SOT-227 Power Module
Single Switch - Power MOSFET, 210 A

SOT-227

FEATURES

- I_D = 210 A, T_C = 25 °C
- ThunderFET power MOSFET
- Reduced switching and conduction losses
- Maximum 175 °C junction temperature
- UL approved file E78996
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

APPLICATIONS

- DC/DC conversions
- Motor drives switch
- DC/AC inverter
- Power supplies
- Uninterruptible power supplies
- AC/DC switchmode power supplies
- Solar micro inverter

PRIMARY CHARACTERISTICS	
V_{DSS}	200 V
$R_{DS(on)}$	4.4 mΩ
I_D	166 A at 90 °C
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, $V_{GS\ at}$ 10 V	I_D	T_C = 25 °C	213	A
		T_C = 90 °C	166	
Pulsed drain current	I_{DM} (1)		468	
Power dissipation	P_D	T_C = 25 °C	652	W
Gate to source voltage	V_{GS}		± 20	V
Single pulse avalanche energy (2)	E_{AS}	T_C = 25 °C, L = 5 mH, V_{DS} = 75 V	5522	mJ
Avalanche current	I_{AS}		47	A
MODULE				
Operating junction temperature range	T_J		-55 to +175	°C
Operating storage temperature range	T_{Stg}		-40 to +150	
Insulation voltage (RMS)	V_{ISOL}	Any terminal to case, t = 1 min	2500	V

Notes

(1) Limited at max. junction temperature

(2) Duty cycle ≤ 1 %

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 = 0.75 mA	200	-	-	V
Breakdown voltage temperature coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D = 0.75 mA (25 °C to 125 °C)	-	0.14	-	V/°C
Static drain to source on-resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 210 A	-	4.4	6.33	mΩ
		V_{GS} = 10 V, I_D = 210 A, T_J = 150 °C	-	10.6	-	
Gate threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 0.75 mA	1.8	3.23	4.3	V
		V_{DS} = V_{GS}, I_{DS} = 0.75 mA, T_J = 125 °C	-	2.36	-	
Temperature coefficient of threshold voltage	$\Delta V_{GE(th)}/\Delta T_J$	V_{DS} = V_{GS}, I_D = 0.75 mA (25 °C to 125 °C)	-	-8.66	-	mV/°C
Forward transconductance	g_{fs}	V_{DS} = 20 V, I_D = 210 A, V_{GS} = 10 V	-	278	-	S
Drain to source leakage current	I_{DSS}	V_{DS} = 200 V, V_{GS} = 0 V	-	0.4	7.5	µA
		V_{DS} = 200 V, V_{GS} = 0 V, T_J = 150 °C	-	155	-	
Gate to source leakage	I_{GSS}	V_{GS} = ± 20 V	-	-	± 200	nA
Total gate charge	Q_g	I_D = 50 A V_{DS} = 100 V V_{GS} = 0 V / 10 V	-	185.6	-	nC
Gate to source charge	Q_{gs}		-	50.9	-	
Gate to drain ("Miller") charge	Q_{gd}		-	45	-	
Turn-on switching energy	E_{on}	V_{DD} = 100 V, I_D = 100 A, $R_{g(on)}$ = 4.7 Ω, V_{GS} = 10 V, T_J = 125 °C	-	0.13	-	mJ
Turn-on delay time	$t_{d(on)}$		-	50	-	ns
Rise time	t_r		-	68	-	
Turn-off switching energy	E_{off}	V_{DD} = 100 V, I_D = 100 A, $R_{g(off)}$ = 6.8 Ω, V_{GS} = 10 V / -1.5 V T_J = 125 °C	-	0.41		mJ
Turn-off delay time	$t_{d(off)}$		-	206	-	ns
Fall time	t_f		-	23	-	
Input capacitance	C_{iss}	V_{GS} = 0 V V_{DS} = 100 V f = 100 kHz	-	11.7	-	nF
Output capacitance	C_{oss}		-	0.375	-	
Reverse transfer capacitance	C_{rss}		-	0.024	-	

SOURCE-DRAIN RATINGS AND CHARACTERISTICS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Pulsed source current (body diode)	I_{SM}	2 ms rectangular pulse	-	-	2070	A
Diode forward voltage	V_{SD}	I_S = 100 A, V_{GS} = 0 V	-	0.85	1.2	V
Reverse recovery time	t_{rr}	T_J = 25 °C, I_F = I_S = 50 A, dI/dt = 100 A/µs, V_R = 100 V	-	197	-	ns
Reverse recovery charge	Q_{rr}		-	1535	-	nC
Reverse recovery current	I_{RRM}		-	15.1	-	A

THERMAL - MECHANICAL SPECIFICATIONS							
PARAMETER		**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Operating junction temperature range		T_J		-55	-	175	°C
Operating storage temperature range		T_{Stg}		-40	-	150	
Junction to case	MOSFET	R_{thJC}		-	-	0.23	°C/W
Case to heatsink	Module	R_{thCS}	Flat, greased surface	-	0.1	-	
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			

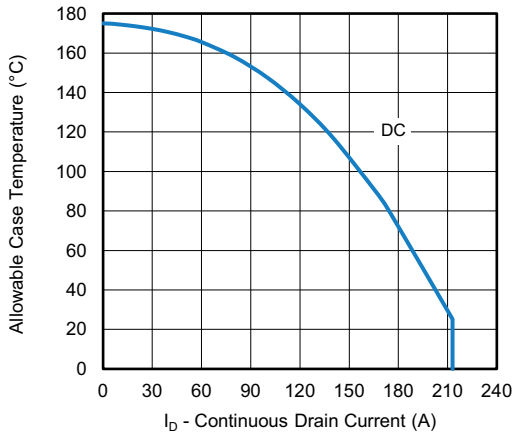


Fig. 1 - Max. Continuous Drain Current vs. Case Temperature

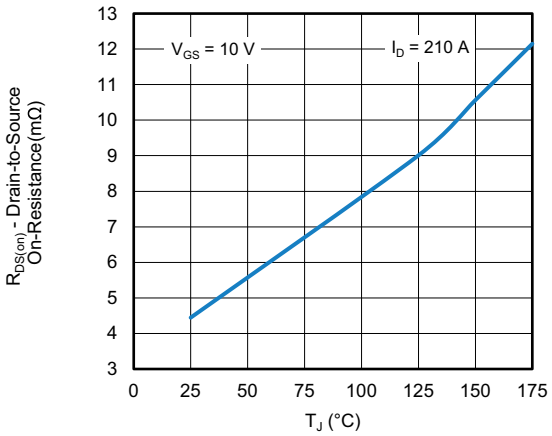


Fig. 4 - Normalized Drain-to-Source On-Resistance vs. Temperature

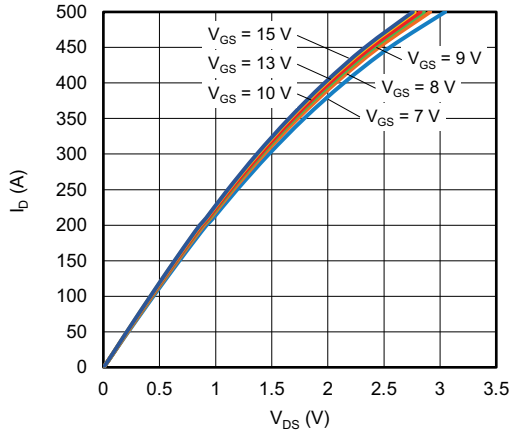


Fig. 2 - Typical Drain to Source Current Output Characteristics at T_J = 25 °C

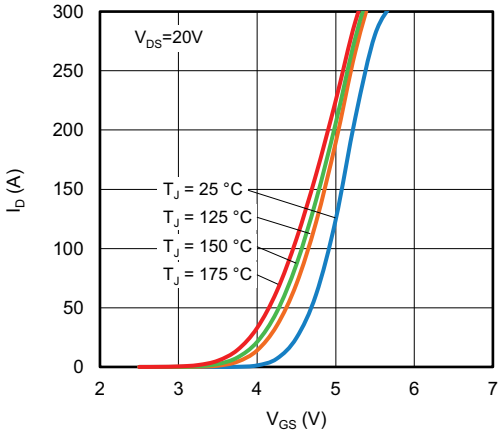


Fig. 5 - Typical Transfer Characteristics

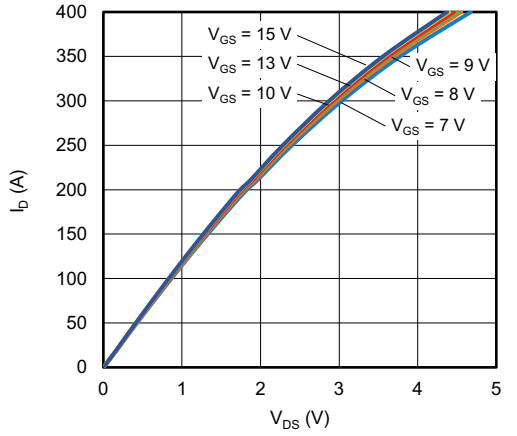


Fig. 3 - Typical Drain to Source Current Output Characteristics at T_J = 125 °C

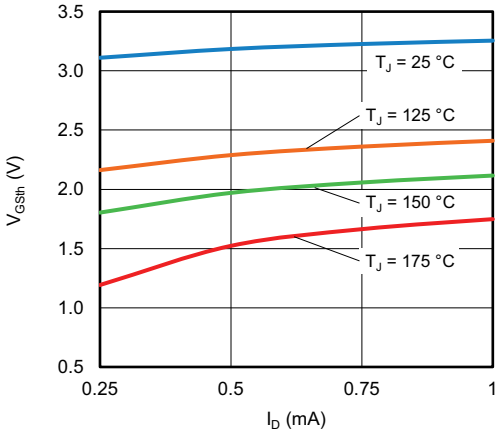


Fig. 6 - Typical Gate THreshold Voltage Characteristics

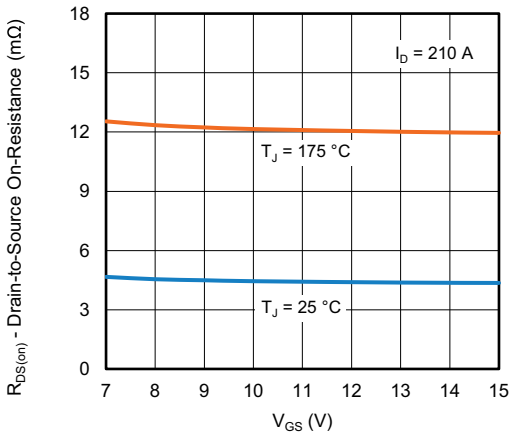


Fig. 7 - Typical Gate Threshold Voltage Characteristics

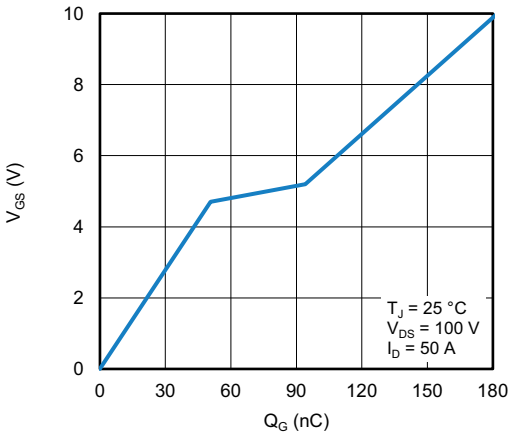


Fig. 10 - Typical Gate Charge vs. Gate to Source Voltage

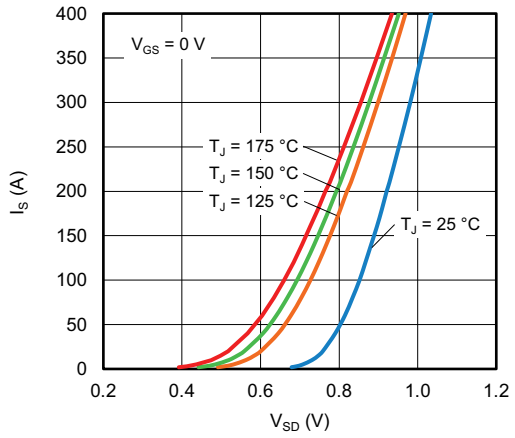


Fig. 8 - Typical Drain to Source On-Resistance vs. Gate to Source Voltage

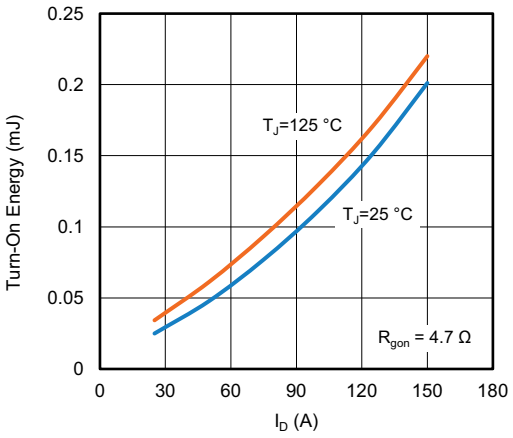


Fig. 11 - Typical Turn-On Energy Loss vs. I_D, V_{GS} = 10 V

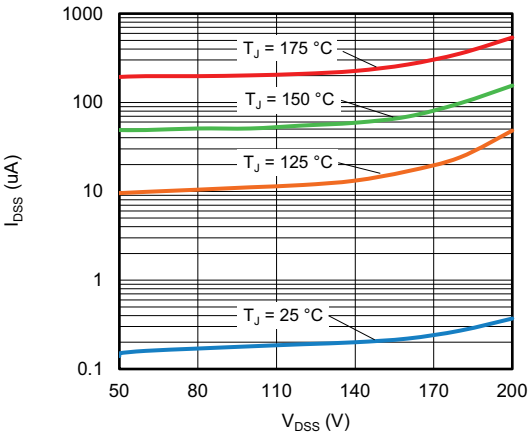


Fig. 9 - Typical Zero Gate Voltage Drain Current

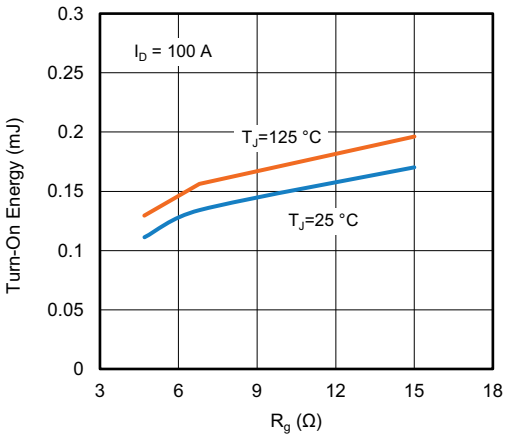


Fig. 12 - Typical Turn-On Energy Loss vs. R_g, V_{GS} = 10 V

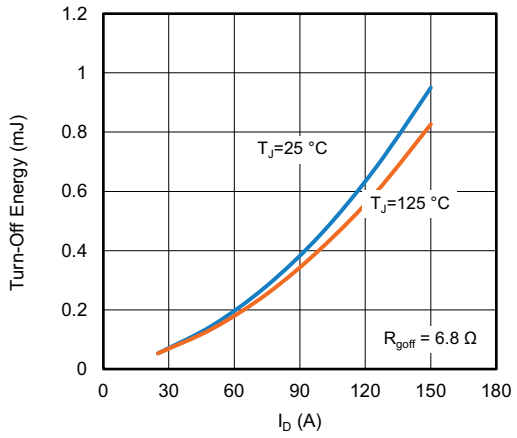


Fig. 13 - Typical Turn-Off Energy Loss vs. I_D, V_{GS} = 10 V / -1.5 V

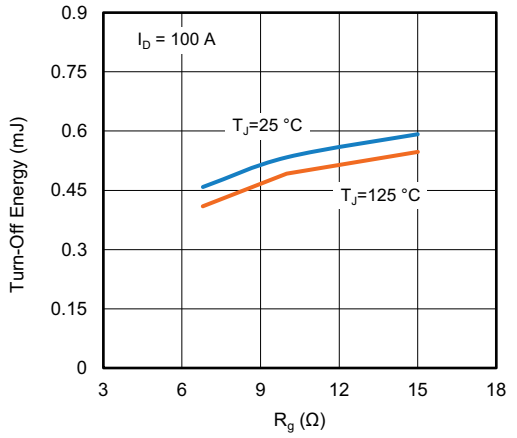


Fig. 14 - Typical Turn-Off Energy Loss vs. R_g, V_{GS} = 10 V / -1.5 V

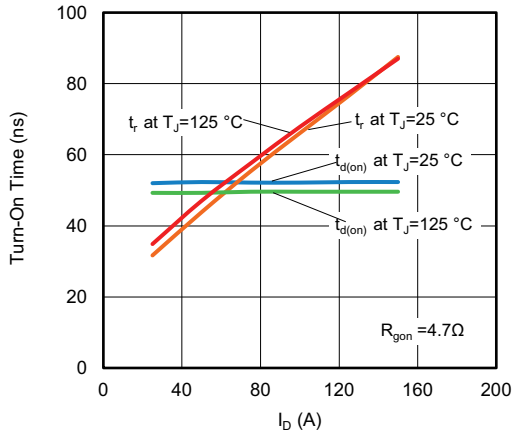


Fig. 15 - Typical Turn-On Switching Time vs. I_D, V_{GS} = 10 V

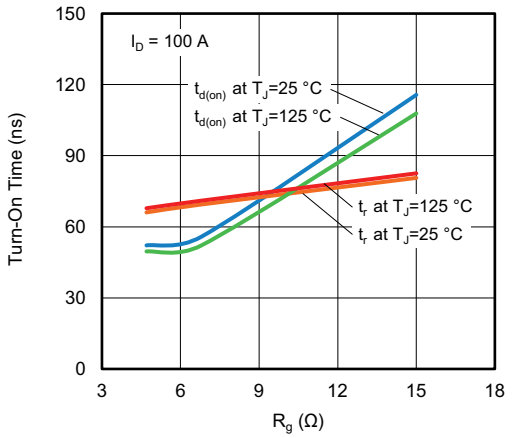


Fig. 16 - Typical Turn-On Switching Time vs. R_g, V_{GS} = 10 V

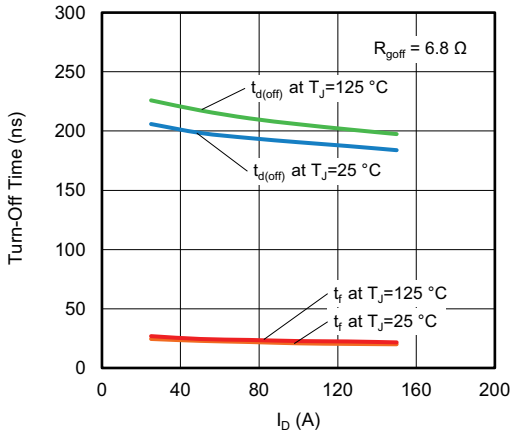


Fig. 17 - Typical Turn-Off Switching Time vs. I_D, V_{GS} = 10 V / -1.5 V

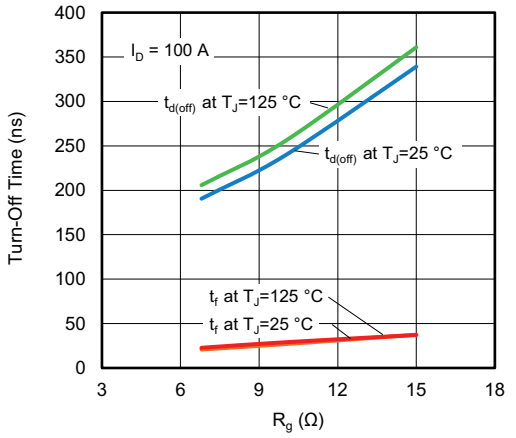


Fig. 18 - Typical Turn-Off Switching Time vs. R_g, V_{GS} = 10 V / -1.5 V

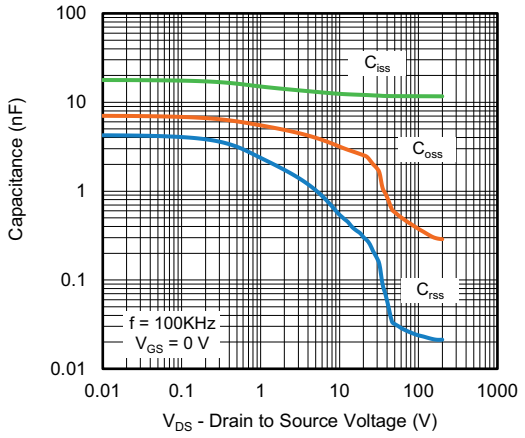


Fig. 19 - Typical Capacitance vs. Drain-to-Source Voltage

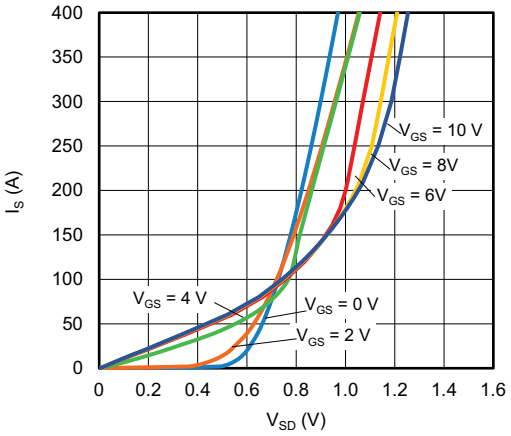


Fig. 21 - Typical Body Diode Source-to-Drain Current Characteristics T_J = 125 °C

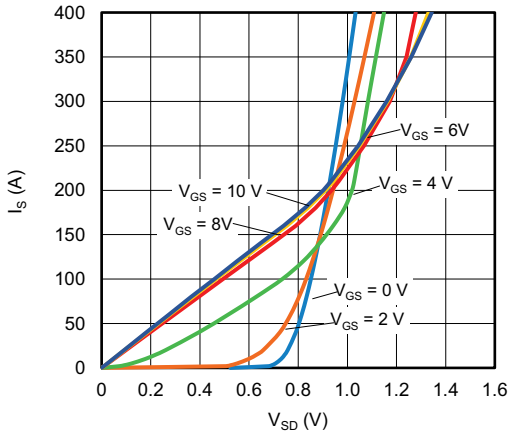


Fig. 20 - Typical Body Diode Source-to-Drain Current Characteristics T_J = 25 °C

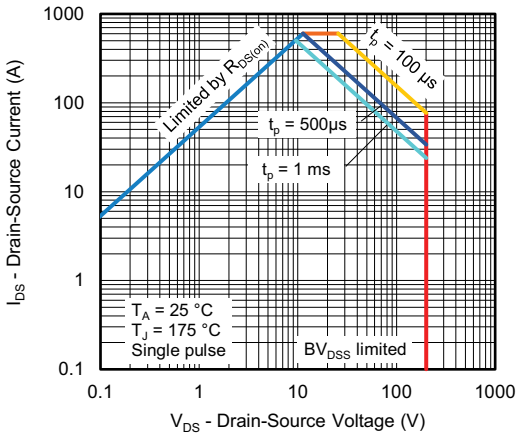


Fig. 22 - Safe Operating Area

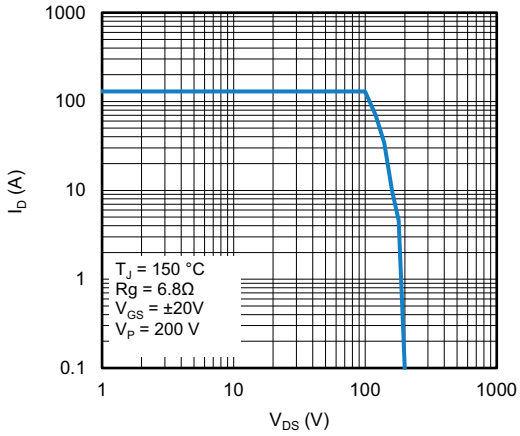


Fig. 23 - Reverse Bias Safe Operating Area

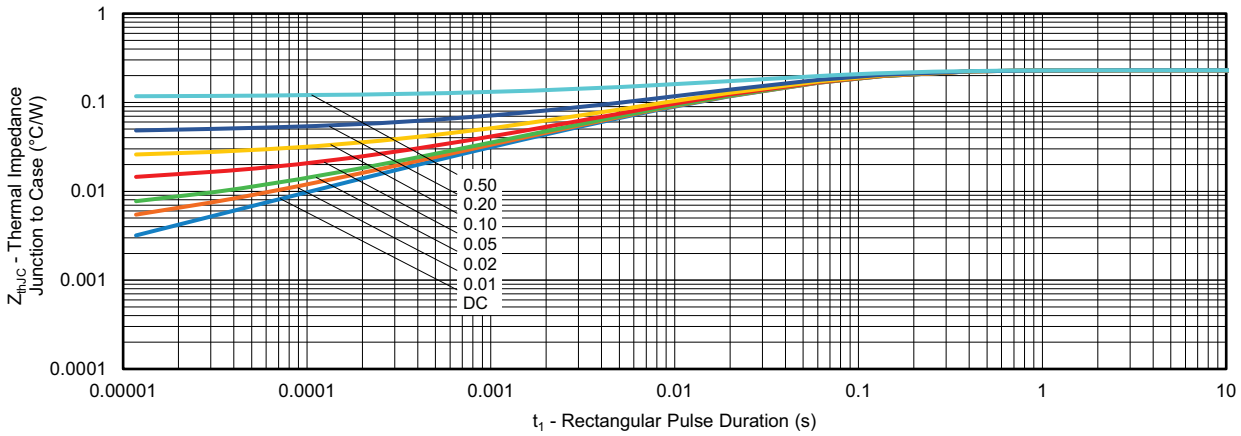


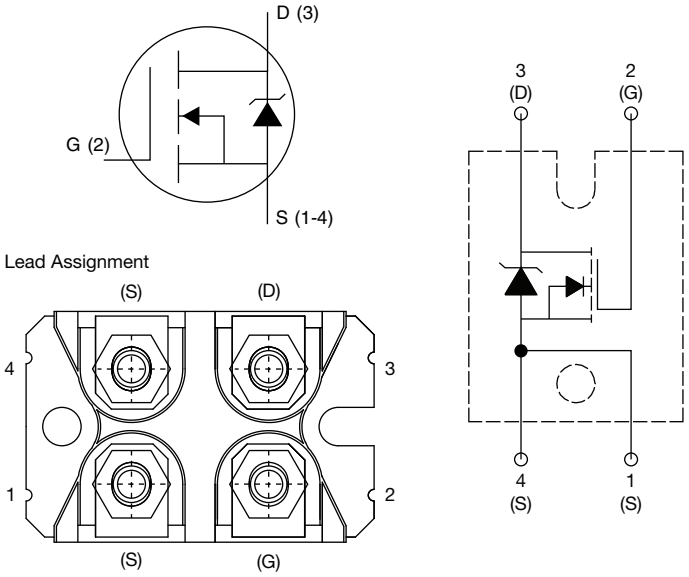
Fig. 24 - Maximum Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

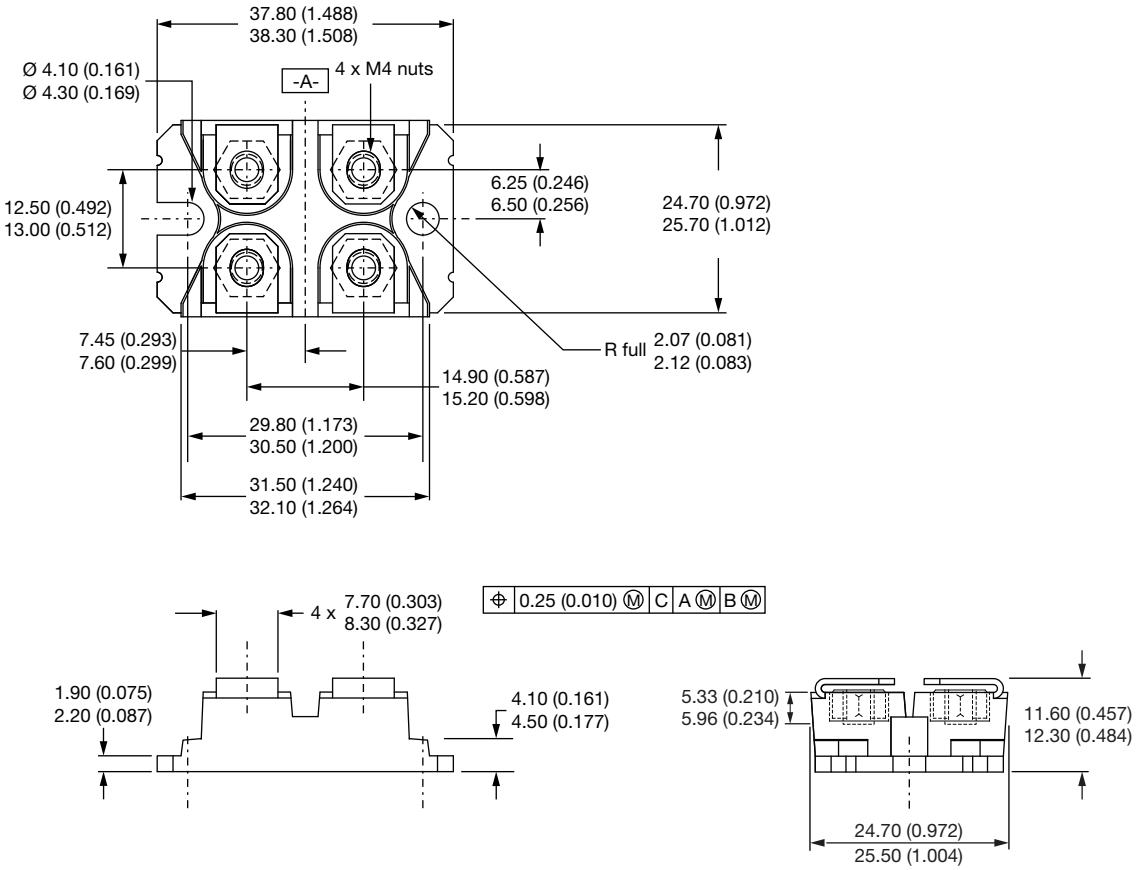
Device code

VS-	F	C	210	S	A	20
1	2	3	4	5	6	7

1	-	Vishay Semiconductors product
2	-	MOSFET module
3	-	MOSFET die generation
4	-	Current rating (210 = 210 A)
5	-	Circuit configuration (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	

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter

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