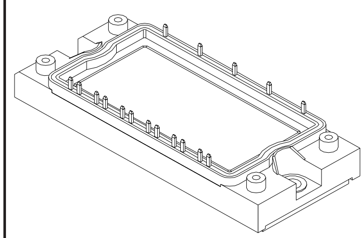
International
IOR Rectifier

GB50XF120K

IGBT SIXPACK MODULE



ECONO2 6PACK

V_{CES} = 1200V

I_C = 50A @ T_C=80°C

t_{sc} > 10µs @ T_J=150°C

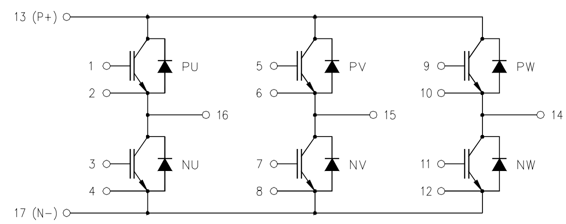
$V_{CE(on)}$ typ. = 2.45V

Features

- Low VCE (on) Non Punch Through IGBT Technology
- Low Diode VF
- 10µs Short Circuit Capability
- Square RBSOA
- HEXFRED Antiparallel Diode with Ultrasoft Reverse Recovery Characteristics
- Positive V_{CE} (on) Temperature Coefficient
- Ceramic DBC Substrate
- Low Stray Inductance Design

Benefits

- Benchmark Efficiency for Motor Control
- Rugged Transient Performance
- Low EMI, Requires Less Snubbing
- Direct Mounting to Heatsink
- PCB Solderable Terminals
- Low Junction to Case Thermal Resistance
- UL Approved E78996



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
I_C @ Tc=25°C	Continuous Collector Current	75	A
I_C @ Tc=80°C	Continuous Collector Current	50	
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	75	
I_F @ Tc=80°C	Diode Continuous Forward Current	50	
I_{FM}	Pulsed Diode Maximum Forward Current	150	
V_{GE}	Gate-to-Emitter Voltage	±20	V
P_D @ Tc=25°C	Maximum Power Dissipation (IGBT and Diode)	329	W
P_D @ Tc=80°C	Maximum Power Dissipation (IGBT and Diode)	184	
T_J	Maximum Operating Junction Temperature	150	°C
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	-	-	0.70	
$R_{\theta CS}$ (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
$\Delta V_{(BR)CES}/\Delta T_J$	Temp. Coefficient of Breakdown Voltage	-	0.31	-	V/°C	V_{GE} = 0 IC = 1mA (25°C - 125°C)
$V_{CE(ON)}$	Collector-to-Emitter Voltage	-	2.45	2.65	V	I_C = 50A V_{GE} = 15V
		-	2.85	3.15		I_C = 75A V_{GE} = 15V
		-	2.85	-		I_C = 50A V_{GE} = 15V T_J = 125°C
		-	3.45	-		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	-	-12	-	mV/°C	$V_{CE} = V_{GE}$ IC = 1mA (25°C-125°C)
I_{CES}	Zero Gate Voltage Collector Current	-	-	100	µA	V_{GE} = 0 V_{CE} = 1200V
		-	1000	-		V_{GE} = 0 V_{CE} = 1200V Tj = 125°C
V_{FM}	Diode Forward Voltage Drop	-	1.95	2.25	V	I_F = 50A
		-	2.20	2.60		I_F = 75A
		-	2.05	-		I_F = 50A Tj = 125°C
		-	2.40	-		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)	-	355	535	nC	I_C = 50A
Q_{GE}	Gate-to-Emitter Charge (turn-on)	-	35	55		V_{CC} = 600A
Q_{GC}	Gate-to-Collector Charge (turn-on)	-	165	250		V_{GE} = 15V
E_{ON}	Turn-On Switching Loss	-	3600	4635	µJ	I_C = 50A V_{CC} = 600V
E_{OFF}	Turn-Off Switching Loss	-	3740	4780		V_{GE} = 15V R_G = 10Ω L = 400µH
E_{TOT}	Total Switching Loss	-	7340	9415		Tj = 25°C ①
E_{ON}	Turn-On Switching Loss	-	5050	7100	µJ	I_C = 50A V_{CC} = 600V
E_{OFF}	Turn-Off Switching Loss	-	5525	7750		V_{GE} = 15V R_G = 10Ω L = 400µH
E_{TOT}	Total Switching Loss	-	10575	14850		Tj = 125°C ①
$t_{d(on)}$	Turn-On delay time	-	60	80	ns	I_C = 50A V_{CC} = 600V
t_r	Rise time	-	40	60		V_{GE} = 15V R_G = 10Ω L =400µH
$t_{d(off)}$	Turn-Off delay time	-	570	665		Tj = 125°C
t_f	Fall time	-	205	270		
C_{ies}	Input Capacitance	-	4945	-	pF	V_{GE} = 0
C_{oes}	Output Capacitance	-	885	-		V_{CC} = 30V
C_{res}	Reverse Transfer Capacitance	-	100	-		f = 1Mhz
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	-	87	-	A	Tj = 125°C V_{CC} = 600V I_F = 50A L = 400µH V_{GE} = 15V R_G = 10Ω

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

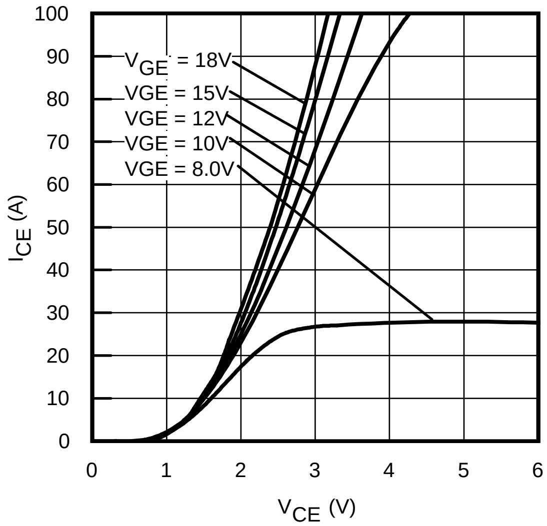


Fig. 1 - Typ. IGBT Output Characteristics
T_J = 25°C; tp = 80µs

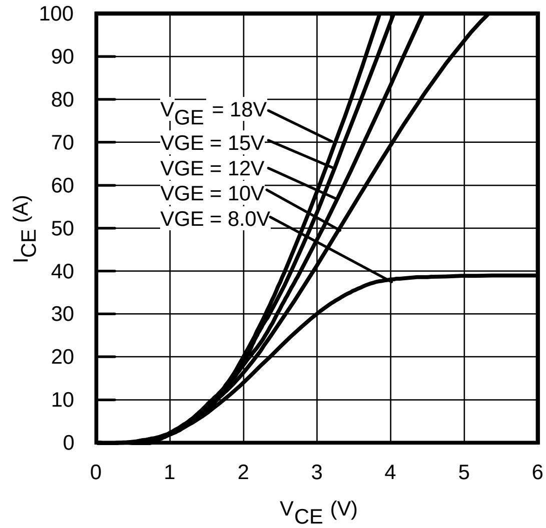


Fig. 2 - Typ. IGBT Output Characteristics
T_J = 125°C; tp = 80µs

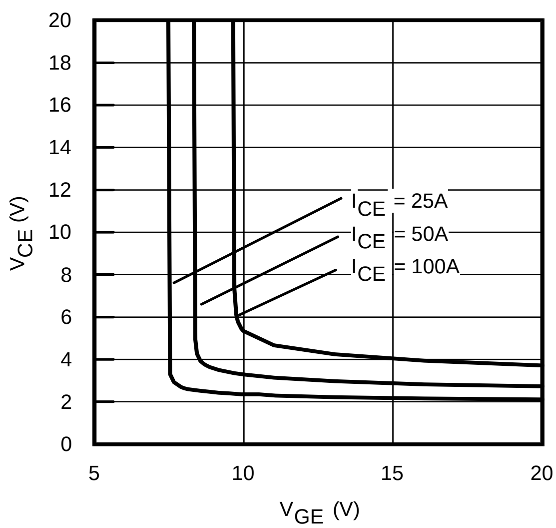


Fig. 3 - Typical V_{CE} vs. V_{GE}
T_J = 25°C

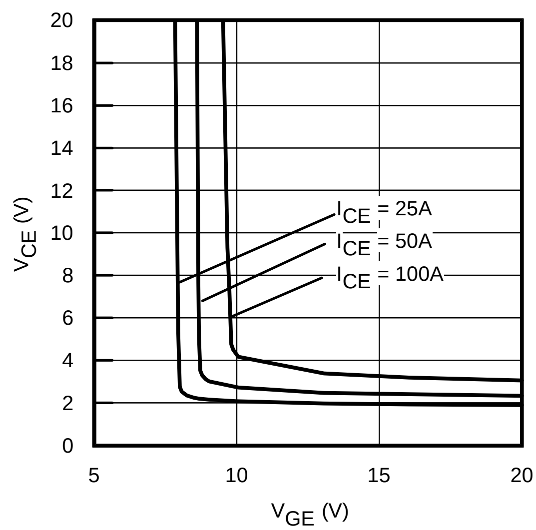


Fig. 4 - Typical V_{CE} vs. V_{GE}
T_J = 125°C

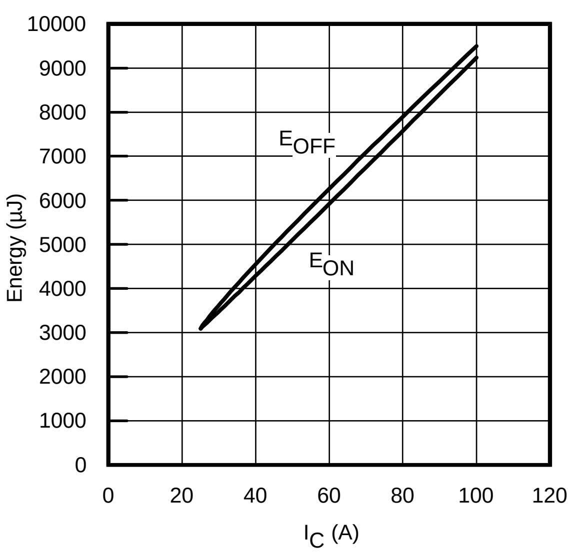


Fig. 5 - Typ. Energy Loss vs. I_C
T_J = 125°C; L=400µH; V_{CE}= 600V
R_G= 10Ω; V_{GE}= 15V

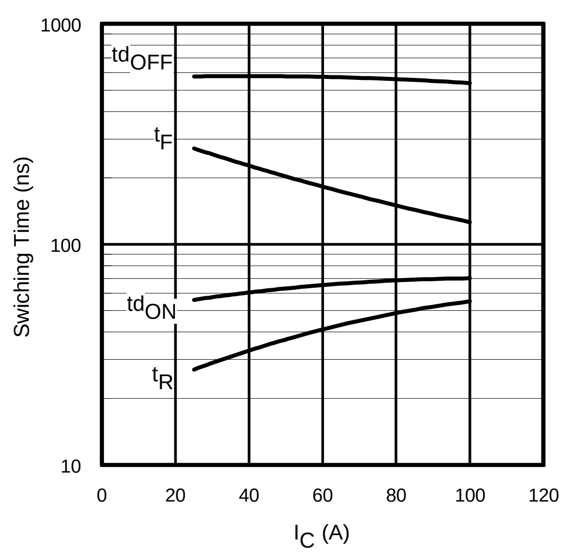


Fig. 6 - Typ. Switching Time vs. I_C
T_J = 125°C; L=400µH; V_{CE}= 600V
R_G= 10Ω; V_{GE}= 15V

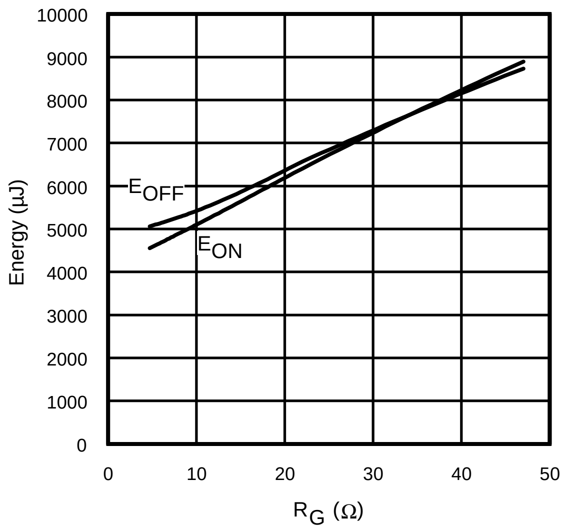


Fig. 7 - Typ. Energy Loss vs. R_G
T_J = 125°C; L=400µH; V_{CE}= 600V
I_{CE}= 50A; V_{GE}= 15V

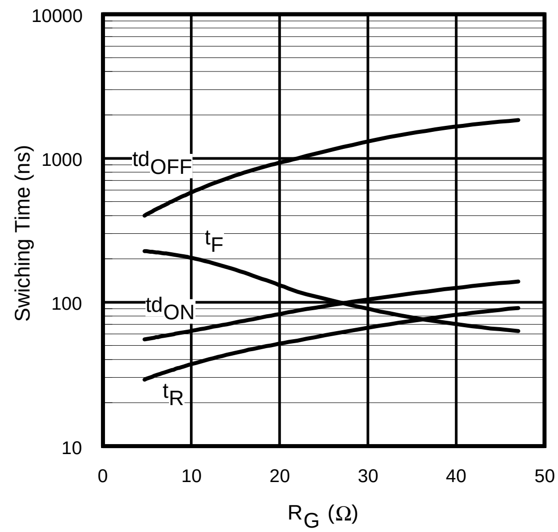


Fig. 8 - Typ. Switching Time vs. R_G
T_J = 125°C; L=400µH; V_{CE}= 600V
I_{CE}= 50A; V_{GE}= 15V

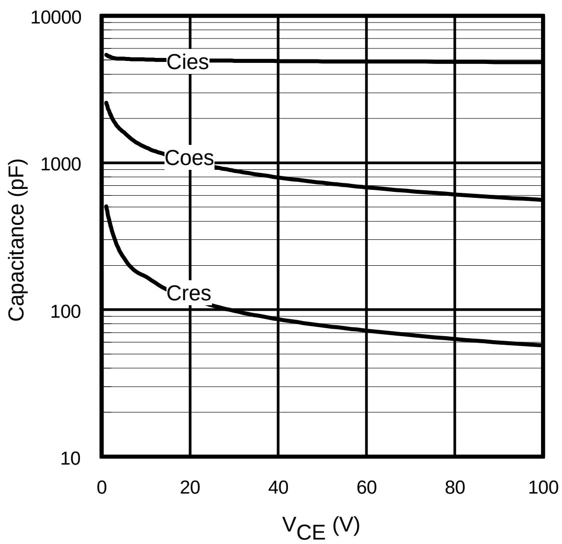


Fig. 9- Typ. Capacitance vs. V_{CE}
V_{GE}= 0V; f = 1MHz

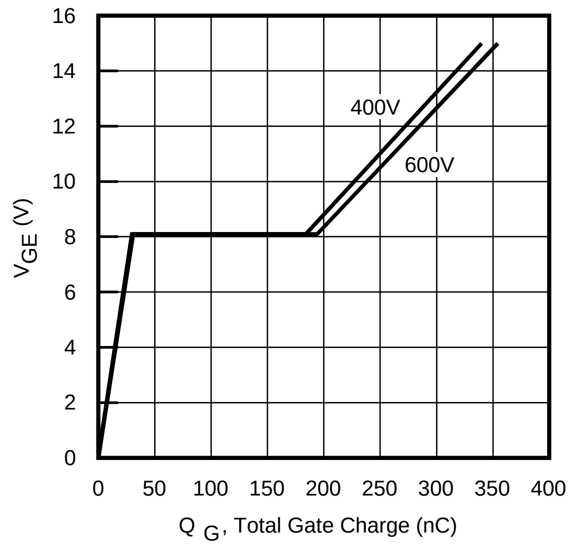


Fig. 10 - Typical Gate Charge vs. V_{GE}
I_{CE} = 50A; L = 600µH

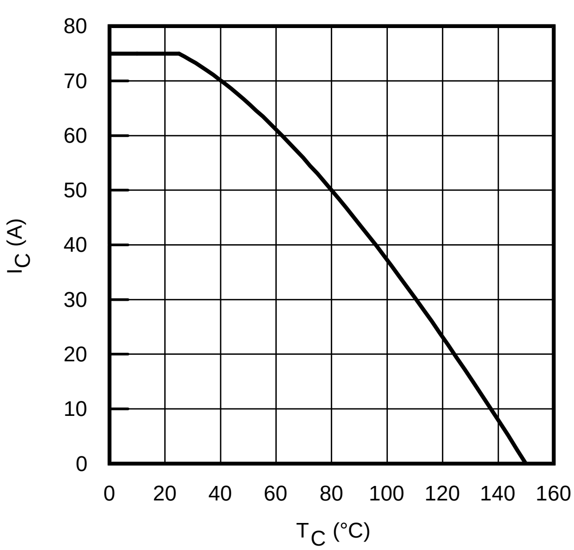


Fig. 11 - Maximum DC Collector Current vs. Case Temperature

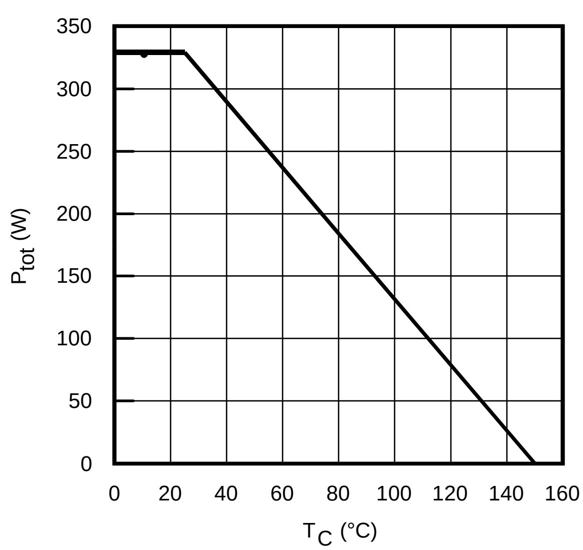


Fig. 12 - Power Dissipation vs. Case Temperature

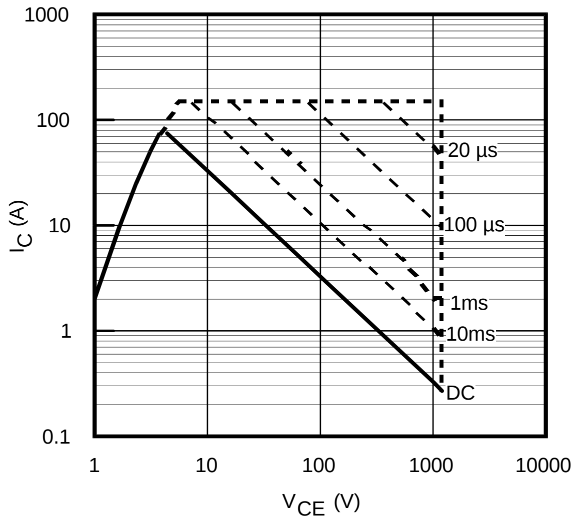


Fig. 13 - Forward SOA
$T_C = 25°C$; $T_J \leq 150°C$

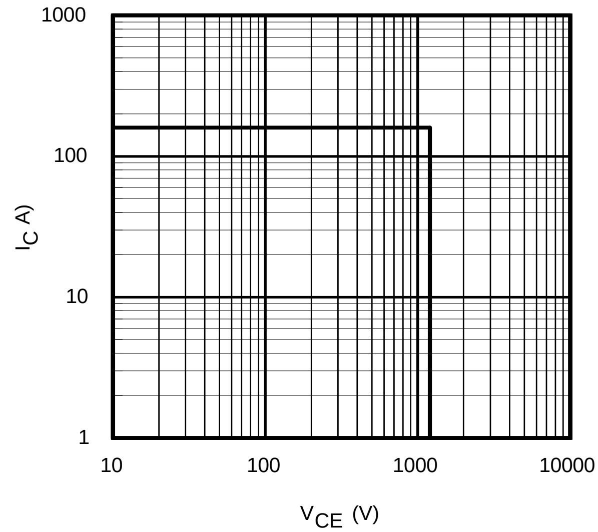


Fig. 14 - Reverse Bias SOA
$T_J = 150°C$; $V_{GE} = 15V$

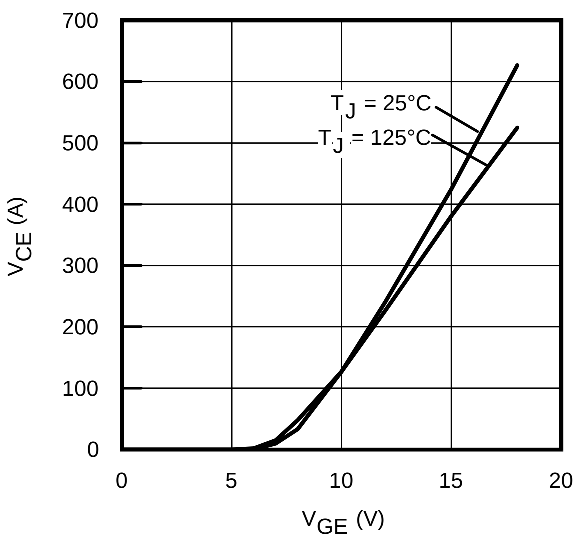


Fig. 15 - Typ. Transfer Characteristics
V_{CE}=50V; tp=10µs

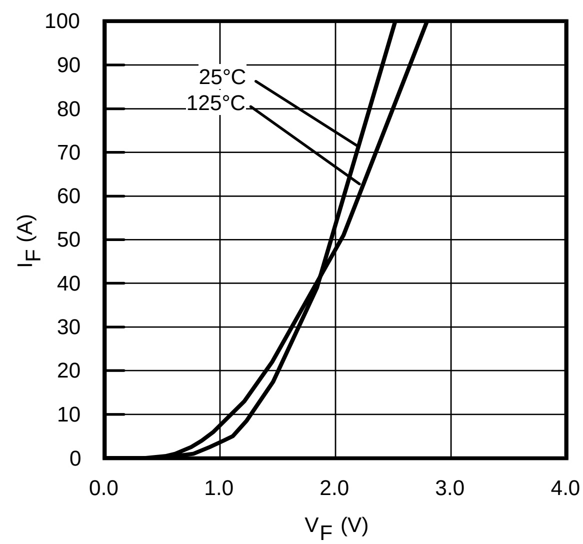


Fig. 16 - Typ. Diode Forward Characteristics
tp = 80µs

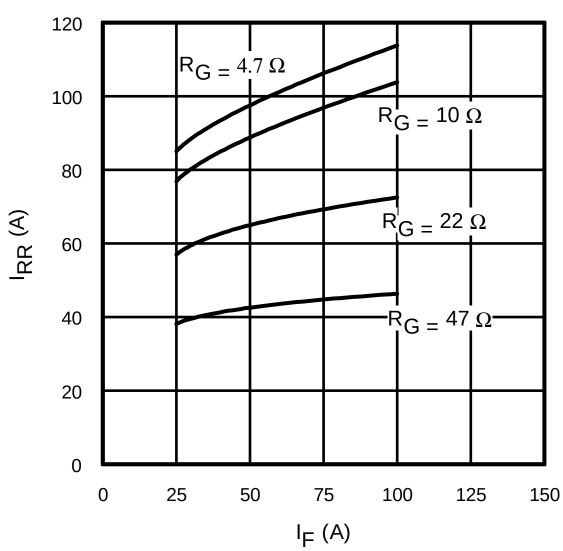


Fig. 17 - Typical Diode I_{RR} vs. I_F
$T_J = 125°C$

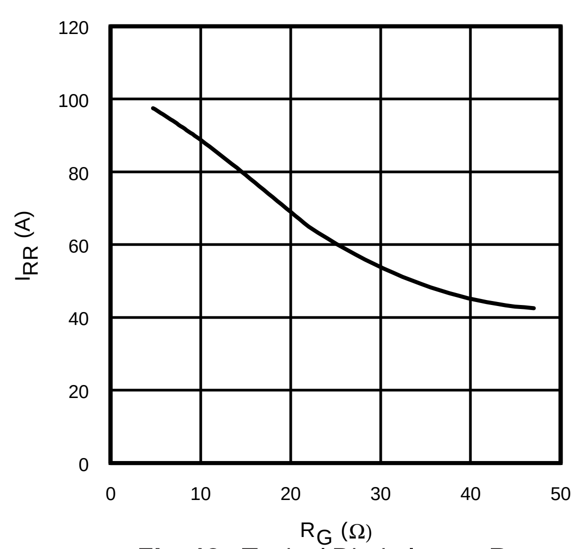


Fig. 18 - Typical Diode I_{RR} vs. R_G
$T_J = 125°C$; $I_F = 50A$

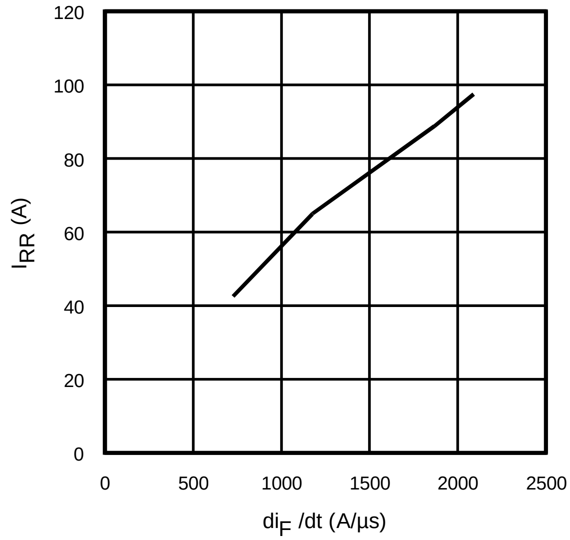


Fig. 19- Typical Diode I_{RR} vs. di_F/dt ; V_{CC}= 600V; V_{GE}= 15V; I_{CE}= 50A; T_J = 125°C

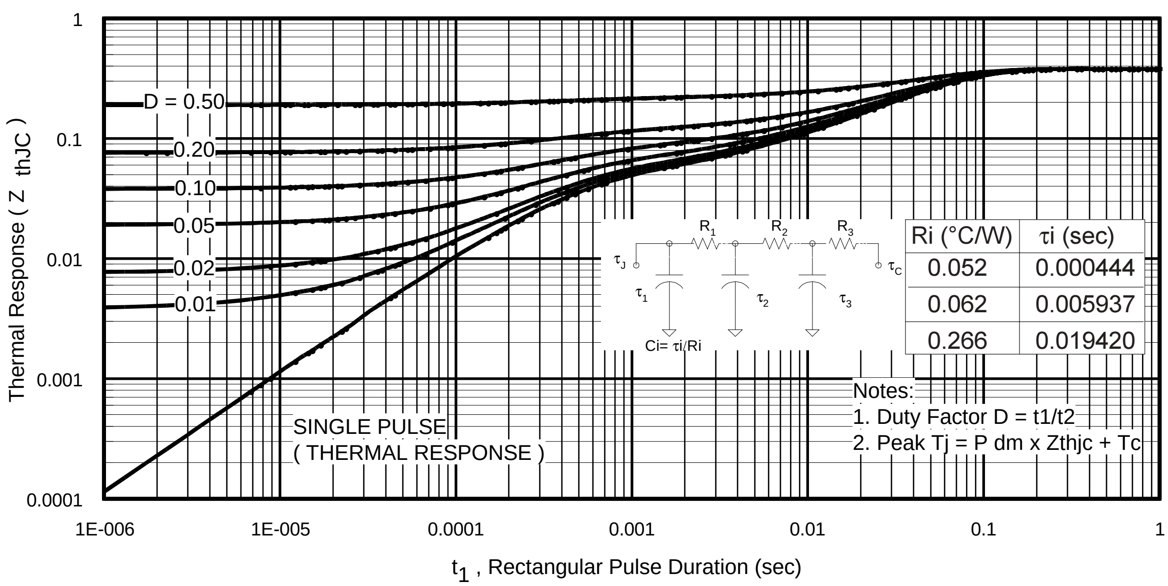


Fig 20. Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)

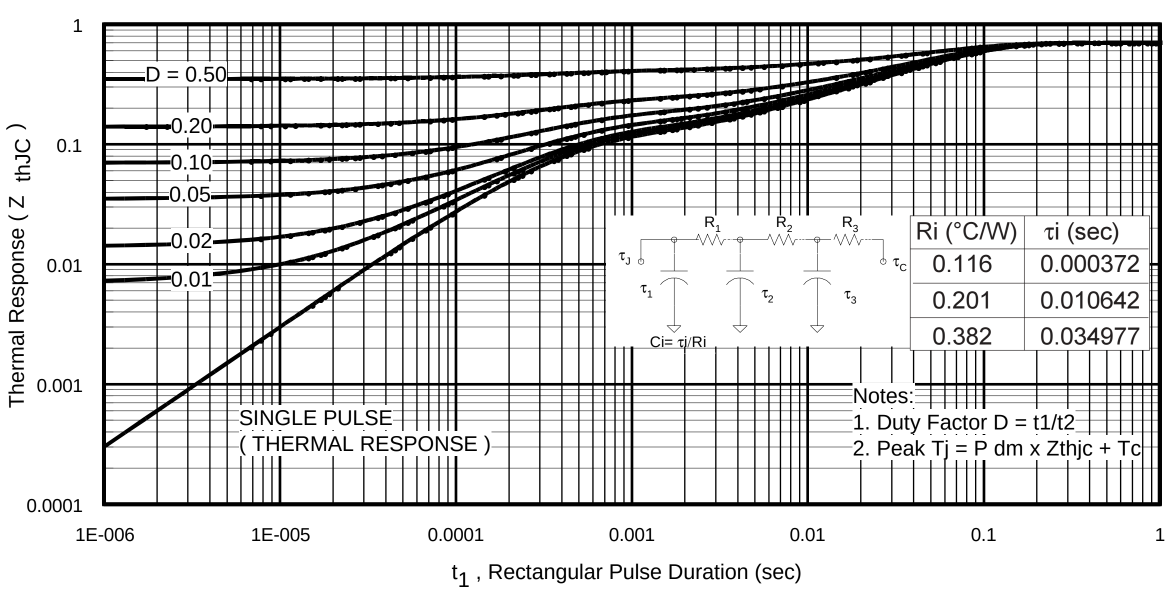


Fig 21. Maximum Transient Thermal Impedance, Junction-to-Case (DIODE)

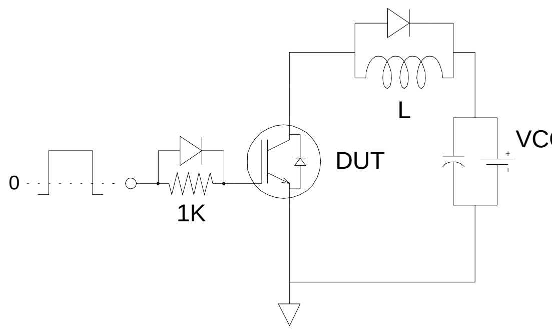


Fig.C.T.1 - Gate Charge Circuit (turn-off)

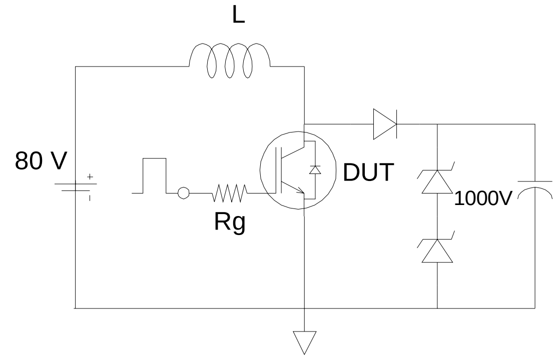


Fig.C.T.2 - RBSOA Circuit

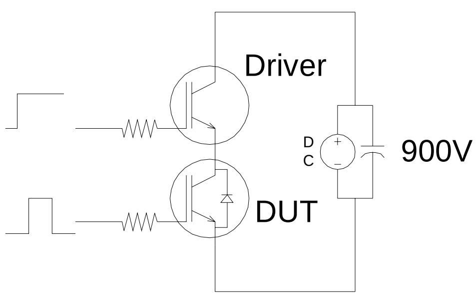


Fig.C.T.3 - S.C. SOA Circuit

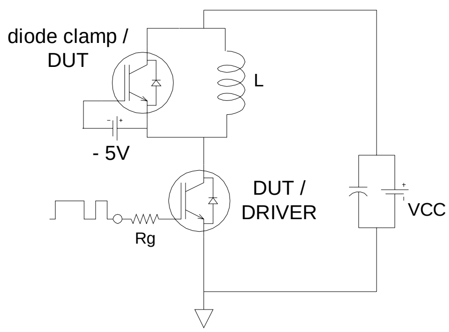


Fig.C.T.4 - Switching Loss Circuit

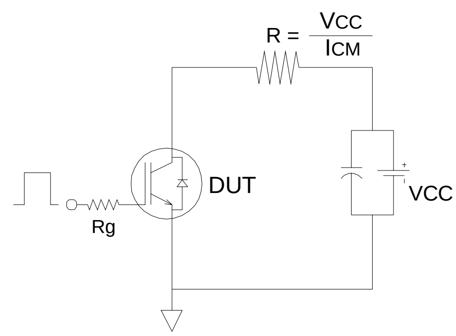


Fig.C.T.5 - Resistive Load Circuit

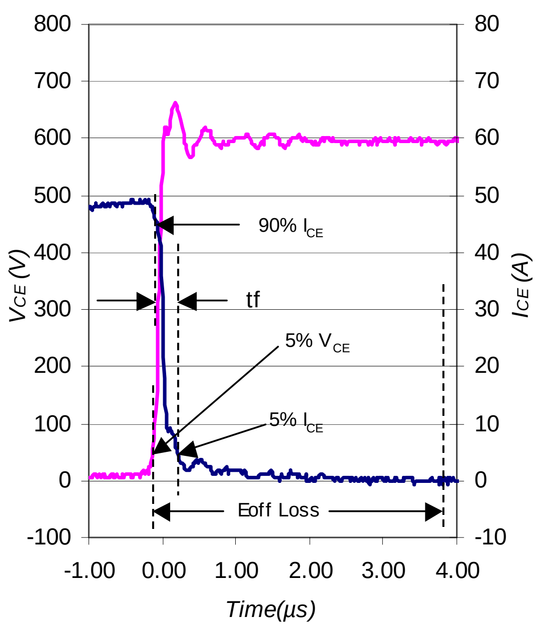


Fig. WF1- Typ. Turn-off Loss Waveform
@ T_J = 125°C using Fig. CT.4

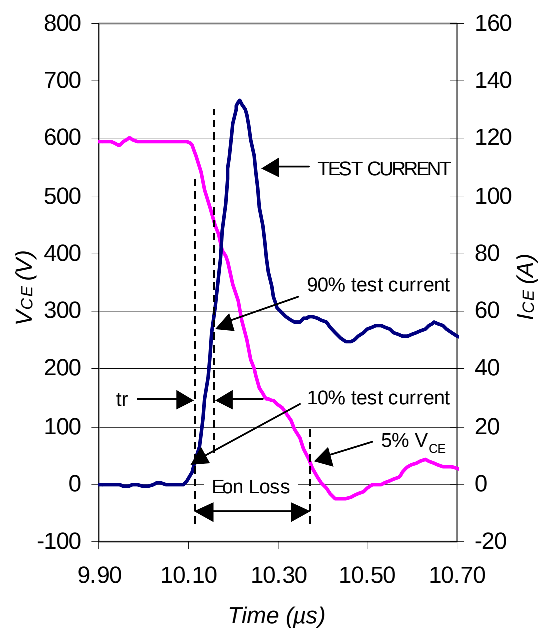
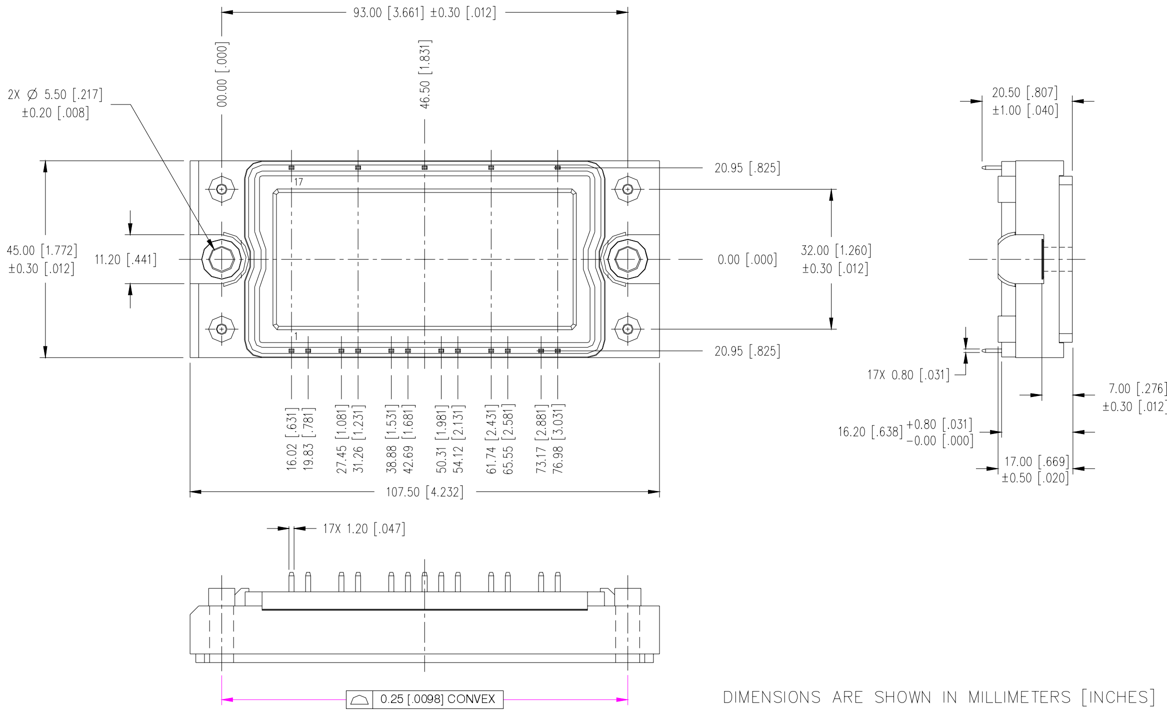


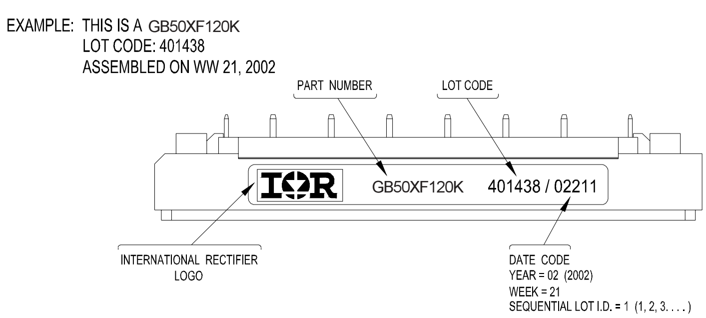
Fig. WF2- Typ. Turn-on Loss Waveform
@ T_J = 125°C using Fig. CT.4

Econo2 6Pak Package Outline

Dimensions are shown in millimeters (inches)



Econo2 6Pak Part Marking Information



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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