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

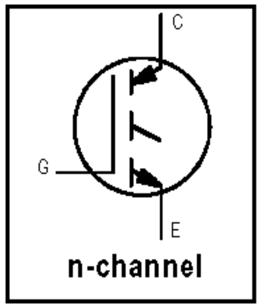
PD- 95230

IRG4PF50WPbF

INSULATED GATE BIPOLAR TRANSISTOR

Features

- Optimized for use in Welding and Switch-Mode Power Supply applications
- Industry benchmark switching losses improve efficiency of all power supply topologies
- 50% reduction of Eoff parameter
- Low IGBT conduction losses
- Latest technology IGBT design offers tighter parameter distribution coupled with exceptional reliability
- Lead-Free



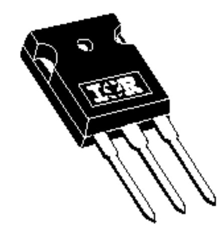
V_{CES} = 900V

$V_{CE(on)}$ typ. = 2.25V

@V_{GE} = 15V, I_C = 28A

Benefits

- Lower switching losses allow more cost-effective operation and hence efficient replacement of larger-die MOSFETs up to 100kHz
- Of particular benefit in single-ended converters and Power Supplies 150W and higher
- Reduction in critical Eoff parameter due to minimal minority-carrier recombination coupled with low on-state losses allow maximum flexibility in device application



TO-247AC

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	900	V
I_C @ T_C = 25°C	Continuous Collector Current	51	A
I_C @ T_C = 100°C	Continuous Collector Current	28	
I_{CM}	Pulsed Collector Current ①	204	
I_{LM}	Clamped Inductive Load Current ②	204	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	186	mJ
P_D @ T_C = 25°C	Maximum Power Dissipation	200	W
P_D @ T_C = 100°C	Maximum Power Dissipation	78	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Soldering Temperature, for 10 seconds	300 (0.063 in. (1.6mm from case)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	----	0.64	°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)	----	g (oz)

04/30/04

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	900	—	—	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	—	0.295	—	V/°C	V_{GE} = 0V, I_C = 3.5mA
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	2.25	2.7	V	I_C = 28A, V_{GE} = 15V
		—	2.74	—		I_C = 60A, See Fig.2, 5
		—	2.12	—		I_C = 28A , 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	—	-13	—	mV/°C	V_{CE} = V_{GE}, I_C = 1.0mA
g_{fe}	Forward Transconductance ⑤	26	39	—	S	V_{CE} ≥ 15V, I_C = 28A
I_{CES}	Zero Gate Voltage Collector Current	—	—	500	µA	V_{GE} = 0V, V_{CE} = 900V
		—	—	2.0		V_{GE} = 0V, V_{CE} = 10V, T_J = 25°C
		—	—	5.0	mA	V_{GE} = 0V, V_{CE} = 900V, 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)	—	160	240	nC	I_C = 28A
Q_{ge}	Gate - Emitter Charge (turn-on)	—	19	29		V_{CC} = 400V See Fig. 8
Q_{gc}	Gate - Collector Charge (turn-on)	—	53	80		V_{GE} = 15V
$t_{d(on)}$	Turn-On Delay Time	—	29	—	ns	T_J = 25°C
t_r	Rise Time	—	26	—		I_C = 28A, V_{CC} = 720V
$t_{d(off)}$	Turn-Off Delay Time	—	110	170		V_{GE} = 15V, R_G = 5.0Ω
t_f	Fall Time	—	150	220		Energy losses include "tail"
E_{on}	Turn-On Switching Loss	—	0.19	—	mJ	See Fig. 10, 11, 13, 14
E_{off}	Turn-Off Switching Loss	—	1.06	—		
E_{ts}	Total Switching Loss	—	1.25	1.7		
$t_{d(on)}$	Turn-On Delay Time	—	28	—	ns	T_J = 150°C,
t_r	Rise Time	—	26	—		I_C = 28A, V_{CC} = 720V
$t_{d(off)}$	Turn-Off Delay Time	—	280	—		V_{GE} = 15V, R_G = 5.0Ω
t_f	Fall Time	—	90	—		Energy losses include "tail"
E_{ts}	Total Switching Loss	—	3.45	—	mJ	See Fig. 13, 14
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	3300	—	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	—	200	—		V_{CC} = 30V See Fig. 7
C_{res}	Reverse Transfer Capacitance	—	45	—		f = 1.0MHz

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 = 5.0Ω, (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.

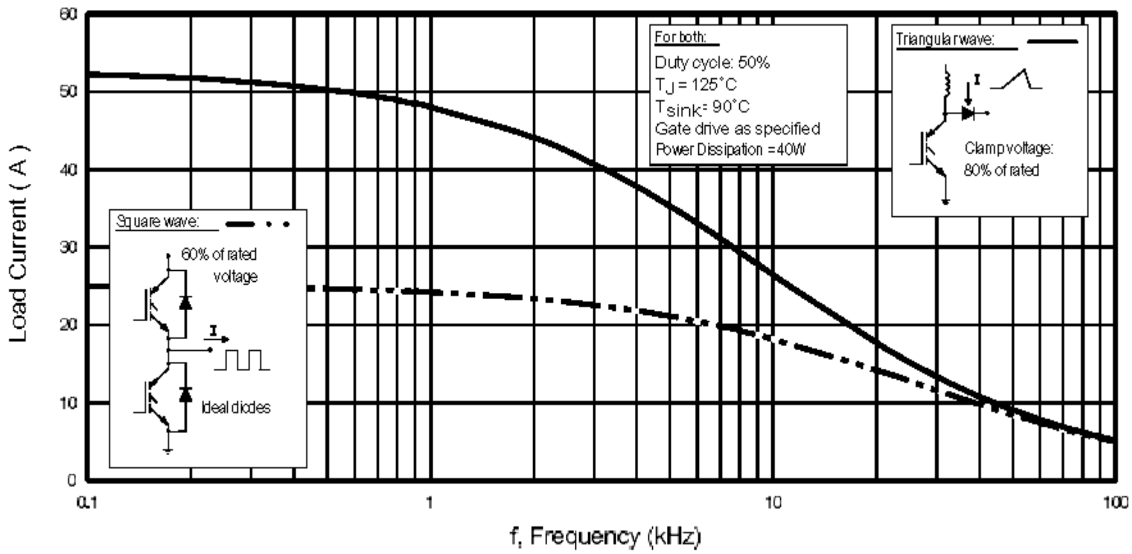


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I = I_{RMS}$ of fundamental; for triangular wave, $I = I_{PK}$)

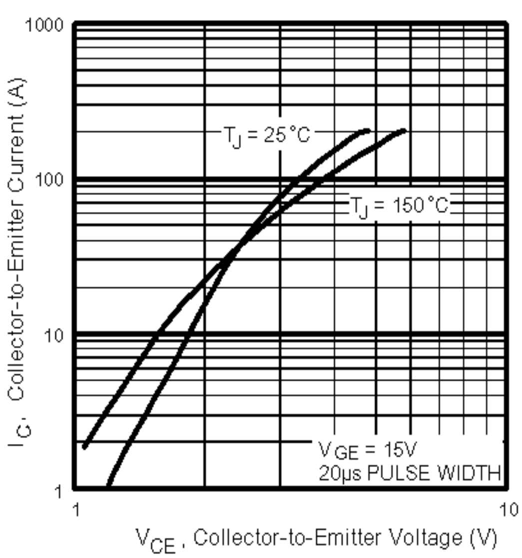


Fig. 2 - Typical Output Characteristics

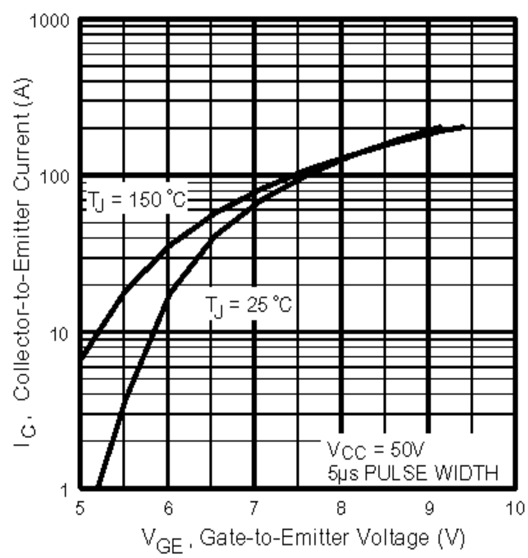


Fig. 3 - Typical Transfer Characteristics

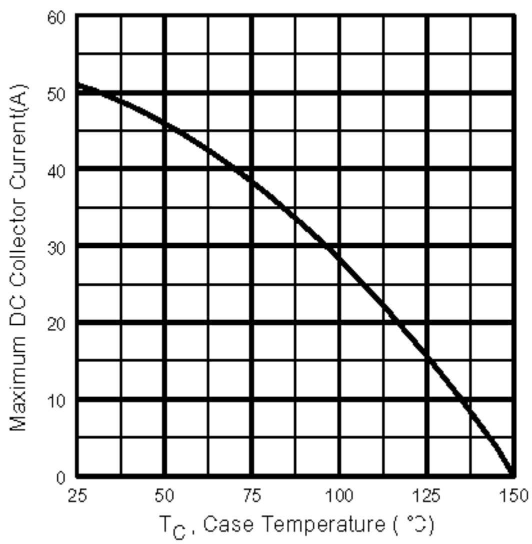


Fig. 4 - Maximum Collector Current vs. Case Temperature

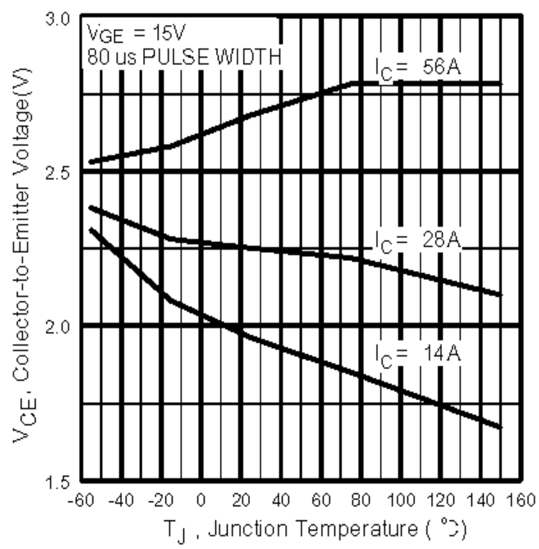


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

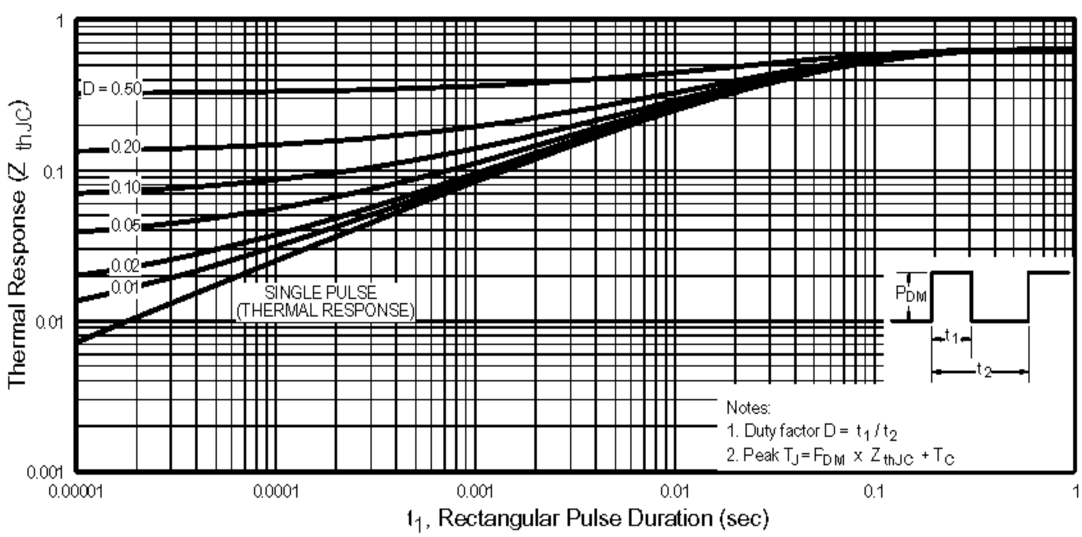


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

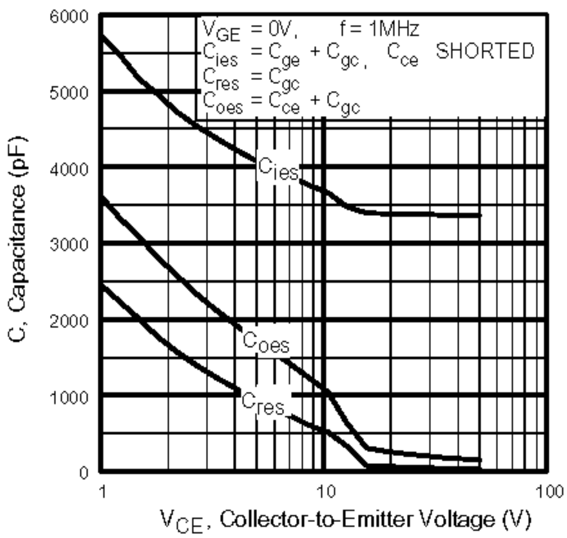


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

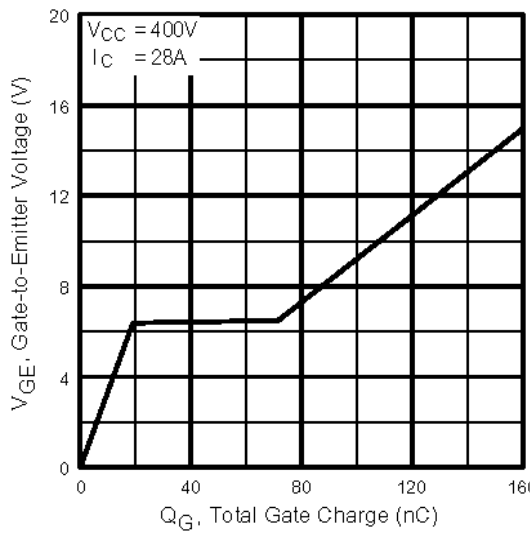


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

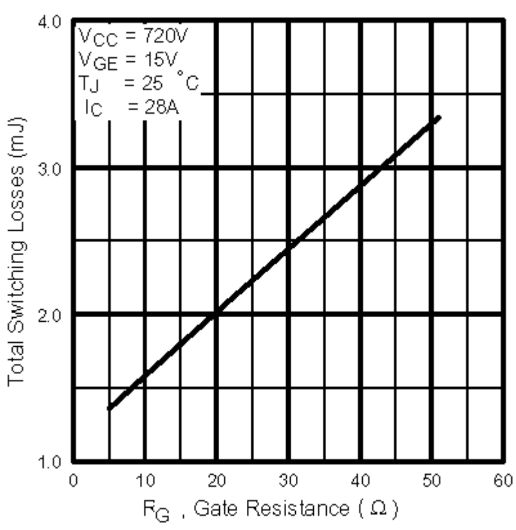


Fig. 9 - Typical Switching Losses vs. Gate Resistance

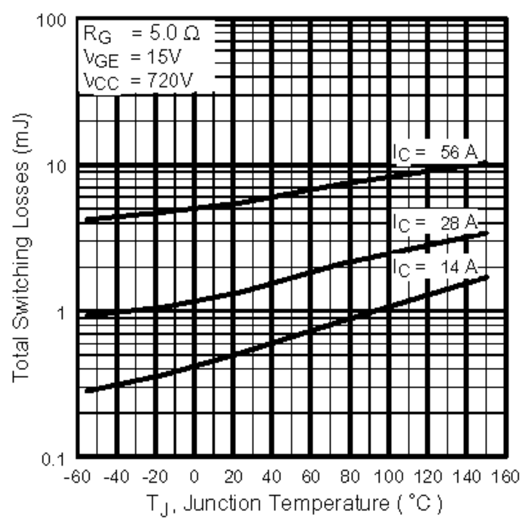


Fig. 10 - Typical Switching Losses vs. Junction Temperature

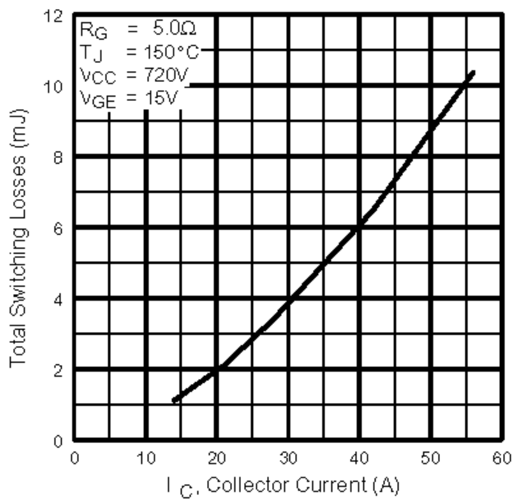


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

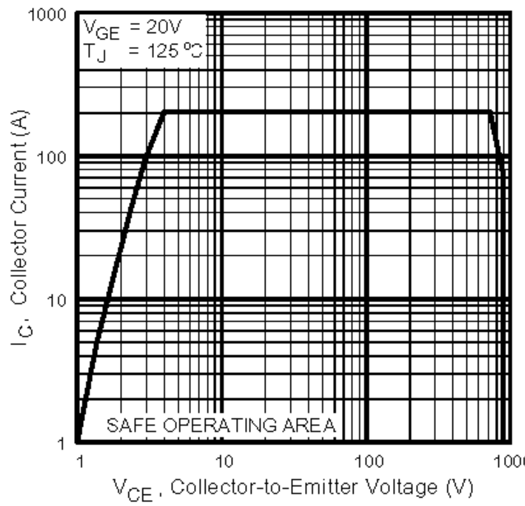
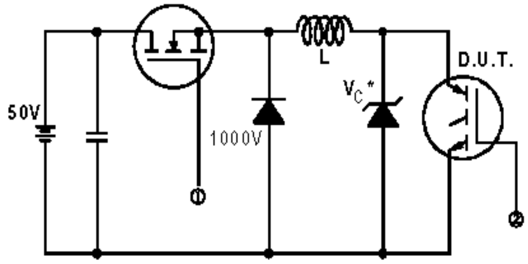


Fig. 12 - Turn-Off SOA



* 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

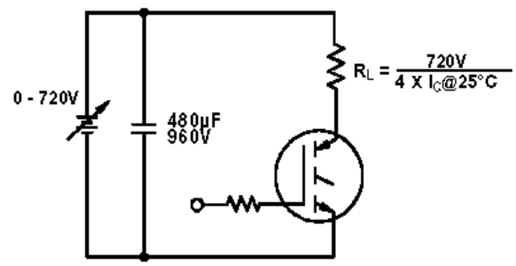


Fig. 13b - Pulsed Collector Current Test Circuit

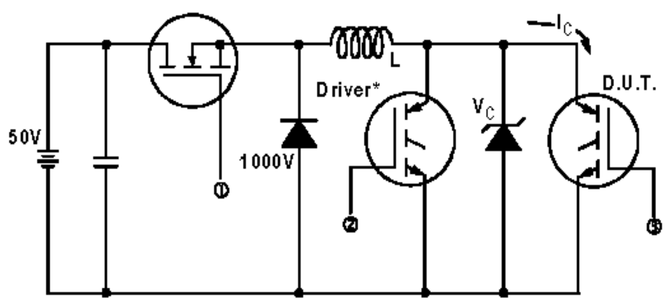


Fig. 14a - Switching Loss Test Circuit

* Driver same type as D.U.T., VC = 720V

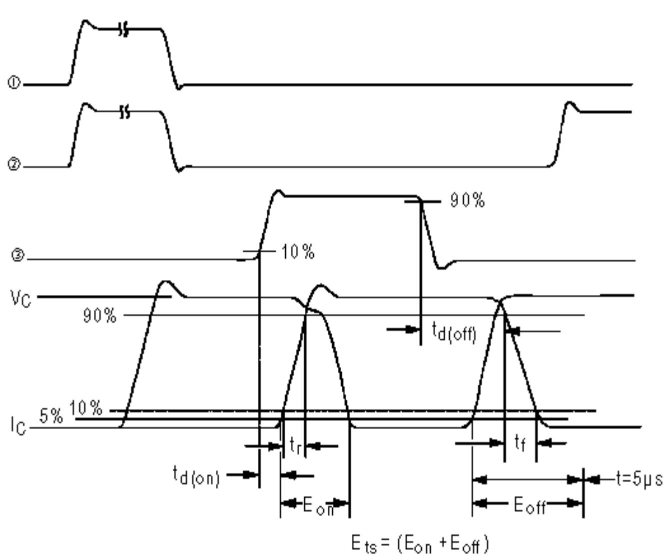
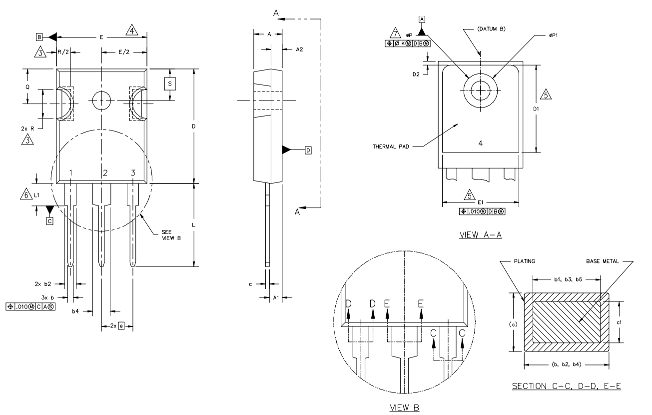


Fig. 14b - Switching Loss Waveforms

TO-247AC Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M 1994.
2. DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS]
3. CONTOUR OF SLOT OPTIONAL.
4. DIMENSION D & 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. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENISONS D1 & E1.
6. LEAD FINISH UNCONTROLLED IN L1.
7. øP TO HAVE A MAXIMUM DRAFT ANGLE OF 1.5 ° TO THE TOP OF THE PART WITH A MAXIMUM HOLE DIAMETER OF .154" [3.91].
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-247 WITH THE EXCEPTION OF DIMENSION c.

SYMBOL	DIMENSIONS				NOTES
	INCHES		MILLIMETERS		
	MIN.	MAX.	MIN.	MAX.	
A	.183	.209	4.65	5.31	
A1	.087	.102	2.21	2.59	
A2	.059	.098	1.50	2.49	
b	.039	.055	0.99	1.40	
b1	.039	.053	0.99	1.35	
b2	.065	.094	1.65	2.39	
b3	.065	.092	1.65	2.37	
b4	.102	.135	2.59	3.43	
b5	.102	.133	2.59	3.38	
c	.015	.034	0.38	0.86	
c1	.015	.030	0.38	0.76	
D	.776	.815	19.71	20.70	4
D1	.515	–	13.08	–	5
D2	.020	.030	0.51	0.76	
E	.602	.625	15.29	15.87	4
E1	.540	–	15.72	–	
e	.215 BSC		5.46 BSC		
øk	.010		2.54		
L	.559	.634	14.20	16.10	
L1	.146	.169	3.71	4.29	
N	3		7.62 BSC		
øP	.140	.144	3.56	3.66	
øP1	–	.275	–	6.98	
Q	.209	.224	5.31	5.69	
R	.178	.216	4.52	5.49	
S	.217 BSC		5.51 BSC		

LEAD ASSIGNMENTS

HEXFET

1.- GATE
2.- DRAIN
3.- SOURCE
4.- DRAIN

IGBTs, CoPACK

1.- GATE
2.- COLLECTOR
3.- EMITTER
4.- COLLECTOR

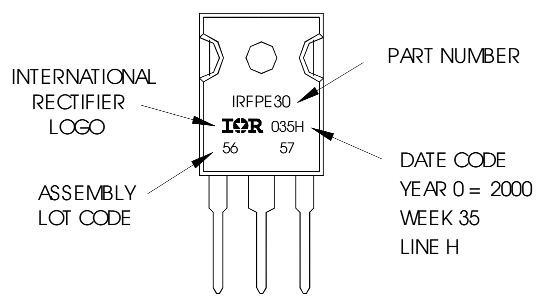
DIODES

1.- ANODE/OPEN
2.- CATHODE
3.- ANODE

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"



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