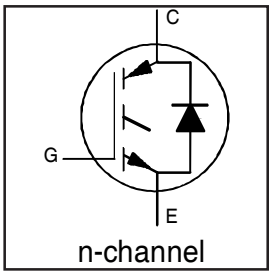
PD -94910A

International
IOR Rectifier

IRG4BC30KDPbF

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

Short Circuit Rated
UltraFast IGBT



V_{CES} = 600V

$V_{CE(on)\ typ.}$ = 2.21V

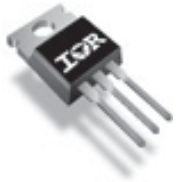
@V_{GE} = 15V, I_C = 16A

Features

- High short circuit rating optimized for motor control, t_{sc} =10µs, @360V V_{CE} (start), T_J = 125°C, V_{GE} = 15V
- Combines low conduction losses with high switching speed
- tighter parameter distribution and higher efficiency than previous generations
- IGBT co-packaged with HEXFRED™ ultrafast, ultrasoft recovery antiparallel diodes
- Lead-Free

Benefits

- Latest generation 4 IGBTs offer highest power density motor controls possible
- HEXFRED™ diodes optimized for performance with IGBTs. Minimized recovery characteristics reduce noise, EMI and switching losses
- This part replaces the IRGBC30KD2 and IRGBC30MD2 products
- For hints see design tip 97003



TO-220AB

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	28	A
I_C @ T_C = 100°C	Continuous Collector Current	16	
I_{CM}	Pulsed Collector Current ①	56	
I_{LM}	Clamped Inductive Load Current ②	56	
I_F @ T_C = 100°C	Diode Continuous Forward Current	12	
I_{FM}	Diode Maximum Forward Current	58	
t_{sc}	Short Circuit Withstand Time	10	µs
V_{GE}	Gate-to-Emitter Voltage	± 20	V
P_D @ T_C = 25°C	Maximum Power Dissipation	100	W
P_D @ T_C = 100°C	Maximum Power Dissipation	42	
T_J	Operating Junction and	-55 to +150	°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	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	–––	–––	1.2	°C/W
$R_{\theta JC}$	Junction-to-Case - Diode	–––	–––	2.5	
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	–––	0.50	–––	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	–––	–––	80	
Wt	Weight	–––	2 (0.07)	–––	g (oz)

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_C = 250µA
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.54	—	V/°C	V_{GE} = 0V, I_C = 1.0mA
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	2.21	2.7	V	I_C = 16A V_{GE} = 15V
		—	2.88	—		I_C = 28A See Fig. 2, 5
		—	2.36	—		I_C = 16A, T_J = 150°C
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0		V_{CE} = V_{GE}, I_C = 250µA
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-12	—	mV/°C	V_{CE} = V_{GE}, I_C = 250µA
g_{fe}	Forward Transconductance ④	5.4	8.1	—	S	V_{CE} = 100V, I_C = 16A
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	µA	V_{GE} = 0V, V_{CE} = 600V
		—	—	2500		V_{GE} = 0V, V_{CE} = 600V, T_J = 150°C
V_{FM}	Diode Forward Voltage Drop	—	1.4	1.7	V	I_C = 12A See Fig. 13
		—	1.3	1.6		I_C = 12A, 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)	—	67	100	nC	I_C = 16A
Q_{ge}	Gate - Emitter Charge (turn-on)	—	11	16		V_{CC} = 400V See Fig.8
Q_{gc}	Gate - Collector Charge (turn-on)	—	25	37		V_{GE} = 15V
$t_{d(on)}$	Turn-On Delay Time	—	60	—	ns	
t_r	Rise Time	—	42	—		T_J = 25°C
$t_{d(off)}$	Turn-Off Delay Time	—	160	250		I_C = 16A, V_{CC} = 480V
t_f	Fall Time	—	80	120		V_{GE} = 15V, R_G = 23Ω
E_{on}	Turn-On Switching Loss	—	0.60	—	mJ	Energy losses include "tail"
E_{off}	Turn-Off Switching Loss	—	0.58	—		and diode reverse recovery
E_{ts}	Total Switching Loss	—	1.18	1.6		See Fig. 9,10,14
t_{sc}	Short Circuit Withstand Time	10	—	—	µs	V_{CC} = 360V, T_J = 125°C
						V_{GE} = 15V, R_G = 10Ω , V_{CPK} < 500V
$t_{d(on)}$	Turn-On Delay Time	—	58	—	ns	T_J = 150°C, See Fig. 11,14
t_r	Rise Time	—	42	—		I_C = 16A, V_{CC} = 480V
$t_{d(off)}$	Turn-Off Delay Time	—	210	—		V_{GE} = 15V, R_G = 23Ω
t_f	Fall Time	—	160	—		Energy losses include "tail"
E_{ts}	Total Switching Loss	—	1.69	—	mJ	and diode reverse recovery
L_E	Internal Emitter Inductance	—	7.5	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	920	—	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	—	110	—		V_{CC} = 30V See Fig. 7
C_{res}	Reverse Transfer Capacitance	—	27	—		f = 1.0MHz
t_{rr}	Diode Reverse Recovery Time	—	42	60	ns	T_J = 25°C See Fig.
		—	80	120		T_J = 125°C 14 I_F = 12A
I_{rr}	Diode Peak Reverse Recovery Current	—	3.5	6.0	A	T_J = 25°C See Fig.
		—	5.6	10		T_J = 125°C 15 V_R = 200V
Q_{rr}	Diode Reverse Recovery Charge	—	80	180	nC	T_J = 25°C See Fig.
		—	220	600		T_J = 125°C 16 di/dt = 200Aµs
$di_{(rec)M}/dt$	Diode Peak Rate of Fall of Recovery	—	180	—	A/µs	T_J = 25°C See Fig.
	During t_b	—	160	—		T_J = 125°C 17

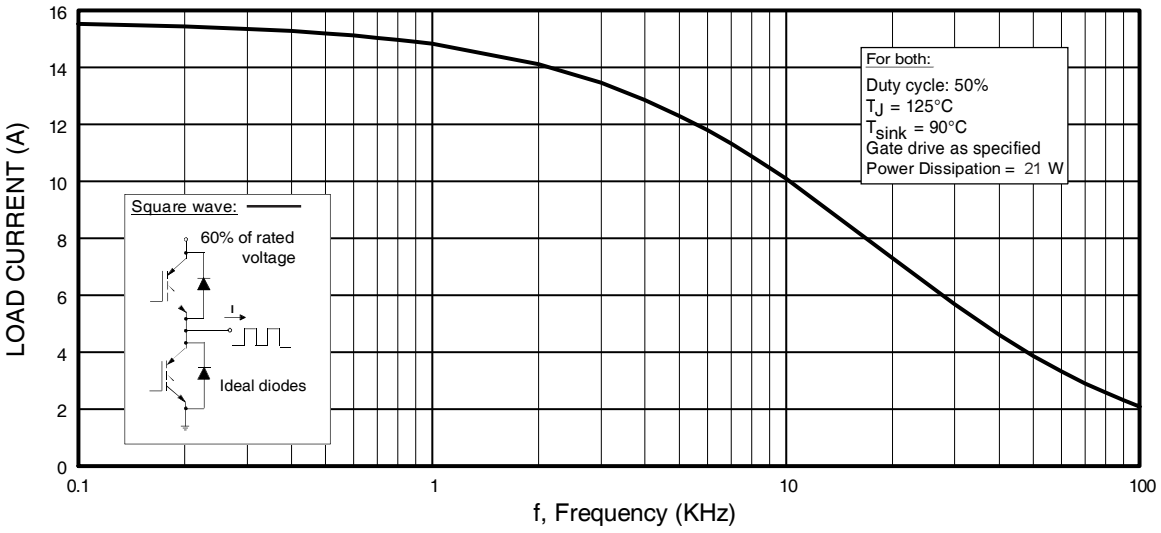


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)

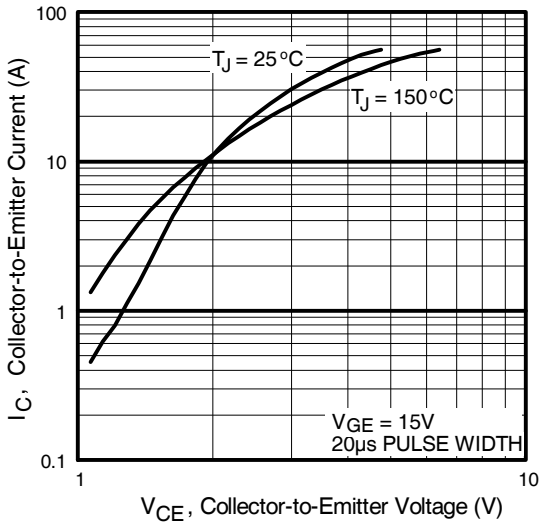


Fig. 2 - Typical Output Characteristics

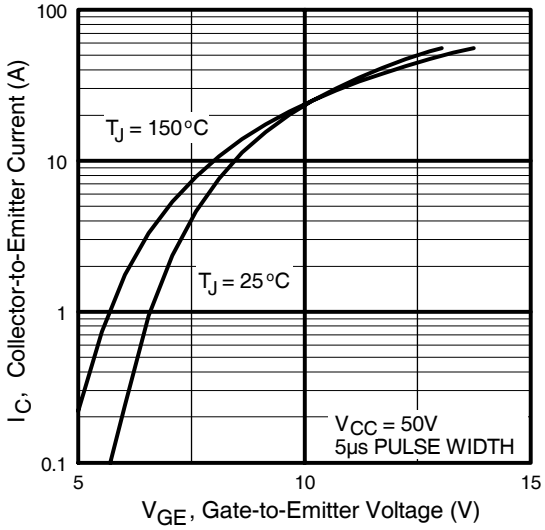


Fig. 3 - Typical Transfer Characteristics

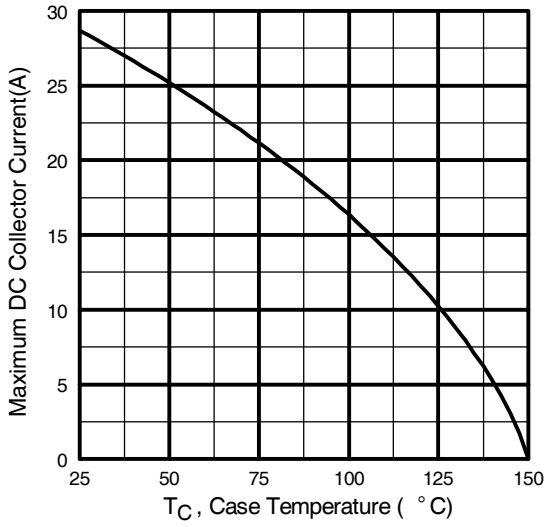


Fig. 4 - Maximum Collector Current vs. Case Temperature

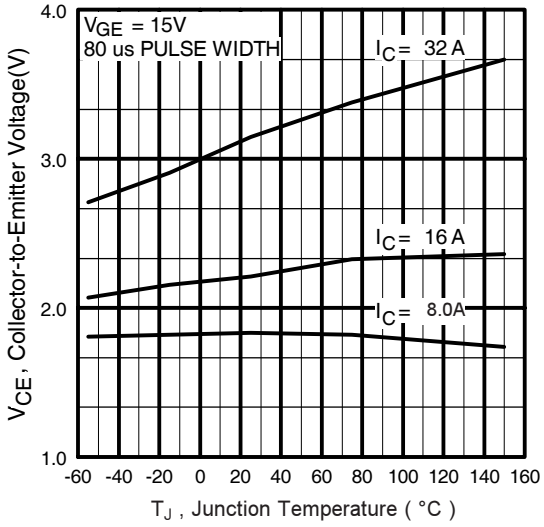


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

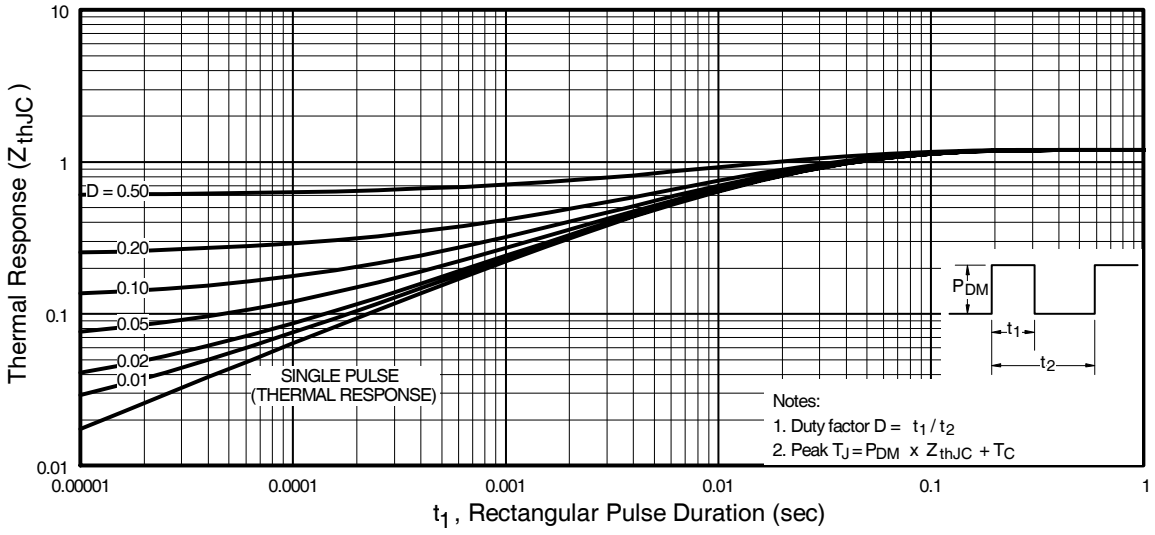


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

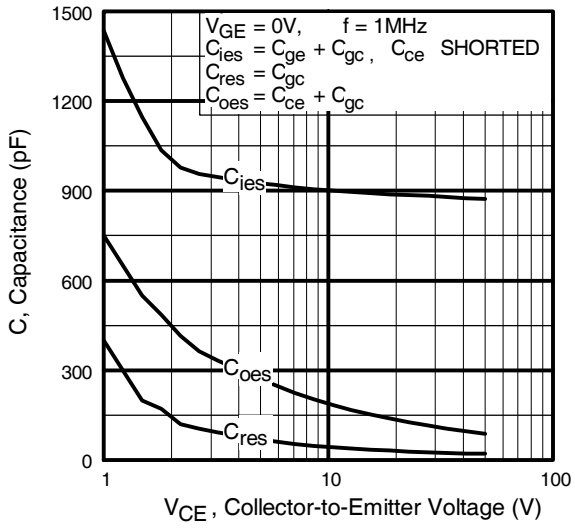


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

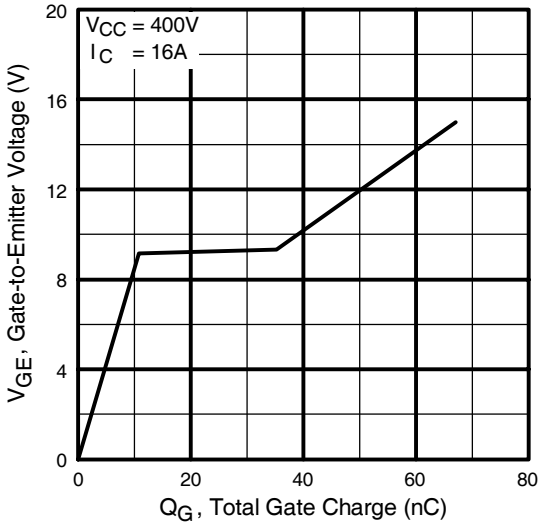


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

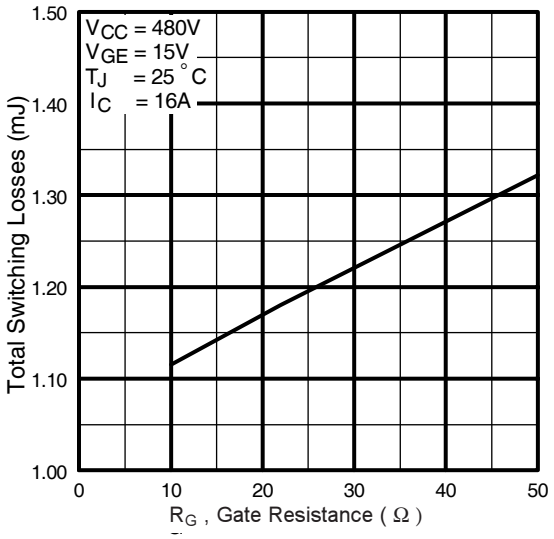


Fig. 9 - Typical Switching Losses vs. Gate Resistance

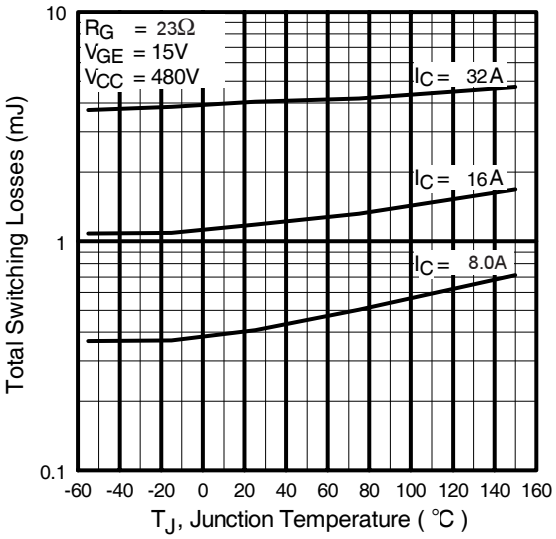


Fig. 10 - Typical Switching Losses vs. Junction Temperature

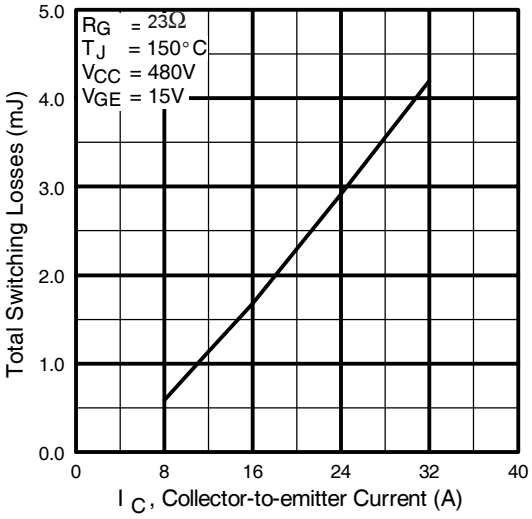


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

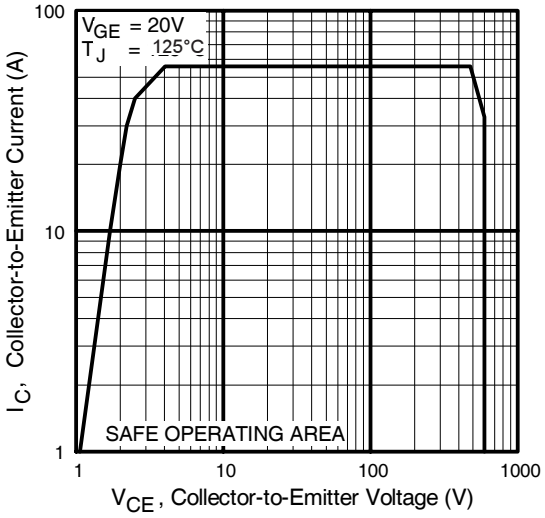


Fig. 12 - Turn-Off SOA

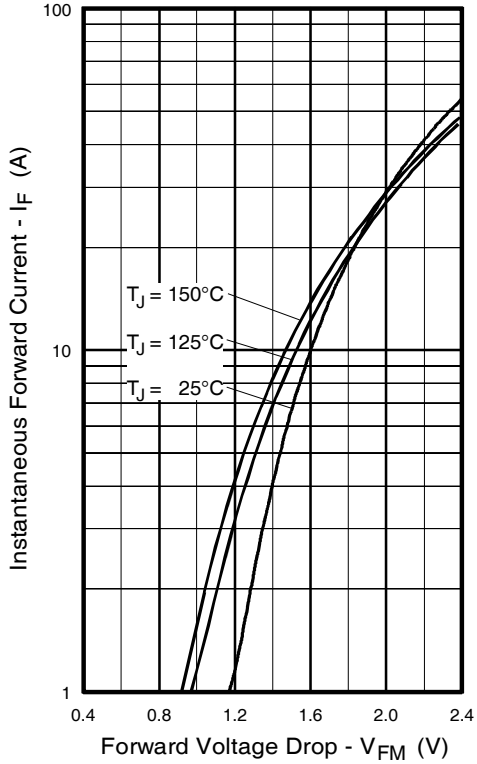


Fig. 13 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

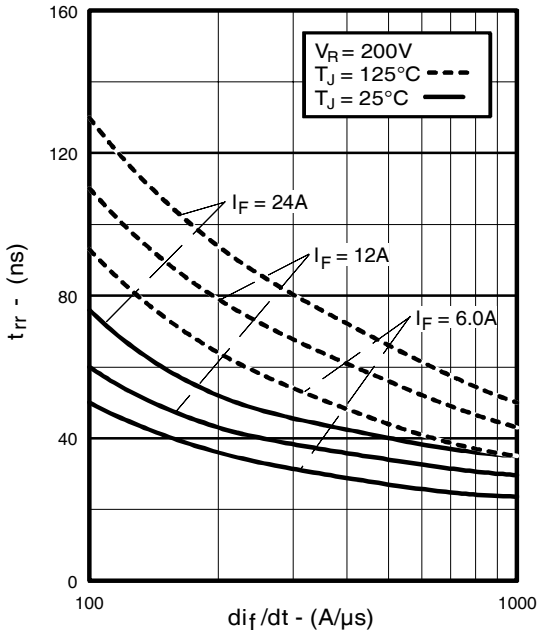


Fig. 14 - Typical Reverse Recovery vs. di_f/dt

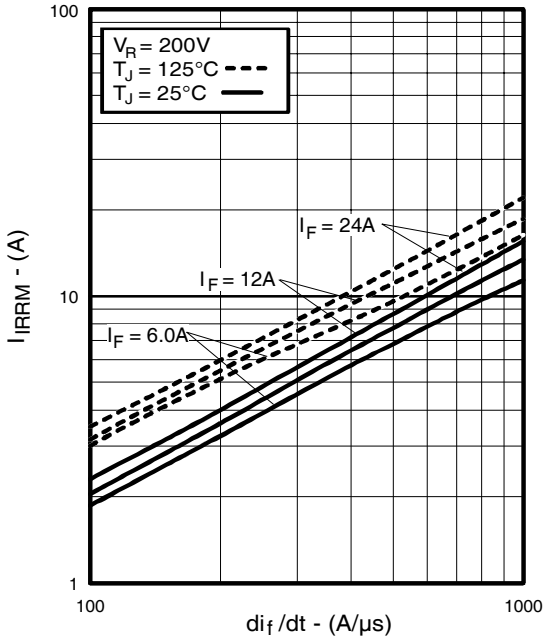


Fig. 15 - Typical Recovery Current vs. di_f/dt

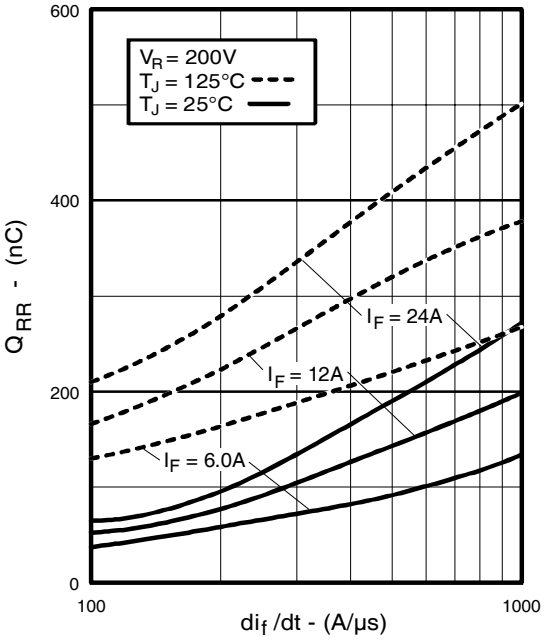


Fig. 16 - Typical Stored Charge vs. di_f/dt

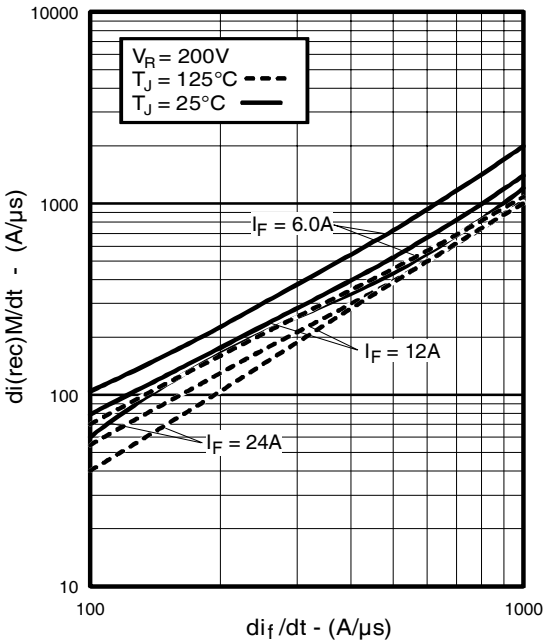


Fig. 17 - Typical $di_{(rec)M}/dt$ vs. di_f/dt

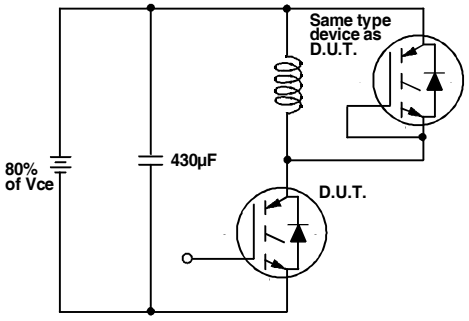


Fig. 18a - Test Circuit for Measurement of I_{LM}, E_{on}, $E_{off(diode)}$, t_{rr}, Q_{rr}, I_{rr}, $t_{d(on)}$, t_r, $t_{d(off)}$, t_f

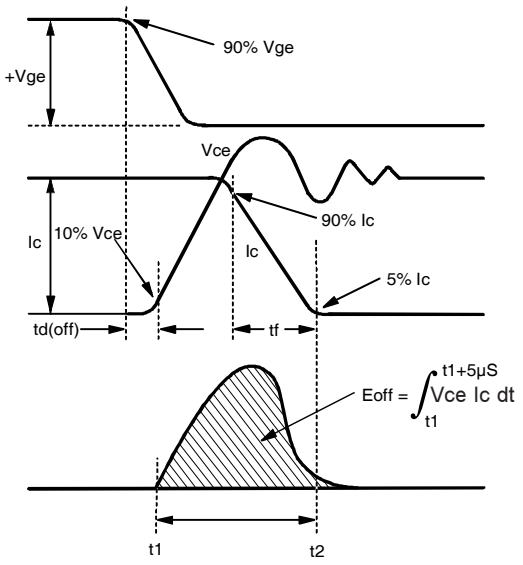


Fig. 18b - Test Waveforms for Circuit of Fig. 18a, Defining E_{off}, $t_{d(off)}$, t_f

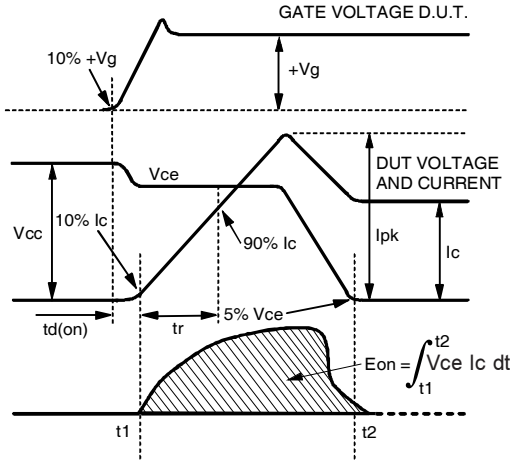


Fig. 18c - Test Waveforms for Circuit of Fig. 18a, Defining E_{on}, $t_{d(on)}$, t_r

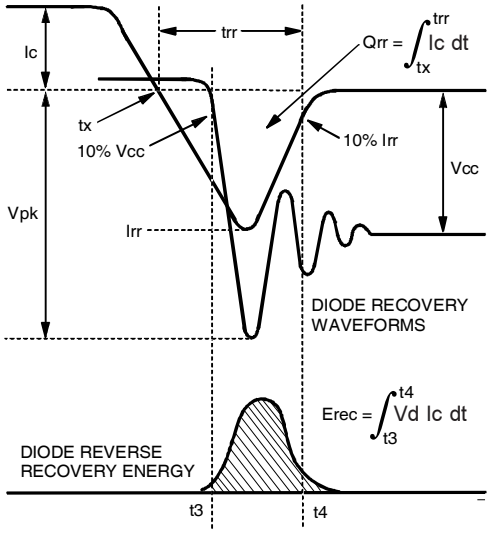


Fig. 18d - Test Waveforms for Circuit of Fig. 18a, Defining E_{rec}, t_{rr}, Q_{rr}, I_{rr}

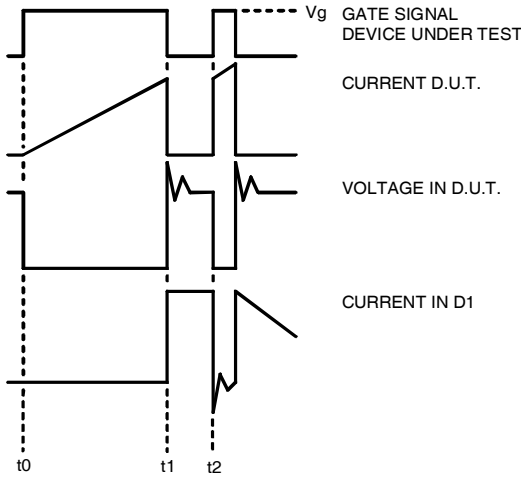


Figure 18e. Macro Waveforms for Figure 18a's Test Circuit

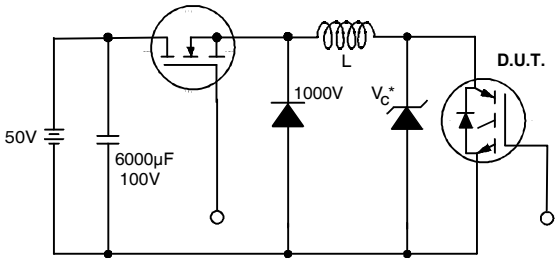


Figure 19. Clamped Inductive Load Test Circuit

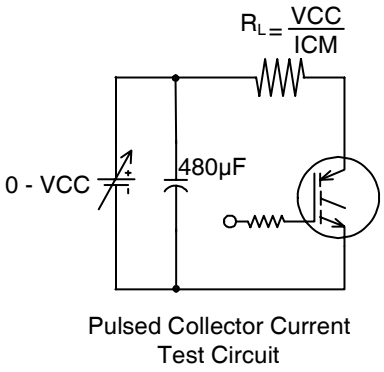


Figure 20. Pulsed Collector Current Test Circuit

Notes:

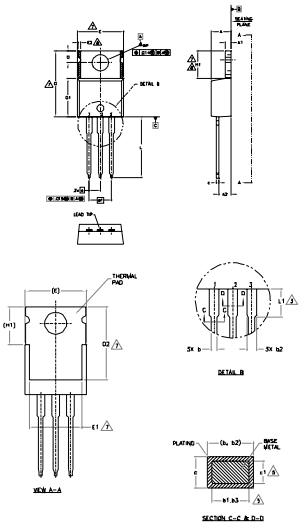
① Repetitive rating: V_{GE}=20V; pulse width limited by maximum junction temperature (figure 20)

② V_{CC}=80%(V_{CES}), V_{GE}=20V, L=10µH, R_G= 23Ω (figure 19)

③ Pulse width ≤ 80µs; duty factor ≤ 0.1%.

④ Pulse width 5.0µs, single shot.

TO-220AB Package Outline (Dimensions are shown in millimeters (inches))



NOTES:
1.- DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994.
2.- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
3.- LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
4.- DIMENSION D, D1 & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5.- DIMENSION b1, b3 & c1 APPLY TO BASE METAL ONLY.
6.- CONTROLLING DIMENSION : INCHES.
7.- THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
8.- DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED
9.- OUTLINE CONFORMS TO JEDEC TO-220, EXCEPT A2 (max.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.

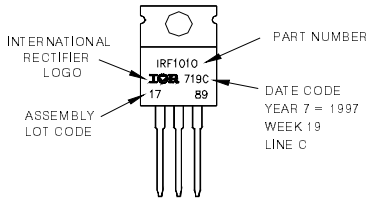
SYMBOL	DIMENSIONS				
	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	3.56	4.83	.140	.190	
A1	0.51	1.40	.020	.055	
A2	2.03	2.92	.080	.115	
b	0.38	1.01	.015	.040	
b1	0.38	0.97	.015	.038	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.36	0.61	.014	.024	
c1	0.36	0.56	.014	.022	5
D	14.22	16.51	.560	.650	4
D1	8.38	9.02	.330	.355	
D2	11.68	12.88	.460	.507	7
E	9.65	10.67	.380	.420	4,7
E1	6.86	8.89	.270	.350	7
E2	–	0.76	–	.030	8
e	2.54 BSC		.100 BSC		
e1	5.08 BSC		.200 BSC		
H1	5.84	6.86	.230	.270	7,8
L	12.70	14.73	.500	.580	
L1	3.56	4.06	.140	.160	3
øP	3.54	4.08	.139	.161	
Q	2.54	3.42	.100	.135	

LEAD ASSIGNMENTS
HEXFET
1.- GATE
2.- DRAIN
3.- SOURCE
IGBT & CoPACK
1.- GATE
2.- COLLECTOR
3.- EMITTER
DIODES
1.- ANODE
2.- CATHODE
3.- ANODE

TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

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



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

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
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Visit us at www.irf.com for sales contact information.02/2010

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- Техническая поддержка
- Подбор комплектации
- Индивидуальный подход
- Гибкое ценообразование
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ООО «НИОКР СИТЕМС»
Москва, 125362, Россия, ул. Вишневая, д. 9, к. 1, Блок 104 а и 104 в

Телефон: 8 (495) 268-14-82
Email: n@nsistems.ru

ИНН: 7735154786
ОГРН: 1167746717709