PD-95882

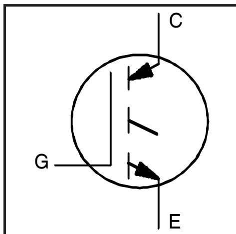
International IOR Rectifier

IRGP4050

PDP Switch

Features

- Key parameters optimized for PDP sustain & Energy recovery applications
- 104A continuous collector current rating reduces component count
- High pulse current rating makes it ideal for capacitive load circuits
- Low temperature co-efficient of $V_{CE\ (ON)}$ ensures reduced power dissipation at operating junction temperatures
- Reverse voltage avalanche rating improves the robustness in sustain driver application
- Short fall & rise times for fast switching



n-channel

$V_{CES} = 250V$

$V_{CE(on)\ typ.} = 1.64V$

$@V_{GE} = 15V, I_C = 30A$

TO-247AC

Description

This IGBT is specifically designed for sustain & energy recovery application in plasma display panels. This IGBT features low $V_{CE\ (ON)}$ and fast switching times to improve circuit efficiency and reliability. Low temperature co-efficient of $V_{CE\ (ON)}$ makes this IGBT an ideal device for PDP sustain driver application.

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	250	V
I_C @ T_C = 25°C	Continuous Collector Current	104*	A
I_C @ T_C = 100°C	Continuous Collector Current	56	
I_{CM}	Pulse Collector Current ①	208	
I_{LM}	Clamped Inductive Load current ②	290	
V_{GE}	Gate-to-Emitter Voltage	±20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	1240	mJ
P_D @ T_C = 25°C	Maximum Power Dissipation	330	W
P_D @ T_C = 100°C	Maximum Power Dissipation	130	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C
	Solder Temperature Range, for 10 sec.	300 (0.063 in. (1.6mm) from case)	

Thermal / Mechanical Characteristics

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case- IGBT	—	—	0.38	°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.)

*Package limited to 60A.

07/05/04

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	250	—	—	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	—	8.2	—	mV/°C	V_{GE} = 0V, I_C = 1mA
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.64	1.90	V	I_C = 30A, V_{GE} = 15V
		—	2.04	—		I_C = 56A
		—	2.60	—		I_C = 104A, T_J = 150°C, See Fig. 2, 5
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0		V_{CE} = V_{GE}, I_C = 250µA
$\Delta V_{GE(th)}/\Delta T_J$	Threshold Voltage temp. coefficient	—	-11	—	mV/°C	V_{CE} = V_{GE}, I_C = 0.25mA
gfe	Forward Transconductance ⑤	34	51	—	S	V_{CE} = 100V, I_C = 56A
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	µA	V_{GE} = 0V, V_{CE} = 250V
		—	—	2.0		V_{GE} = 0V, V_{CE} = 10V
		—	—	5000		V_{GE} = 0V, V_{CE} = 250V, 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)	—	230	350	nC	I_C = 56A
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	37	56		V_{CC} = 200V, See Fig. 8
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	78	120		V_{GE} = 15V
$t_{d(on)}$	Turn-On delay time	—	37	—	ns	T_J = 25°C
t_r	Rise time	—	35	—		I_C = 30A, V_{CC} = 180V
$t_{d(off)}$	Turn-Off delay time	—	120	180		V_{GE} = 15V, R_G = 5.0Ω
t_f	Fall time	—	59	89		Energy losses include "tail"
E_{on}	Turn-On Switching Loss	—	45	—	µJ	See Fig. 9, 10, 14
E_{off}	Turn-Off Switching Loss	—	125	—		
E_{TS}	Total Switching Loss	—	170	—		
$t_{d(on)}$	Turn-On delay time	—	35	—	ns	T_J = 150°C
t_r	Rise time	—	35	—		I_C = 30A, V_{CC} = 180V
$t_{d(off)}$	Turn-Off delay time	—	130	—		V_{GE} = 15V, R_G = 5.0Ω
t_f	Fall time	—	120	—		Energy losses include "tail"
E_{TS}	Total Switching Loss	—	280	—	µJ	See Fig. 11, 14
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	4650	—	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	—	480	—		V_{CC} = 30V, See Fig. 7
C_{res}	Reverse Transfer Capacitance	—	92	—		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 ≤ 2.5ms; duty factor ≤ 0.1%.
⑤ Pulse width 5.0µs, single shot.

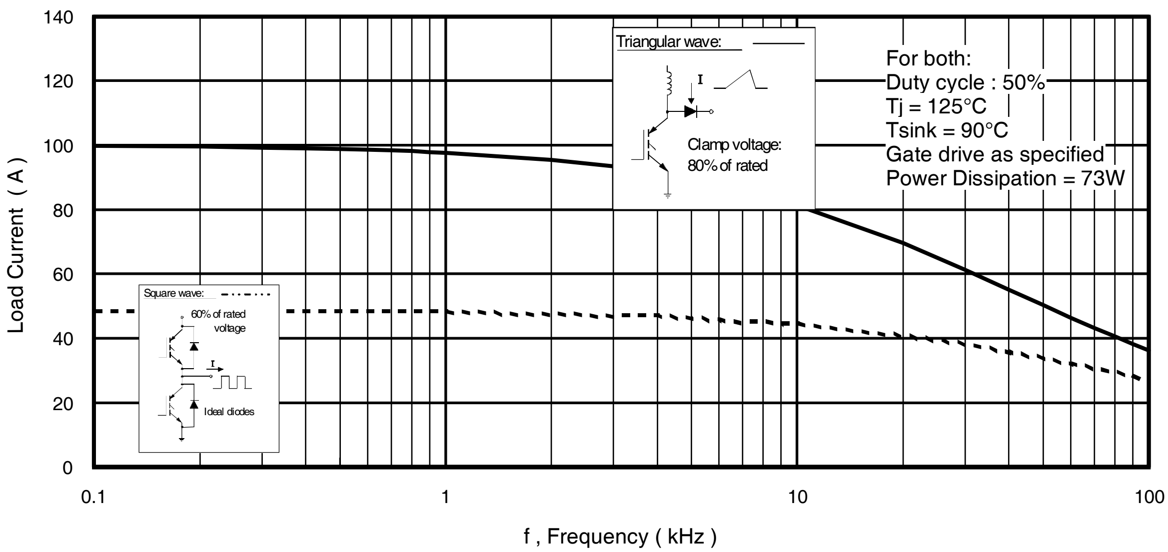


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)

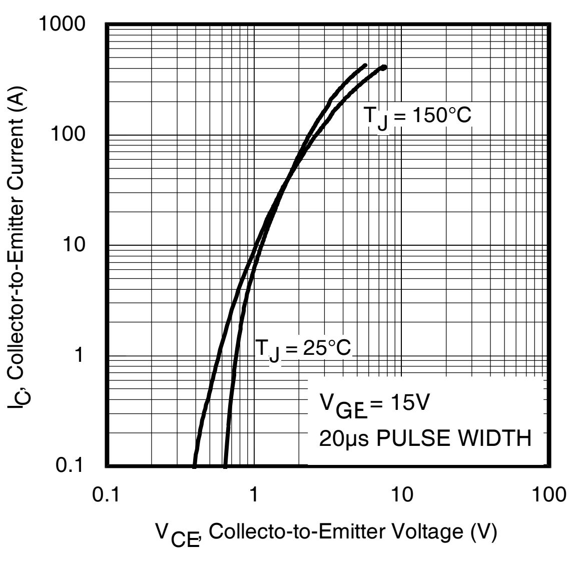


Fig. 2 - Typical Output Characteristics

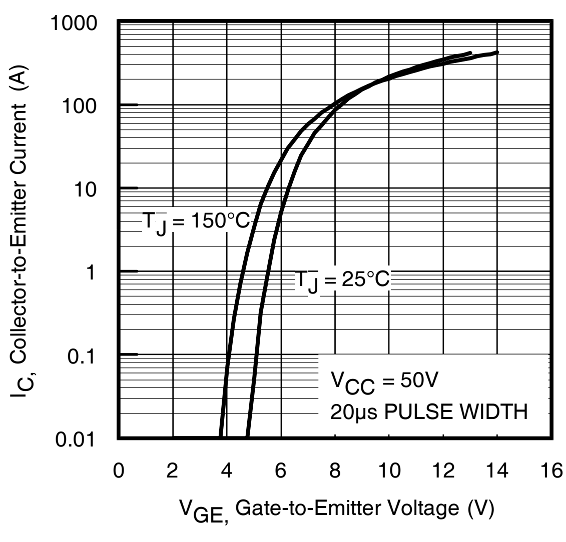


Fig. 3 - Typical Transfer Characteristics

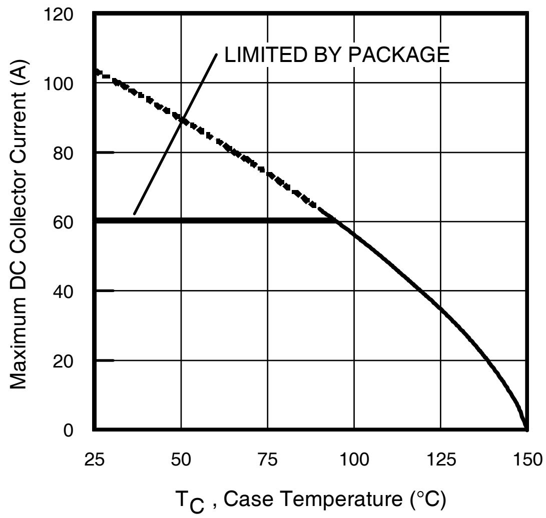


Fig. 4 - Maximum Collector Current vs. Case Temperature

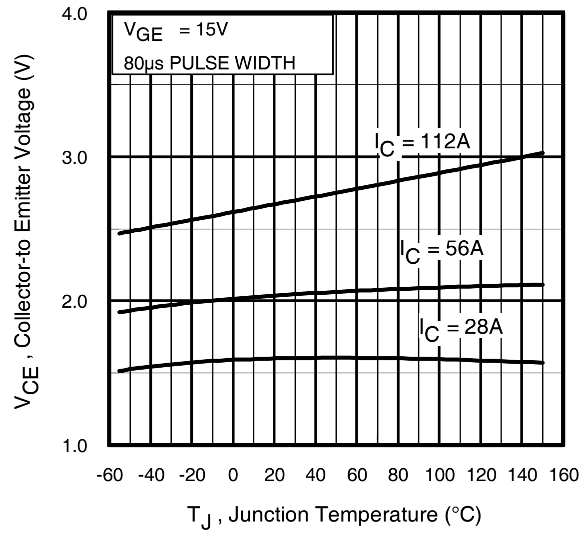


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

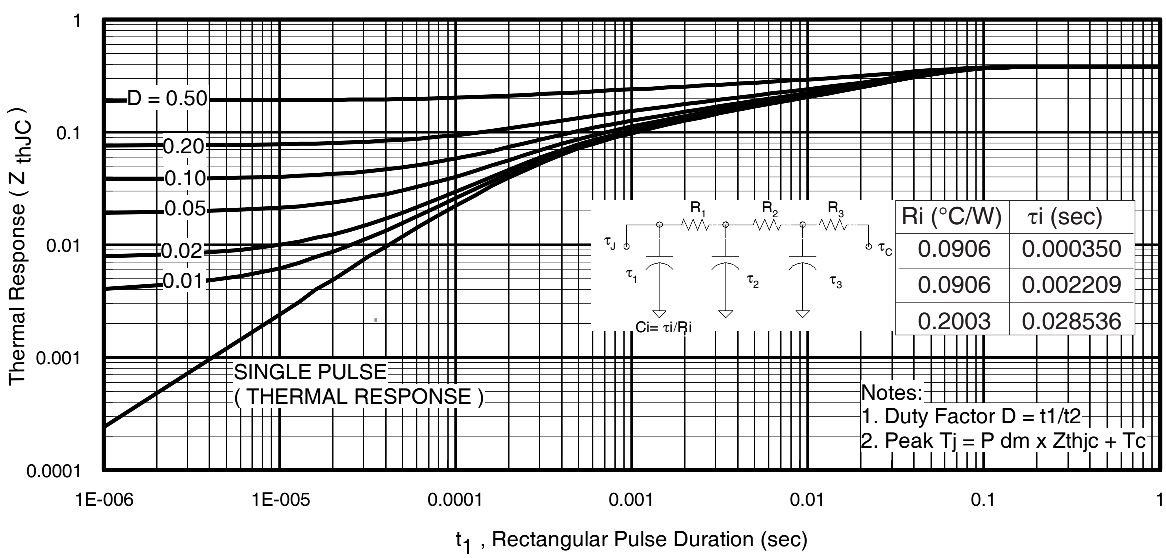


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

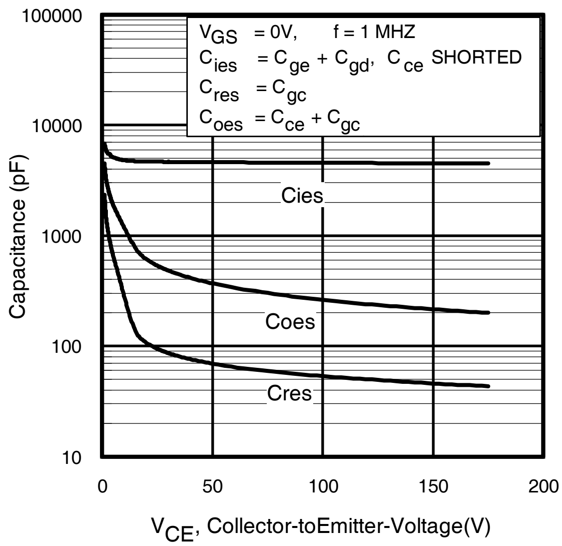


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

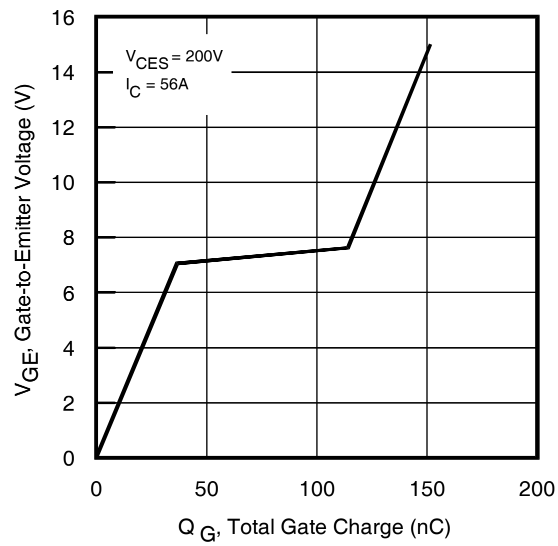


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

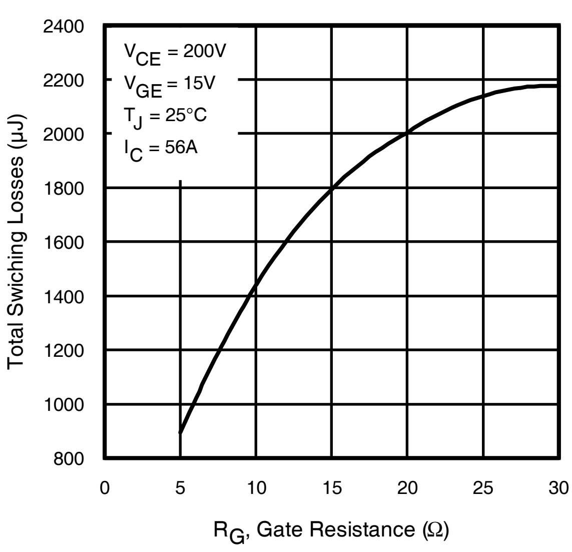


Fig. 9 - Typical Switching Losses vs. Gate Resistance

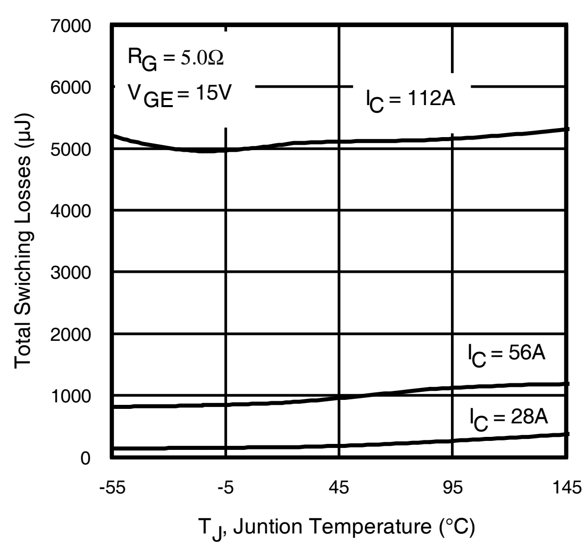


Fig. 10 - Typical Switching Losses vs. Junction Temperature

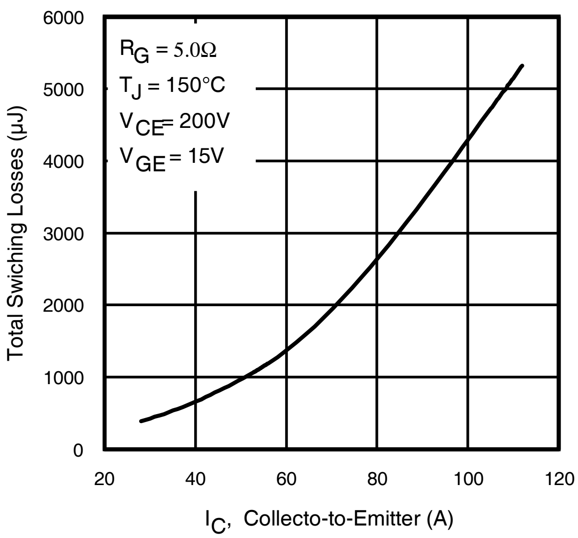


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

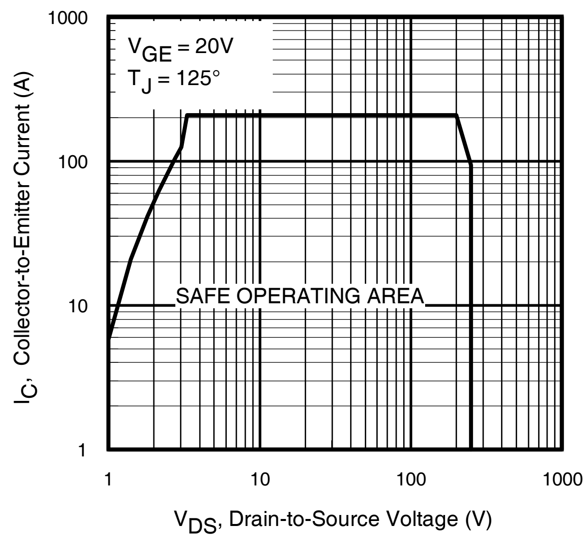
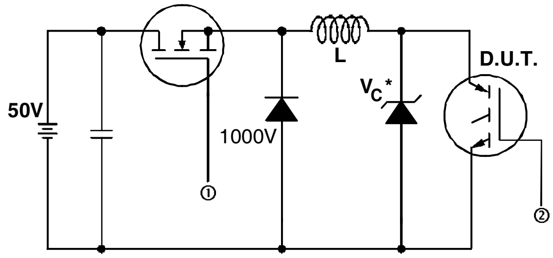


Fig. 12 - Turn-Off SOA



* 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

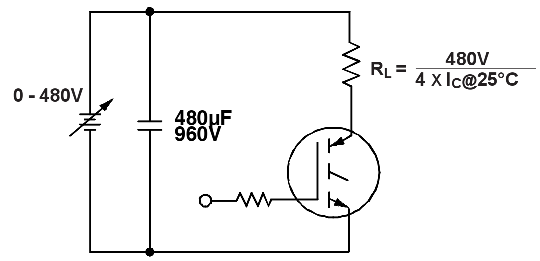


Fig. 13b - Pulsed Collector Current Test Circuit

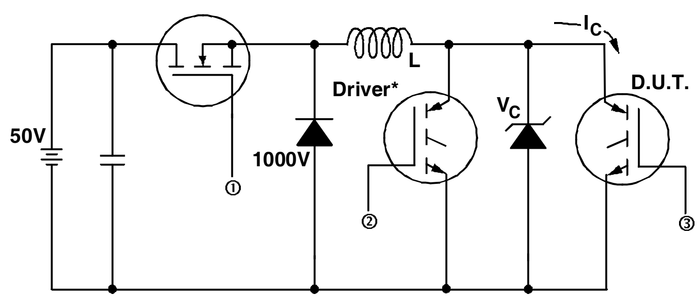


Fig. 14a - Switching Loss Test Circuit

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

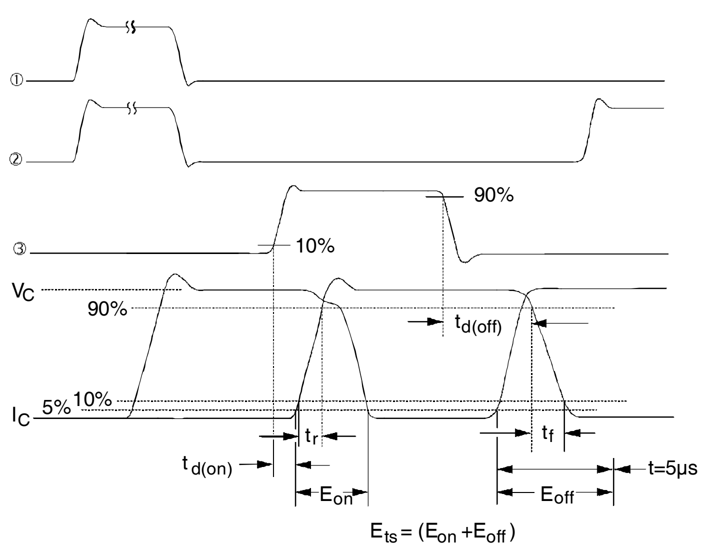
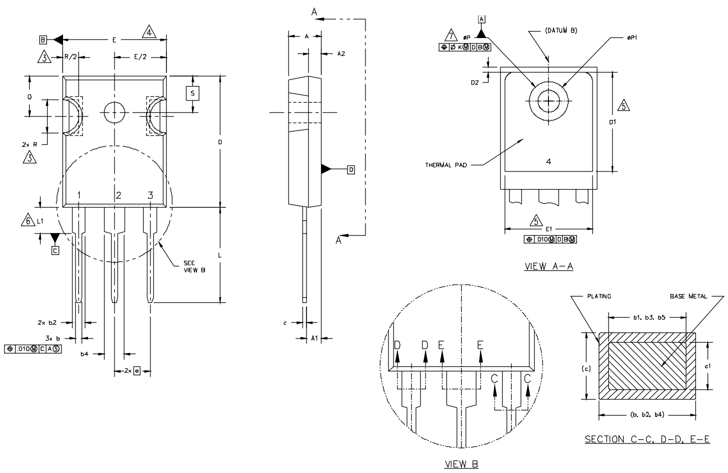


Fig. 14b - Switching Loss Waveforms

TO-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

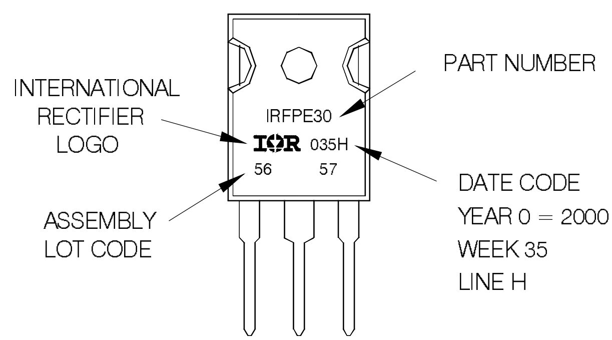
DIODES

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"



TO-247AC package is not recommended for Surface Mount Application.

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
IGR Rectifier

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