Insulated Gate Bipolar Transistor (Ultrafast IGBT), 75 A

SOT-227

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
Package	SOT-227

FEATURES

- NPT Generation V IGBT technology
- Square RBSOA
- 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
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

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 °C	131	A
		T_C = 80 °C	89	
Pulsed collector current	I_{CM}		200	
Clamped inductive load current	I_{LM}		200	
Gate to emitter voltage	V_{GE}		± 20	V
Power dissipation	P_D	T_C = 25 °C	658	W
		T_C = 80 °C	369	
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 = 250 μA	1200	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	V_{GE} = 15 V, I_C = 75 A	-	3.3	3.8	
		V_{GE} = 15 V, I_C = 75 A, T_J = 125 °C	-	3.6	3.9	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 250 μA	4	5	6	
Temperature coefficient of threshold voltage	$V_{GE(th)}/\Delta T_J$	V_{CE} = V_{GE}, I_C = 1 mA (25 °C to 125 °C)	-	- 12	-	mV/°C
Collector to emitter leakage current	I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V	-	3	250	μA
		V_{GE} = 0 V, V_{CE} = 1200 V, T_J = 150 °C	-	4	20	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} = 600 V, V_{GE} = 15 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 A, V_{CC} = 600 V, V_{GE} = 15 V, R_g = 5 Ω, L = 500 µH	Energy losses include tail and diode recovery (see fig. 18)	-	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 A, V_{CC} = 600 V, V_{GE} = 15 V, R_g = 5 Ω, L = 500 µH, T_J = 125 °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 °C, I_C = 200 A, R_g = 22 Ω, V_{GE} = 15 V to 0 V, V_{CC} = 900 V, V_P = 1200 V, L = 500 µH		Fullsquare			

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Junction and storage temperaure range	T_J, T_{STG}		- 40	-	150	°C/W
Thermal resistance, junction to case	R_{thJC}		-	-	0.19	
Thermal resistance case to heatsink	R_{thCS}	Flat, greased surface	-	0.05	-	
Weight			-	30	-	g
Mounting torque			-	-	1.3	Nm
Case style			SOT-227			

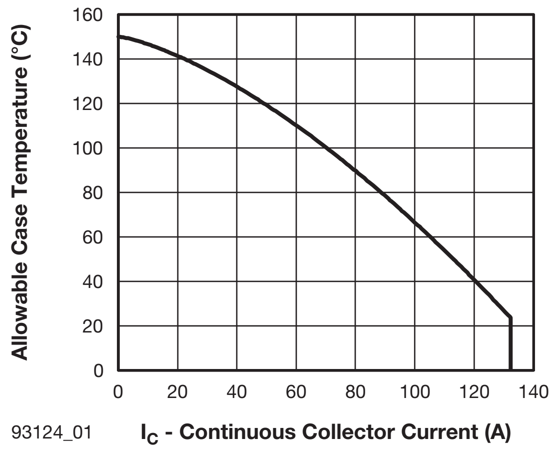


Fig. 1 - Maximum DC IGBT Collector Current vs. Case Temperature

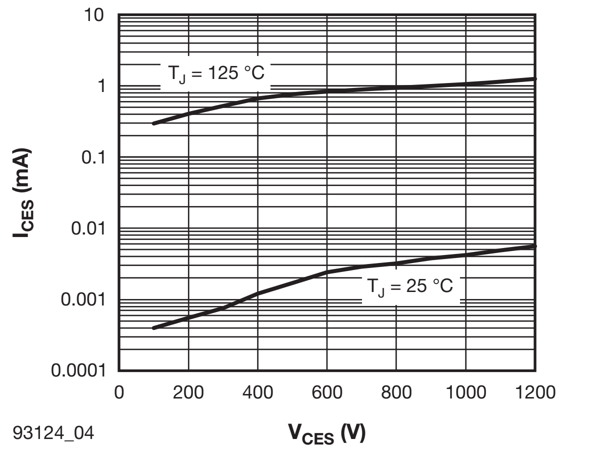


Fig. 4 - Typical IGBT Zero Gate Voltage Collector Current

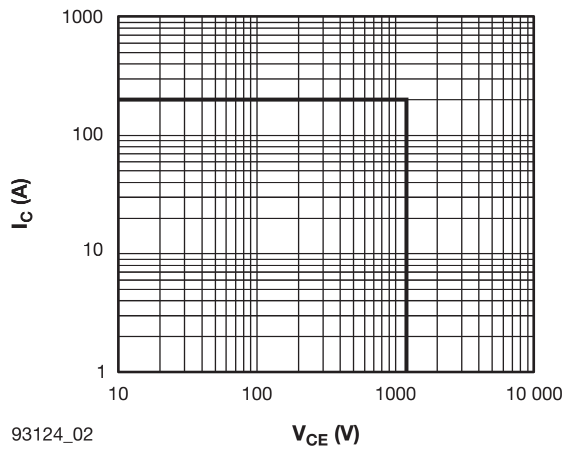


Fig. 2 - IGBT Reverse Bias SOA
T_J = 150 °C, V_{GE} = 15 V

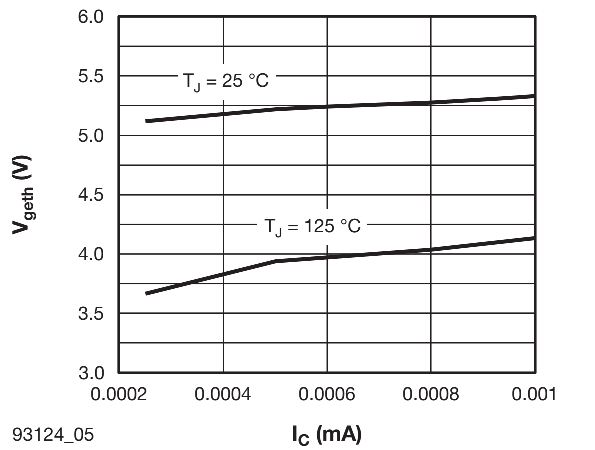


Fig. 5 - Typical IGBT Threshold Voltage

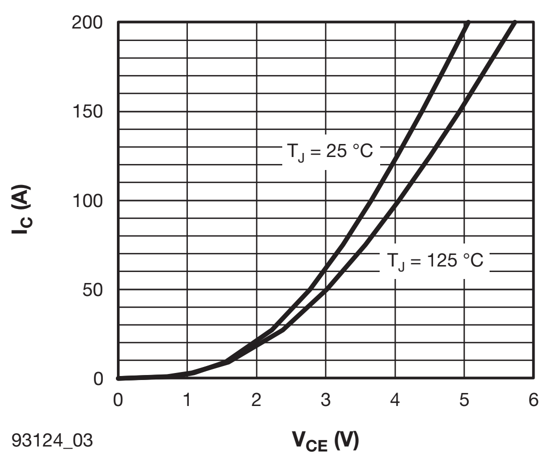


Fig. 3 - Typical IGBT Collector Current Characteristics

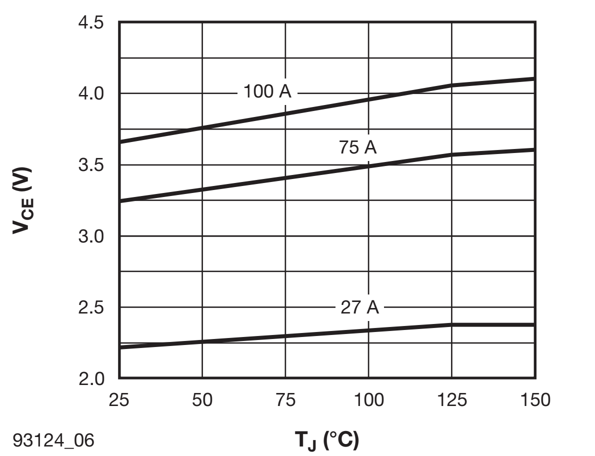


Fig. 6 - Typical IGBT Collector to Emitter Voltage vs. Junction Temperature, V_{GE} = 15 V

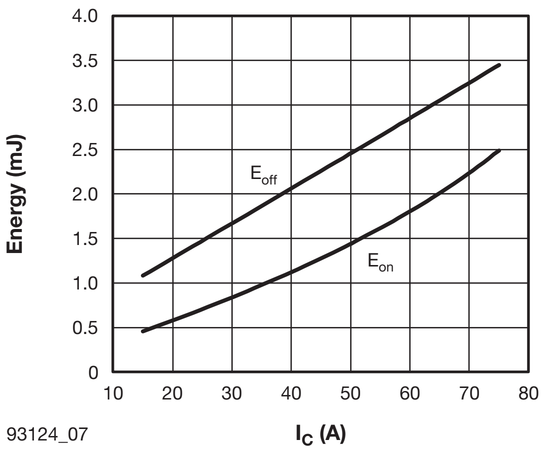


Fig. 7 - Typical IGBT Energy Loss vs. I_C
T_J = 125 °C, L = 500 µH, V_{CC} = 600 V,
R_g = 5 Ω, V_{GE} = 15 V

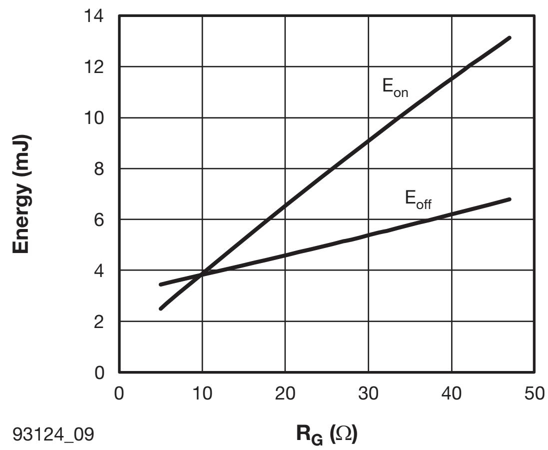


Fig. 9 - Typical IGBT Energy Loss vs. R_g
T_J = 125 °C, I_C = 75 A, L = 500 µH,
V_{CC} = 600 V, V_{GE} = 15 V

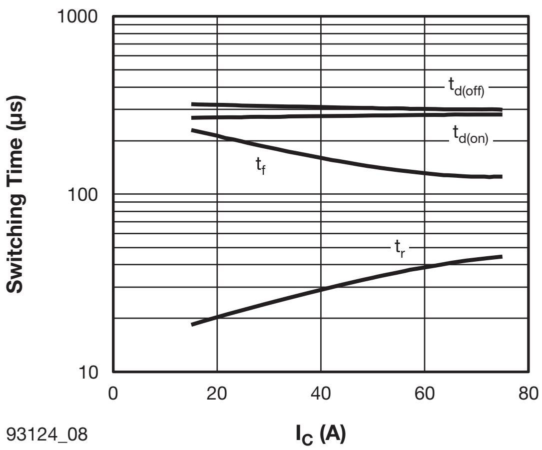


Fig. 8 - Typical IGBT Switching Time vs. I_C
T_J = 125 °C, L = 500 µH, V_{CC} = 600 V,
R_g = 5 Ω, V_{GE} = 15 V

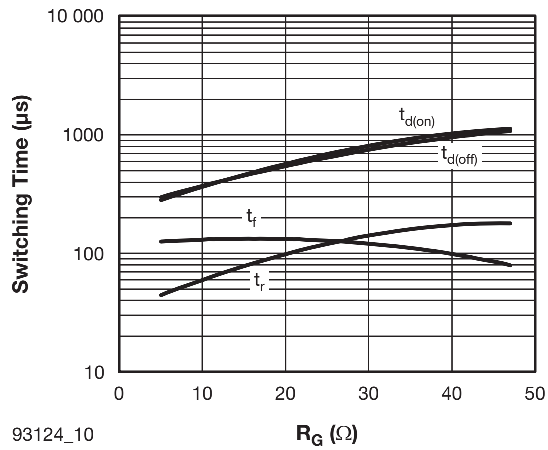


Fig. 10 - Typical IGBT Switching Time vs. R_g
T_J = 125 °C, L = 500 µH, V_{CC} = 600 V,
R_g = 5 Ω, V_{GE} = 15 V

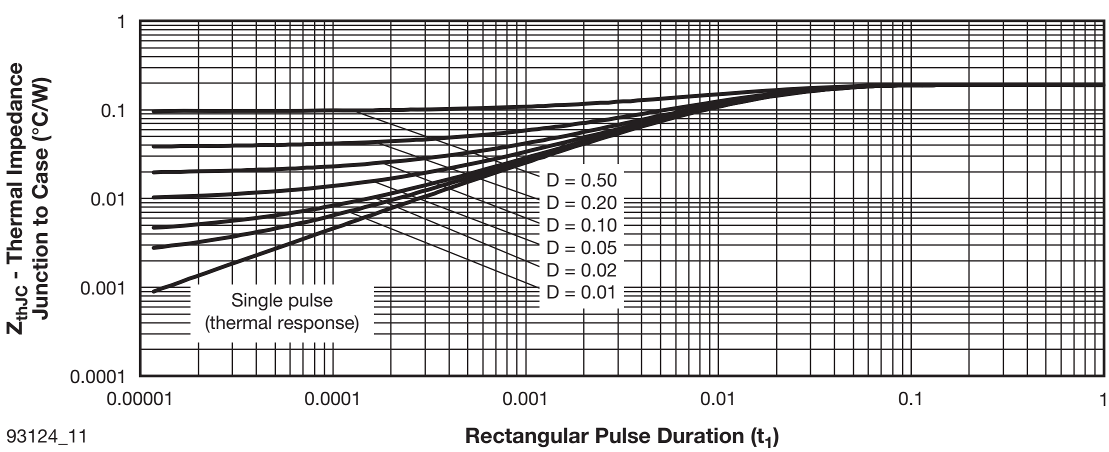
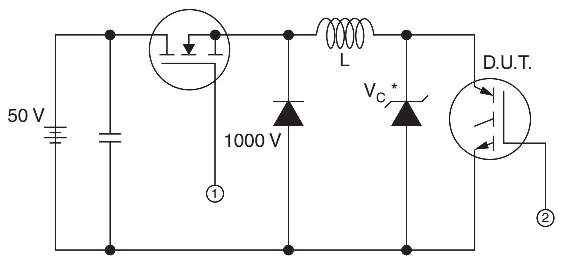


Fig. 11 - Maximum Thermal Impedance Z_{thJC} Characteristics



* 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. 12 - Clamped Inductive Load Test Circuit

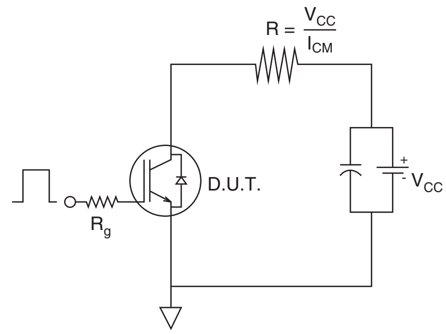


Fig. 13 - Pulsed Collector Current Test Circuit

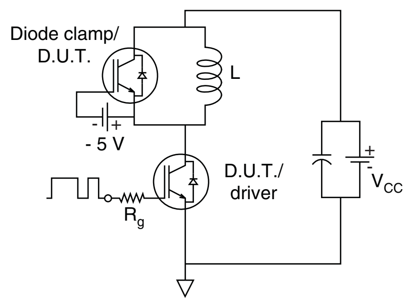


Fig. 14 - Switching Loss Test Circuit

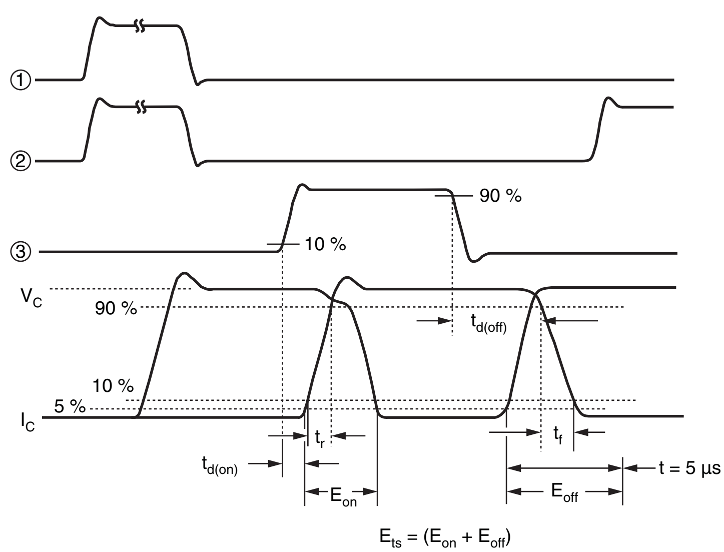


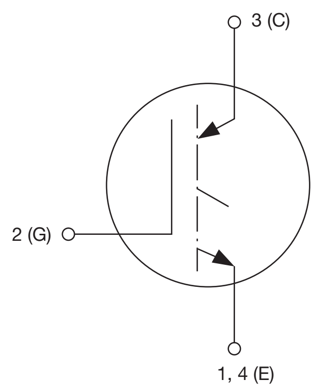
Fig. 15 - Switching Loss Waveforms Test Circuit

ORDERING INFORMATION TABLE

Device code	VS-	G	B	75	S	A	120	U	P
	1	2	3	4	5	6	7	8	9

1 - Vishay Semiconductors product
2 - Insulated Gate Bipolar Transistor (IGBT)
3 - B = IGBT Generation 5
4 - Current rating (75 = 75 A)
5 - Circuit configuration (S = Single switch without antiparallel diode)
6 - Package indicator (A = SOT-227)
7 - Voltage rating (120 = 1200 V)
8 - Speed/type (U = Ultrafast IGBT)
9 - Totally lead (Pb)-free

CIRCUIT CONFIGURATION



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

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