International
IOR Rectifier

GB25XF120K

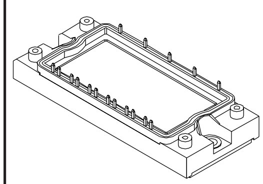
IGBT 6PACK MODULE

Features

- Low VCE (on) Non Punch Through IGBT Technology
- Low Diode VF
- 10µs Short Circuit Capability
- Square RBSOA
- HEXFRED Antiparallel Diode with Ultrasoft Diode Reverse Recovery Characteristics
- Positive VCE (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 Listed ①



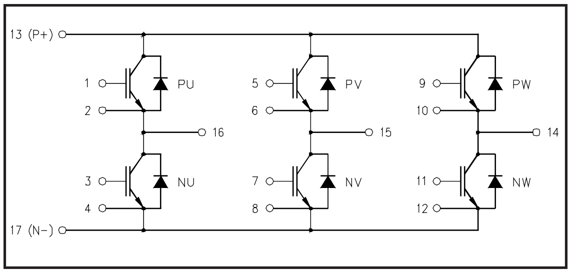
ECONO2 6PACK

V_{CES} = 1200V

I_C = 25A, T_C=80°C

t_{sc} > 10µs, T_J=150°C

$V_{CE(on)}$ typ. = 2.35V



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
I_C @ T_C = 25°C	Continuous Collector Current	40	A
I_C @ T_C = 80°C	Continuous Collector Current	25	
I_{CM}	Pulsed Collector Current (Ref.Fig.C.T.5)	80	
I_{LM}	Clamped Inductive Load current	80	
I_F @ T_C = 25°C	Diode Continuous Forward Current	40	
I_F @ T_C = 80°C	Diode Continuous Forward Current	25	
I_{FM}	Diode Maximum Forward Current	80	
V_{GE}	Gate-to-Emitter Voltage	±20	V
P_D @ T_C = 25°C	Maximum Power Dissipation	198	W
P_D @ T_C = 80°C	Maximum Power Dissipation	111	
T_J	Maximum Operating Junction Temperature	150	°C
T_{STG}	Storage Temperature Range	-40 to +125	
V_{ISOL}	Isolation Voltage	AC 2500 (1min)	V

Thermal and Mechanical Characteristics

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Junction-to-Case- IGBT	——	——	0.63	°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

10/18/02

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

	Parameter	Min.	Typ.	Max.	Units	Conditions	Ref.Fig
BV_{CES}	Collector-to-Emitter Breakdown Voltage	1200	—	—	V	V_{GE} = 0V, I_C = 500µA	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.84	—	V/°C	V_{GE} = 0V, I_C = 1mA (25°C-125°C)	
$V_{CE(on)}$	Collector-to-Emitter Voltage	—	2.35	2.50	V	I_C = 25A, V_{GE} = 15V	1,2
		—	2.80	3.00		I_C = 40A, V_{GE} = 15V	3,4
		—	2.75	—		I_C = 25A, V_{GE} = 15V, T_J = 125°C	
		—	3.40	—		I_C = 40A, V_{GE} = 15V, T_J = 125°C	
$V_{GE(th)}$	Gate Threshold Voltage	4.0	5.0	6.0		V_{CE} = V_{GE}, I_C = 250µA	3,4
$\Delta V_{GE(th)}$	Threshold Voltage temp. coefficient	—	-12	—	mV/°C	V_{CE} = V_{GE}, I_C = 1mA (25°C-125°C)	
I_{CES}	Zero Gate Voltage Collector Current	—	5	40	µA	V_{GE} = 0V, V_{CE} = 1200V	
		—	500	—		V_{GE} = 0V, V_{CE} = 1200V, T_J = 125°C	
V_{FM}	Diode Forward Voltage Drop	—	1.90	2.40	V	I_F = 25A	16
		—	2.15	2.75		I_F = 40A	
		—	2.00	—		I_F = 25A, T_J = 125°C	
		—	2.35	—		I_F = 40A, T_J = 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	Ref.Fig
Q_g	Total Gate Charge (turn-on)	—	180	272	nC	I_C = 25A	10
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	20	33		V_{CC} = 600V	CT1
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	90	137		V_{GE} = 15V	
E_{on}	Turn-On Switching Loss	—	2220	4260	µJ	I_C = 25A, V_{CC} = 600V	CT4
E_{off}	Turn-Off Switching Loss	—	1850	3100		V_{GE} = 15V, R_G = 10Ω, L = 400µH	
E_{tot}	Total Switching Loss	—	4070	7360		T_J = 25°C ②	
E_{on}	Turn-On Switching Loss	—	3150	5120	µJ	I_C = 25A, V_{CC} = 600V	5,7
E_{off}	Turn-Off Switching Loss	—	2720	4260		V_{GE} = 15V, R_G = 10Ω, L = 400µH	CT4
E_{tot}	Total Switching Loss	—	5870	9380		T_J = 125°C ②	WF1,2
$t_{d(on)}$	Turn-On delay time	—	60	80	ns	I_C = 25A, V_{CC} = 600V	6,8
t_r	Rise time	—	30	45		V_{GE} = 15V, R_G = 10Ω, L = 400µH	CT4
$t_{d(off)}$	Turn-Off delay time	—	450	850		T_J = 125°C	WF1
t_f	Fall time	—	200	320			WF2
C_{ies}	Input Capacitance	—	2370	—	pF	V_{GE} = 0V	
C_{oes}	Output Capacitance	—	455	—		V_{CC} = 30V	9
C_{res}	Reverse Transfer Capacitance	—	60	—		f = 1Mhz	
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				T_J = 150°C, I_C = 80A R_G = 10Ω, V_{GE} = +15V to 0V	CT2 14
SCSOA	Short Circuit Safe Operating Area	10	—	—	µs	T_J = 150°C V_{CC} = 900V, V_P = 1200V R_G = 10Ω, V_{GE} = +15V to 0V	CT3
I_{rr}	Peak Reverse Recovery Current	—	55	—	A	T_J = 125°C V_{CC} = 600V, I_F = 25A, L = 400µH V_{GE} = 15V, R_G = 10Ω	17,18,19 CT4

① For UL Applications, T_J is limited to +125°C (See File E78996).
② Energy losses include "tail" and diode reverse recovery.

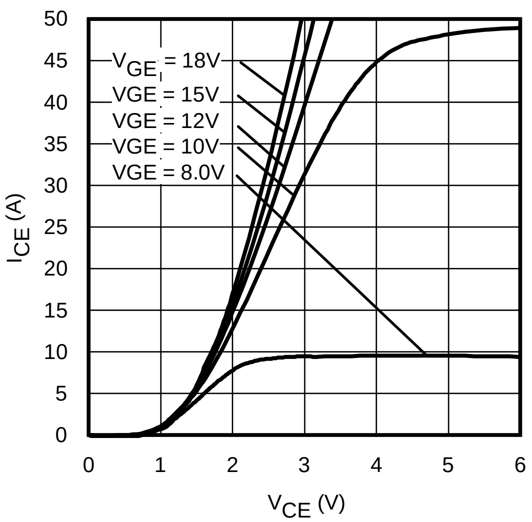


Fig. 1 - Typ. IGBT Output Characteristics
T_J = 25°C; tp = 80µs

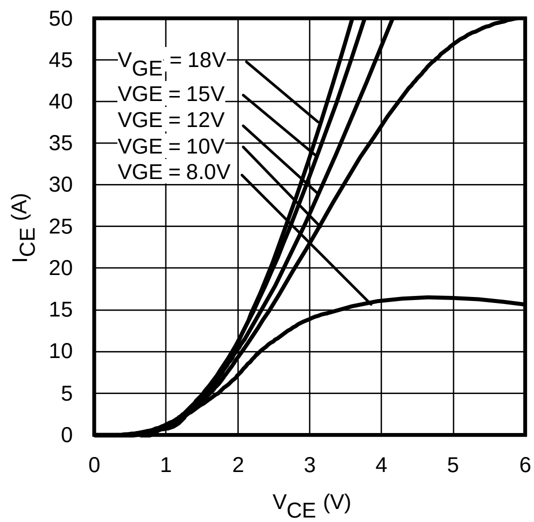


Fig. 2 - Typ. IGBT Output Characteristics
T_J = 125°C; tp = 80µs

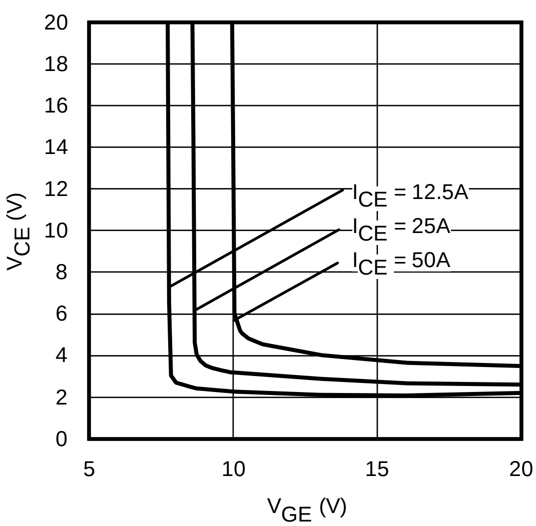


Fig. 3 - Typical V_{CE} vs. V_{GE}
T_J = 25°C

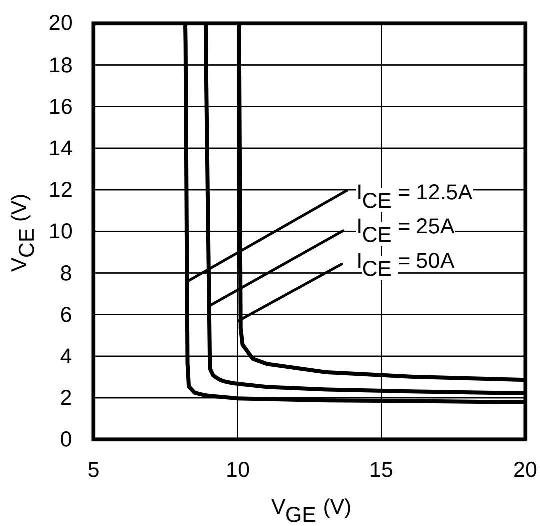


Fig. 4 - Typical V_{CE} vs. V_{GE}
T_J = 125°C

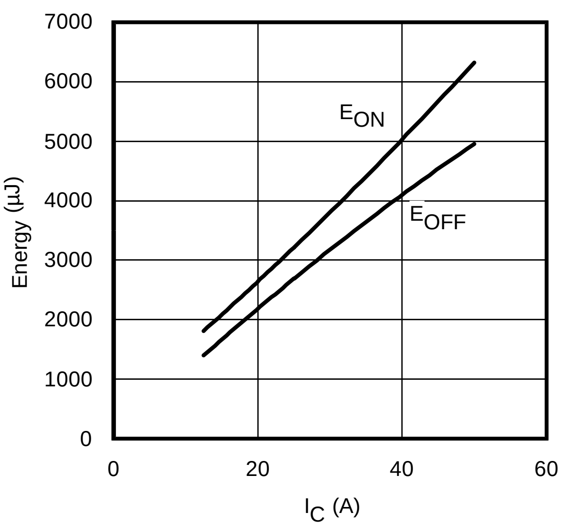


Fig. 5 - Typ. Energy Loss vs. I_C
T_J = 125°C; L=400µH; V_{CE}= 600V
R_G= 10Ω; V_{GE}= 15V

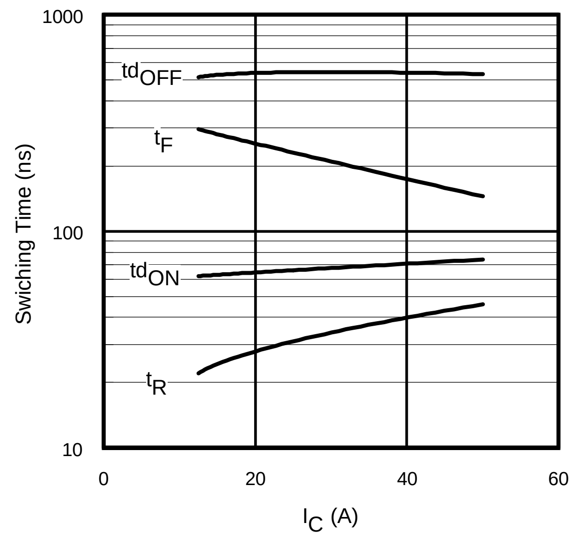


Fig. 6 - Typ. Switching Time vs. I_C
T_J = 125°C; L=400µH; V_{CE}= 600V
R_G= 10Ω; V_{GE}= 15V

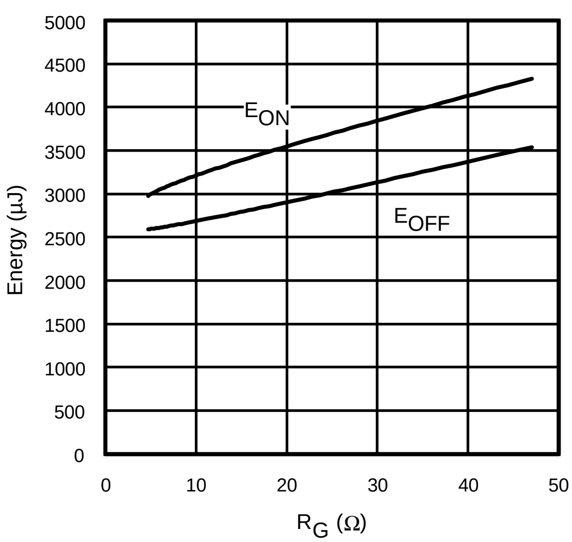


Fig. 7 - Typ. Energy Loss vs. R_G
T_J = 125°C; L=400µH; V_{CE}= 600V
I_{CE}= 25A; V_{GE}= 15V

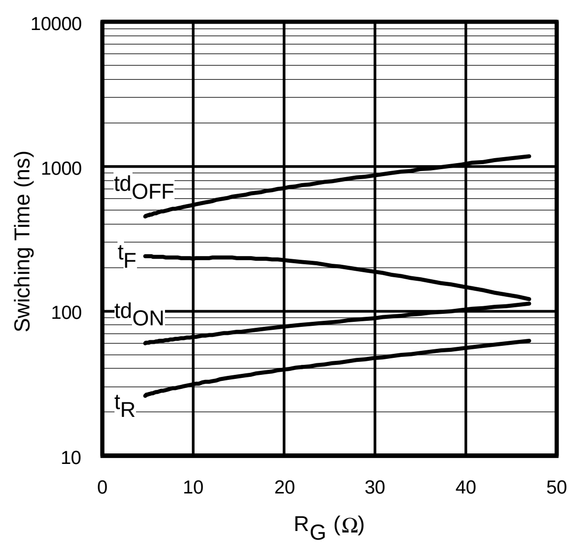


Fig. 8 - Typ. Switching Time vs. R_G
T_J = 125°C; L=400µH; V_{CE}= 600V
I_{CE}= 25A; V_{GE}= 15V

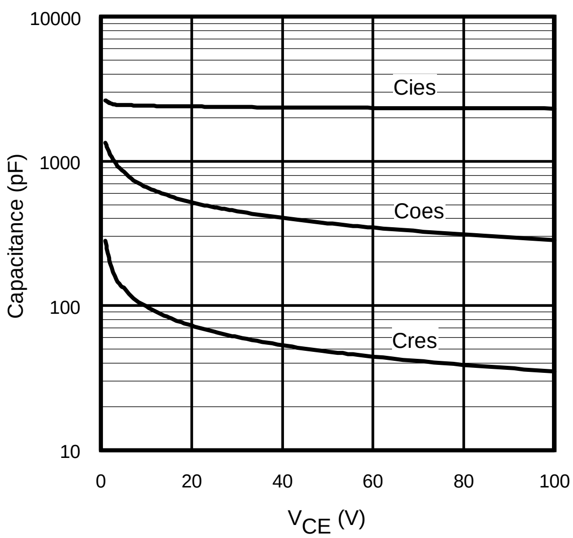


Fig. 9- Typ. Capacitance vs. V_{CE}
V_{GE}= 0V; f = 1MHz

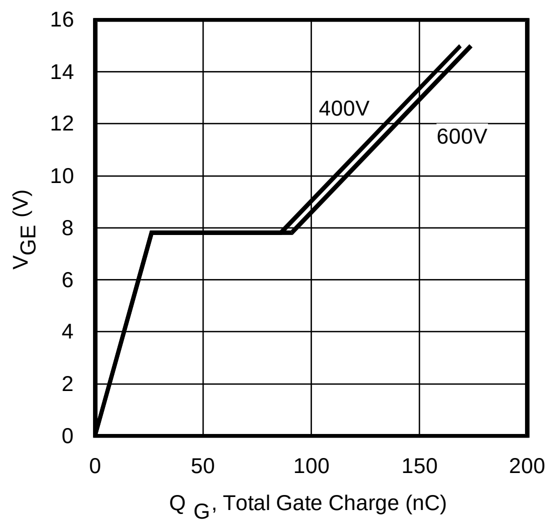


Fig. 10 - Typical Gate Charge vs. V_{GE}
I_{CE} = 25A; L = 600µH

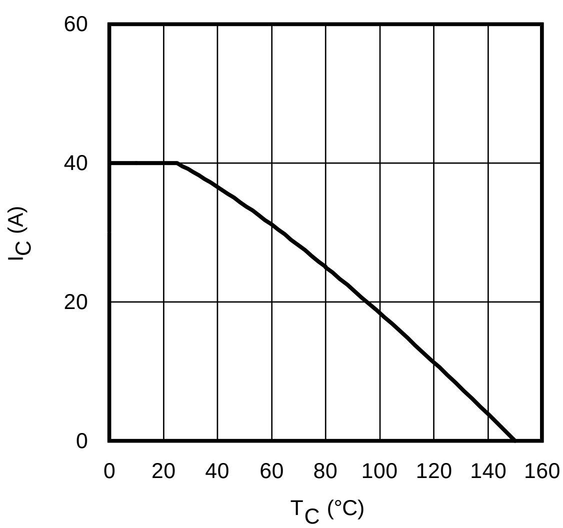


Fig. 11 - Maximum DC Collector Current vs. Case Temperature

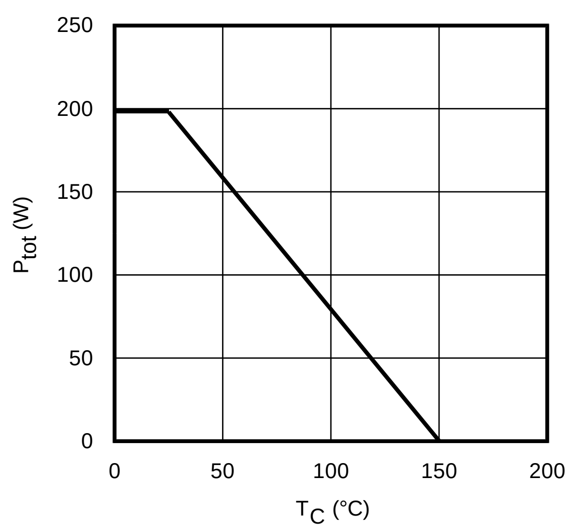


Fig. 12 - Power Dissipation vs. Case Temperature

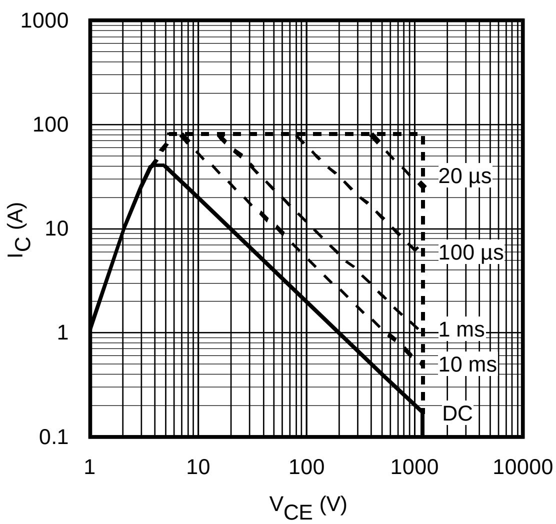


Fig. 13 - Forward SOA
T_C = 25°C; $T_J \leq$ 150°C

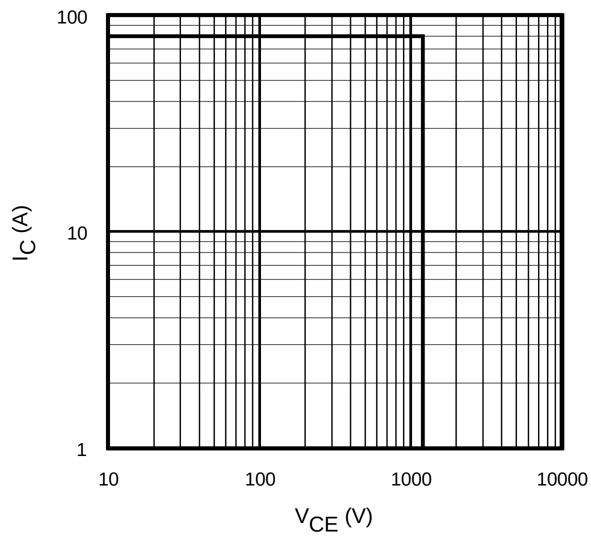


Fig. 14 - Reverse Bias SOA
T_J = 150°C; V_{GE} =15V

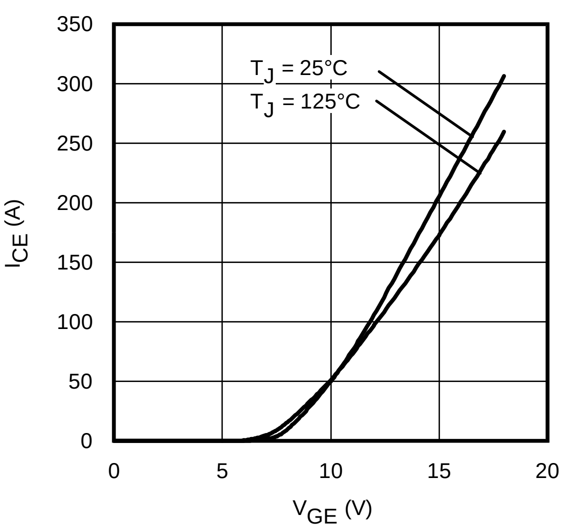


Fig. 15 - Typ. Transfer Characteristics
V_{CE} = 50V; tp = 10µs

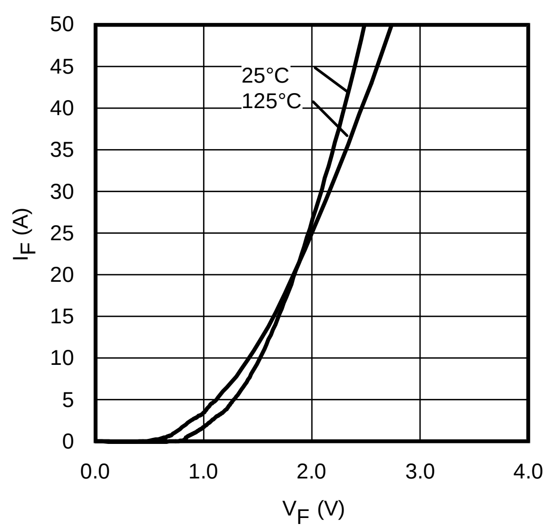


Fig. 16 - Typ. Diode Forward Characteristics
tp = 80µs

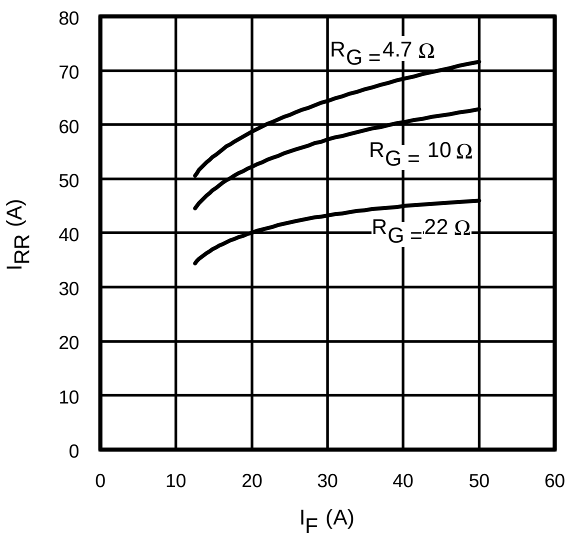


Fig. 17 - Typical Diode I_{RR} vs. I_F
T_J = 125°C

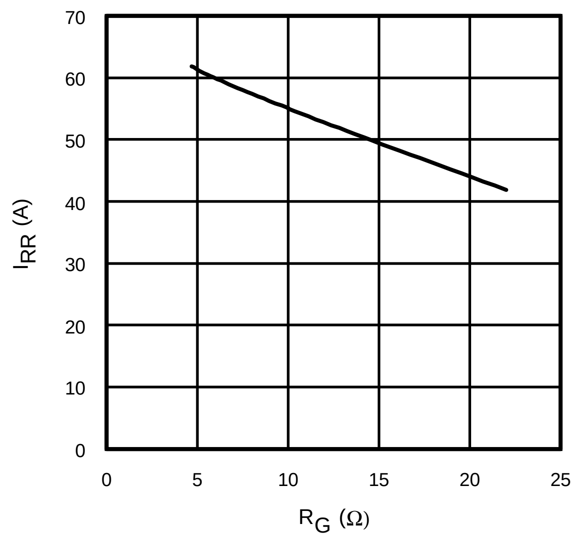


Fig. 18 - Typical Diode I_{RR} vs. R_G
T_J = 125°C; I_F = 25A

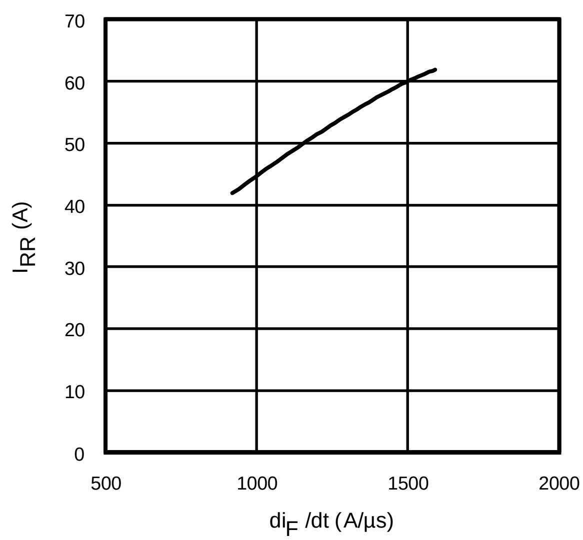


Fig. 19- Typical Diode I_{RR} vs. di_F/dt
V_{CC}= 600V; V_{GE}= 15V;
I_{CE}= 25A; T_J = 125°C

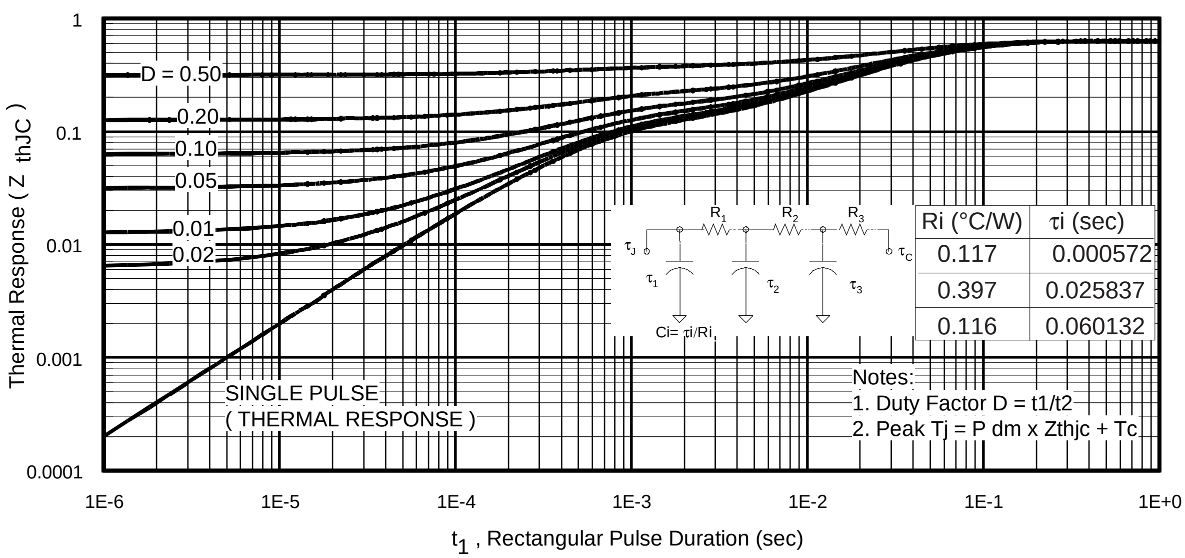


Fig 20. Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)

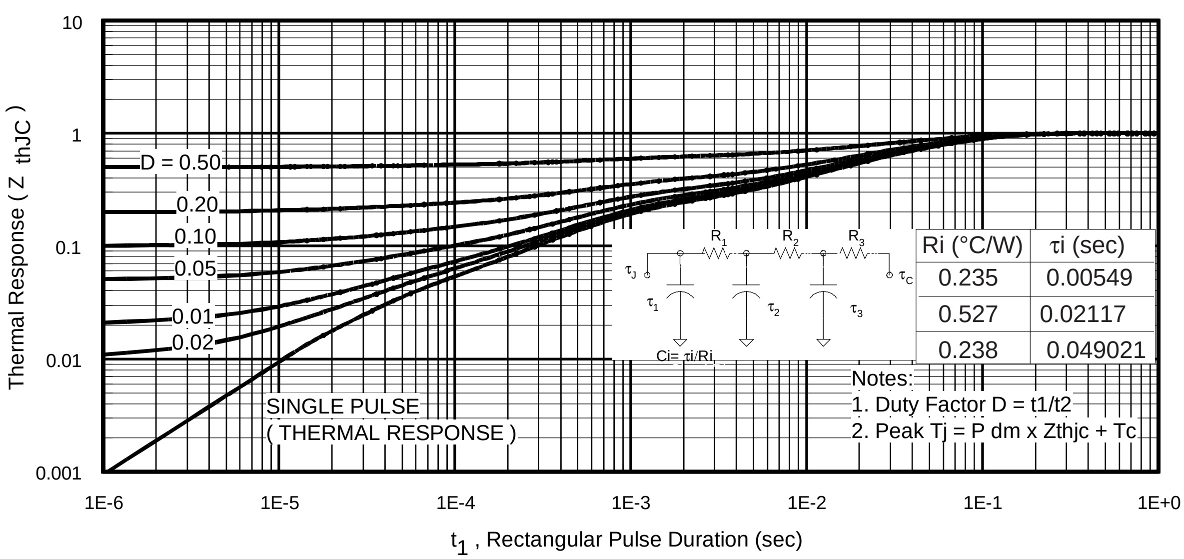


Fig 21. Maximum Transient Thermal Impedance, Junction-to-Case (DIODE)

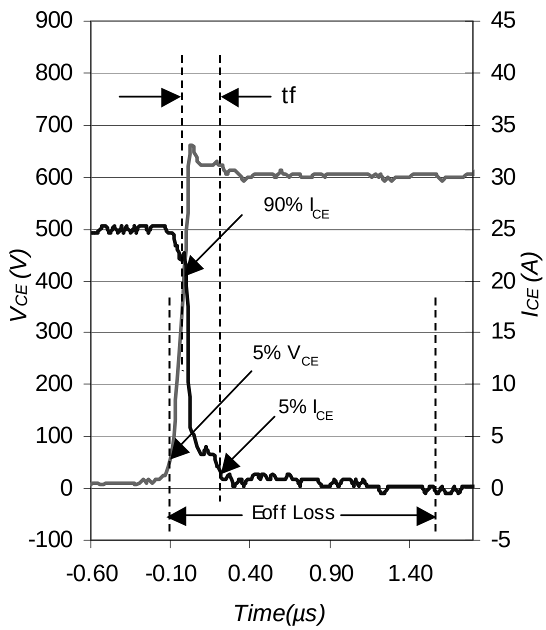


Fig. WF1- Typ. Turn-off Loss Waveform
@ T_J = 125°C using Fig. CT.4

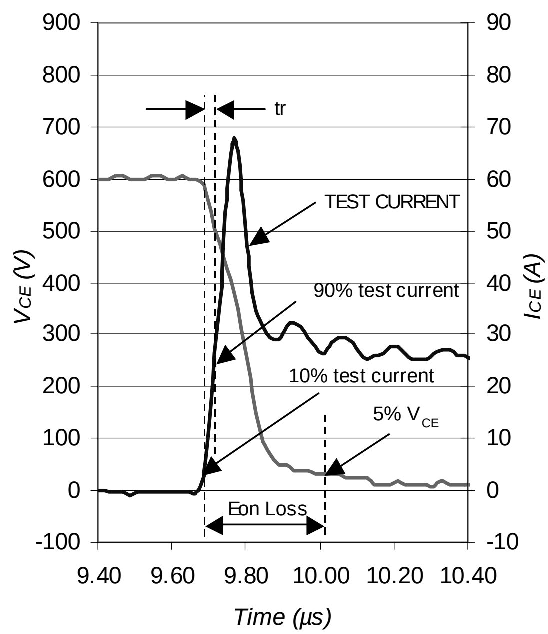


Fig. WF2- Typ. Turn-on Loss Waveform
@ T_J = 125°C using Fig. CT.4

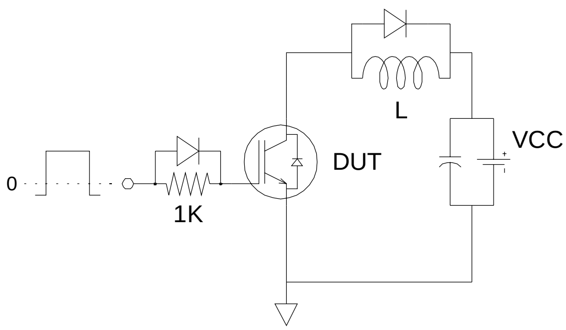


Fig.C.T.1 - Gate Charge Circuit (turn-off)

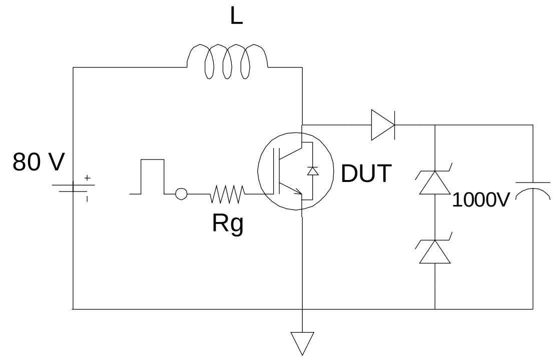


Fig.C.T.2 - RBSOA Circuit

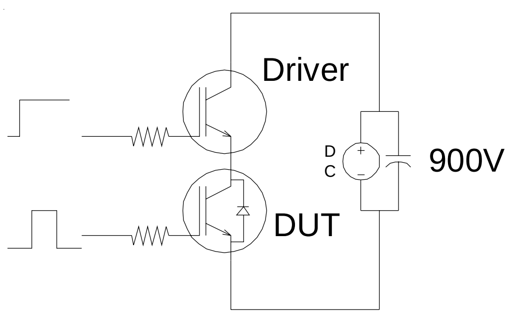


Fig.C.T.3 - S.C. SOA Circuit

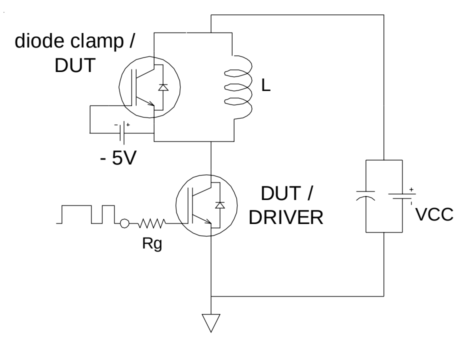


Fig.C.T.4 - Switching Loss Circuit

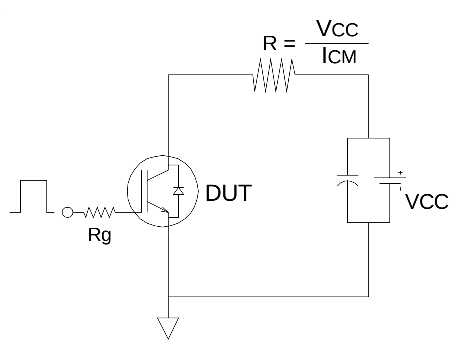
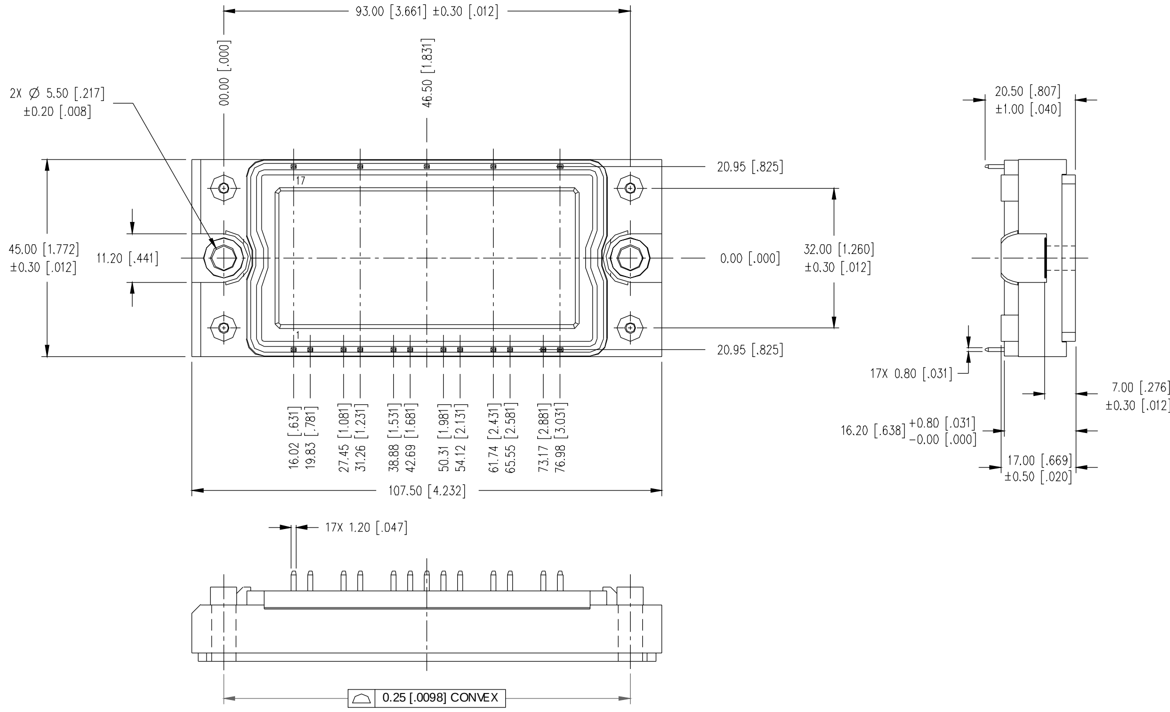


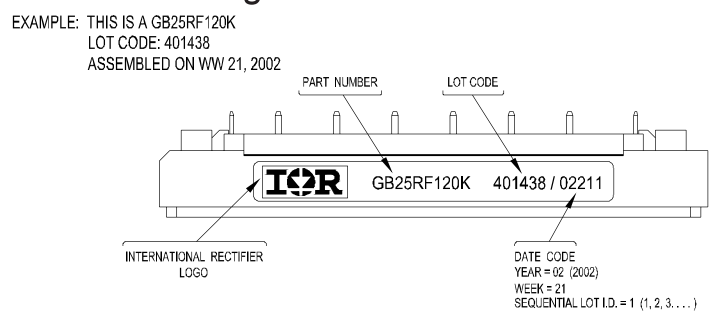
Fig.C.T.5 - Resistive Load Circuit

Econo2 6Pack Package Outline

Dimensions are shown in millimeters (inches)



Econo2 6Pack 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
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