


# Power MOSFET, 190 A


**SOT-227**

## 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)


**RoHS**  
COMPLIANT

## PRIMARY CHARACTERISTICS

$V_{DSS}$	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	$I_D$	$T_C = 40^\circ C$	190	A
		$T_C = 100^\circ C$	130	
Pulsed drain current	$I_{DM}$		720	
Power dissipation	$P_D$	$T_C = 25^\circ C$	568	W
Linear derating factor			2.7	W/ $^\circ C$
Gate to source voltage	$V_{GS}$		$\pm 20$	V
Single pulse avalanche energy	$E_{AS}^{(2)}$		700	mJ
Avalanche current	$I_{AR}^{(1)}$		180	A
Repetitive avalanche energy	$E_{AR}^{(1)}$		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	$^\circ C$
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  $T_J = 25^\circ C$ ,  $L = 43 \mu H$ ,  $R_g = 25 \Omega$ ,  $I_{AS} = 180 A$   
(3)  $I_{SD} \leq 180 A$ ,  $dI/dt \leq 83 A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ C$

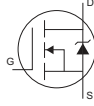
**THERMAL - MECHANICAL SPECIFICATIONS**

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	-	-	1.8 (15.9)	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 $L_S + L_D$ )				

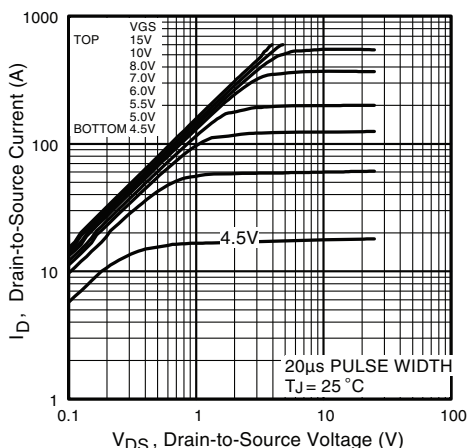


Fig. 1 - Typical Output Characteristics

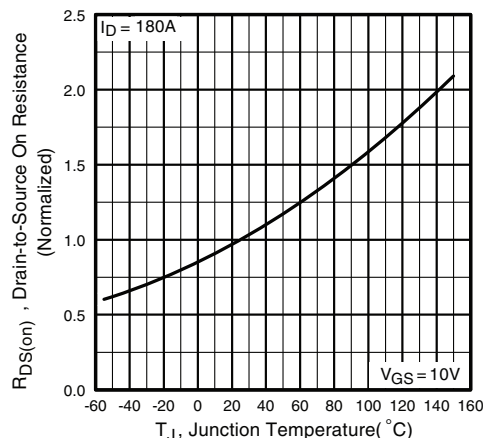


Fig. 4 - Normalized On-Resistance vs. Temperature

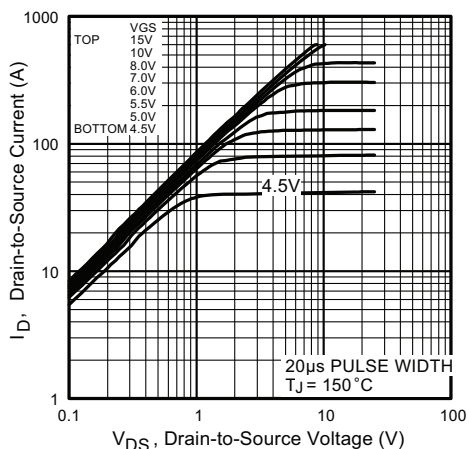


Fig. 2 - Typical Output Characteristics

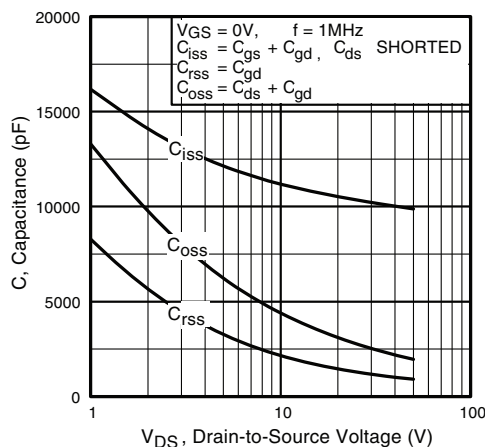


Fig. 5 - Typical Capacitance vs. Drain to Source Voltage

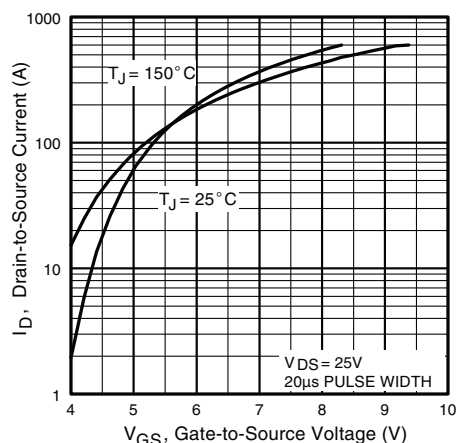


Fig. 3 - Typical Transfer Characteristics

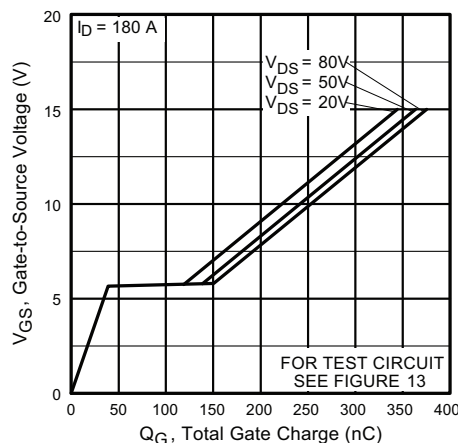


Fig. 6 - Typical Gate Charge vs. Gate to Source Voltage

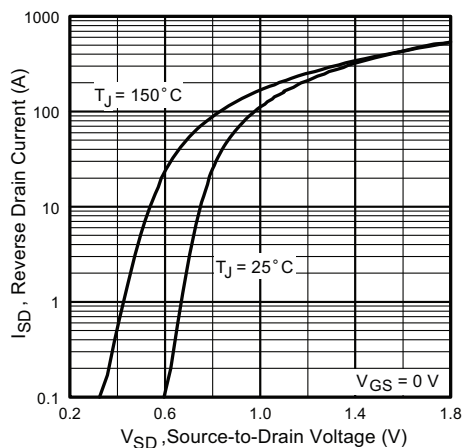


Fig. 7 - Typical Source Drain Diode Forward Voltage

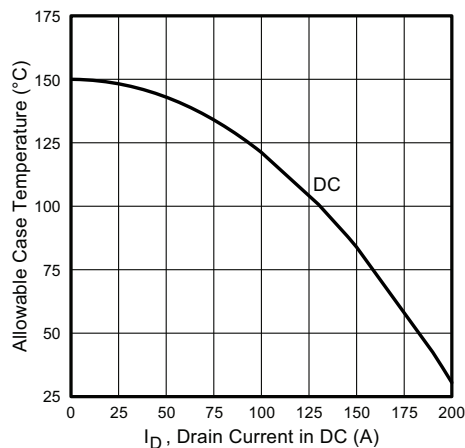


Fig. 9 - Maximum Drain Current vs. Case Temperature

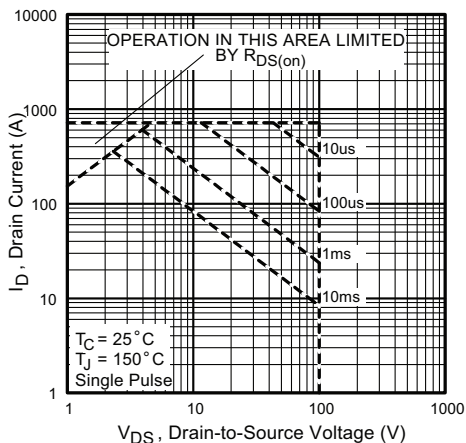


Fig. 8 - Maximum Safe Operating Area

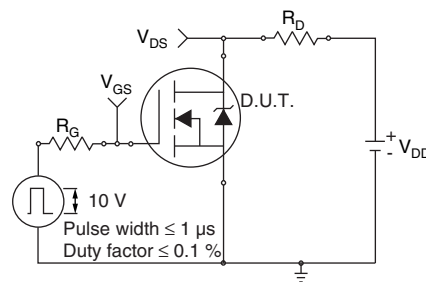


Fig. 10 - Switching Time Test Circuit

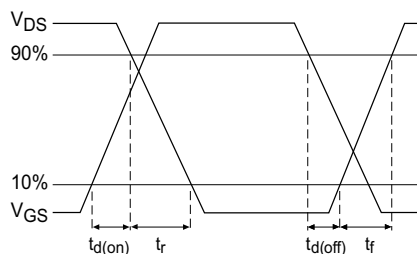


Fig. 11 - Switching Time Waveforms

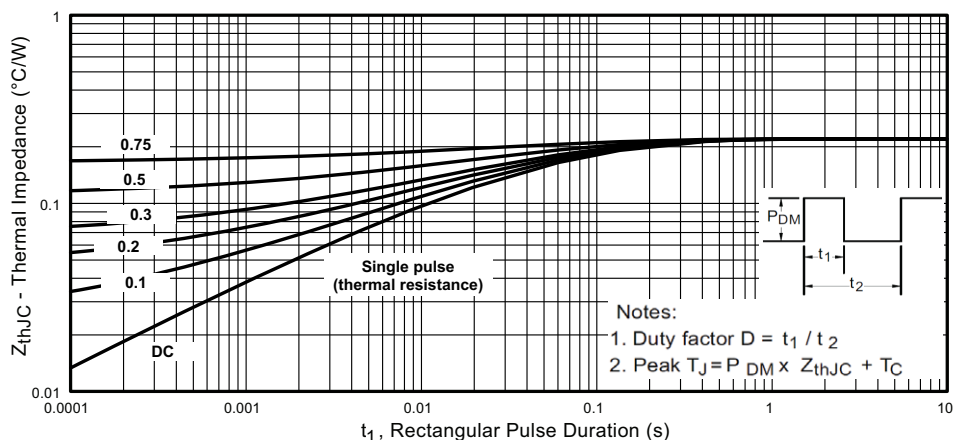


Fig. 12 - Maximum Effective Transient Thermal Impedance, Junction to Case

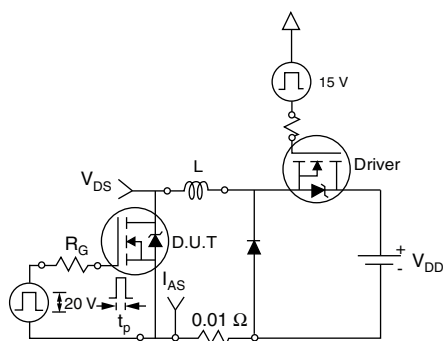


Fig. 13 - Unclamped Inductive Test Circuit

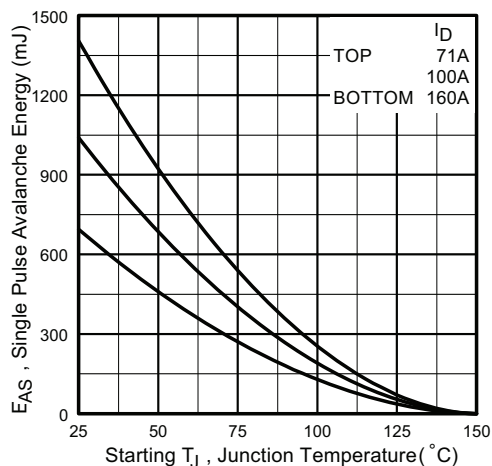


Fig. 15 - Maximum Avalanche Energy vs. Drain Current

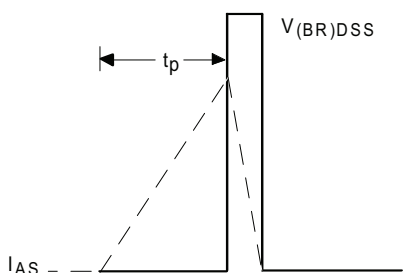


Fig. 14 - Unclamped Inductive Waveforms

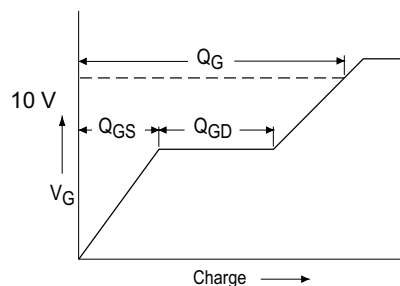


Fig. 16 - Basic Gate Charge Waveform

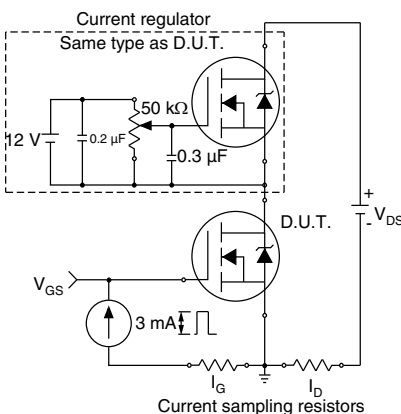


Fig. 17 - Gate Charge Test Circuit

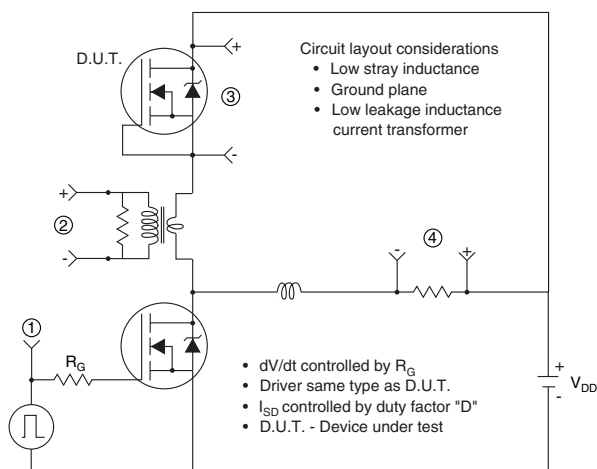


Fig. 18 - Peak Diode Recovery dV/dt Test Circuit

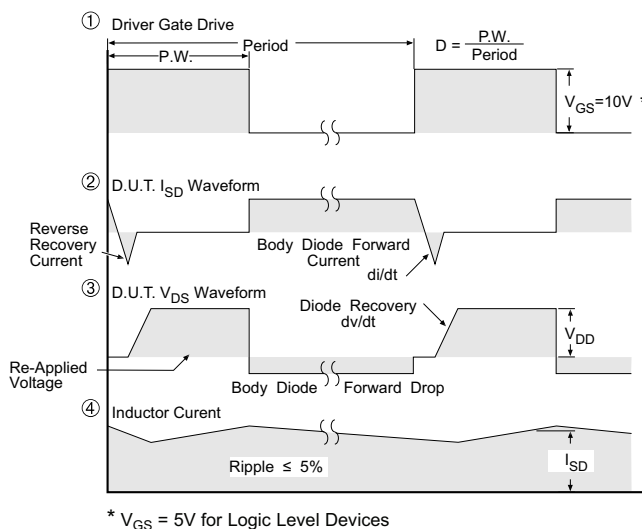
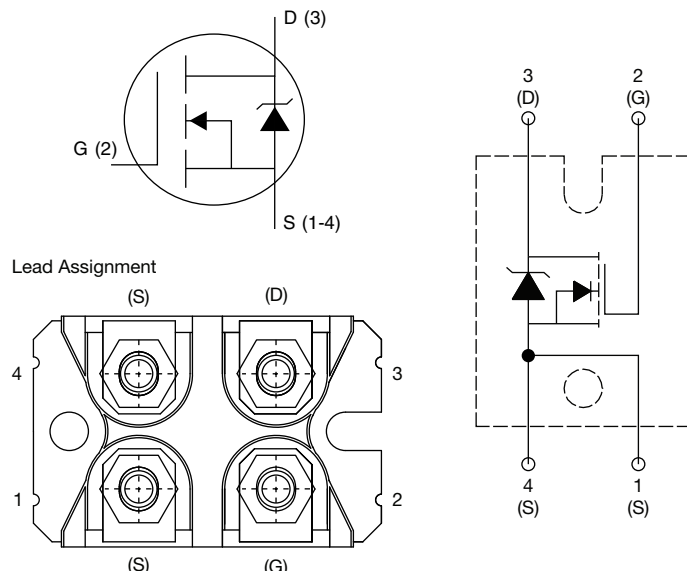


Fig. 19 - For N-Channel Power MOSFETs

**ORDERING INFORMATION TABLE**

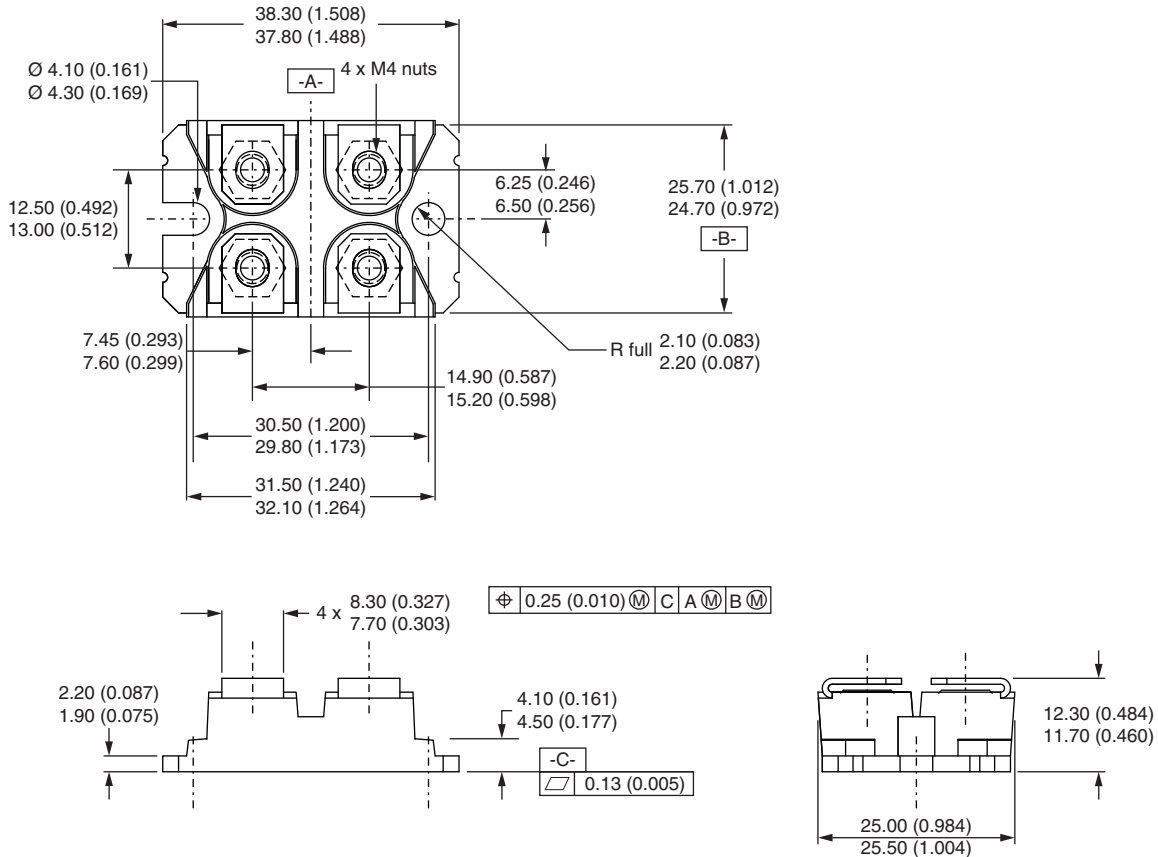
Device code	VS-	F	B	190	S	A	10
	1	2	3	4	5	6	7
<b>1</b>	- Vishay Semiconductors product						
<b>2</b>	- Power MOSFET						
<b>3</b>	- Generation 5 MOSFET						
<b>4</b>	- Current rating (190 = 190 A)						
<b>5</b>	- Single switch						
<b>6</b>	- Package indicator (SOT-227)						
<b>7</b>	- Voltage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

CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Single switch	S	

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

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