Insulated Gate Bipolar Transistor (High Speed Trench IGBT), 93 A



SOT-227

PRIMARY CHARACTERISTICS	
V_{CES}	600 V
I_C DC	90 A at 92 °C
$V_{CE(on)}$ typical at 100 A, 25 °C	1.64 V
I_F DC	90 A at 103 °C
Speed	8 kHz to 30 kHz
Package	SOT-227
Circuit configuration	Single switch with AP diode

FEATURES

- Trench IGBT technology with positive temperature coefficient
- Square RBSOA
- HEXFRED® anti-parallel diodes with ultrasoft reverse recovery
- Fully isolated package
- Very low internal inductance (≤ 5 nH typical)
- Industry standard outline
- UL approved file E78996
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

BENEFITS

- Designed for increased operating efficiency in power conversion: UPS, SMPS, welding, induction heating
- Easy to assemble and parallel
- Direct mounting to heatsink
- Plug-in compatible with other SOT-227 packages
- Lower conduction losses and switching losses
- Low EMI, requires less snubbing

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	V_{CES}		600	V
Continuous collector current	I_C	T_C = 25 °C	146	A
		T_C = 90 °C	92	
Pulsed collector current	I_{CM}	T_C = 150 °C, t_p = 6 ms, V_{GE} = 15 V	300	
Clamped inductive load current	I_{LM}		300	
Diode continuous forward current	I_F	T_C = 25 °C	100	
		T_C = 90 °C	108	
Gate-to-emitter voltage	V_{GE}		± 20	V
Power dissipation, IGBT	P_D	T_C = 25 °C	446	W
		T_C = 90 °C	214	
Power dissipation, diode	P_D	T_C = 25 °C	379	
		T_C = 90 °C	182	
Isolation voltage	V_{ISOL}	Any terminal to case, t = 1 min	2500	V

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ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Collector to emitter breakdown voltage	$V_{BR(CES)}$	V_{GE} = 0 V, I_C = 400 µA	600	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	V_{GE} = 15 V, I_C = 100 A	-	1.64	2.15	
		V_{GE} = 15 V, I_C = 100 A, T_J = 125 °C	-	1.85	-	
		V_{GE} = 15 V, I_C = 100 A, T_J = 150°C	-	1.91	-	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 1.0 mA	2.9	4.1	5.3	
		V_{CE} = V_{GE}, I_C = 1 mA, T_J = 125 °C	-	3.1	-	
Temperature coefficient of threshold voltage	$\Delta V_{GE(th)}/\Delta T_J$	V_{CE} = V_{GE}, I_C = 1 mA (25 °C to 125 °C)	-	-10	-	mV/°C
Collector to emitter leakage current	I_{CES}	V_{GE} = 0 V, V_{CE} = 600 V	-	1.5	100	µA
		V_{GE} = 0 V, V_{CE} = 600 V, T_J = 125 °C	-	1.0	-	mA
		V_{GE} = 0 V, V_{CE} = 600 V, T_J = 150 °C	-	3.5	-	
Forward voltage drop, diode	V_{FM}	I_C = 100 A, V_{GE} = 0 V	-	1.6	2.1	V
		I_C = 100 A, V_{GE} = 0 V, T_J = 125 °C	-	1.56	-	
		I_C = 100 A, V_{GE} = 0 V, T_J = 150 °C	-	1.53	-	
Gate to emitter leakage current	I_{GES}	V_{GE} = ± 20 V	-	-	± 200	nA

SWITCHING CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Total gate charge (turn-on)	Q_g	I_C = 100 A, V_{CC} = 520 V, V_{GE} = 15 V		-	247	-	nC
Gate to emitter charge (turn-on)	Q_{ge}			-	39	-	
Gate to collector charge (turn-on)	Q_{gc}			-	85	-	
Turn-on switching loss	E_{on}	I_C = 100 A, V_{CC} = 300 V, V_{GE} = 15 V, R_g = 15 Ω, L = 500 µH, T_J = 25 °C	Energy losses include tail and diode recovery. Used Antiparallel diode	-	1.89	-	mJ
Turn-off switching loss	E_{off}			-	0.88	-	
Total switching loss	E_{tot}			-	2.77	-	
Turn-on delay time	$t_{d(on)}$			-	50	-	ns
Rise time	t_r			-	67	-	
Turn-off delay time	$t_{d(off)}$			-	162	-	
Fall time	t_f			-	25	-	
Turn-on switching loss	E_{on}	I_C = 100 A, V_{CC} = 300 V, V_{GE} = 15 V, R_g = 15 Ω, L = 500 µH, T_J = 125 °C		-	1.81	-	mJ
Turn-off switching loss	E_{off}			-	1.0	-	
Total switching loss	E_{tot}			-	2.81	-	
Turn-on delay time	$t_{d(on)}$			-	50	-	ns
Rise time	t_r			-	66	-	
Turn-off delay time	$t_{d(off)}$			-	174	-	
Fall time	t_f			-	23	-	
Reverse bias safe operating area	RBSOA	T_J = 150 °C, I_C = 100 A, R_g = 15 Ω, V_{GE} = 15 V to 0 V, V_{CC} = 300 V, V_P = 600 V, L = 500 µH		Fullsquare			
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 200 A/µs, V_R = 200 V		-	95	-	ns
Diode peak reverse current	I_{rr}			-	10	-	A
Diode recovery charge	Q_{rr}			-	480	-	nC
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 200 A/µs, V_R = 200 V, T_J = 125 °C		-	144	-	ns
Diode peak reverse current	I_{rr}			-	16	-	A
Diode recovery charge	Q_{rr}			-	1136	-	nC

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THERMAL AND MECHANICAL SPECIFICATIONS							
PARAMETER		SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Junction and storage temperature range		T_J, T_{Stg}		-40	-	150	°C
Junction to case	IGBT	R_{thJC}		-	-	0.28	°C/W
	Diode			-	-	0.33	
Case to heatsink		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					

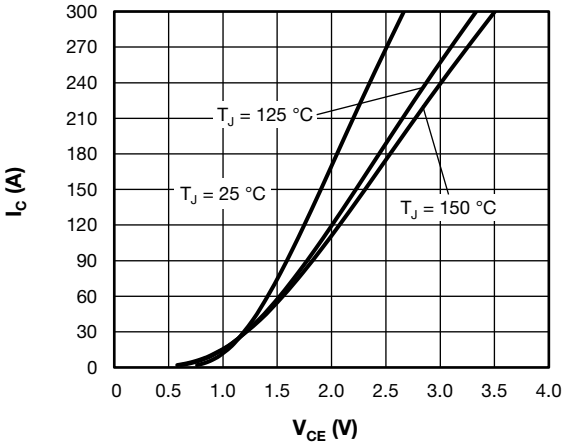


Fig. 1 - Typical Trench IGBT Output Characteristics, V_{GE} = 15 V

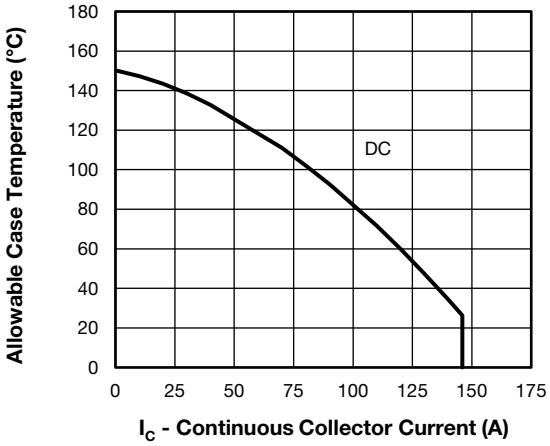


Fig. 3 - Maximum Trench IGBT Continuous Collector Current vs. Case Temperature

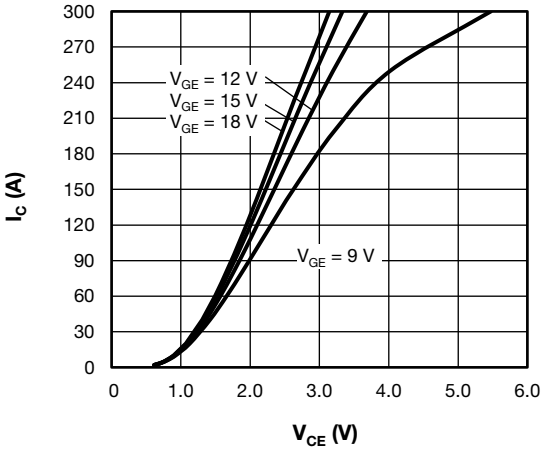


Fig. 2 - Typical Trench IGBT Output Characteristics, T_J = 125 °C

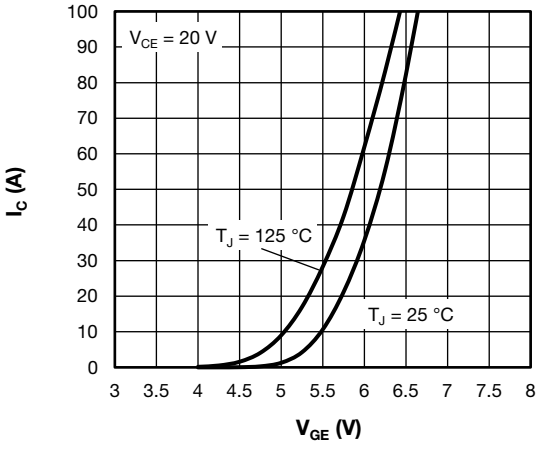


Fig. 4 - Typical Trench IGBT Transfer Characteristics

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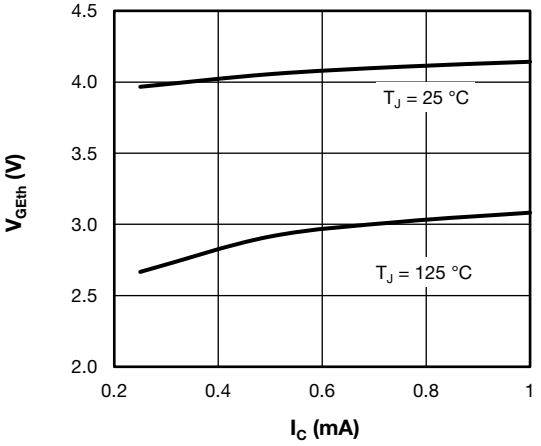


Fig. 5 - Typical Trench IGBT Gate Threshold Voltage

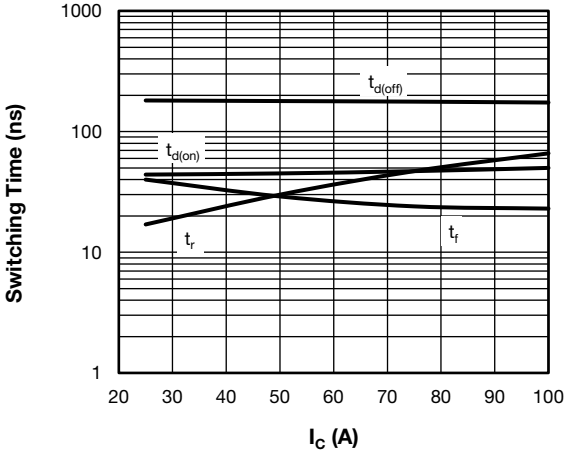


Fig. 8 - Typical Trench IGBT Switching Time vs. I_C
(with Antiparallel Diode)
T_J = 125 °C, V_{CC} = 300 V, R_g = 15 Ω, V_{GE} = +15 V/-15 V, L = 500 µH

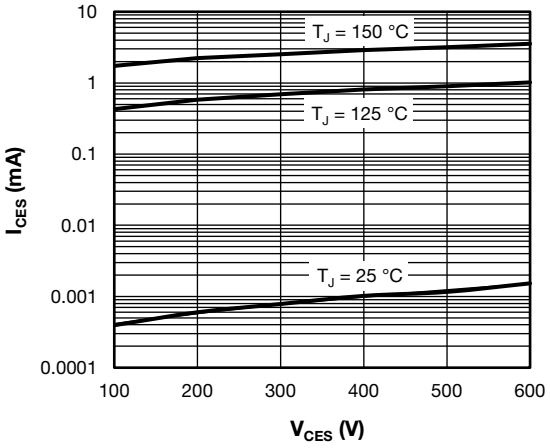


Fig. 6 - Typical Trench IGBT Zero Gate Voltage Collector Current

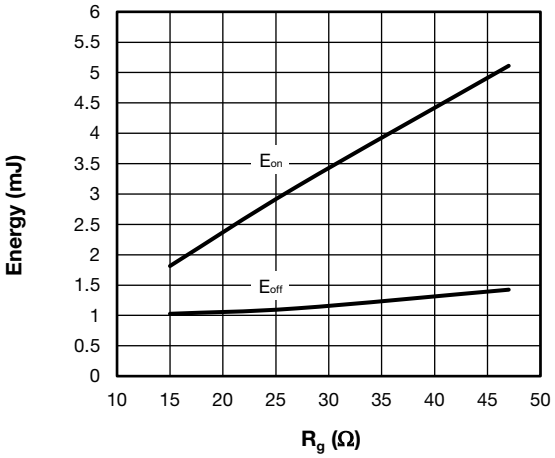


Fig. 9 - Typical Trench IGBT Energy Loss vs. R_g
(with Antiparallel Diode)
T_J = 125 °C, V_{CC} = 300 V, I_C = 100A, V_{GE} = +15 V/-15 V, L = 500 µH

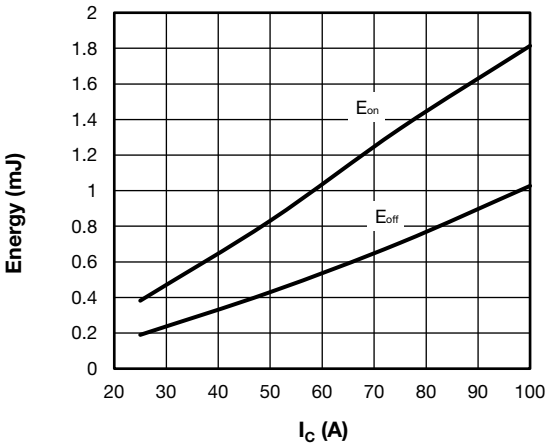


Fig. 7 - Typical Trench IGBT Energy Loss vs. I_C
(with Antiparallel Diode)
T_J = 125 °C, V_{CC} = 300 V, R_g = 15 Ω, V_{GE} = +15 V/-15 V, L = 500 µH

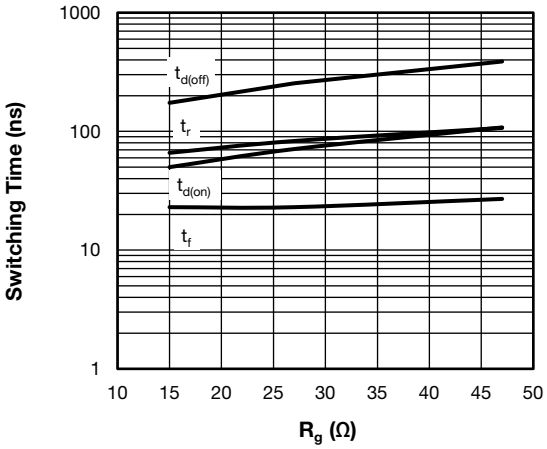


Fig. 10 - Typical Trench IGBT Switching Time vs. R_g
T_J = 125 °C, V_{CC} = 300 V, I_C = 100A, V_{GE} = +15 V/-15 V, L = 500 µH

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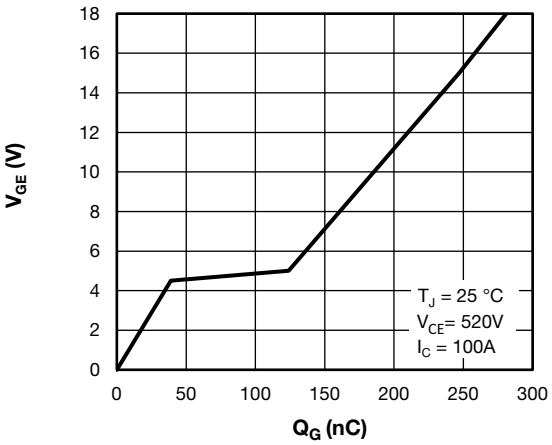


Fig. 11 - Typical Trench IGBT Gate Charge vs. Gate to Emitter Voltage

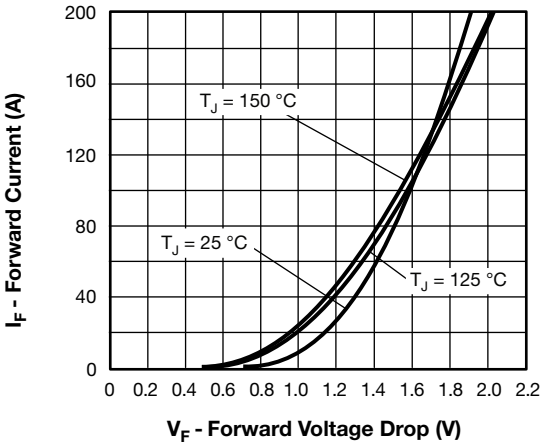


Fig. 12 - Typical Forward Voltage Drop Characteristics

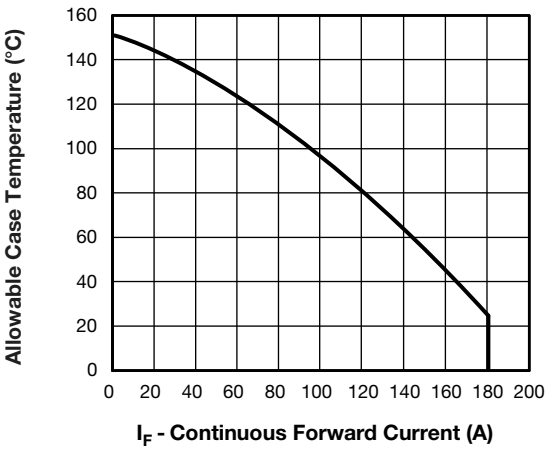


Fig. 13 - Maximum Antiparallel Diode Continuous Forward Current vs. Case Temperature

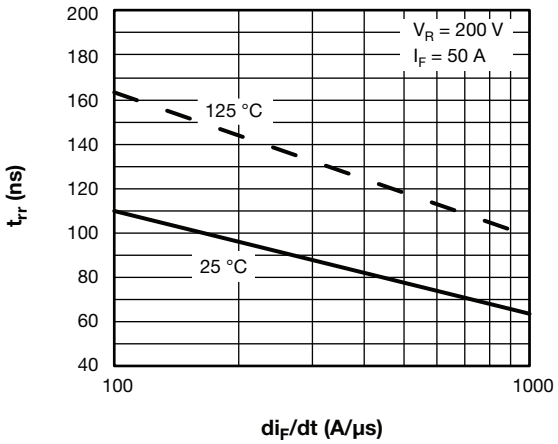


Fig. 14 - Typical Reverse Recovery Time vs. dI_F/dt of Diode

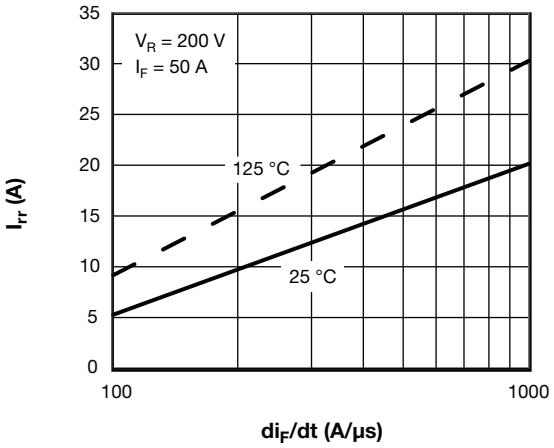


Fig. 15 - Typical Reverse Recovery Current vs. dI_F/dt of Diode

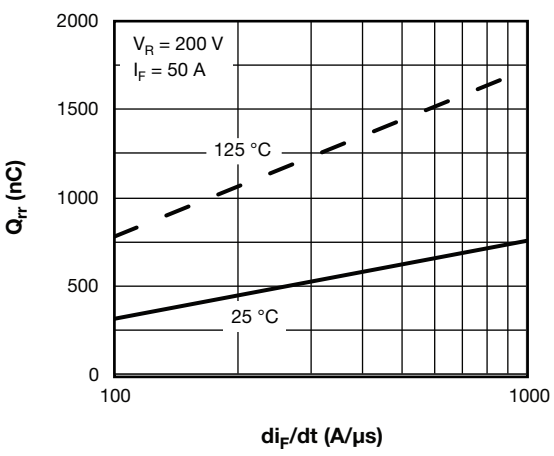


Fig. 16 - Typical Stored Charge vs. dI_F/dt of Diode

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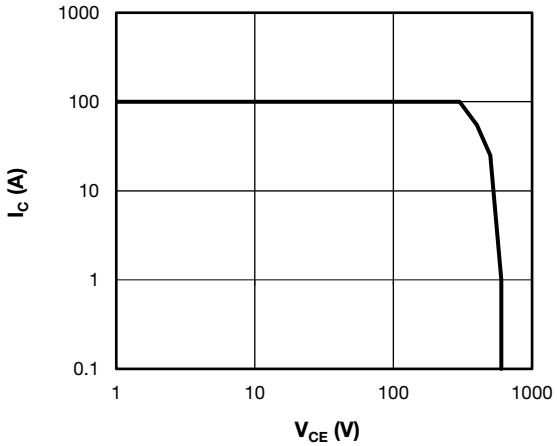


Fig. 17 - Trench IGBT Reverse BIAS SOA
T_J = 150 °C, I_C = 100A, R_g = 15 Ω, V_{GE} = +15 V/0 V,
V_{CC} = 300 V_p = 600 V

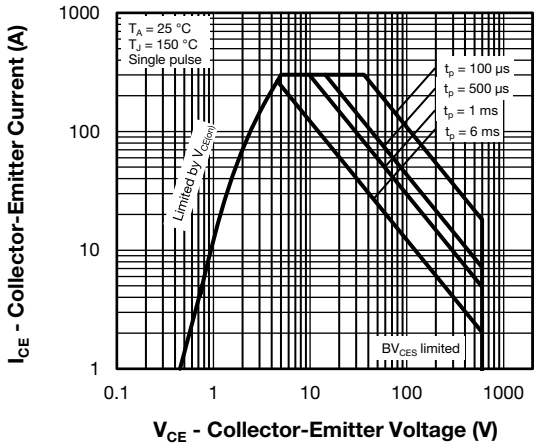


Fig. 18 - Trench IGBT Safe Operating Area

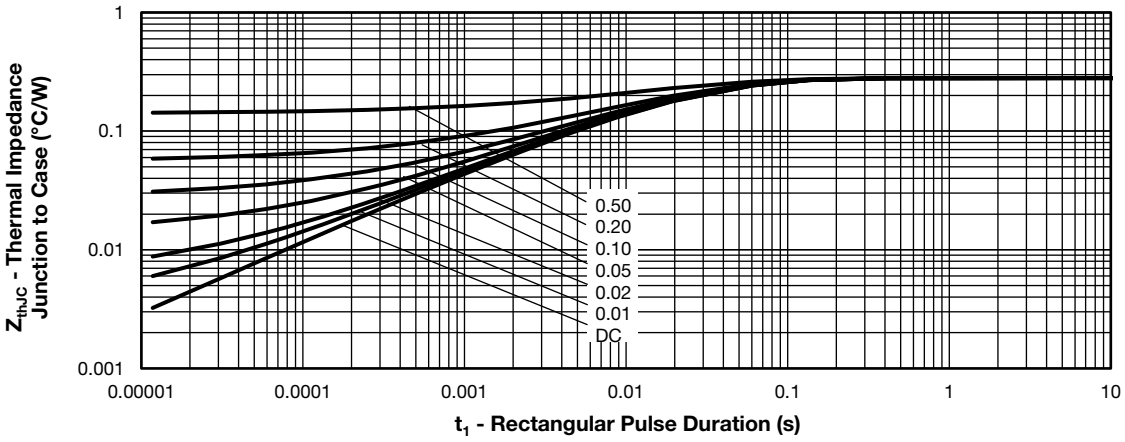


Fig. 19 - Maximum Thermal Impedance Z_{thJC} Characteristics, IGBT

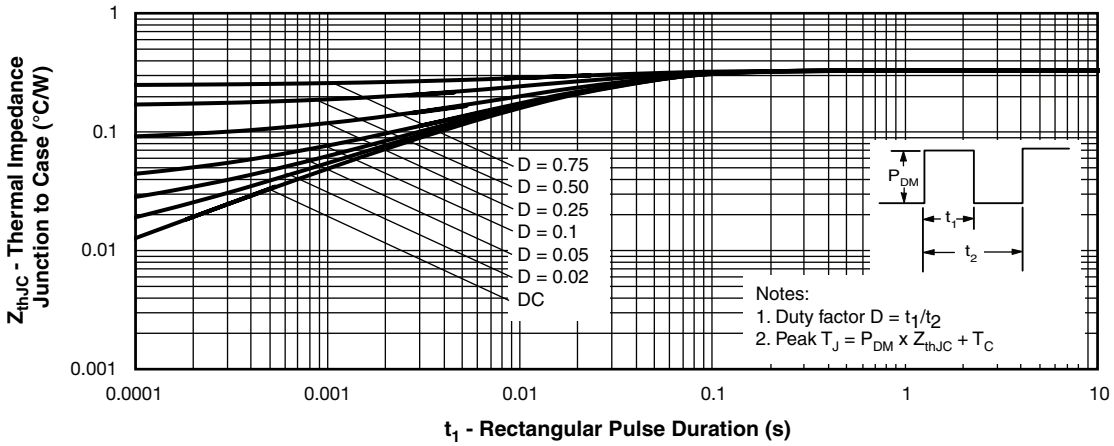
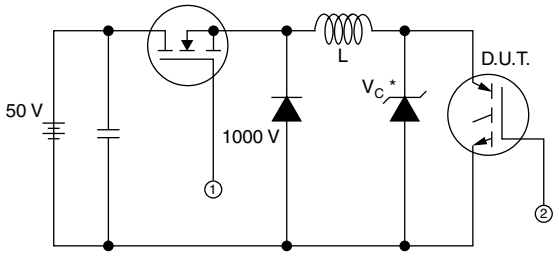


Fig. 20 - Maximum Thermal Impedance Z_{thJC} Characteristics, Diode

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* Driver same type as D.U.T.; V_C = 80 % of $V_{ce(max)}$
* Note: Due to the 50 V power supply, pulse width and inductor will increase to obtain Id

Fig. 21 - Clamped Inductive Load Test Circuit

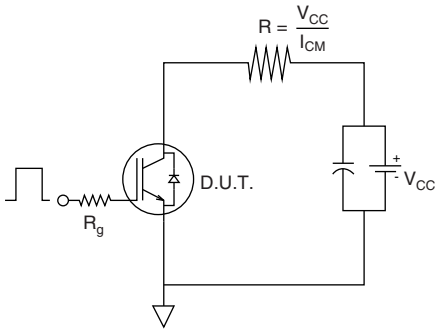


Fig. 22 - Pulsed Collector Current Test Circuit

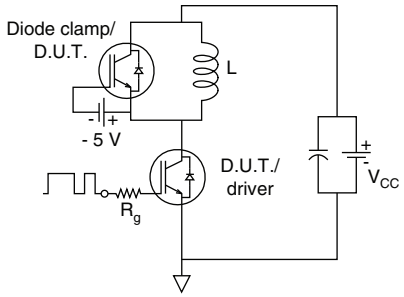
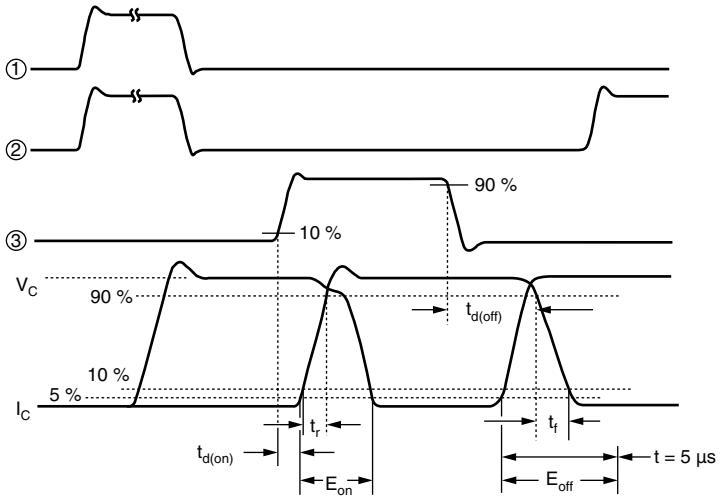


Fig. 23 - Switching Loss Test Circuit



$E_{ts} = (E_{on} + E_{off})$

Fig. 24 - Switching Loss Waveforms Test Circuit

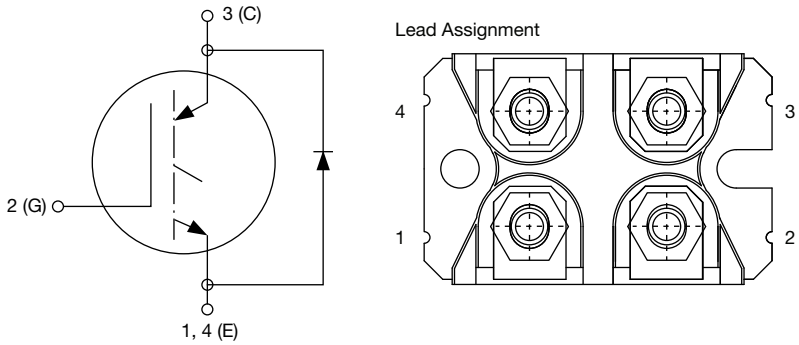
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ORDERING INFORMATION TABLE

Device code

VS-	G	T	90	D	A	60	U
1	2	3	4	5	6	7	8

1 - Vishay Semiconductors product
2 - Insulated gate bipolar transistor (IGBT)
3 - T = Trench IGBT
4 - Current rating (90 = 90 A)
5 - Circuit configuration (D = single switch with AP diode)
6 - Package indicator (A = SOT-227)
7 - Voltage rating (60 = 600 V)
8 - Speed / type (U = ultrafast IGBT)

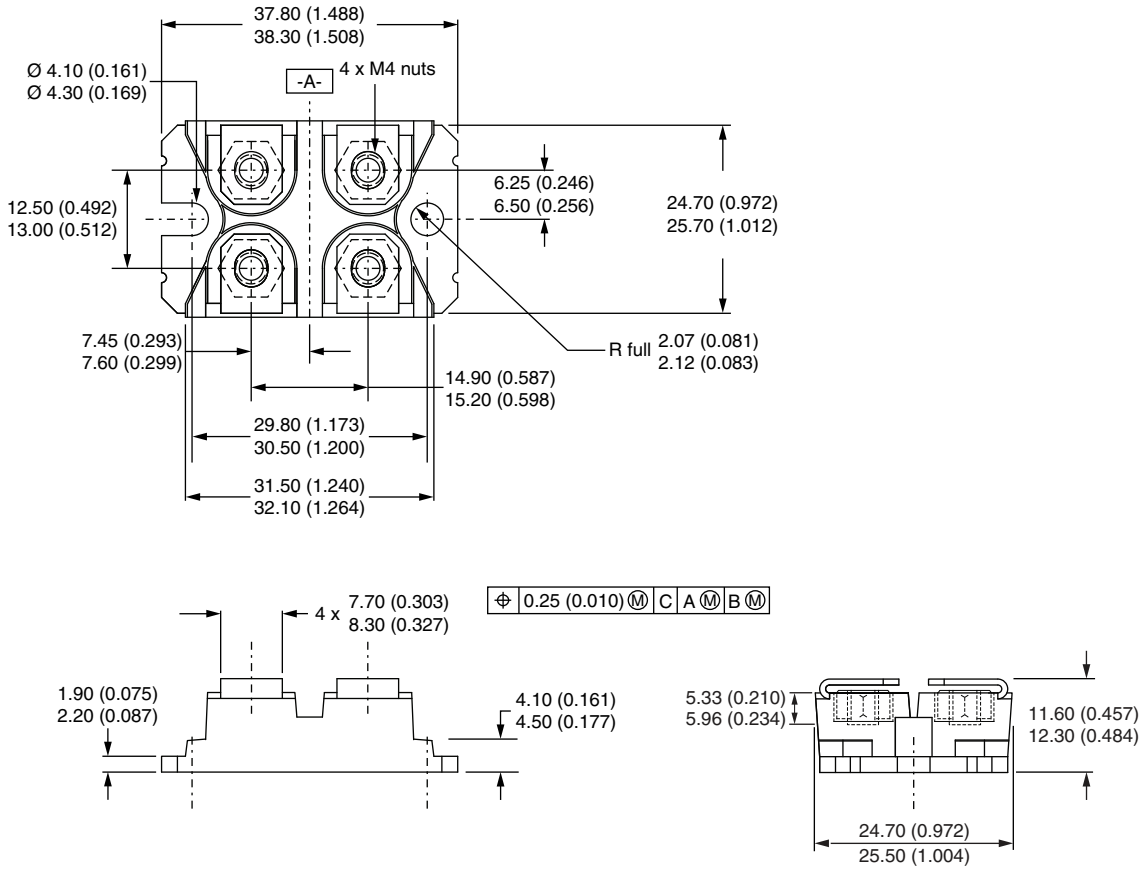
CIRCUIT CONFIGURATION		
CIRCUIT	**CIRCUIT CONFIGURATION CODE**	**CIRCUIT DRAWING**
Single switch with AP diode	D	

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

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SOT-227 Generation 2

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter

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Üretici parça numarasını yazın; stok ve fiyatı hemen görün.

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Toplu alım ve teklif

Listede olmayan ya da yüksek adetli parçalar için teklif isteyin.

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Entegreci is an online electronic components store based in Türkiye. Search by manufacturer part number to see stock, prices and datasheets for integrated circuits, microcontrollers, transistors, passive components and connectors, or request a quote for parts that are not listed.

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