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With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

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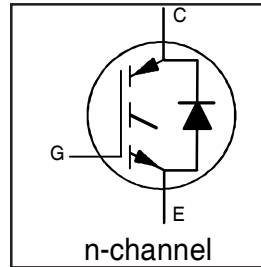


IRG4BC20SDPbF

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE Standard Speed IGBT

Features

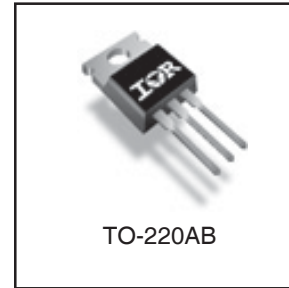
- Extremely low voltage drop 1.4Vtyp. @ 10A
- S-Series: Minimizes power dissipation at up to 3 KHz PWM frequency in inverter drives, up to 4 KHz in brushless DC drives.
- Very Tight Vce(on) distribution
- IGBT co-packaged with HEXFRED™ ultrafast, ultra-soft-recovery anti-parallel diodes for use in bridge configurations
- Industry standard TO-220AB package
- Lead-Free



$V_{CES} = 600V$
$V_{CE(on) typ.} = 1.4V$
@ $V_{GE} = 15V, I_C = 10A$

Benefits

- Generation 4 IGBT's offer highest efficiencies available
- IGBT's optimized for specific application conditions
- HEXFRED diodes optimized for performance with IGBT's. Minimized recovery characteristics require less/no snubbing
- Lower losses than MOSFET's conduction and Diode losses



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	19	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	10	
I_{CM}	Pulsed Collector Current ①	38	
I_{LM}	Clamped Inductive Load Current ②	38	
$I_F @ T_C = 100^\circ C$	Diode Continuous Forward Current	7.0	
I_{FM}	Diode Maximum Forward Current	38	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	60	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	24	
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	—	—	2.1	°C/W
$R_{\theta JC}$	Junction-to-Case - Diode	—	—	3.5	
$R_{\theta CS}$	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)

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)CES}	Collector-to-Emitter Breakdown Voltage _f	600	—	—	V	V _{GE} = 0V, I _C = 250μA
ΔV _{(BR)CES} /ΔT _J	Temperature Coeff. of Breakdown Voltage	—	0.75	—	V/°C	V _{GE} = 0V, I _C = 1.0mA
V _{CE(on)}	Collector-to-Emitter Saturation Voltage	—	1.40	1.6	V	I _C = 10A I _C = 19A I _C = 10A, T _J = 150°C
		—	1.85	—		
		—	1.44	—		
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	—	-11	—	mV/°C	V _{CE} = V _{GE} , I _C = 250μA
g _{fe}	Forward Transconductance ④	2.0	5.8	—	S	V _{CE} = 100V, I _C = 10A
I _{CES}	Zero Gate Voltage Collector Current	—	—	250	μA	V _{GE} = 0V, V _{CE} = 600V V _{GE} = 0V, V _{CE} = 600V, T _J = 150°C
		—	—	1700		
V _{FM}	Diode Forward Voltage Drop	—	1.4	1.7	V	I _C = 8.0A I _C = 8.0A, T _J = 150°C
		—	1.3	1.6		
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)	—	27	40	nC	I _C = 10A V _{CC} = 400V V _{GE} = 15V
Q _{ge}	Gate - Emitter Charge (turn-on)	—	4.3	6.5		
Q _{gc}	Gate - Collector Charge (turn-on)	—	10	15		
t _{d(on)}	Turn-On Delay Time	—	62	—	ns	T _J = 25°C I _C = 10A, V _{CC} = 480V V _{GE} = 15V, R _G = 50Ω Energy losses include "tail" and diode reverse recovery.
t _r	Rise Time	—	32	—		
t _{d(off)}	Turn-Off Delay Time	—	690	1040		
t _f	Fall Time	—	480	730	mJ	See Fig. 9, 10, 11, 18
E _{on}	Turn-On Switching Loss	—	0.32	—		
E _{off}	Turn-Off Switching Loss	—	2.58	—		
E _{ts}	Total Switching Loss	—	2.90	4.5	ns	T _J = 150°C, See Fig. 10, 11, 18 I _C = 10A, V _{CC} = 480V V _{GE} = 15V, R _G = 50Ω Energy losses include "tail" and diode reverse recovery.
t _{d(on)}	Turn-On Delay Time	—	64	—		
t _r	Rise Time	—	35	—		
t _{d(off)}	Turn-Off Delay Time	—	980	—	mJ	See Fig. 7
t _f	Fall Time	—	800	—		
E _{ts}	Total Switching Loss	—	4.33	—		
L _E	Internal Emitter Inductance	—	7.5	—	nH	Measured 5mm from package
C _{ies}	Input Capacitance	—	550	—	pF	V _{GE} = 0V V _{CC} = 30V f = 1.0MHz
C _{oes}	Output Capacitance	—	39	—		
C _{res}	Reverse Transfer Capacitance	—	7.1	—		
t _{rr}	Diode Reverse Recovery Time	—	37	55	ns	T _J = 25°C See Fig. 14 T _J = 125°C
		—	55	90		
I _{rr}	Diode Peak Reverse Recovery Current	—	3.5	5.0	A	T _J = 25°C See Fig. 15 T _J = 125°C
		—	4.5	8.0		
Q _{rr}	Diode Reverse Recovery Charge	—	65	138	nC	T _J = 25°C See Fig. 16 T _J = 125°C
		—	124	360		
di _{(rec)M} /dt	Diode Peak Rate of Fall of Recovery During t _b	—	240	—	A/μs	T _J = 25°C See Fig. 17 T _J = 125°C
		—	210	—		

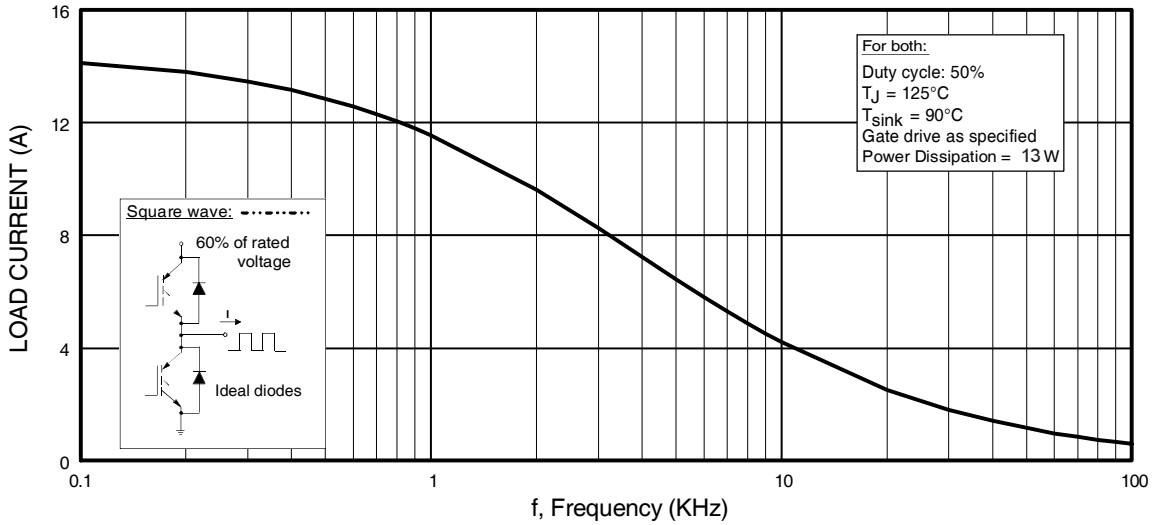


Fig. 1 - Typical Load Current vs. Frequency
 (Load Current = I_{RMS} of fundamental)

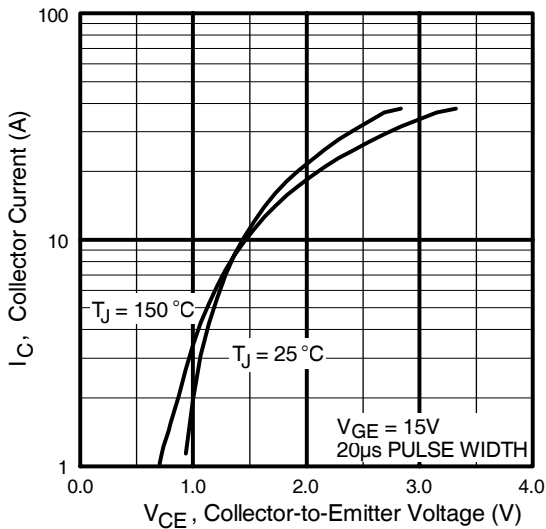


Fig. 2 - Typical Output Characteristics
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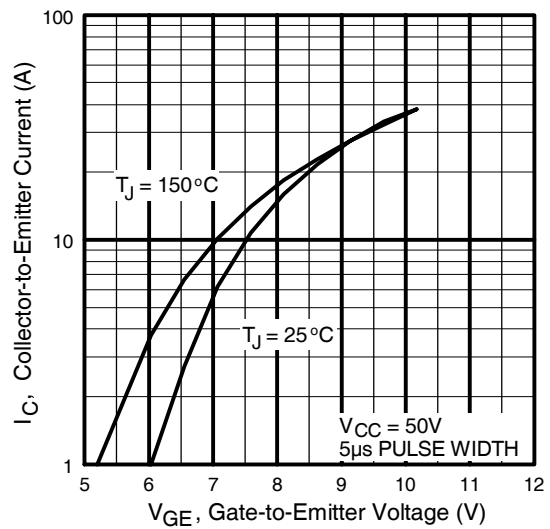


Fig. 3 - Typical Transfer Characteristics

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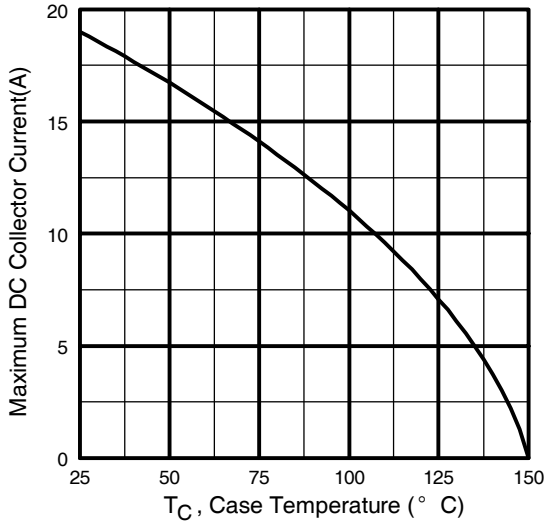


Fig. 4 - Maximum Collector Current vs. Case Temperature

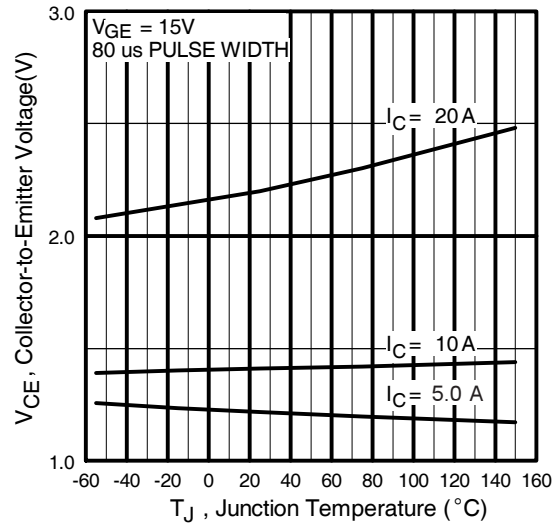


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

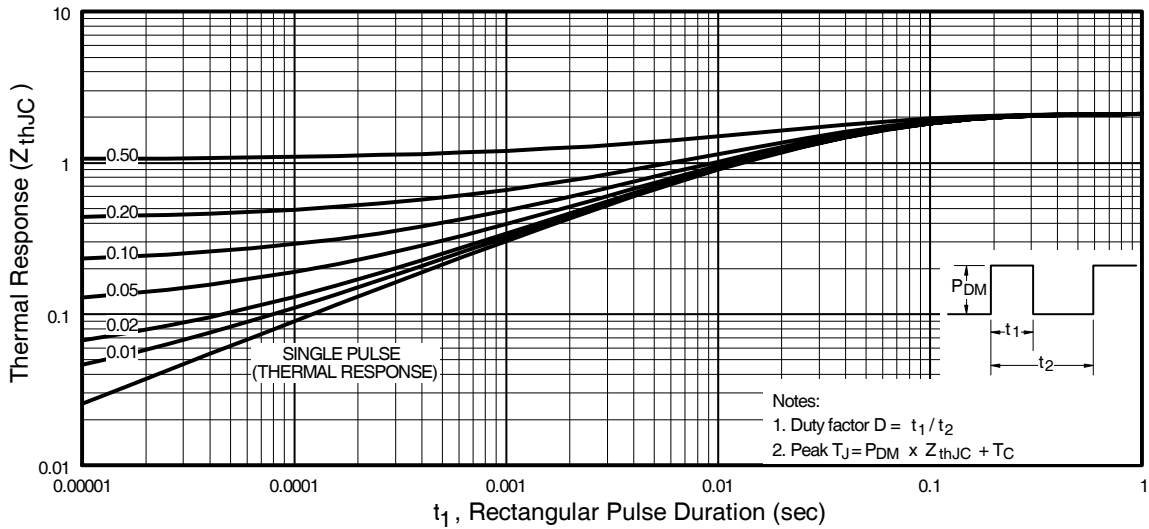


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

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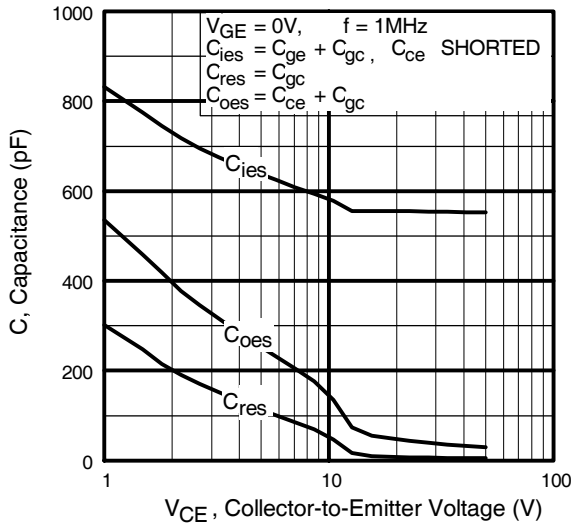


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

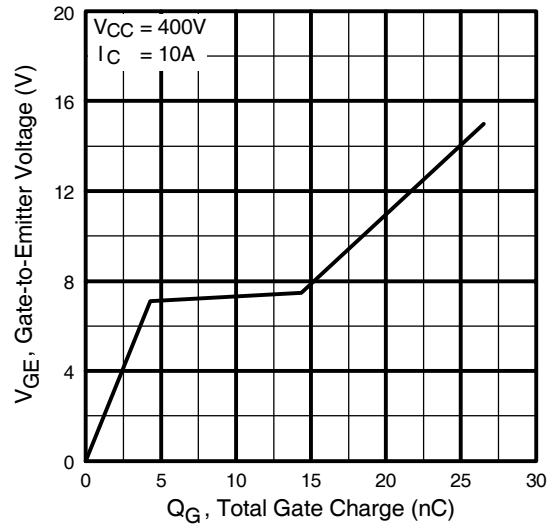


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

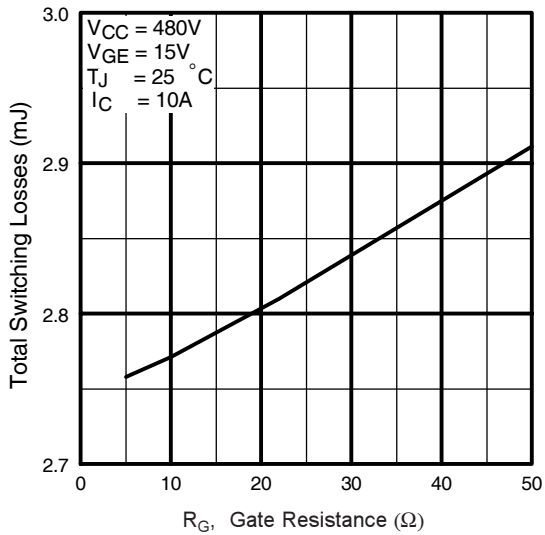


Fig. 9 - Typical Switching Losses vs. Gate Resistance

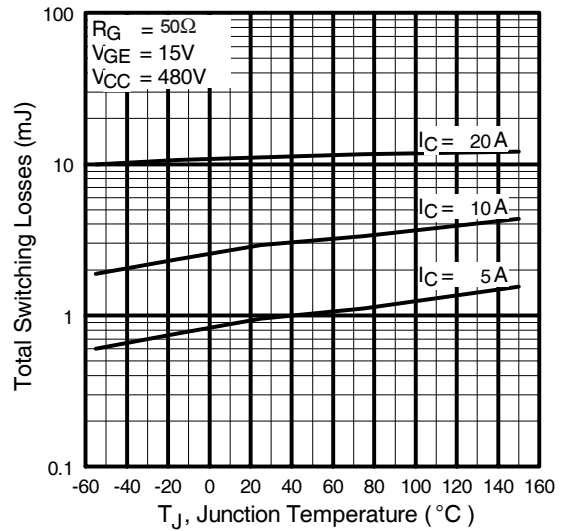


Fig. 10 - Typical Switching Losses vs. Junction Temperature

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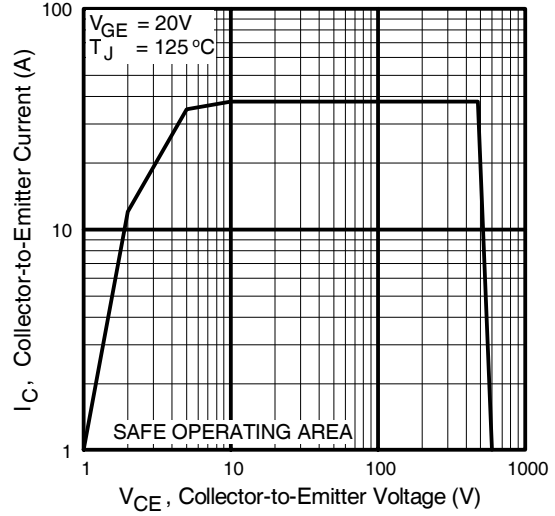
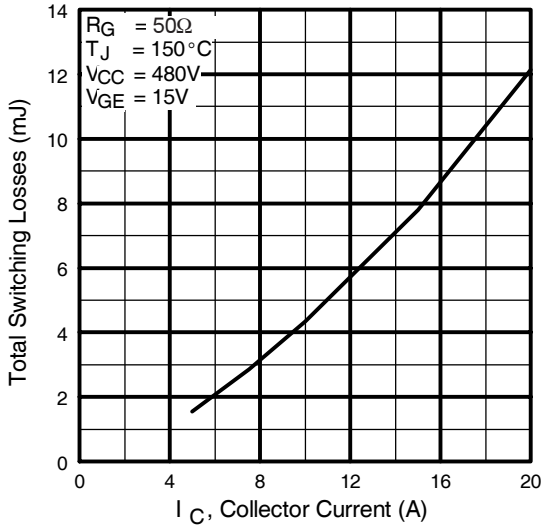


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

Fig. 12 - Turn-Off SOA

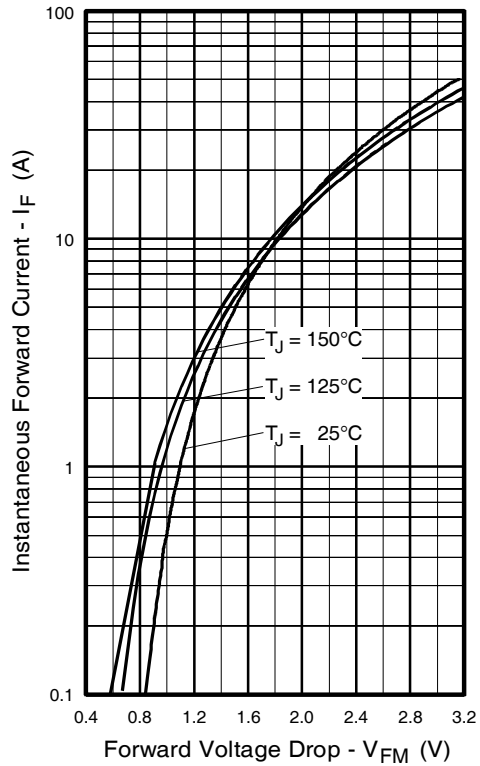


Fig. 13 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

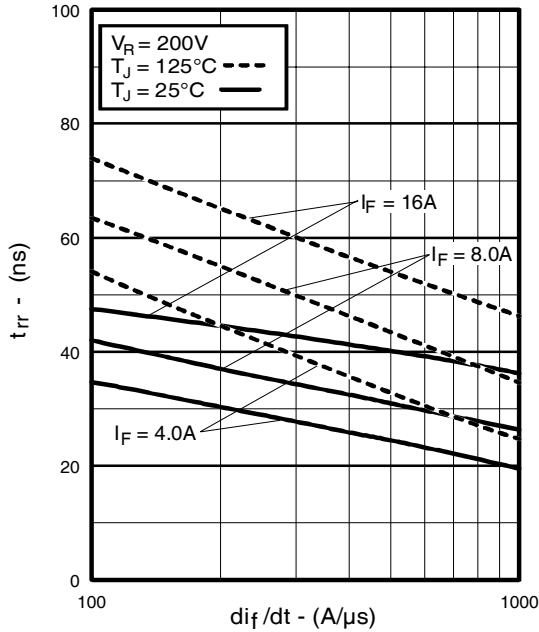


Fig. 14 - Typical Reverse Recovery vs. di_f/dt

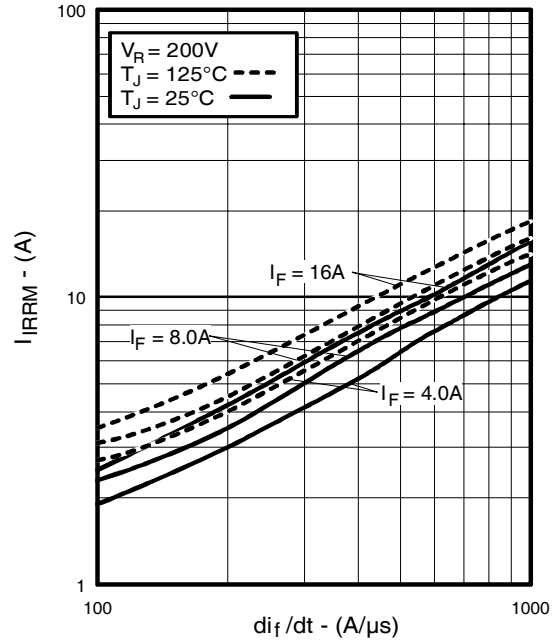


Fig. 15 - Typical Recovery Current vs. di_f/dt

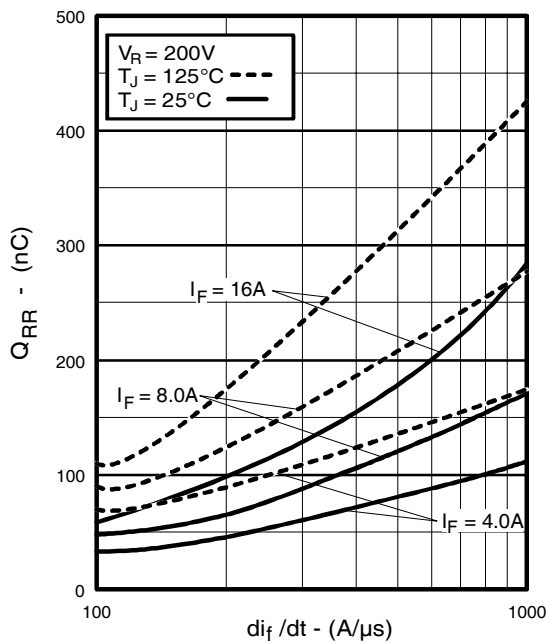


Fig. 16 - Typical Stored Charge vs. di_f/dt
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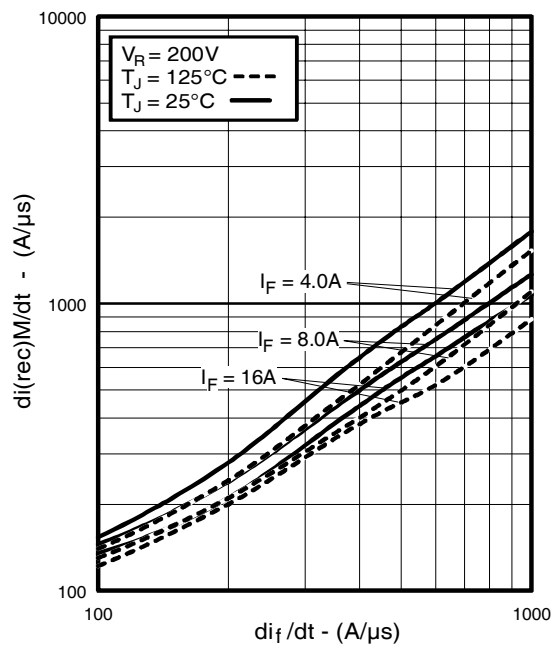


Fig. 17 - Typical $di_{(rec)M}/dt$ vs. di_f/dt

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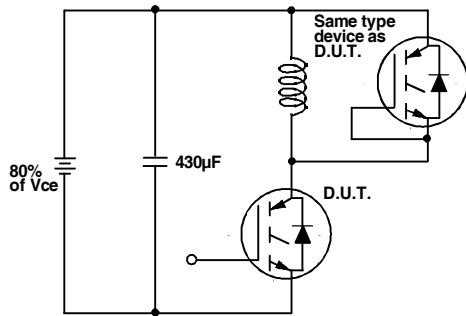


Fig. 18a - Test Circuit for Measurement of I_{LM} , E_{on} , $E_{off}(\text{diode})$, t_{rr} , Q_{rr} , I_{rr} , $t_{d(on)}$, t_r , $t_{d(off)}$, t_f

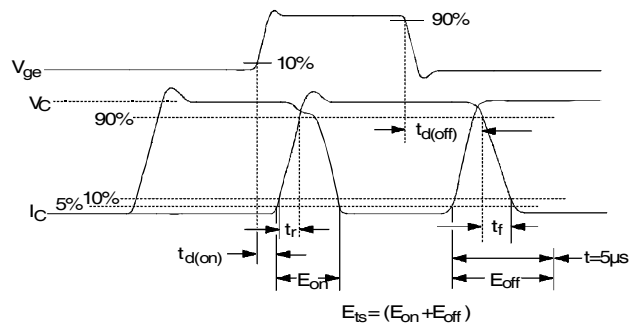


Fig. 18b - Test Waveforms for Circuit of Fig. 18a, Defining E_{off} , $t_{d(off)}$, t_f

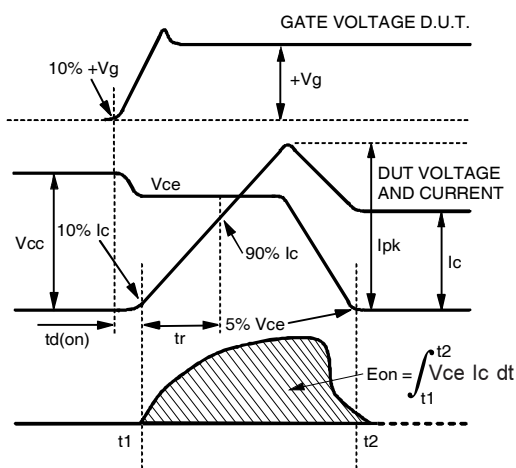


Fig. 18c - Test Waveforms for Circuit of Fig. 18a, Defining E_{on} , $t_{d(on)}$, t_r

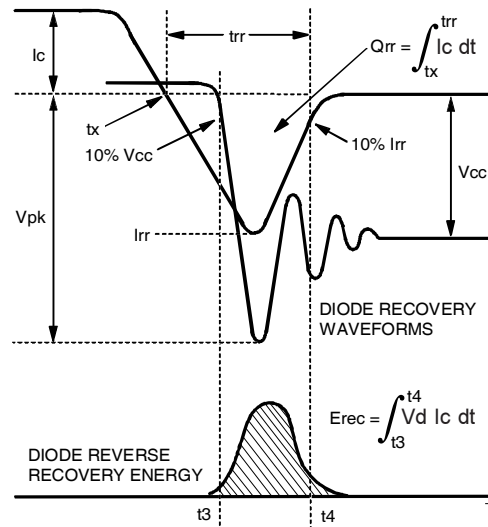


Fig. 18d - Test Waveforms for Circuit of Fig. 18a, Defining E_{rec} , t_{rr} , Q_{rr} , I_{rr}

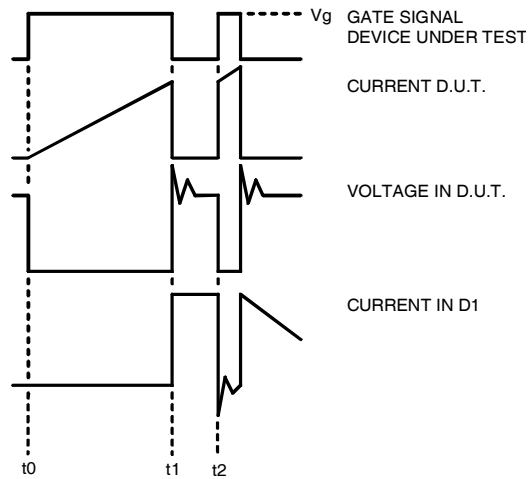


Figure 18e. Macro Waveforms for Figure 18a's Test Circuit

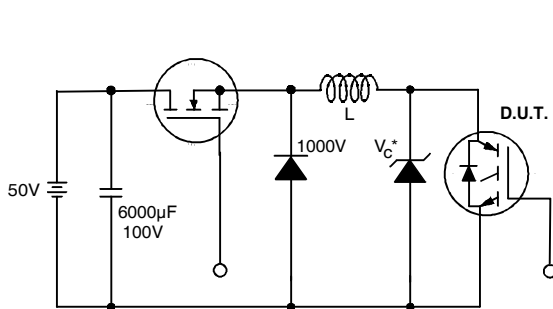
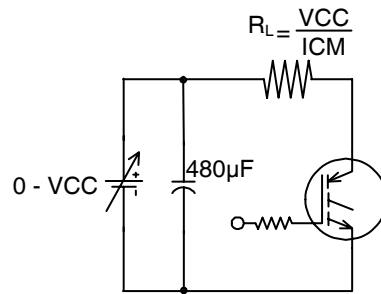


Figure 19. Clamped Inductive Load Test Circuit



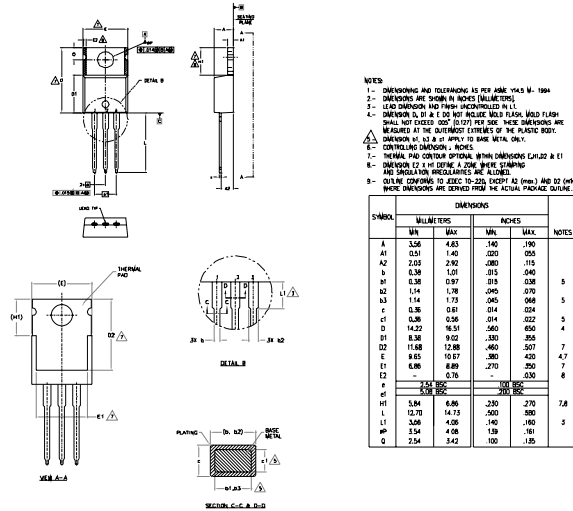
Pulsed Collector Current
 Test Circuit

Figure 20. Pulsed Collector Current
 Test Circuit

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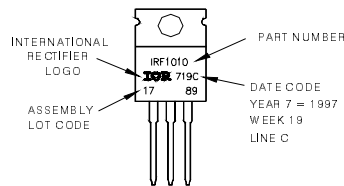


TO-220AB Package Outline (Dimensions are shown in millimeters (inches))



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/>

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 μs , single shot.

Data and specifications subject to change without notice.



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