

# IRFP27N60KPbF

HEXFET® Power MOSFET

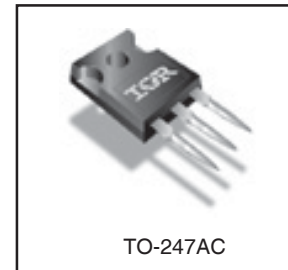
## Applications

- 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	

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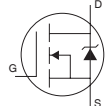
## Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

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%  $V_{DSS}$ .

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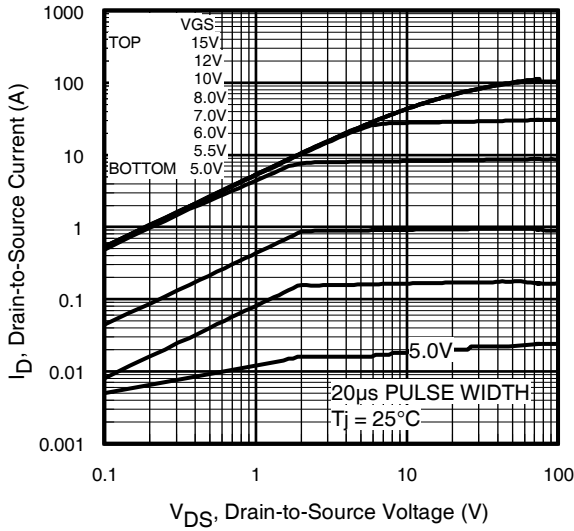


Fig 1. Typical Output Characteristics

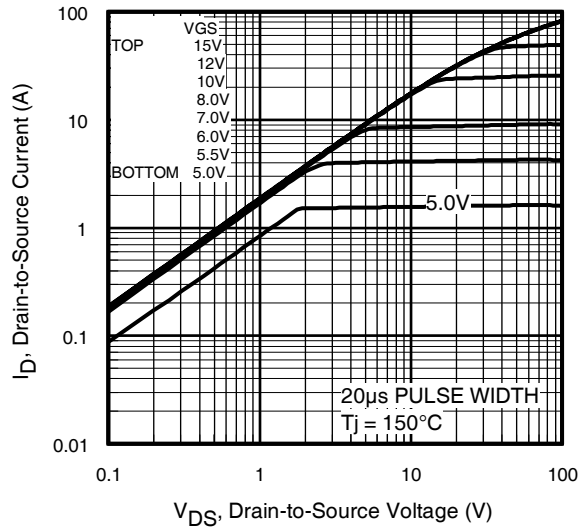


Fig 2. Typical Output Characteristics

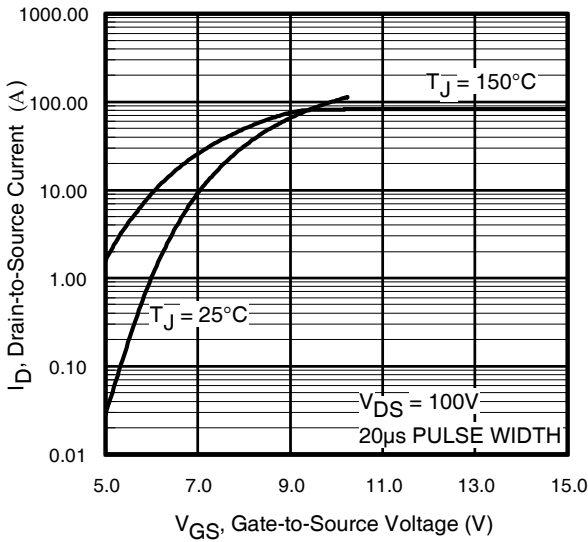


Fig 3. Typical Transfer Characteristics

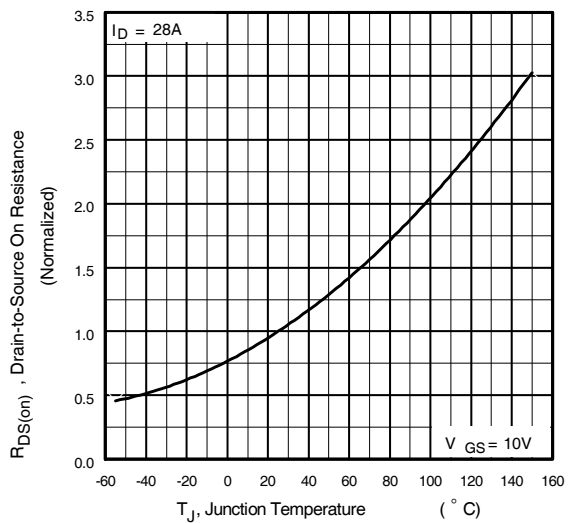
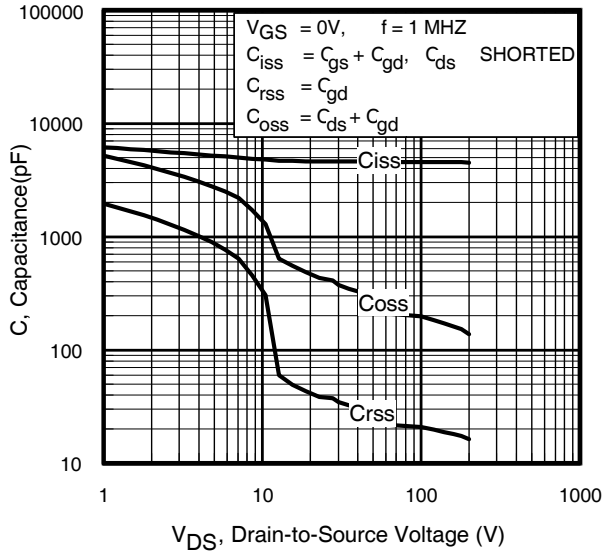
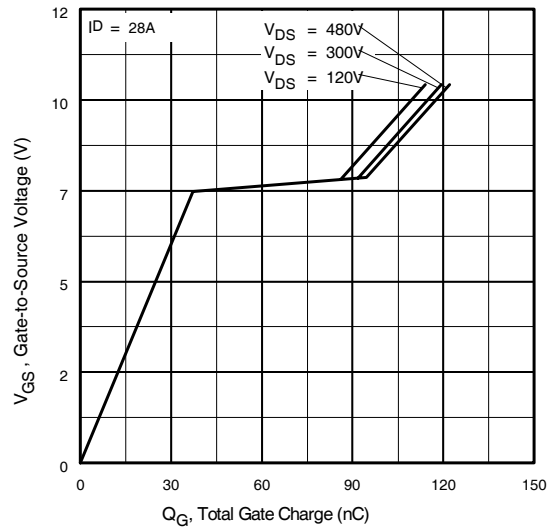


Fig 4. Normalized On-Resistance Vs. Temperature

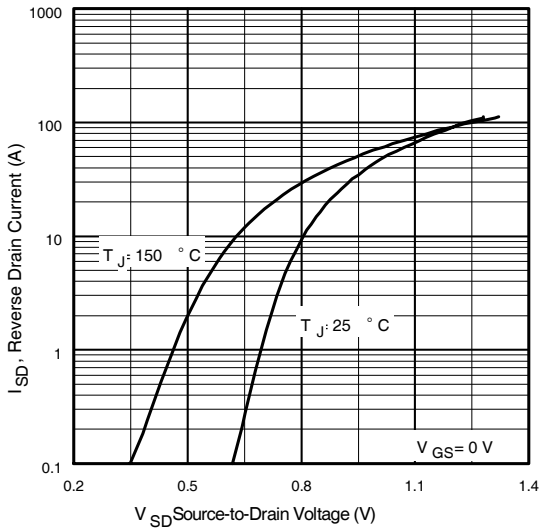
# IRFP27N60KPbF



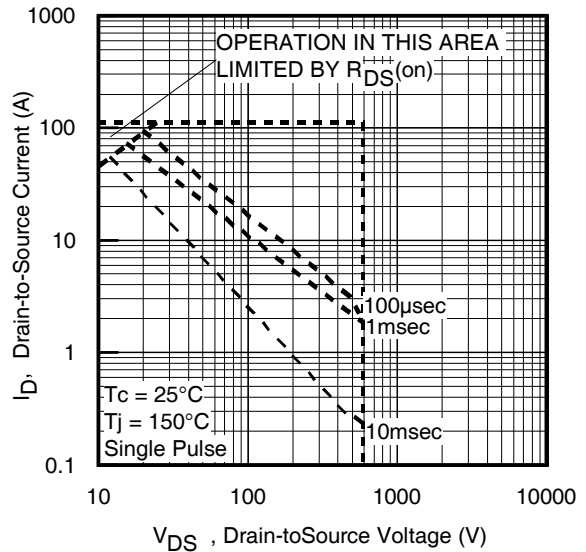
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



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

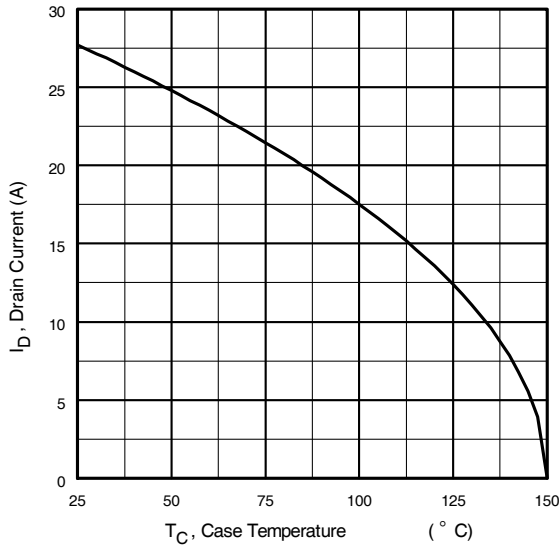


**Fig 7.** Typical Source-Drain Diode Forward Voltage

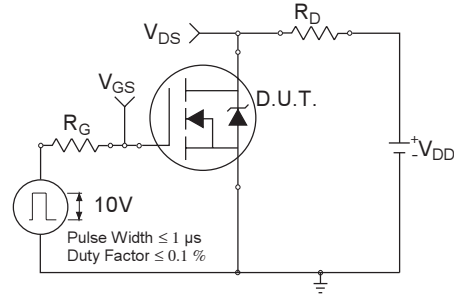


**Fig 8.** Maximum Safe Operating Area

# IRFP27N60KPbF



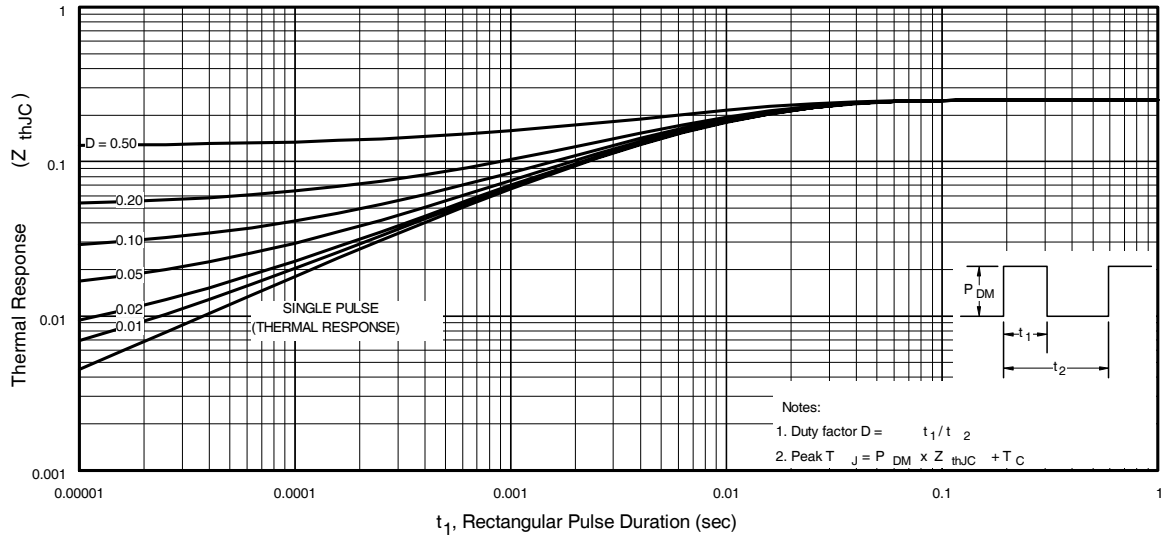
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



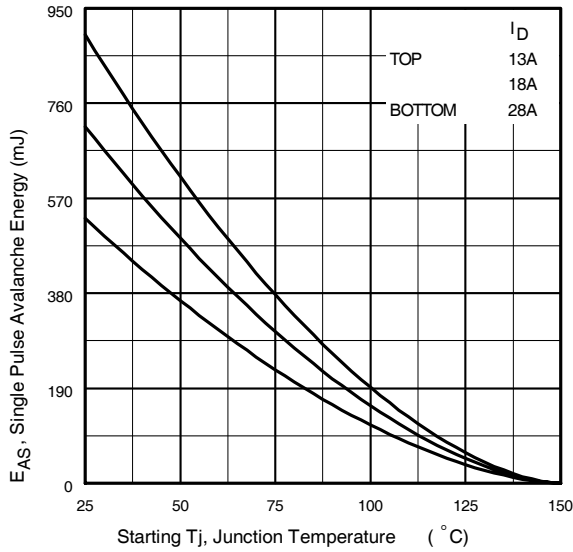
**Fig 10b.** Switching Time Waveforms



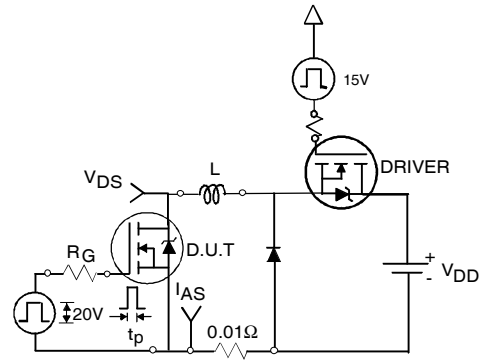
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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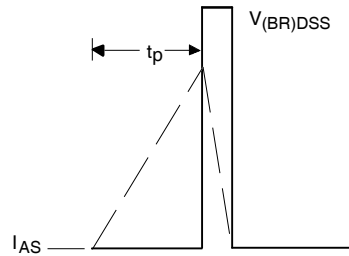
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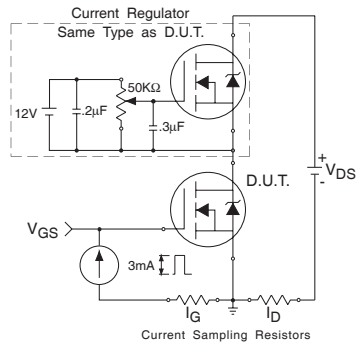
**Fig 12a.** Maximum Avalanche Energy Vs. Drain Current



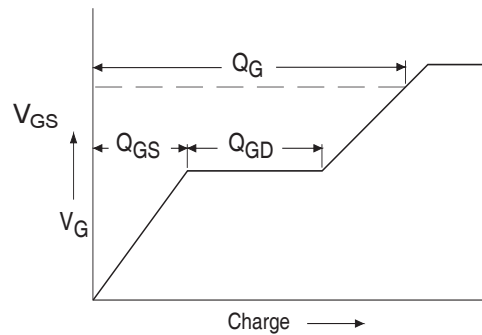
**Fig 12c.** Unclamped Inductive Test Circuit



**Fig 12d.** Unclamped Inductive Waveforms

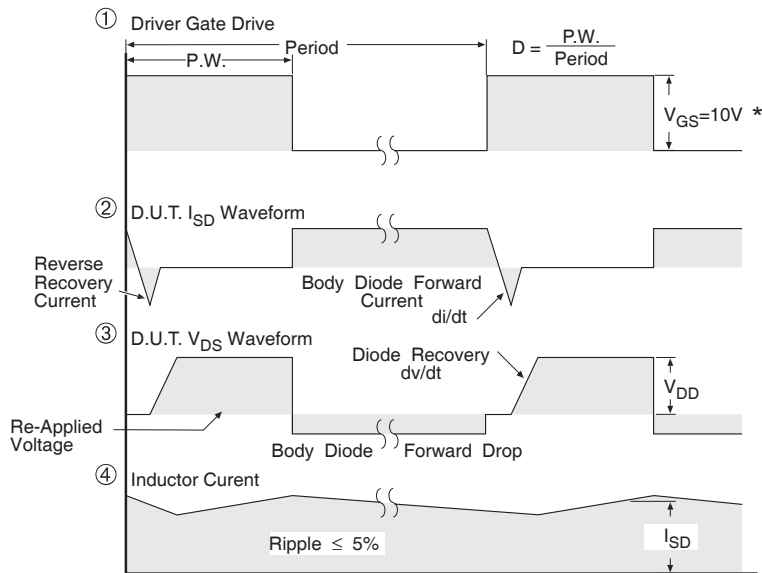
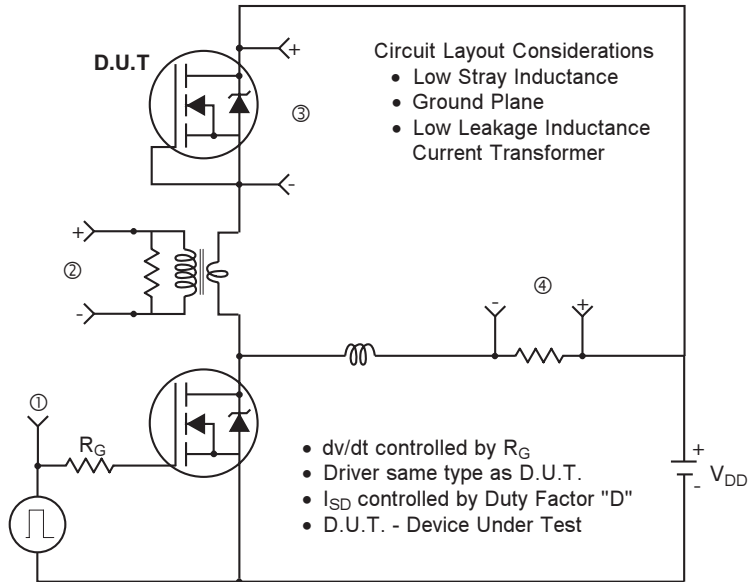


**Fig 13a.** Gate Charge Test Circuit



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

## Peak Diode Recovery dv/dt Test Circuit



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

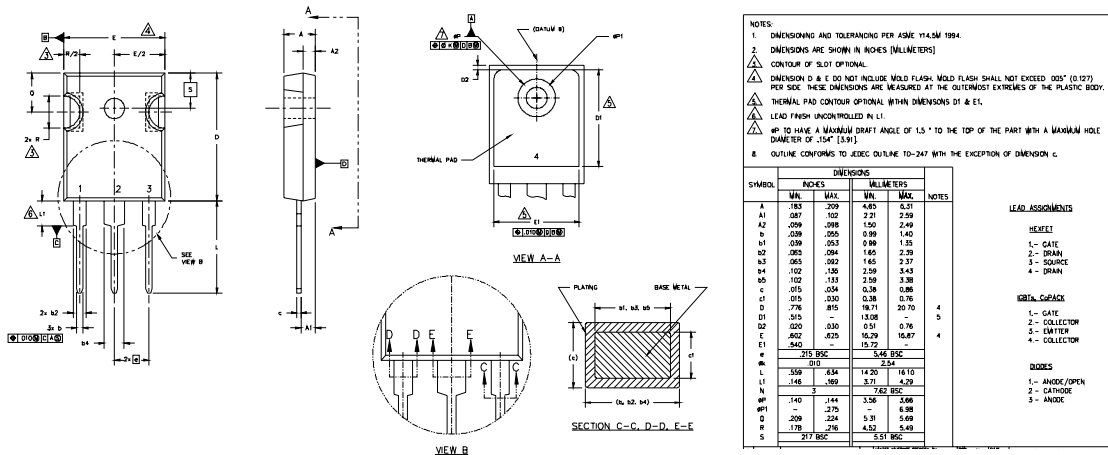
**Fig 14.** For N-Channel HEXFET® Power MOSFETs

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## TO-247AC Package Outline

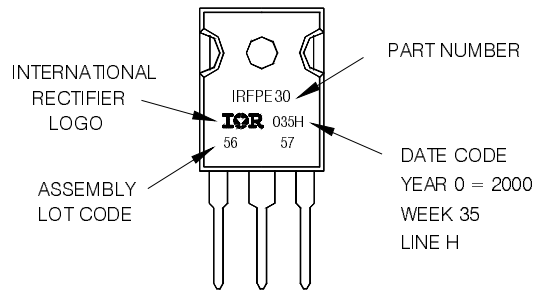
Dimensions are shown in millimeters (inches)



## 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.

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**IR** Rectifier

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