Power MOSFET, 38 A

SOT-227

FEATURES

- Fully isolated package
- Easy to use and parallel
- Low on-resistance
- Dynamic dV/dt rating
- Fully avalanche rated
- Simple drive requirements
- Low drain to case capacitance
- Low internal inductance
- UL approved file E78996
- Designed for industrial level
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

PRODUCT SUMMARY	
V_{DSS}	500 V
$R_{DS(on)}$	0.13 Ω
I_D	38 A
Type	Modules - MOSFET
Package	SOT-227

DESCRIPTION

Third Generation Power MOSFETs from Vishay Semiconductors provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SOT-227 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 500 W. The low thermal resistance of the SOT-227 contribute to its wide 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 = 25 °C	38	A
		T_C = 100 °C	24	
Pulsed drain current	I_{DM} (1)		150	
Power dissipation	P_D	T_C = 25 °C	500	W
Linear derating factor			4.0	W/°C
Gate to source voltage	V_{GS}		± 20	V
Single pulse avalanche energy	E_{AS} (2)		580	mJ
Avalanche current	I_{AR} (1)		38	A
Repetitive avalanche energy	E_{AR} (1)		50	mJ
Peak diode recovery dV/dt	dV/dt (3)		10	V/ns
Operating junction and storage temperature range	T_J, T_{Stg}		- 55 to + 150	°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 (see fig. 11)

(2) Starting T_J = 25 °C, L = 0.80 mH, R_g = 25 Ω, I_{AS} = 38 A (see fig. 12)

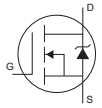
(3) I_{SD} ≤ 38 A, dI/dt ≤ 410 A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150 °C

THERMAL AND 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}		-	-	0.25	°C/W
Case to heatsink	R_{thCS}	Flat, greased surface	-	0.05	-	
Weight			-	30	-	g
Mounting torque			-	-	1.3	Nm
Case style	SOT-227					

ELECTRICAL CHARACTERISTCS (T_J = 25 °C unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Drain to source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1.0 mA	500	-	-	V
Breakdown voltage temperature coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	Reference to 25 °C, I_D = 1 mA	-	0.66	-	V/°C
Static drain to source on-resistance	$R_{DS(on)}$ (1)	V_{GS} = 10 V, I_D = 23 A	-	-	0.13	Ω
Gate threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	2.0	-	4.0	V
Forward transconductance	g_{fs}	V_{DS} = 25 V, I_D = 23 A	22	-	-	S
Drain to source leakage current	I_{DSS}	V_{DS} = 500 V, V_{GS} = 0 V	-	-	50	µA
		V_{DS} = 400 V, V_{GS} = 0 V, T_J = 125 °C	-	-	500	
Gate to source forward leakage	I_{GSS}	V_{GS} = 20 V	-	-	200	nA
Gate to source reverse leakage		V_{GS} = - 20 V	-	-	- 200	
Total gate charge	Q_g	I_D = 38 A V_{DS} = 400 V V_{GS} = 10 V; see fig. 6 and 13 (1)	-	280	420	nC
Gate to source charge	Q_{gs}		-	37	55	
Gate to drain ("Miller") charge	Q_{gd}		-	150	220	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 250 V I_D = 38 A R_g = 10 Ω (ιντερναλ) R_D = 8 Ω, see fig. 10 (1)	-	42	-	ns
Rise time	t_r		-	340	-	
Turn-off delay time	$t_{d(off)}$		-	200	-	
Fall time	t_f		-	330	-	
Internal source inductance	L_S	Between lead, and center of die contact	-	5.0	-	nH
Input capacitance	C_{iss}	V_{GS} = 0 V V_{DS} = 25 V f = 1.0 MHz, see fig. 5	-	6900	-	pF
Output capacitance	C_{oss}		-	1600	-	
Reverse transfer capacitance	C_{rss}		-	580	-	

Note

(1) Pulse width ≤ 300 µs, duty cycle ≤ 2 %

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. 	-	-	38	A
Pulsed source current (body diode)	I_{SM} (1)		-	-	150	
Diode forward voltage	V_{SD} (2)	T_J = 25 °C, I_S = 38 A, V_{GS} = 0 V	-	-	1.3	V
Reverse recovery time	t_{rr}	T_J = 25 °C, I_F = 38 A; dI/dt = 100 A/µs (2)	-	830	1300	ns
Reverse recovery charge	Q_{rr}		-	15	22	µC
Forward turn-on time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S + L_D)				

Notes

(1) Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)

(2) Pulse width ≤ 300 µs, duty cycle ≤ 2 %

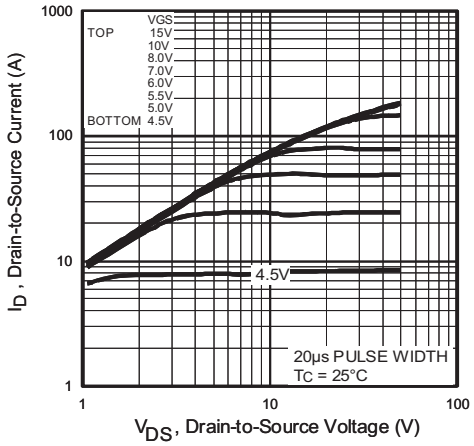


Fig. 1 - Typical Output Characteristics

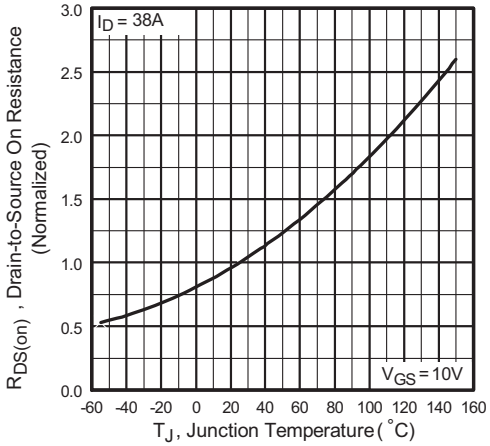


Fig. 4 - Normalized On-Resistance vs. Temperature

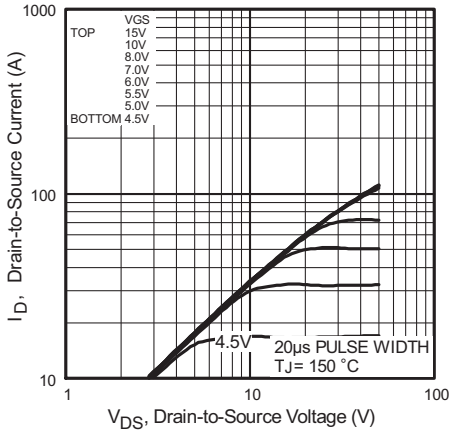


Fig. 2 - Typical Output Characteristics

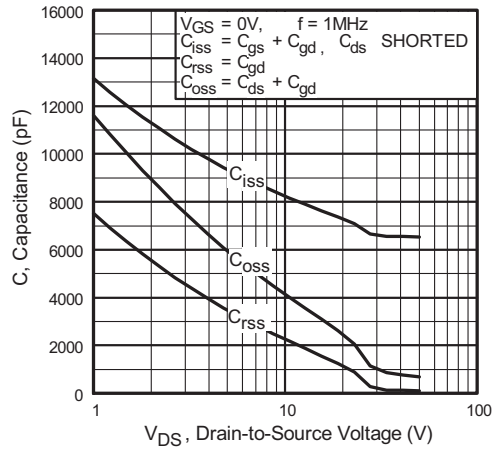


Fig. 5 - Typical Capacitance vs. Drain to Source Voltage

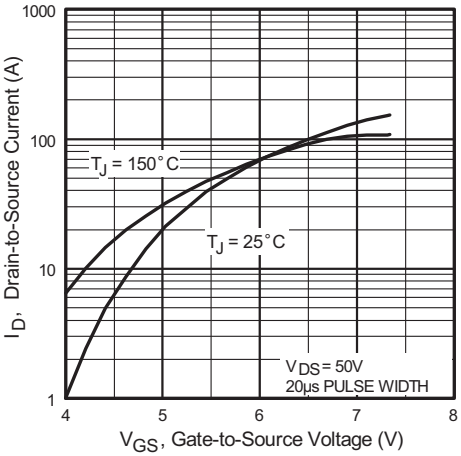


Fig. 3 - Typical Transfer Characteristics

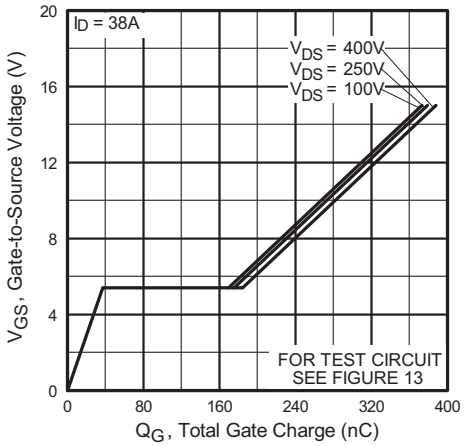


Fig. 6 - Typical Gate Charge vs. Gate to Source Voltage

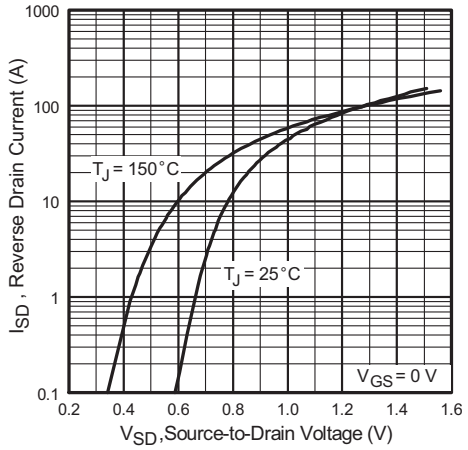


Fig. 7 - Typical Source Drain Diode Forward Voltage

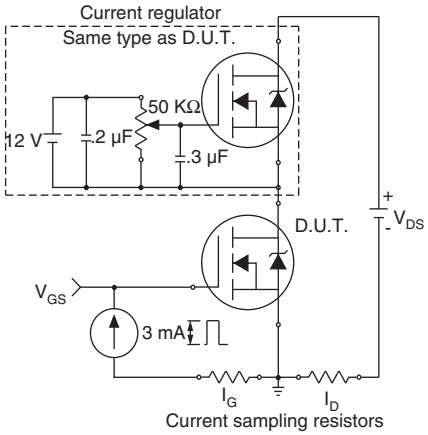


Fig. 10 - Gate Charge Test Circuit

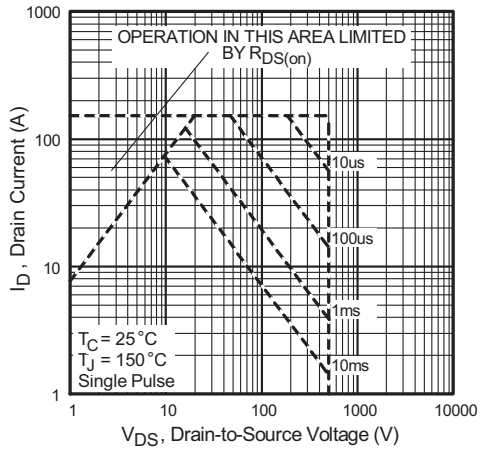


Fig. 8 - Maximum Safe Operating Area

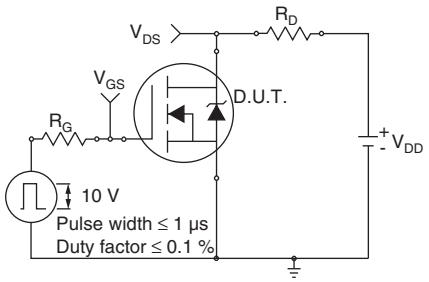


Fig. 11 - Switching Time Test Circuit

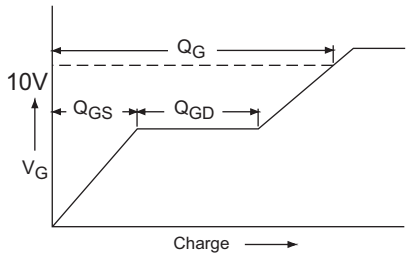


Fig. 9 - Basic Gate Charge Waveform

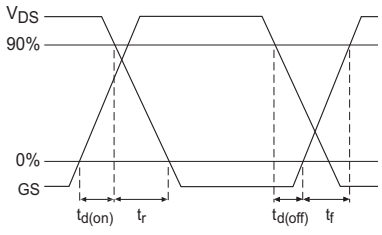


Fig. 12 - Switching Time Waveforms

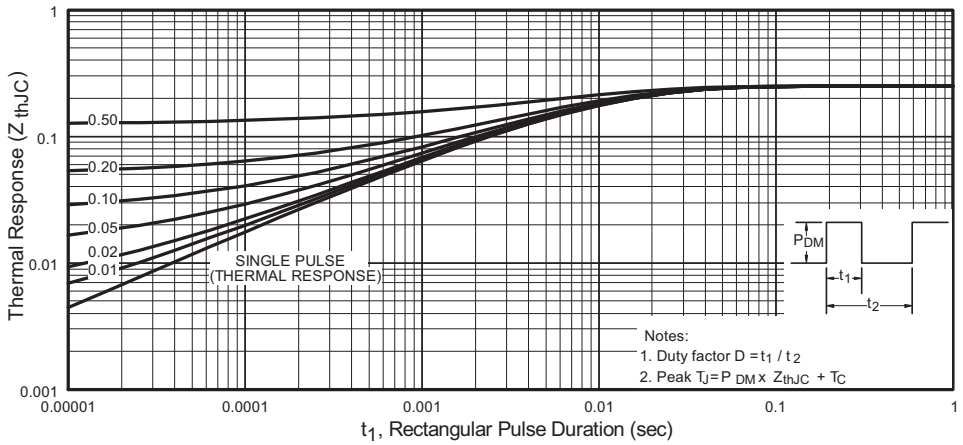


Fig. 13 - Maximum Effective Transient Thermal Impedance, Junction to Case

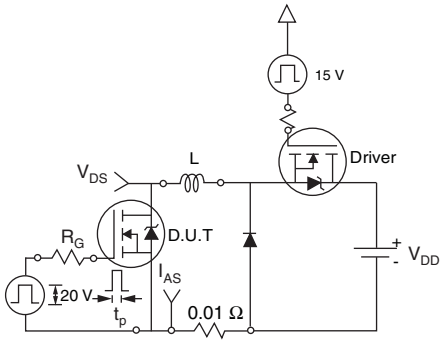


Fig. 14 - Unclamped Inductive Test Circuit

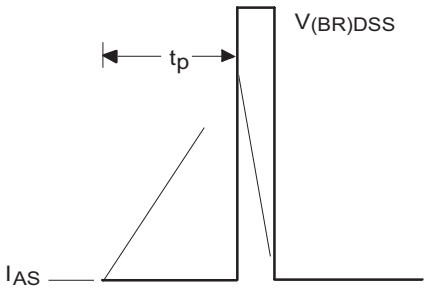


Fig. 15 - Unclamped Inductive Waveforms

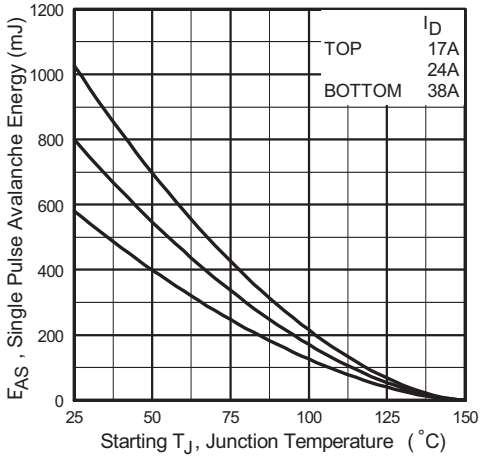


Fig. 16 - Maximum Avalanche Energy vs. Drain Current

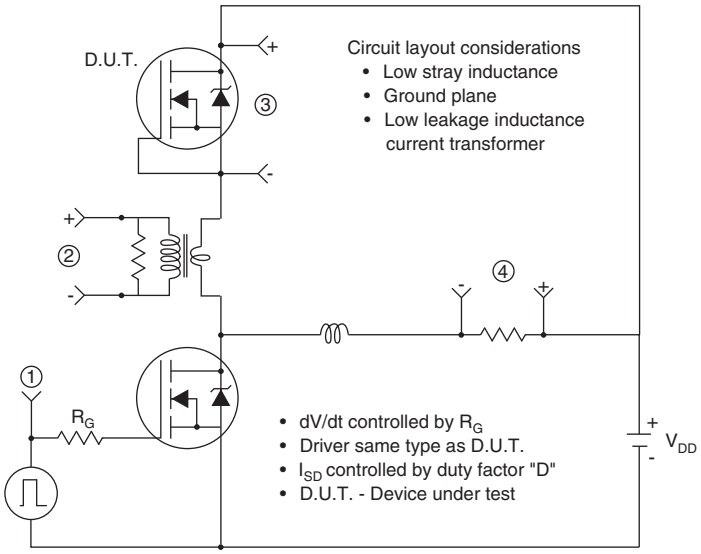
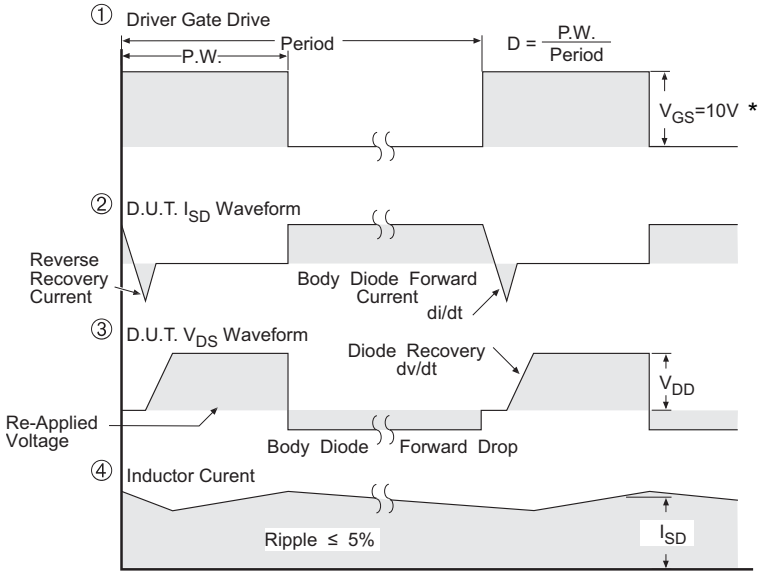


Fig. 17 - Peak Diode Recovery dV/dt Test Circuit



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

Fig. 18 - For N-Channel Power MOSFETs

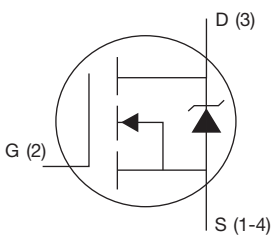
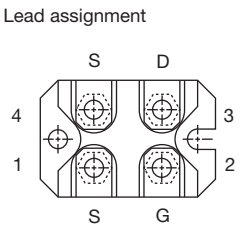
ORDERING INFORMATION TABLE

Device code

VS-	F	A	38	S	A	50	LC	P
1	2	3	4	5	6	7	8	9

1	-	Vishay Semiconductors product
2	-	Power MOSFET
3	-	Generation 3, MOSFET silicon, DBC construction
4	-	Current rating (38 = 38 A)
5	-	Single switch (see Circuit Configuration table)
6	-	SOT-227
7	-	Voltage rating (50 = 500 V)
8	-	Low charge
9	-	P = Lead (Pb)-free

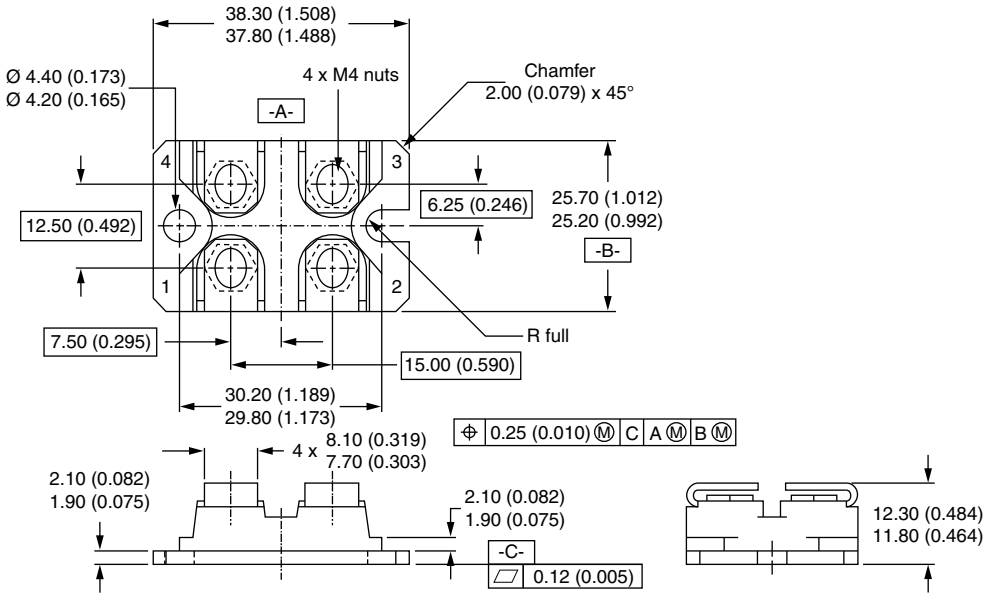
CIRCUIT CONFIGURATION

CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Single switch no diode	S	 

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95036
Packaging information	www.vishay.com/doc?95037

SOT-227

DIMENSIONS in millimeters (inches)



Notes

- Dimensioning and tolerancing per ANSI Y14.5M-1982
- Controlling dimension: millimeter

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