_J = 25\text{ °C}$ unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Drain to source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	100	-	-	V
Breakdown voltage temperature coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	Reference to $25\text{ °C}, I_D = 1\text{ mA}$	-	0.093	-	V/°C
Static drain to source on-resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 180\text{ A}$	-	0.0054	0.0065	$\Omega$
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.0	3.3	4.35	V
Forward transconductance	$g_{fs}$	$V_{DS} = 25\text{ V}, I_D = 180\text{ A}$	93	-	-	S
Drain to source leakage current	$I_{DSS}$	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$	-	-	50	$\mu\text{A}$
		$V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ °C}$	-	-	500	
Gate to source forward leakage	$I_{GSS}$	$V_{GS} = 20\text{ V}$	-	-	200	nA
		$V_{GS} = -20\text{ V}$	-	-	- 200	
Total gate charge	$Q_g$	$I_D = 180\text{ A}$ $V_{DS} = 80\text{ V}$ $V_{GS} = 10\text{ V}$	-	250	-	nC
Gate to source charge	$Q_{gs}$		-	40	-	
Gate to drain ("Miller") charge	$Q_{gd}$		-	110	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 50\text{ V}$ $I_D = 180\text{ A}$ $R_g = 2.0\text{ }\Omega$ (internal) $R_D = 0.27\text{ }\Omega$	-	45	-	ns
Rise time	$t_r$		-	351	-	
Turn-off delay time	$t_{d(off)}$		-	181	-	
Fall time	$t_f$		-	335	-	
Internal source inductance	$L_S$	Between lead, and center of die contact	-	5.0	-	nH
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ $V_{DS} = 25\text{ V}$ $f = 1.0\text{ MHz}$	-	10 700	-	pF
Output capacitance	$C_{oss}$		-	2800	-	
Reverse transfer capacitance	$C_{rss}$		-	1300	-	

SOURCE-DRAIN RATINGS AND CHARACTERISTICS						
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. 	-	-	190	A
Pulsed source current (body diode)	$I_{SM}$		-	-	740	
Diode forward voltage	$V_{SD}$	$T_J = 25\text{ °C}, I_S = 180\text{ A}, V_{GS} = 0\text{ V}$	-	1.0	1.3	V
Reverse recovery time	$t_{rr}$	$T_J = 25\text{ °C}, I_F = 180\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$	-	300	-	ns
Reverse recovery charge	$Q_{rr}$		-	2.6	-	$\mu\text{C}$
Forward turn-on time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$ )				

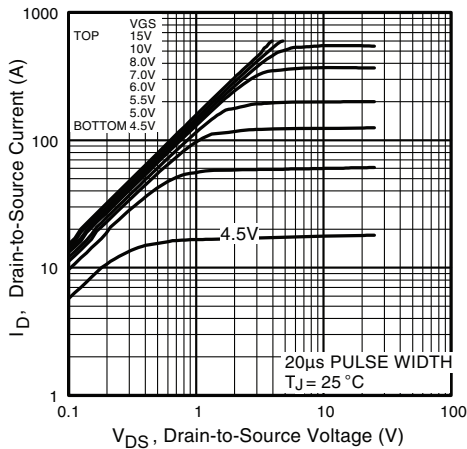


Fig. 1 - Typical Output Characteristics

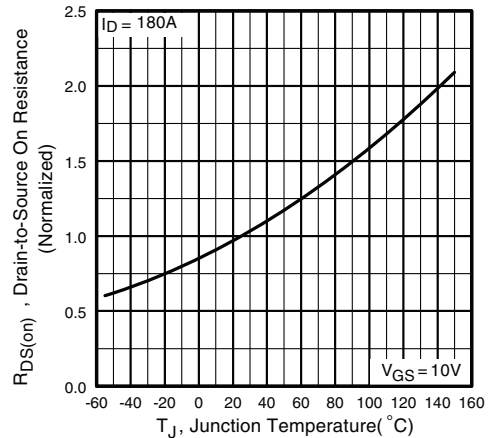


Fig. 4 - Normalized On-Resistance vs. Temperature

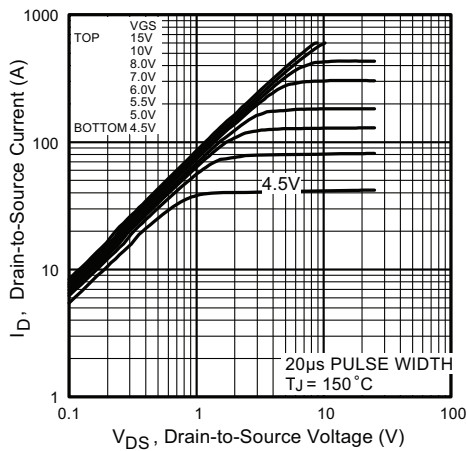


Fig. 2 - Typical Output Characteristics

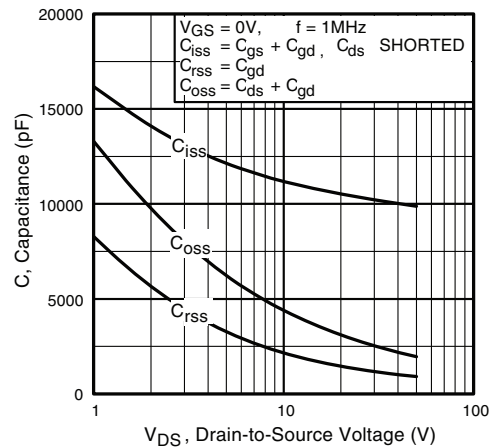


Fig. 5 - Typical Capacitance vs. Drain to Source Voltage

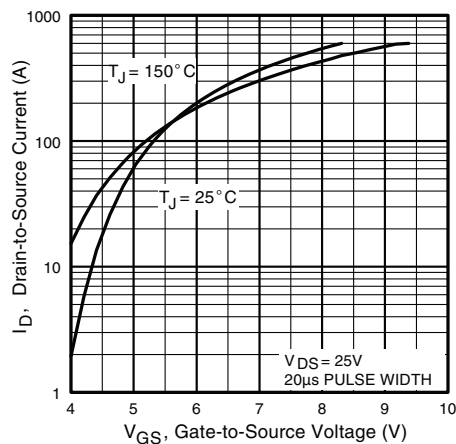


Fig. 3 - Typical Transfer Characteristics

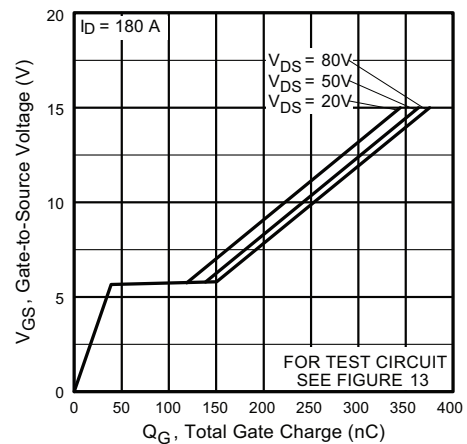


Fig. 6 - Typical Gate Charge vs. Gate to Source Voltage

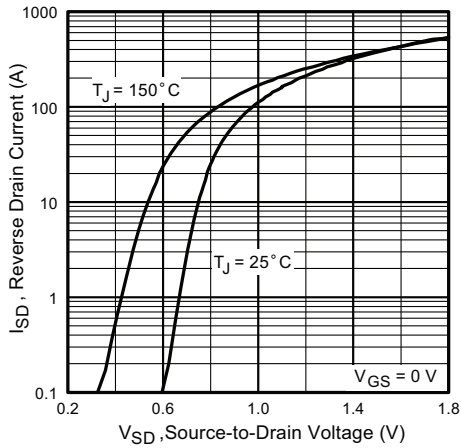


Fig. 7 - Typical Source Drain Diode Forward Voltage

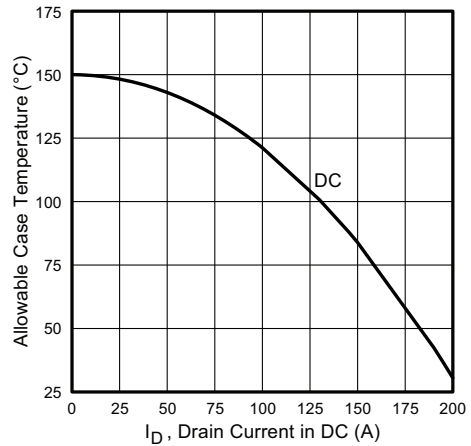


Fig. 9 - Maximum Drain Current vs. Case Temperature

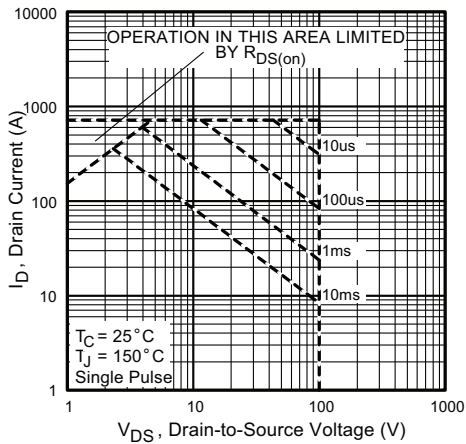


Fig. 8 - Maximum Safe Operating Area

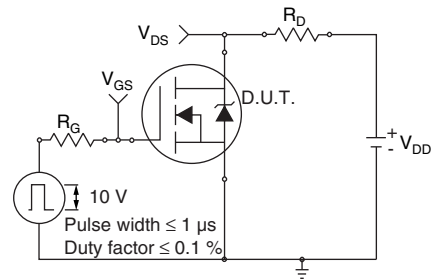


Fig. 10a - Switching Time Test Circuit

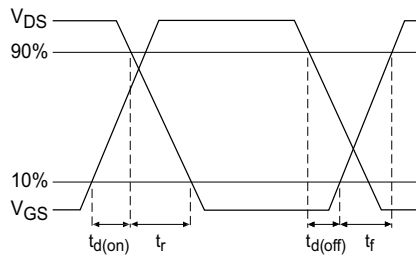


Fig. 10b - Switching Time Waveforms

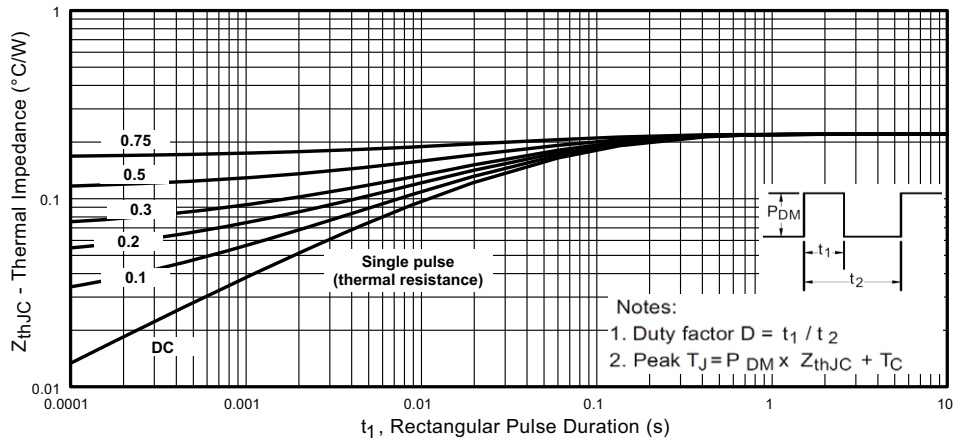


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction to Case

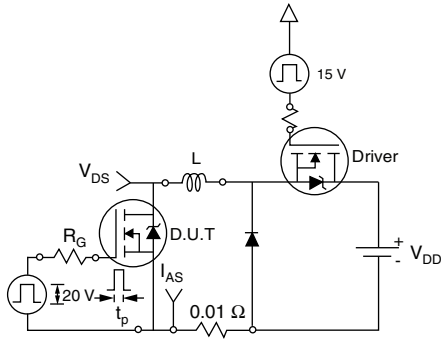


Fig. 12a - Unclamped Inductive Test Circuit

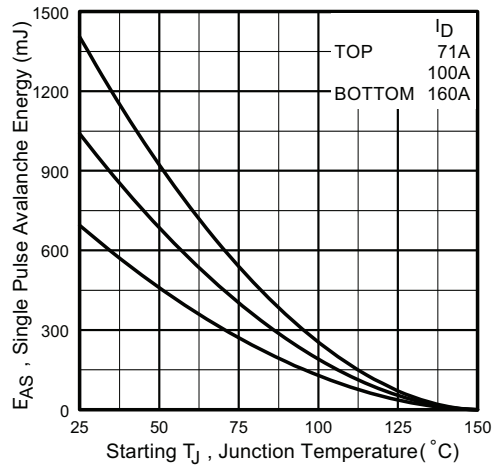


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

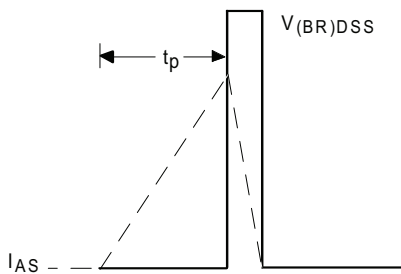


Fig. 12b - Unclamped Inductive Waveforms

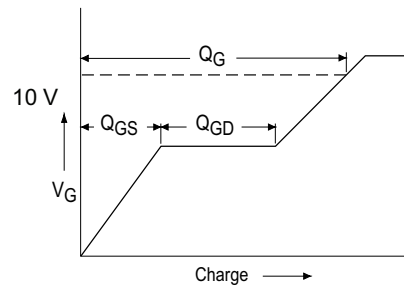


Fig. 13a - Basic Gate Charge Waveform

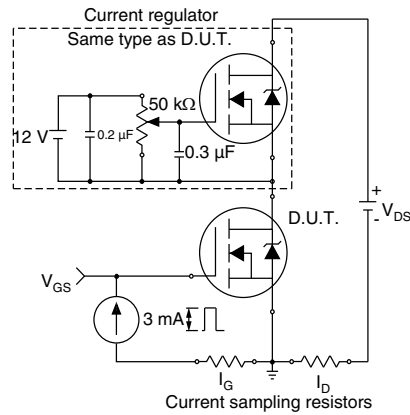


Fig. 13b - Gate Charge Test Circuit

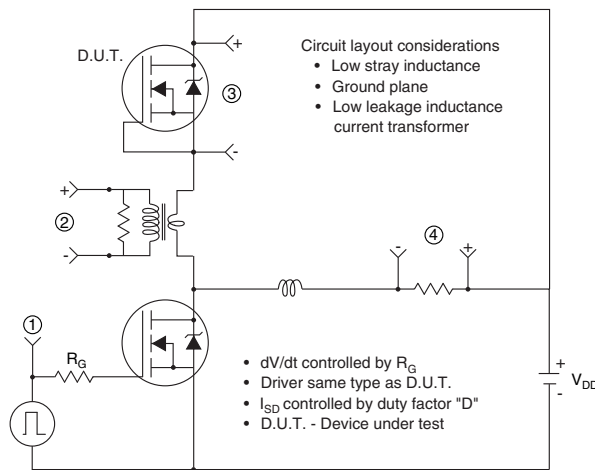
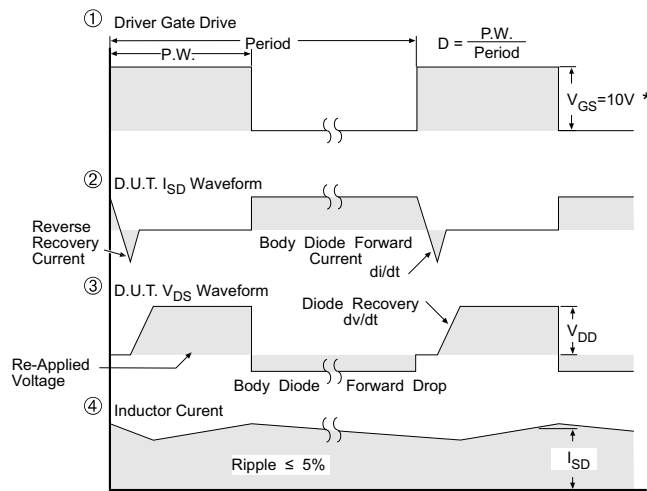


Fig. 13c - Peak Diode Recovery dV/dt Test Circuit



\*  $V_{GS} = 5V$  for Logic Level Devices

Fig. 14 - For N-Channel Power MOSFETs

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>F</b>	<b>B</b>	<b>190</b>	<b>S</b>	<b>A</b>	<b>10</b>
	①	②	③	④	⑤	⑥	⑦
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
	- Vishay Semiconductors product	- Power MOSFET	- Generation 5 MOSFET	- Current rating (190 = 190 A)	- Single switch	- Package indicator (SOT-227)	- Voltage rating (10 = 100 V)

CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Single switch	S	<p>The circuit drawing for the 'Single switch' configuration includes three parts:                     <ul style="list-style-type: none"> <li>A MOSFET symbol with gate (G) labeled (2), drain (D) labeled (3), and source (S) labeled (1-4).</li> <li>A 'Lead Assignment' diagram showing a top-down view of the SOT-227 package with pins 1, 2, 3, and 4. Pin 1 is labeled (S), pin 2 is (G), pin 3 is (D), and pin 4 is (S).</li> <li>A schematic diagram showing the MOSFET connected to pins 3 (D), 2 (G), 4 (S), and 1 (S).</li> </ul> </p>

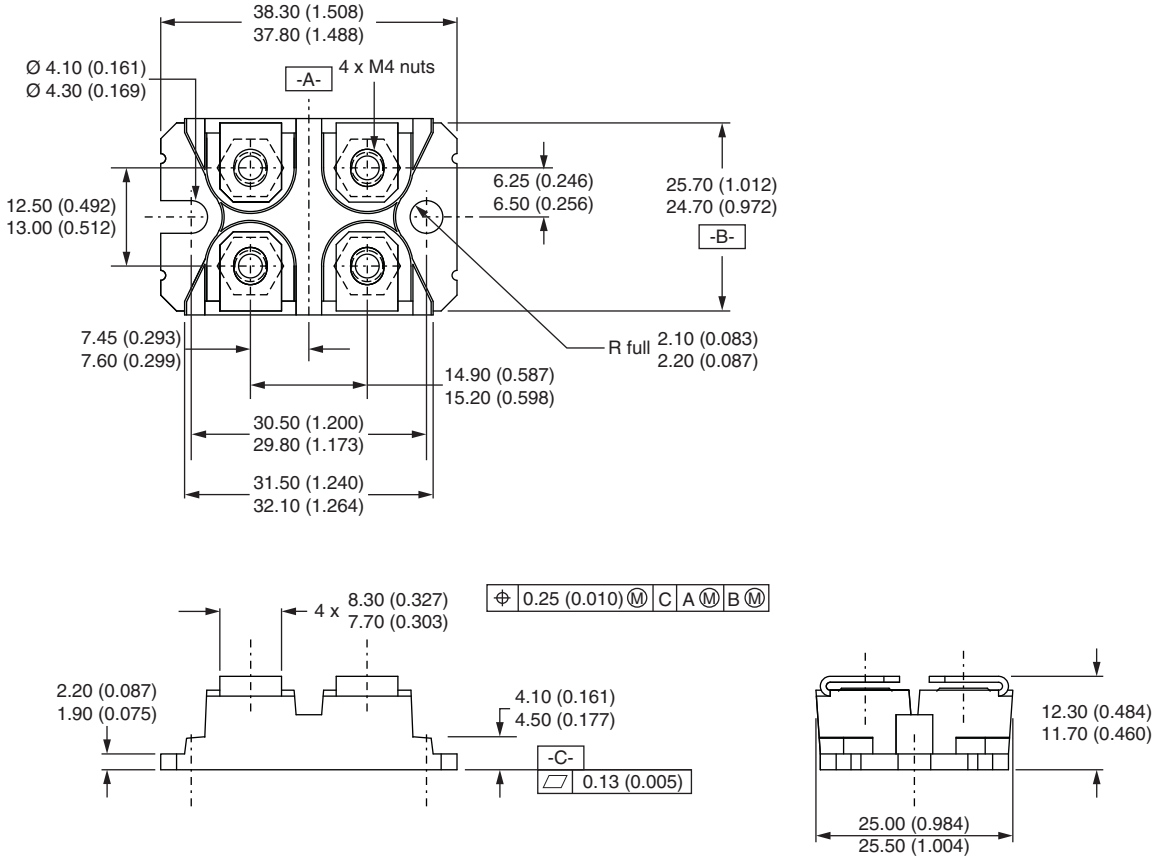
**LINKS TO RELATED DOCUMENTS**

Dimensions	<a href="http://www.vishay.com/doc?95423">www.vishay.com/doc?95423</a>
Packaging information	<a href="http://www.vishay.com/doc?95425">www.vishay.com/doc?95425</a>



### SOT-227 Generation II

**DIMENSIONS** in millimeters (inches)



**Note**

- Controlling dimension: millimeter





## **Disclaimer**

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Vishay:](#)

[VS-FB190SA10](#)