SOT-227 Power Module
Single Switch - Power MOSFET, 220 A

SOT-227

FEATURES

- Enhanced body diode dV/dt and dI_F/dt capability
- Improved gate avalanche and dynamic dV/dt ruggedness
- Fully characterized capacitance and avalanche SOA
- Fully isolated package
- Easy to use and parallel
- Low on-resistance
- Simple drive requirements
- UL approved file E78996
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

APPLICATIONS

- High efficiency synchronous rectification SMPS
- Uninterruptible power supply
- High speed power switching
- Hard switched and high frequency circuits

DESCRIPTION

This generation of 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 400 W to 700 W. The low thermal resistance of the SOT-227 contribute to its wide acceptance throughout the industry.

PRIMARY CHARACTERISTICS	
V_{DSS}	200 V
$R_{DS(on)}$	4.8 mΩ
I_D	220 A
Type	Modules - MOSFET
Package	SOT-227

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
MOSFET				
Drain to source voltage	V_{DSS}		200	V
Continuous drain current at V_{GS} 10 V	I_D	T_C = 25 °C	220	A
		T_C = 100 °C	158	
Pulsed drain current	I_{DM} (1)		520	
Power dissipation	P_D	T_C = 25 °C	789	W
		T_C = 100 °C	395	
Gate to source voltage	V_{GS}		± 30	V
Single pulse avalanche energy	E_{AS} (2)		1200	mJ
Avalanche current	I_{AR} (3)		70	A
Repetitive avalanche energy	E_{AR} (3)		600	mJ
MODULE				
Operating junction temperature range	T_J		-55 to +175	°C
Operating storage temperature range	T_{Stg}		-55 to +175	
Insulation withstand voltage (AC-RMS)	V_{ISOL}		2.5	kV

Notes

(1) Repetitive rating; pulse width limited by maximum junction temperature

(2) Limited by T_J max., starting T_J = 25 °C, L = 0.23 mH, R_g = 25 Ω, I_{AS} = 102 A, V_{GS} = 10 V. Part not recommended for use above this value

(3) Repetitive rating; pulse width limited by maximum junction temperature starting T_J = 25 °C, L = 0.23 mH, R_g = 25 Ω, V_{GS} = 10 V, duty cycle 1 %

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Junction and storage temperature range	T_J, T_{Stg}		-55	-	175	°C
Junction to case	R_{thJC}		-	-	0.19	°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 °C unless otherwise specified)						
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	200	-	-	V
Breakdown voltage temperature coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	Reference to 25 °C, I_D = 1.0 mA	-	0.21	-	V/°C
Static drain to source on-resistance	$R_{DS(on)}$ (1)	V_{GS} = 10 V, I_D = 150 A	-	4.8	7.0	mΩ
Gate threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 500 µA	3	4	5.1	V
		V_{DS} = V_{GS}, I_D = 500 µA, T_J = 125 °C	-	2.5	-	
Forward transconductance	g_{fs}	V_{DS} = 20 V, I_D = 150 A	-	385	-	S
Gate resistance, internal	R_g		-	2	-	Ω
Drain to source leakage current	I_{DSS}	V_{DS} = 200 V, V_{GS} = 0 V	-	1	50	µA
		V_{DS} = 200 V, V_{GS} = 0 V, T_J = 125 °C	-	40	1000	
		V_{DS} = 200 V, V_{GS} = 0 V, T_J = 175 °C	-	2	10	mA
Gate to source forward leakage	I_{GSS}	V_{GS} = 20 V	-	-	250	nA
Gate to source reverse leakage		V_{GS} = -20 V	-	-	-250	
Total gate charge	Q_g	I_D = 150 A, V_{DS} = 100 V, V_{GS} = 10 V, see fig.15 and fig.19 (1)	-	350	-	nC
Gate to source charge	Q_{gs}		-	120	-	
Gate to drain (“Miller”) charge	Q_{gd}		-	110	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 120 V, I_D = 150 A, R_g = 5 Ω, L = 500 µH, diode used: 20CZU02	-	360	-	ns
Rise time	t_r		-	245	-	
Turn-off delay time	$t_{d(off)}$		-	205	-	
Fall time	t_f		-	220	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 120 V, I_D = 150 A, R_g = 5 Ω, L = 500 µH, T_J = 125 °C, diode used: 20CZU02	-	350	-	ns
Rise time	t_r		-	243	-	
Turn-off delay time	$t_{d(off)}$		-	210	-	
Fall time	t_f		-	175	-	
Internal source inductance	L_S	Between lead, and center of die contact	-	5	-	nH
Input capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 50 V, f = 1.0 MHz, see fig.14	-	21 000	-	pF
Output capacitance	C_{oss}		-	1600	-	
Reverse transfer capacitance	C_{rss}		-	320	-	
Drain to case capacitance	C_{d-cs}	V_{GS} = 0 V, (G-S shortened); f = 1 MHz	-	43	-	

SOURCE-DRAIN RATINGS AND CHARACTERISTICS (T_J = 25 °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	-	-	220	A
Pulsed source current (body diode)	I_{SM} (1)		-	-	520	
Diode forward voltage	V_{SD} (2)	T_J = 25 °C, I_S = 150 A, V_{GS} = 0 V	-	0.87	1.0	V
		T_J = 125 °C, I_S = 150 A, V_{GS} = 0 V	-	0.75	-	
		T_J = 175 °C, I_S = 150 A, V_{GS} = 0 V	-	0.70	-	
Reverse recovery time	t_{rr}	T_J = 25 °C, I_F = 50 A, dI_F/dt = 100 A/µs, V_R = 100 V (2)	-	170	-	ns
Reverse recovery current	I_{rr}		-	12	-	A
Reverse recovery charge	Q_{rr}		-	1060	-	nC
Reverse recovery time	t_{rr}	T_J = 125 °C, I_F = 50 A, dI_F/dt = 100 A/µs, V_R = 100 V (2)	-	200	-	ns
Reverse recovery current	I_{rr}		-	15	-	A
Reverse recovery charge	Q_{rr}		-	1550	-	nC
Forward turn-on time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS + LD)				

Notes

(1) Repetitive rating; pulse width limited by maximum junction temperature

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

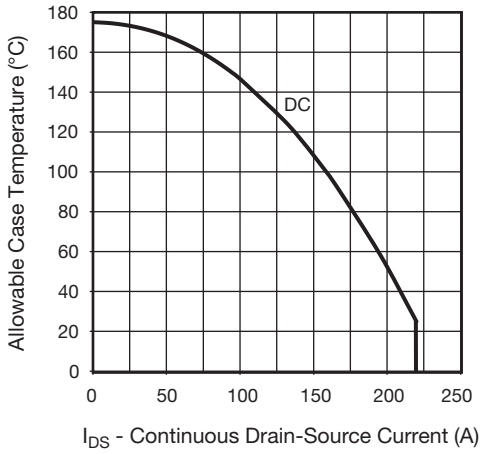


Fig. 1 - Maximum DC MOSFET Drain-Source Current vs. Case Temperature

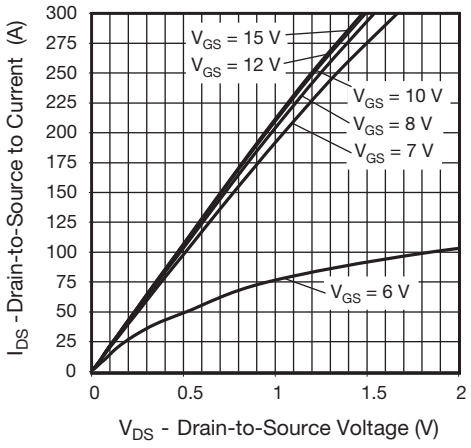


Fig. 3 - Typical Drain-to-Source Current Output Characteristics, at T_J = 25 °C

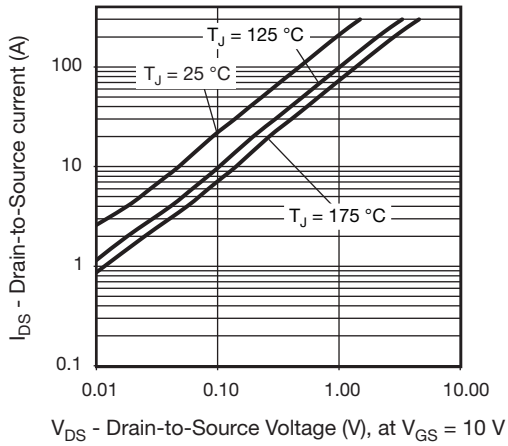


Fig. 2 - Typical Drain-to-Source Current Output Characteristics, V_{GS} = 10 V

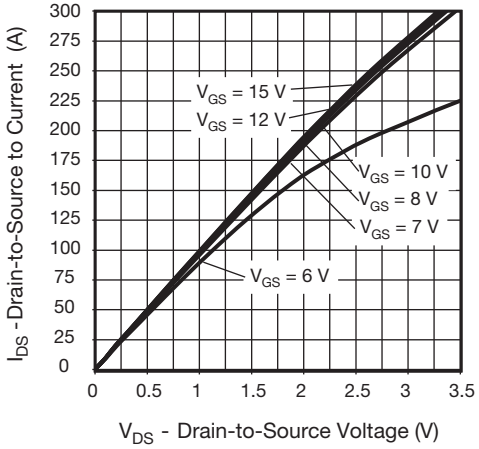


Fig. 4 - Typical Drain-to-Source Current Output Characteristics, at T_J = 125 °C

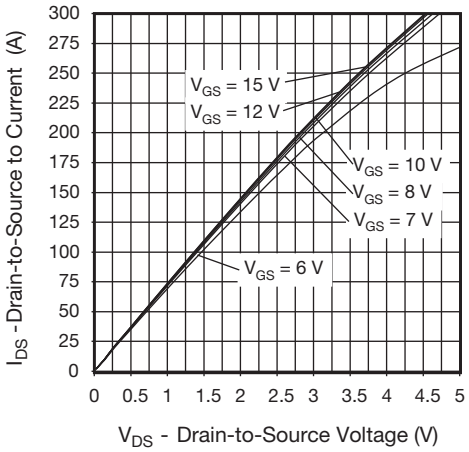


Fig. 5 - Typical Drain-to-Source Current Output Characteristics, at T_J = 175 °C

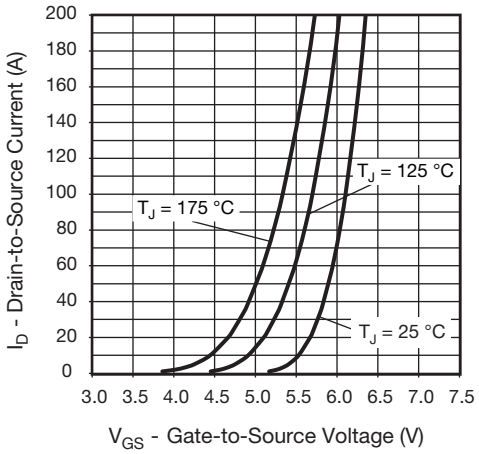


Fig. 8 - Typical MOSFET Transfer Characteristics

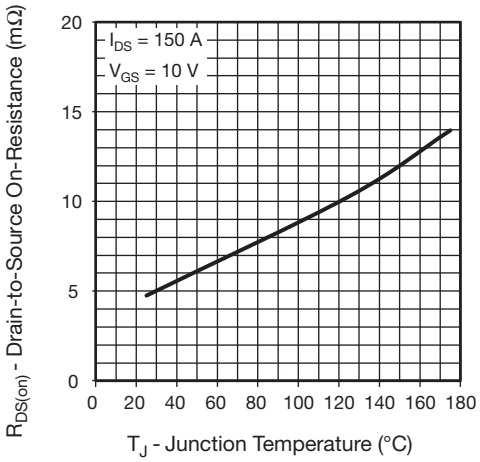


Fig. 6 - Typical Drain-to-Source On-Resistance vs. Temperature

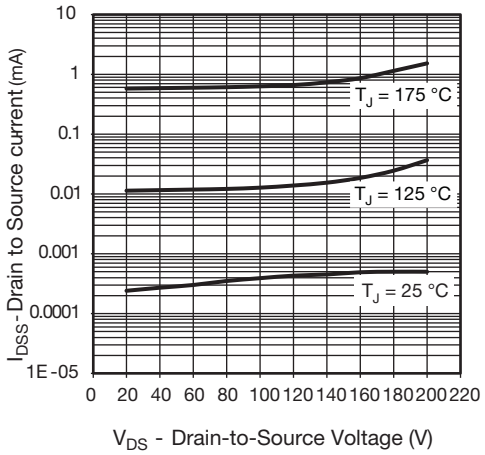


Fig. 9 - Typical MOSFET Zero Gate Voltage Drain Current

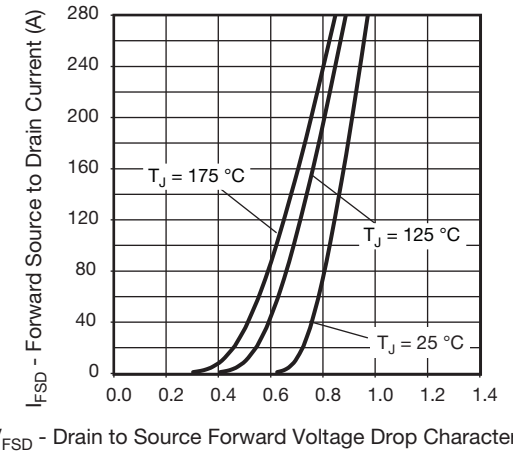


Fig. 7 - Typical Body Diode Forward Voltage Drop Characteristics

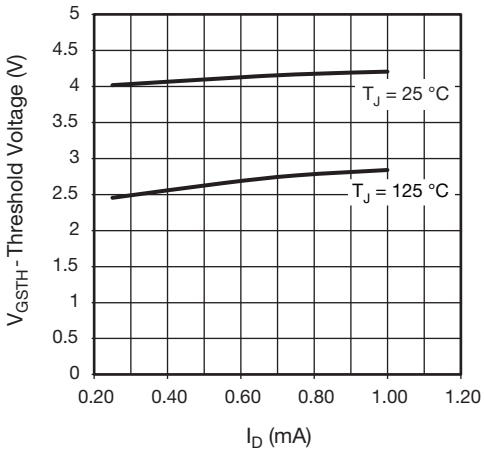


Fig. 10 - Typical MOSFET Threshold Voltage

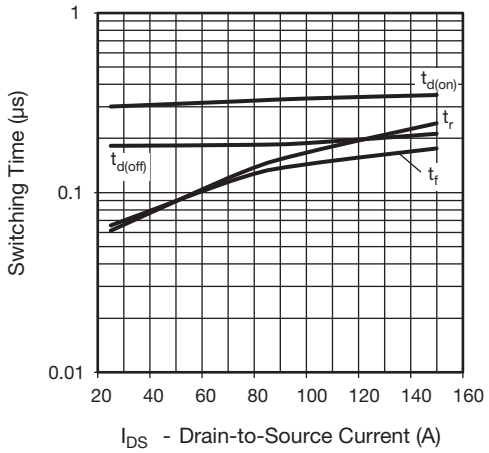


Fig. 11 - Typical MOSFET Switching Time vs. I_{DS},
T_J =125 °C, V_{DD} = 120 V, V_{GS} = 10 V, L = 500 µH, R_g = 5 Ω
Diode Used: 20CZU02

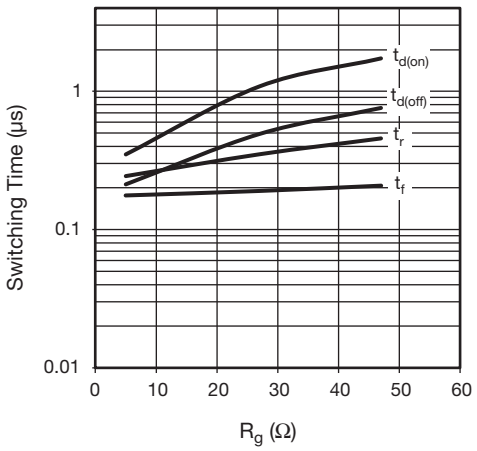


Fig. 12 - Typical MOSFET Switching Time vs. R_g,
T_J =125 °C, I_{DS} = 150 A, V_{DD} = 120 V, V_{GS} = 10 V, L = 500 µH
Diode Used: 20CZU02

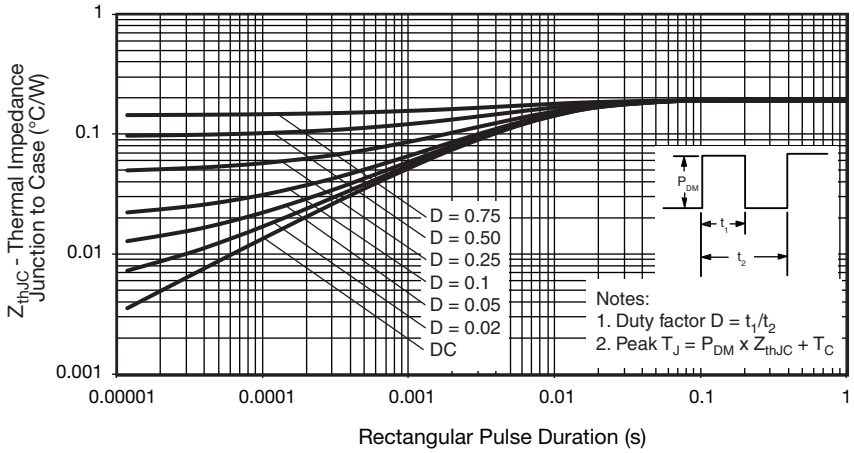


Fig. 13 - Maximum Thermal Impedance Z_{thJC} Characteristics, MOSFET

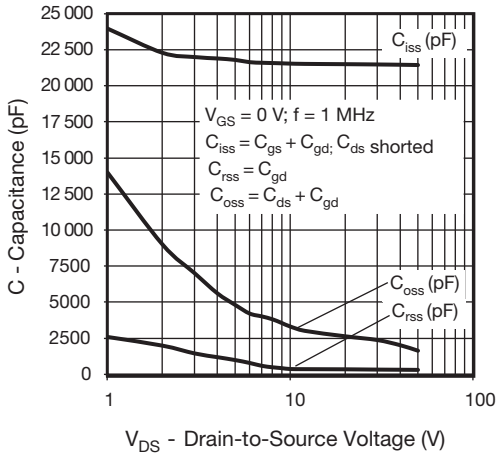


Fig. 14 - Typical Capacitance vs. Drain-to-Source Voltage

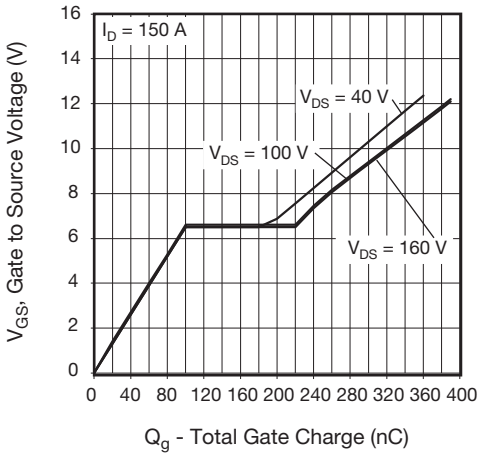


Fig. 15 - Typical Gate Charge vs. Gate-to-Source Voltage

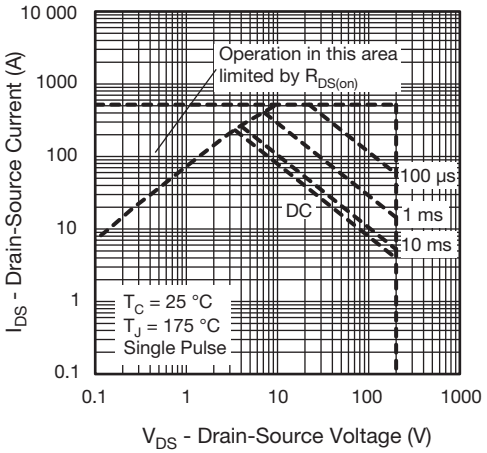


Fig. 16 - Maximum Safe Operating Area

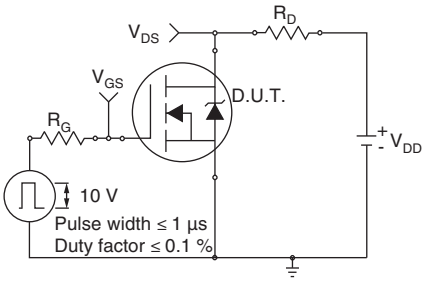


Fig. 17 - Switching Time Test Circuit

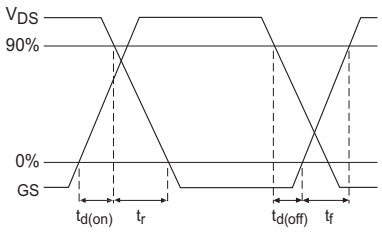


Fig. 18 - Switching Time Waveform

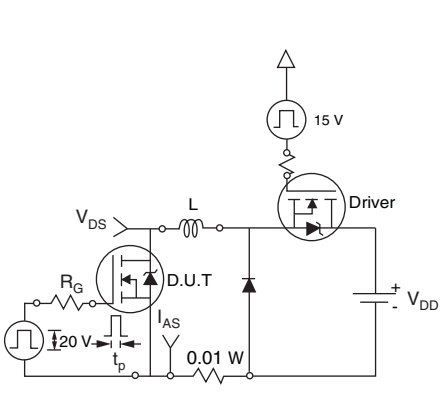


Fig. 19 - Unclamped Inductive Test Circuit

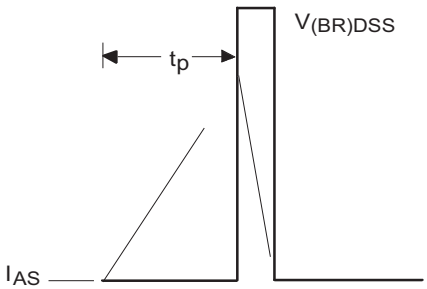


Fig. 20 - Unclamped Inductive Waveform

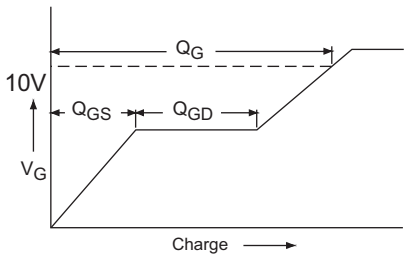


Fig. 21 - Basic Gate Charge Waveform

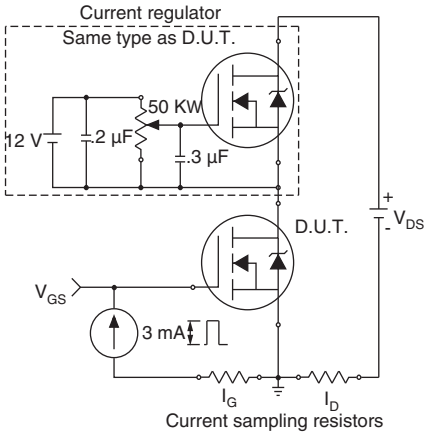


Fig. 22 - Gate Charge Test Circuit

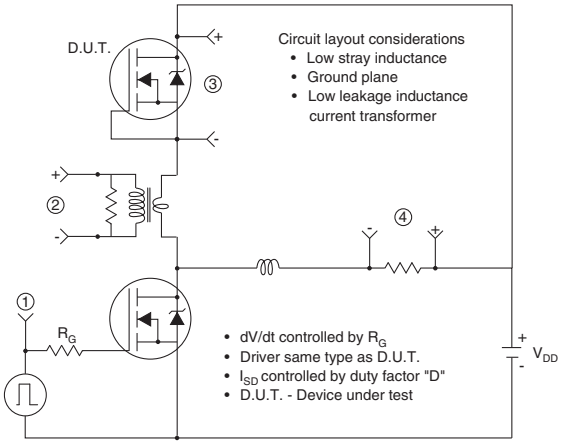
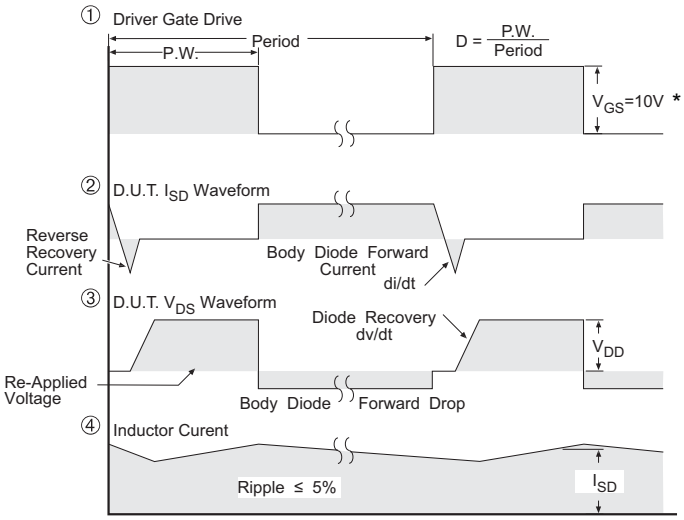


Fig. 23 - Peak Diode Recovery dV/dt Test Circuit



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

Fig. 24 - For N-Channel Power MOSFETs

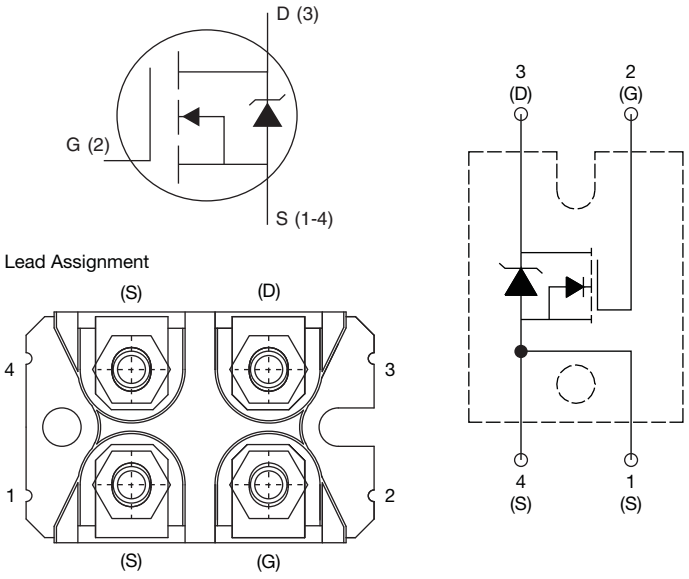
ORDERING INFORMATION TABLE

Device code

VS-	F	C	220	S	A	20
1	2	3	4	5	6	7

- 1 - Vishay Semiconductors product
- 2 - MOSFET module
- 3 - MOSFET die generation
- 4 - Current rating (220 = 220 A)
- 5 - S = single switch
- 6 - Package indicator SOT-227
- 7 - Voltage rating (20 = 200 V)

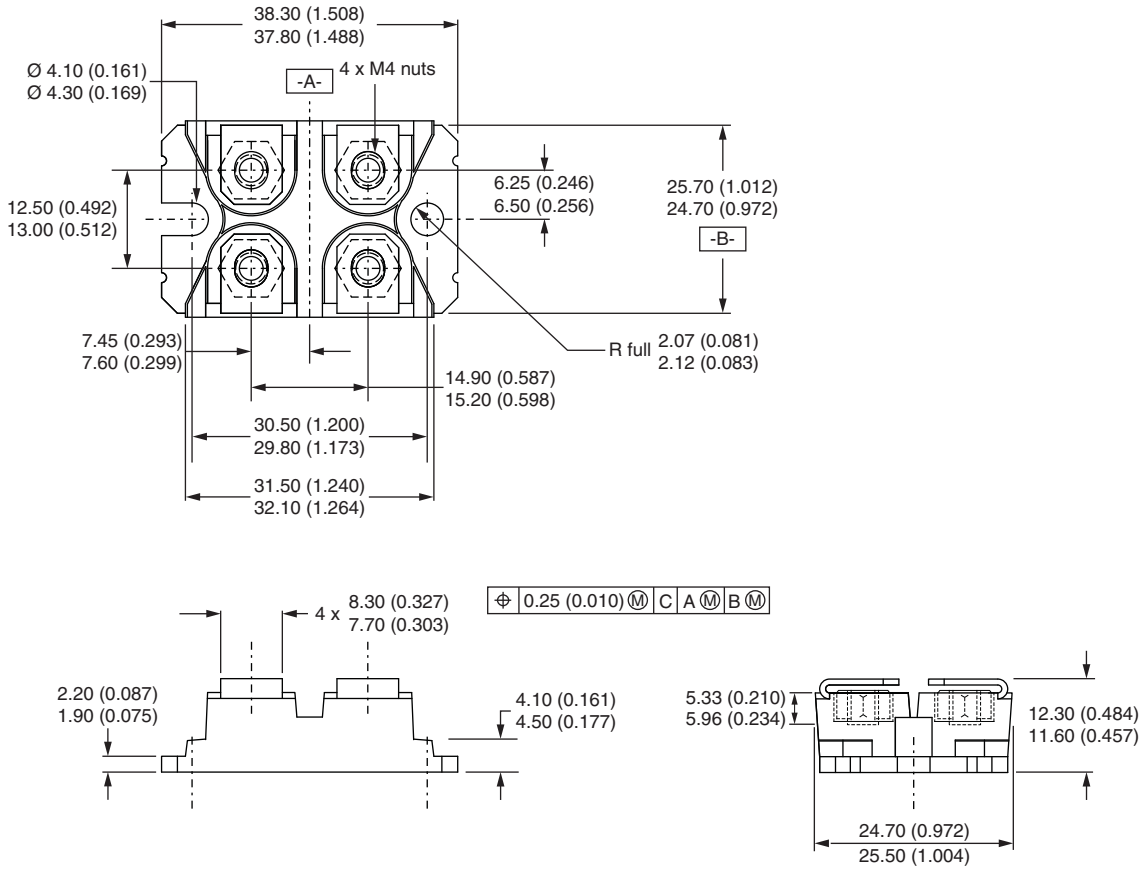
CIRCUIT CONFIGURATION

CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Single switch	S	

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95423
Packaging information	www.vishay.com/doc?95425

SOT-227 Generation 2

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.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Discrete Semiconductor Modules ***category:***

Click to view products by Vishay ***manufacturer:***

Other Similar products are found below :

M252511FV M254043 DD260N12K-A DD285N02K DD380N16A DDB6U144N16R DDB6U145N16L APT20M11JFLL APT2X101DL40J APT2X21DC60J APT2X30D40J APT2X30D60J APT2X31DQ120J APT39M60J APT47M60J APT50DF170HJ APT50M50JLL APT50M75JLLU3 APT50N60JCCU2 APT58M80J APT80F60J DZ540N26K B522F-2-YEC MSTC90-16 MT16HTF12864AZ-800G1 MT18HTF12872PZ-667G1 MT18HTF25672FDZ-667H1D6 MT18HTF25672PZ-80EH1 MT18RTF25672FDZ-667H1D6 MT36HTF51272FZ-667H1D4 MT36HTF51272FZ-667H1D6 MT8HTF12864HTZ-667H1 MT9HTF6472PZ-667G1 MT9HVF12872PZ-80EH1 MT9HVF6472PZ-667G1 ND104N16K 25.163.0653.1 25.163.2453.0 25.163.4253.0 25.190.2053.0 25.194.3453.0 25.320.4853.1 25.320.5253.1 25.325.3653.1 25.326.3253.1 25.326.3553.1 25.330.1653.1 25.330.4753.1 25.330.5253.1 25.334.3253.1