

HEXFET® Power MOSFET

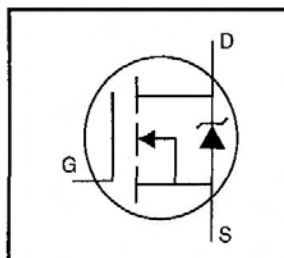
- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- Isolated Central Mounting Hole
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements

• Lead-Free

Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

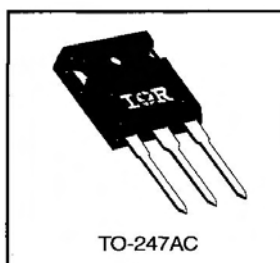
The TO-247 package is preferred for commercial-industrial applications where higher power levels preclude the use of TO-220 devices. The TO-247 is similar but superior to the earlier TO-218 package because of its isolated mounting hole. It also provides greater creepage distance between pins to meet the requirements of most safety specifications.



$$V_{DS} = 450V$$

$$R_{DS(on)} = 0.35\Omega$$

$$I_D = 14A$$



Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ $T_C = 25^\circ C$	Continuous Drain Current, V_{GS} @ 10 V	14	A
I_D @ $T_C = 100^\circ C$	Continuous Drain Current, V_{GS} @ 10 V	9.1	
I_{DM}	Pulsed Drain Current ①	56	
P_D @ $T_C = 25^\circ C$	Power Dissipation	190	W
	Linear Derating Factor	1.5	W/°C
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	740	mJ
I_{AR}	Avalanche Current ①	14	A
E_{AR}	Repetitive Avalanche Energy ①	19	mJ
dv/dt	Peak Diode Recovery dv/dt ③	3.5	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C
	Soldering Temperature, for 10 seconds	300 (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	—	—	0.65	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	—	40	

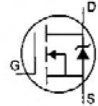
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Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	450	—	—	V	$V_{GS}=0V$, $I_D=250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.61	—	V/°C	Reference to 25°C , $I_D=1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.35	Ω	$V_{GS}=10V$, $I_D=8.4A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS}=V_{GS}$, $I_D=250\mu A$
g_{fs}	Forward Transconductance	5.9	—	—	S	$V_{DS}=50V$, $I_D=8.4A$ ④
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS}=450V$, $V_{GS}=0V$
		—	—	250		$V_{DS}=360V$, $V_{GS}=0V$, $T_J=125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS}=20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS}=-20V$
Q_g	Total Gate Charge	—	—	160	nC	$I_D=14A$
Q_{gs}	Gate-to-Source Charge	—	—	21		$V_{DS}=360V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	83		$V_{GS}=10V$ See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	14	—	ns	$V_{DD}=225V$
t_r	Rise Time	—	44	—		$I_D=14A$
$t_{d(off)}$	Turn-Off Delay Time	—	89	—		$R_G=6.2\Omega$
t_f	Fall Time	—	46	—		$R_D=16\Omega$ See Figure 10 ④
L_D	Internal Drain Inductance	—	5.0	—	nH	Between lead, 6 mm (0.25in.) from package and center of die contact
L_S	Internal Source Inductance	—	13	—		
C_{iss}	Input Capacitance	—	2700	—	pF	$V_{GS}=0V$
C_{oss}	Output Capacitance	—	720	—		$V_{DS}=25V$
C_{rss}	Reverse Transfer Capacitance	—	300	—		$f=1.0MHz$ See Figure 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	14	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	56		
V_{SD}	Diode Forward Voltage	—	—	1.5	V	$T_J=25^\circ\text{C}$, $I_S=14A$, $V_{GS}=0V$ ④
t_{rr}	Reverse Recovery Time	—	580	870	ns	$T_J=25^\circ\text{C}$, $I_F=14A$
Q_{rr}	Reverse Recovery Charge	—	5.1	7.6	μC	$di/dt=100A/\mu s$ ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

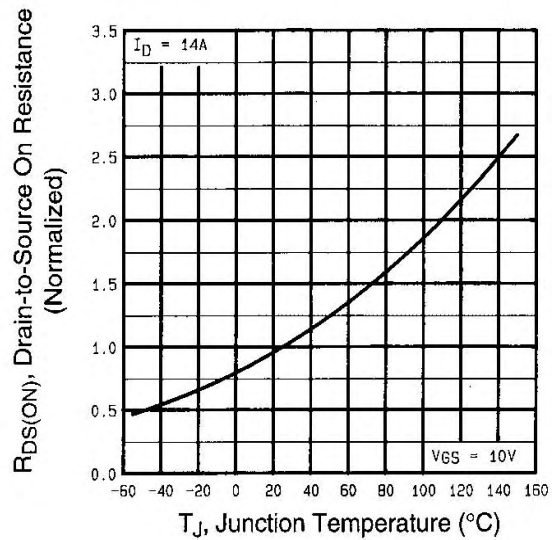
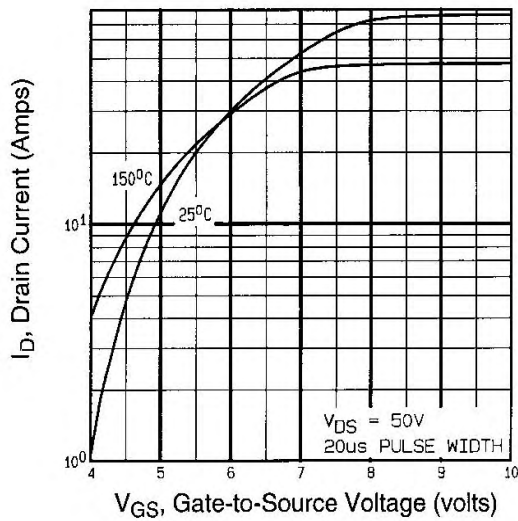
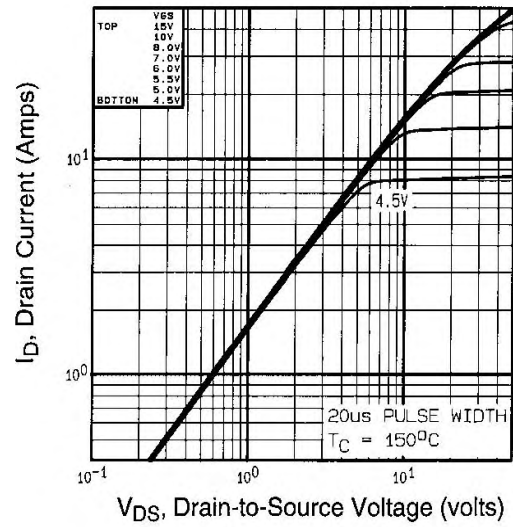
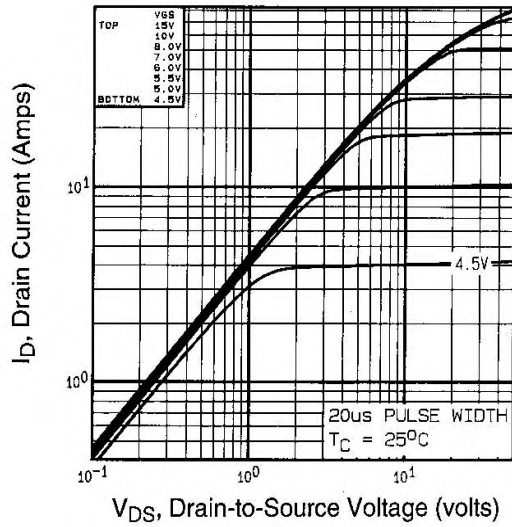
Notes:

① Repetitive rating; pulse width limited by max. junction temperature (See Figure 11)

③ $I_{SD} \leq 14A$, $di/dt \leq 125A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 150^\circ\text{C}$

② $V_{DD}=50V$, starting $T_J=25^\circ\text{C}$, $L=6.7mH$, $R_G=25\Omega$, $I_{AS}=14A$ (See Figure 12)

④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.



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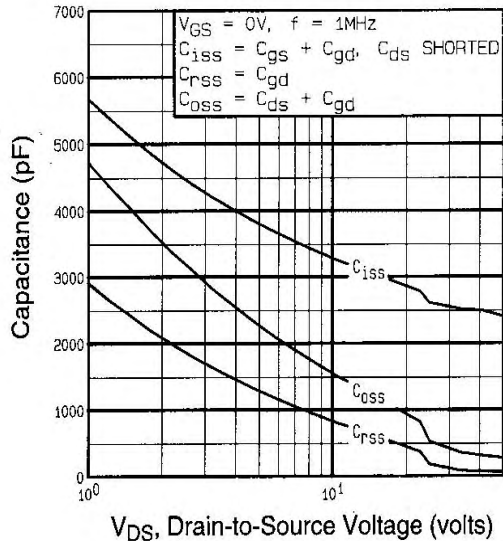


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

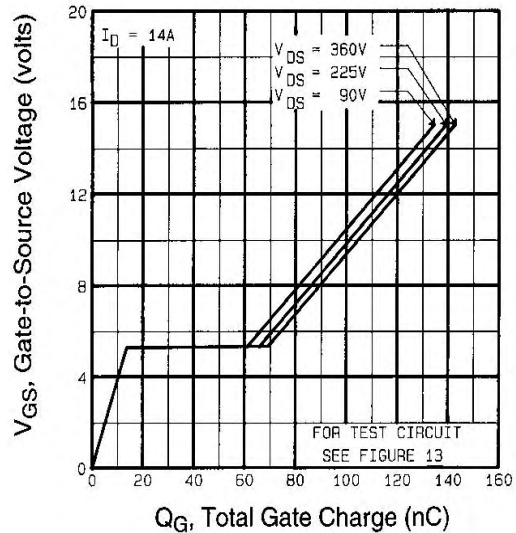


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

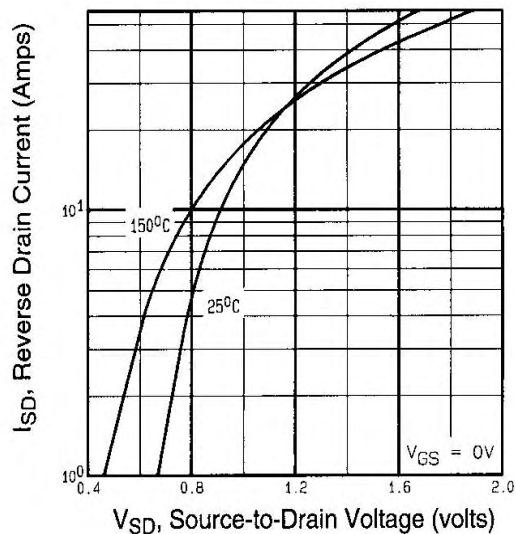


Fig 7. Typical Source-Drain Diode Forward Voltage

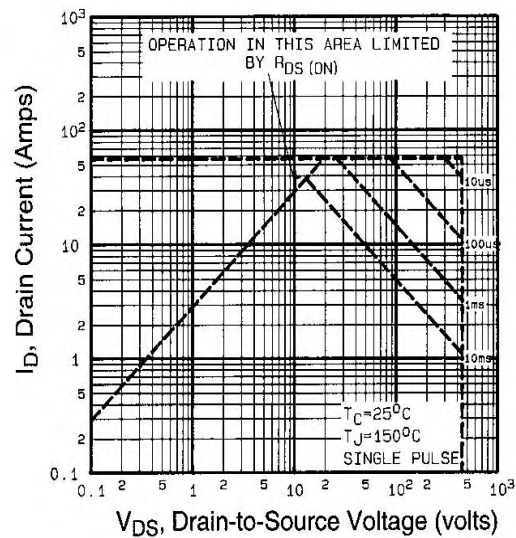


Fig 8. Maximum Safe Operating Area

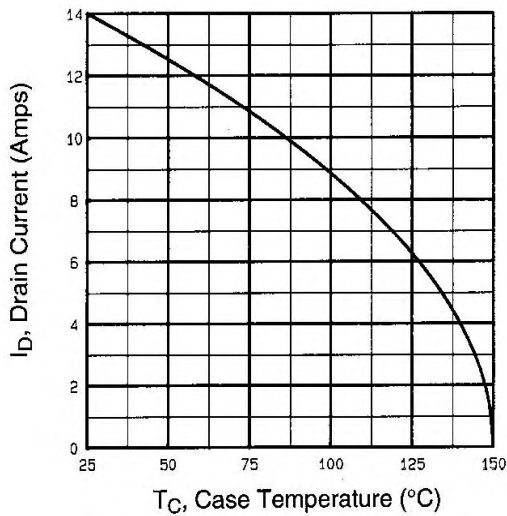


Fig 9. Maximum Drain Current Vs. Case Temperature

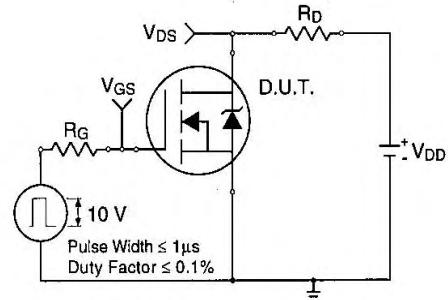


Fig 10a. Switching Time Test Circuit

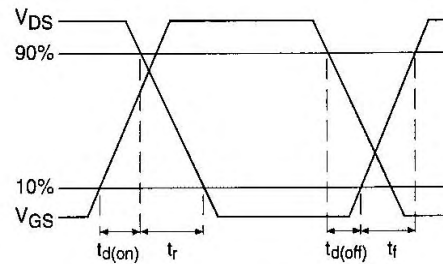


Fig 10b. Switching Time Waveforms

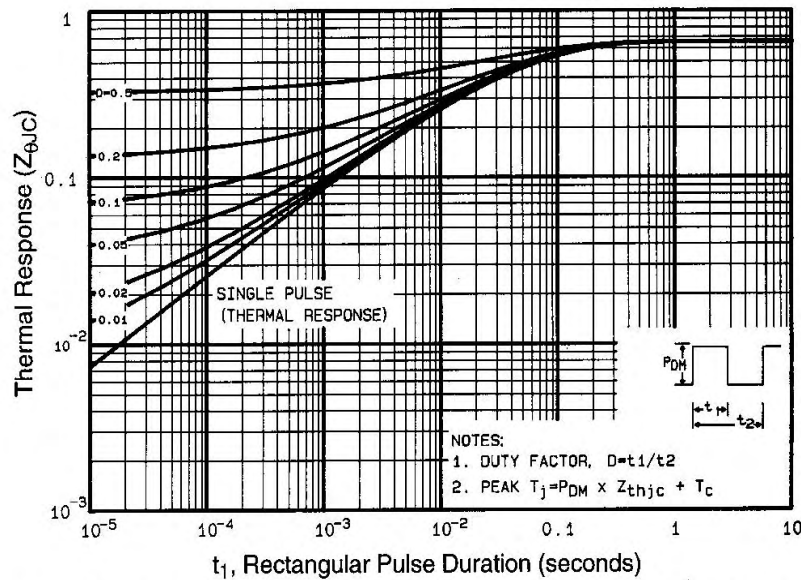


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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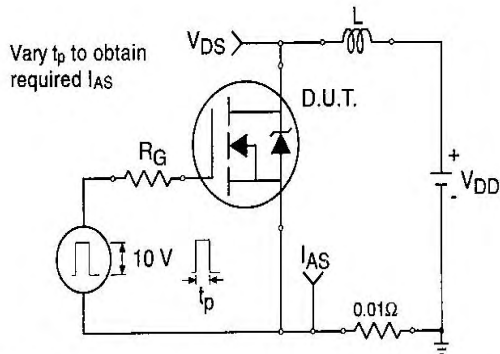


Fig 12a. Unclamped Inductive Test Circuit

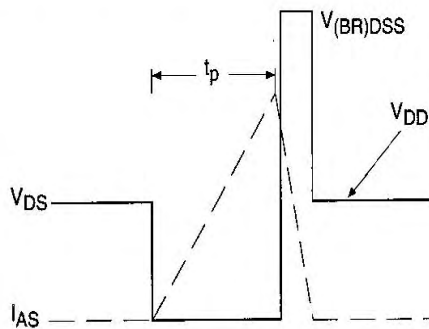


Fig 12b. Unclamped Inductive Waveforms

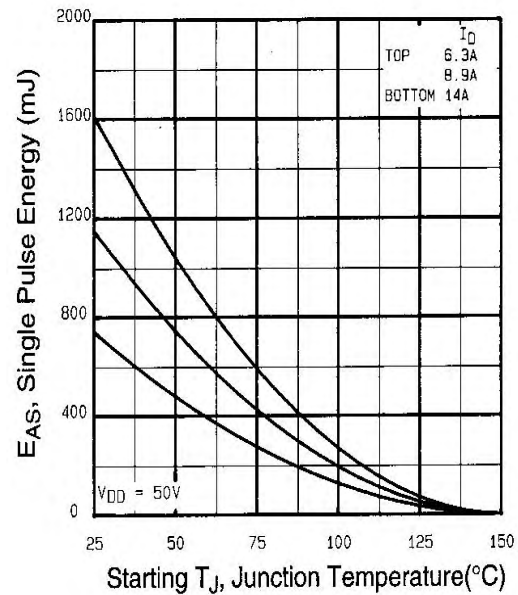


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

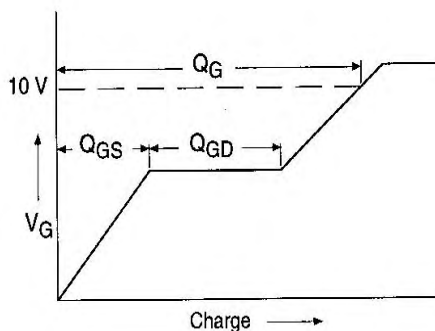


Fig 13a. Basic Gate Charge Waveform

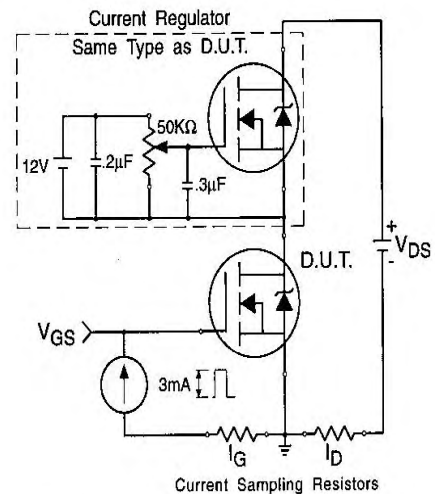
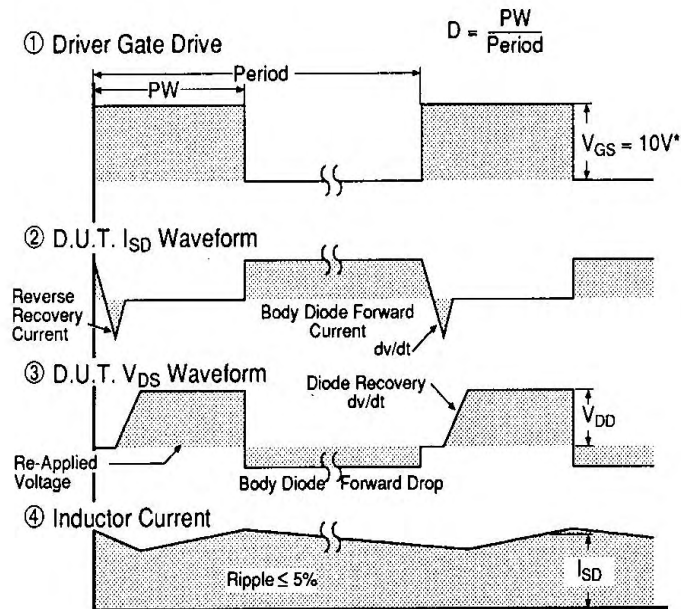
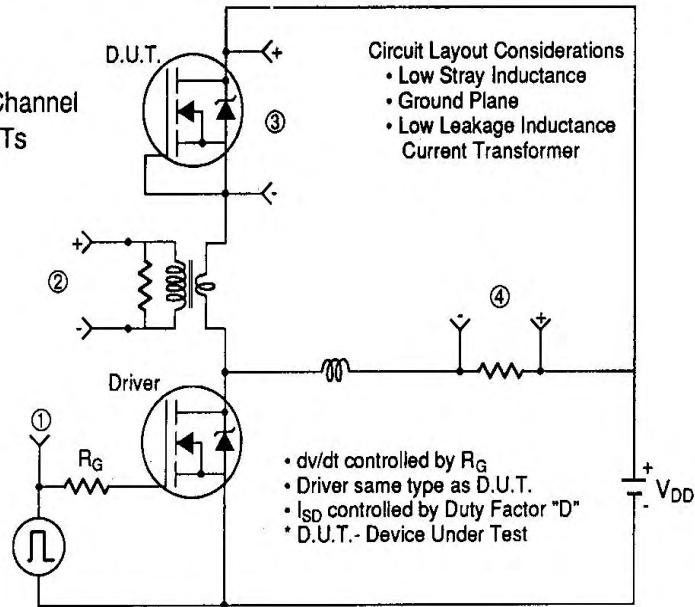


Fig 13b. Gate Charge Test Circuit

Appendix A

Peak Diode Recovery dv/dt Test Circuit

Fig 14. For N-Channel HEXFETs

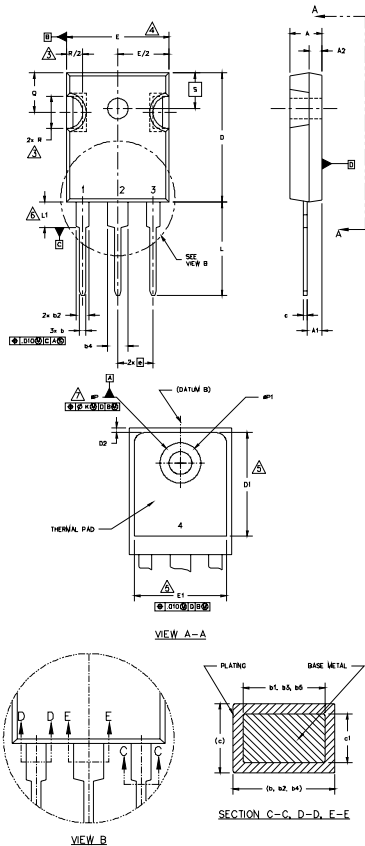


* $V_{GS} = 5V$ for Logic Level Devices

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TO-247AC Package Outline Dimensions are shown in millimeters (inches)

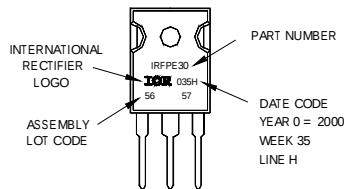


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M 1994.
 2. DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS]
 3. CONTOUR OF SLOT OPTIONAL.
 4. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
 5. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS 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	4	LEAD ASSIGNMENTS
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	4	IGBTs, CoPACK
D	.776	.815	19.71	20.70		
D1	.515	-	13.08	-		
D2	.020	.030	0.51	0.76		
E	.602	.625	15.29	15.87		
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			

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.

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TAC Fax: (310) 252-7903

Visit us at www.irf.com for sales contact information. 08/04

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