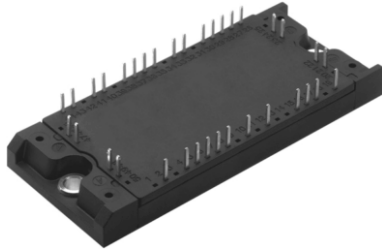


## IGBT Fourpack Module, 75 A


**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

### PRODUCT SUMMARY

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

### BENEFITS

- Benchmark efficiency for SMPS application 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

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	$V_{CES}$		1200	V
Continuous collector current	$I_C$	$T_C = 25\text{ °C}$	100	A
		$T_C = 80\text{ °C}$	67	
Pulsed collector current See fig. C.T.5	$I_{CM}$		200	
Clamped inductive load current	$I_{LM}$		200	
Diode continuous forward current	$I_F$	$T_C = 25\text{ °C}$	60	
		$T_C = 80\text{ °C}$	40	
Diode maximum forward current	$I_{FM}$		150	
Gate to emitter voltage	$V_{GE}$		$\pm 20$	V
Maximum power dissipation (IGBT)	$P_D$	$T_C = 25\text{ °C}$	480	W
		$T_C = 80\text{ °C}$	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

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	$V_{BR(CE)}$	$V_{GE} = 0\text{ V}$ , $I_C = 500\text{ }\mu\text{A}$	1200	-	-	V
Collector to emitter voltage	$V_{CE(ON)}$	$I_C = 75\text{ A}$ , $V_{GE} = 15\text{ V}$	-	3.4	4.0	
		$I_C = 100\text{ A}$ , $V_{GE} = 15\text{ V}$	-	3.8	4.5	
		$I_C = 75\text{ A}$ , $V_{GE} = 15\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	4.0	4.5	
		$I_C = 100\text{ A}$ , $V_{GE} = 15\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	4.53	5.1	
Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$ , $I_C = 250\text{ }\mu\text{A}$	4.0	5.0	6.0	
Threshold voltage temperature coefficient	$\Delta V_{GE(th)}/\Delta T_J$	$V_{CE} = V_{GE}$ , $I_C = 1\text{ mA}$ ( $25\text{ }^\circ\text{C}$ to $125\text{ }^\circ\text{C}$ )	-	- 11	-	mV/ $^\circ\text{C}$
Zero gate voltage collector current	$I_{CES}$	$V_{GE} = 0\text{ V}$ , $V_{CE} = 1200\text{ V}$	-	7	250	$\mu\text{A}$
		$V_{GE} = 0\text{ V}$ , $V_{CE} = 1200\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	580	2000	
Diode forward voltage drop	$V_{FM}$	$I_F = 75\text{ A}$	-	3.7	4.9	V
		$I_F = 100\text{ A}$	-	4.1	5.5	
		$I_F = 75\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$	-	3.7	5.1	
		$I_F = 100\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$	-	4.2	5.7	
Gate to emitter leakage current	$I_{GES}$	$V_{GE} = \pm 20\text{ V}$	-	-	$\pm 200$	nA

<b>SWITCHING CHARACTERISTICS</b> ( $T = 25\text{ }^\circ\text{C}$ unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Total gate charge (turn-on)	$Q_G$	$I_C = 75\text{ A}$ $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$	-	630	-	nC	
Gate to emitter charge (turn-on)	$Q_{GE}$		-	65	-		
Gate to collector charge (turn-on)	$Q_{GC}$		-	250	-		
Turn-on switching loss	$E_{on}$	$I_C = 75\text{ A}$ , $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$ , $R_g = 5\text{ }\Omega$ , $L = 500\text{ }\mu\text{H}$ $T_J = 25\text{ }^\circ\text{C}$ <sup>(1)</sup>	-	1.74	-	mJ	
Turn-off switching loss	$E_{off}$		-	1.46	-		
Total switching loss	$E_{tot}$		-	3.20	-		
Turn-on switching loss	$E_{on}$		-	2.44	-		
Turn-off switching loss	$E_{off}$	$I_C = 75\text{ A}$ , $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$ , $R_g = 5\text{ }\Omega$ , $L = 500\text{ }\mu\text{H}$ $T_J = 125\text{ }^\circ\text{C}$ <sup>(1)</sup>	-	2.35	-	mJ	
Total switching loss	$E_{tot}$		-	4.79	-		
Turn-on delay time	$t_{d(on)}$		-	268	-		
Rise time	$t_r$	$I_C = 75\text{ A}$ , $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$ , $R_g = 5\text{ }\Omega$ , $L = 500\text{ }\mu\text{H}$ $T_J = 125\text{ }^\circ\text{C}$	-	43	-	ns	
Turn-off delay time	$t_{d(off)}$		-	308	-		
Fall time	$t_f$		-	127	-		
Reverse bias safe operating area	RBSOA	$T_J = 150\text{ }^\circ\text{C}$ , $I_C = 200\text{ A}$ $R_g = 10\text{ }\Omega$ , $V_{GE} = 15\text{ V to } 0\text{ V}$	Fullsquare				
Short circuit safe operating area	SCSOA	$T_J = 150\text{ }^\circ\text{C}$ $V_{CC} = 900\text{ V}$ , $V_P = 1200\text{ V}$ $R_g = 10\text{ }\Omega$ , $V_{GE} = 15\text{ V to } 0\text{ V}$	10	-	-	$\mu\text{s}$	
Diode peak reverse recovery current	$I_{rr}$	$V_{CC} = 200\text{ V}$ $I_F = 50\text{ A}$ $di/dt = 10\text{ A}/\mu\text{s}$	$T_J = 25\text{ }^\circ\text{C}$	-	13	18	A
			$T_J = 125\text{ }^\circ\text{C}$	-	19	23	
Diode reverse recovery time	$t_{rr}$		$T_J = 25\text{ }^\circ\text{C}$	-	132	189	ns
			$T_J = 125\text{ }^\circ\text{C}$	-	200	270	
Total reverse recovery charge	$Q_{rr}$		$T_J = 25\text{ }^\circ\text{C}$	-	858	1700	nC
			$T_J = 125\text{ }^\circ\text{C}$	-	1900	3105	

**Note**

<sup>(1)</sup> Energy losses include “tail” and diode reverse recovery



<b>THERMISTOR ELECTRICAL SPECIFICATIONS</b> (T = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Resistance	R <sub>25</sub>		4538	5000	5495	Ω
		T <sub>J</sub> = 100 °C	468.6	493.3	518	
B value	B	T <sub>J</sub> = 25 °C/50 °C	3307	3375	3443	°K

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

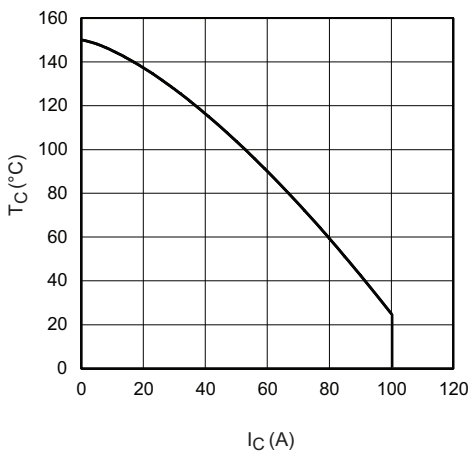


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

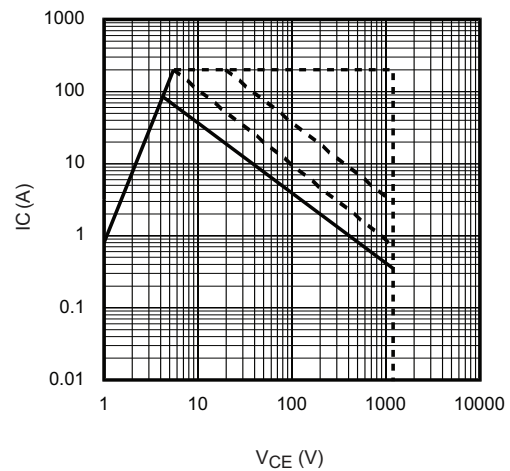


Fig. 3 - Forward SOA  
T<sub>C</sub> = 25 °C; T<sub>J</sub> ≤ 150 °C

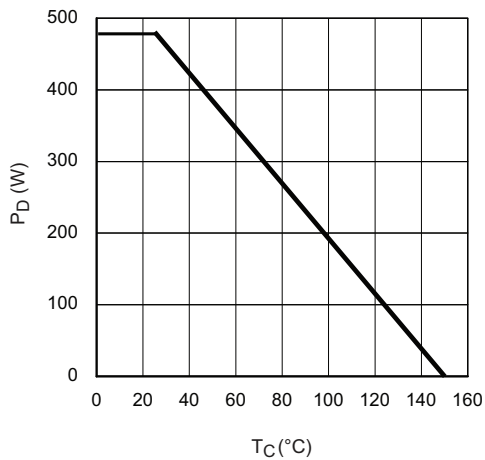


Fig. 2 - Power Dissipation vs. Case Temperature

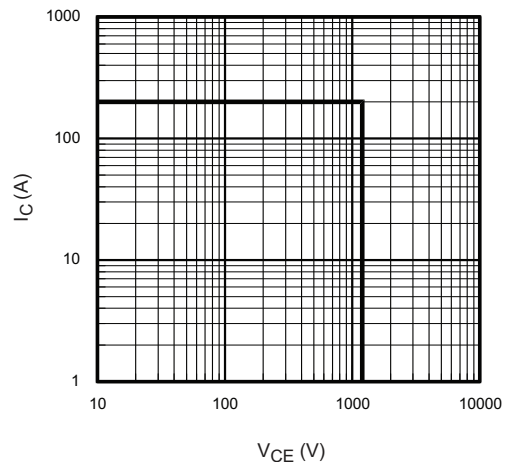


Fig. 4 - Reverse Bias SOA  
T<sub>J</sub> = 150 °C; V<sub>GE</sub> = 15 V

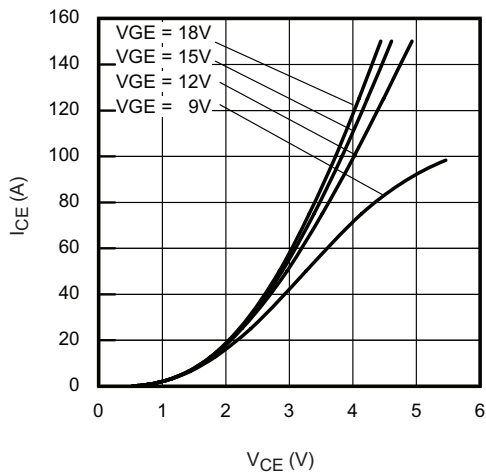


Fig. 5 - Typical IGBT Output Characteristics  
 $T_J = 25^\circ\text{C}$ ;  $t_p = 500 \mu\text{s}$

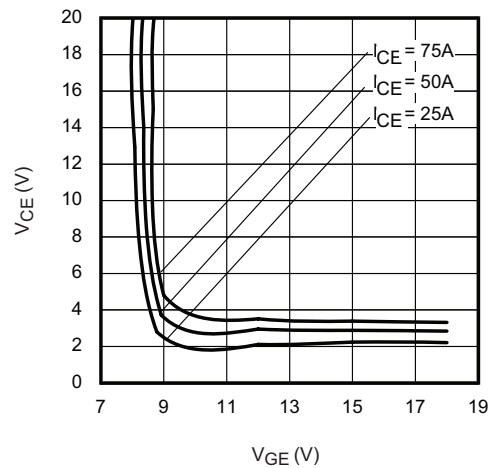


Fig. 8 - Typical  $V_{CE}$  vs.  $V_{GE}$   
 $T_J = 25^\circ\text{C}$

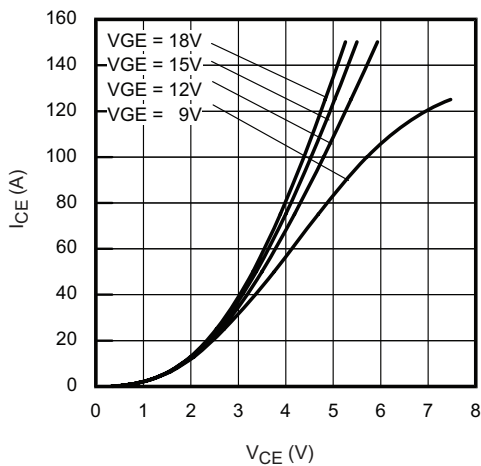


Fig. 6 - Typical IGBT Output Characteristics  
 $T_J = 125^\circ\text{C}$ ;  $t_p = 500 \mu\text{s}$

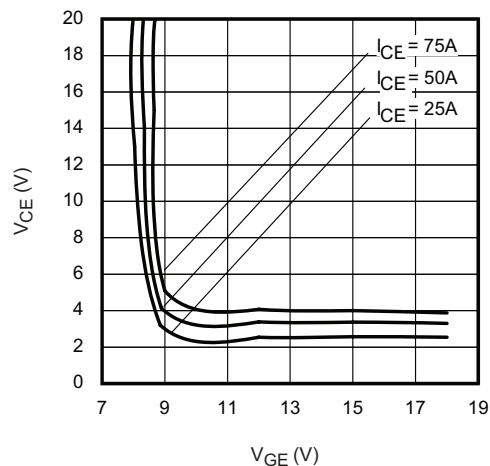


Fig. 9 - Typical  $V_{CE}$  vs.  $V_{GE}$   
 $T_J = 125^\circ\text{C}$

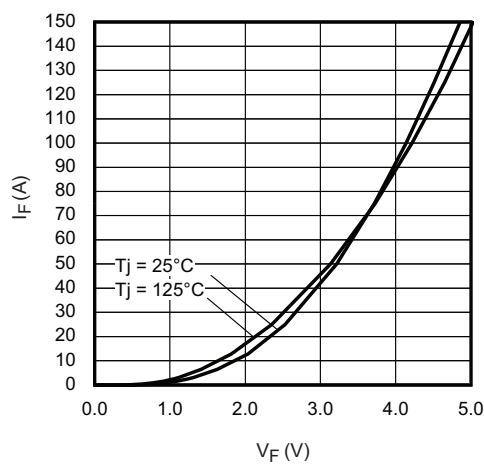


Fig. 7 - Typical Diode Forward Characteristics  
 $t_p = 500 \mu\text{s}$

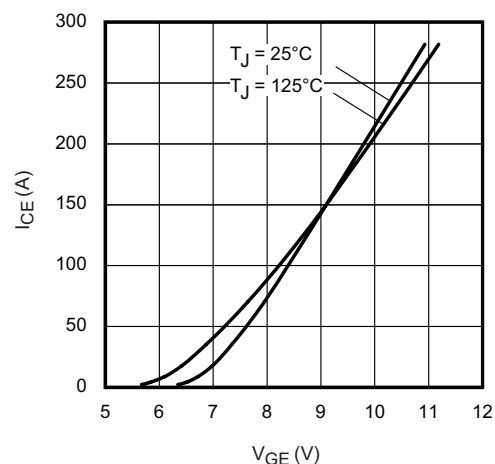


Fig. 10 - Typical Transfer Characteristics  
 $V_{CE} = 20 \text{ V}$ ;  $t_p = 500 \mu\text{s}$

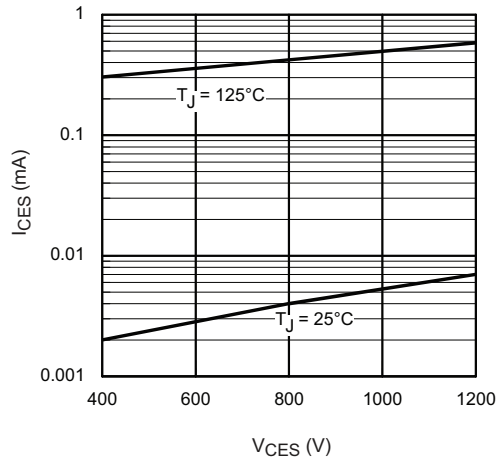


Fig. 11 - Typical Zero Gate Voltage Collector Current

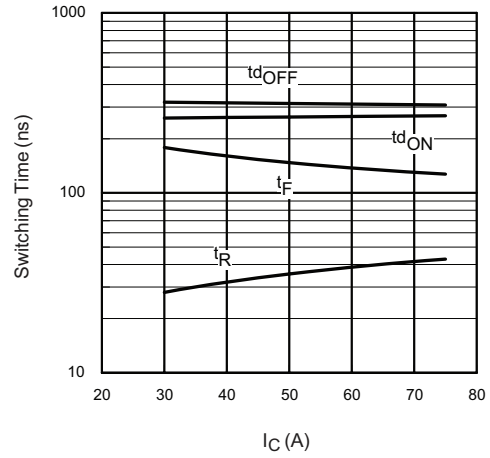
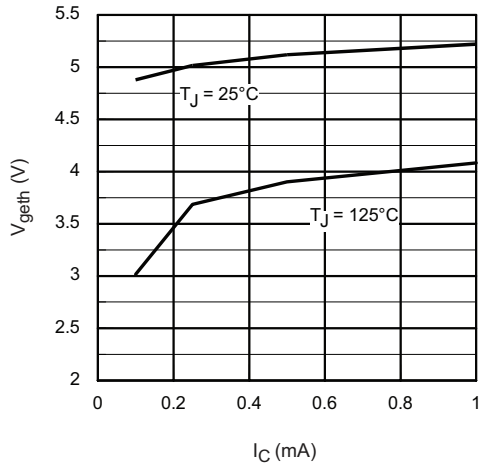
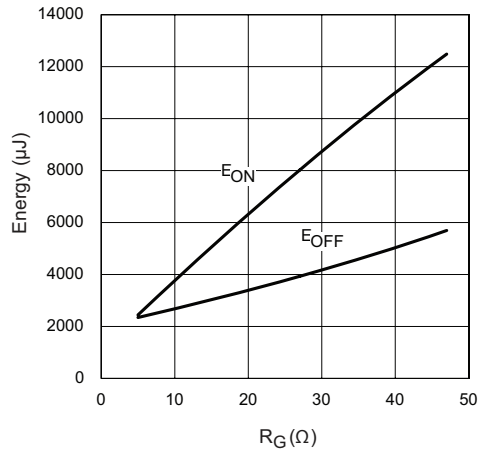
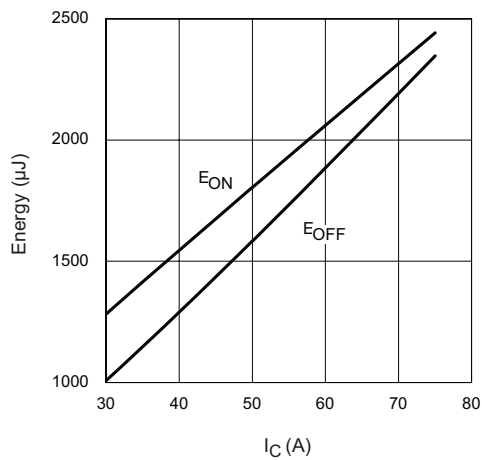
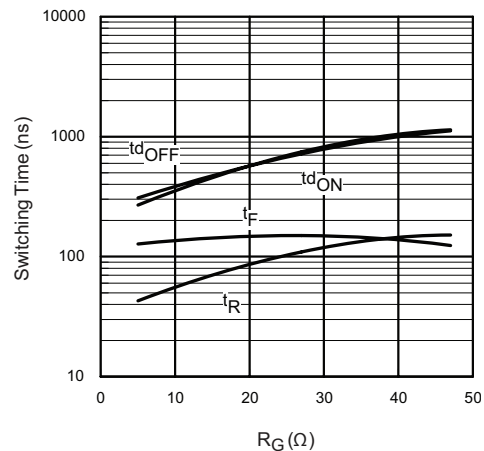

 Fig. 14 - Typical Switching Time vs.  $I_C$   
 $T_J = 125^\circ\text{C}$ ;  $L = 500\ \mu\text{H}$ ;  $V_{CC} = 600\ \text{V}$ ,  $R_g = 5\ \Omega$ ;  $V_{GE} = 15\ \text{V}$ 


Fig. 12 - Typical Threshold Voltage


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

 Fig. 13 - Typical Energy Loss vs.  $I_C$   
 $T_J = 125^\circ\text{C}$ ;  $L = 500\ \mu\text{H}$ ;  $V_{CC} = 600\ \text{V}$ ,  $R_g = 5\ \Omega$ ;  $V_{GE} = 15\ \text{V}$ 

 Fig. 16 - Typical Switching Time vs.  $R_g$   
 $T_J = 125^\circ\text{C}$ ;  $L = 500\ \mu\text{H}$ ;  $V_{CC} = 600\ \text{V}$ ,  $I_C = 75\ \text{A}$ ;  $V_{GE} = 15\ \text{V}$

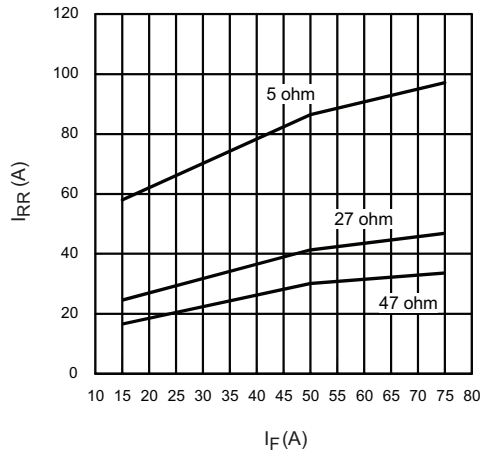


Fig. 17 - Typical Diode  $I_{RR}$  vs.  $I_F$   
 $T_J = 125^\circ\text{C}$

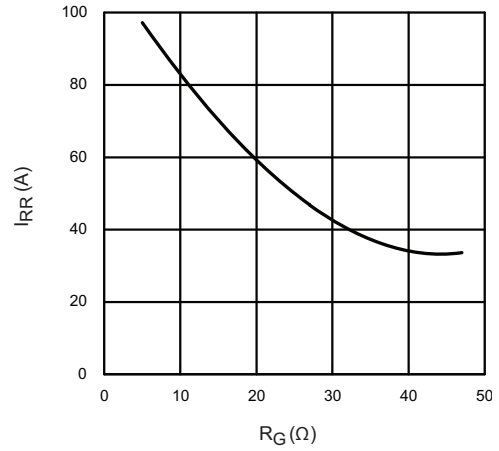


Fig. 19 - Typical Diode  $I_{RR}$  vs.  $R_G$   
 $T_J = 125^\circ\text{C}; I_F = 75\text{ A}$

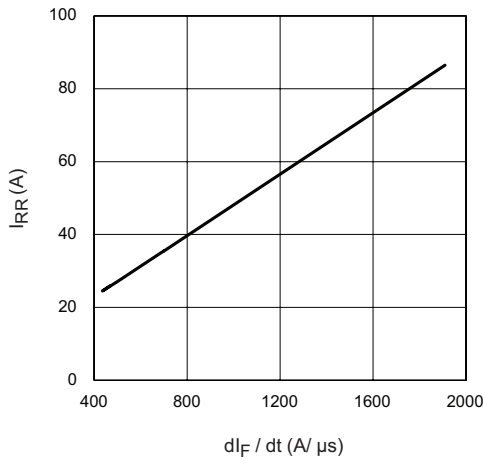


Fig. 18 - Typical Diode  $I_{RR}$  vs.  $dI_F/dt$   
 $V_{CC} = 600\text{ V}; I_F = 75\text{ A}$

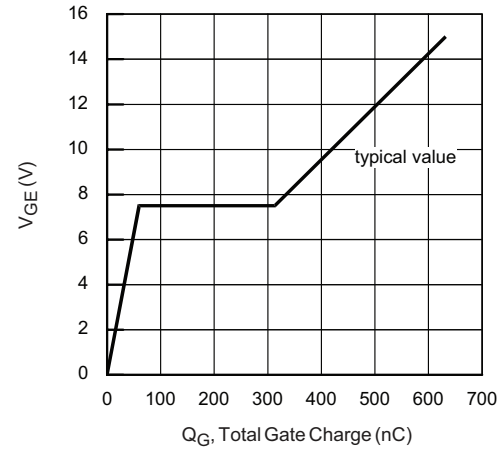


Fig. 20 - Typical Gate Charge vs.  $V_{GE}$   
 $I_{CE} = 5.0\text{ A}; L = 600\text{ }\mu\text{H}$

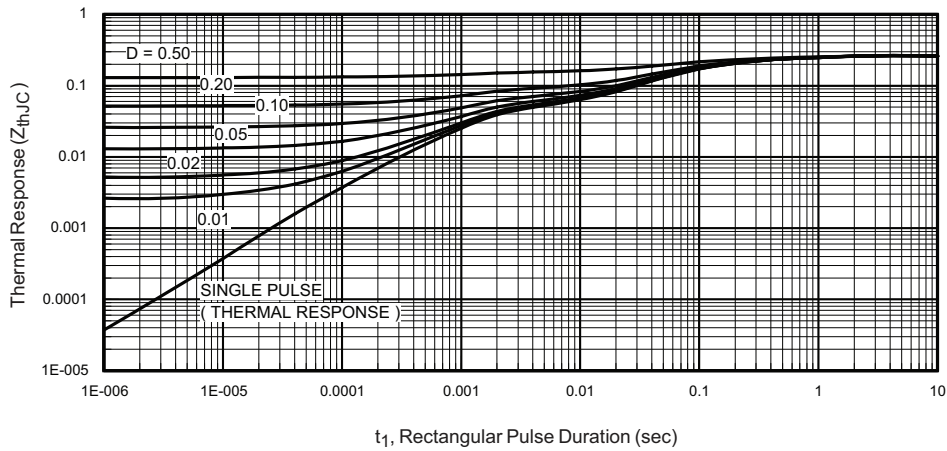


Fig. 21 - Maximum Transient Thermal Impedance, Junction to Case (IGBT)

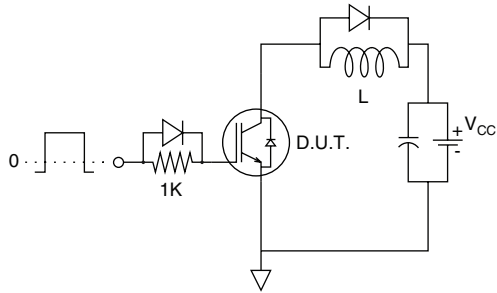


Fig. C.T.1 - Gate Charge Circuit (Turn-Off)

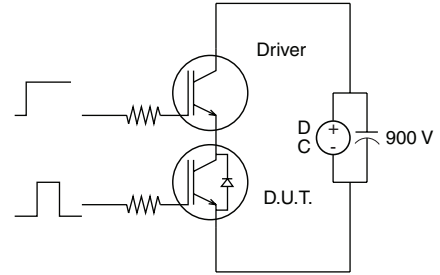


Fig. C.T.3 - S.C. SOA Circuit

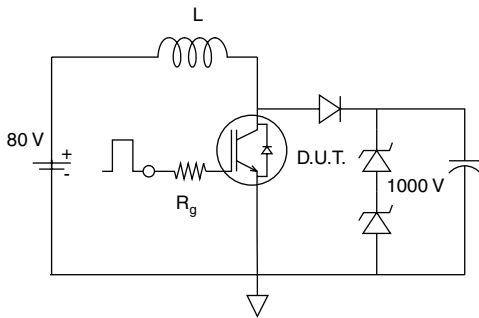


Fig. C.T.2 - RBSOA Circuit

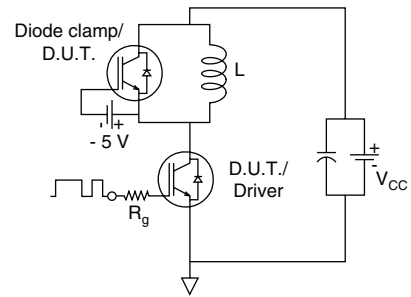


Fig. C.T.4 - Switching Loss Circuit

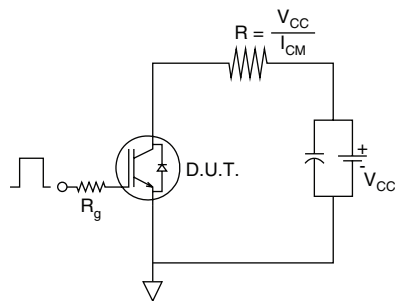


Fig. C.T.5 - Resistive Load Circuit

# GB75YF120UT

Vishay High Power Products IGBT Fourpack Module, 75 A

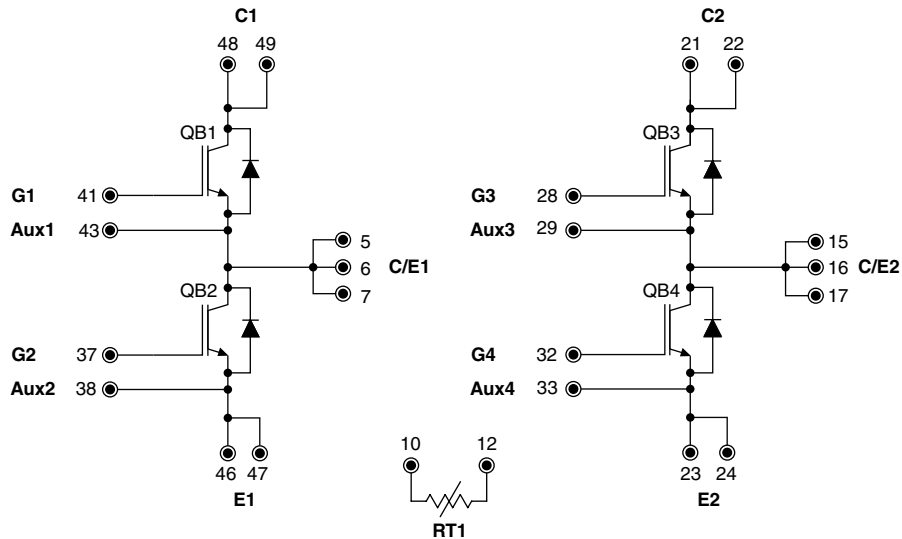


## ORDERING INFORMATION TABLE

Device code	<b>G</b>	<b>B</b>	<b>75</b>	<b>Y</b>	<b>F</b>	<b>120</b>	<b>U</b>	<b>T</b>
	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	<a href="http://www.vishay.com/doc?95252">www.vishay.com/doc?95252</a>
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