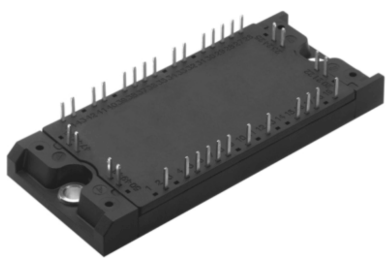
IGBT Fourpack Module, 75 A



ECONO2 4PACK

FEATURES

- Square RBSOA
- HEXFRED® low Q_{rr}, low switching energy
- Positive $V_{CE(on)}$ temperature coefficient
- Copper baseplate
- Low stray inductance design
- Speed 8 kHz to 60 kHz
- Compliant to RoHS directive 2002/95/EC

RoHS COMPLIANT

BENEFITS

- Benchmark efficiency for SMPS appreciation in particular HF welding
- Rugged transient performance
- Low EMI, requires less snubbing
- Direct mounting to heatsink space saving
- PCB solderable terminals
- Low junction to case thermal resistance

PRODUCT SUMMARY	
V_{CES}	1200 V
I_C at T_C = 67 °C	75 A
$V_{CE(on)}$ (typical)	3.4 V

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	100	A
		T_C = 80 °C	67	
Pulsed collector current See fig. C.T.5	I_{CM}		200	
Clamped inductive load current	I_{LM}		200	
Diode continuous forward current	I_F	T_C = 25 °C	60	
		T_C = 80 °C	40	
Diode maximum forward current	I_{FM}		150	
Gate to emitter voltage	V_{GE}		± 20	V
Maximum power dissipation (IGBT)	P_D	T_C = 25 °C	480	W
		T_C = 80 °C	270	
Maximum operating junction temperature	T_J		150	°C
Storage temperature range	T_{Stg}		- 40 to + 125	
Isolation voltage	V_{ISOL}		AC 2500 (MIN)	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 = 500 μA	1200	-	-	V
Collector to emitter voltage	$V_{CE(ON)}$	I_C = 75 A, V_{GE} = 15 V	-	3.4	4.0	
		I_C = 100 A, V_{GE} = 15 V	-	3.8	4.5	
		I_C = 75 A, V_{GE} = 15 V, T_J = 125 °C	-	4.0	4.5	
		I_C = 100 A, V_{GE} = 15 V, T_J = 125 °C	-	4.53	5.1	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 250 μA	4.0	5.0	6.0	
Threshold voltage temperature coefficient	$\Delta V_{GE(th)}/\Delta T_J$	V_{CE} = V_{GE}, I_C = 1 mA (25 °C to 125 °C)	-	- 11	-	mV/°C
Zero gate voltage collector current	I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V	-	7	250	μA
		V_{GE} = 0 V, V_{CE} = 1200 V, T_J = 125 °C	-	580	2000	
Diode forward voltage drop	V_{FM}	I_F = 75 A	-	3.7	4.9	V
		I_F = 100 A	-	4.1	5.5	
		I_F = 75 A, T_J = 125 °C	-	3.7	5.1	
		I_F = 100 A, T_J = 125 °C	-	4.2	5.7	
Gate to emitter leakage current	I_{GES}	V_{GE} = ± 20 V	-	-	± 200	nA

SWITCHING CHARACTERISTICS (T = 25 °C unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Total gate charge (turn-on)	Q_G	I_C = 75 A V_{CC} = 600 V V_{GE} = 15 V		-	630	-	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 T_J = 25 °C (1)		-	1.74	-	mJ
Turn-off switching loss	E_{off}			-	1.46	-	
Total switching loss	E_{tot}			-	3.20	-	
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 (1)		-	2.44	-	
Turn-off switching loss	E_{off}			-	2.35	-	
Total switching loss	E_{tot}			-	4.79	-	
Turn-on delay time	$t_{d(on)}$	I_C = 75 A, V_{CC} = 600 V V_{GE} = 15 V, R_g = 5 Ω, L = 500 μH T_J = 125 °C		-	268	-	ns
Rise time	t_r			-	43	-	
Turn-off delay time	$t_{d(off)}$			-	308	-	
Fall time	t_f			-	127	-	
Reverse bias safe operating area	RBSOA	T_J = 150 °C, I_C = 200 A R_g = 10 Ω, V_{GE} = 15 V to 0 V		Fullsquare			
Short circuit safe operating area	SCSOA	T_J = 150 °C V_{CC} = 900 V, V_P = 1200 V R_g = 10 Ω, V_{GE} = 15 V to 0 V		10	-	-	μs
Diode peak reverse recovery current	I_{rr}	T_J = 25 °C	V_{CC} = 200 V I_F = 50 A dI/dt = 10 A/μs	-	13	18	A
		T_J = 125 °C		-	19	23	
Diode reverse recovery time	t_{rr}	T_J = 25 °C		-	132	189	ns
		T_J = 125 °C		-	200	270	
Total reverse recovery charge	Q_{rr}	T_J = 25 °C		-	858	1700	nC
		T_J = 125 °C		-	1900	3105	

Note

(1) Energy losses include "tail" and diode reverse recovery

THERMISTOR ELECTRICAL SPECIFICATIONS (T = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Resistance	R_{25}		4538	5000	5495	Ω
		T_J = 100 °C	468.6	493.3	518	
B value	B	T_J = 25 °C/50 °C	3307	3375	3443	°K

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Junction to case IGBT	R_{thJC} (IGBT)	-	-	0.26	°C/W
Junction to case DIODE	R_{thJC} (DIODE)	-	-	0.56	
Case to sink, flat, greased surface	R_{thCS} (MODULE)	-	0.02	-	
Mounting torque (M5)		2.7	-	3.3	Nm
Weight		-	170	-	g

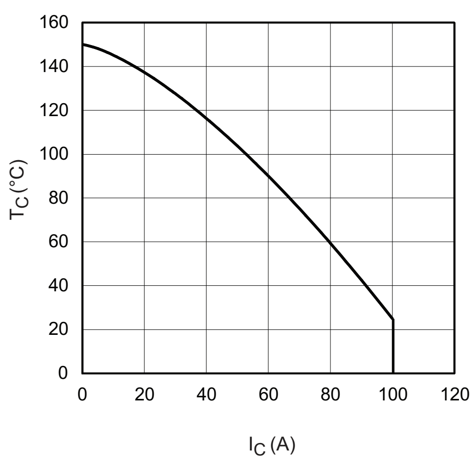


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

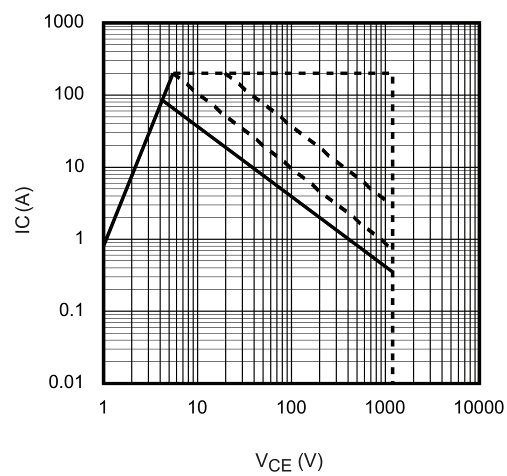


Fig. 3 - Forward SOA
T_C = 25 °C; T_J ≤ 150 °C

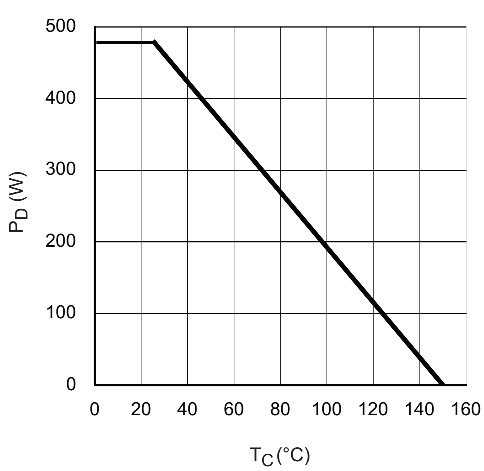


Fig. 2 - Power Dissipation vs. Case Temperature

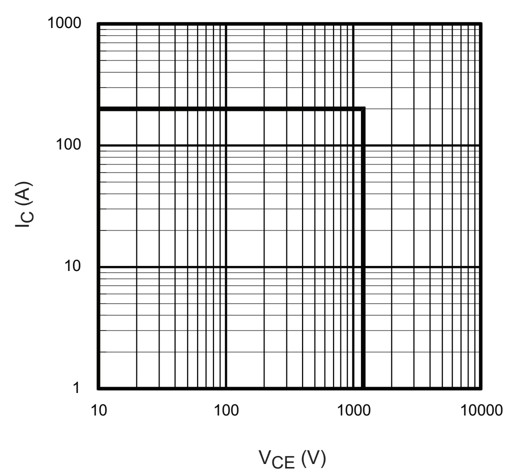


Fig. 4 - Reverse Bias SOA
T_J = 150 °C; V_{GE} = 15 V

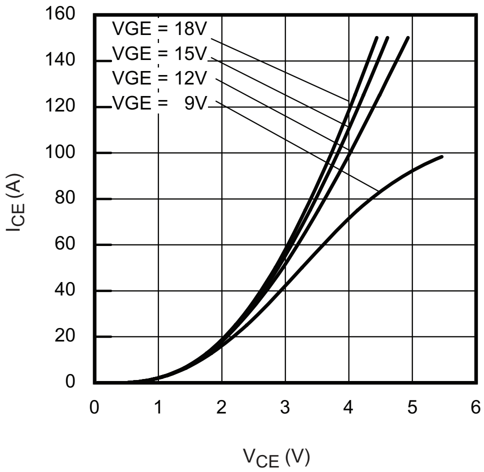


Fig. 5 - Typical IGBT Output Characteristics
T_J = 25 °C; t_p = 500 µs

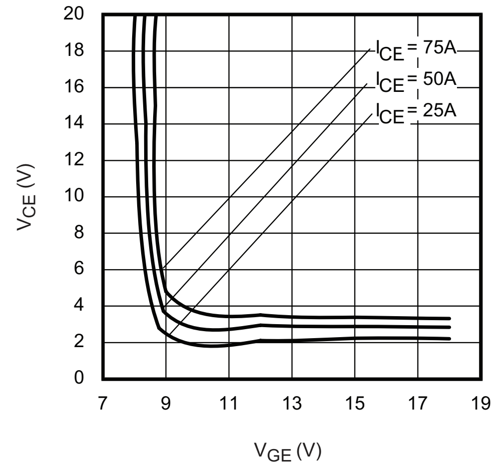


Fig. 8 - Typical V_{CE} vs. V_{GE}
T_J = 25 °C

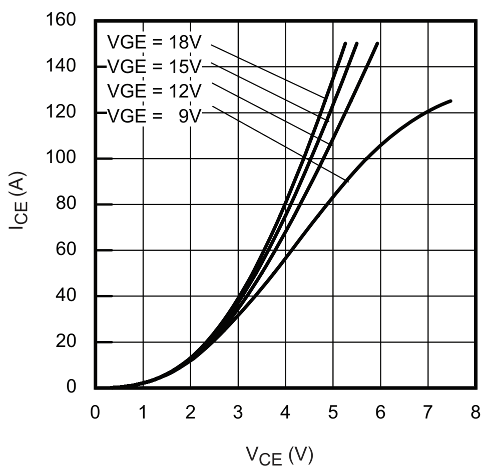


Fig. 6 - Typical IGBT Output Characteristics
T_J = 125 °C; t_p = 500 µs

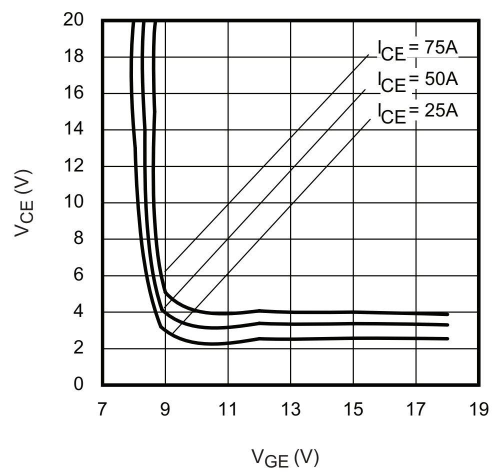


Fig. 9 - Typical V_{CE} vs. V_{GE}
T_J = 125 °C

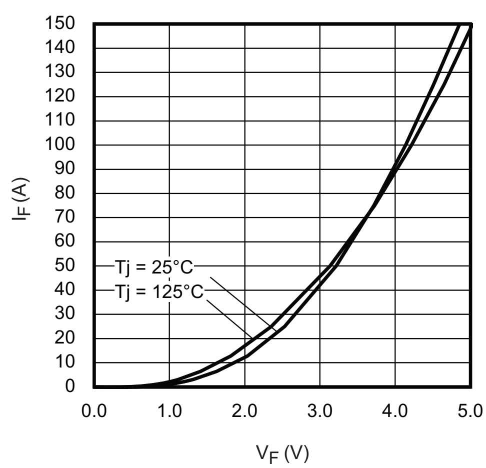


Fig. 7 - Typical Diode Forward Characteristics
t_p = 500 µs

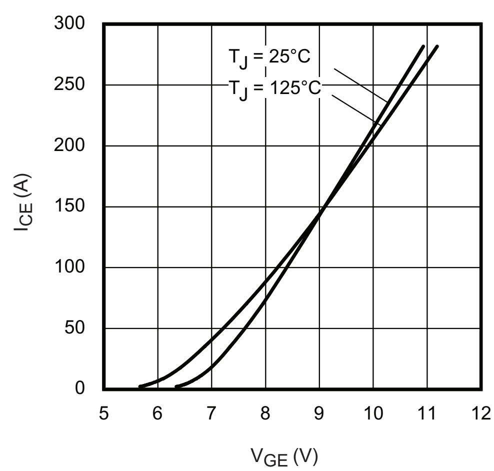


Fig. 10 - Typical Transfer Characteristics
V_{CE} = 20 V; t_p = 500 µs

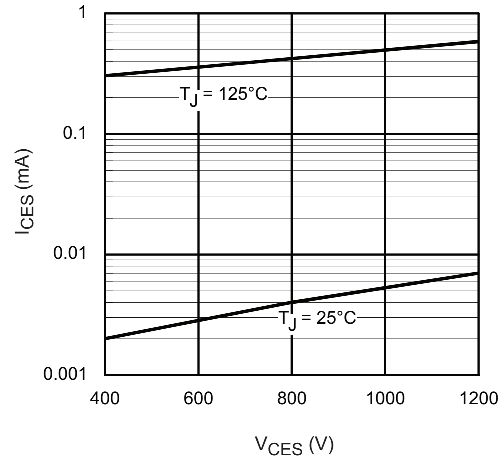


Fig. 11 - Typical Zero Gate Voltage Collector Current

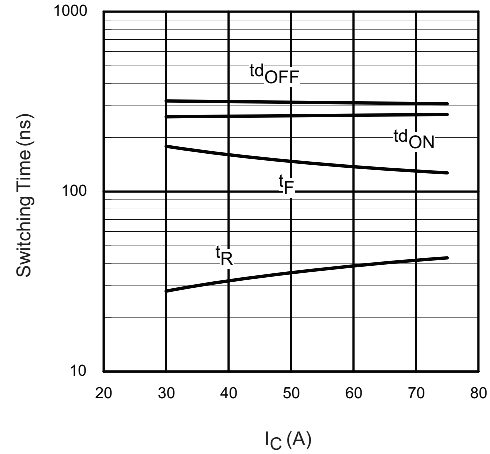


Fig. 14 - Typical Switching Time vs. I_C
T_J = 125 °C; L = 500 μH; V_{CC} = 600 V, R_g = 5 Ω; V_{GE} = 15 V

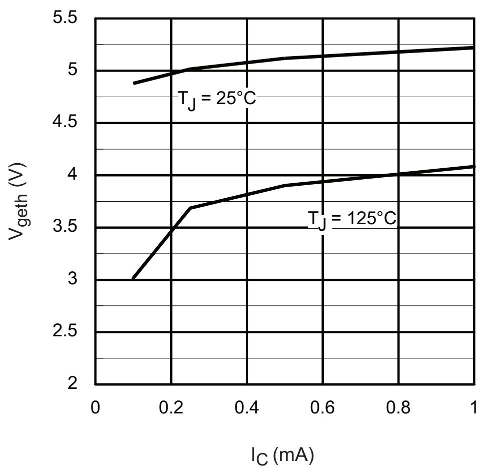


Fig. 12 - Typical Threshold Voltage

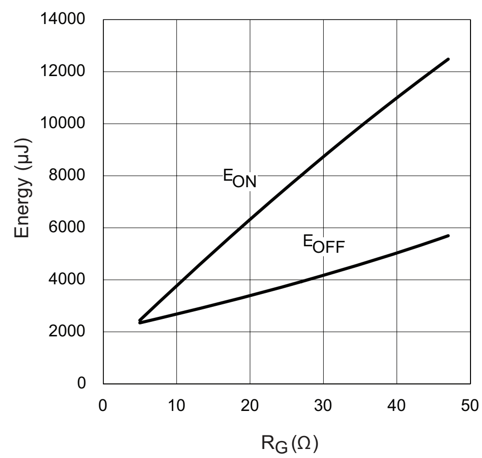


Fig. 15 - Typical Energy Loss vs. R_g
T_J = 125 °C; L = 500 μH; V_{CC} = 600 V, I_C = 75 A; V_{GE} = 15 V

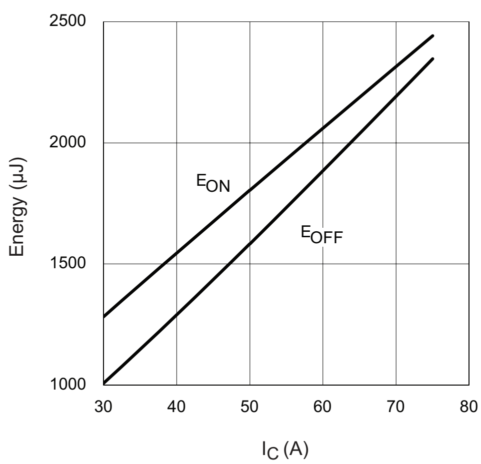


Fig. 13 - Typical Energy Loss vs. I_C
T_J = 125 °C; L = 500 μH; V_{CC} = 600 V, R_g = 5 Ω; V_{GE} = 15 V

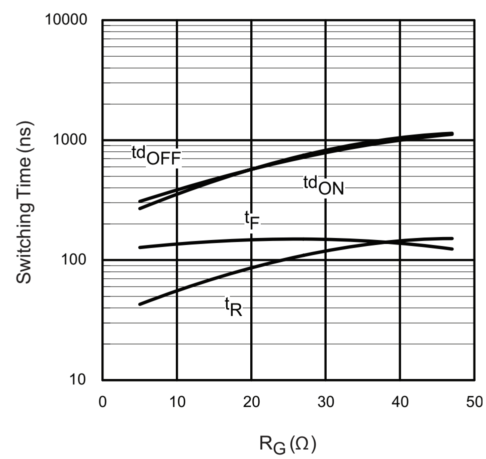


Fig. 16 - Typical Switching Time vs. R_g
T_J = 125 °C; L = 500 μH; V_{CC} = 600 V, I_C = 75 A; V_{GE} = 15 V

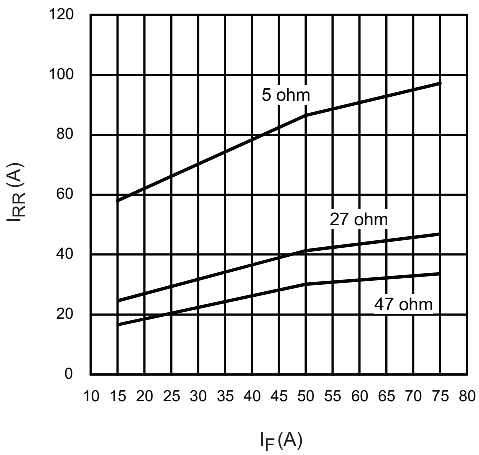


Fig. 17 - Typical Diode I_{RR} vs. I_F
T_J = 125 °C

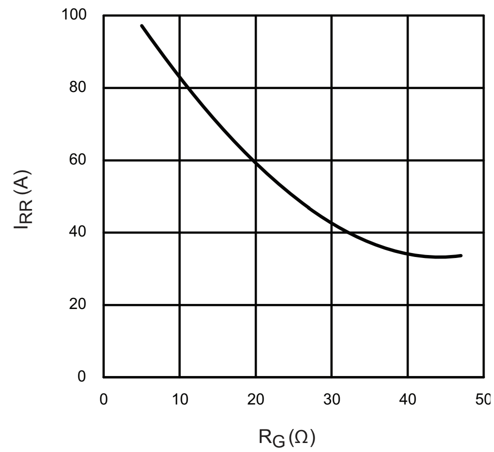


Fig. 19 - Typical Diode I_{RR} vs. R_g
T_J = 125 °C; I_F = 75 A

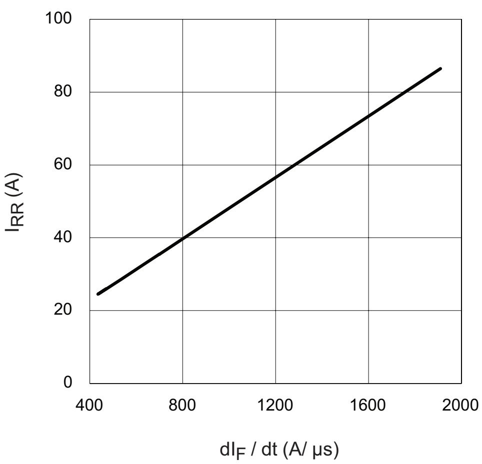


Fig. 18 - Typical Diode I_{RR} vs. dI_F/dt
V_{CC} = 600 V; I_F = 75 A

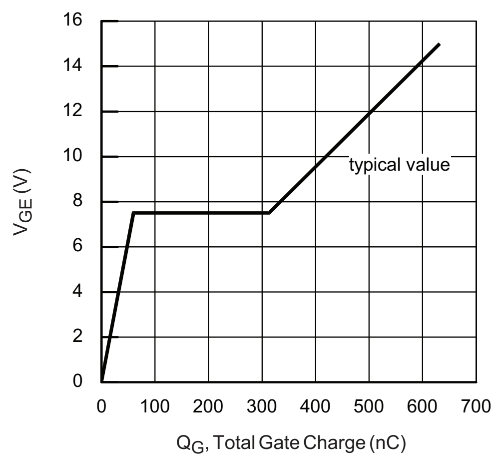


Fig. 20 - Typical Gate Charge vs. V_{GE}
I_{CE} = 5.0 A; L = 600 µH

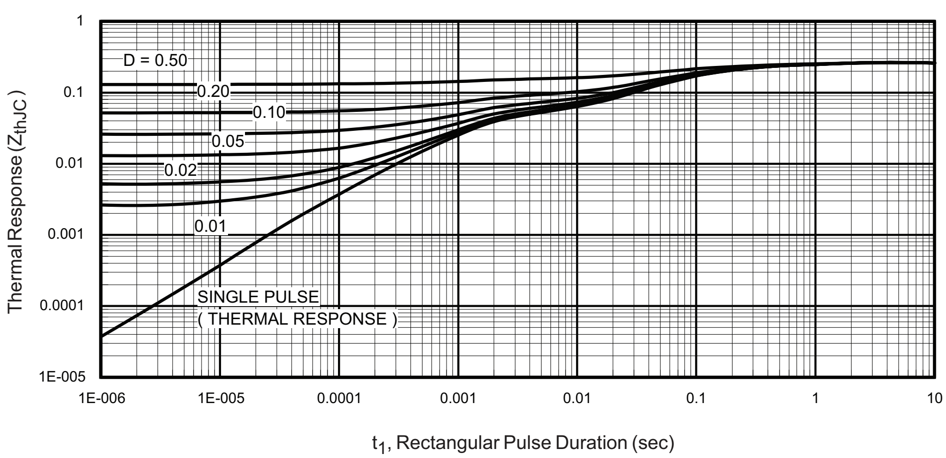


Fig. 21 - Maximum Transient Thermal Impedance, Junction to Case (IGBT)

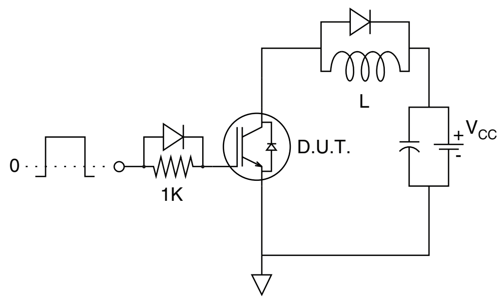


Fig. C.T.1 - Gate Charge Circuit (Turn-Off)

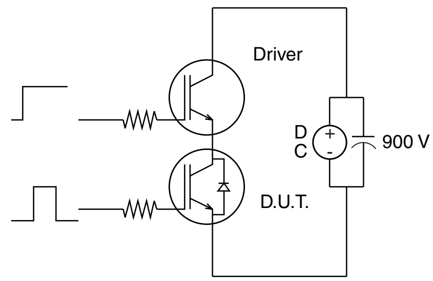


Fig. C.T.3 - S.C. SOA Circuit

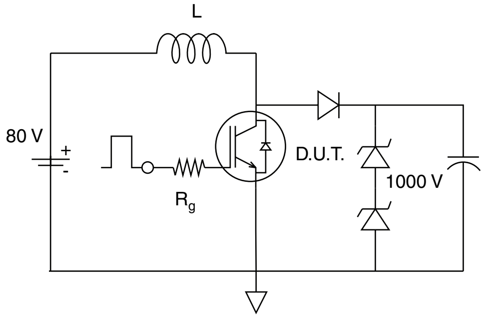


Fig. C.T.2 - RBSOA Circuit

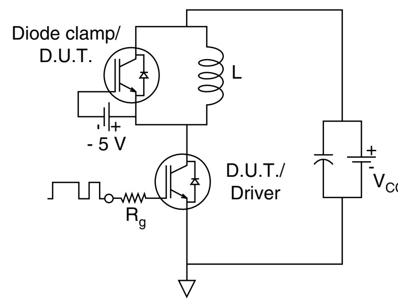


Fig. C.T.4 - Switching Loss Circuit

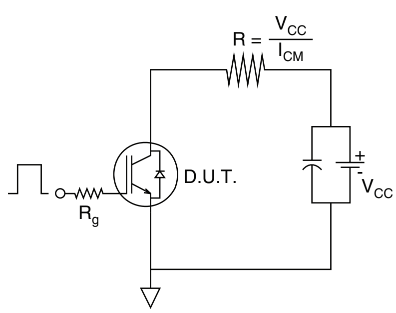


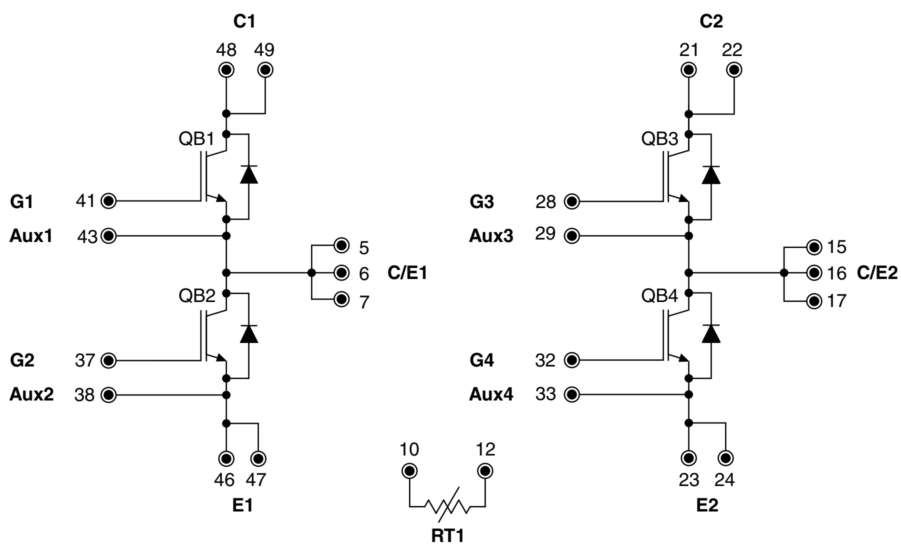
Fig. C.T.5 - Resistive Load Circuit

ORDERING INFORMATION TABLE

Device code	G	B	75	Y	F	120	U	T
	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 (Y = Fourpack)
5 - Package indicator (F = ECONO2)
6 - Voltage rating (120 = 1200 V)
7 - Speed/type (U = Ultrafast IGBT)
8 - T = Thermistor

CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95252

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