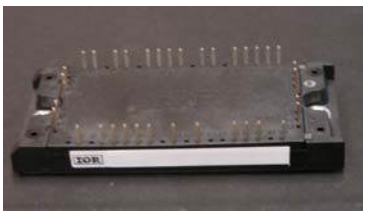
International
IOR Rectifier

GB50YF120N

IGBT FOUR PAK MODULE



ECONO2 4PAK

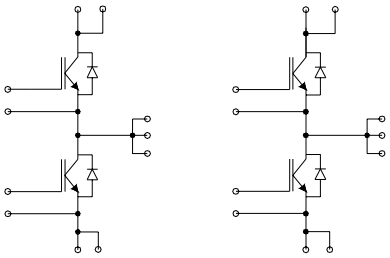
V_{CES} = 1200V

I_C = 50A @ T_C = 66°C

$V_{CE(on)}$ typ. = 3.49V

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	66	A
I_C @ Tc=80°C	Continuous Collector Current	44	
I_{CM}	Pulsed Collector Current (Ref. Fig. C.T.5)	150	
I_{LM}	Clamped Inductive Load Current	150	
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)	330	W
P_D @ Tc=80°C	Maximum Power Dissipation (IGBT)	180	
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	-	-	0.38	°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	-	3.49	3.9	V	I_C = 50A V_{GE} = 15V
		-	4.15	4.5		I_C = 75A V_{GE} = 15V
		-	4.16	4.5		I_C = 50A V_{GE} = 15V T_J = 125°C
		-	4.97	5.4		I_C = 75A V_{GE} = 15V T_J = 125°C
$V_{GE}(th)$	Gate Threshold Voltage	4.0	4.9	6.0		V_{CE} = V_{GE} IC = 250µA
$\Delta V_{GE}(th)/\Delta T_J$	Thresold Voltage temp. coefficient	-	- 10	-	mV/°C	V_{CE} = V_{GE} IC = 1mA (25°C-125°C)
I_{CES}	Zero Gate Voltage Collector Current	-	11	250	µA	V_{GE} = 0 V_{CE} = 1200V
		-	600	1000		V_{GE} = 0 V_{CE} = 1200V Tj = 125°C
V_{FM}	Diode Forward Voltage Drop	-	3.30	4.5	V	I_F = 50A
		-	3.90	5.0		I_F = 75A
		-	3.6	4.8		I_F = 50A Tj = 125°C
		-	4.37	5.5		I_F = 75A 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)	-	400	-		I_C = 50A
Q_{GE}	Gate-to-Emitter Charge (turn-on)	-	43	-	nC	V_{CC} = 600A
Q_{GC}	Gate-to-Collector Charge (turn-on)	-	187	-		V_{GE} = 15V
E_{ON}	Turn-On Switching Loss	-	930	-	µJ	I_C = 50A V_{CC} = 600V
E_{OFF}	Turn-Off Switching Loss	-	1198	-		V_{GE} = 15V R_G = 4.7Ω L = 500µH
E_{TOT}	Total Switching Loss	-	2128	-		Tj = 25°C ①
E_{ON}	Turn-On Switching Loss	-	1684	-	µJ	I_C = 50A V_{CC} = 600V
E_{OFF}	Turn-Off Switching Loss	-	1772	-		V_{GE} = 15V R_G = 4.7Ω L = 500µH
E_{TOT}	Total Switching Loss	-	3456	-		Tj = 125°C ①
$t_{d(on)}$	Turn-On delay time	-	128	-	ns	I_C = 50A V_{CC} = 600V
t_r	Rise time	-	56	-		V_{GE} = 15V R_G = 4.7Ω L =500µH
$t_{d(off)}$	Turn-Off delay time	-	292	-		Tj = 125°C
t_f	Fall time	-	134	-		
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	-	1.3	2.3	A	Tj = 25°C
		-	2.0	3		Tj = 125°C
t_{rr}	Diode Rev. Recovery Time	-	0.453	0.49	µs	Tj = 25°C V_{CC} = 600V I_F = 50A
		-	0.74	0.82	µs	Tj = 125°C dI/ dt = 7A/µs
Q_{rr}	Total Rev. Recovery Charge	-	0.12	0.3	µC	Tj = 25°C
		-	0.4	1.5	µC	Tj = 125°C

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

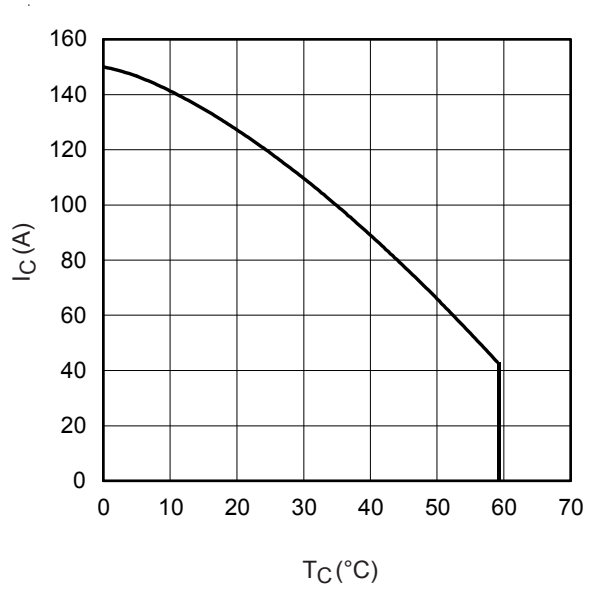


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

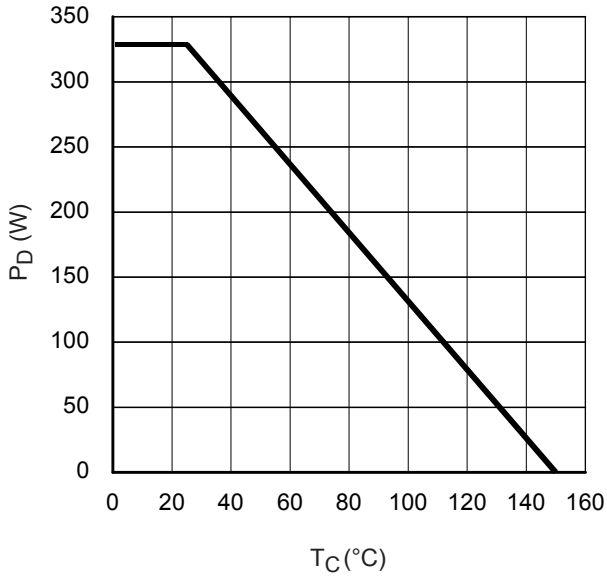


Fig. 2 - Power Dissipation vs. Case Temperature

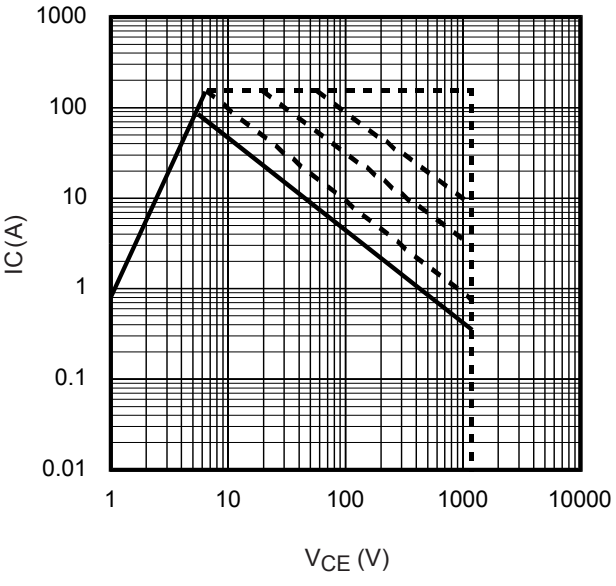


Fig. 3 - Forward SOA
T_C = 25°C; $T_J \leq$ 150°C

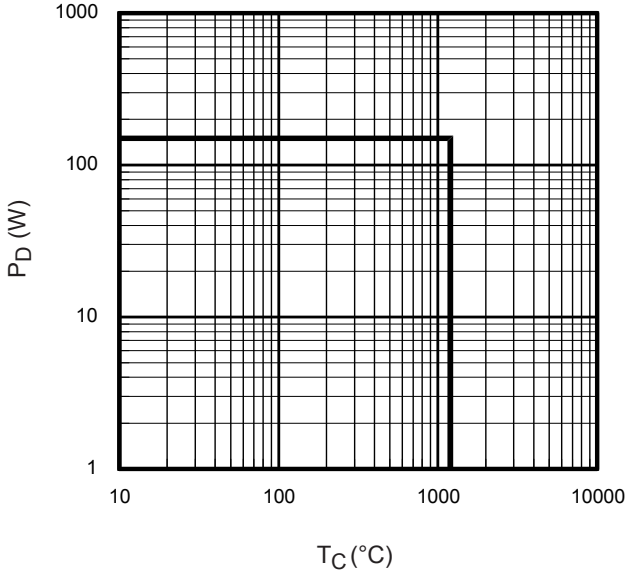


Fig. 4 - Reverse Bias SOA
T_J = 150°C; V_{GE} =15V

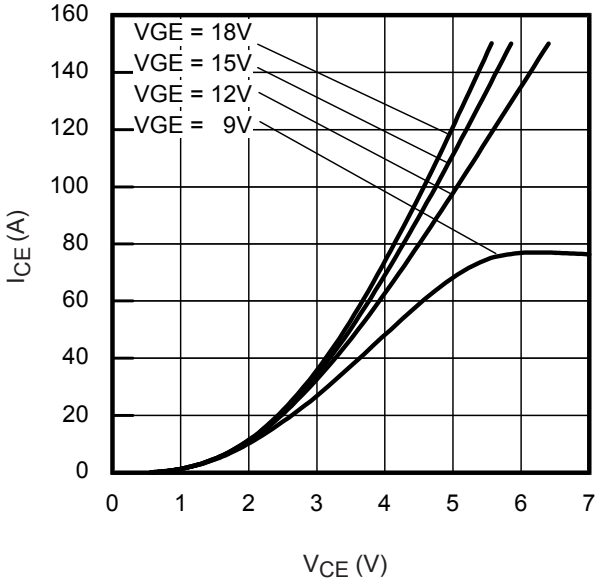


Fig. 5 - Typ. IGBT Output Characteristics
T_J = 25°C; tp = 500µs

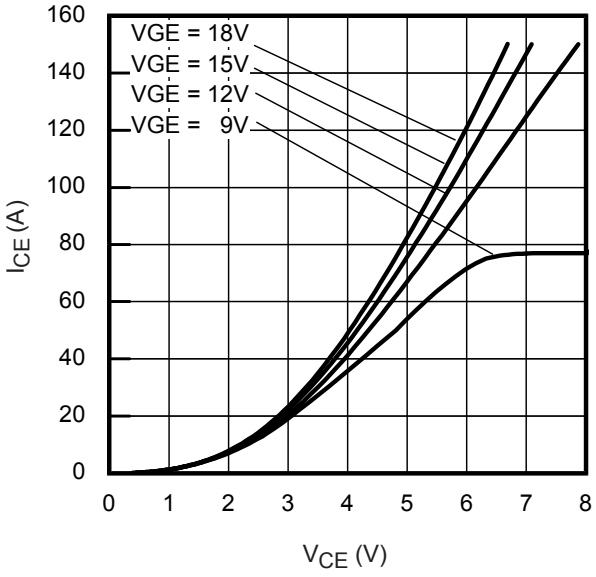


Fig. 6 - Typ. IGBT Output Characteristics
T_J = 125°C; tp = 500µs

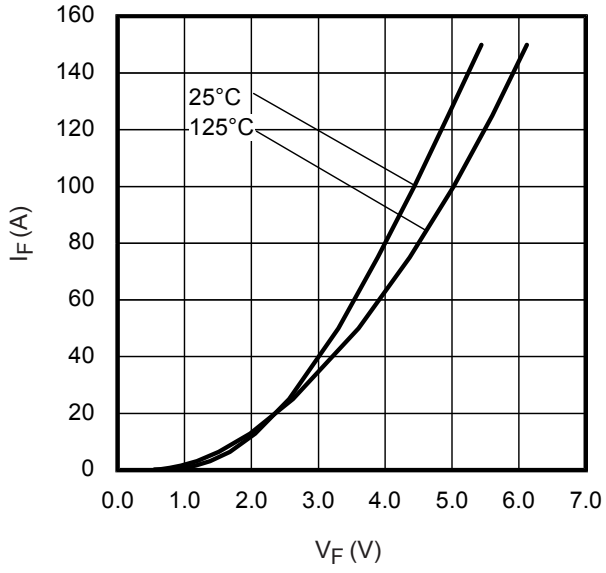


Fig. 7 - Typ. Diode Forward Characteristics
tp = 500µs

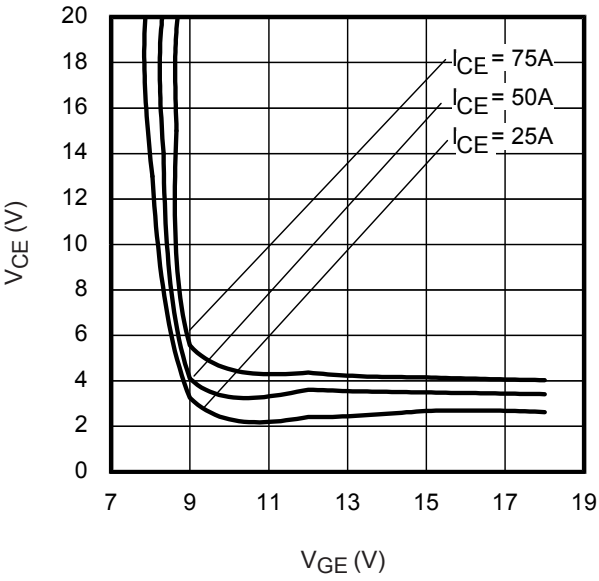


Fig. 8 - Typical V_{CE} vs. V_{GE}
T_J = 25°C

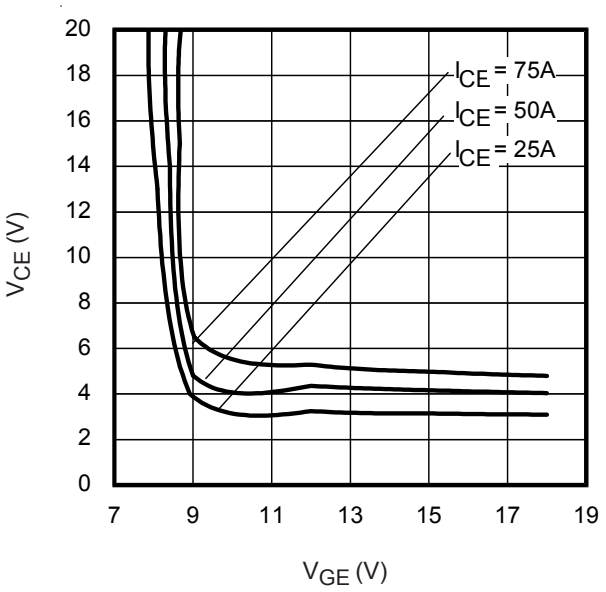


Fig. 9 - Typical V_{CE} vs. V_{GE}
T_J = 125°C

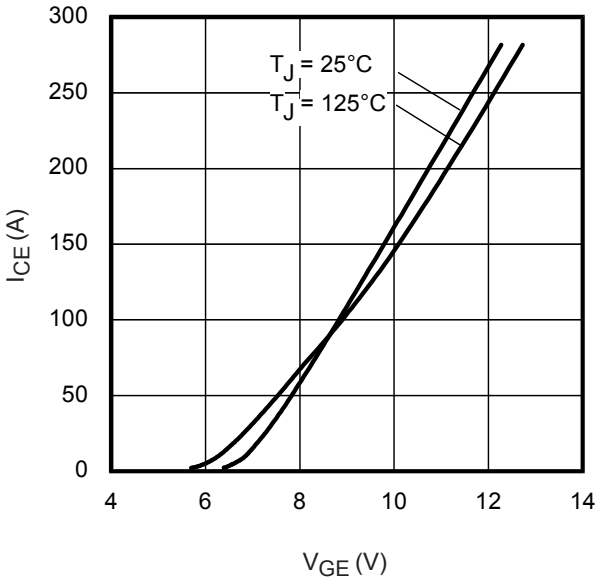


Fig. 10 - Typ. Transfer Characteristics
V_{CE} = 20V; tp = 500µs

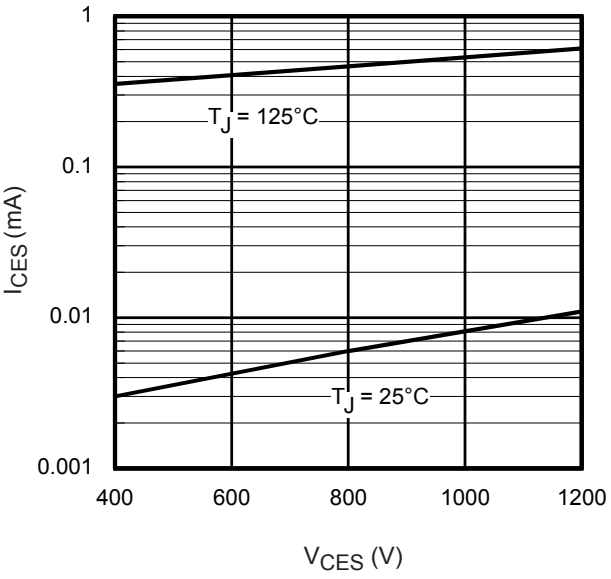


Fig. 11 - Typ Zero Gate Voltage Collector Current

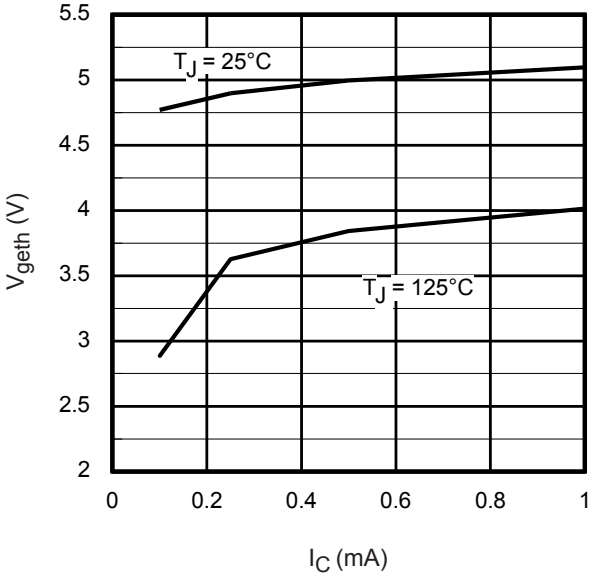


Fig. 12 - Typ Threshold Voltage

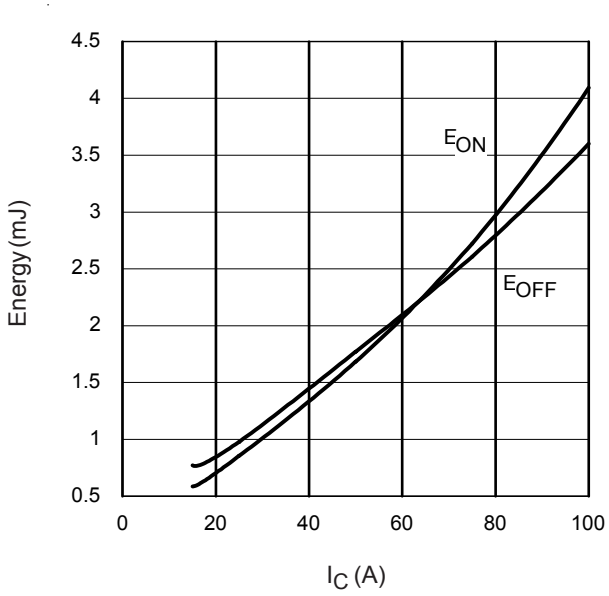


Fig. 13 - Typ. Energy Loss vs. I_C
T_J = 125°C; L=200µH; V_{CE}= 600V
R_G= 5Ω; V_{GE}= 15V

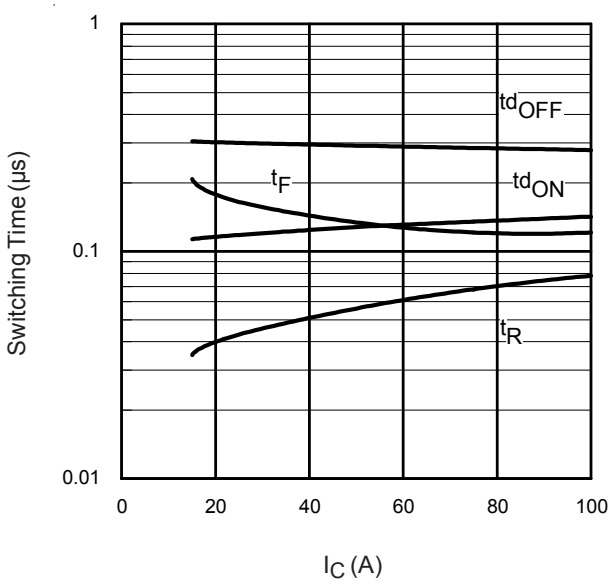


Fig. 14 - Typ. Switching Time vs. I_C
T_J = 125°C; L=200µH; V_{CE}= 600V
R_G= 5Ω; V_{GE}= 15V

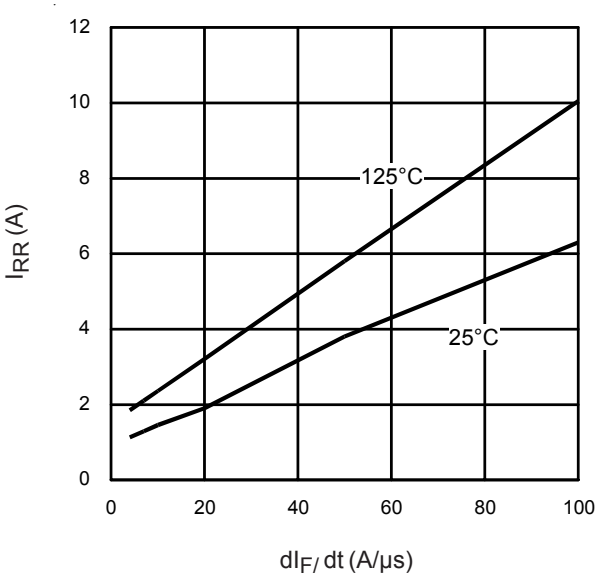


Fig. 15- Typical Diode I_{REC} vs. di_F/dt
V_{CC}= 600V; I_F= 50A

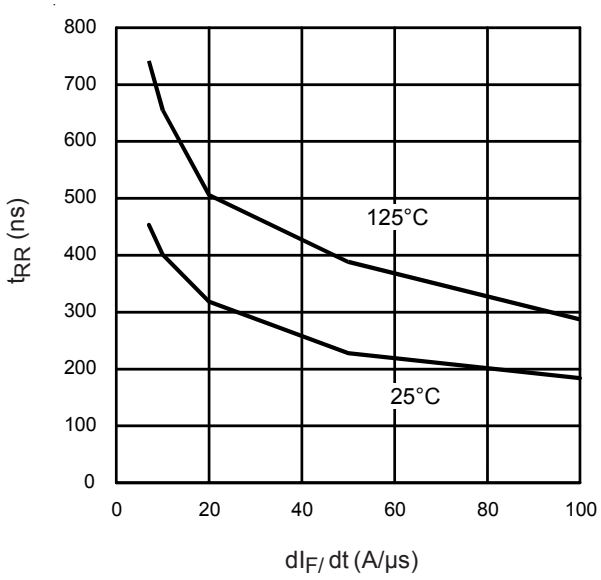


Fig. 16- Typical Diode t_{RR} vs. di_F/dt
V_{CC}= 600V; I_F= 50A

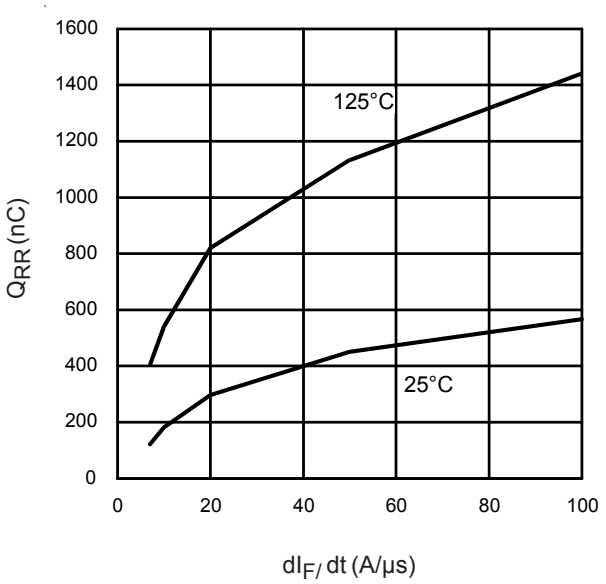


Fig. 17- Typical Diode Q_{RR} vs. di_F/dt
V_{CC}= 600V; I_F= 50A

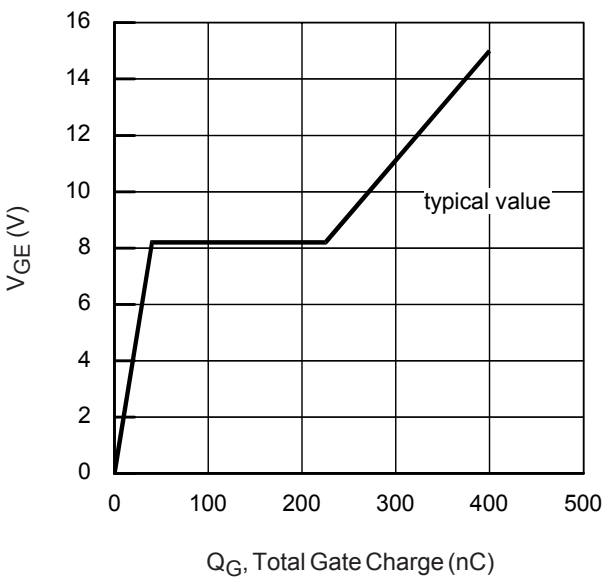


Fig. 18 - Typical Gate Charge vs. V_{GE}
I_{CE} = 5.0A; L = 600µH

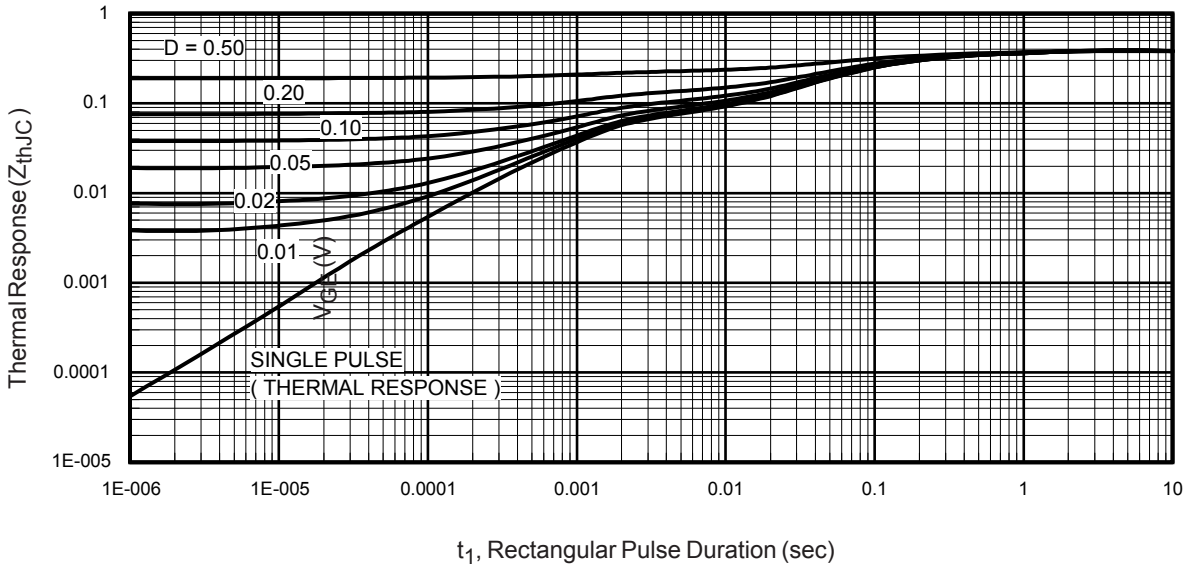


Fig 19 - Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)

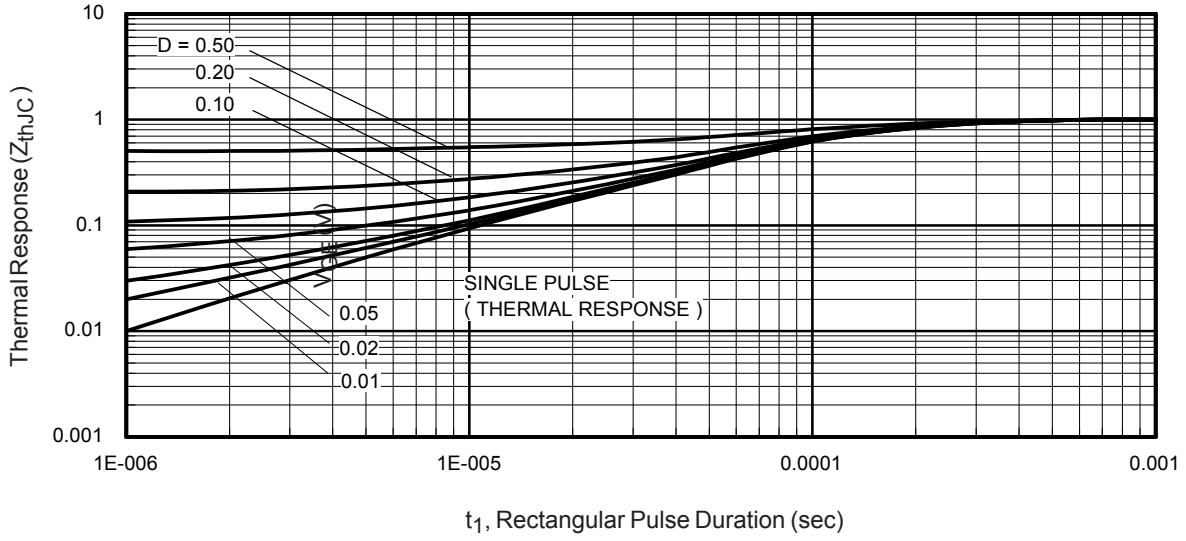


Fig 20 - Maximum Transient Thermal Impedance, Junction-to-Case (DIODE)

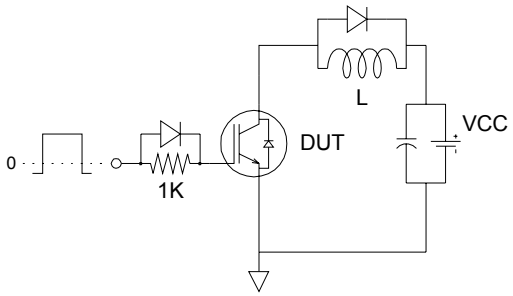


Fig.C.T.1 - Gate Charge Circuit (turn-off)

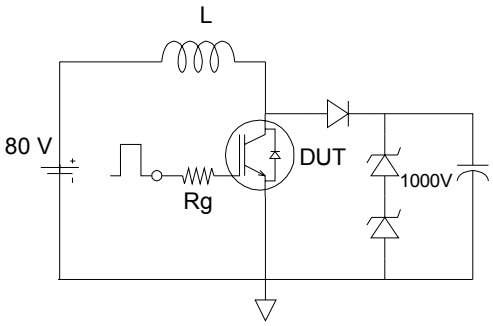


Fig.C.T.2 - RBSOA Circuit

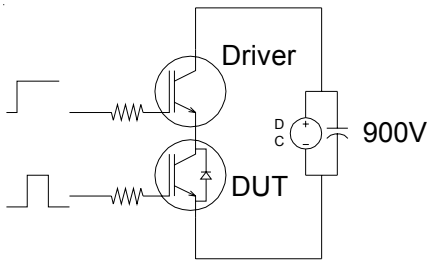


Fig.C.T.3 - S.C. SOA Circuit

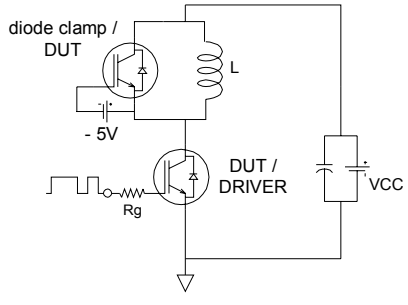


Fig.C.T.4 - Switching Loss Circuit

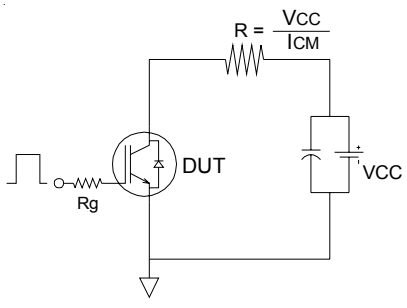
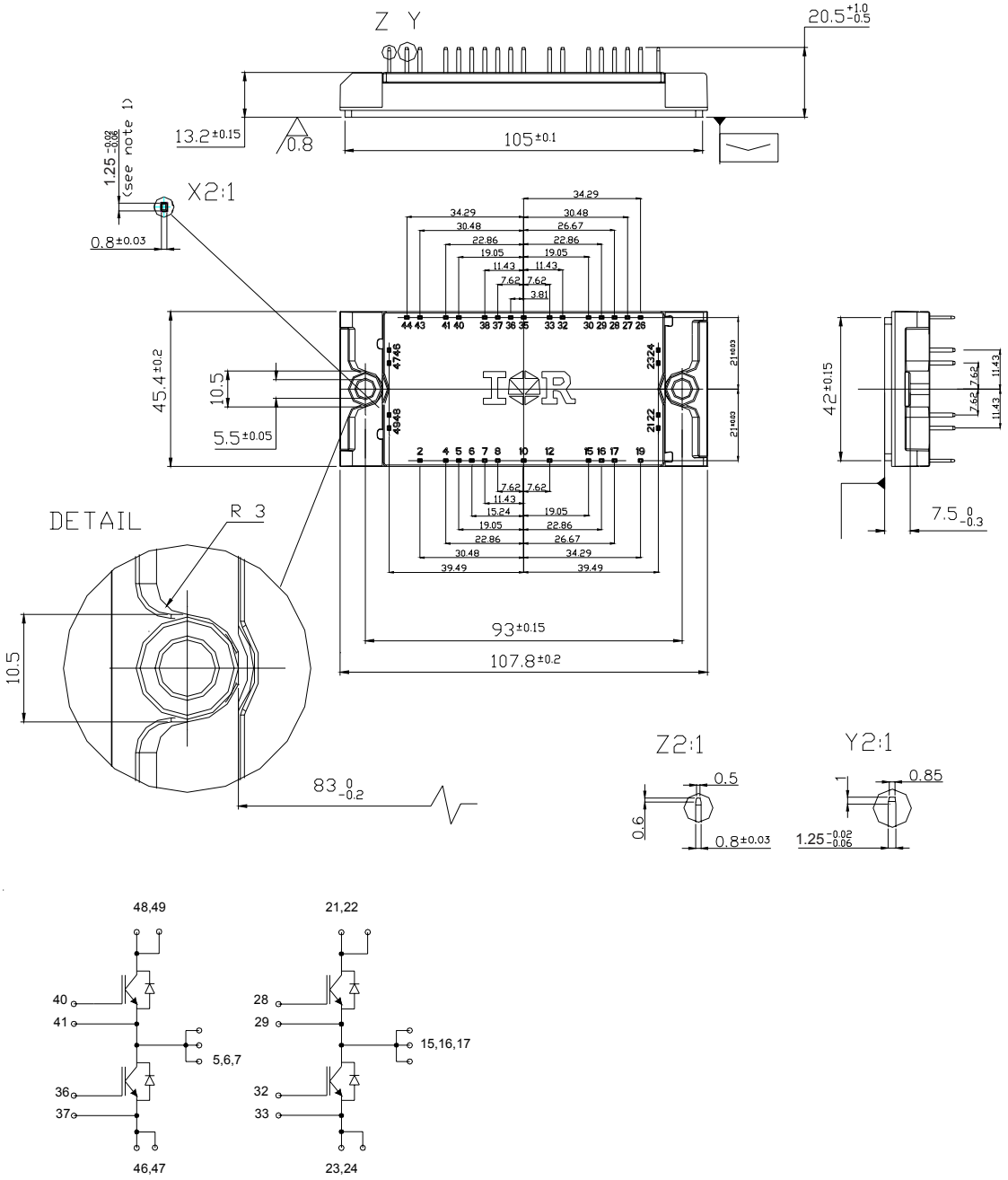


Fig.C.T.5 - Resistive Load Circuit

Econo2 4Pak Package Outline

Dimensions are shown in millimeters (inches)



Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial market.
Qualification Standards can be found on IR's Web site.

International
IOR Rectifier

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Notice

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