International
IOR Rectifier

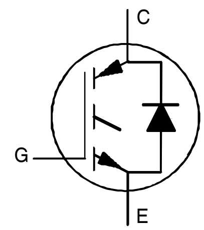
IRG4IBC10UDPbF

UltraFast Co-Pack IGBT

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

Features

- UltraFast: Optimized for high operating up to 80 kHz in hard switching, >200 kHz in resonant mode
- Generation 4 IGBT design provides tighter parameter distribution and higher efficiency than previous generation
- IGBT co-packaged with HEXFRED® ultrafast, ultra-soft recovery anti-parallel diodes for use in bridge configurations
- Industry standard TO-220 Full-Pak
- Lead-Free



n-channel

V_{CES} = 600V

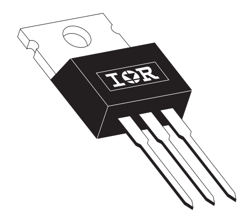
$V_{CE(on)\ typ.}$ = 2.15V

@V_{GE}=15V, I_C=5.0A

$t_{f\ (typ.)}$ = 140ns

Benefits

- Generation 4 IGBTs offer highest efficiencies available
- IGBTs optimized for specifica application conditions
- HEXFRED® diodes optimized for performace with IGBTs Minimized recovery characteristics require less/no snubbing


TO-220AB

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-toEmitter Breakdown Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current, V_{GE} @ 15V	6.8	A
I_C @ T_C = 100°C	Continuous Collector, V_{GE} @ 15V	3.9	
I_{CM}	Pulsed Collector Current ①	27	
I_{LM}	Clamped Inductive Load Current ②	27	
I_F@Tc = 100°C	Diode Continuous Forward Current ②	3.9	
I_{FM}	Diode Maximum Forward Current	27	
V_{ISOL}	rms Isolated Voltage, Terminal to case, t=1min	2500	V
V_{GE}	Gate-to-Emitter Voltage	±20	
P_D @T_C = 25°C	Power Dissipation	25	W
P_D @T_C = 100°C	Power Dissipation	10	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Soldering Temperature for 10 seconds	300 (0.063 in.) (1.6mm from case)	
	Mounting Torque, 6-32 or M3 Screw	10lb·in (1.1N·m)	N

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	——	5.0	°C/W
$R_{\theta JC}$	Junction-to-Case - Diode	——	9.0	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	——	65	
Wt	Weight	2.1 (0.075)	——	g (oz)

01/28/2011

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage③	600	——	——	V	V_{GE} = 0V, I_{CE} = 250µA
$\Delta V_{(BR)CES}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.54	——	V/°C	V_{GE} = 0V, I_{CE} = 1.0mA
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	——	2.15	2.6	V	V_{GE} = 15V, I_{CE} = 5.0A
		——	2.61	——		V_{GE} = 15V, I_{CE} = 8.5A
		——	2.30	——		V_{GE} = 15V, I_{CE} = 5.0A, T_J = 150°C
$V_{GE(th)}$	Gate Threshold Voltage	3.0	——	6.0	V	V_{CE} = V_{GE}, I_{CE} = 250µA
$\Delta V_{GE(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	——	-8.7	——	mV/°C	
g_{fe}	Forward Transconductance ⑤	2.8	4.2	——	S	V_{CE} = 100V, I_{CE} = 5.0A
I_{CES}	Collector-to-Emitter Leakage Current	——	——	250	µA	V_{CE} = 600V, V_{GE} = 0V
		——	——	1000		V_{CE} = 600V, V_{GE} = 0V, T_J = 150°C
V_{FM}	Diode Forward Voltage Drop	——	1.5	1.8	V	I_C = 4.0A
		——	1.4	1.7		I_C = 4.0A, T_J = 125°C
I_{GES}	Gate-to-Emitter Forward Leakage	——	——	100	nA	V_{GE} = 20V
	Gate-to-Emitter Reverse Leakage	——	——	-100		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)	——	15	22	nC	V_{CE} = 400V		
Q_{ge}	Gate-to-Emitter Charge (turn-on)	——	2.6	4.0		I_C = 5.0A		
Q_{gc}	Gate-to-Collector Charge	——	5.8	8.7		V_{GE} = 15V, See Fig. 8		
$t_{d(on)}$	Turn-On delay time	——	40	——	ns			
t_r	Rise time	——	16	——		I_C = 5.0A, V_{CC} = 480V		
$t_{d(off)}$	Turn-Off delay time	——	87	130		V_{GE} = 15V, R_G = 100Ω		
t_f	Fall time	——	140	210		T_J = 25°C		
$E_{(on)}$	Turn-On Switching Loss	——	0.14	——	mJ	Energy losses include "tail" and		
$E_{(off)}$	Turn-Off Switching Loss	——	0.12	——		diode reverse recovery.		
E_{ts}	Total Switching Loss	——	0.26	0.33		See Fig. 9, 10, 18		
$t_{d(on)}$	Turn-On delay time	——	38	——	ns	I_C = 5.0A, V_{CC} = 480V See Fig. 11, 18		
t_r	Rise time	——	18	——		V_{GE} = 15V, R_G = 100Ω		
$t_{d(off)}$	Turn-Off delay time	——	95	——		T_J = 150°C		
t_f	Fall time	——	250	——		Energy losses include "tail" and		
E_{ts}	Total Switching Loss	——	0.45	——	mJ	diode reverse recovery.		
L_E	Internal Emitter Inductance	——	7.5	——	nH	Measured 5mm from package		
C_{ies}	Input Capacitance	——	270	——	pF	V_{GE} = 0V		
C_{oes}	Output Capacitance	——	21	——		V_{CE} = 30V		
C_{res}	Reverse Transfer Capacitance	——	3.5	——		f = 1.0MHz, See Fig. 7		
t_{rr}	Diode Reverse Recovery Time	——	28	42	ns	T_J=25°C,	See Fig.	I_F=4.0A, V_R=200V
		——	38	57		T_J=125°C	14	di/dt=200A/µs
I_{rr}	Diode Peak Reverse Recovery Current	——	2.9	5.2	A	T_J=25°C,	See Fig.	I_F=4.0A, V_R=200V
		——	3.7	6.7		T_J=125°C	15	di/dt=200A/µs
Q_{rr}	Diode Reverse Recovery Charge	——	40	60	nC	T_J=25°C,	See Fig.	I_F=4.0A, V_R=200V
		——	70	105		T_J=125°C	16	di/dt=200A/µs
$di_{(rec)M}/dt$	Diode Peak Rate of Fall of Recovery	——	280	——	A/µs	T_J=25°C,	See Fig.	I_F=4.0A, V_R=200V
	During t_b	——	235	——		T_J=125°C	17	di/dt=200A/µs

Details of note ① through ④ are on the last page

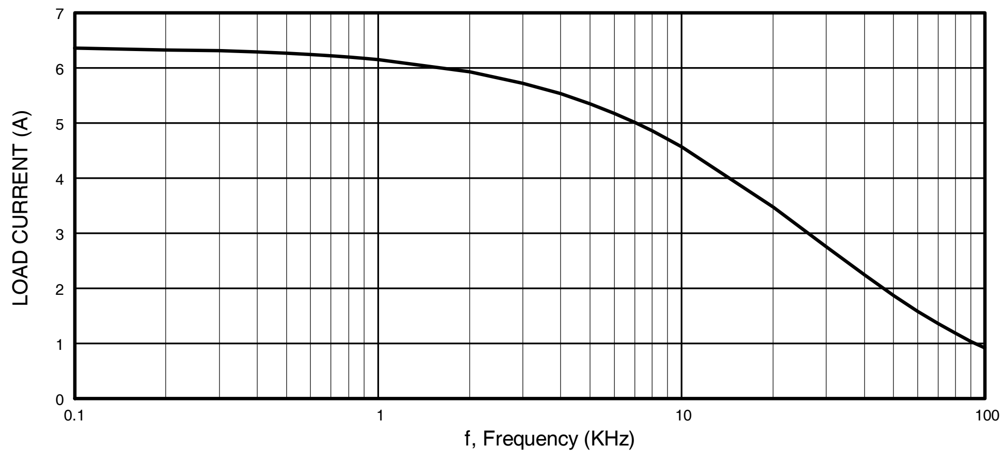


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I=I_{RMS}$ of fundamental; for triangular wave, $I=I_{PK}$)

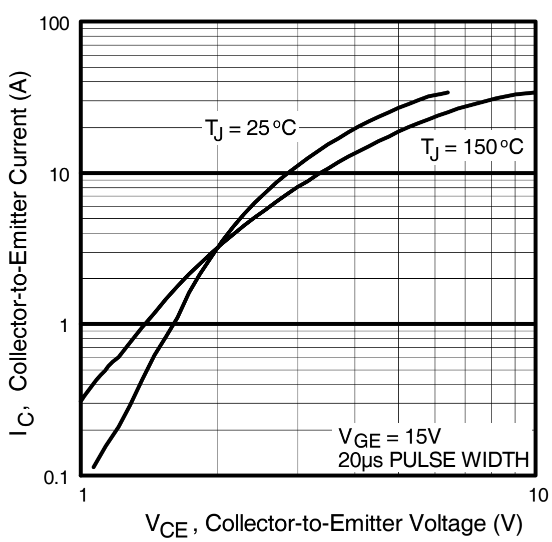


Fig. 2 - Typical Output Characteristics

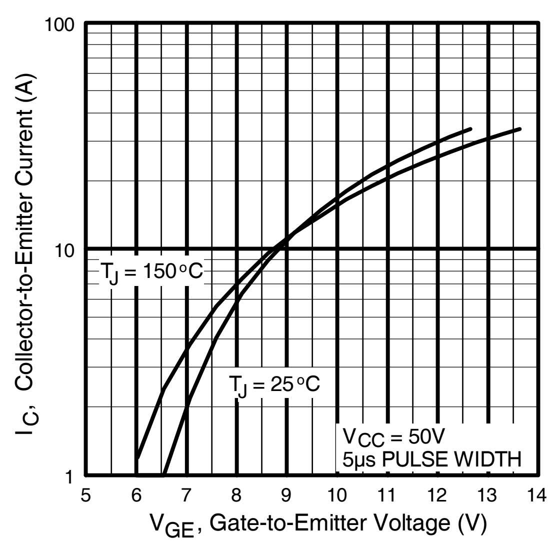


Fig. 3 - Typical Transfer Characteristics

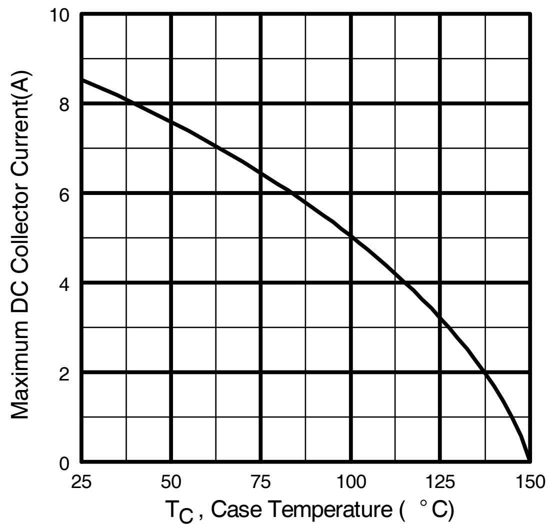


Fig. 4 - Maximum Collector Current vs. Case Temperature

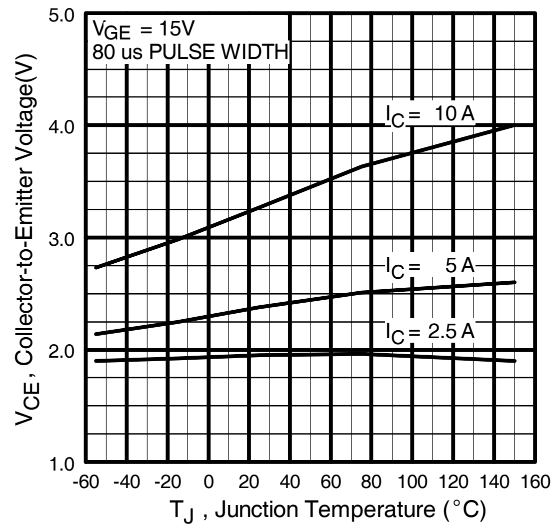


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

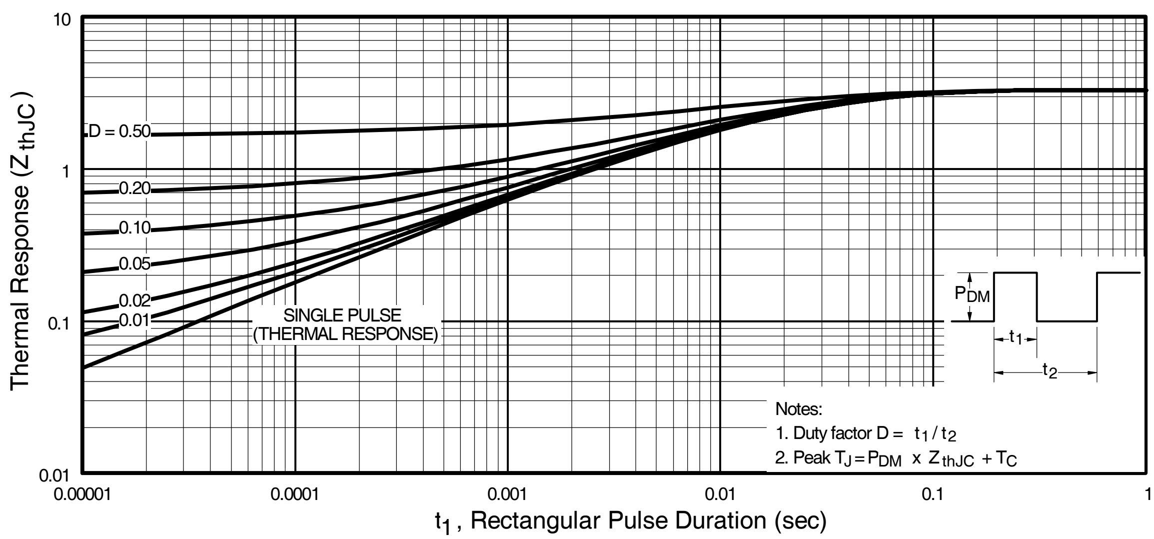


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

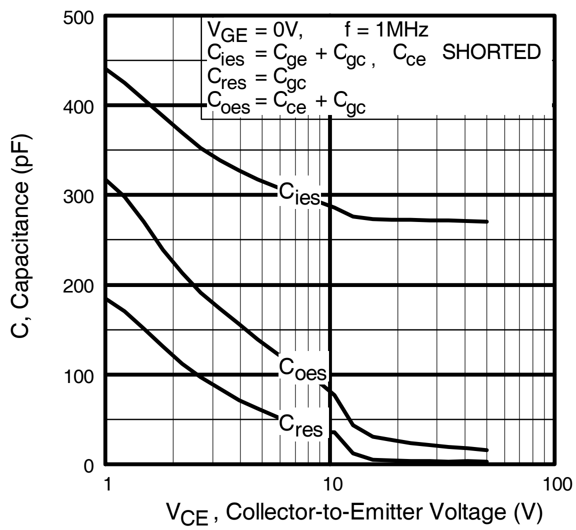


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

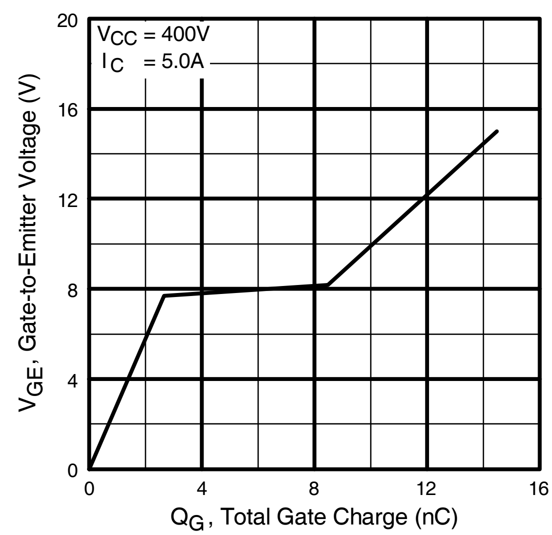


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

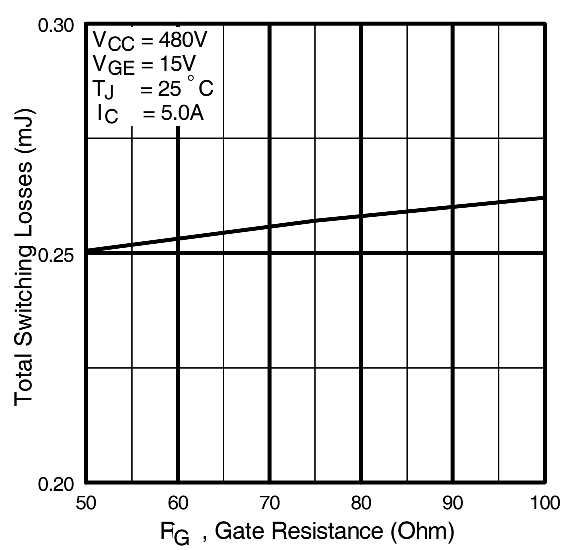


Fig. 9 - Typical Switching Losses vs. Gate Resistance

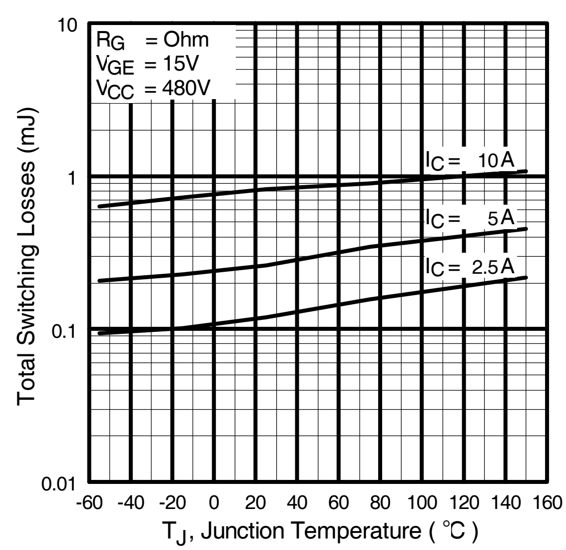


Fig. 10 - Typical Switching Losses vs. Junction Temperature

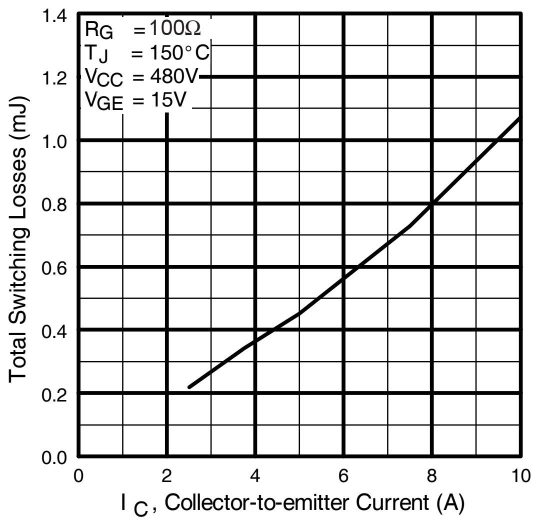


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

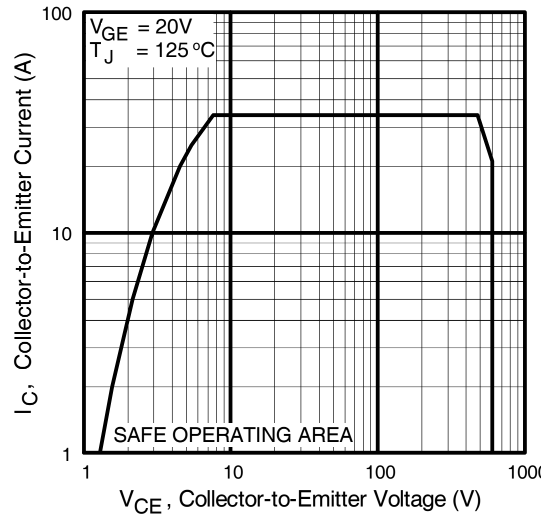


Fig. 12 - Turn-Off SOA

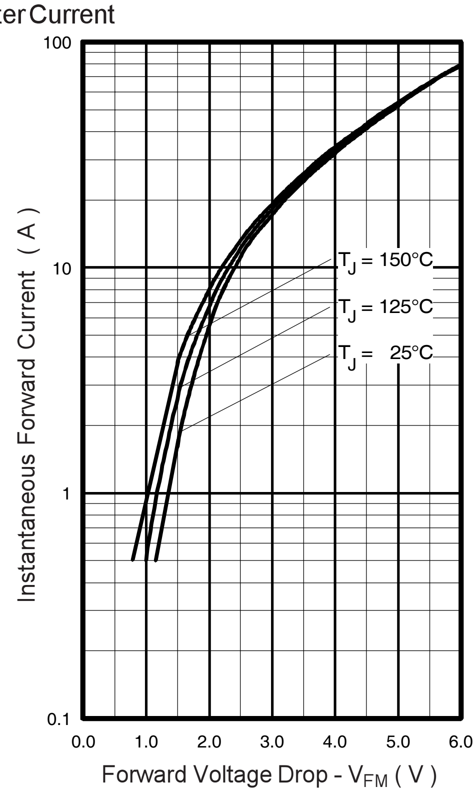


Fig. 13 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

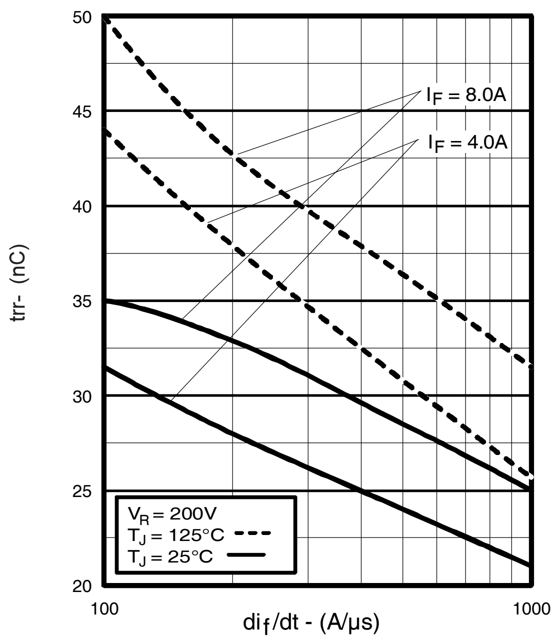


Fig. 14 - Typical Reverse Recovery vs. di_f/dt

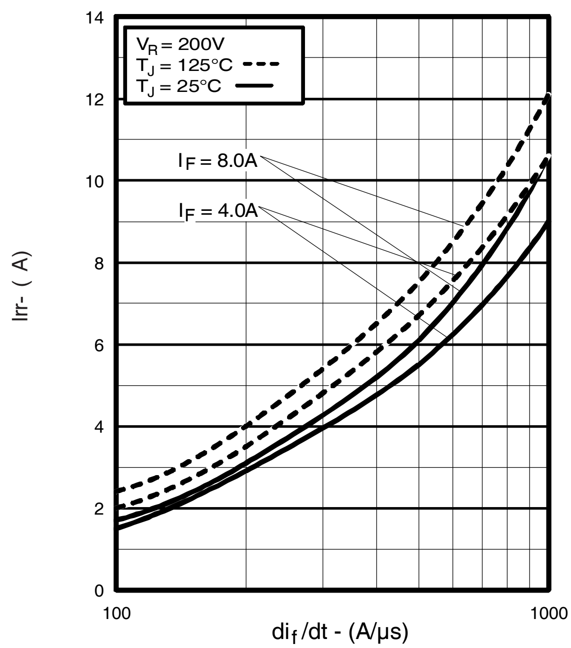


Fig. 15 - Typical Recovery Current vs. di_f/dt

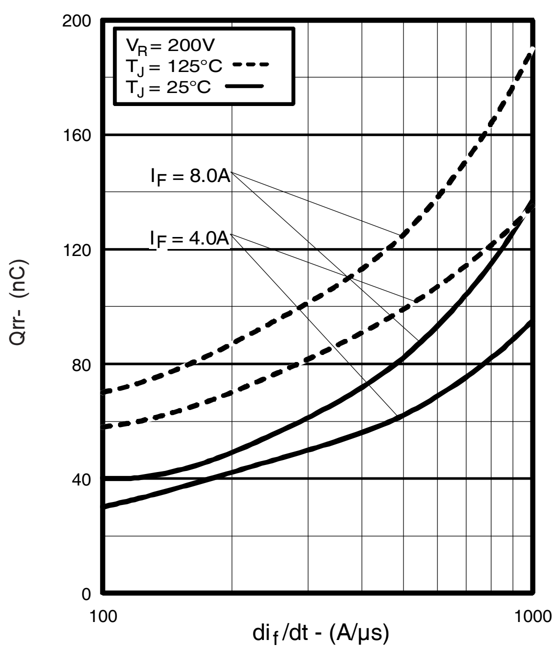


Fig. 16 - Typical Stored Charge vs. di_f/dt

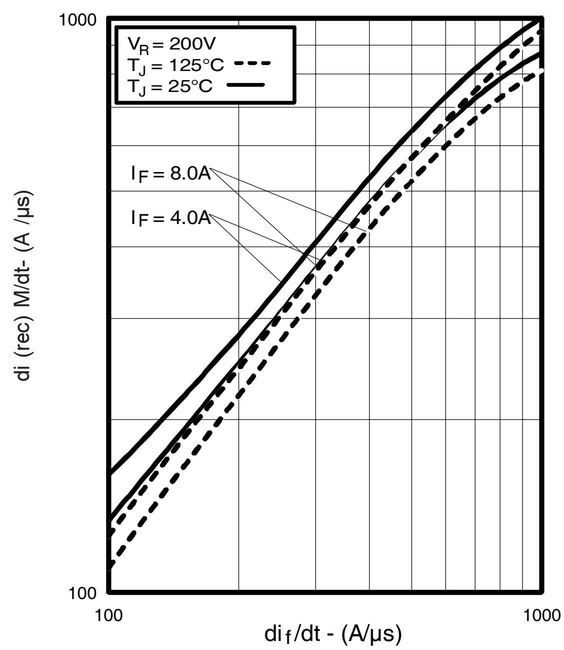


Fig. 17 - Typical $di_{(rec)M}/dt$ vs. di_f/dt,

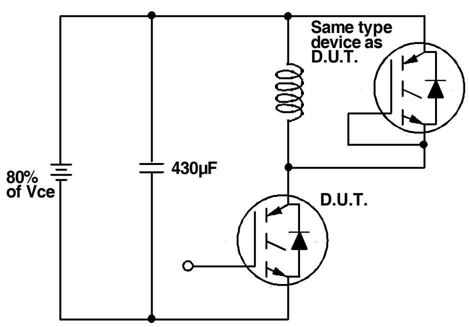


Fig. 18a - Test Circuit for Measurement of I_{LM}, E_{on}, $E_{off(diode)}$, t_{rr}, Q_{rr}, I_{rr}, $t_{d(on)}$, t_r, $t_{d(off)}$, t_f

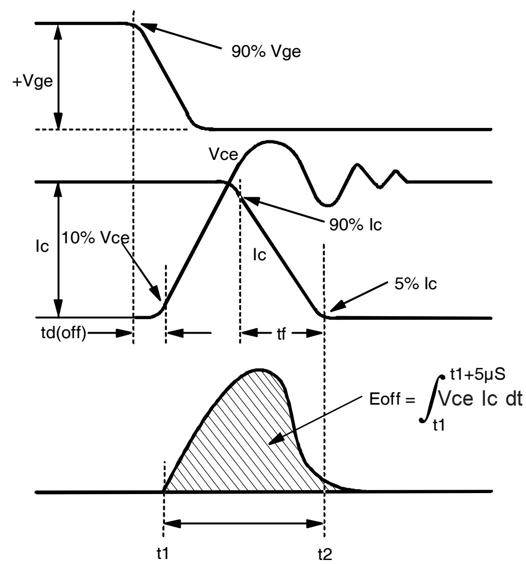


Fig. 18b - Test Waveforms for Circuit of Fig. 18a, Defining E_{off}, $t_{d(off)}$, t_f

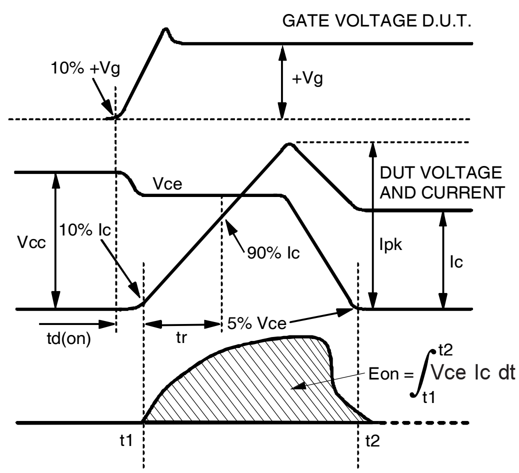


Fig. 18c - Test Waveforms for Circuit of Fig. 18a, Defining E_{on}, $t_{d(on)}$, t_r

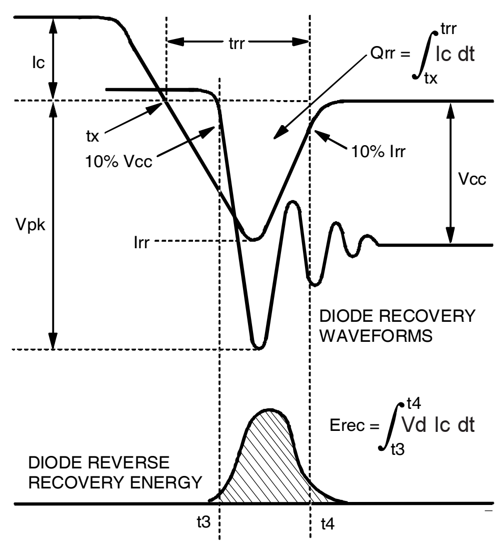


Fig. 18d - Test Waveforms for Circuit of Fig. 18a, Defining E_{rec}, t_{rr}, Q_{rr}, I_{rr}

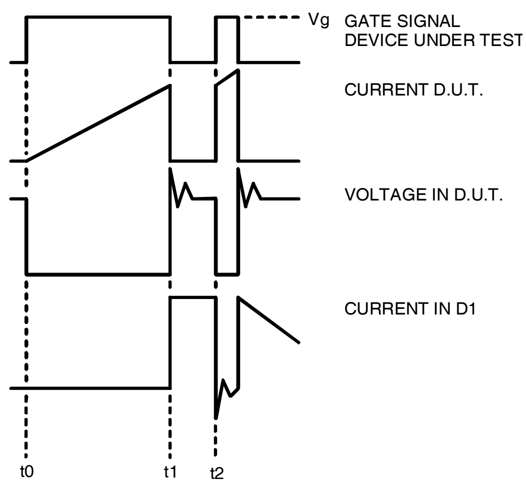


Figure 18e. Macro Waveforms for Figure 18a's Test Circuit

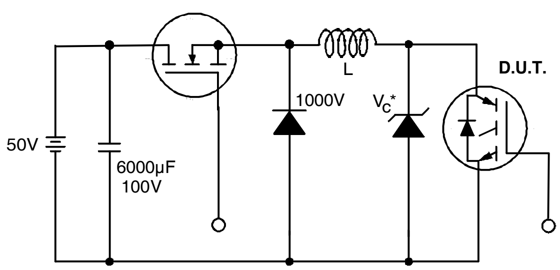


Figure 19. Clamped Inductive Load Test Circuit

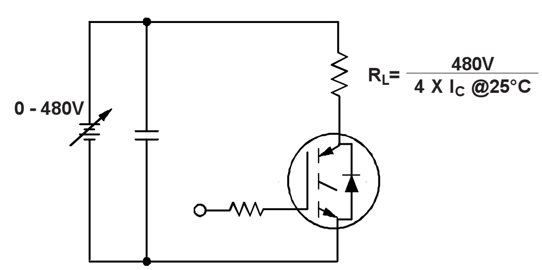
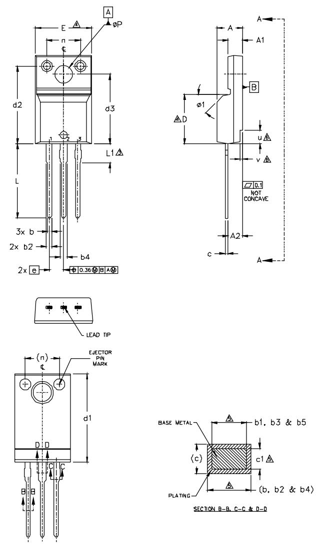


Figure 20. Pulsed Collector Current Test Circuit

TO-220AB Full-Pak Package Outline

Dimensions are shown in millimeters (inches)



SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.57	4.83	.180	.190	
A1	2.57	2.83	.101	.111	
A2	2.51	2.93	.099	.115	
b	0.61	0.94	.024	.037	
b1	0.61	0.89	.024	.035	5
b2	0.76	1.27	.030	.050	
b3	0.76	1.22	.030	.048	5
b4	1.02	1.52	.040	.060	
b5	1.02	1.47	.040	.058	5
c	0.33	0.63	.013	.025	
c1	0.33	0.58	.013	.023	5
D	8.66	9.80	.341	.386	4
d1	15.80	16.13	.622	.635	
d2	13.97	14.22	.550	.560	
d3	12.30	12.93	.484	.509	
E	9.63	10.75	.379	.423	4
e	2.54 BSC		.100 BSC		
L	13.20	13.72	.520	.540	
L1	3.37	3.67	.122	.145	3
n	6.05	6.60	.238	.260	
øP	3.05	3.45	.120	.136	
u	2.40	2.50	.094	.098	6
v	0.40	0.50	.016	.020	6
ø1	–	45°	–	45°	

NOTES:

1.0 DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994

2.0 DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].

3.0 LEAD DIMENSION AND FINISH UNCONTROLLED IN L1

4.0 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTER MOST EXTREMES OF THE PLASTIC BODY.

5.0 DIMENSION b1, b3, b5 & c1 APPLY TO BASE METAL ONLY

6.0 STEP OPTIONAL ON PLASTIC BODY DEFINED BY DIMENSIONS u & v.

7.0 CONTROLLING DIMENSION : INCHES.

LEAD ASSIGNMENTS

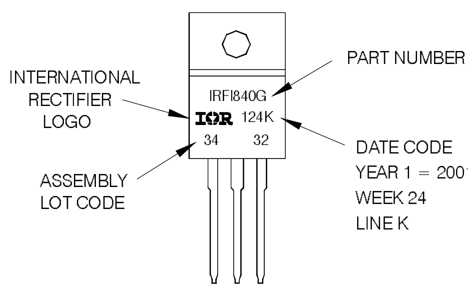
HEXFET
1.- GATE
2.- DRAIN
3.- SOURCE

IGBTs, CoPACK
1.- GATE
2.- COLLECTOR
3.- EMITTER

TO-220AB Full-Pak Part Marking Information

EXAMPLE: THIS IS AN IRFI840G
WITH ASSEMBLY
LOT CODE 3432
ASSEMBLED ON WW 24, 2001
IN THE ASSEMBLY LINE "K"

Note: "P" in assembly line position indicates "Lead-Free"



TO-220AB Full-Pak package is not recommended for Surface Mount Application.

Notes:

① Repetitive rating; V_{GE} = 20V, pulse width limited by max. junction temperature (See fig. 20).
② V_{CC} = 80%(V_{CES}), V_{GE} = 20V, L = 10μH, R_G = 100Ω, (See fig. 19).
③ Pulse width ≤ 80μs; duty factor ≤ 0.1%.
④ Pulse width 5.0μs, single shot.

Note: For the most current drawing please refer to IR website at http://www.irf.com/package/

Data and specifications subject to change without notice.

International IOR Rectifier

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Visit us at www.irf.com for sales contact information.01/2011

单击下面可查看定价，库存，交付和生命周期等信息

>>Infineon Technologies(英飞凌)