


Insulated Gate Bipolar Transistor (Ultrafast IGBT), 75 A


SOT-227
FEATURES

- NPT Generation V IGBT technology
- Square RBSOA
- HEXFRED® low Q_{rr} , low switching energy
- Positive $V_{CE(on)}$ temperature coefficient
- Fully isolated package
- Speed 8 kHz to 60 kHz
- Very low internal inductance (≤ 5 nH typical)
- Industry standard outline
- UL approved file E78996 
- Compliant to RoHS directive 2002/95/EC


**RoHS
COMPLIANT**
PRODUCT SUMMARY

V_{CES}	1200 V
I_C DC	75 A at 95 °C
$V_{CE(on)}$ typical at 75 A, 25 °C	3.3 V

BENEFITS

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

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	V_{CES}		1200	V
Continuous collector current	I_C	$T_C = 25\text{ °C}$	131	A
		$T_C = 80\text{ °C}$	89	
Pulsed collector current	I_{CM}		200	
Clamped inductive load current	I_{LM}		200	
Diode continuous forward current	I_F	$T_C = 25\text{ °C}$	59	
		$T_C = 80\text{ °C}$	39	
Gate to emitter voltage	V_{GE}		± 20	V
Power dissipation, IGBT	P_D	$T_C = 25\text{ °C}$	658	W
		$T_C = 80\text{ °C}$	369	
Power dissipation, diode	P_D	$T_C = 25\text{ °C}$	240	
		$T_C = 80\text{ °C}$	135	
Isolation voltage	V_{ISOL}	Any terminal to case, $t = 1$ min	2500	V

ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	$V_{BR(CES)}$	$V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$	1200	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	$V_{GE} = 15\text{ V}, I_C = 75\text{ A}$	-	3.3	3.8	
		$V_{GE} = 15\text{ V}, I_C = 75\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	3.6	3.9	
Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250\text{ }\mu\text{A}$	4	5	6	
Temperature coefficient of threshold voltage	$V_{GE(th)}/\Delta T_J$	$V_{CE} = V_{GE}, I_C = 1\text{ mA}$ (25 °C to 125 °C)	-	- 12	-	mV/°C
Collector to emitter leakage current	I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}$	-	3	250	μA
		$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	4	20	mA
Forward voltage drop	V_{FM}	$I_C = 75\text{ A}, V_{GE} = 0\text{ V}$	-	3.4	5.0	V
		$I_C = 75\text{ A}, V_{GE} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	3.3	5.2	
Gate to emitter leakage current	I_{GES}	$V_{GE} = \pm 20\text{ V}$	-	-	± 200	nA

SWITCHING CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Total gate charge (turn-on)	Q_g	$I_C = 50\text{ A}, V_{CC} = 600\text{ V}, V_{GE} = 15\text{ V}$	-	690	-	nC
Gate to emitter charge (turn-on)	Q_{ge}		-	65	-	
Gate to collector charge (turn-on)	Q_{gc}		-	250	-	
Turn-on switching loss	E_{on}	$I_C = 75\text{ A}, V_{CC} = 600\text{ V}, V_{GE} = 15\text{ V}, R_g = 5\text{ }\Omega, L = 500\text{ }\mu\text{H}, T_J = 25\text{ }^\circ\text{C}$	-	1.53	-	mJ
Turn-off switching loss	E_{off}		-	1.76	-	
Total switching loss	E_{tot}		-	3.29	-	
Turn-on switching loss	E_{on}	$I_C = 75\text{ A}, V_{CC} = 600\text{ V}, V_{GE} = 15\text{ V}, R_g = 5\text{ }\Omega, L = 500\text{ }\mu\text{H}, T_J = 125\text{ }^\circ\text{C}$	-	2.49	-	
Turn-off switching loss	E_{off}		-	3.45	-	
Total switching loss	E_{tot}		-	5.94	-	
Turn-on delay time	$t_{d(on)}$		-	281	-	ns
Rise time	t_r	-	45	-		
Turn-off delay time	$t_{d(off)}$	-	300	-		
Fall time	t_f	-	126	-		
Reverse bias safe operating area	RBSOA	$T_J = 150\text{ }^\circ\text{C}, I_C = 200\text{ A}, R_g = 22\text{ }\Omega, V_{GE} = 15\text{ V to } 0\text{ V}, V_{CC} = 900\text{ V}, V_P = 1200\text{ V}, L = 500\text{ }\mu\text{H}$	Fullsquare			
Diode reverse recovery time	t_{rr}	$I_F = 50\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}, V_R = 200\text{ V}$	-	142	210	ns
Diode peak reverse current	I_{rr}		-	13	16	A
Diode recovery charge	Q_{rr}		-	923	1680	nC
Diode reverse recovery time	t_{rr}	$I_F = 50\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}, V_R = 200\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	202	260	ns
Diode peak reverse current	I_{rr}		-	18	22	A
Diode recovery charge	Q_{rr}		-	1818	2860	nC



THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T_J, T_{Stg}	- 40	-	150	°C
Junction to case	IGBT	-	-	0.19	°C/W
	Diode	-	-	0.52	
Case to sink per module	R_{thCS}	-	0.05	-	
Mounting torque, 6-32 or M3 screw		-	-	1.3	Nm
Weight		-	30	-	g

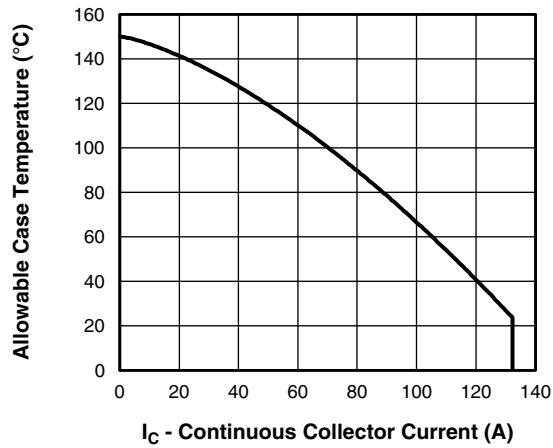


Fig. 1 - Maximum DC IGBT Collector Current vs. Case Temperature

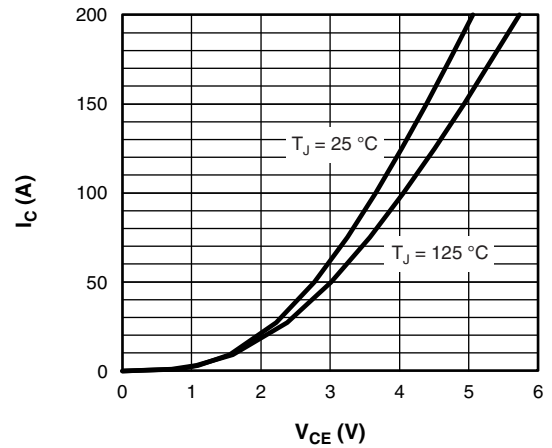


Fig. 3 - Typical IGBT Collector Current Characteristics

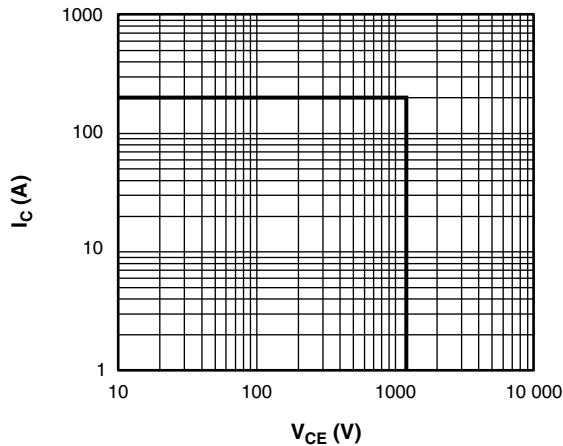


Fig. 2 - IGBT Reverse Bias SOA
 $T_J = 150\text{ °C}, V_{GE} = 15\text{ V}$

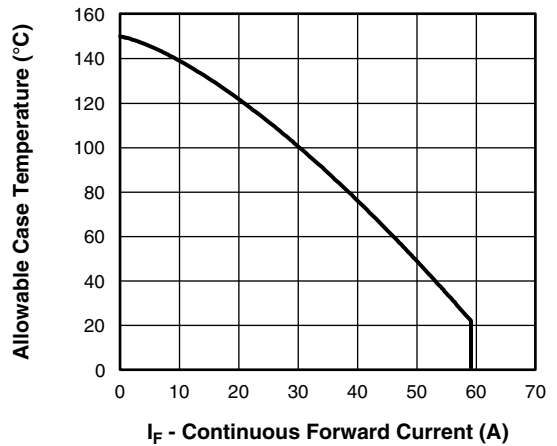


Fig. 4 - Maximum DC Forward Current vs. Case Temperature

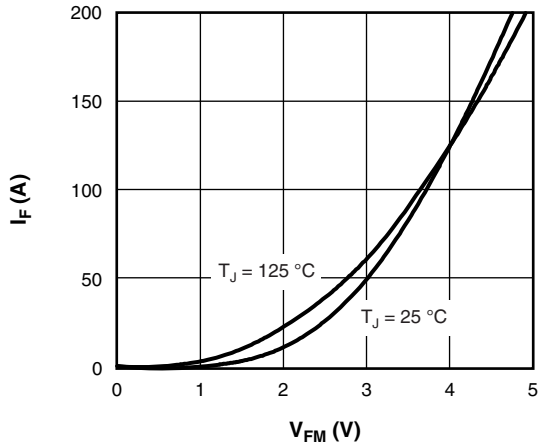


Fig. 5 - Typical Diode Forward Characteristics

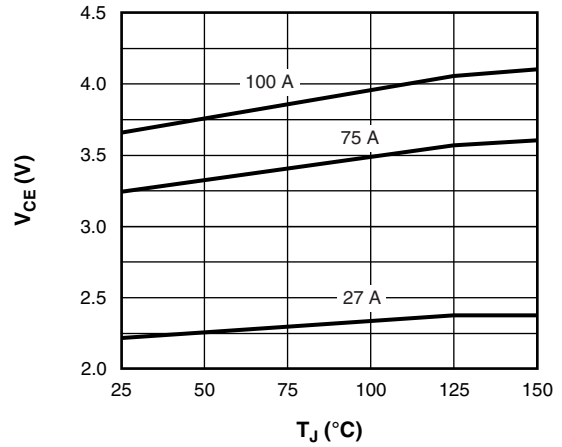


Fig. 8 - Typical IGBT Collector to Emitter Voltage vs. Junction Temperature, $V_{GE} = 15\text{ V}$

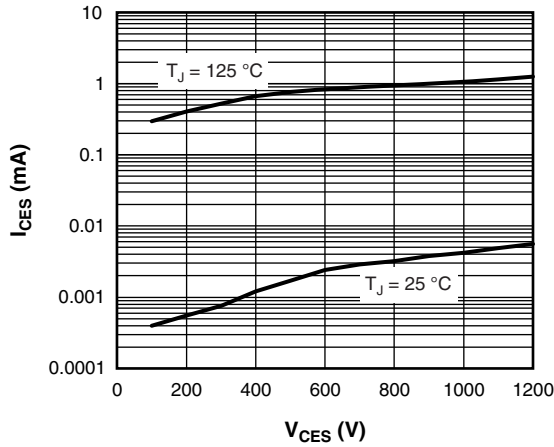


Fig. 6 - Typical IGBT Zero Gate Voltage Collector Current

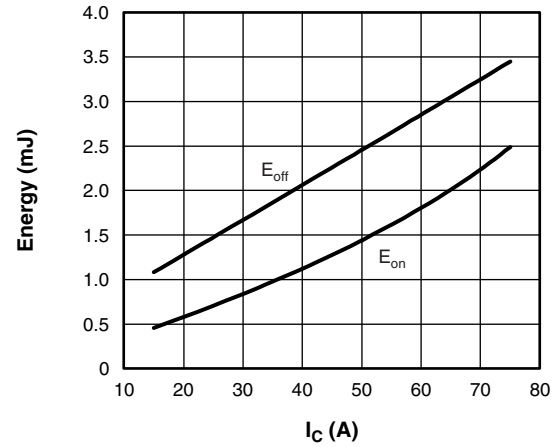


Fig. 9 - Typical IGBT Energy Loss vs. I_C
 $T_J = 125\text{ °C}$, $L = 500\text{ }\mu\text{H}$, $V_{CC} = 600\text{ V}$,
 $R_g = 5\text{ }\Omega$, $V_{GE} = 15\text{ V}$

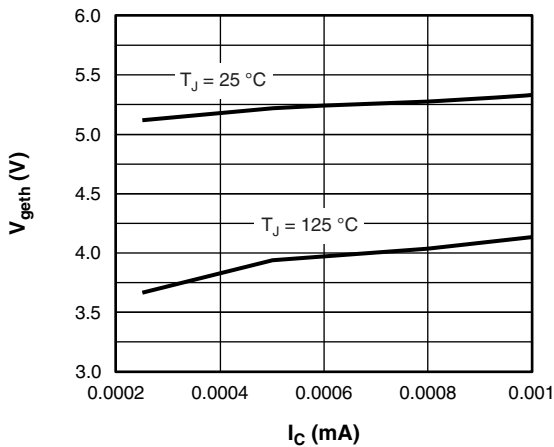


Fig. 7 - Typical IGBT Threshold Voltage

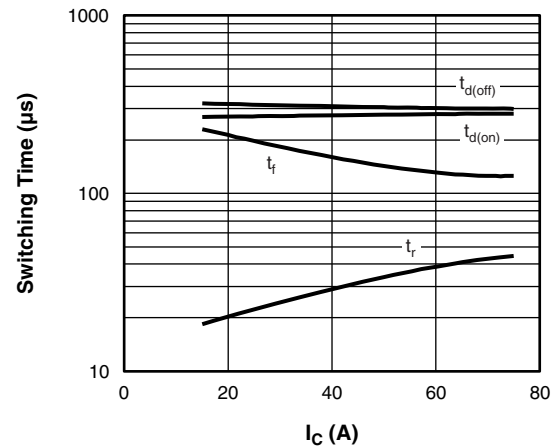


Fig. 10 - Typical IGBT Switching Time vs. I_C
 $T_J = 125\text{ °C}$, $L = 500\text{ }\mu\text{H}$, $V_{CC} = 600\text{ V}$,
 $R_g = 5\text{ }\Omega$, $V_{GE} = 15\text{ V}$

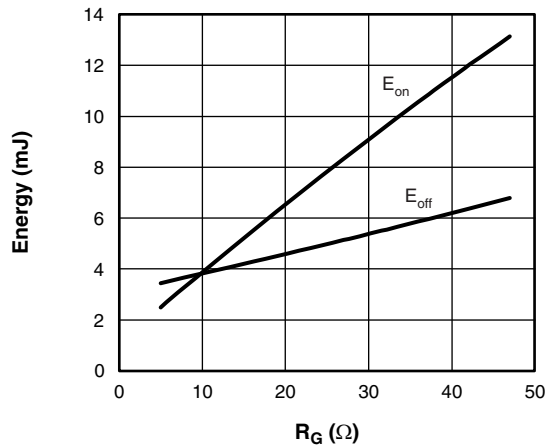


Fig. 11 - Typical IGBT Energy Loss vs. R_g
 $T_J = 125\text{ }^\circ\text{C}$, $I_C = 75\text{ A}$, $L = 500\text{ }\mu\text{H}$,
 $V_{CC} = 600\text{ V}$, $V_{GE} = 15\text{ V}$

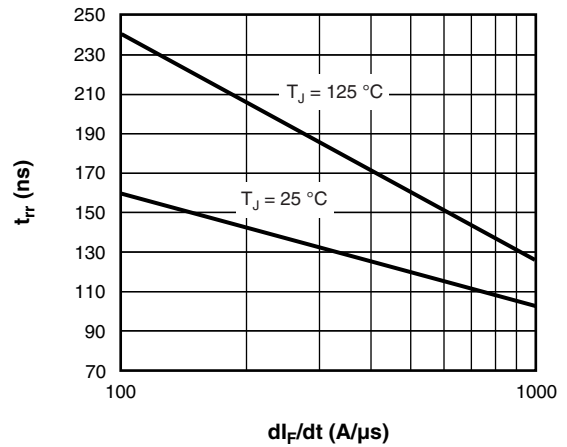


Fig. 13 - Typical t_{rr} diode vs. dI_F/dt
 $V_{RR} = 200\text{ V}$, $I_F = 50\text{ A}$

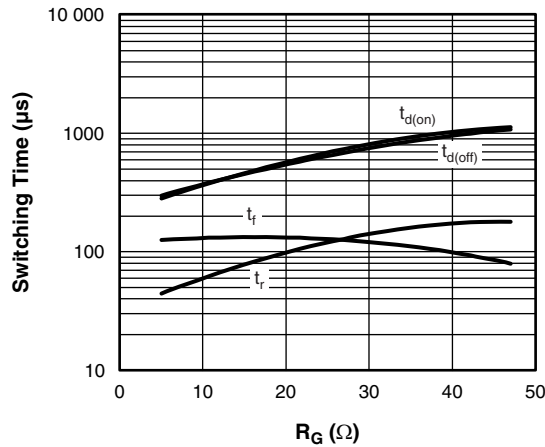


Fig. 12 - Typical IGBT Switching Time vs. R_g
 $T_J = 125\text{ }^\circ\text{C}$, $L = 500\text{ }\mu\text{H}$, $V_{CC} = 600\text{ V}$,
 $R_g = 5\text{ }\Omega$, $V_{GE} = 15\text{ V}$

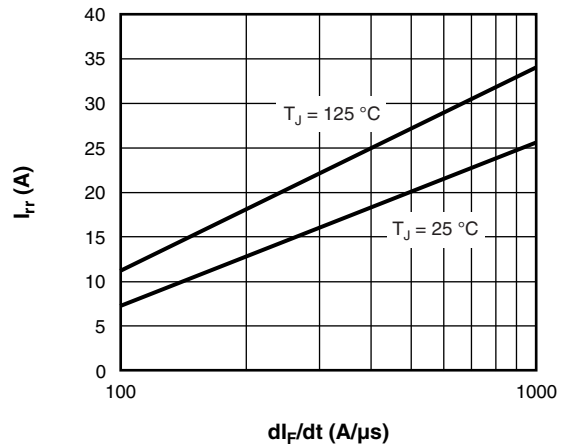


Fig. 14 - Typical I_{rr} diode vs. dI_F/dt
 $V_{RR} = 200\text{ V}$, $I_F = 50\text{ A}$

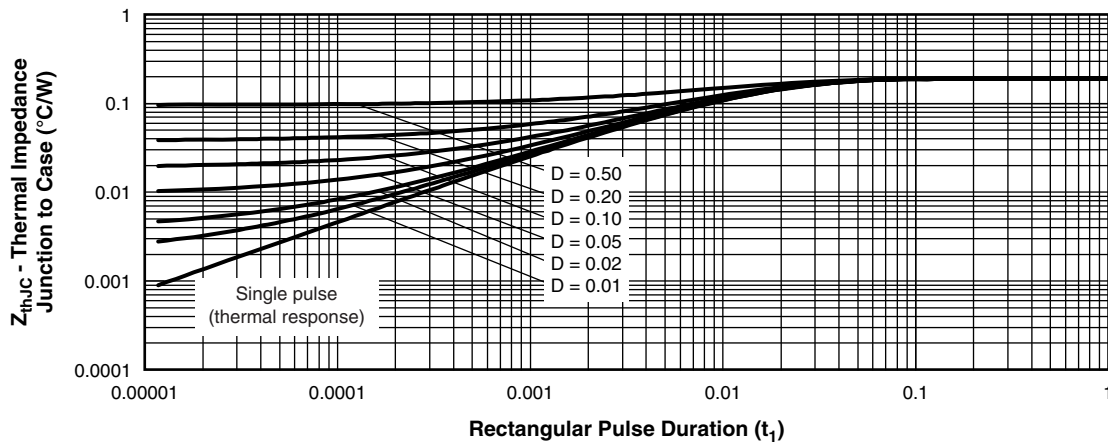


Fig. 15 - Maximum Thermal Impedance Z_{thJC} Characteristics (IGBT)

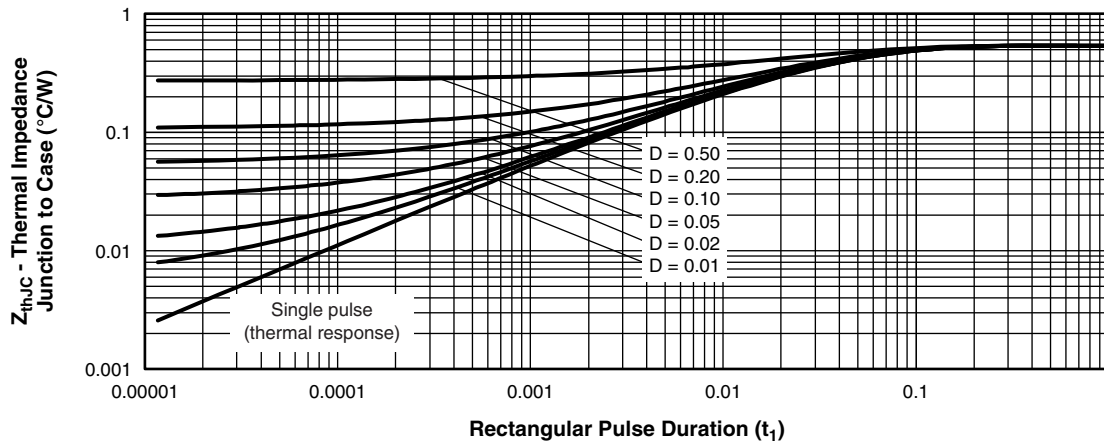


Fig. 16 - Maximum Thermal Impedance Z_{thJC} Characteristics (diode)

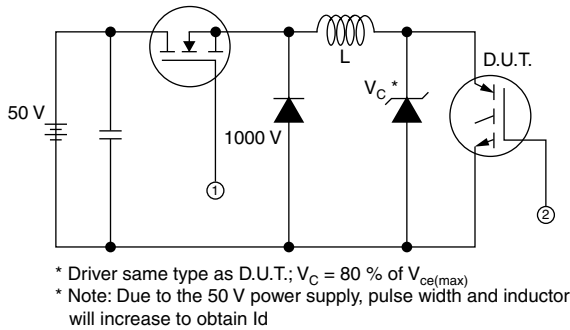


Fig. 17a - Clamped Inductive Load Test Circuit

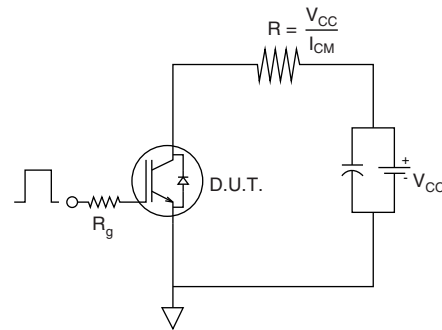


Fig. 17b - Pulsed Collector Current Test Circuit

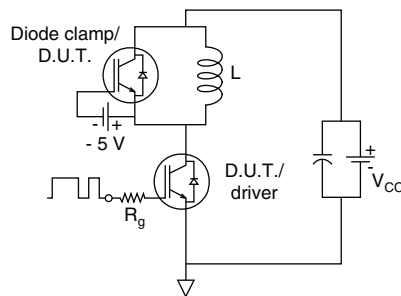


Fig. 18a - Switching Loss Test Circuit

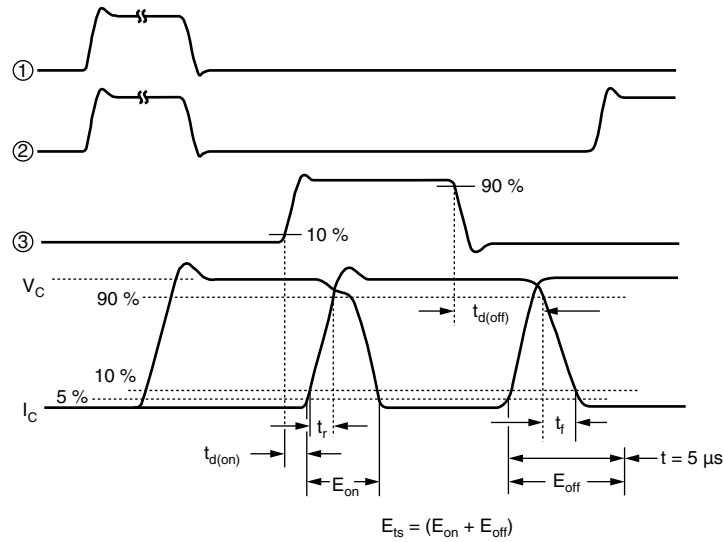


Fig. 18b - Switching Loss Waveforms Test Circuit

ORDERING INFORMATION TABLE

Device code	G	B	75	D	A	120	U	P
	①	②	③	④	⑤	⑥	⑦	⑧

- 1** - Insulated Gate Bipolar Transistor (IGBT)
- 2** - B = IGBT Generation 5
- 3** - Current rating (75 = 75 A)
- 4** - Circuit configuration (D = Single switch with antiparallel diode)
- 5** - Package indicator (A = SOT-227)
- 6** - Voltage rating (120 = 1200 V)
- 7** - Speed/type (U = Ultrafast IGBT)
- 8** - Totally lead (Pb)-free

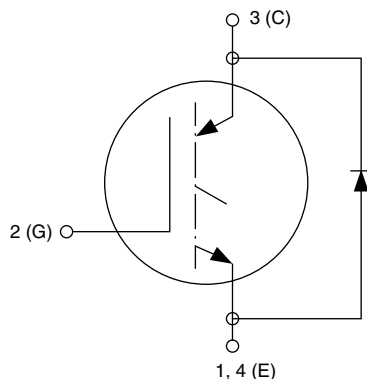
GB75DA120UP

Vishay Semiconductors

Insulated Gate Bipolar Transistor
(Ultrafast IGBT), 75 A



CIRCUIT CONFIGURATION

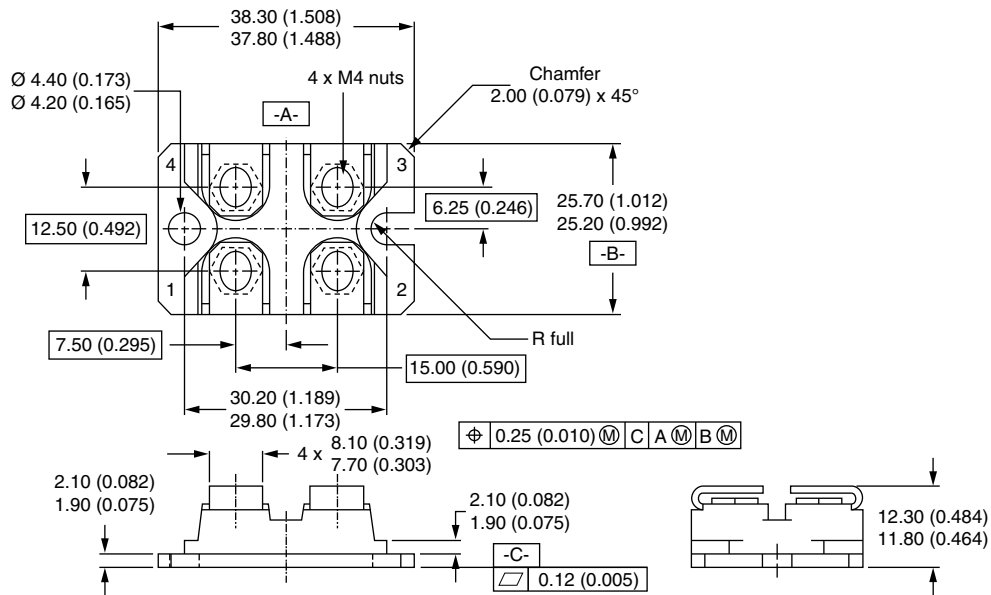


LINKS TO RELATED DOCUMENTS

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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