

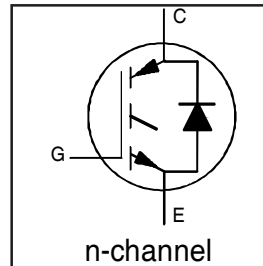
IRG4IBC20KDPbF

INSULATED GATE BIPOLAR TRANSISTOR WITH
ULTRAFAST SOFT RECOVERY DIODE

Short Circuit Rated
UltraFast IGBT

Features

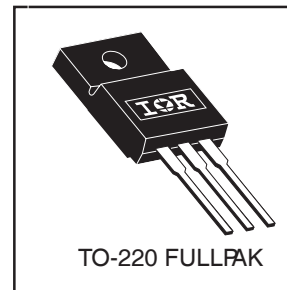
- High switching speed optimized for up to 25kHz with low $V_{CE(on)}$
- Short Circuit Rating 10 μ s @ 125°C, $V_{GE} = 15V$
- Generation 4 IGBT design provides tighter parameter distribution and higher efficiency than previous generation
- IGBT co-packaged with HEXFRED™ ultrafast, ultra-soft-recovery anti-parallel diodes for use in bridge configurations
- Industry standard TO-220 FULLPAK
- Lead-Free



$V_{CES} = 600V$
 $V_{CE(on)} \text{ typ.} = 2.27V$
@ $V_{GE} = 15V, I_C = 6.3A$

Benefits

- Generation 4 IGBTs offer highest efficiencies available maximizing the power density of the system
- IGBTs optimized for specific application conditions
- HEXFRED™ diodes optimized for performance with IGBTs. Minimized recovery characteristics reduce noise EMI
- Designed to exceed the power handling capability of equivalent industry-standard IGBTs



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	11.5	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	6.3	
I_{CM}	Pulsed Collector Current ①	23	
I_{LM}	Clamped Inductive Load Current ②	23	
$I_F @ T_C = 100^\circ C$	Diode Continuous Forward Current	6.3	
I_{FM}	Diode Maximum Forward Current	23	
t_{sc}	Short Circuit Withstand Time	10	μ s
V_{ISOL}	RMS Isolation Voltage, Terminal to Case, $t = 1 \text{ min}$	2500	V
V_{GE}	Gate-to-Emitter Voltage	± 20	
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	34	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	14	
T_J	Operating Junction and	-55 to +150	$^\circ C$
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	
	Mounting Torque, 6-32 or M3 Screw.	10 lbf•in (1.1 N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	---	3.7	$^\circ C/W$
$R_{\theta CS}$	Junction-to-Case - Diode	---	5.5	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	---	65	
Wt	Weight	2.0 (0.07)	---	g (oz)

IRG4IBC20KDPbF

International
IR Rectifier

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)CES}	Collector-to-Emitter Breakdown Voltage ^③	600	—	—	V	V _{GE} = 0V, I _C = 250μA
ΔV _{(BR)CES} /ΔT _J	Temperature Coeff. of Breakdown Voltage	—	0.49	—	V/°C	V _{GE} = 0V, I _C = 1.0mA
V _{CE(on)}	Collector-to-Emitter Saturation Voltage	—	2.27	2.8	V	I _C = 9.0A V _{GE} = 15V
		—	3.01	—		I _C = 16A See Fig. 2, 5
		—	2.43	—		I _C = 9.0A, T _J = 150°C
V _{GE(th)}	Gate Threshold Voltage	3.0	—	6.0		V _{CE} = V _{GE} , I _C = 250μA
ΔV _{GE(th)} /ΔT _J	Temperature Coeff. of Threshold Voltage	—	-10	—	mV/°C	V _{CE} = V _{GE} , I _C = 250μA
g _{fe}	Forward Transconductance ^④	2.9	4.3	—	S	V _{CE} = 100V, I _C = 9.0A
I _{CES}	Zero Gate Voltage Collector Current	—	—	250	μA	V _{GE} = 0V, V _{CE} = 600V
		—	—	1000		V _{GE} = 0V, V _{CE} = 600V, T _J = 150°C
V _{FM}	Diode Forward Voltage Drop	—	1.4	1.7	V	I _C = 8.0A See Fig. 13
		—	1.3	1.6		I _C = 8.0A, T _J = 150°C
I _{GES}	Gate-to-Emitter Leakage Current	—	—	±100	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)	—	34	51	nC	I _C = 9.0A
Q _{ge}	Gate - Emitter Charge (turn-on)	—	4.9	7.4		V _{CC} = 400V See Fig.8
Q _{gc}	Gate - Collector Charge (turn-on)	—	14	21		V _{GE} = 15V
t _{d(on)}	Turn-On Delay Time	—	54	—	ns	T _J = 25°C
t _r	Rise Time	—	34	—		I _C = 9.0A, V _{CC} = 480V
t _{d(off)}	Turn-Off Delay Time	—	180	270		V _{GE} = 15V, R _G = 50Ω
t _f	Fall Time	—	72	110		Energy losses include "tail" and diode reverse recovery
E _{on}	Turn-On Switching Loss	—	0.34	—	mJ	See Fig. 9,10,14
E _{off}	Turn-Off Switching Loss	—	0.30	—		
E _{ts}	Total Switching Loss	—	0.64	0.96		
t _{sc}	Short Circuit Withstand Time	10	—	—	μs	V _{CC} = 360V, T _J = 125°C V _{GE} = 15V, R _G = 50Ω, V _{CPK} < 500V
t _{d(on)}	Turn-On Delay Time	—	51	—	ns	T _J = 150°C, See Fig. 10,11,14
t _r	Rise Time	—	37	—		I _C = 9.0A, V _{CC} = 480V
t _{d(off)}	Turn-Off Delay Time	—	220	—		V _{GE} = 15V, R _G = 50Ω
t _f	Fall Time	—	160	—		Energy losses include "tail" and diode reverse recovery
E _{ts}	Total Switching Loss	—	0.85	—	mJ	
L _E	Internal Emitter Inductance	—	7.5	—	nH	Measured 5mm from package
C _{ies}	Input Capacitance	—	450	—	pF	V _{GE} = 0V
C _{oes}	Output Capacitance	—	61	—		V _{CC} = 30V See Fig. 7
C _{res}	Reverse Transfer Capacitance	—	14	—		f = 1.0MHz
t _{rr}	Diode Reverse Recovery Time	—	37	55	ns	T _J = 25°C See Fig. 14
		—	55	90		T _J = 125°C
I _{rr}	Diode Peak Reverse Recovery Current	—	3.5	5.0	A	T _J = 25°C See Fig. 15
		—	4.5	8.0		T _J = 125°C
Q _{rr}	Diode Reverse Recovery Charge	—	65	138	nC	T _J = 25°C See Fig. 16
		—	124	360		T _J = 125°C
di _(rec) M/dt	Diode Peak Rate of Fall of Recovery During t _b	—	240	—	A/μs	T _J = 25°C See Fig. 17
		—	210	—		T _J = 125°C

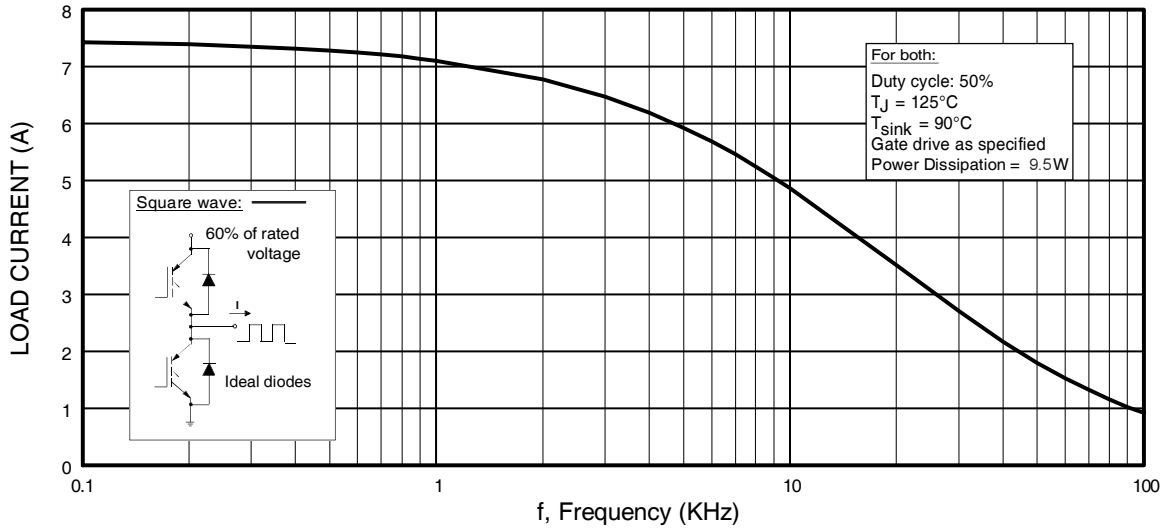


Fig. 1 - Typical Load Current vs. Frequency
 (Load Current = I_{RMS} of fundamental)

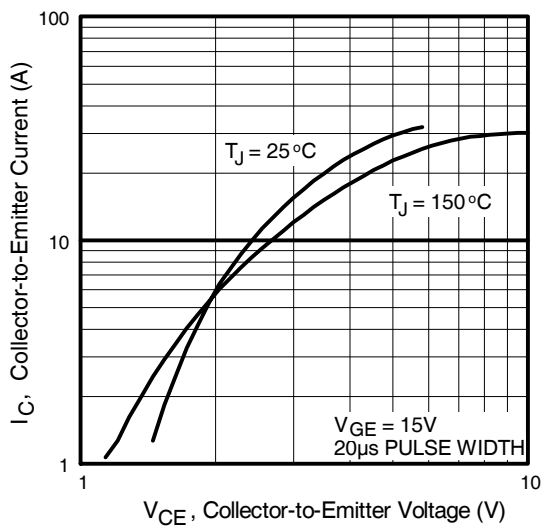


Fig. 2 - Typical Output Characteristics

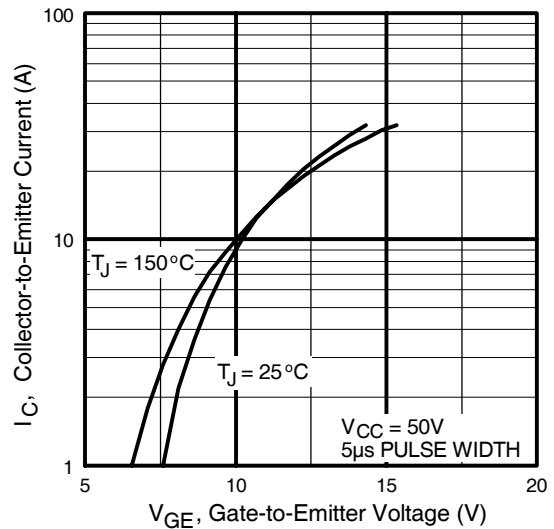


Fig. 3 - Typical Transfer Characteristics

IRG4IBC20KDPbF

International
IRF Rectifier

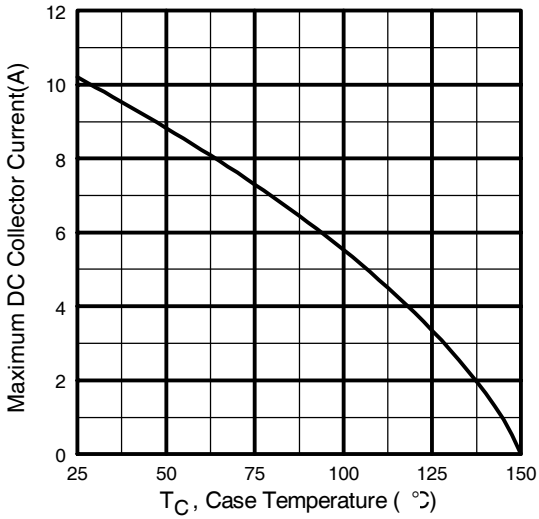


Fig. 4 - Maximum Collector Current vs. Case Temperature

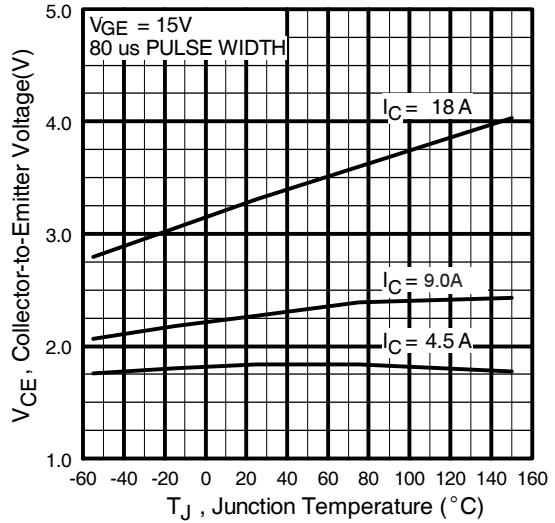


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

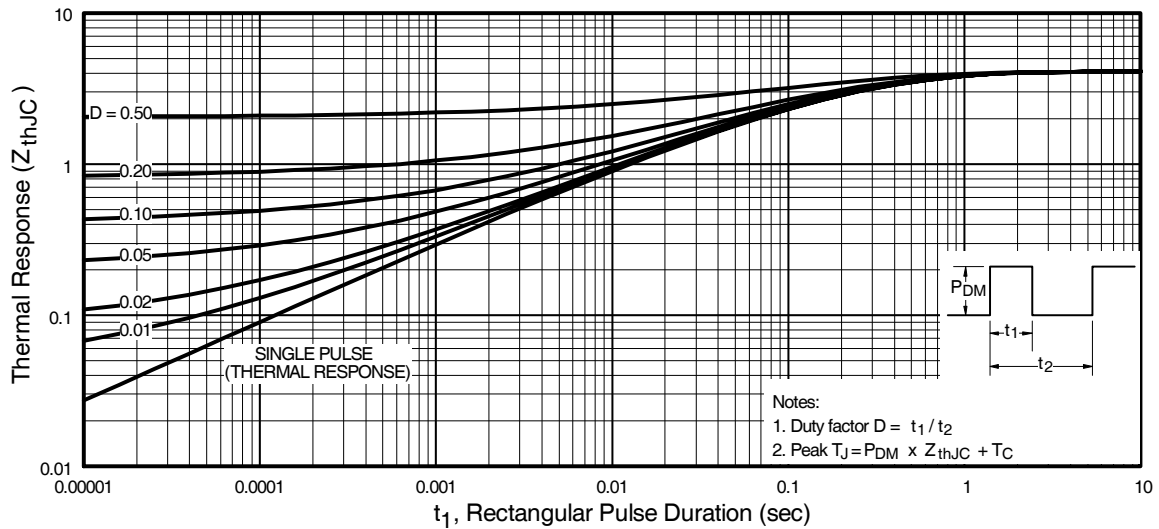


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

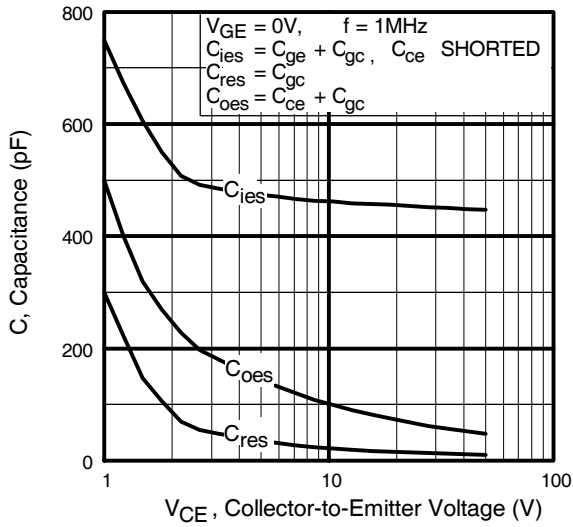


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

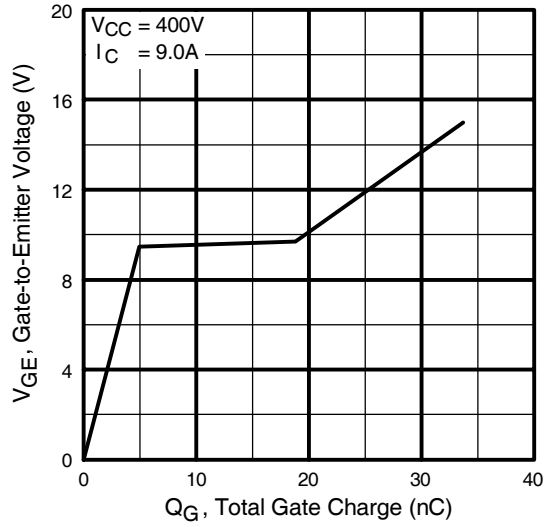


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

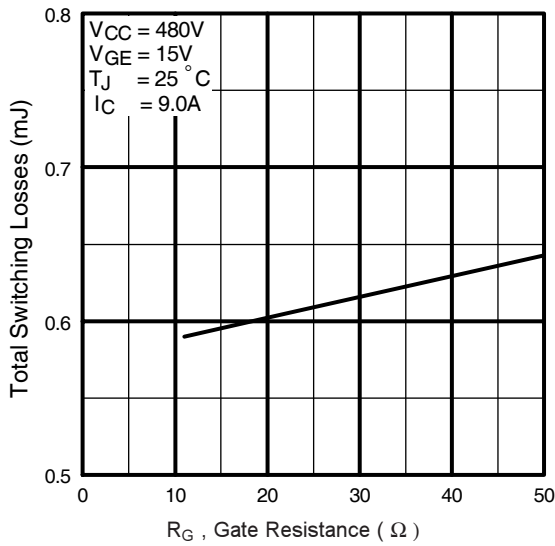


Fig. 9 - Typical Switching Losses vs. Gate Resistance

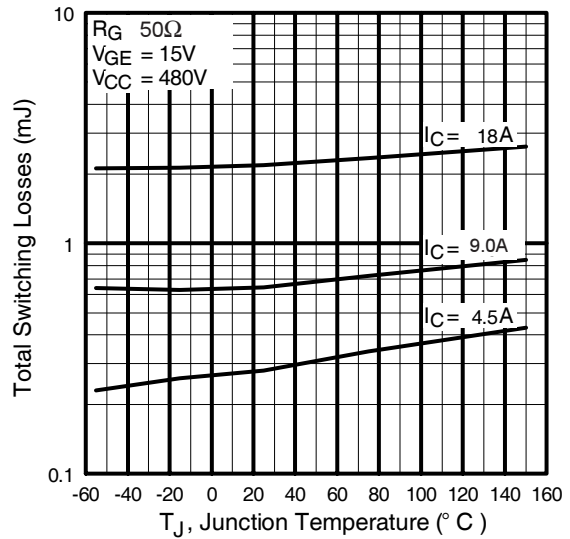


Fig. 10 - Typical Switching Losses vs. Junction Temperature

IRG4IBC20KDPbF

International
IR Rectifier

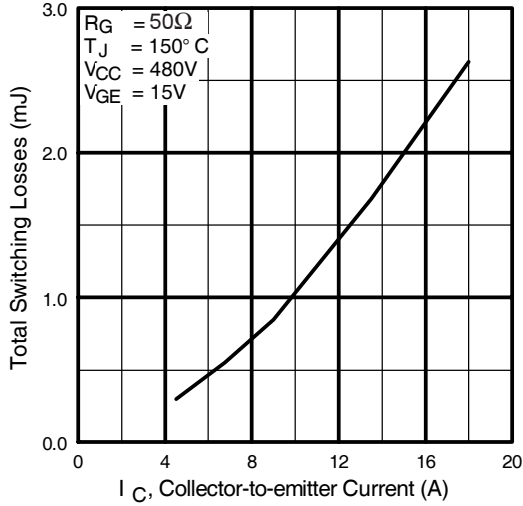


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

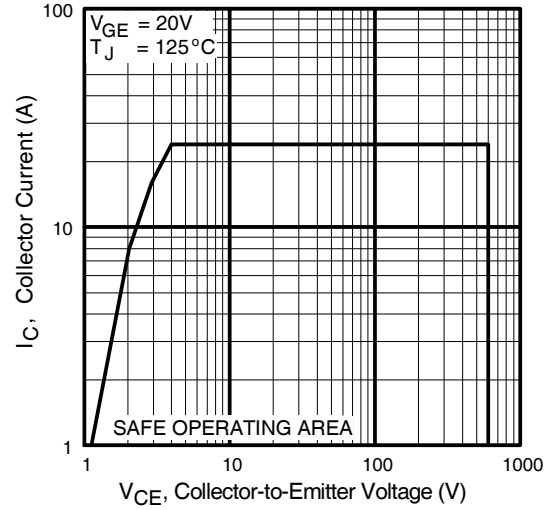


Fig. 12 - Turn-Off SOA

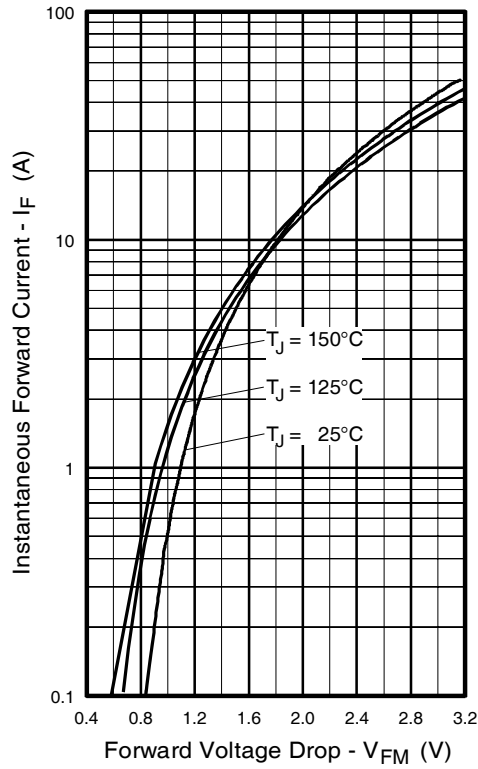


Fig. 13 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

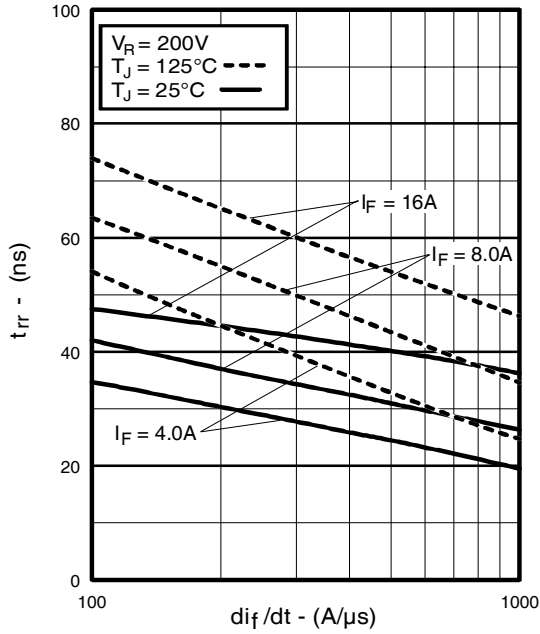


Fig. 14 - Typical Reverse Recovery vs. di_f/dt

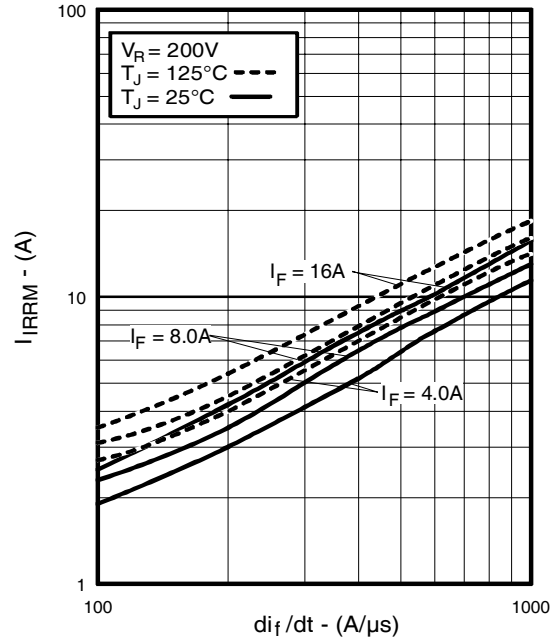


Fig. 15 - Typical Recovery Current vs. di_f/dt

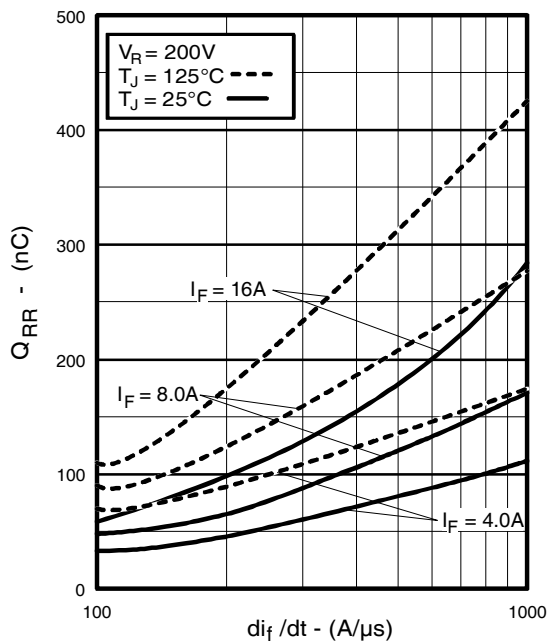


Fig. 16 - Typical Stored Charge vs. di_f/dt

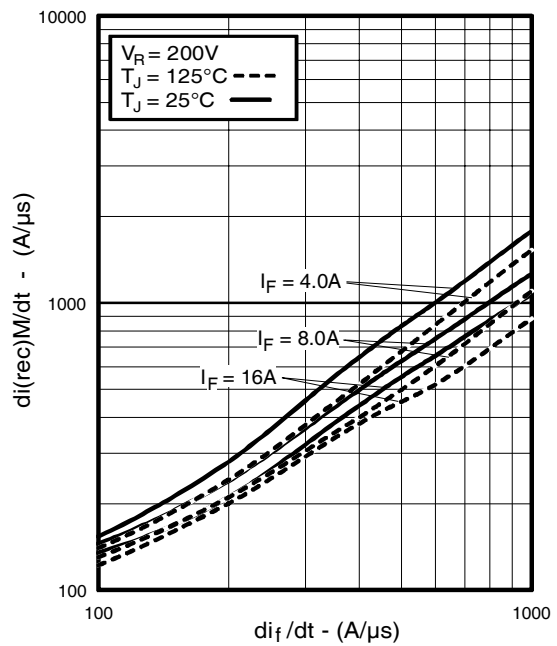


Fig. 17 - Typical $di_{(rec)M}/dt$ vs. di_f/dt

IRG4IBC20KDPbF

International
IR Rectifier

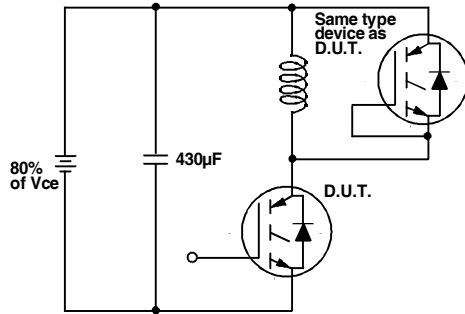


Fig. 18a - Test Circuit for Measurement of I_{LM} , E_{on} , $E_{off}(\text{diode})$, t_{rr} , Q_{rr} , I_{rr} , $t_{d(on)}$, t_r , $t_{d(off)}$, t_f

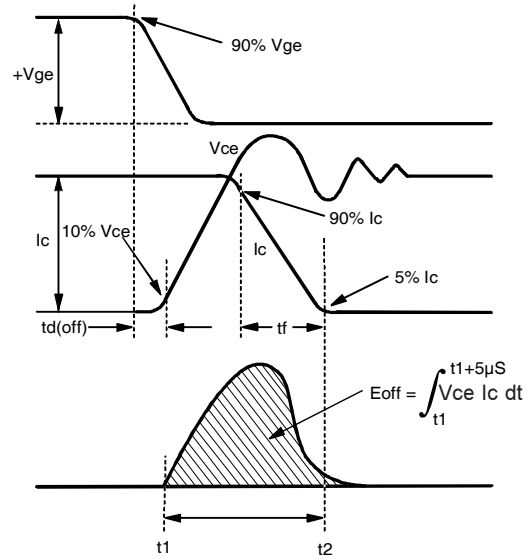


Fig. 18b - Test Waveforms for Circuit of Fig. 18a, Defining E_{off} , $t_{d(off)}$, t_f

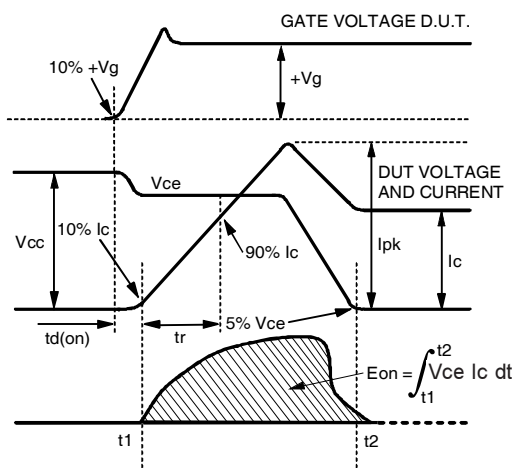


Fig. 18c - Test Waveforms for Circuit of Fig. 18a, Defining E_{on} , $t_{d(on)}$, t_r

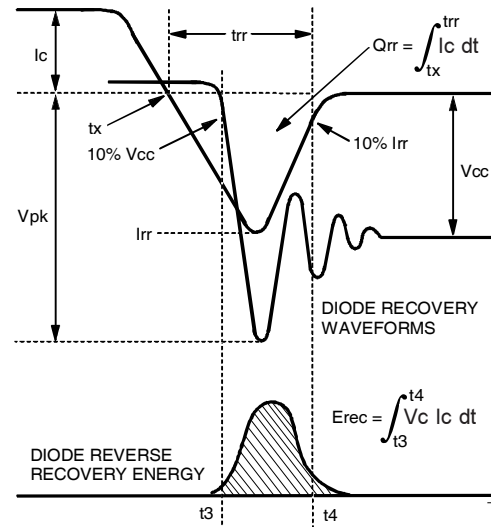


Fig. 18d - Test Waveforms for Circuit of Fig. 18a, Defining E_{rec} , t_{rr} , Q_{rr} , I_{rr}

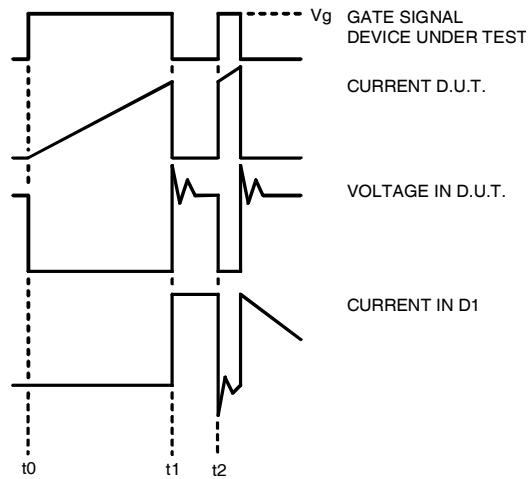


Figure 18e. Macro Waveforms for Figure 18a's Test Circuit

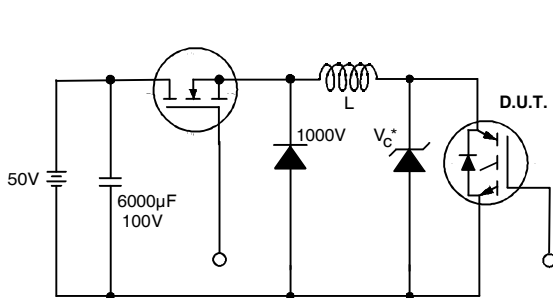


Figure 19. Clamped Inductive Load Test Circuit

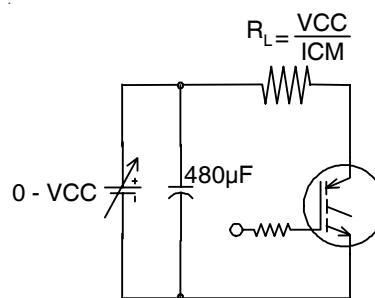


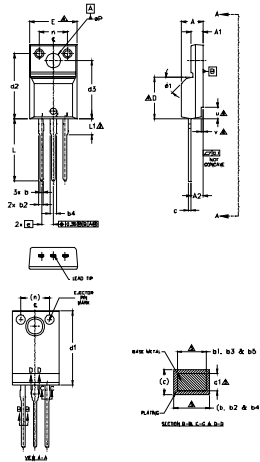
Figure 20. Pulsed Collector Current Test Circuit

IRG4IBC20KDPbF

International
IR Rectifier

TO-220AB Full-Pak Package Outline

Dimensions are shown in millimeters (inches)



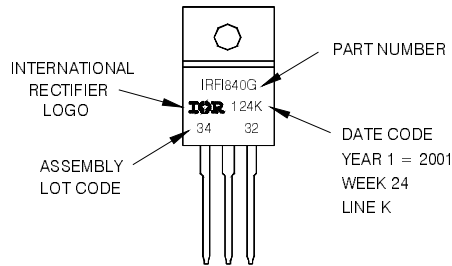
SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.57	4.83	.180	.190	
A1	2.57	2.83	.101	.111	
A2	2.51	2.93	.099	.115	
b	0.61	0.94	.024	.037	
b1	0.61	0.89	.024	.035	5
b2	0.76	1.27	.030	.050	
b3	0.76	1.22	.030	.048	5
b4	1.02	1.52	.040	.060	
b5	1.02	1.47	.040	.058	5
c	0.33	0.63	.013	.025	
c1	0.33	0.38	.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	10.76	.379	.423	4
e	2.54 BSC		100 BSC		
L	13.20	13.72	.520	.540	3
L1	3.37	3.67	.122	.145	
n	6.05	6.60	.238	.260	
øP	3.05	3.45	.120	.136	
u	2.40	2.60	.094	.098	6
v	0.40	0.50	.016	.020	6
ø1	-	45°	-	45°	

NOTES
 1. DIMENSIONS AND TOLERANCING AS PER ASME Y14.5 M - 1994.
 2. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
 3. LEAD DIMENSION AND FINISH UNCONTROLLED IN LT.
 4. DIMENSION D & E DO NOT INCLUDE WELD FLASH. WELD FLASH SHALL NOT EXCEED .002 (0.075) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTER MOST EXTREMES OF THE PLASTIC BODY.
 5. DIMENSION H1, H2, H3 & H4 APPLY TO BARE METAL ONLY.
 6. STEP OPTIONAL ON PLASTIC BODY DEFINED BY DIMENSIONS A & A1.
 7. CONTROLLING DIMENSION - BONES.
 LEAD ASSIGNMENTS
 1. GATE
 2. DRAIN
 3. SOURCE
 LABEL CODES
 1. GATE
 2. COLLECTOR
 3. EMITTER

TO-220AB Full-Pak Part Marking Information

EXAMPLE: THIS IS AN IRF1840G
 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 maximum junction temperature (figure 20)
- ② $V_{CC}=80\%(V_{CES})$, $V_{GE}=20V$, $L=10\mu H$, $R_G=50\Omega$ (figure 19)
- ③ Pulse width $\leq 80\mu s$; duty factor $\leq 0.1\%$.
- ④ Pulse width $5.0\mu s$, 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
IR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
 TAC Fax: (310) 252-7903

Visit us at www.irf.com for sales contact information.01/2010

单击下面可查看定价，库存，交付和生命周期等信息

[>>Infineon Technologies\(英飞凌\)](#)