

# IRFP27N60KPbF

HEXFET® Power MOSFET

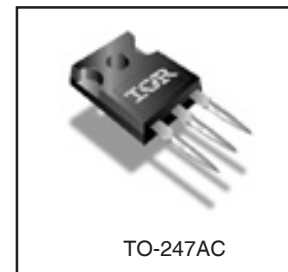
## Applications

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

## 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

V <sub>DSS</sub>	R <sub>DS(on)</sub> typ.	I <sub>D</sub>
600V	180mΩ	27A



## Absolute Maximum Ratings

	Parameter	Max.	Units
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	27	A
I <sub>D</sub> @ T <sub>C</sub> = 100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	18	
I <sub>DM</sub>	Pulsed Drain Current ①	110	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Power Dissipation	500	W
	Linear Derating Factor	4.0	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ③	13	V/ns
T <sub>J</sub>	Operating Junction and	-55 to + 150	°C
T <sub>STG</sub>	Storage Temperature Range		
	Soldering Temperature, for 10 seconds (1.6mm from case )	300	
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

## Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy②	—	530	mJ
I <sub>AR</sub>	Avalanche Current①	—	27	A
E <sub>AR</sub>	Repetitive Avalanche Energy①	—	50	mJ

## Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case	—	0.29	°C/W
R <sub>θCS</sub>	Case-to-Sink, Flat, Greased Surface	0.24	—	
R <sub>θJA</sub>	Junction-to-Ambient	—	40	

# IRFP27N60KPbF

International  
IR Rectifier

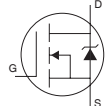
## Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

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	—	0.64	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	180	220	mΩ	$V_{GS} = 10V, I_D = 16A$ 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		$V_{DS} = 480V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 30V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -30V$

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$g_{fs}$	Forward Transconductance	14	—	—	S	$V_{DS} = 50V, I_D = 16A$
$Q_g$	Total Gate Charge	—	—	180	nC	$I_D = 27A$
$Q_{gs}$	Gate-to-Source Charge	—	—	56		$V_{DS} = 480V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	86		$V_{GS} = 10V, \text{See Fig. 6 and 13 } \textcircled{4}$
$t_{d(on)}$	Turn-On Delay Time	—	27	—	ns	$V_{DD} = 300V$
$t_r$	Rise Time	—	110	—		$I_D = 27A$
$t_{d(off)}$	Turn-Off Delay Time	—	43	—		$R_G = 4.3\Omega$
$t_f$	Fall Time	—	38	—		$V_{GS} = 10V, \text{See Fig. 10 } \textcircled{4}$
$C_{iss}$	Input Capacitance	—	4660	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	460	—		$V_{DS} = 25V$
$C_{riss}$	Reverse Transfer Capacitance	—	41	—		$f = 1.0\text{MHz}, \text{See Fig. 5}$
$C_{oss}$	Output Capacitance	—	5490	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$
$C_{oss}$	Output Capacitance	—	120	—		$V_{GS} = 0V, V_{DS} = 480V, f = 1.0\text{MHz}$
$C_{oss \text{ eff.}}$	Effective Output Capacitance	—	250	—		$V_{GS} = 0V, V_{DS} = 0V \text{ to } 480V \textcircled{5}$

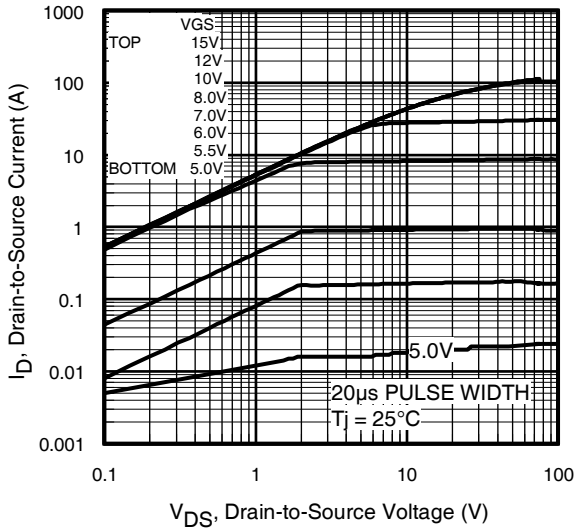
## Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	27	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	110		
$V_{SD}$	Diode Forward Voltage	—	—	1.5	V	$T_J = 25^\circ\text{C}, I_S = 27A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	620	920	ns	$T_J = 25^\circ\text{C}, I_F = 27A$
$Q_{rr}$	Reverse Recovery Charge	—	11	16	μC	$di/dt = 100A/\mu s$ ④
$I_{RRM}$	Reverse Recovery Current	—	36	53	A	
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$ )				

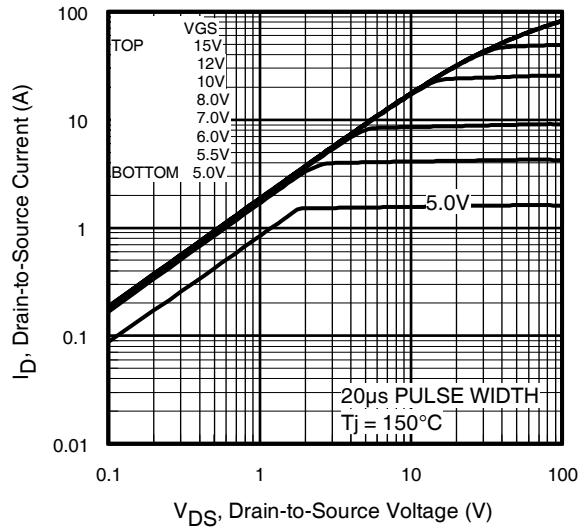
### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See Fig. 11)
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 1.4\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 27A$ ,  $dv/dt = 13V/ns$ . (See Figure 12a)
- ③  $I_{SD} \leq 27A$ ,  $di/dt \leq 390A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$ .
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ⑤  $C_{oss \text{ eff.}}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 80%  $V_{DSS}$ .

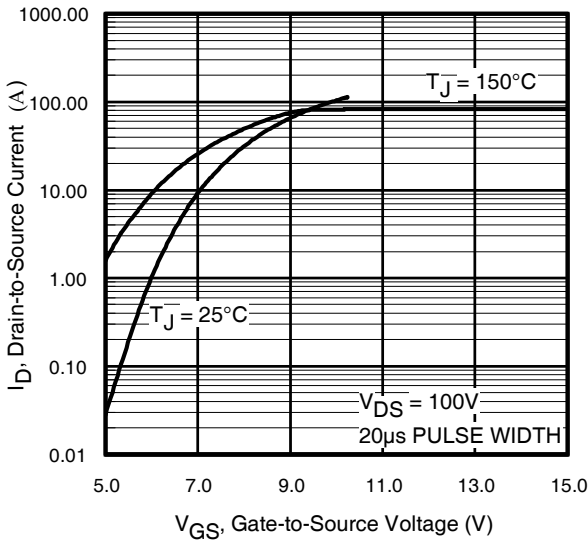
# IRFP27N60KPbF



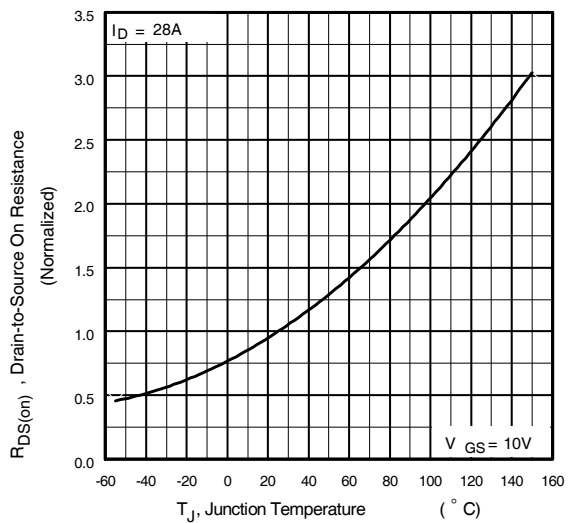
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics

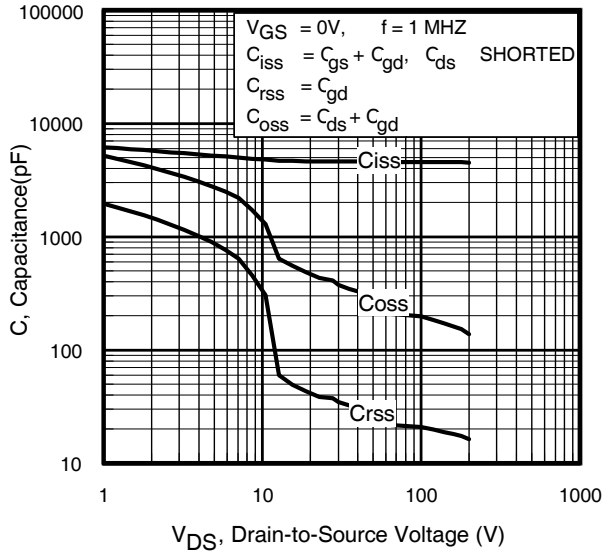


**Fig 3.** Typical Transfer Characteristics

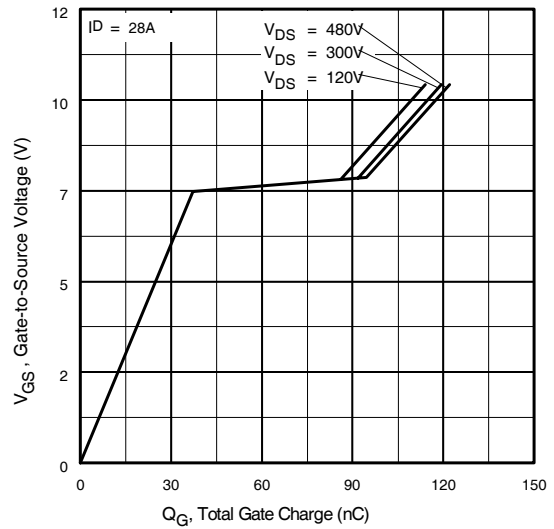


**Fig 4.** Normalized On-Resistance Vs. Temperature

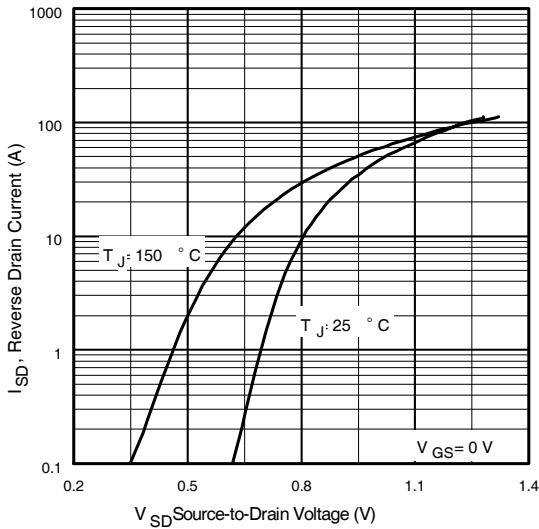
# IRFP27N60KPbF



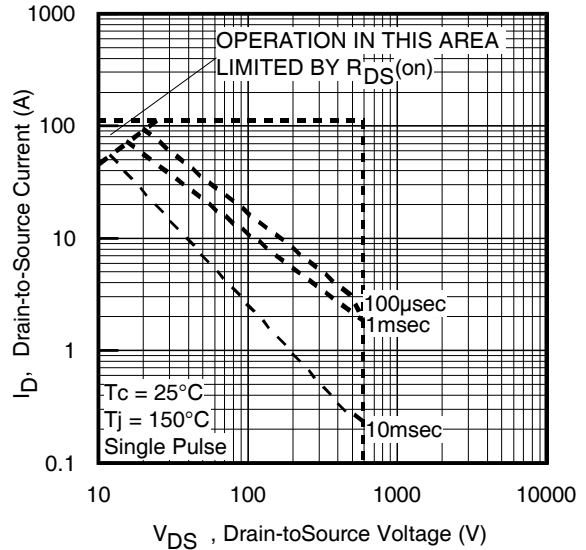
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



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

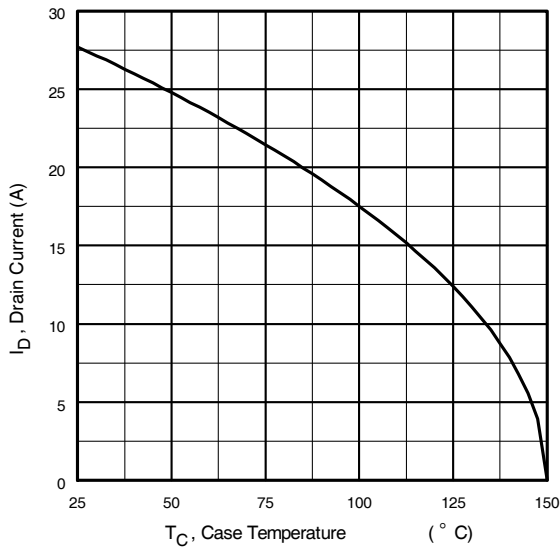


**Fig 7.** Typical Source-Drain Diode Forward Voltage

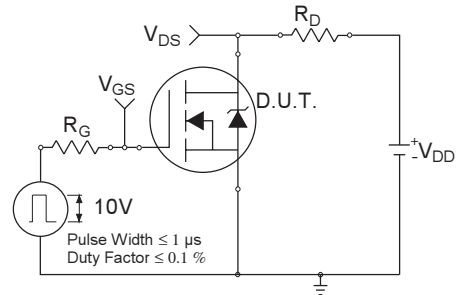


**Fig 8.** Maximum Safe Operating Area

# IRFP27N60KPbF



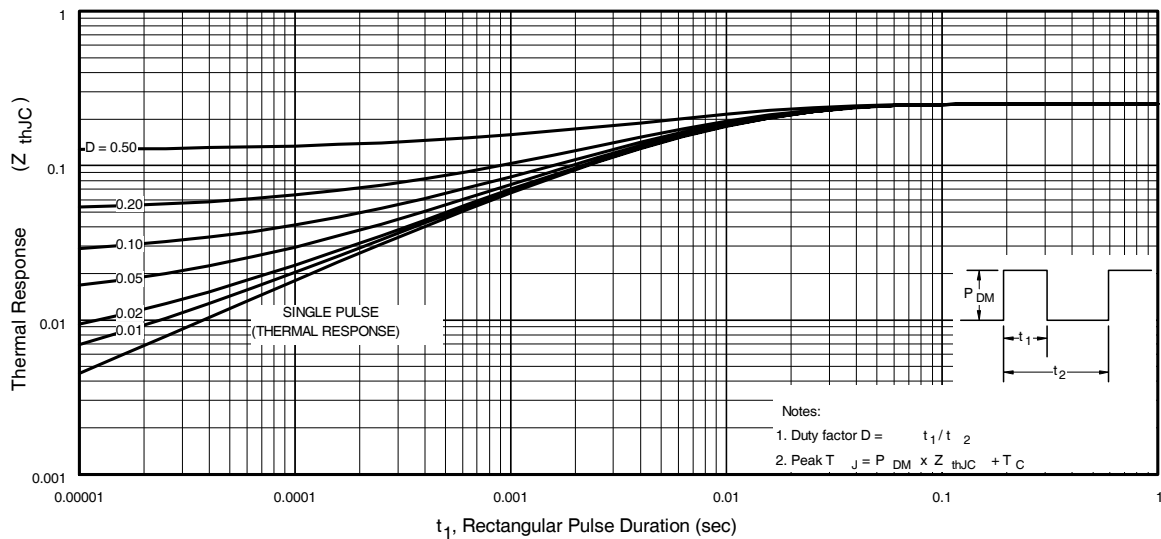
**Fig 9.** Maximum Drain Current Vs. Case Temperature



**Fig 10a.** Switching Time Test Circuit

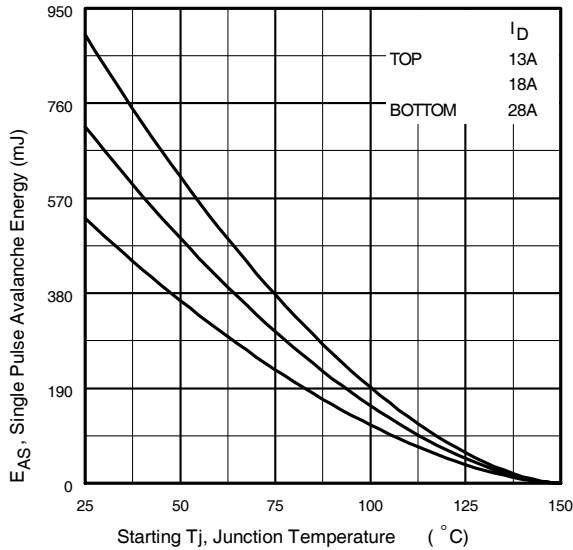


**Fig 10b.** Switching Time Waveforms

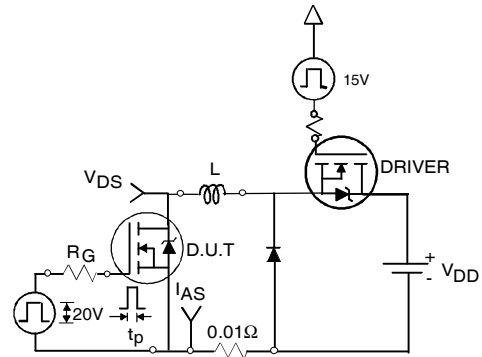


**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

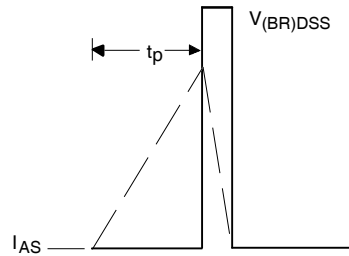
# IRFP27N60KPbF



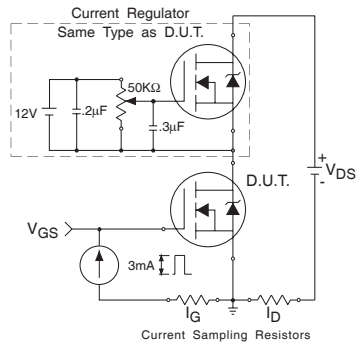
**Fig 12a.** Maximum Avalanche Energy Vs. Drain Current



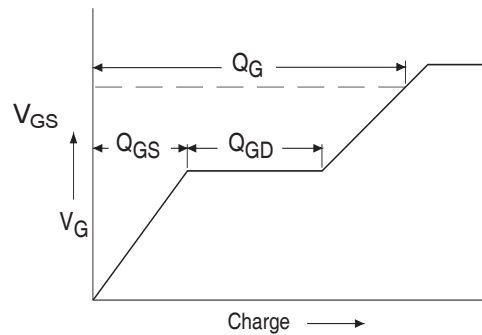
**Fig 12c.** Unclamped Inductive Test Circuit



**Fig 12d.** Unclamped Inductive Waveforms

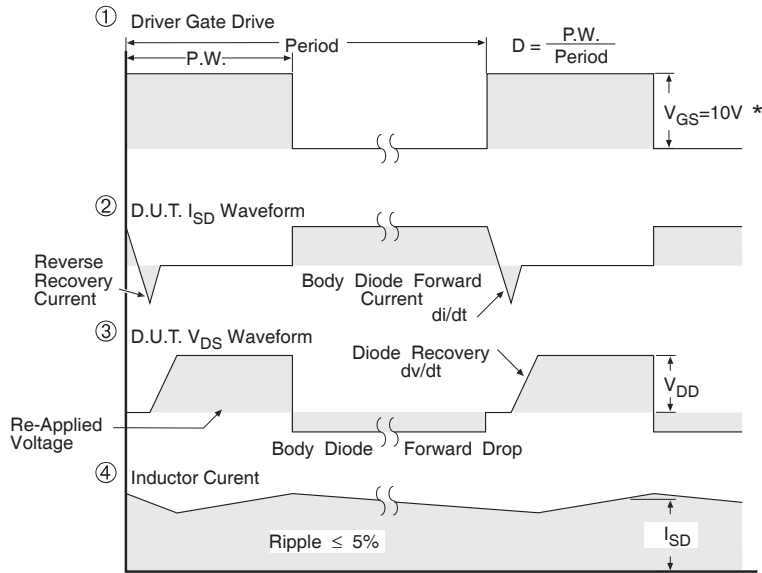
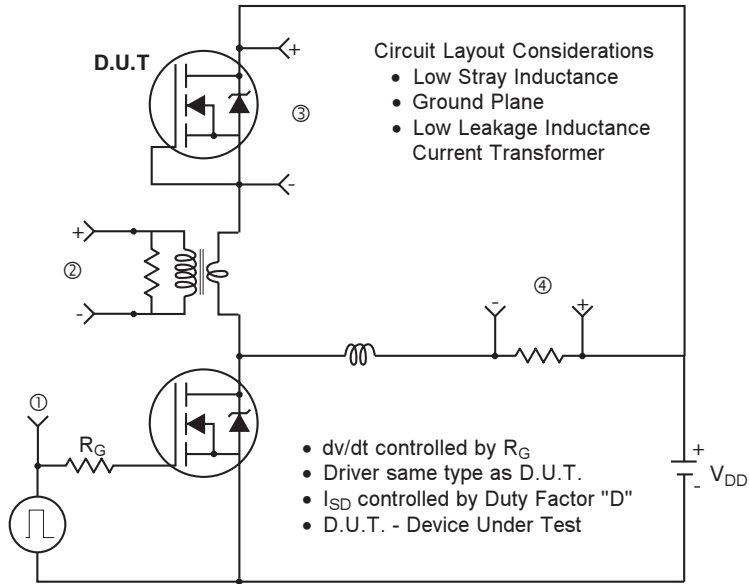


**Fig 13a.** Gate Charge Test Circuit



**Fig 13b.** Basic Gate Charge Waveform

## Peak Diode Recovery dv/dt Test Circuit



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

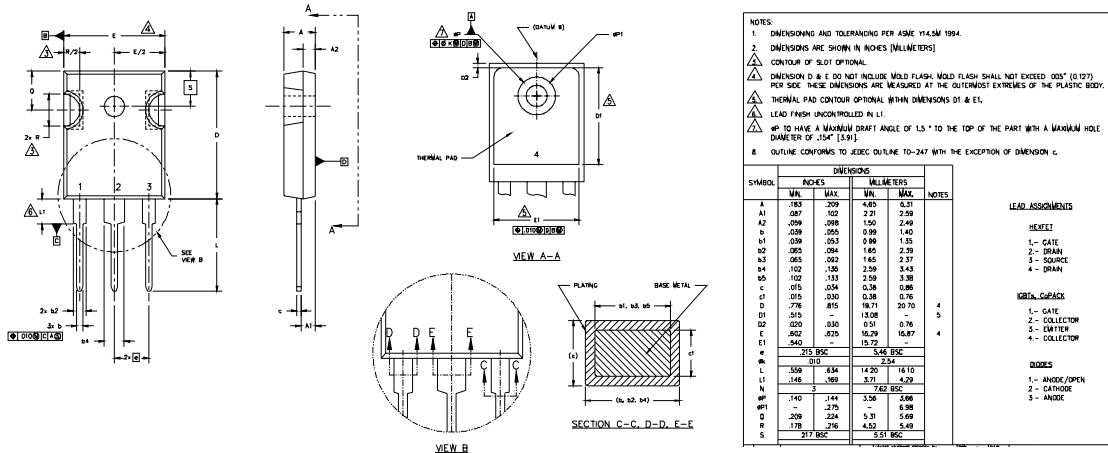
**Fig 14.** For N-Channel HEXFET® Power MOSFETs

# IRFP27N60KPbF

International  
**IR** Rectifier

## TO-247AC Package Outline

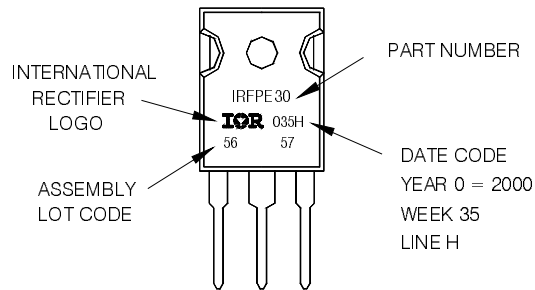
Dimensions are shown in millimeters (inches)



## 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.  
This product has been designed and qualified for the Industrial market.  
Qualification Standards can be found on IR's Web site.

International  
**IR** Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105  
TAC Fax: (310) 252-7903  
09/05





## 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.