Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

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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International
IOR Rectifier

PD - 95638

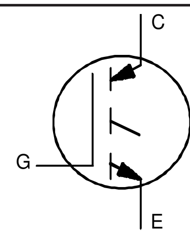
IRG4BC20KPbF

Short Circuit Rated
UltraFast IGBT

INSULATED GATE BIPOLAR TRANSISTOR

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
• Latest generation design provides tighter parameter distribution and higher efficiency than previous generations
• Lead-Free



n-channel

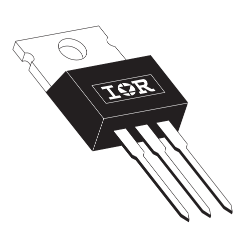
V_{CES} = 600V

$V_{CE(on)\ typ.}$ = 2.27V

@V_{GE} = 15V, I_C = 9.0A

Benefits

• As a Freewheeling Diode we recommend our HEXFRED[TM] ultrafast, ultrasoft recovery diodes for minimum EMI / Noise and switching losses in the Diode and IGBT
• Latest generation 4 IGBTs offer highest power density motor controls possible
• This part replaces the IRGBC20K and IRGBC20M devices



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	16	A
I_C @ T_C = 100°C	Continuous Collector Current	9.0	
I_{CM}	Pulsed Collector Current ①	32	
I_{LM}	Clamped Inductive Load Current ②	32	
t_{sc}	Short Circuit Withstand Time	10	µs
V_{GE}	Gate-to-Emitter Voltage	±20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	29	mJ
P_D @ T_C = 25°C	Maximum Power Dissipation	60	W
P_D @ T_C = 100°C	Maximum Power Dissipation	24	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	
	Mounting torque, 6-32 or M3 screw.	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	–––	2.1	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.5	–––	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	–––	80	
Wt	Weight	2.0 (0.07)	–––	g (oz)

07/23/04

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

	Parameter	Min.	Typ.	Max.	Units	Conditions	
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	—	—	V	V_{GE} = 0V, I_C = 250μA	
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ④	18	—	—	V	V_{GE} = 0V, I_C = 1.0A	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.49	—	V/°C	V_{GE} = 0V, I_C = 1.0mA	
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	2.00	—	V	I_C = 6.0A	V_{GE} = 15V See Fig.2, 5
		—	2.27	2.8		I_C = 9.0A	
		—	3.01	—		I_C = 16A	
		—	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	
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-10	—	mV/°C	$V_{CE} = V_{GE}$, I_C = 250μA	
g_{fe}	Forward Transconductance ⑤	2.9	4.3	—	S	V_{CE} = 100 V, I_C = 9.0A	
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	μA	V_{GE} = 0V, V_{CE} = 600V	
		—	—	2.0		V_{GE} = 0V, V_{CE} = 10V, T_J = 25°C	
		—	—	1000		V_{GE} = 0V, V_{CE} = 600V, 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	—	28	—	ns	
t_r	Rise Time	—	27	—		T_J = 25°C
$t_{d(off)}$	Turn-Off Delay Time	—	150	220		I_C = 9.0A, V_{CC} = 480V
t_f	Fall Time	—	100	150		V_{GE} = 15V, R_G = 50Ω
E_{on}	Turn-On Switching Loss	—	0.15	—	mJ	Energy losses include "tail"
E_{off}	Turn-Off Switching Loss	—	0.25	—		See Fig. 9,10,14
E_{ts}	Total Switching Loss	—	0.40	0.6		
t_{sc}	Short Circuit Withstand Time	10	—	—	μs	V_{CC} = 400V, T_J = 125°C V_{GE} = 15V, R_G = 50Ω , V_{CPK} < 500V
$t_{d(on)}$	Turn-On Delay Time	—	28	—	ns	T_J = 150°C,
t_r	Rise Time	—	29	—		I_C = 9.0A, V_{CC} = 480V
$t_{d(off)}$	Turn-Off Delay Time	—	190	—		V_{GE} = 15V, R_G = 50Ω
t_f	Fall Time	—	190	—		Energy losses include "tail"
E_{ts}	Total Switching Loss	—	0.68	—	mJ	See Fig. 11,14
E_{on}	Turn-On Switching Loss	—	0.07	—	mJ	T_J = 25°C, V_{GE} = 15V, R_G = 50Ω
E_{off}	Turn-Off Switching Loss	—	0.13	—		I_C = 6.0A, V_{CC} = 480V
E_{ts}	Total Switching Loss	—	0.20	—		Energy losses include "tail"
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	—		ƒ = 1.0MHz

Details of note ① through ⑤ are on the last page

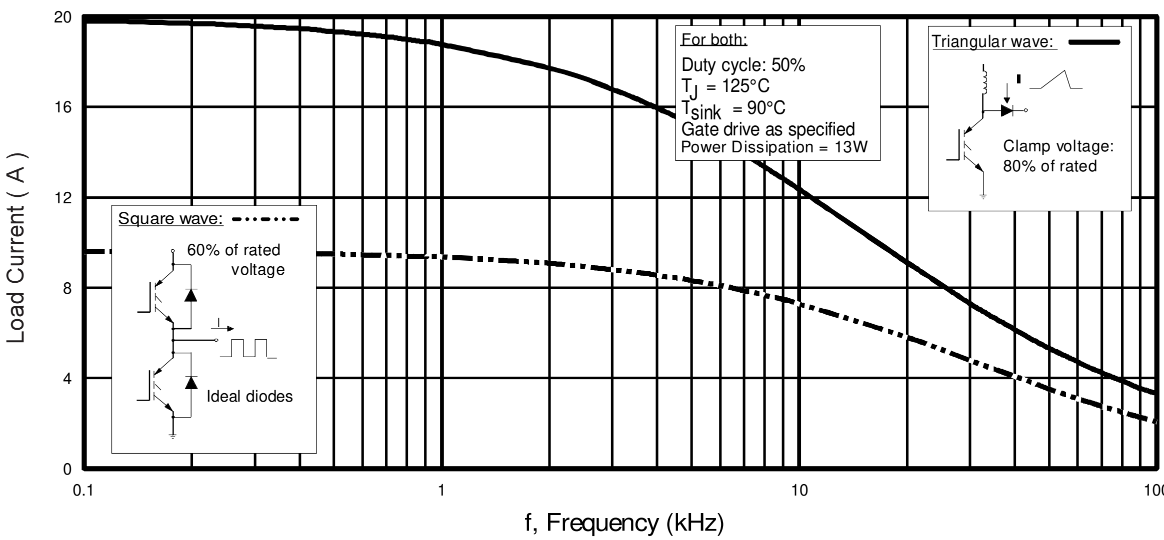


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)

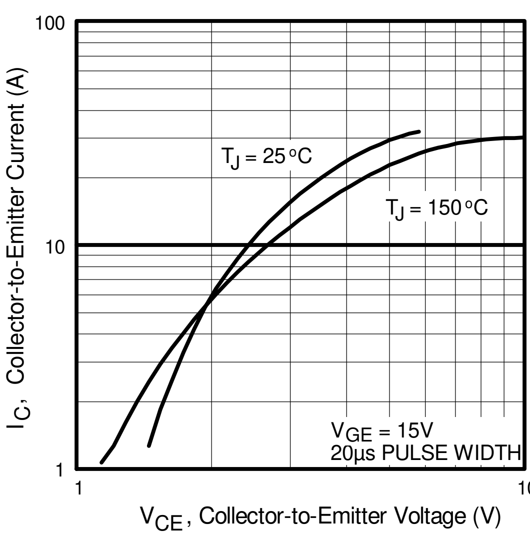


Fig. 2 - Typical Output Characteristics

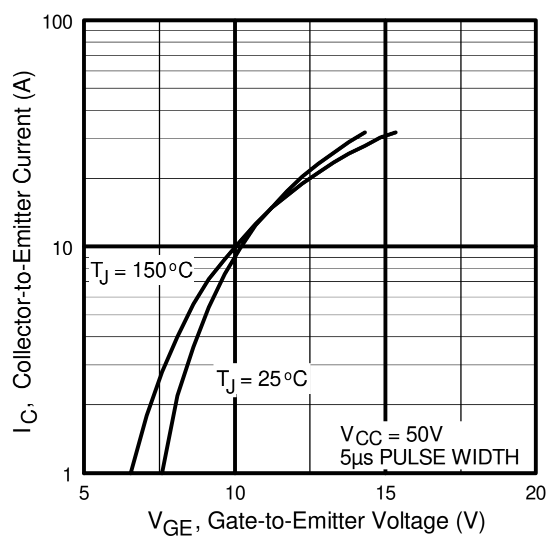
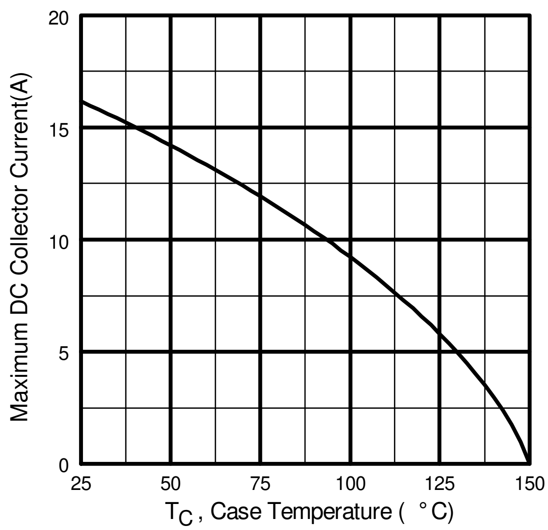


Fig. 3 - Typical Transfer Characteristics



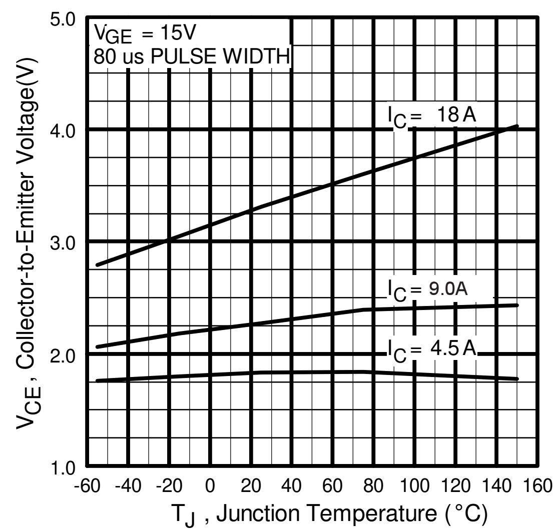


Fig. 4 - Maximum Collector Current vs. Case Temperature

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

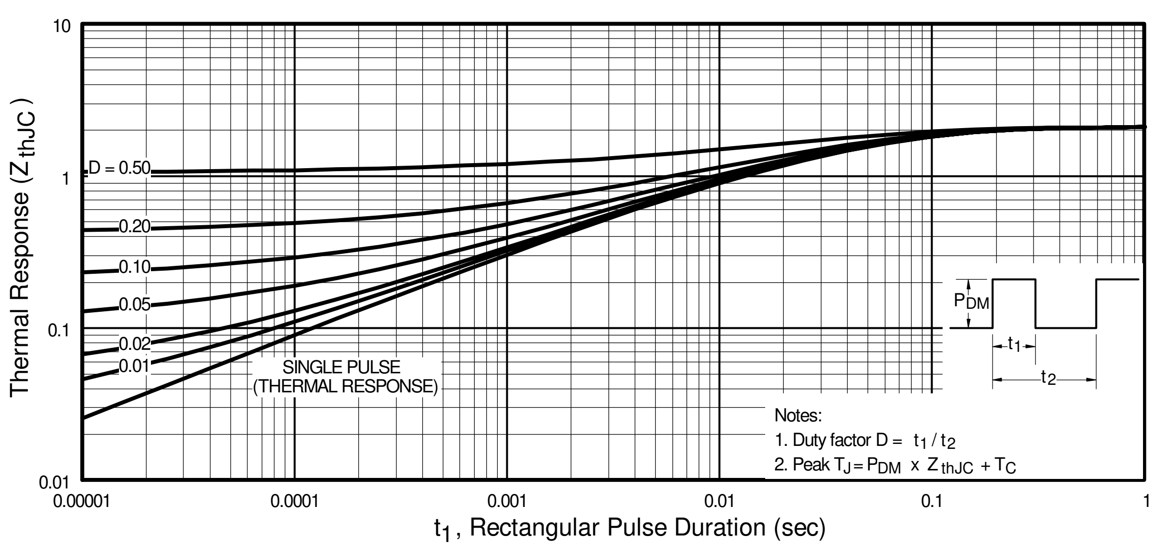


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

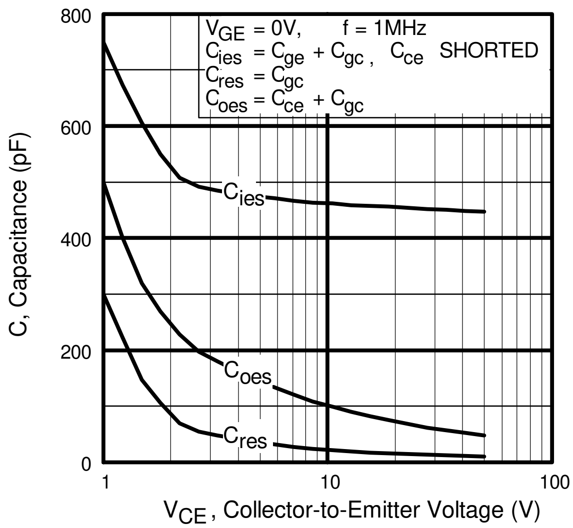


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

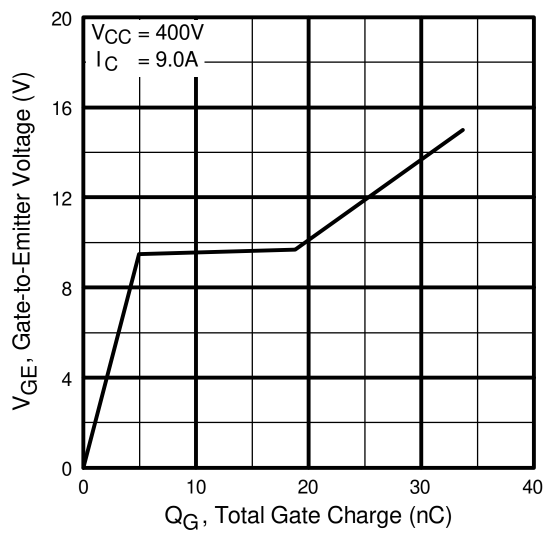


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

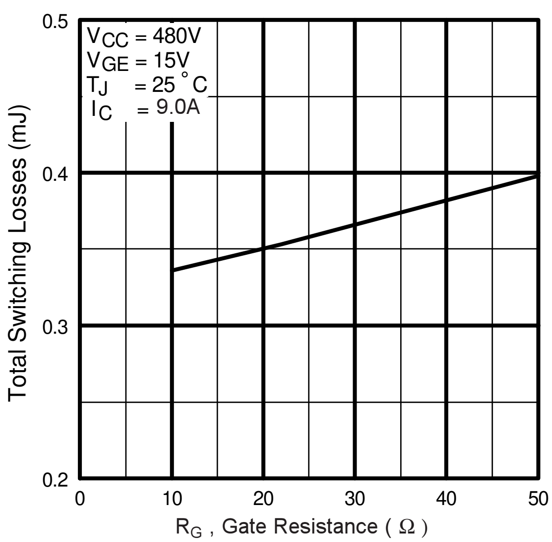


Fig. 9 - Typical Switching Losses vs. Gate Resistance

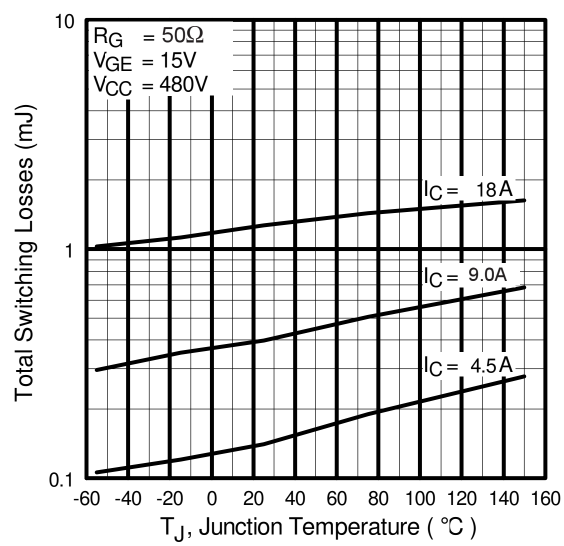


Fig. 10 - Typical Switching Losses vs. Junction Temperature

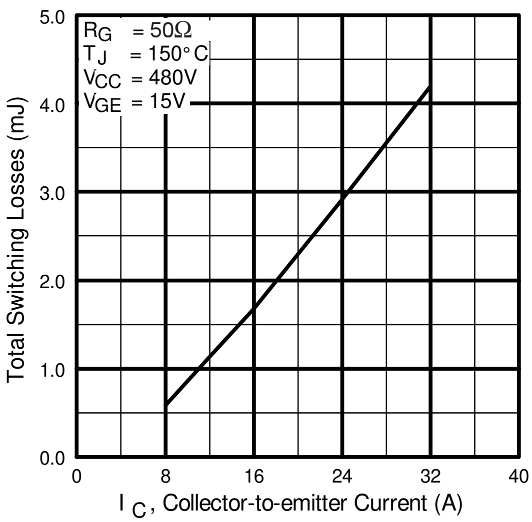


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

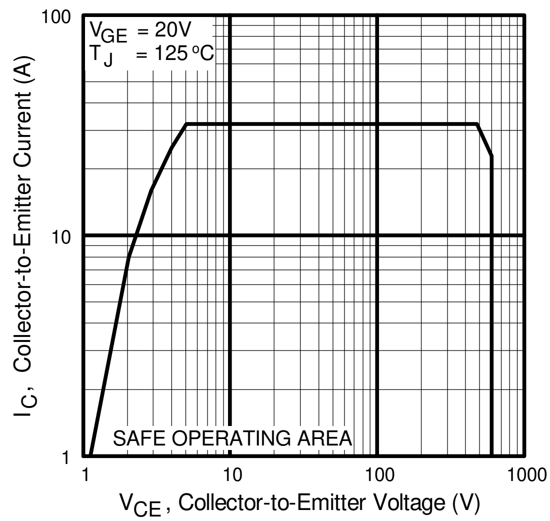
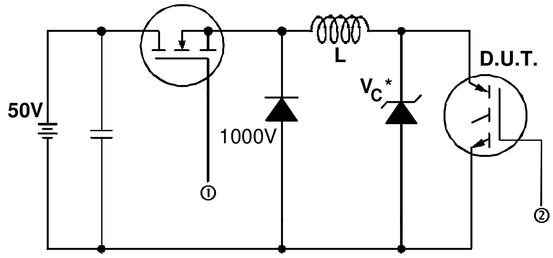


Fig. 12 - Turn-Off SOA



* Driver same type as D.U.T.; Vc = 80% of Vce(max)
* Note: Due to the 50V power supply, pulse width and inductor will increase to obtain rated Id.

Fig. 13a - Clamped Inductive Load Test Circuit

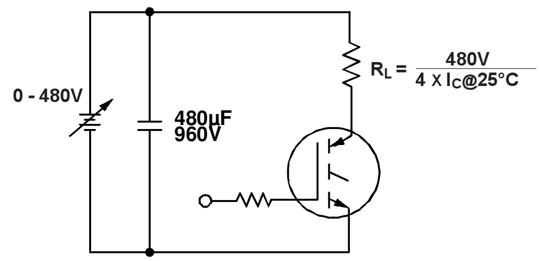


Fig. 13b - Pulsed Collector Current Test Circuit

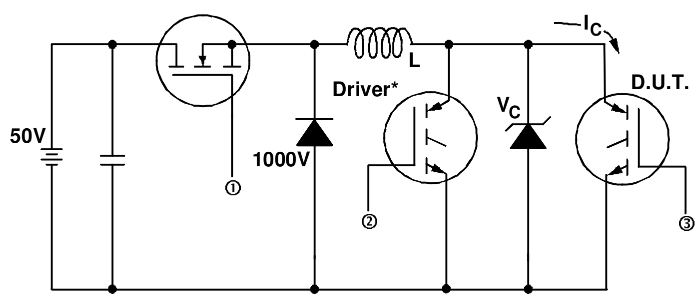


Fig. 14a - Switching Loss Test Circuit

* Driver same type as D.U.T., VC = 480V

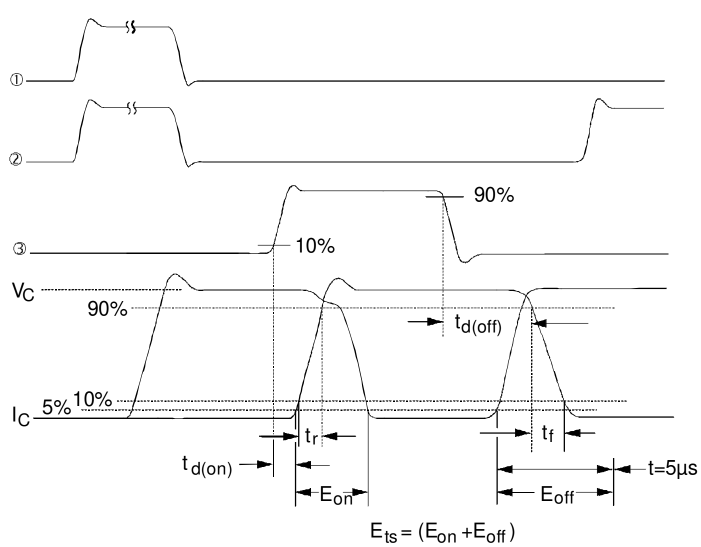
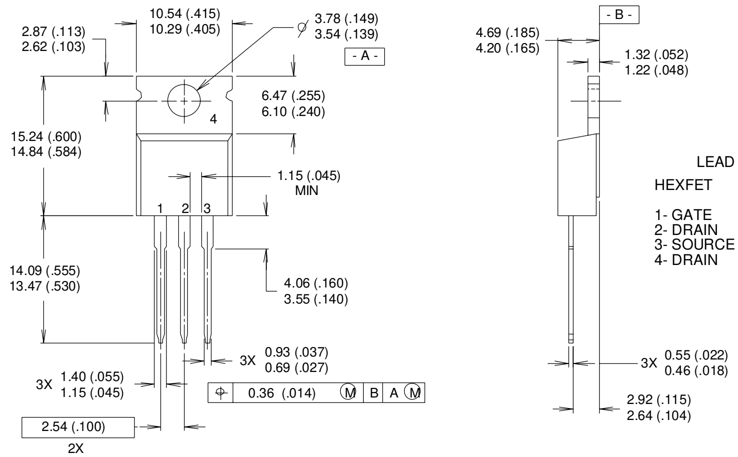


Fig. 14b - Switching Loss Waveforms

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



LEAD ASSIGNMENTS

HEXFET	IGBTs, CoPACK
1- GATE	1- GATE
2- DRAIN	2- COLLECTOR
3- SOURCE	3- EMITTER
4- DRAIN	4- COLLECTOR

NOTES:

1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.

2 CONTROLLING DIMENSION : INCH

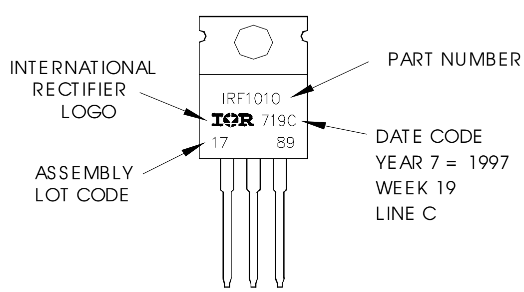
3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.

4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

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"



Notes:

① Repetitive rating; V_{GE} = 20V, pulse width limited by max. junction temperature. (See fig. 13b)

② V_{CC} = 80%(V_{CES}), V_{GE} = 20V, L = 10µH, R_G = 50Ω, (See fig. 13a)

③ Repetitive rating; pulse width limited by maximum junction temperature.

④ Pulse width ≤ 80µs; duty factor ≤ 0.1%.

⑤ Pulse width 5.0µs, single shot.

Data and specifications subject to change without notice.

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