"High Side Chopper" IGBT SOT-227 (Warp 2 Speed IGBT), 70 A

SOT-227

FEATURES

- NPT warp 2 speed IGBT technology with positive temperature coefficient
- Square RBSOA
- Low $V_{CE(on)}$
- FRED Pt® hyperfast rectifier
- Fully isolated package
- Very low internal inductance (≤ 5 nH typical)
- Industry standard outline
- UL approved file E78996
- Compliant to RoHS directive 2002/95/EC

Pb-free
RoHS COMPLIANT

PRODUCT SUMMARY	
V_{CES}	600 V
I_C DC	70 A at 88 °C
$V_{CE(on)}$ typical at 70 A, 25 °C	2.4 V
I_F DC	70 A at 86 °C

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
- Higher switching frequency up to 150 kHz
- 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	111	A
		T_C = 80 °C	76	
Pulsed collector current	I_{CM}		120	
Clamped inductive load current	I_{LM}		120	
Diode continuous forward current	I_F	T_C = 25 °C	113	
		T_C = 80 °C	75	
Peak diode forward current	I_{FM}		200	
Gate to emitter voltage	V_{GE}		± 20	V
Power dissipation, IGBT	P_D	T_C = 25 °C	447	W
		T_C = 80 °C	250	
Power dissipation, diode	P_D	T_C = 25 °C	236	
		T_C = 80 °C	132	
RMS isolation voltage	V_{ISOL}	Any terminal to case, t = 1 min	2500	V

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 = 1 mA	600	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	V_{GE} = 15 V, I_C = 35 A	-	1.69	1.88	
		V_{GE} = 15 V, I_C = 70 A	-	2.23	2.44	
		V_{GE} = 15 V, I_C = 35 A, T_J = 125 °C	-	2.07	2.31	
		V_{GE} = 15 V, I_C = 70 A, T_J = 125 °C	-	2.89	3.21	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 500 µA	3	3.9	5	
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)	-	- 9	-	mV/°C
Collector to emitter leakage current	I_{CES}	V_{GE} = 0 V, V_{CE} = 600 V	-	1	100	µA
		V_{GE} = 0 V, V_{CE} = 600 V, T_J = 125 °C	-	0.07	2.0	mA
Diode reverse breakdown voltage	V_{BR}	I_R = 1 mA	600	-	-	V
Diode forward voltage drop	V_{FM}	I_C = 35 A, V_{GE} = 0 V	-	1.80	2.33	V
		I_C = 70 A, V_{GE} = 0 V	-	2.13	2.71	
		I_C = 35 A, V_{GE} = 0 V, T_J = 125 °C	-	1.35	1.81	
		I_C = 70 A, V_{GE} = 0 V, T_J = 125 °C	-	1.70	2.32	
Diode reverse leakage current	I_{RM}	V_R = V_R rated	-	0.1	50	µA
		T_J = 125 °C, V_R = V_R rated	-	0.02	3	mA
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 = 50 A, V_{CC} = 400 V, V_{GE} = 15 V		-	320	-	nC
Gate to emitter charge (turn-on)	Q_{ge}			-	42	-	
Gate to collector charge (turn-on)	Q_{gc}			-	110	-	
Turn-on switching loss	E_{on}	I_C = 70 A, V_{CC} = 360 V, V_{GE} = 15 V, R_g = 5 Ω, L = 500 µH, T_J = 25 °C		-	1.15	-	mJ
Turn-off switching loss	E_{off}			-	1.16	-	
Total switching loss	E_{tot}			-	2.31	-	
Turn-on switching loss	E_{on}	I_C = 70 A, V_{CC} = 360 V, V_{GE} = 15 V, R_g = 5 Ω, L = 500 µH, T_J = 125 °C	Energy losses include tail and diode recovery (see fig. 18)	-	1.27	-	
Turn-off switching loss	E_{off}			-	1.28	-	
Total switching loss	E_{tot}			-	2.55	-	
Turn-on delay time	$t_{d(on)}$			-	208	-	ns
Rise time	t_r			-	69	-	
Turn-off delay time	$t_{d(off)}$			-	208	-	
Fall time	t_f			-	100	-	
Reverse bias safe operating area	RBSOA	T_J = 150 °C, I_C = 120 A, R_g = 22 Ω, V_{GE} = 15 V to 0 V, V_{CC} = 400 V, V_P = 600 V		Fullsquare			
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 200 A/µs, V_R = 200 V		-	59	93	ns
Diode peak reverse current	I_{rr}			-	4	6	A
Diode recovery charge	Q_{rr}			-	118	279	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		-	130	159	ns
Diode peak reverse current	I_{rr}			-	11	13	A
Diode recovery charge	Q_{rr}			-	715	995	nC

For technical questions within your region, please contact one of the following:
DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com

Document Number: 93103
Revision: 22-Jul-10

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER		**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Maximum junction and storage temperature range		T_J, T_{Stg}	- 40	-	150	°C
Thermal resistance, junction to case	IGBT	R_{thJC}	-	-	0.28	°C/W
	Diode		-	-	0.53	
Thermal resistance, case to sink per module		R_{thCS}	-	0.05	-	
Mounting torque, 6-32 or M3 screw			-	-	1.3	Nm
Weight			-	30	-	g

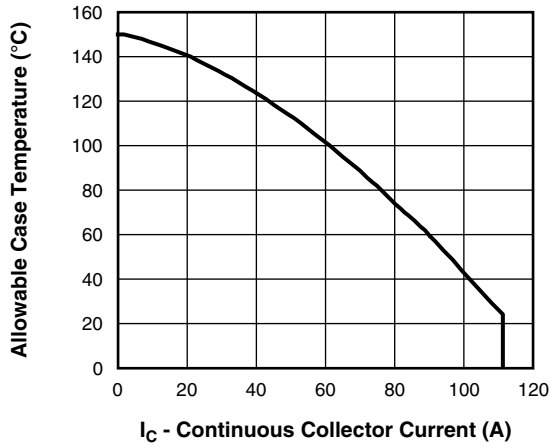


Fig. 1 - Maximum DC IGBT Collector Current vs. Case Temperature

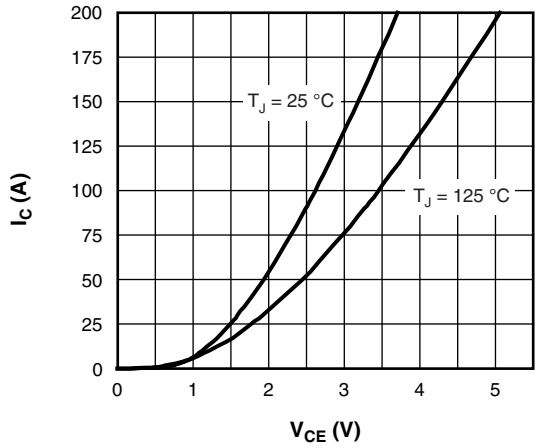


Fig. 3 - Typical IGBT Collector Current Characteristics

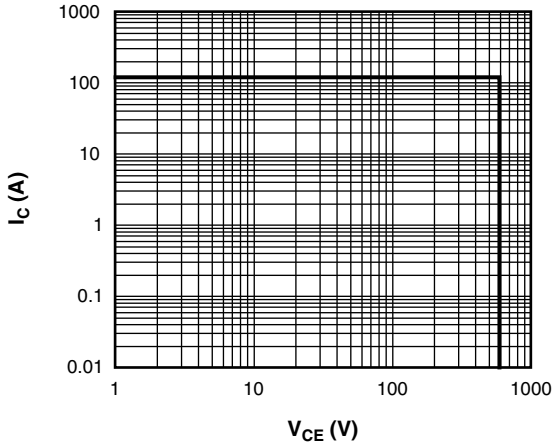


Fig. 2 - IGBT Reverse Bias SOA
T_J = 150 °C, V_{GE} = 15 V

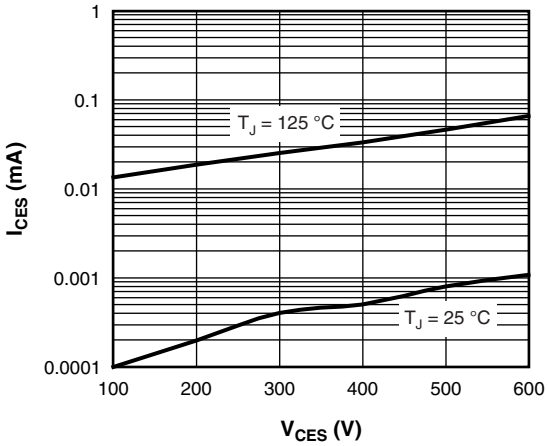


Fig. 4 - Typical IGBT Zero Gate Voltage Collector Current

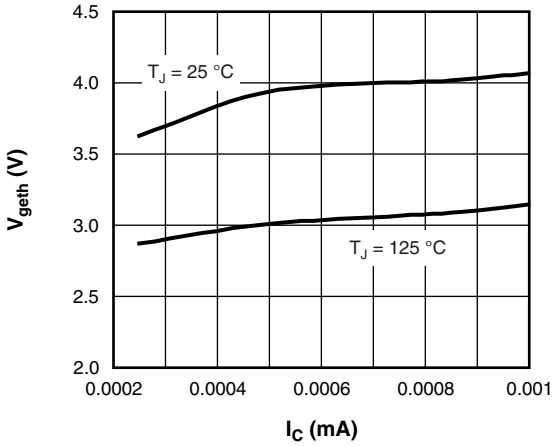


Fig. 5 - Typical IGBT Threshold Voltage

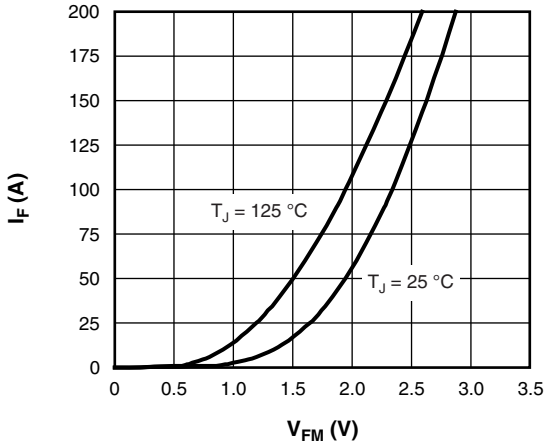


Fig. 8 - Typical Diode Forward Characteristics

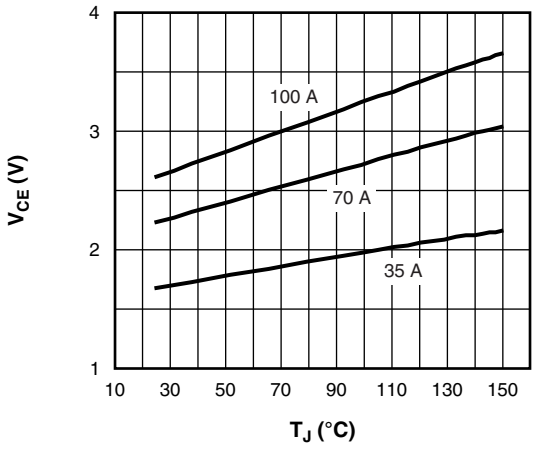


Fig. 6 - Typical IGBT Collector to Emitter Voltage vs. Junction Temperature, V_{GE} = 15 V

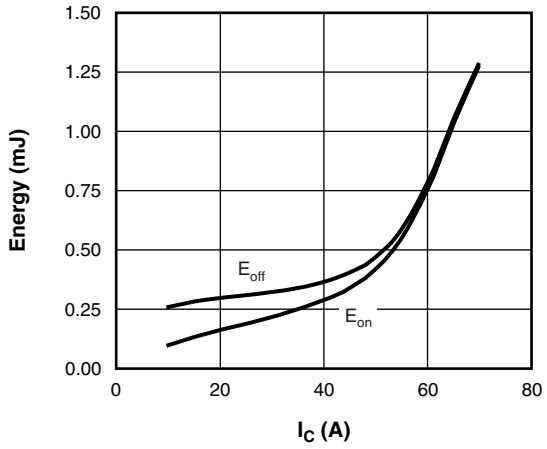


Fig. 9 - Typical IGBT Energy Loss vs. I_C
T_J = 125 °C, L = 500 µH, V_{CC} = 360 V,
R_g = 5 Ω, V_{GE} = 15 V

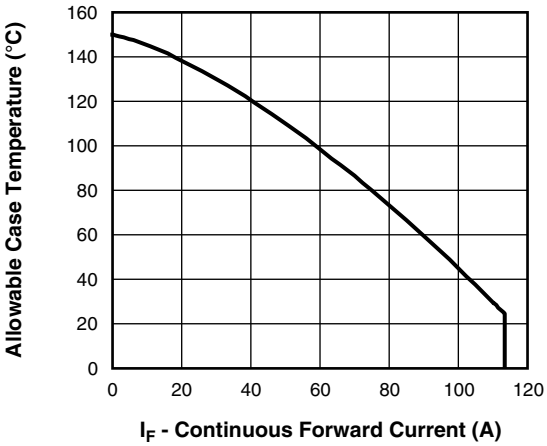


Fig. 7 - Maximum DC Forward Current vs. Case Temperature

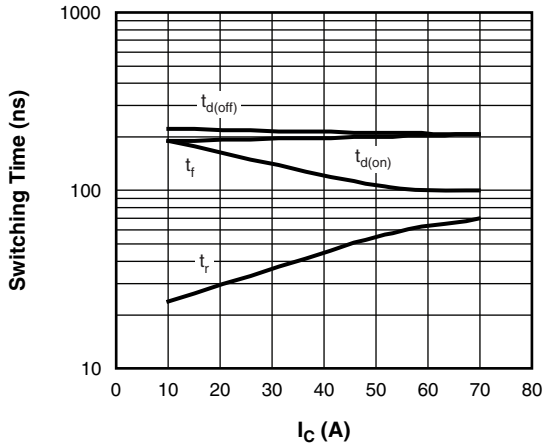


Fig. 10 - Typical IGBT Switching Time vs. I_C
T_J = 125 °C, L = 500 µH, V_{CC} = 360 V,
R_g = 5 Ω, V_{GE} = 15 V

For technical questions within your region, please contact one of the following:
DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com

Document Number: 93103
Revision: 22-Jul-10

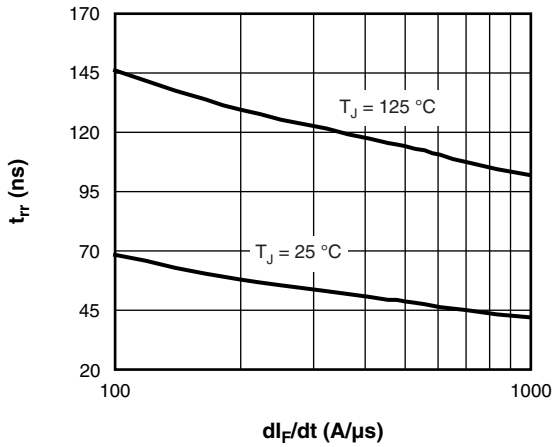


Fig. 11 - Typical t_{rr} Diode vs. dI_F/dt
V_R = 200 V, I_F = 50 A

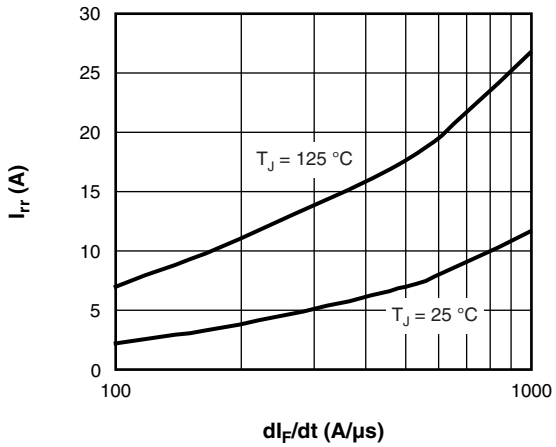


Fig. 12 - Typical I_{rr} Diode vs. dI_F/dt
V_{RR} = 200 V, I_F = 50 A

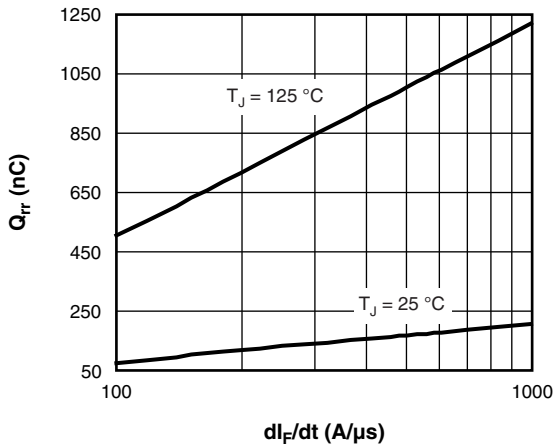


Fig. 13 - Typical Q_{rr} Diode vs. dI_F/dt
V_R = 200 V, I_F = 50 A

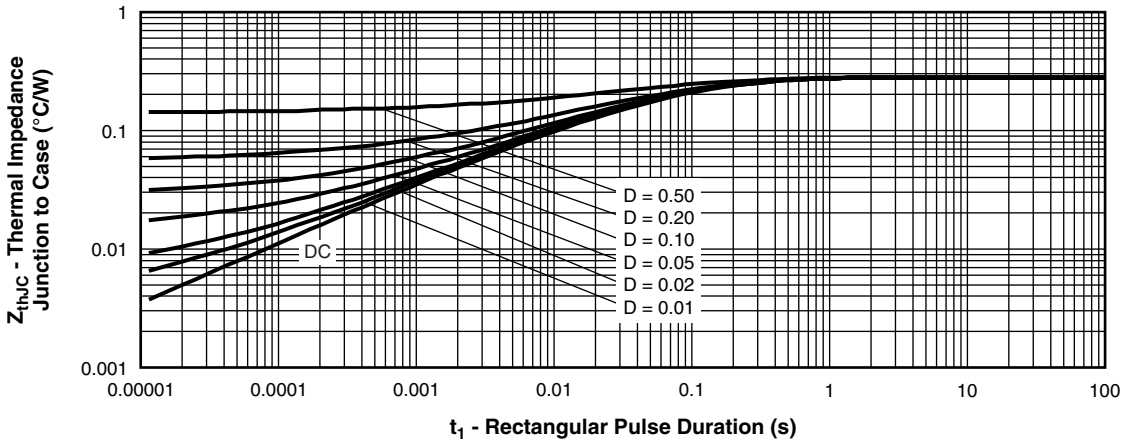


Fig. 14 - Maximum Thermal Impedance Z_{thJC} Characteristics (IGBT)

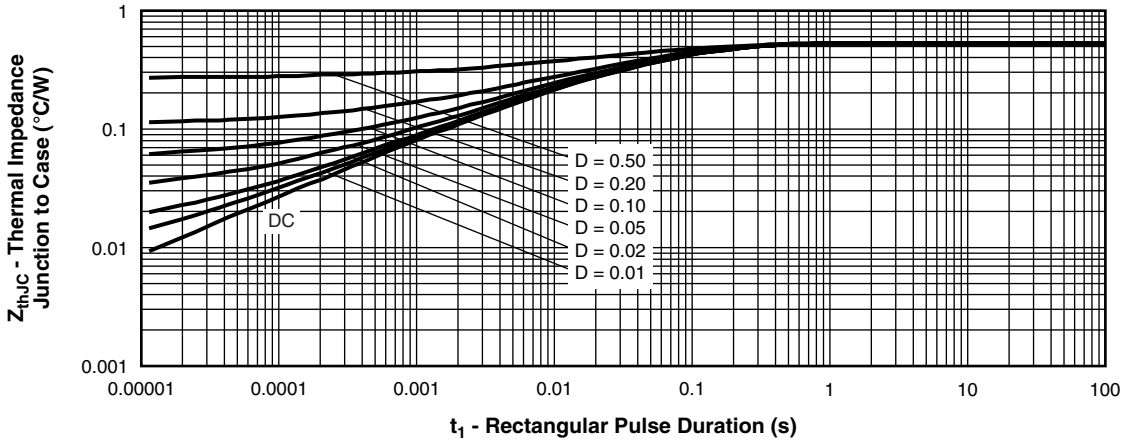


Fig. 15 - Maximum Thermal Impedance Z_{thJC} Characteristics (DIODE)

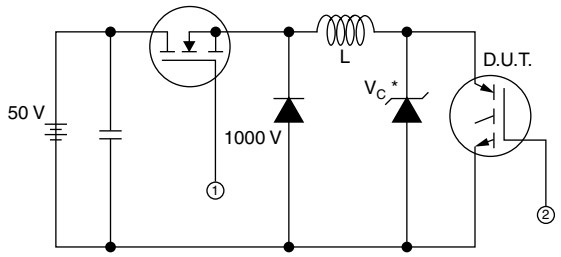


Fig. 16a - Clamped Inductive Load Test Circuit

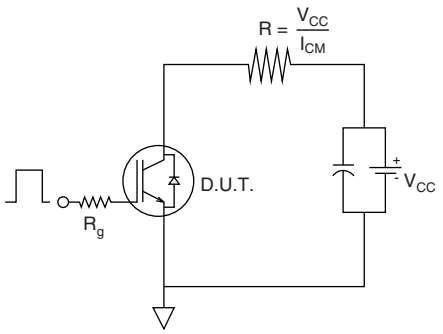


Fig. 16b - Pulsed Collector Current Test Circuit

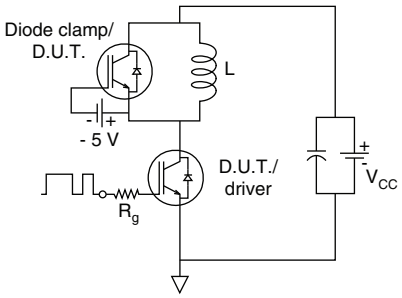


Fig. 17a - Switching Loss Test Circuit

For technical questions within your region, please contact one of the following:
DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com

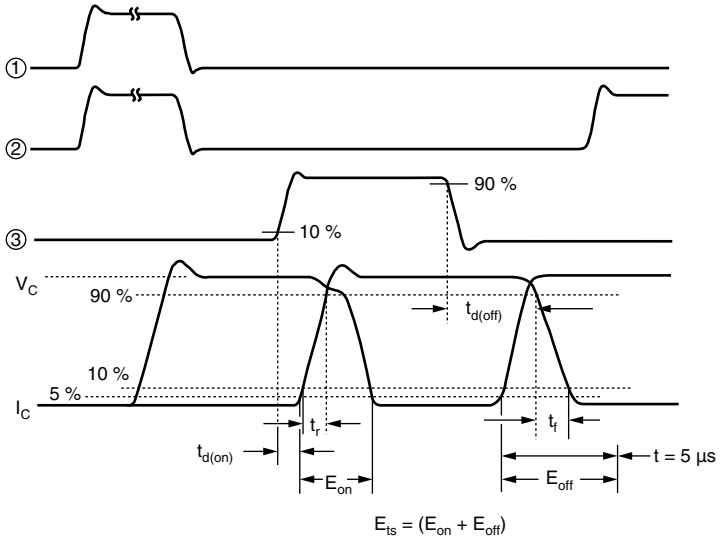


Fig. 17b - Switching Loss Waveforms Test Circuit

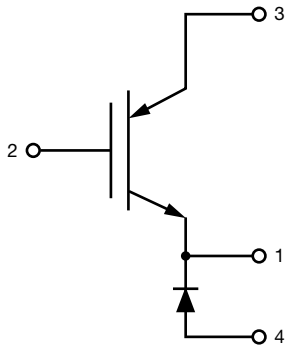
ORDERING INFORMATION TABLE

Device code

G	B	70	N	A	60	U	F
1	2	3	4	5	6	7	8

1	-	Insulated Gate Bipolar Transistor (IGBT)
2	-	B = IGBT Generation 5
3	-	Current rating (70 = 70 A)
4	-	Circuit configuration (N = High Side Chopper)
5	-	Package indicator (A = SOT-227)
6	-	Voltage rating (60 = 600 V)
7	-	Speed/type (U = Ultrafast IGBT)
8	-	F = F/W FRED Pt® diode

CIRCUIT CONFIGURATION



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

Disclaimer

All product specifications and data are subject to change without notice.

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 herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

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.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.