



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.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



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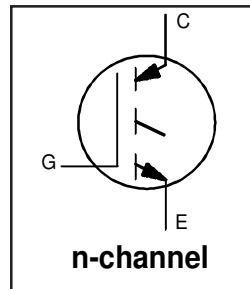
IRG4PC60UPbF

INSULATED GATE BIPOLAR TRANSISTOR

UltraFast Speed IGBT

Features

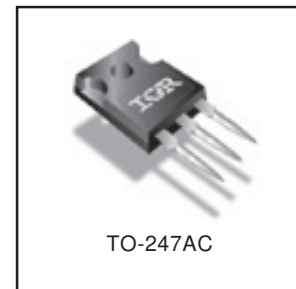
- UltraFast: Optimized for high operating frequencies up to 50 kHz in hard switching, >200 kHz in resonant mode.
- Generation 4 IGBT design provides tighter parameter distribution and higher efficiency.
- Industry standard TO-247AC package.
- Lead-Free



$V_{CES} = 600V$
$V_{CE(on) typ.} = 1.6V$
@ $V_{GE} = 15V, I_C = 40A$

Benefits

- Generation 4 IGBT's offer highest efficiency available.
- IGBT's optimized for specified application conditions.
- Designed for best performance when used with IR Hexfred & IR Fred companion diodes.



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	600	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	75	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	40	
I_{CM}	Pulsed Collector Current ①	300	
I_{LM}	Clamped Inductive Load Current ②	300	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	200	mJ
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	520	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	210	
T_J	Operating Junction and Storage Temperature Range	-55 to + 150	°C
T_{STG}			
	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	----	0.24	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	----	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	----	40	
Wt	Weight	6 (0.21)	----	

Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	----	----	V	$V_{GE} = 0V, I_C = 250\mu A$
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ④	17	----	----	V	$V_{GE} = 0V, I_C = 1.0A$
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	----	0.28	----	V/ $^\circ\text{C}$	$V_{GE} = 0V, I_C = 1.0mA$
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	----	1.7	2.0	V	$I_C = 40A$ $I_C = 75A$ $I_C = 40A, T_J = 150^\circ\text{C}$ $V_{GE} = 15V$ See Fig.2, 5
		----	1.9	----		
		----	1.6	----		
$V_{GE(th)}$	Gate Threshold Voltage	3.0	----	6.0		$V_{CE} = V_{GE}, I_C = 250\mu A$
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	----	-12	----	mV/ $^\circ\text{C}$	$V_{CE} = V_{GE}, I_C = 250\mu A$
g_{fe}	Forward Transconductance ⑤	44	59	----	S	$V_{CE} \geq 100V, I_C = 40A$
I_{CES}	Zero Gate Voltage Collector Current	----	----	250	μA	$V_{GE} = 0V, V_{CE} = 600V$ $V_{GE} = 0V, V_{CE} = 10V, T_J = 25^\circ\text{C}$ $V_{GE} = 0V, V_{CE} = 600V, T_J = 150^\circ\text{C}$
		----	----	2.0		
		----	----	5000		
I_{GES}	Gate-to-Emitter Leakage Current	----	----	± 100	nA	$V_{GE} = \pm 20V$

Switching Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	----	310	320	nC	$I_C = 40A$ $V_{CC} = 480V$ $V_{GE} = 15V$ See Fig. 8
Q_{ge}	Gate - Emitter Charge (turn-on)	----	41	46		
Q_{gc}	Gate - Collector Charge (turn-on)	----	110	120		
$t_{d(on)}$	Turn-On Delay Time	----	39	----	ns	$T_J = 25^\circ\text{C}$ $I_C = 40A, V_{CC} = 480V$ $V_{GE} = 15V, R_G = 5.0\Omega$ Energy losses include "tail" See Fig. 10, 11, 13, 14
t_r	Rise Time	----	42	----		
$t_{d(off)}$	Turn-Off Delay Time	----	200	----		
t_f	Fall Time	----	100	----		
E_{on}	Turn-On Switching Loss	----	0.28	----	mJ	See Fig. 10, 11, 13, 14
E_{off}	Turn-Off Switching Loss	----	1.1	----		
E_{ts}	Total Switching Loss	----	1.3	1.8	mJ	$T_J = 150^\circ\text{C},$ $I_C = 40A, V_{CC} = 480V$ $V_{GE} = 15V, R_G = 5.0\Omega$ Energy losses include "tail" See Fig. 13, 14
$t_{d(on)}$	Turn-On Delay Time	----	36	----		
t_r	Rise Time	----	42	----		
$t_{d(off)}$	Turn-Off Delay Time	----	300	----		
t_f	Fall Time	----	160	----		
E_{ts}	Total Switching Loss	----	2.6	----	mJ	See Fig. 13, 14
L_E	Internal Emitter Inductance	----	13	----	nH	Measured 5mm from package
C_{ies}	Input Capacitance	----	5860	----	pF	$V_{GE} = 0V$ $V_{CC} = 30V$ $f = 1.0MHz$ See Fig. 7
C_{oes}	Output Capacitance	----	370	----		
C_{res}	Reverse Transfer Capacitance	----	75	----		

Notes:

- ① Repetitive rating; $V_{GE} = 20V$, pulse width limited by max. junction temperature. (See fig. 13b)
- ② $V_{CC} = 80\%(V_{CES}), V_{GE} = 20V, L = TBD \mu H,$
 $R_G = 5.0\Omega.$ (See fig. 13a)
- ③ Repetitive rating; pulse width limited by maximum junction temperature.
- ④ Pulse width $\leq 80\mu s$; duty factor $\leq 0.1\%.$
- ⑤ Pulse width $5.0\mu s$, single shot.

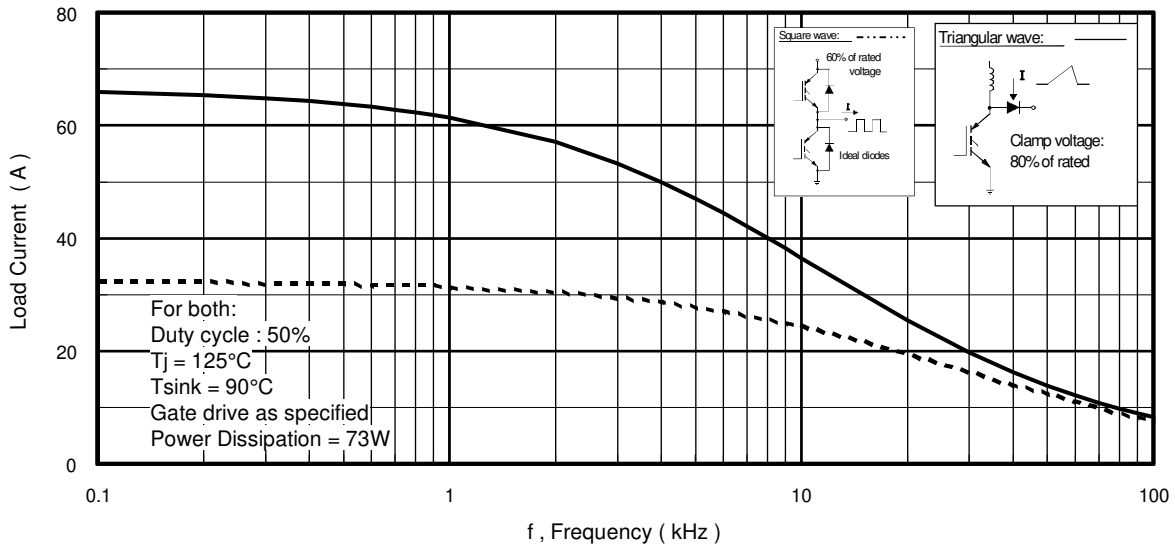


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I = I_{RMS}$ of fundamental; for triangular wave, $I = I_{PK}$)

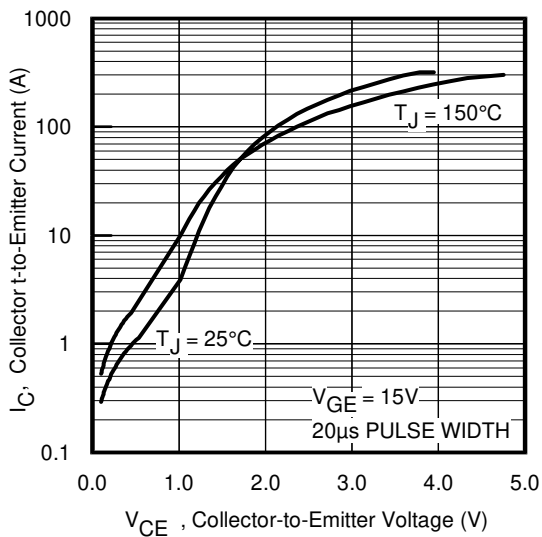


Fig. 2 - Typical Output Characteristics

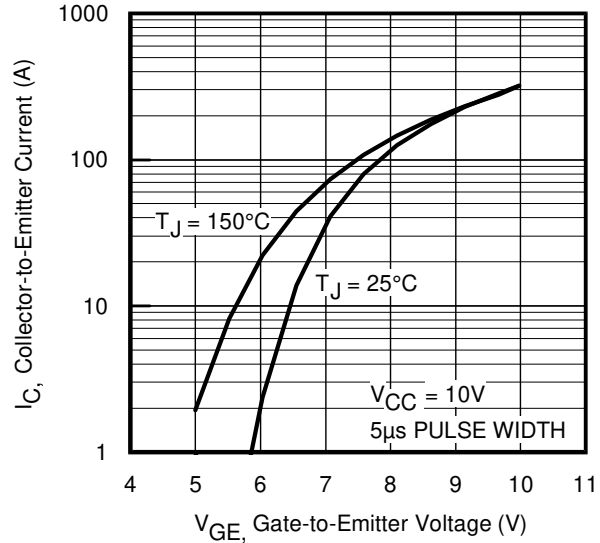


Fig. 3 - Typical Transfer Characteristics

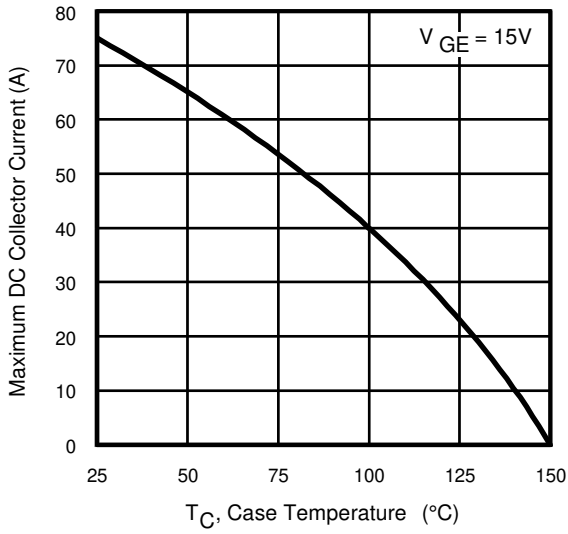


Fig. 4 - Maximum Collector Current vs. Case Temperature

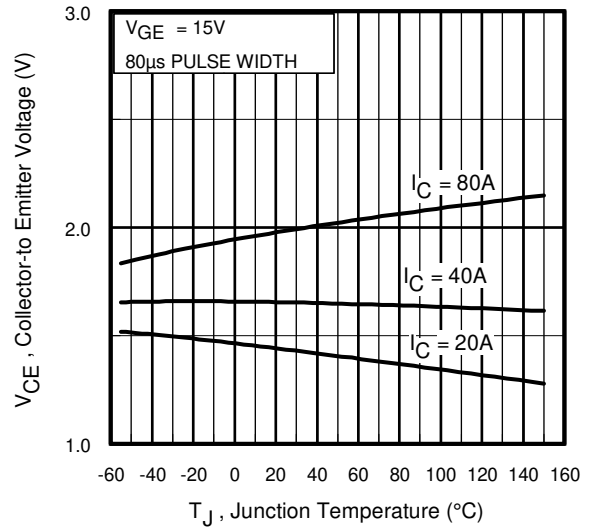


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

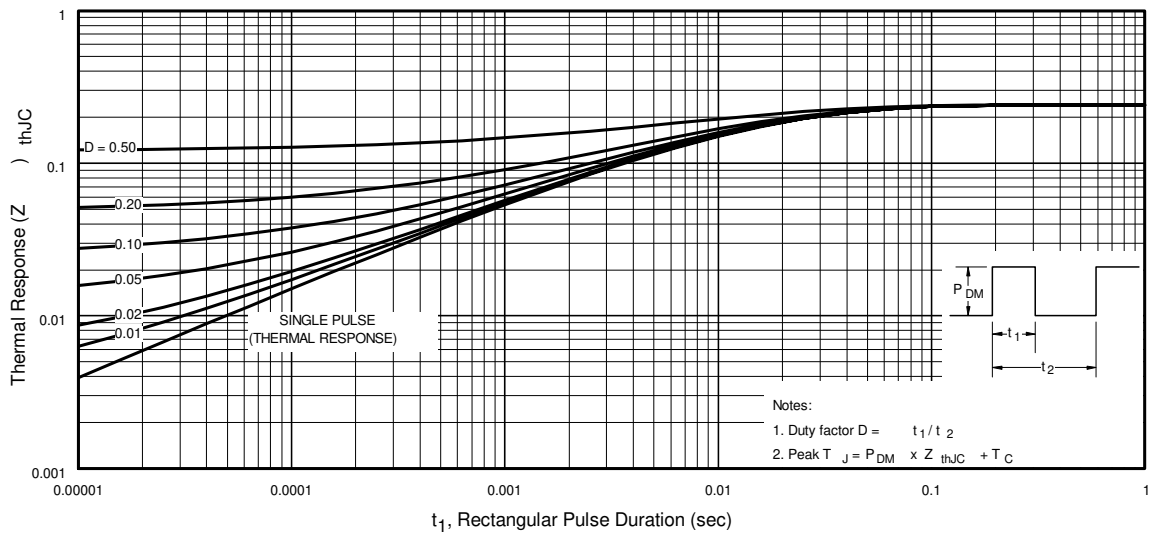


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

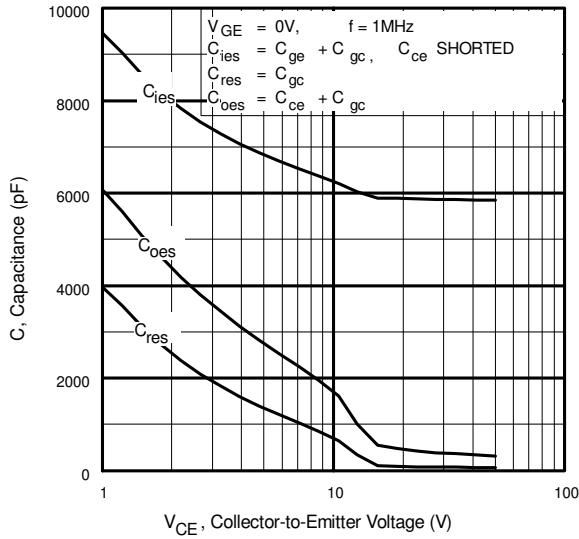


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

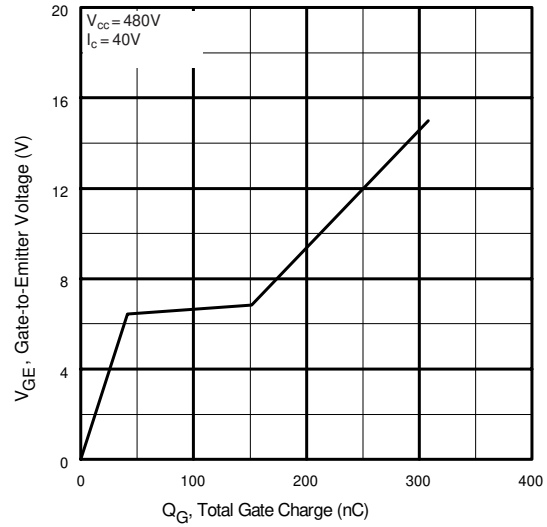


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

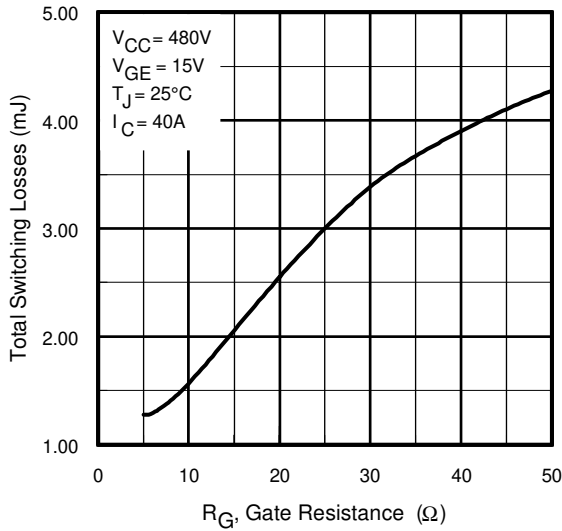


Fig. 9 - Typical Switching Losses vs. Gate Resistance

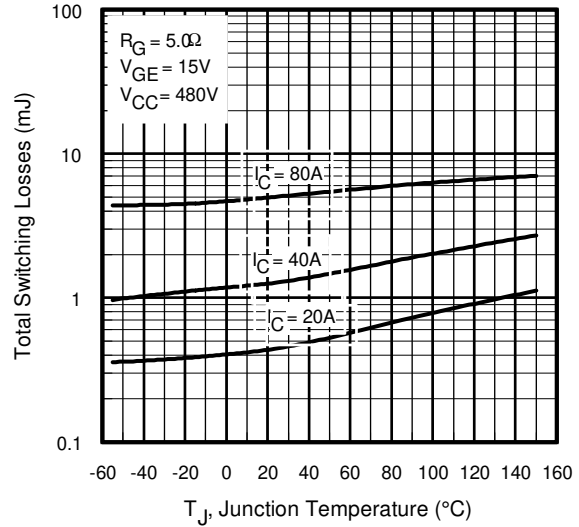


Fig. 10 - Typical Switching Losses vs. Junction Temperature

IRG4PC60UPbF

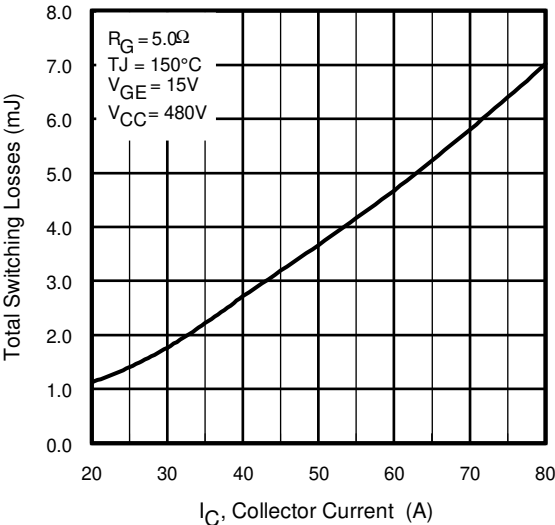


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

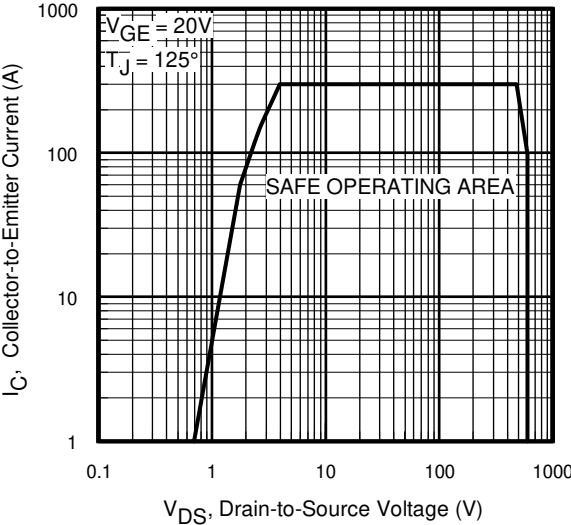
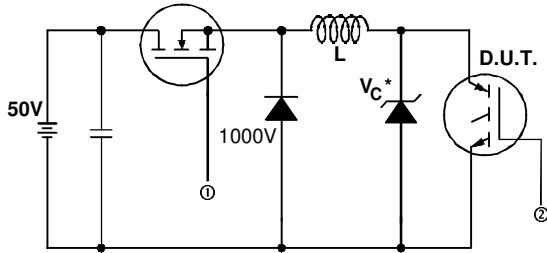


Fig. 12 - Turn-Off SOA



* Driver same type as D.U.T.; $V_c = 80\%$ of $V_{ce(max)}$
 * Note: Due to the 50V power supply, pulse width and inductor will increase to obtain rated I_d .

Fig. 13a - Clamped Inductive Load Test Circuit

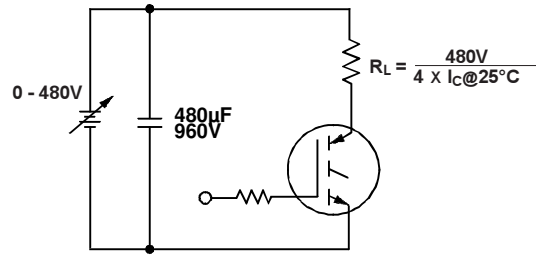


Fig. 13b - Pulsed Collector Current Test Circuit

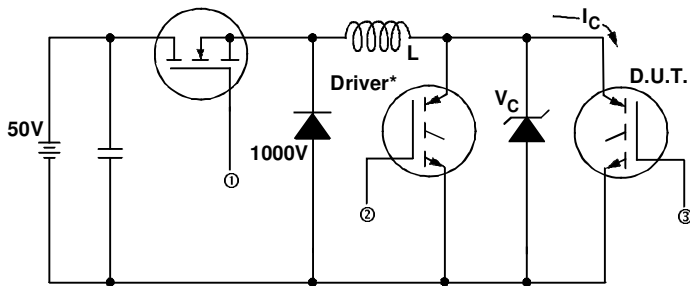


Fig. 14a - Switching Loss Test Circuit

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

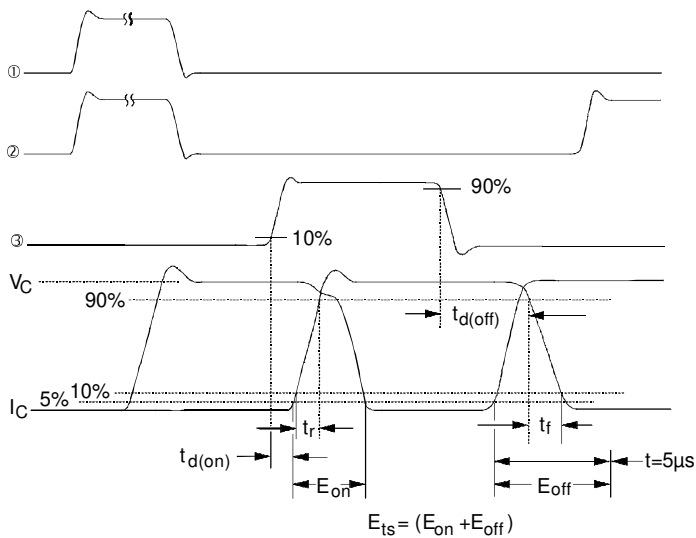


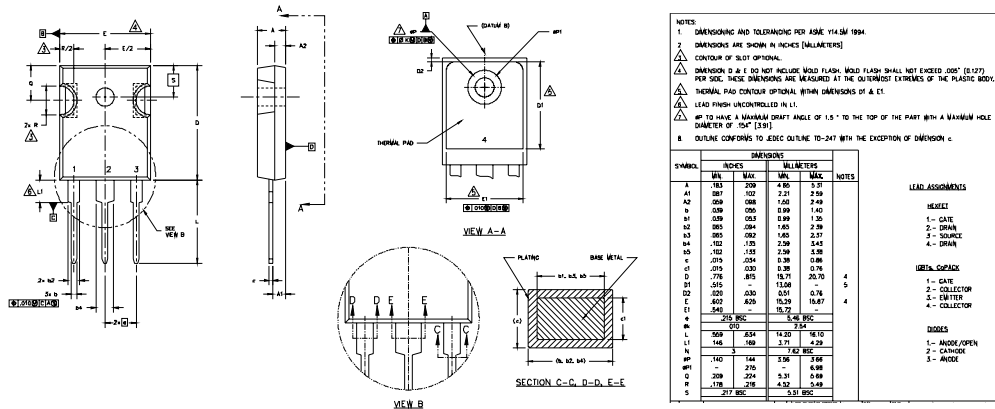
Fig. 14b - Switching Loss Waveforms

IRG4PC60UPbF

TO-247AC Package Outline

International
IR Rectifier

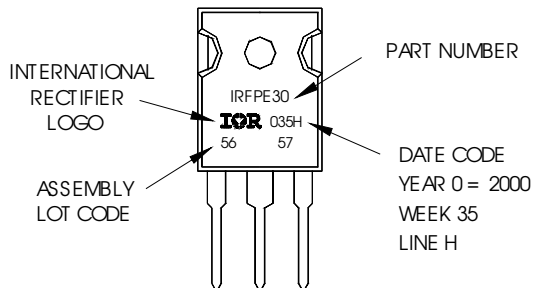
Dimensions are shown in millimeters (inches)



TO-247AC Part Marking Information

EXAMPLE: THIS IS AN IRFPE30
WITH ASSEMBLY
LOT CODE 5657
ASSEMBLED ON WW 35, 2000
IN THE ASSEMBLY LINE "H"

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



Data and specifications subject to change without notice.
This product has been designed and qualified for the Industrial market.
Qualification Standards can be found on IR's Web site.

International
IR Rectifier

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