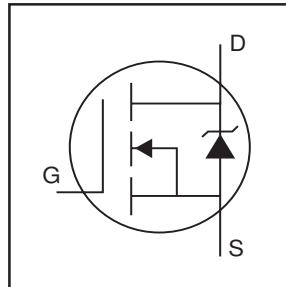


HEXFET® Power MOSFET

- Advanced Process Technology
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated

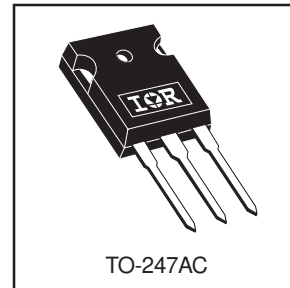


$V_{DSS} = 100V$
$R_{DS(on)} = 0.052\Omega$
$I_D = 33A$

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient device for use in a wide variety of applications.

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.



Absolute Maximum Ratings

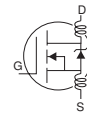
	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ ⑤	33	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ ⑤	23	
I_{DM}	Pulsed Drain Current ① ⑤	110	
$P_D @ T_C = 25^\circ C$	Power Dissipation	140	W
	Linear Derating Factor	0.91	W/°C
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ② ⑤	300	mJ
I_{AR}	Avalanche Current ①	16	A
E_{AR}	Repetitive Avalanche Energy ①	14	mJ
dv/dt	Peak Diode Recovery dv/dt ③ ⑤	5.0	V/ns
T_J	Operating Junction and	-55 to + 175	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 screw.	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	1.1	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	—	40	

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	100	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS/ΔT_J}	Breakdown Voltage Temp. Coefficient	—	0.11	—	V/°C	Reference to 25°C, I _D = 1mA ^⑤
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	—	0.052	Ω	V _{GS} = 10V, I _D = 16A ^④
V _{GS(th)}	Gate Threshold Voltage	2.0	—	4.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	Forward Transconductance	11	—	—	S	V _{DS} = 50V, I _D = 16A ^⑤
I _{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	V _{DS} = 100V, V _{GS} = 0V
		—	—	250		V _{DS} = 80V, V _{GS} = 0V, T _J = 150°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	—	—	94	nC	I _D = 16A
Q _{gs}	Gate-to-Source Charge	—	—	15		V _{DS} = 80V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	—	43		V _{GS} = 10V, See Fig. 6 and 13 ^{④⑤}
t _{d(on)}	Turn-On Delay Time	—	8.2	—	ns	V _{DD} = 50V
t _r	Rise Time	—	39	—		I _D = 16A
t _{d(off)}	Turn-Off Delay Time	—	44	—		R _G = 5.1Ω
t _f	Fall Time	—	33	—		R _D = 3.0Ω, See Fig. 10 ^{④⑤}
L _D	Internal Drain Inductance	—	5.0	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L _S	Internal Source Inductance	—	13	—		
C _{iss}	Input Capacitance	—	1400	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	330	—		V _{DS} = 25V
C _{rss}	Reverse Transfer Capacitance	—	170	—		f = 1.0MHz, See Fig. 5 ^⑤



Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	33	A	MOSFET symbol showing the integral reverse p-n junction diode.
I _{SM}	Pulsed Source Current (Body Diode) ^{①⑤}	—	—	110		
V _{SD}	Diode Forward Voltage	—	—	1.3	V	T _J = 25°C, I _S = 16A, V _{GS} = 0V ^④
t _{rr}	Reverse Recovery Time	—	170	250	ns	T _J = 25°C, I _F = 16A
Q _{rr}	Reverse Recovery Charge	—	1.1	1.6	μC	di/dt = 100A/μs ^{④⑤}

Notes:

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

② V_{DD} = 25V, starting T_J = 25°C, L = 2.0mH
R_G = 25Ω, I_{AS} = 16A. (See Figure 12)

③ I_{SD} ≤ 16A, di/dt ≤ 210A/μs, V_{DD} ≤ V_{(BR)DSS},
T_J ≤ 175°C

④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

⑤ Uses IRF540N data and test conditions.

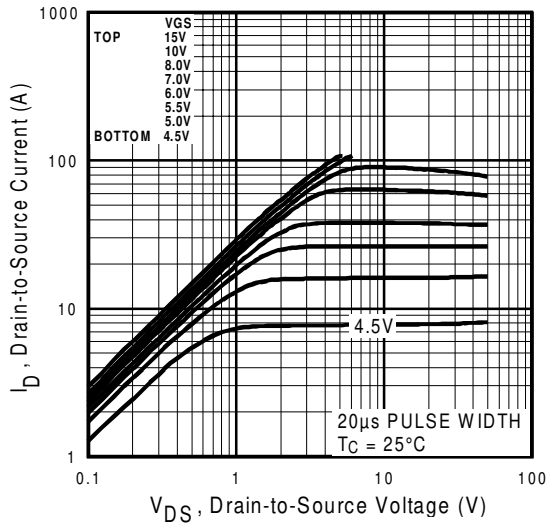


Fig 1. Typical Output Characteristics

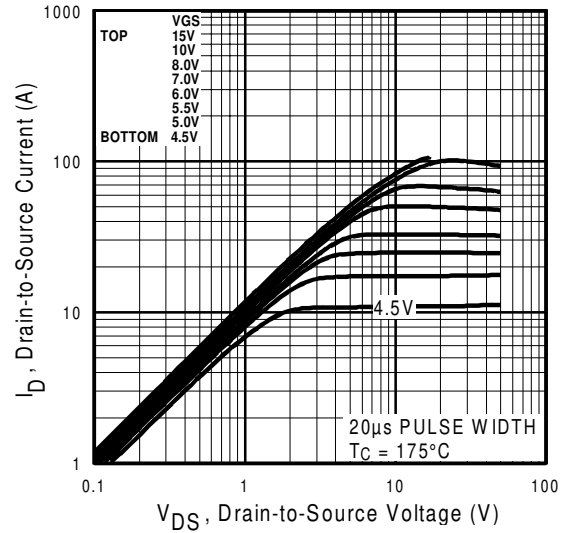


Fig 2. Typical Output Characteristics

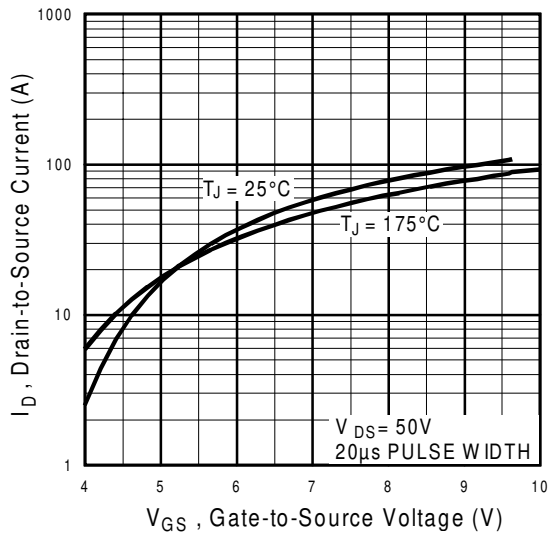


Fig 3. Typical Transfer Characteristics

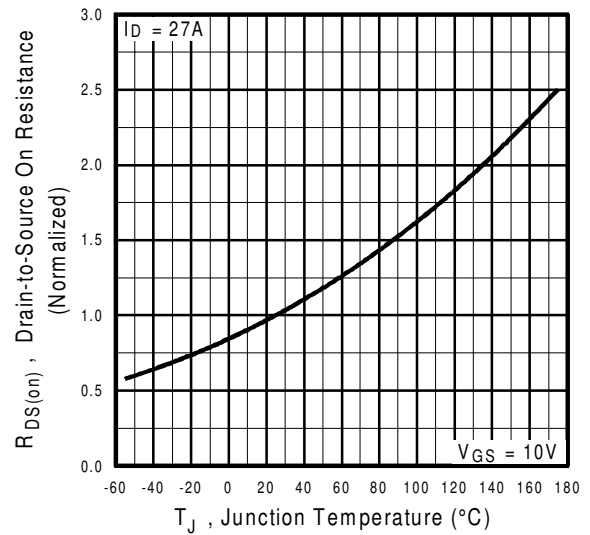


Fig 4. Normalized On-Resistance Vs. Temperature

IRFP140N

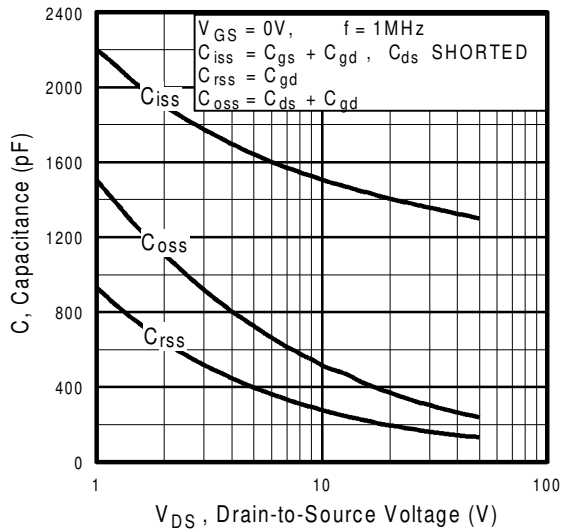


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

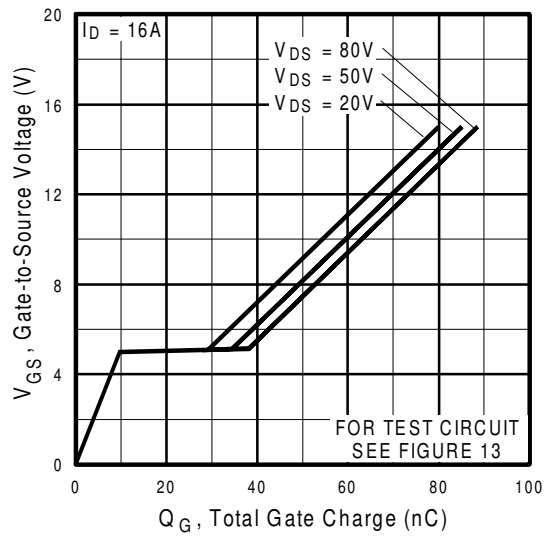


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

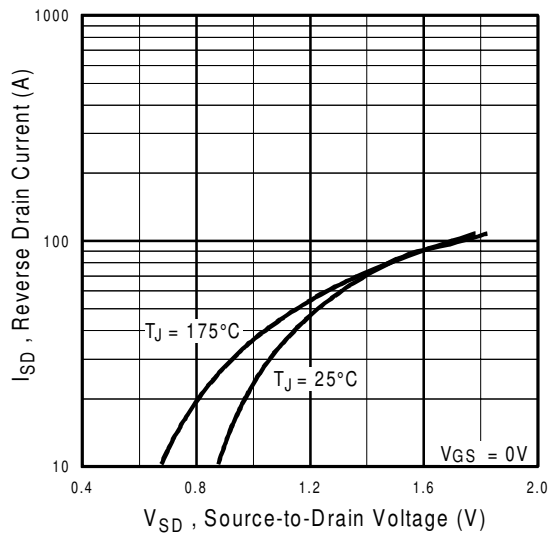


Fig 7. Typical Source-Drain Diode Forward Voltage

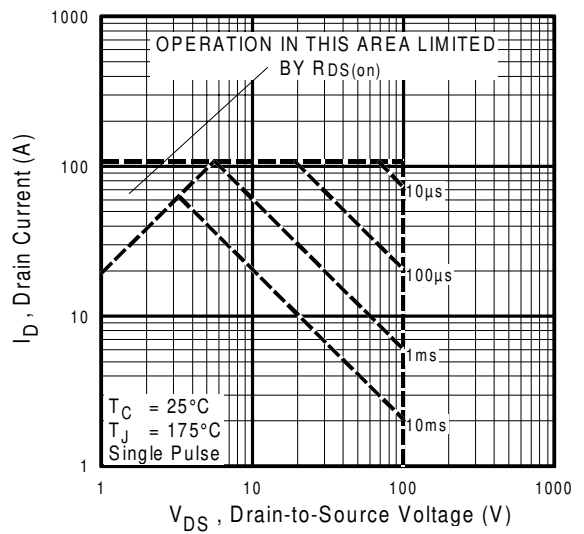


Fig 8. Maximum Safe Operating Area

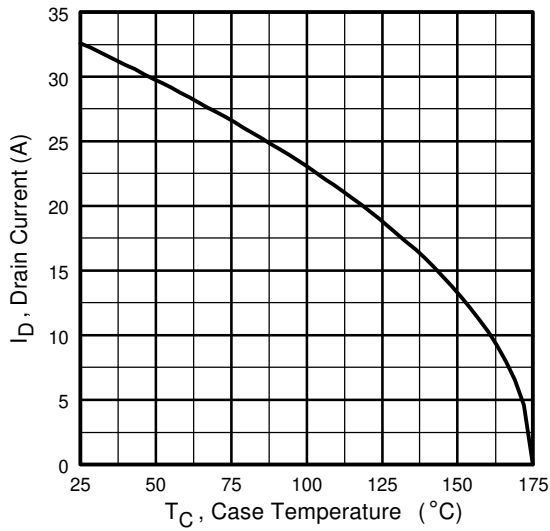


Fig 9. Maximum Drain Current Vs. Case Temperature

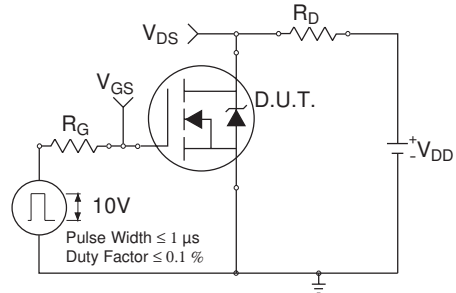


Fig 10a. Switching Time Test Circuit

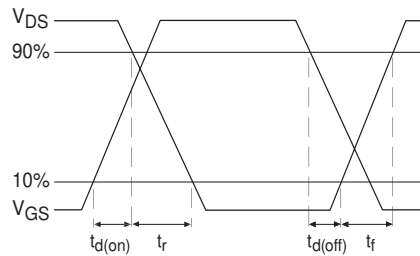


Fig 10b. Switching Time Waveforms

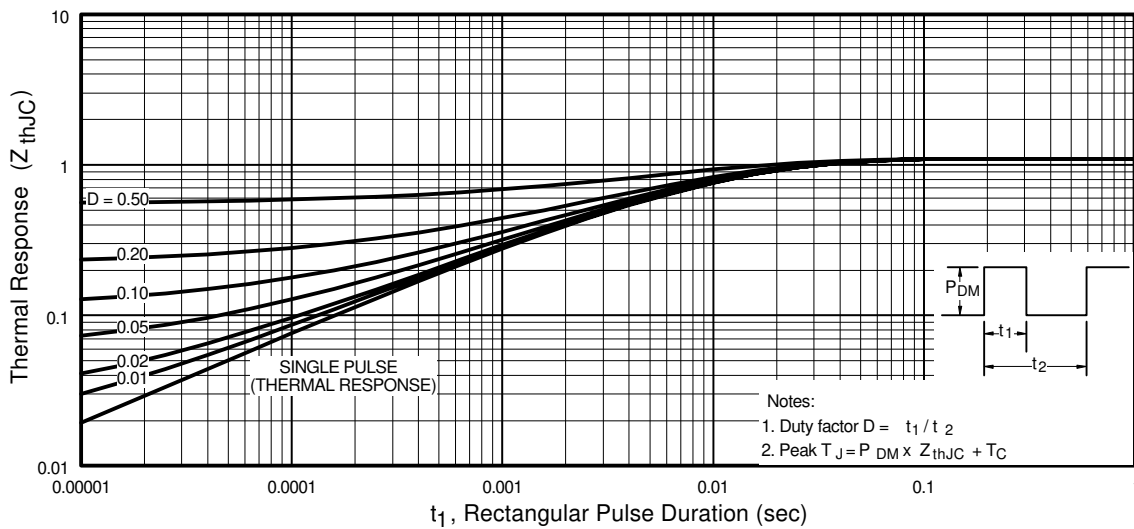


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRFP140N

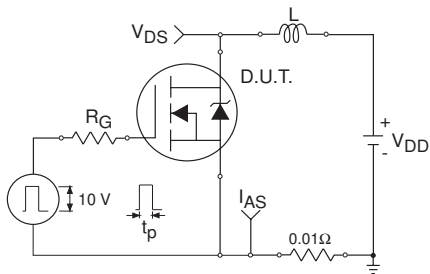


Fig 12a. Unclamped Inductive Test Circuit

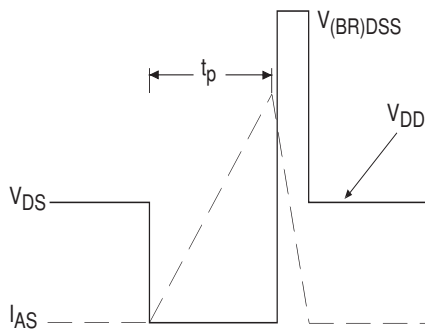


Fig 12b. Unclamped Inductive Waveforms

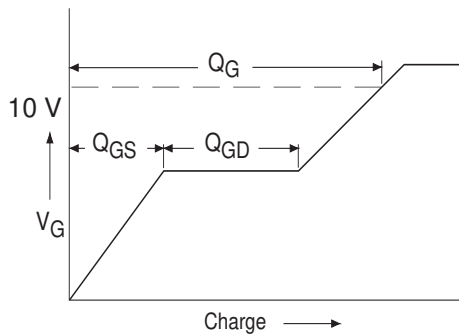


Fig 13a. Basic Gate Charge Waveform

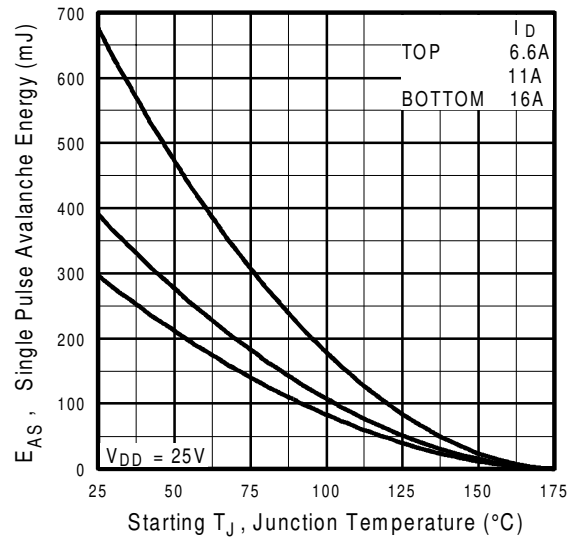


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

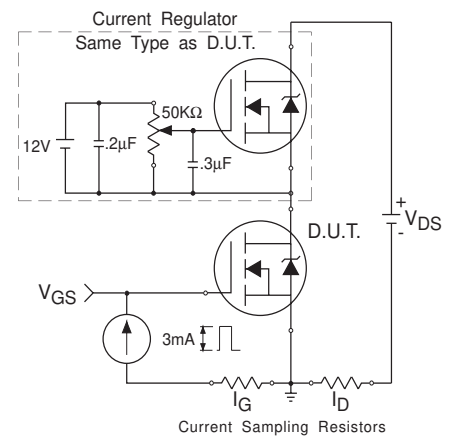
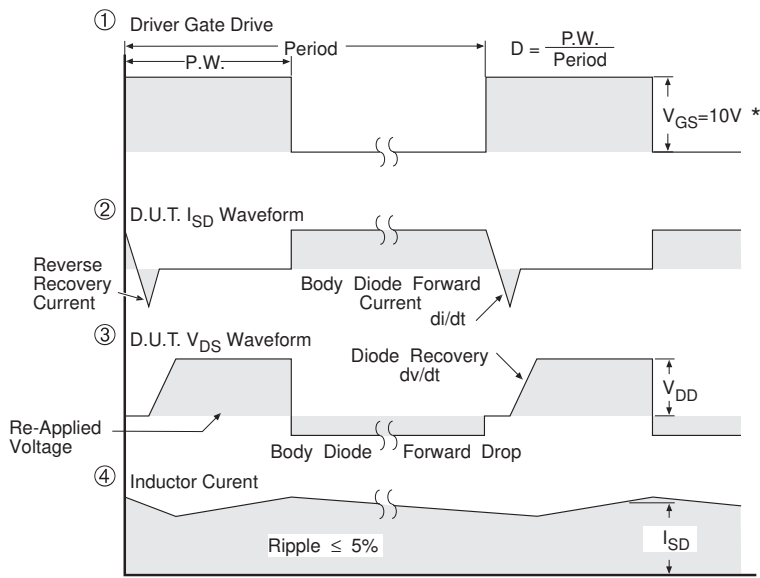
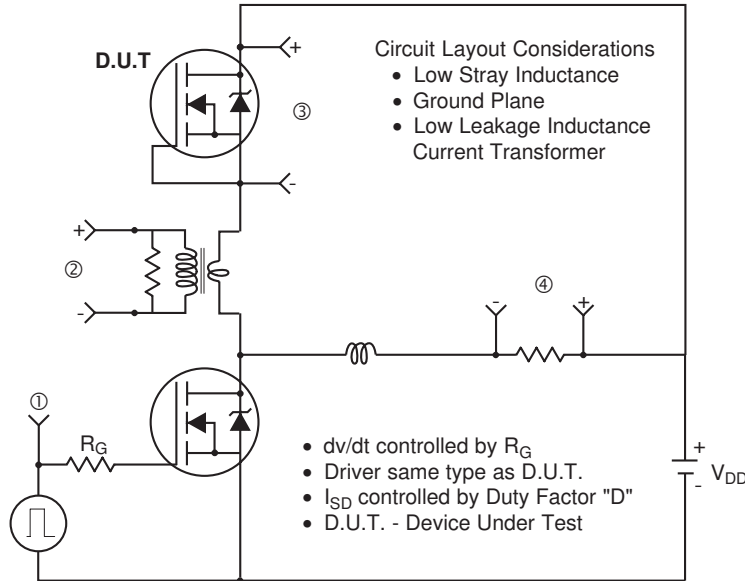


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

Fig 14. For N-Channel HEXFETS

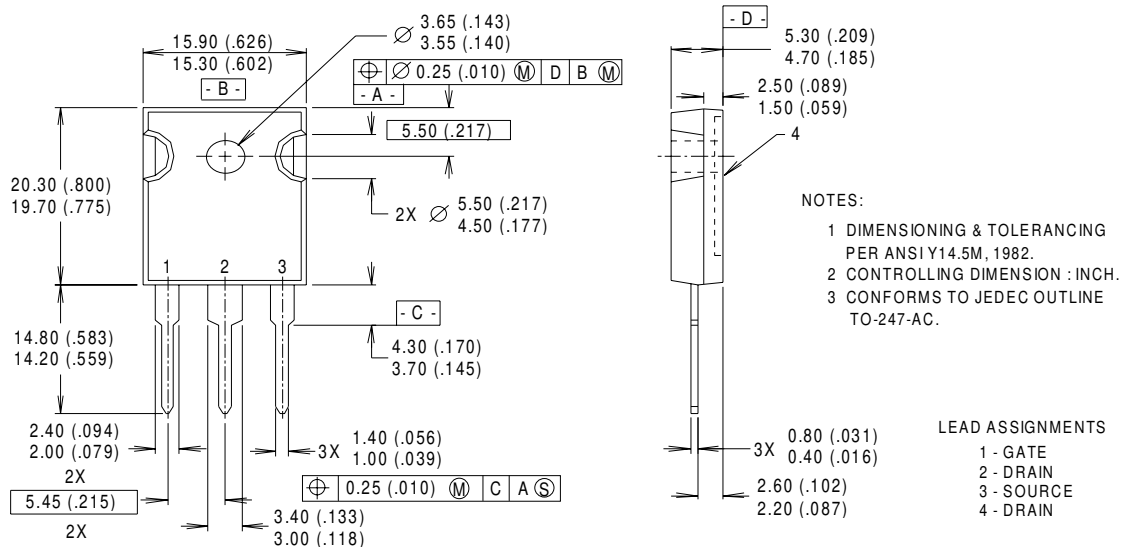
IRFP140N

International
IR Rectifier

Package Outline

TO-247AC Outline

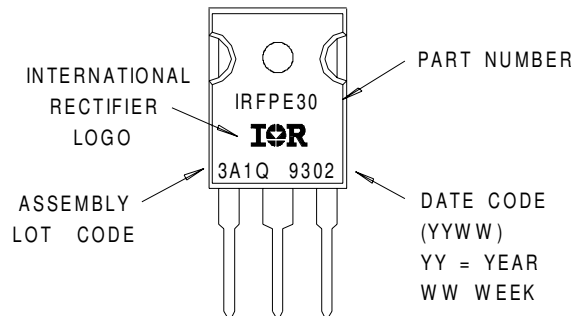
Dimensions are shown in millimeters (inches)



Part Marking Information

TO-247AC

EXAMPLE : THIS IS AN IRFPE30
 WITH ASSEMBLY
 LOT CODE 3A1Q



International
IR Rectifier

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IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T3Z2, Tel: (905) 453 2200

IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590

IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111

IR FAR EAST: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo Japan 171 Tel: 81 3 3983 0086

IR SOUTHEAST ASIA: 1 Kim Seng Promenade, Great World City West Tower, 13-11, Singapore 237994 Tel: ++ 65 838 4630

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<http://www.irf.com/> Data and specifications subject to change without notice. 8/98

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