

IRFP22N60KPbF

SMPS MOSFET

HEXFET® Power MOSFET

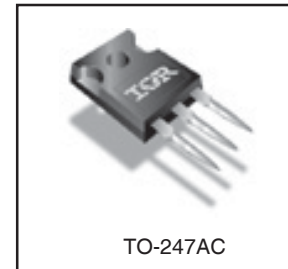
Applications

- Hard Switching Primary or PFS Switch
- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High Speed Power Switching
- Motor Drive
- Lead-Free

V_{DSS}	R_{DS(on)} typ.	I_D
600V	240mΩ	22A

Benefits

- Low Gate Charge Qg results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dv/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Enhanced Body Diode dv/dt Capability



Absolute Maximum Ratings

	Parameter	Max.	Units
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V	22	A
I _D @ T _C = 100°C	Continuous Drain Current, V _{GS} @ 10V	14	
I _{DM}	Pulsed Drain Current ①	88	
P _D @ T _C = 25°C	Power Dissipation	370	W
	Linear Derating Factor	2.9	W/°C
V _{GS}	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ②	15	V/ns
T _J	Operating Junction and	-55 to + 150	
T _{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	°C

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E _{AS}	Single Pulse Avalanche Energy②	—	380	mJ
I _{AR}	Avalanche Current①	—	22	A
E _{AR}	Repetitive Avalanche Energy①	—	37	mJ

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
R _{θJC}	Junction-to-Case	—	0.34	°C/W
R _{θCS}	Case-to-Sink, Flat, Greased Surface	0.24	—	
R _{θJA}	Junction-to-Ambient	—	40	

IRFP22N60KPbF

International
IR Rectifier

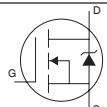
Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	600	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.30	—	V/°C	Reference to 25°C , $I_D = 1\text{mA}$ ⓐ
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	240	280	mΩ	$V_{GS} = 10V, I_D = 13A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	3.0	—	5.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	50	μA	$V_{DS} = 600V, V_{GS} = 0V$
		—	—	250	μA	$V_{DS} = 480V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 30V$
	Gate-to-Source Reverse Leakage	—	—	-100	nA	$V_{GS} = -30V$

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	11	—	—	S	$V_{DS} = 50V, I_D = 13A$
Q_g	Total Gate Charge	—	—	150	nC	$I_D = 22A$
Q_{gs}	Gate-to-Source Charge	—	—	45		$V_{DS} = 480V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	76		$V_{GS} = 10V$ ④
$t_{d(on)}$	Turn-On Delay Time	—	26	—	ns	$V_{DD} = 300V$
t_r	Rise Time	—	99	—		$I_D = 22A$
$t_{d(off)}$	Turn-Off Delay Time	—	48	—		$R_G = 6.2\ \Omega$
t_f	Fall Time	—	37	—		$V_{GS} = 10V$ ④
C_{iss}	Input Capacitance	—	3570	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	350	—		$V_{DS} = 25V$
C_{riss}	Reverse Transfer Capacitance	—	36	—		$f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	4710	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	92	—		$V_{GS} = 0V, V_{DS} = 480V, f = 1.0\text{MHz}$
$C_{oss\ eff.}$	Effective Output Capacitance	—	180	—		$V_{GS} = 0V, V_{DS} = 0V\ \text{to}\ 480V$ ⑤

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	22	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	88		
V_{SD}	Diode Forward Voltage	—	—	1.5	V	$T_J = 25^\circ\text{C}, I_S = 22A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	590	890	ns	$T_J = 25^\circ\text{C}$
		—	670	1010		$T_J = 125^\circ\text{C}$
Q_{rr}	Reverse Recovery Charge	—	7.2	11	μC	$T_J = 25^\circ\text{C}$
		—	8.5	13		$T_J = 125^\circ\text{C}$
I_{RRM}	Reverse Recovery Current	—	26	39	A	$T_J = 25^\circ\text{C}$
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.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 1.5\text{mH}$, $R_G = 25\ \Omega$, $I_{AS} = 22A$
- ③ $I_{SD} \leq 22A$, $di/dt \leq 360\ \text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 150^\circ\text{C}$.
- ④ Pulse width $\leq 300\ \mu\text{s}$; duty cycle $\leq 2\%$.
- 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} .

IRFP22N60KPbF

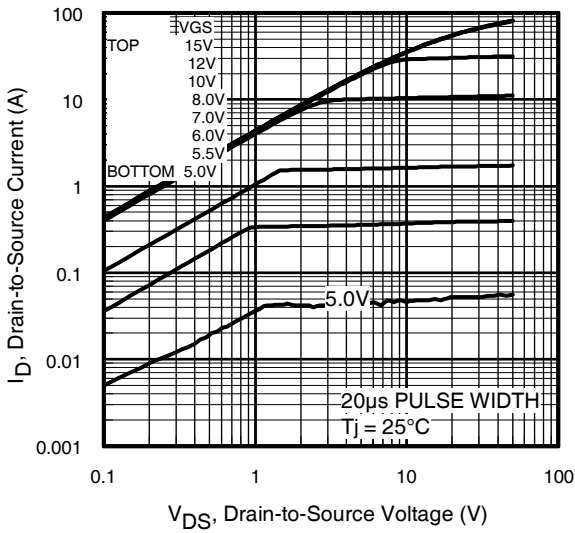


Fig 1. Typical Output Characteristics

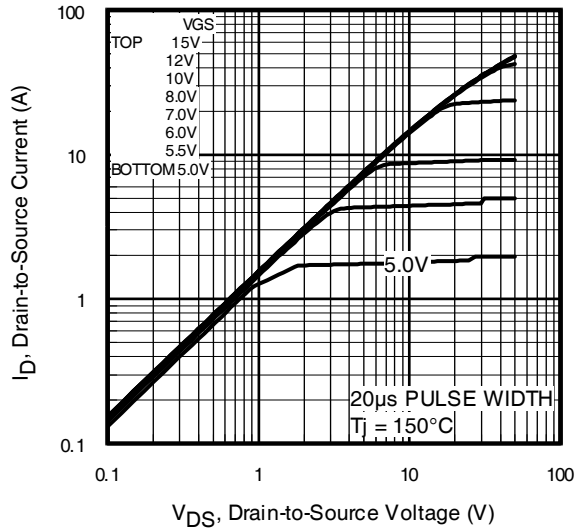


Fig 2. Typical Output Characteristics

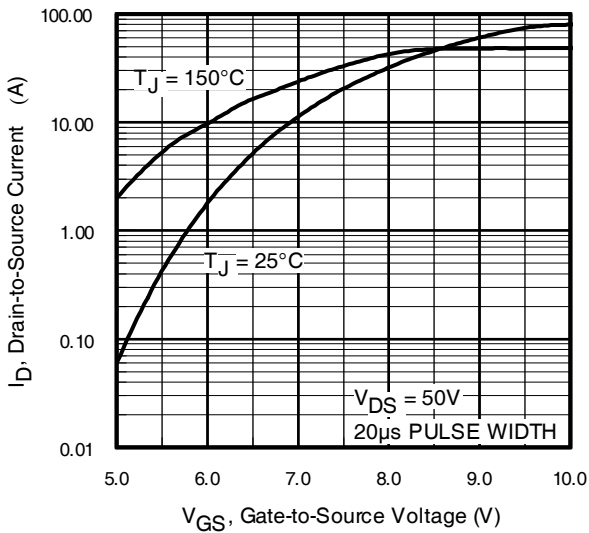


Fig 3. Typical Transfer Characteristics

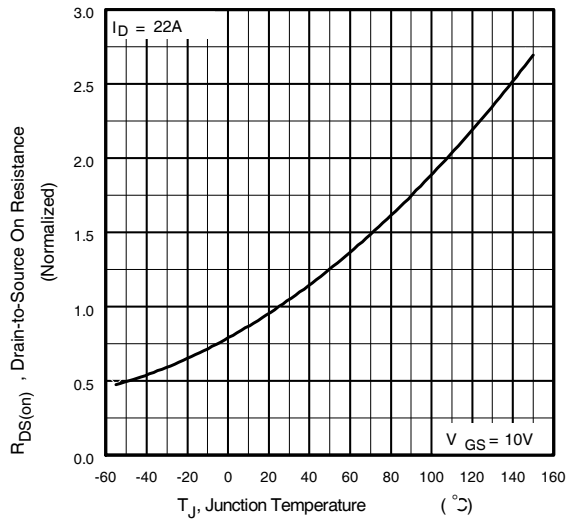


Fig 4. Normalized On-Resistance Vs. Temperature

IRFP22N60KPbF

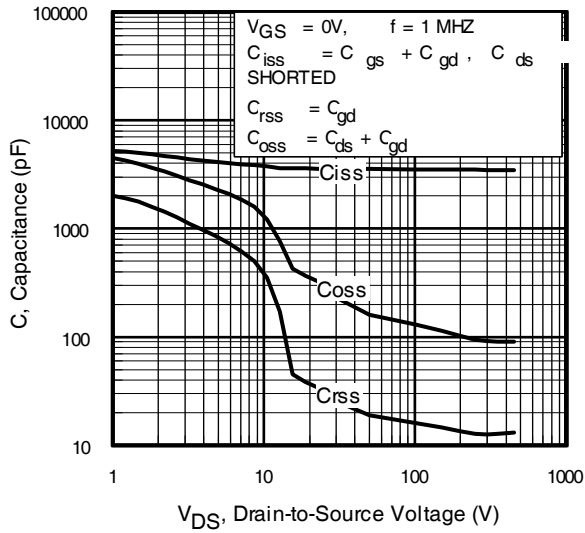


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

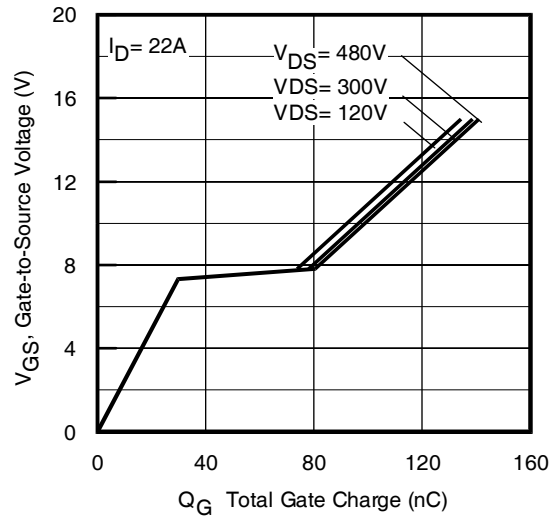


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

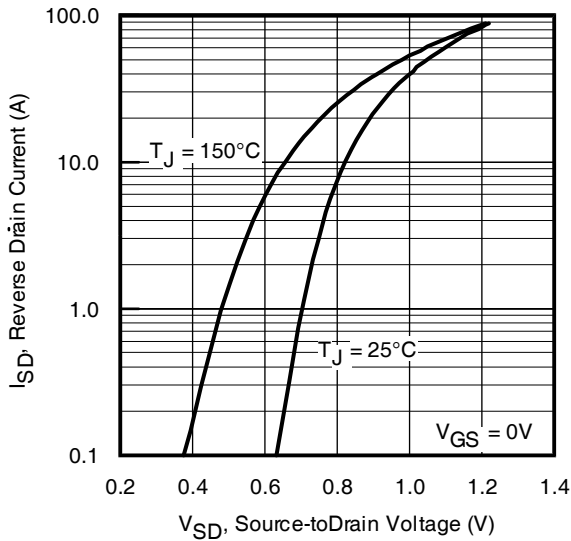


Fig 7. Typical Source-Drain Diode Forward Voltage

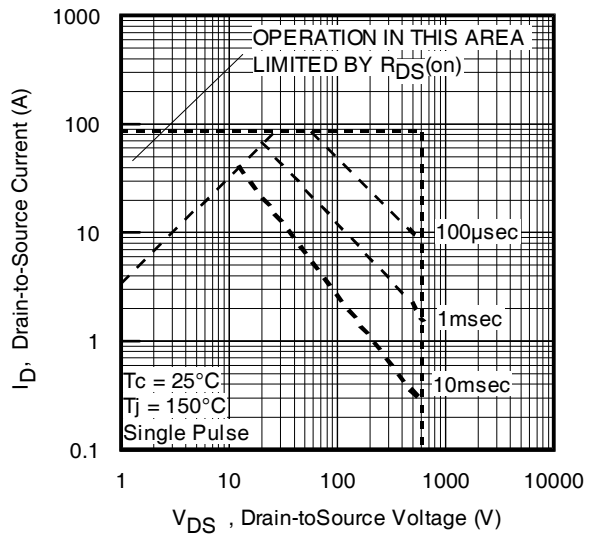


Fig 8. Maximum Safe Operating Area

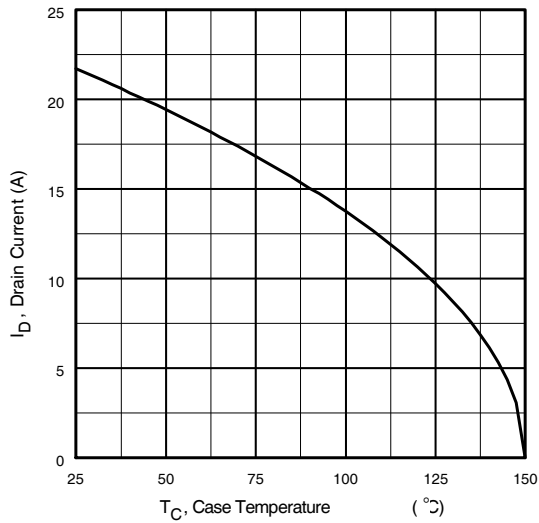


Fig 9. Maximum Drain Current Vs. Case Temperature

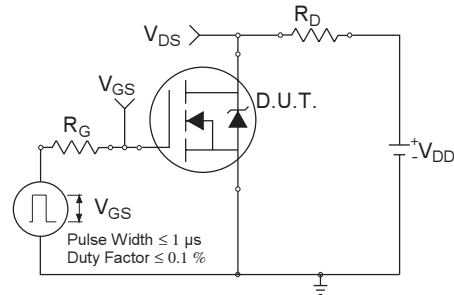


Fig 10a. Switching Time Test Circuit

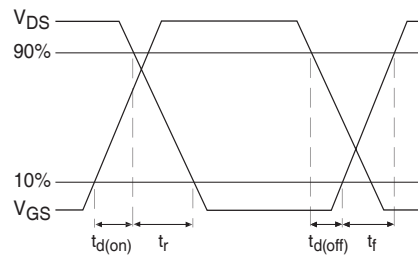


Fig 10b. Switching Time Waveforms

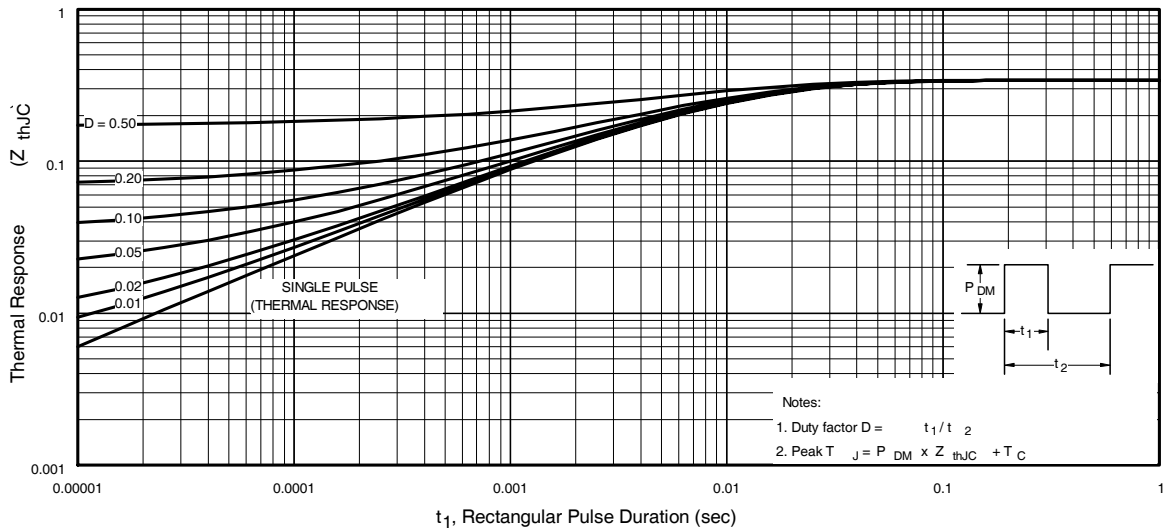


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRFP22N60KPbF

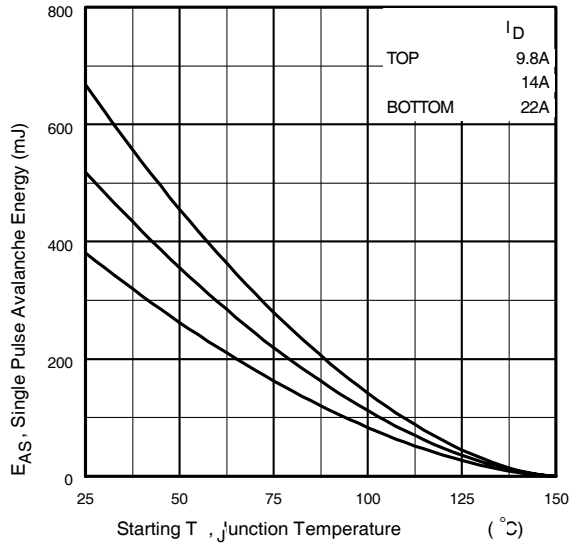


Fig 12a. Maximum Avalanche Energy Vs. Drain Current

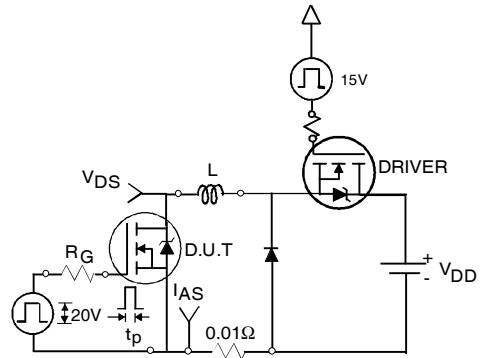


Fig 12c. Unclamped Inductive Test Circuit

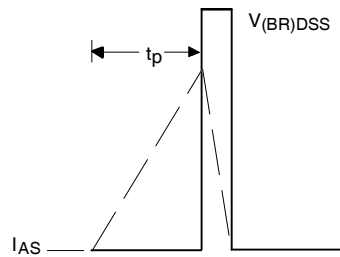


Fig 12d. Unclamped Inductive Waveforms

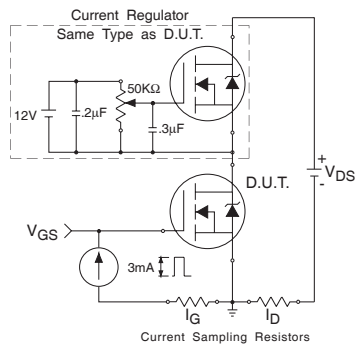


Fig 13a. Gate Charge Test Circuit

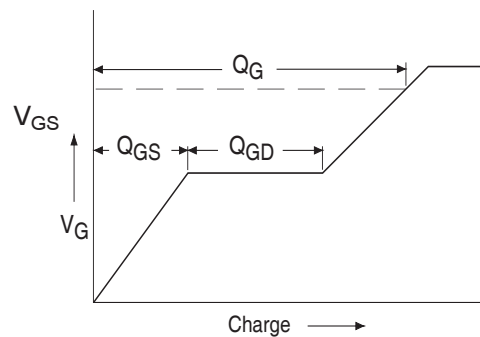
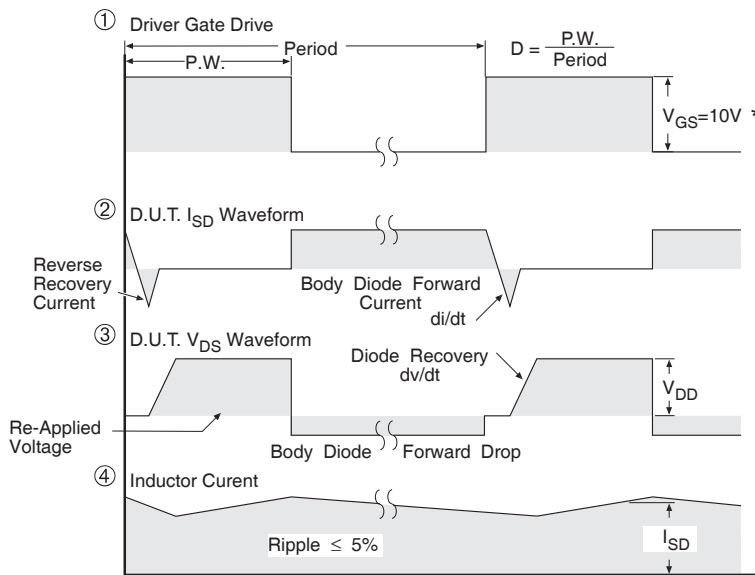
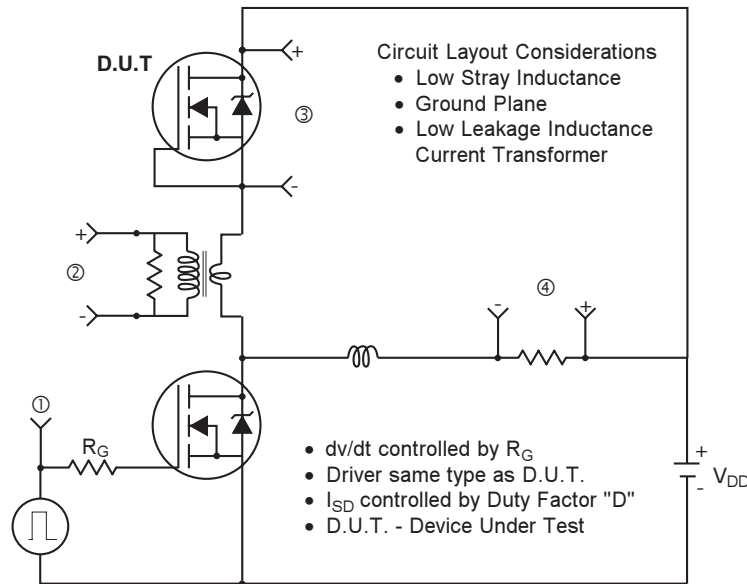


Fig 13b. Basic Gate Charge Waveform

Peak Diode Recovery dv/dt Test Circuit



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

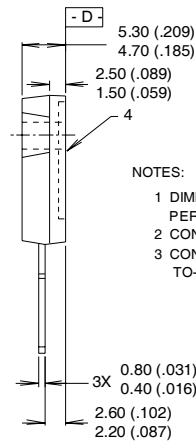
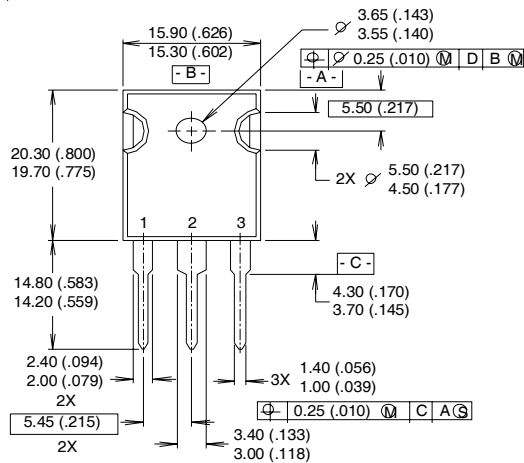
Fig 14. For N-Channel HEXFET® Power MOSFETs

IRFP22N60KPbF



TO-247AC Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

- 1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
- 2 CONTROLLING DIMENSION : INCH.
- 3 CONFORMS TO JEDEC OUTLINE TO-247-AC.

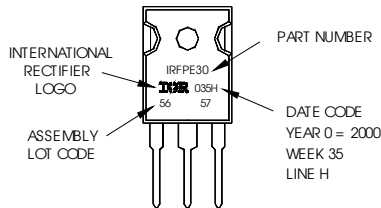
LEAD ASSIGNMENTS

Hexfet	IGBT
1 - Gate	1 - Gate
2 - Drain	2 - Collector
3 - Source	3 - Emitter
4 - Drain	4 - Collector

TO-247AC Part Marking Information

EXAMPLE: THIS IS AN IRFPE30
WITH ASSEMBLY
LOT CODE 5657
ASSEMBLED ON WW35, 2000
IN THE ASSEMBLY LINE "H"

Note: "P" in assembly line
position indicates "Lead-Free"



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.



IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903
12/03



Notice

The products described herein were acquired by Vishay Intertechnology, Inc., as part of its acquisition of International Rectifier's Power Control Systems (PCS) business, which closed in April 2007. Specifications of the products displayed herein are pending review by Vishay and are subject to the terms and conditions shown below.

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.

International Rectifier®, IR®, the IR logo, HEXFET®, HEXSense®, HEXDIP®, DOL®, INTERO®, and POWIRTRAIN® are registered trademarks of International Rectifier Corporation in the U.S. and other countries. All other product names noted herein may be trademarks of their respective owners.