PD -93906

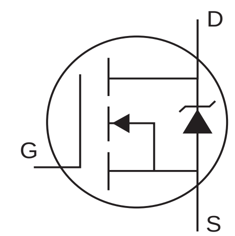
International
IOR Rectifier

PROVISIONAL

IRFP2907

HEXFET® Power MOSFET

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



V_{DSS} = 75V

$R_{DS(on)}$ = 0.0045Ω

I_D = 177A⑥

Description

Seventh Generation HEXFET® Power MOSFETs from International Rectifier utilize advanced processing techniques to achieve extremely low 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 and reliable 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.

TO-247AC

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	177⑥	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	125⑥	A
I_{DM}	Pulsed Drain Current ①	710	A
P_D @T_C = 25°C	Power Dissipation	330	W
	Linear Derating Factor	2.2	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②	1280	mJ
I_{AR}	Avalanche Current①	110	A
E_{AR}	Repetitive Avalanche Energy①	33	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	°C
	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	—–	0.45	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	—–	°C/W
$R_{\theta JA}$	Junction-to-Ambient	—–	40	°C/W

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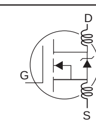
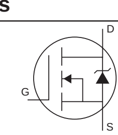
Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	75	——	——	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.086	——	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	0.0038	0.0045	Ω	V_{GS} = 10V, I_D = 110A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	——	4.0	V	V_{DS} = 10V, I_D = 250µA
g_{fs}	Forward Transconductance	160	——	——	S	V_{DS} = 25V, I_D = 110A
I_{DSS}	Drain-to-Source Leakage Current	——	——	20	µA	V_{DS} = 75V, V_{GS} = 0V
		——	——	250		V_{DS} = 60V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	200	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	——	——	-200		V_{GS} = -20V
Q_g	Total Gate Charge	——	310	460	nC	I_D = 110A
Q_{gs}	Gate-to-Source Charge	——	49	74		V_{DS} = 60V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	88	130		V_{GS} = 10V④
$t_{d(on)}$	Turn-On Delay Time	——	18	——	ns	V_{DD} = 38V
t_r	Rise Time	——	140	——		I_D = 110A
$t_{d(off)}$	Turn-Off Delay Time	——	180	——		R_G = 1.1Ω
t_f	Fall Time	——	120	——		V_{GS} = 10V ④
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	——	14550	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	2080	——		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	——	450	——		f = 1.0MHz, See Fig. 5
C_{oss}	Output Capacitance	——	9440	——		V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz
C_{oss}	Output Capacitance	——	1350	——		V_{GS} = 0V, V_{DS} = 60V, f = 1.0MHz
C_{oss} eff.	Effective Output Capacitance ⑤	——	2390	——		V_{GS} = 0V, V_{DS} = 0V to 60V

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	177⑥	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	710		
V_{SD}	Diode Forward Voltage	——	——	1.3	V	T_J = 25°C, I_S = 110A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	——	170	260	ns	T_J = 25°C, I_F = 110A
Q_{rr}	Reverse RecoveryCharge	——	1040	1560	nC	di/dt = 100A/µs 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 fig. 11)

② Starting T_J = 25°C, L = 0.21mH R_G = 25Ω, I_{AS} = 110A. (See Figure 12)

③ $I_{SD} \leq$ 110A, di/dt ≤ 310A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 175°C

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

⑤ C_{oss} eff. is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .

⑥ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 70A.

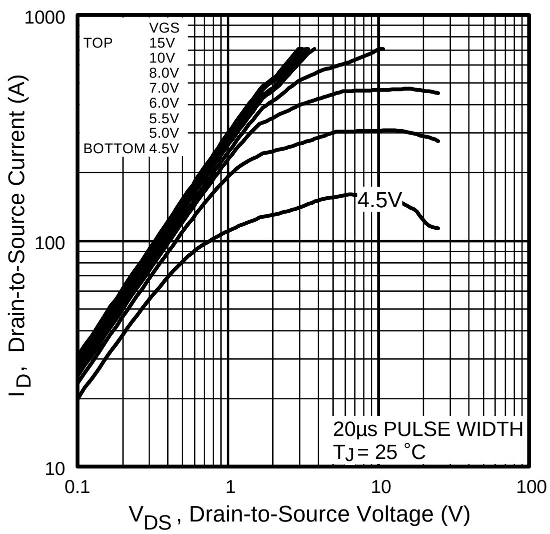


Fig 1. Typical Output Characteristics

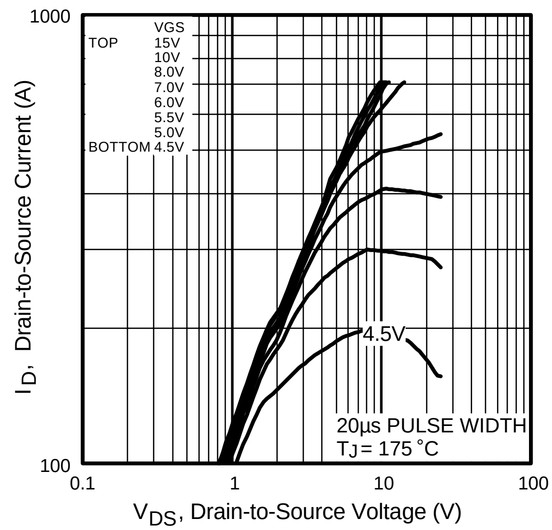


Fig 2. Typical Output Characteristics

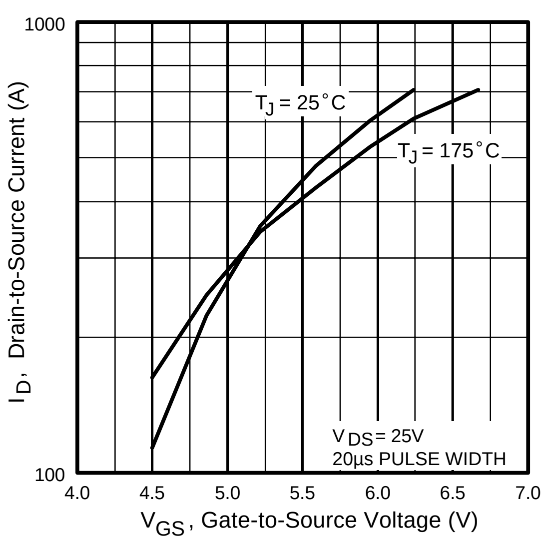


Fig 3. Typical Transfer Characteristics

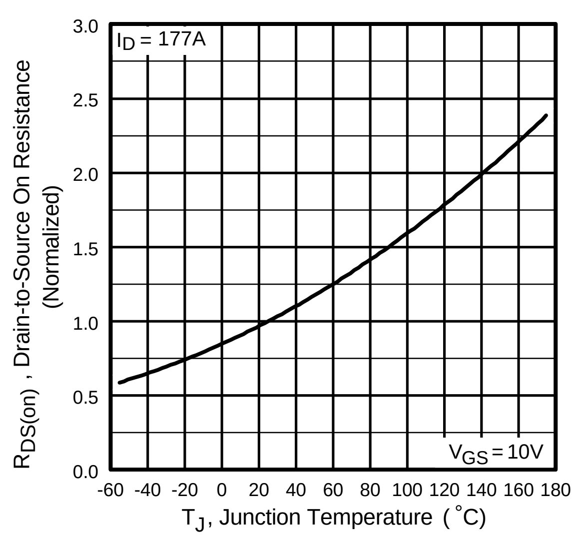


Fig 4. Normalized On-Resistance Vs. Temperature

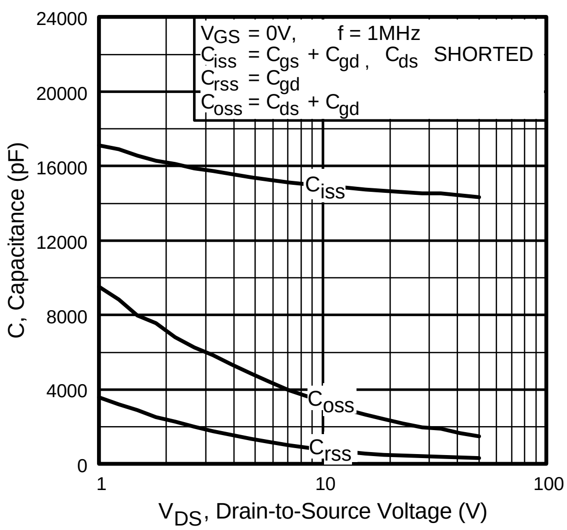


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

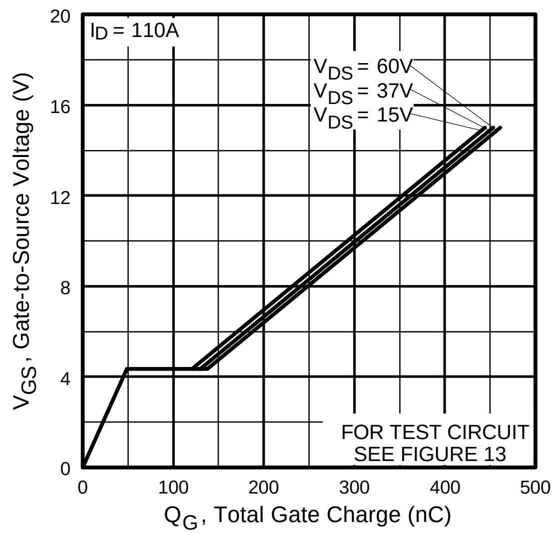


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

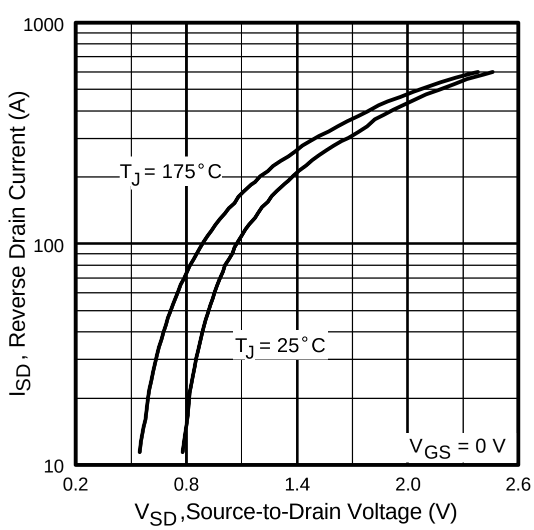


Fig 7. Typical Source-Drain Diode Forward Voltage

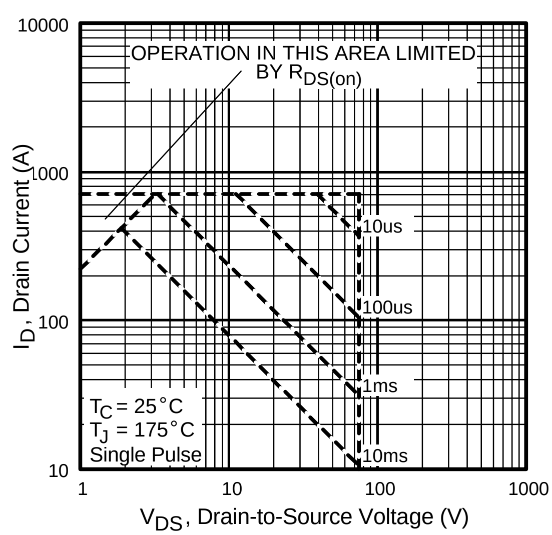


Fig 8. Maximum Safe Operating Area

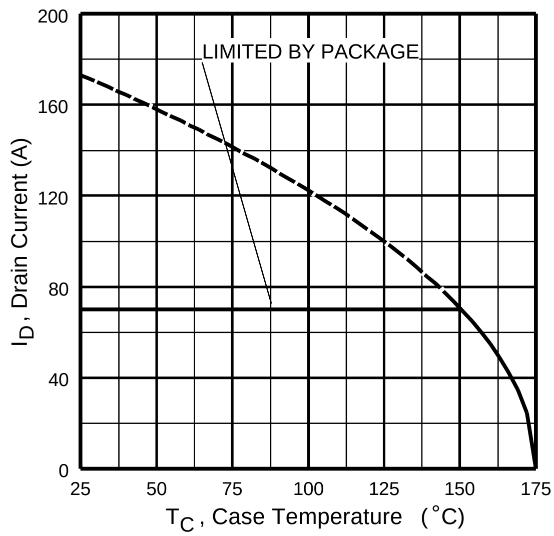
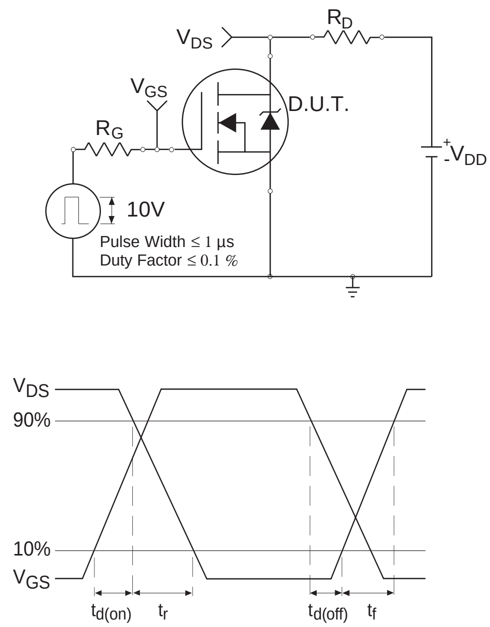


Fig 9. Maximum Drain Current Vs. Case Temperature



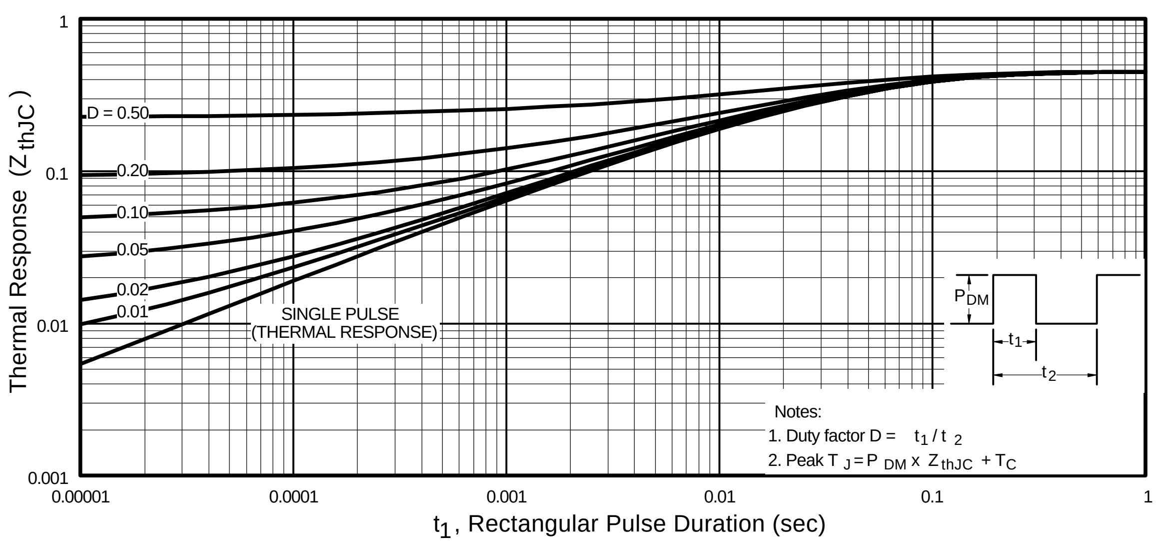


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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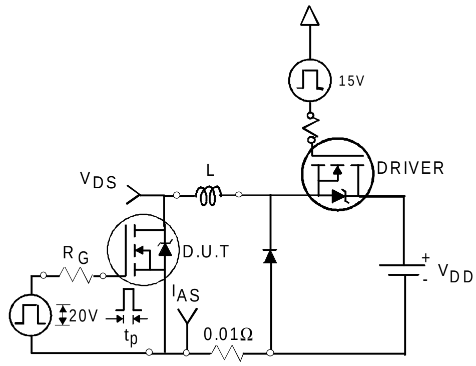


Fig 12a. Unclamped Inductive Test Circuit

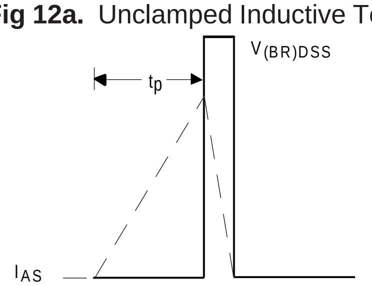


Fig 12b. Unclamped Inductive Waveforms

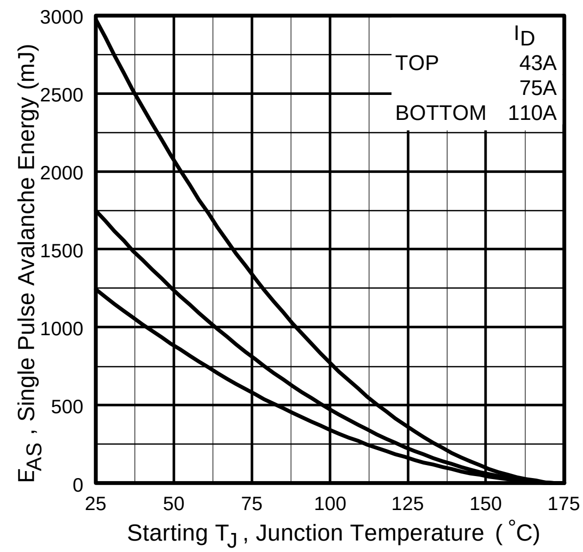


Fig 12c. Maximum Avalanche Energy
Vs. Drain Current

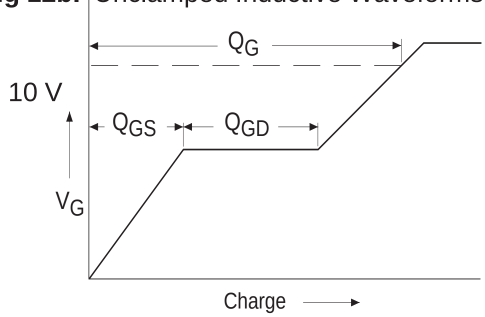


Fig 13a. Basic Gate Charge Waveform

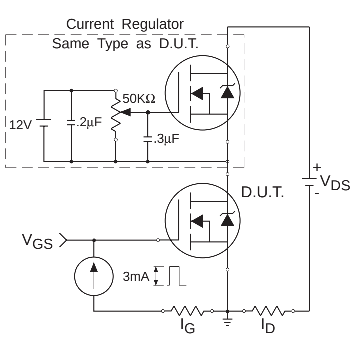


Fig 13b. Gate Charge Test Circuit

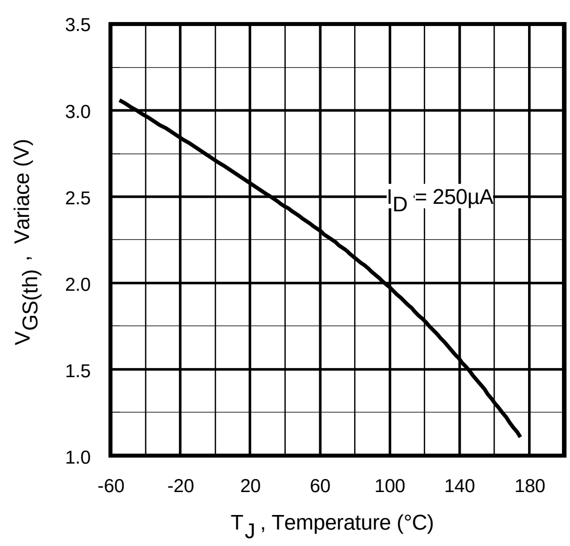
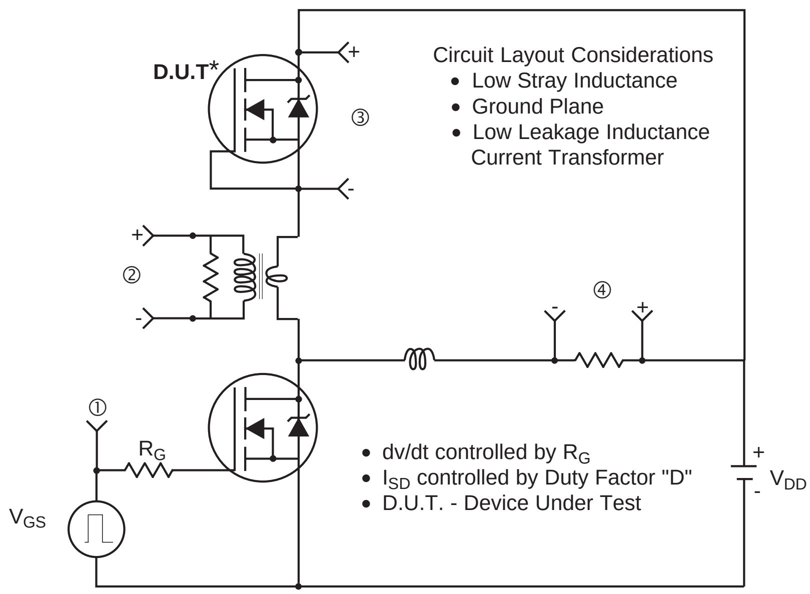
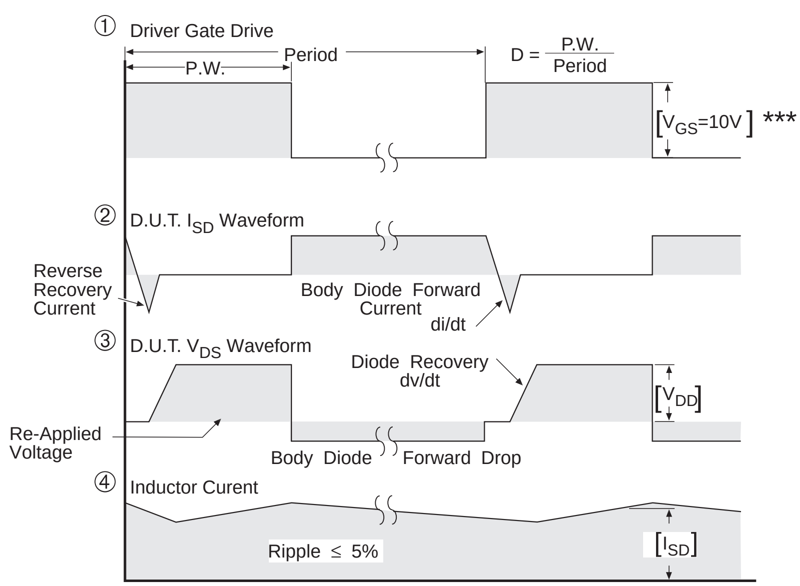


Fig 14. Threshold Voltage Vs. Temperature

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity of D.U.T for P-Channel

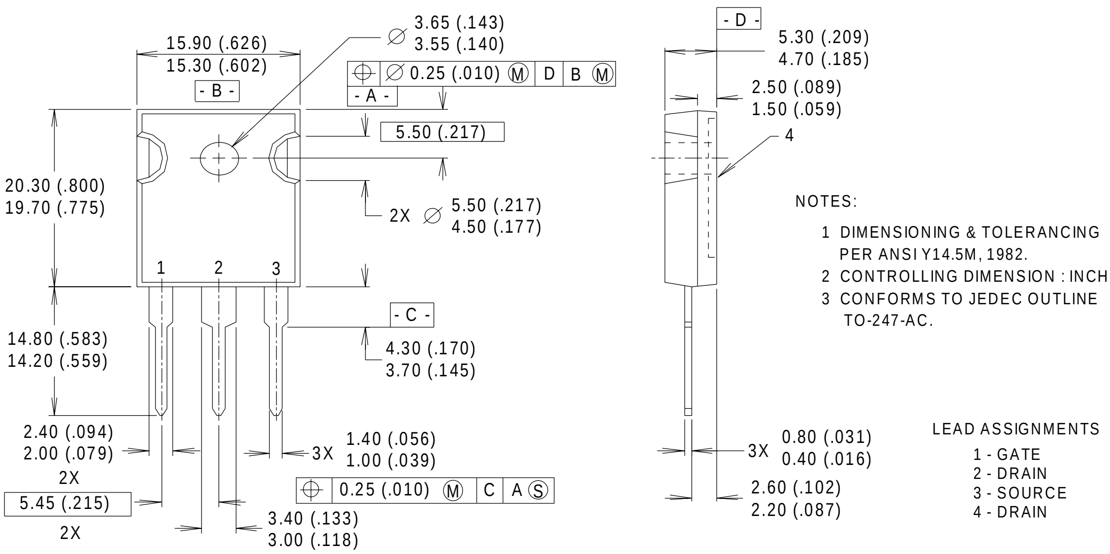


*** V_{GS} = 5.0V for Logic Level and 3V Drive Devices

Fig 14. For N-channel HEXFET® power MOSFETs

TO - 247 Package Outline

Dimensions are shown in millimeters (inches)



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IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
IR EUROPEAN REGIONAL CENTRE: 439/445 Godstone Rd, Whyteleafe, Surrey CR3 OBL, UK Tel: ++ 44 (0)20 8645 8000
IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T3Z2, Tel: (905) 453 2200
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 (0) 6172 96590
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 011 451 0111
IR JAPAN: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo 171 Tel: 81 (0)3 3983 0086
IR SOUTHEAST ASIA: 1 Kim Seng Promenade, Great World City West Tower, 13-11, Singapore 237994 Tel: ++ 65 (0)838 4630
IR TAIWAN:16 Fl. Suite D. 207, Sec. 2, Tun Haw South Road, Taipei, 10673 Tel: 886-(0)2 2377 9936

Data and specifications subject to change without notice. 4/00