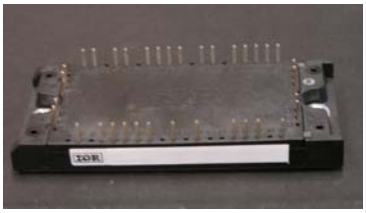
Bulletin I27209 01/06

International
IOR Rectifier

GB75YF120N

IGBT FOUR PAK MODULE



ECONO2 4PAK

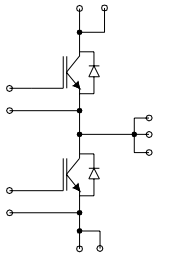
V_{CES} = 1200V

I_C = 75A @ T_C = 67°C

$V_{CE(on)}$ typ. = 3.4V

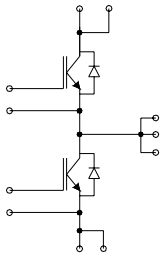
Features

- Square RBSOA
- HEXFRED low Qrr, low Switching Energy
- Positive $V_{CE(on)}$ Temperature Coefficient
- Copper Baseplate
- Low Stray Inductance Design



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



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
I_C @ Tc=25°C	Continuous Collector Current	100	A
I_C @ Tc=80°C	Continuous Collector Current	67	
I_{CM}	Pulsed Collector Current (Ref. Fig. C.T.5)	200	
I_{LM}	Clamped Inductive Load Current	200	
I_F @ Tc=25°C	Diode Continuous Forward Current	40	
I_F @ Tc=80°C	Diode Continuous Forward Current	25	
I_{FM}	Diode Maximum Forward Current	150	
V_{GE}	Gate-to-Emitter Voltage	±20	V
P_D @ Tc=25°C	Maximum Power Dissipation (IGBT)	480	W
P_D @ Tc=80°C	Maximum Power Dissipation (IGBT)	270	
T_J	Maximum Operating Junction Temperature	150	℃
T_{STG}	Storage Temperature Range	-40 to +125	
V_{ISOL}	Isolation Voltage	AC 2500 (MIN)	V

Thermal and Mechanical Characteristics

	Parameter	Min	Typical	Maximum	Units
$R_{\theta JC}$ (IGBT)	Junction-to-Case IGBT	-	-	0.26	°C/W
$R_{\theta JC}$ (Diode)	Junction-to-Case Diode	-	-	1.00	
$R_{\theta CS}$ (Module)	Case-to-Sink, flat, greased surface	-	0.05	-	
	Mounting Torque (M5)	2.7	-	3.3	N*m
	Weight	-	170	-	g

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$BV_{(CES)}$	Collector-to-Emitter Breakdown Voltage	1200	-	-	V	V_{GE} = 0 IC = 500µA
$V_{CE(ON)}$	Collector-to-Emitter Voltage	-	3.4	4.0	V	I_C = 75A V_{GE} = 15V
		-	3.8	4.5		I_C = 100A V_{GE} = 15V
		-	4.0	4.5		I_C = 75A V_{GE} = 15V T_J = 125°C
		-	4.53	5.1		I_C = 100A V_{GE} = 15V T_J = 125°C
$V_{GE}(th)$	Gate Threshold Voltage	4.0	5.0	6.0		V_{CE} = V_{GE} IC = 250µA
$\Delta V_{GE}(th)/\Delta T_J$	Thresold Voltage temp. coefficient	-	-11	-	mV/°C	V_{CE} = V_{GE} IC = 1mA (25°C-125°C)
I_{CES}	Zero Gate Voltage Collector Current	-	7	250	µA	V_{GE} = 0 V_{CE} = 1200V
		-	580	2000		V_{GE} = 0 V_{CE} = 1200V Tj = 125°C
V_{FM}	Diode Forward Voltage Drop	-	3.9	5.0	V	I_F = 75A
		-	4.43	5.8		I_F = 100A
		-	4.37	5.4		I_F = 75A Tj = 125°C
		-	5.02	6.4		I_F = 100A Tj = 125°C
I_{GES}	Gate-to-Emitter Leakage Current	-	-	± 200	nA	V_{GE} = ±20V

Switching Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_G	Total Gate Charge (turn-on)	-	630	-		I_C = 50A
Q_{GE}	Gate-to-Emitter Charge (turn-on)	-	65	-	nC	V_{CC} = 600A
Q_{GC}	Gate-to-Collector Charge (turn-on)	-	250	-		V_{GE} = 15V
E_{ON}	Turn-On Switching Loss	-	1505	-	µJ	I_C = 50A V_{CC} = 600V
E_{OFF}	Turn-Off Switching Loss	-	2411	-		V_{GE} = 15V R_G = 4.7Ω L = 500µH
E_{TOT}	Total Switching Loss	-	3916	-		Tj = 25°C ①
E_{ON}	Turn-On Switching Loss	-	2248	-	µJ	I_C = 50A V_{CC} = 600V
E_{OFF}	Turn-Off Switching Loss	-	3351	-		V_{GE} = 15V R_G = 4.7Ω L = 500µH
E_{TOT}	Total Switching Loss	-	7599	-		Tj = 125°C ①
$t_{d(on)}$	Turn-On delay time	-	169	-	ns	I_C = 50A V_{CC} = 600V
t_r	Rise time	-	71	-		V_{GE} = 15V R_G = 4.7Ω L =500µH
$t_{d(off)}$	Turn-Off delay time	-	393	-		Tj = 125°C
t_f	Fall time	-	136	-		
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				Tj = 150°C I_C = 150A R_G =10Ω V_{GE} = 15V to 0
SCSOA	Short Circuit Safe Operating Area	10	-	-	µs	Tj = 150°C V_{CC} = 900V V_P = 1200V R_G = 10Ω V_{GE} = 15V to 0
I_{rr}	Diode Peak Rev. Recovery Current	-	1.45	2.5	A	Tj = 25°C
		-	2.35	4.0		Tj = 125°C
t_{rr}	Diode Rev. Recovery Time	-	0.401	0.5	µs	Tj = 25°C V_{CC} = 600V I_F = 75A
		-	0.655	0.8	µs	Tj = 125°C dI/ dt = 10A/µs
Q_{rr}	Total Rev. Recovery Charge	-	0.181	0.4	µC	Tj = 25°C
		-	0.54	1.5	µC	Tj = 125°C

① Energy losses include "tail" and diode reverse recovery.

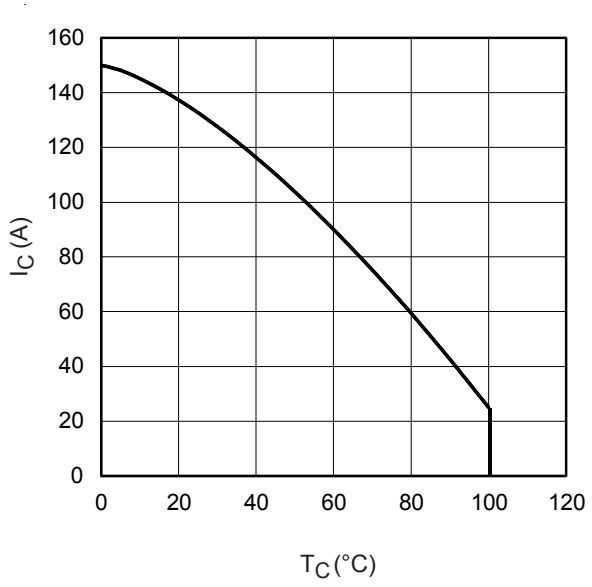


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

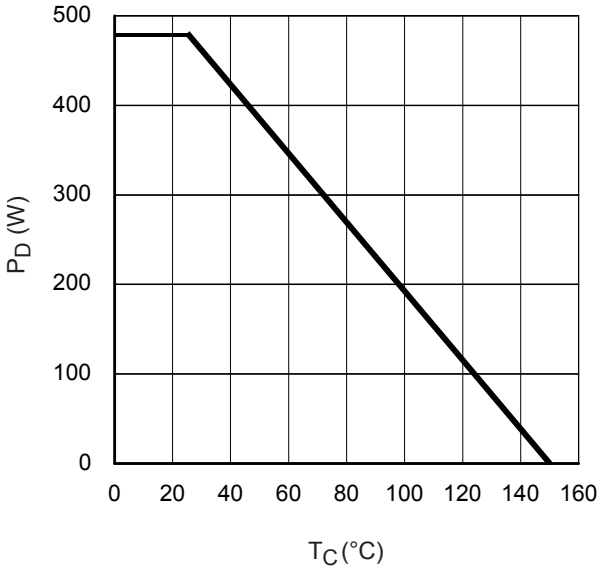


Fig. 2 - Power Dissipation vs. Case Temperature

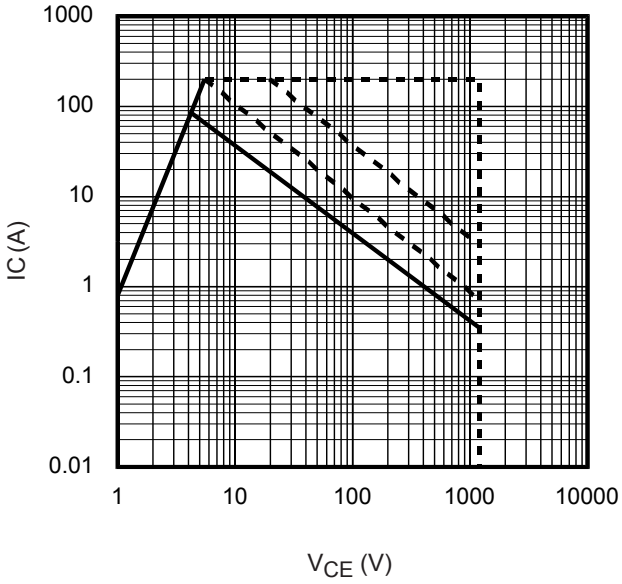


Fig. 3 - Forward SOA
T_C = 25°C; $T_J \leq$ 150°C

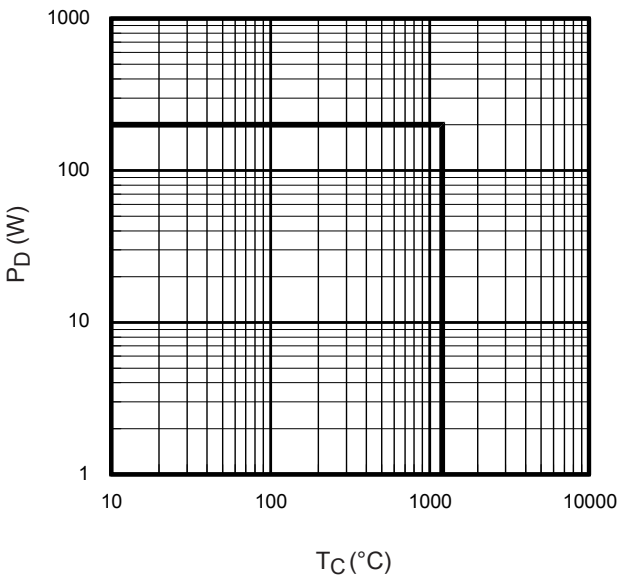


Fig. 4 - Reverse Bias SOA
T_J = 150°C; V_{GE} =15V

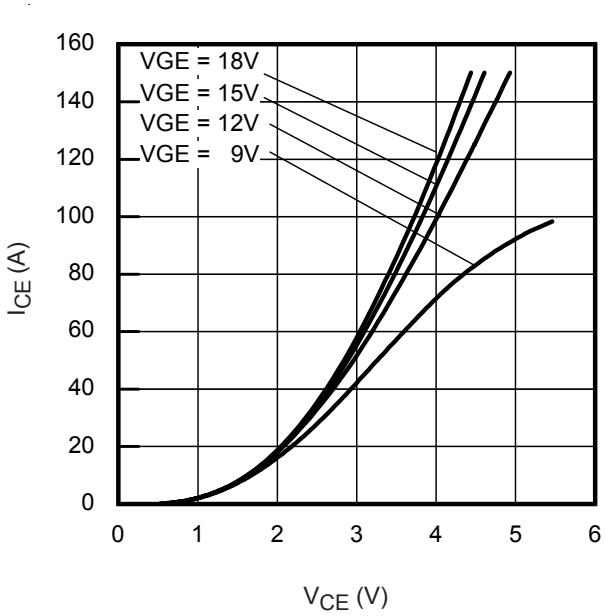


Fig. 5 - Typ. IGBT Output Characteristics
T_J = 25°C; tp = 500µs

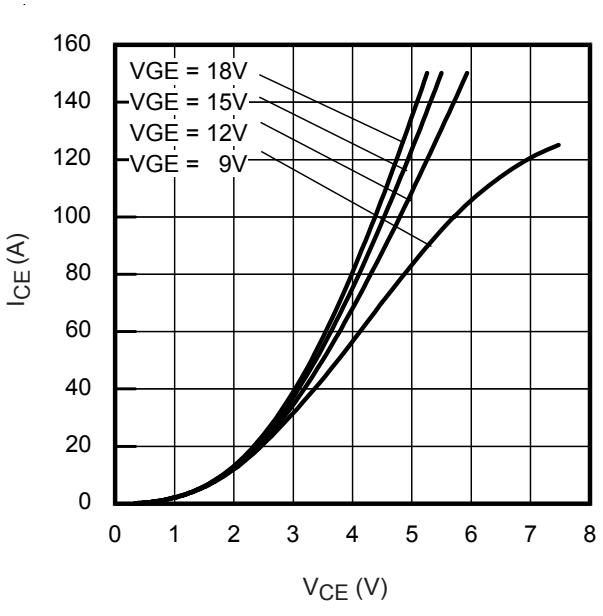


Fig. 6 - Typ. IGBT Output Characteristics
T_J = 125°C; tp = 500µs

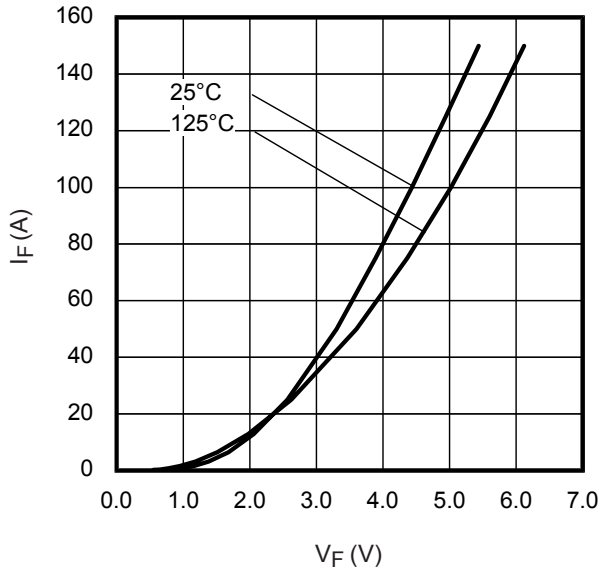


Fig. 7 - Typ. Diode Forward Characteristics
tp = 500µs

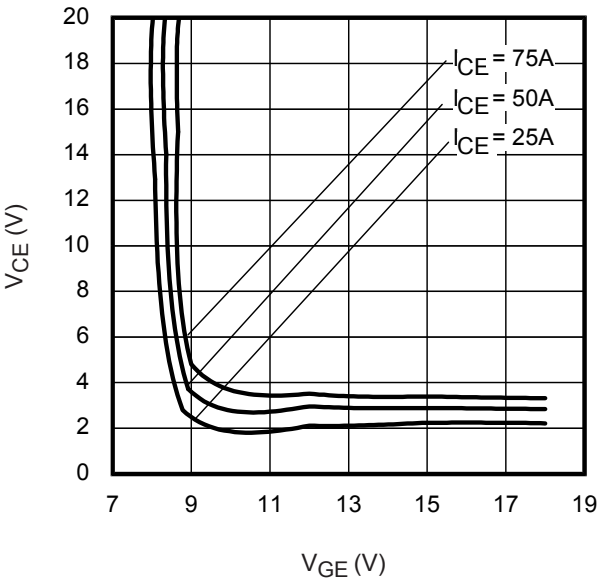


Fig. 8 - Typical V_{CE} vs. V_{GE}
T_J = 25°C

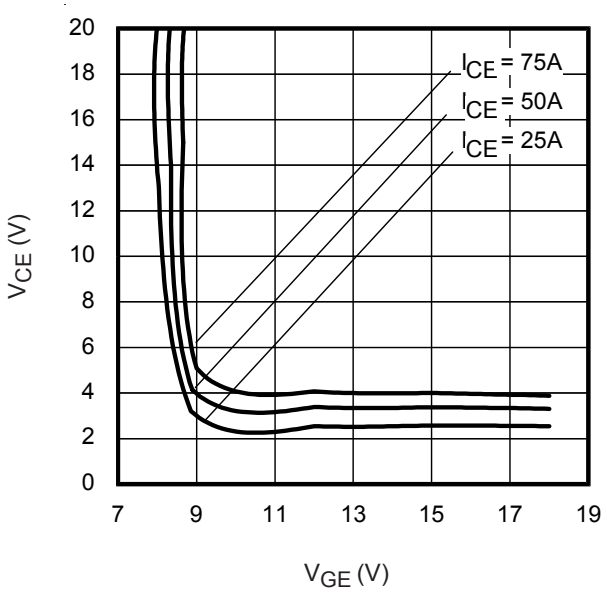


Fig. 9 - Typical V_{CE} vs. V_{GE}
T_J = 125°C

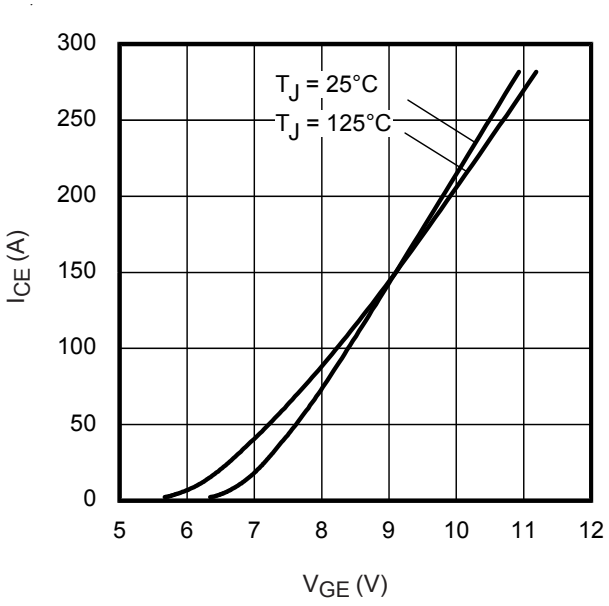


Fig. 10 - Typ. Transfer Characteristics
V_{CE} = 20V; tp = 500µs

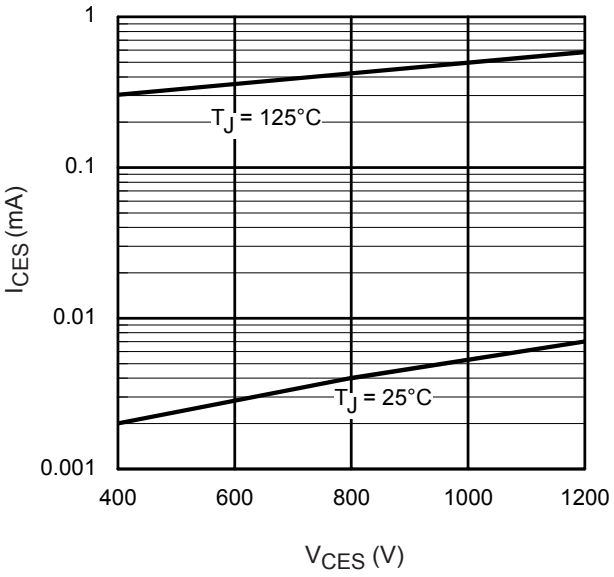


Fig. 11 - Typ Zero Gate Voltage Collector Current

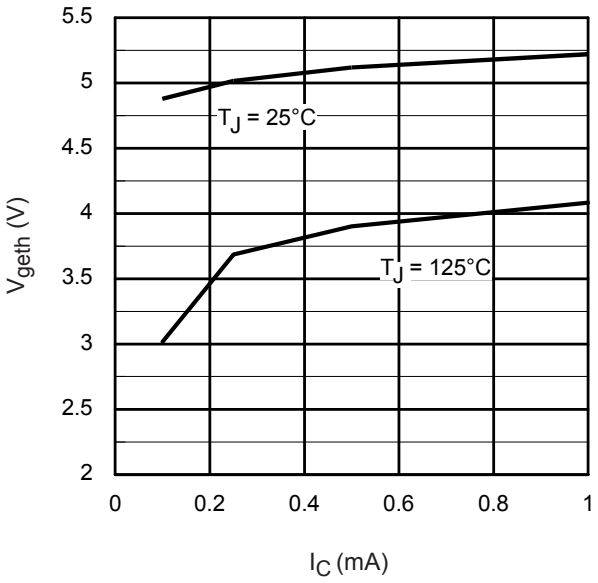


Fig. 12 - Typ Threshold Voltage

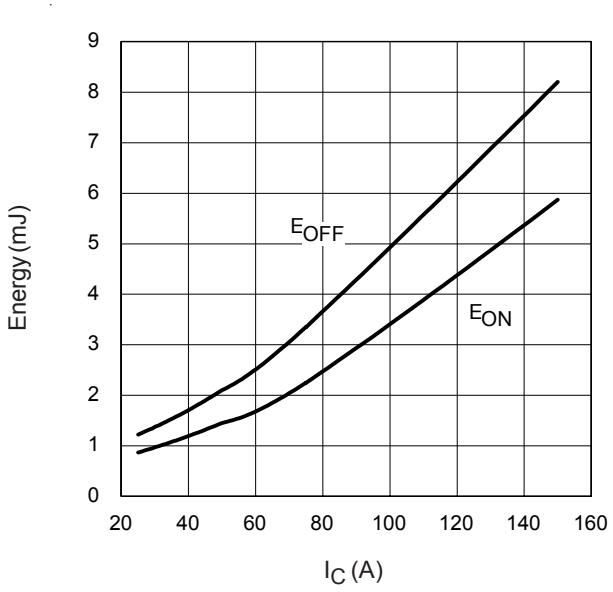


Fig. 13 - Typ. Energy Loss vs. I_C
T_J = 125°C; L=200µH; V_{CE}= 600V
R_G= 5Ω; V_{GE}= 15V

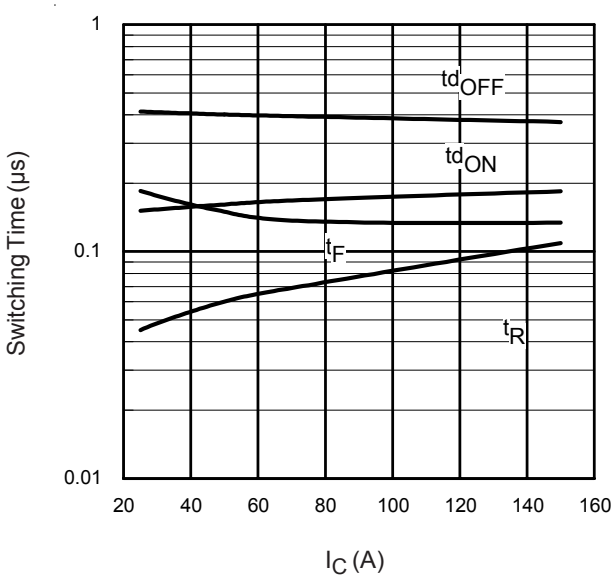


Fig. 14 - Typ. Switching Time vs. I_C
T_J = 125°C; L=200µH; V_{CE}= 600V
R_G= 5Ω; V_{GE}= 15V

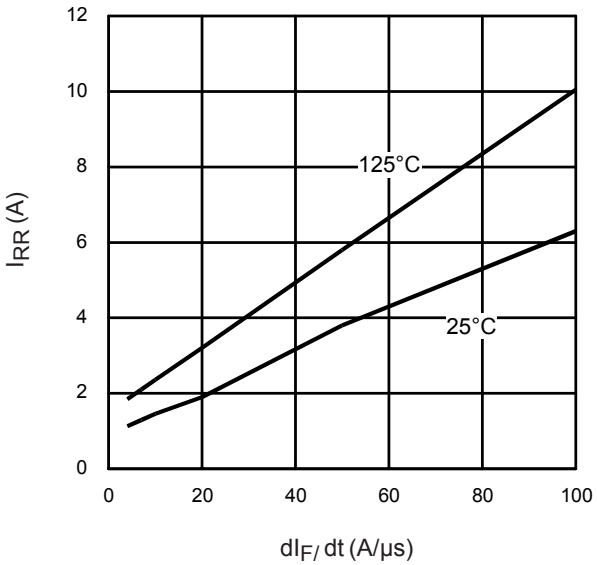


Fig. 15- Typical Diode I_{REC} vs. di_F/dt
V_{CC}= 600V; I_F= 50A

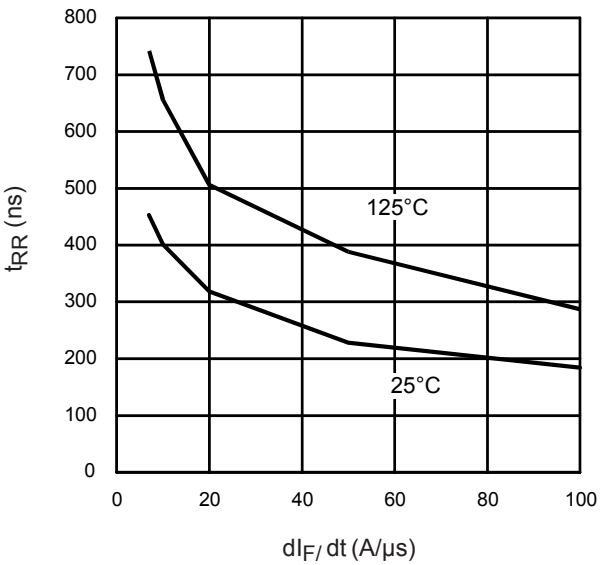


Fig. 16- Typical Diode t_{RR} vs. di_F/dt
V_{CC}= 600V; I_F= 50A

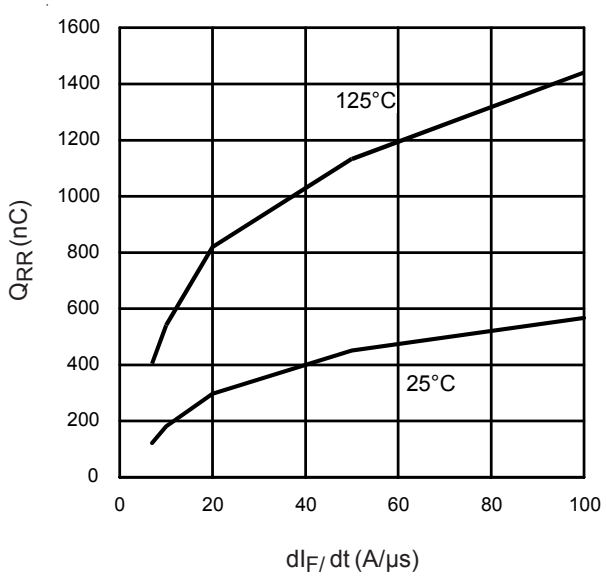


Fig. 17- Typical Diode Q_{RR} vs. di_F/dt
V_{CC}= 600V; I_F= 50A

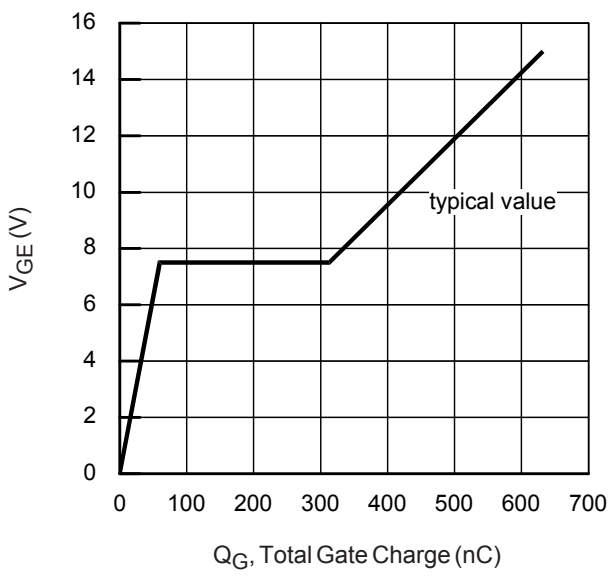


Fig. 18 - Typical Gate Charge vs. V_{GE}
I_{CE} = 5.0A; L = 600µH

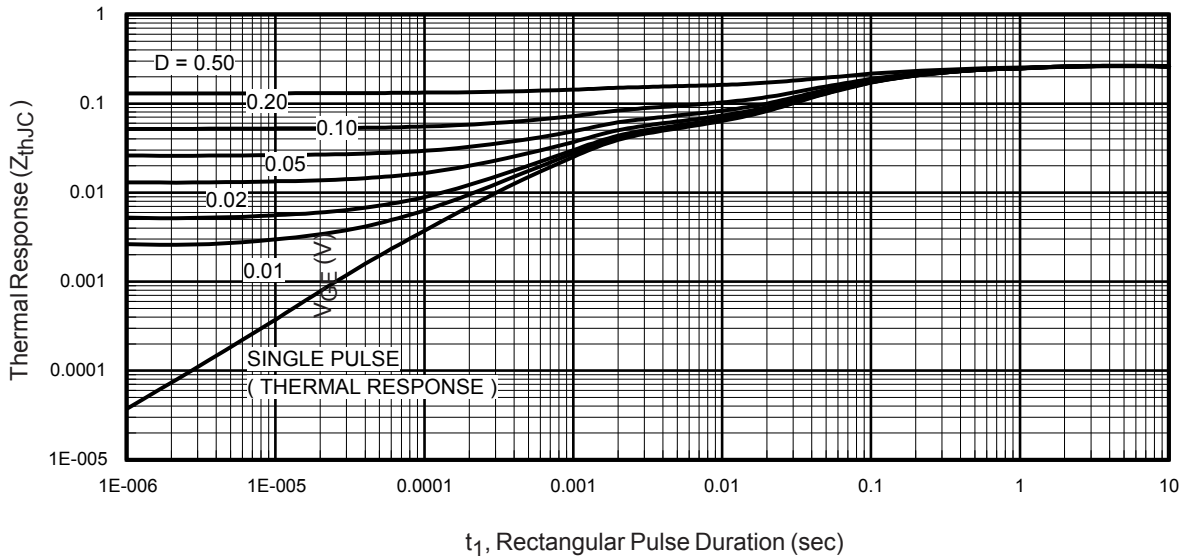


Fig 19 - Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)

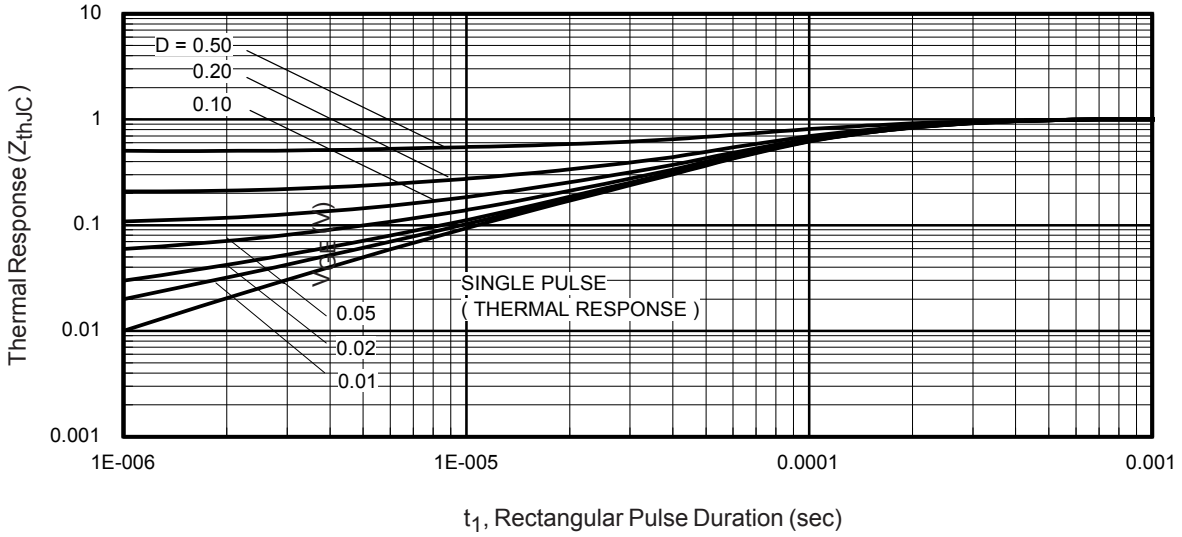


Fig 20 - Maximum Transient Thermal Impedance, Junction-to-Case (DIODE)

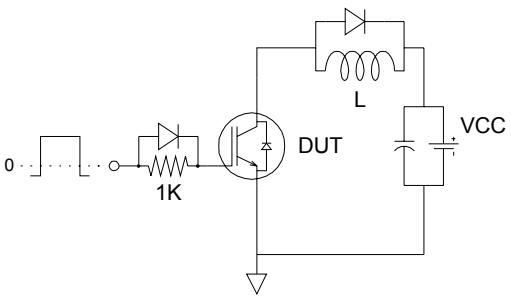


Fig.C.T.1 - Gate Charge Circuit (turn-off)

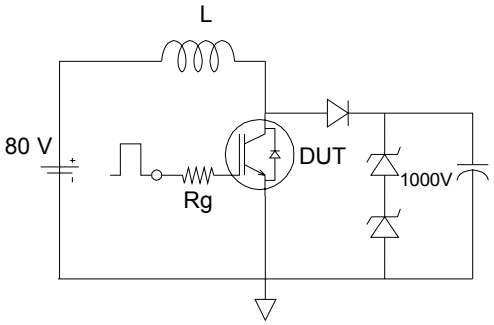


Fig.C.T.2 - RBSOA Circuit

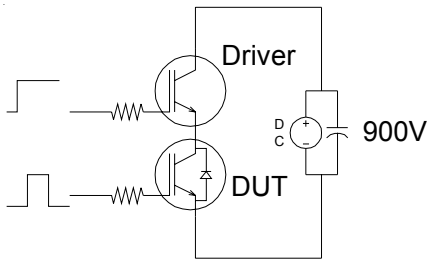


Fig.C.T.3 - S.C. SOA Circuit

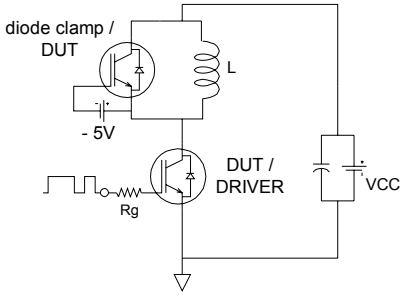


Fig.C.T.4 - Switching Loss Circuit

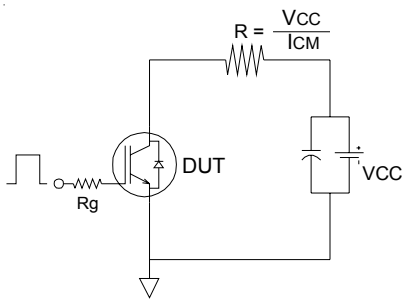
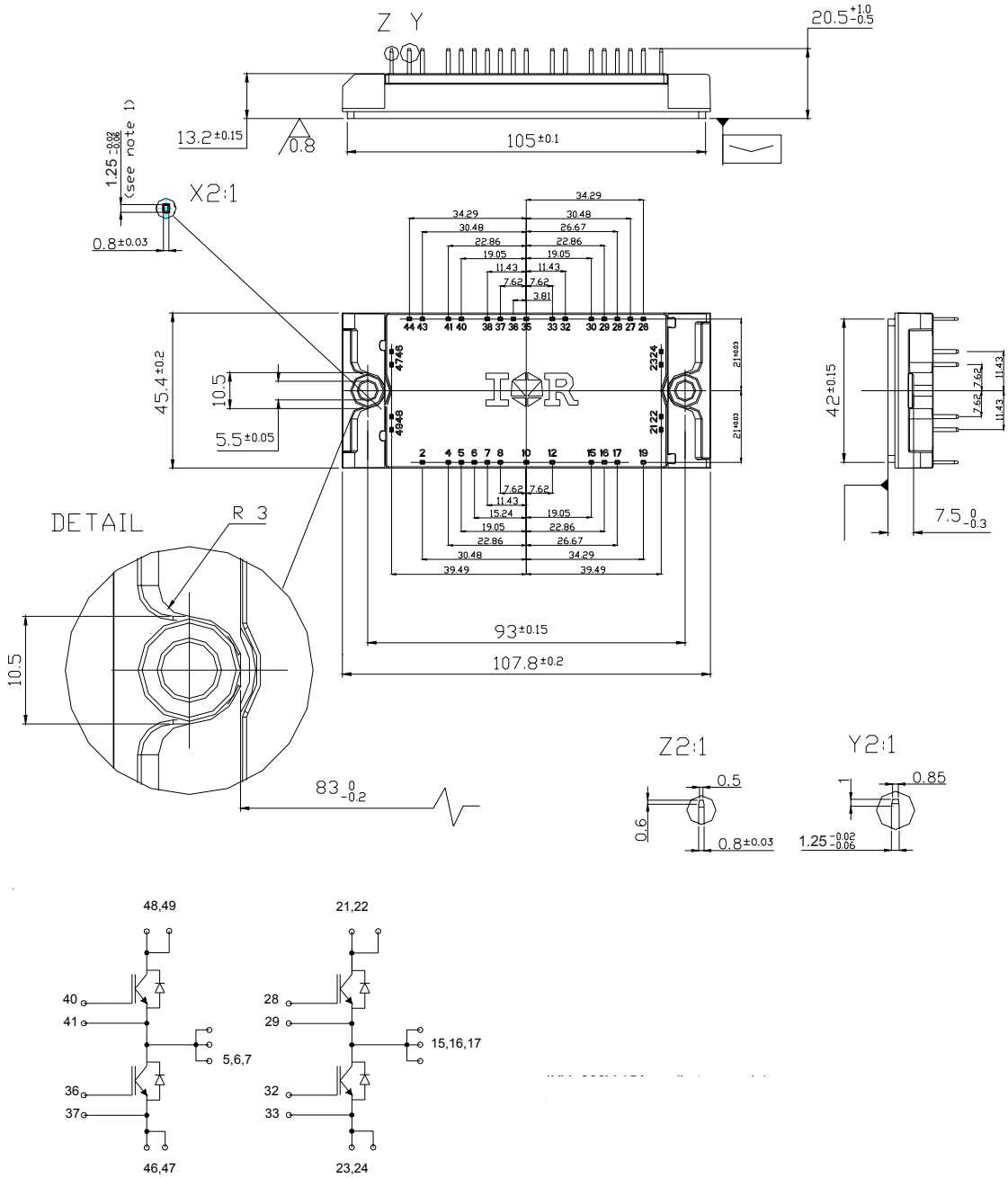


Fig.C.T.5 - Resistive Load Circuit

Econo2 4Pak Package Outline

Dimensions are shown in millimeters (inches)



International
IOR Rectifier

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