

## 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
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified for industrial level



**RoHS**  
COMPLIANT

### 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 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

<sup>(1)</sup> Repetitive rating; pulse width limited by maximum junction temperature.

<sup>(2)</sup> Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 43\text{ }\mu\text{H}$ ,  $R_g = 25\text{ }\Omega$ ,  $I_{AS} = 180\text{ A}$ .

<sup>(3)</sup>  $I_{SD} \leq 180\text{ A}$ ,  $dI/dt \leq 83\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150\text{ }^\circ\text{C}$ .

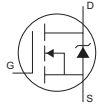
**THERMAL RESISTANCE**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Junction to case	$R_{thJC}$	-	-	0.22	°C/W
Case to heatsink, flat, greased surface	$R_{thCS}$	-	0.05	-	

**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 $L_S + L_D$ )				

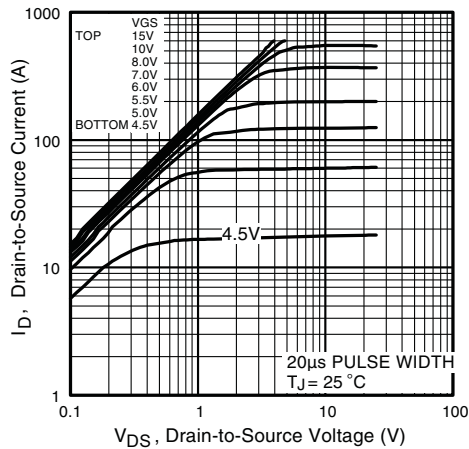


Fig. 1 - Typical Output Characteristics

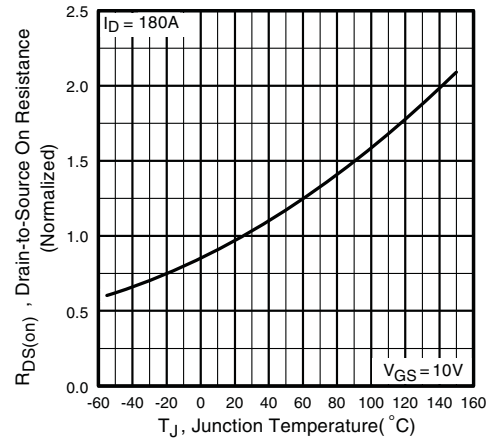


Fig. 4 - Normalized On-Resistance vs. Temperature

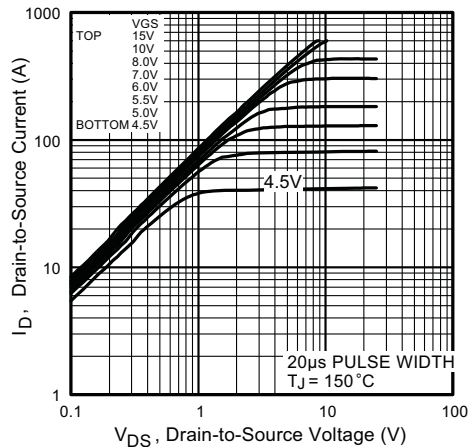


Fig. 2 - Typical Output Characteristics

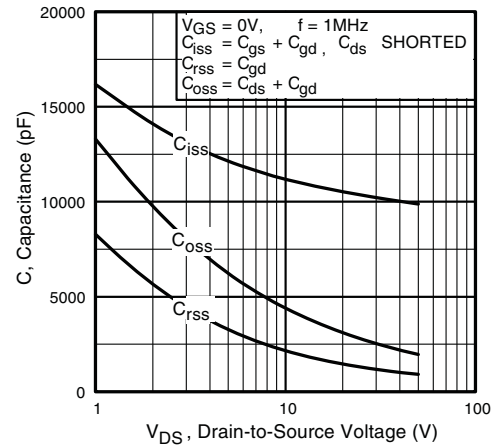


Fig. 5 - Typical Capacitance vs. Drain to Source Voltage

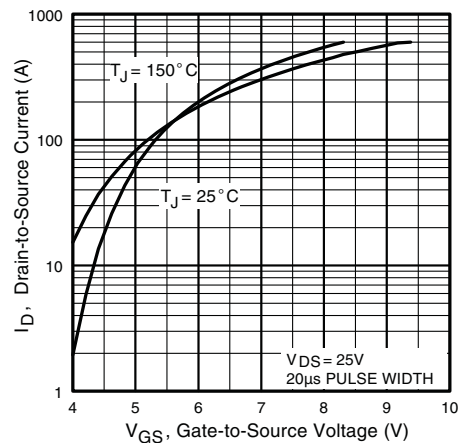


Fig. 3 - Typical Transfer Characteristics

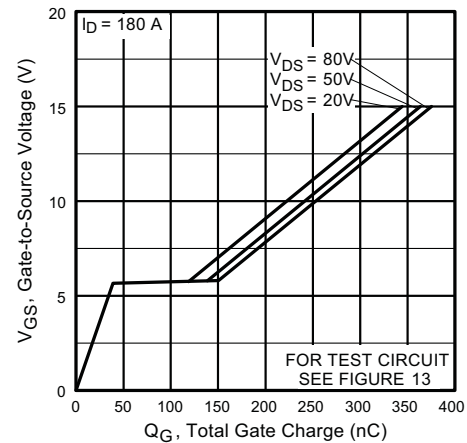


Fig. 6 - Typical Gate Charge vs. Gate to Source Voltage

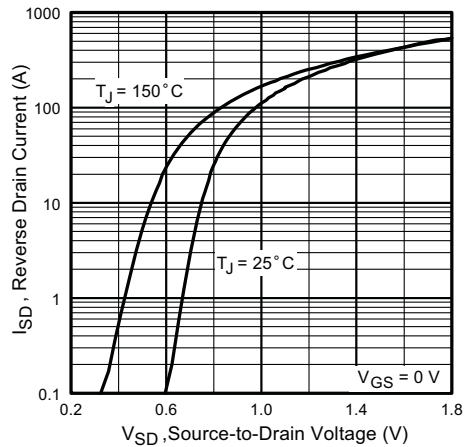


Fig. 7 - Typical Source Drain Diode Forward Voltage

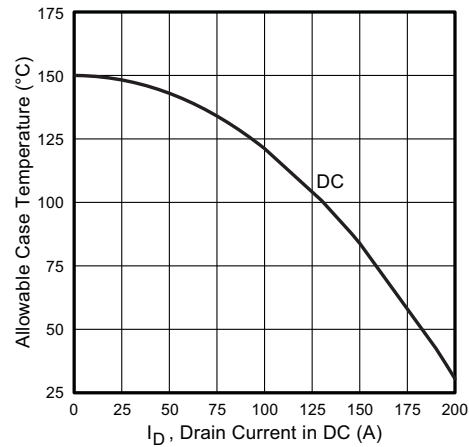


Fig. 9 - Maximum Drain Current vs. Case Temperature

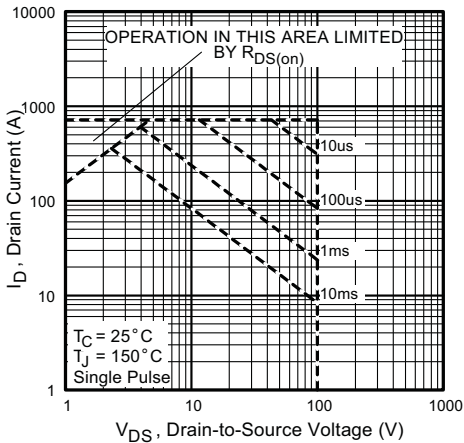


Fig. 8 - Maximum Safe Operating Area

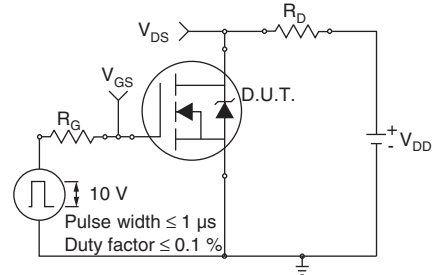


Fig. 10a - Switching Time Test Circuit

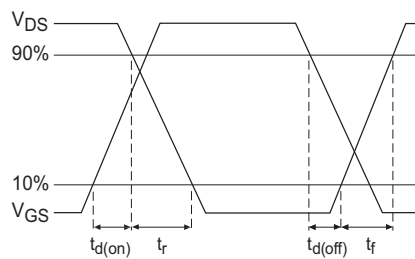


Fig. 10b - Switching Time Waveforms

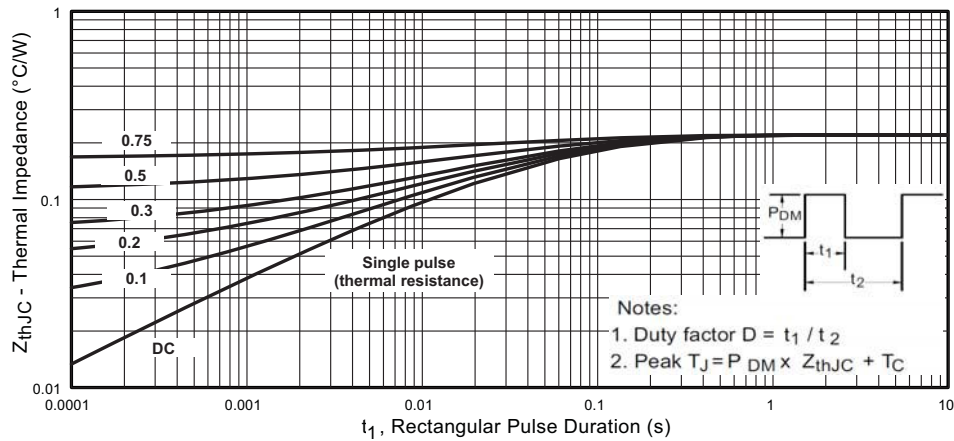


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction to Case

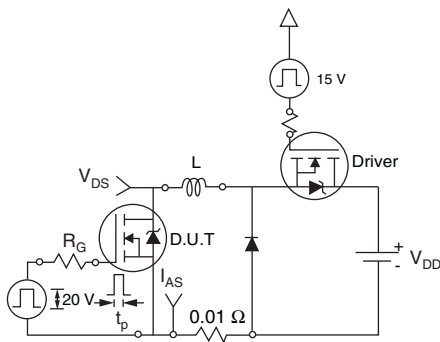


Fig. 12a - Unclamped Inductive Test Circuit

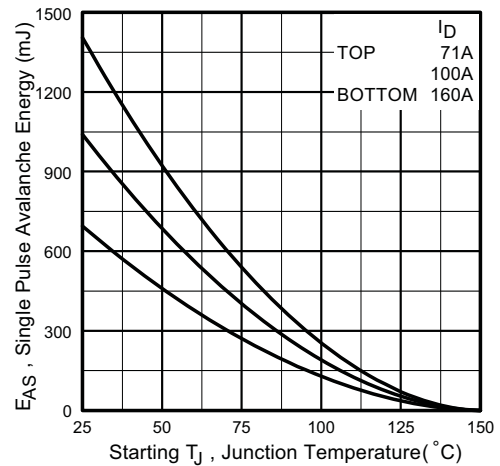


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

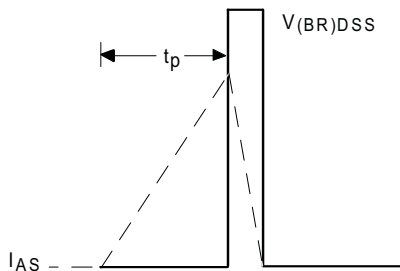


Fig. 12b - Unclamped Inductive Waveforms

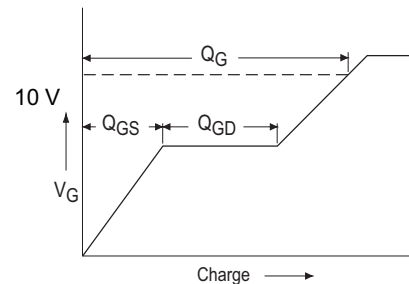


Fig. 13a - Basic Gate Charge Waveform

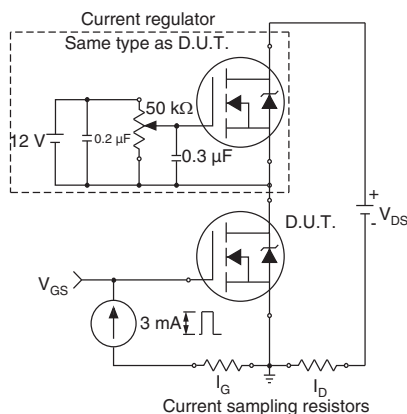


Fig. 13b - Gate Charge Test Circuit

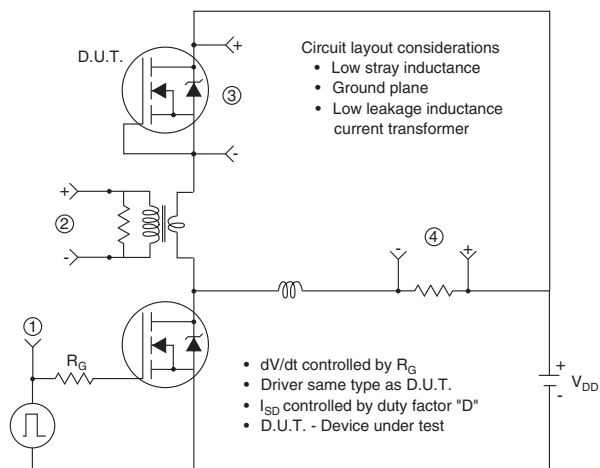
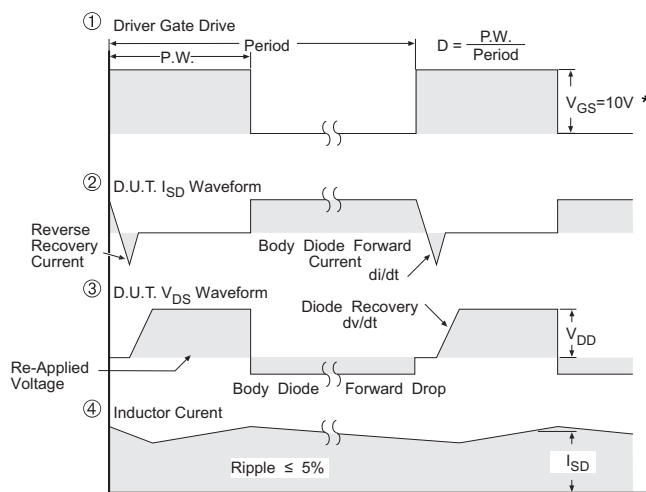


Fig. 13c - Peak Diode Recovery dv/dt Test Circuit

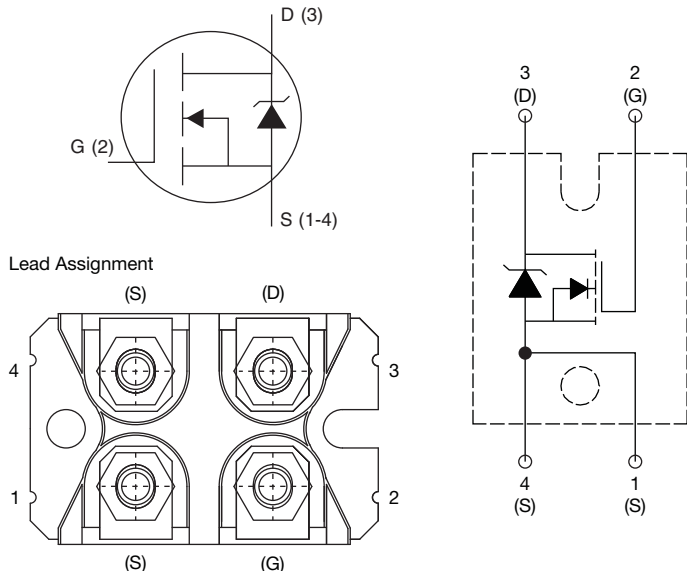


\*  $V_{GS} = 5V$  for Logic Level Devices

Fig. 14 - For N-Channel Power MOSFETs

**ORDERING INFORMATION TABLE**

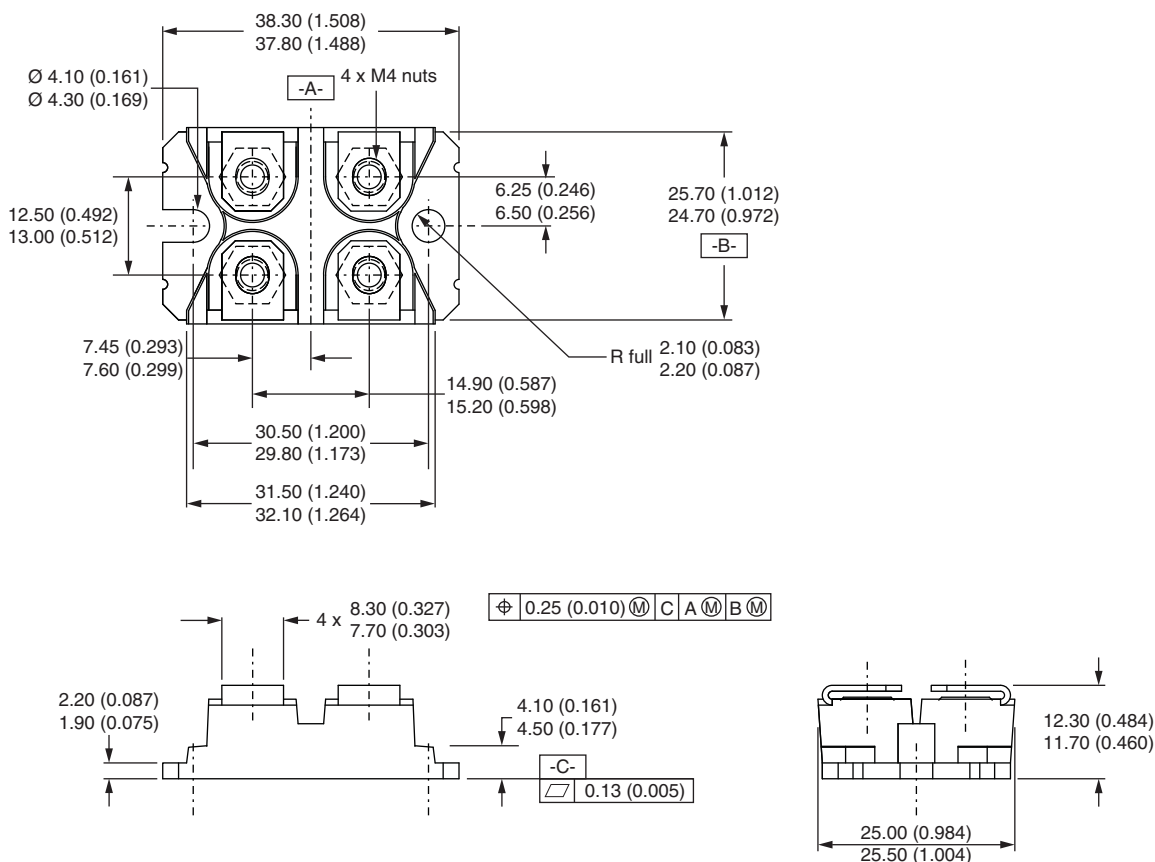
Device code	VS-	F	B	190	S	A	10
	1	2	3	4	5	6	7
1	- Vishay Semiconductors product						
2	- Power MOSFET						
3	- Generation 5 MOSFET						
4	- Current rating (190 = 190 A)						
5	- Single switch						
6	- Package indicator (SOT-227)						
7	- Voltage rating (10 = 100 V)						

CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Single switch	S	 <p>The circuit drawing for the 'Single switch' configuration (code S) includes a MOSFET symbol with terminals G (2), D (3), and S (1-4). Below the symbol is a lead assignment diagram for the SOT-227 package, showing pins 1, 2, 3, and 4 with their respective functions: 1 (S), 2 (G), 3 (D), and 4 (S).</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





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