

# International IR Rectifier

PD - 94322

## IRFP17N50L

### SMPS MOSFET

HEXFET® Power MOSFET

#### Applications

- Switch Mode Power Supply (SMPS)
- Zero Voltage Switching (ZVS) and High Frequency Circuit
- Uninterruptible Power Supply
- High Speed Power Switching
- PWM Inverters

V <sub>DSS</sub>	R <sub>DS(on) typ.</sub>	T <sub>rr typ.</sub>	I <sub>D</sub>
500V	0.28Ω	170ns	16A

#### Benefits

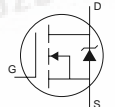
- Low Gate Charge Q<sub>g</sub> results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dv/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Low T<sub>rr</sub> and Soft Diode Recovery
- High Performance Optimised Anti-parallel Diode



#### Absolute Maximum Ratings

	Parameter	Max.	Units
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	16	A
I <sub>D</sub> @ T <sub>C</sub> = 100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	11	
I <sub>DM</sub>	Pulsed Drain Current ①	64	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Power Dissipation	220	W
	Linear Derating Factor	1.8	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	
T <sub>STG</sub>	Storage Temperature Range		
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	°C
	Mounting Torque, 6-32 or M3 screw	10	lbft.in(N.m)

#### Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	16	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	64		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.5	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 16A, V <sub>GS</sub> = 0V ④
t <sub>rr</sub>	Reverse Recovery Time	—	170	250	ns	T <sub>J</sub> = 25°C
			220	330		T <sub>J</sub> = 125°C
Q <sub>rr</sub>	Reverse Recovery Charge	—	470	710	nC	T <sub>J</sub> = 25°C
			810	1210		T <sub>J</sub> = 125°C
I <sub>RSM</sub>	Reverse Recovery Current	—	7.3	11	A	
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> )				



# IRFP17N50L

International  
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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	500	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.6	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$ ⑥
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	0.28	0.32	$\Omega$	$V_{GS} = 10V, I_D = 9.9A$ 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	$\mu A$	$V_{DS} = 500V, V_{GS} = 0V$
		—	—	2.0	mA	$V_{DS} = 400V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	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	$V_{DS} = 50V, I_D = 9.9A$
$Q_g$	Total Gate Charge	—	—	130	nC	$I_D = 16A$ $V_{DS} = 400V$ $V_{GS} = 10V$ ④
$Q_{gs}$	Gate-to-Source Charge	—	—	33		
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	59		
$t_{d(on)}$	Turn-On Delay Time	—	21	—	ns	$V_{DD} = 250V$ $I_D = 16A$ $R_G = 7.5\Omega$ $V_{GS} = 10V$ ④
$t_r$	Rise Time	—	51	—		
$t_{d(off)}$	Turn-Off Delay Time	—	50	—		
$t_f$	Fall Time	—	28	—		
$C_{iss}$	Input Capacitance	—	2760	—	pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0\text{MHz}$ $V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$ $V_{GS} = 0V, V_{DS} = 400V, f = 1.0\text{MHz}$ $V_{GS} = 0V, V_{DS} = 0V$ to $400V$ ⑤
$C_{oss}$	Output Capacitance	—	325	—		
$C_{riss}$	Reverse Transfer Capacitance	—	37	—		
$C_{oss}$	Output Capacitance	—	3690	—		
$C_{oss}$	Output Capacitance	—	84	—		
$C_{oss \text{ eff.}}$	Effective Output Capacitance	—	159	—		

## Avalanche Characteristics

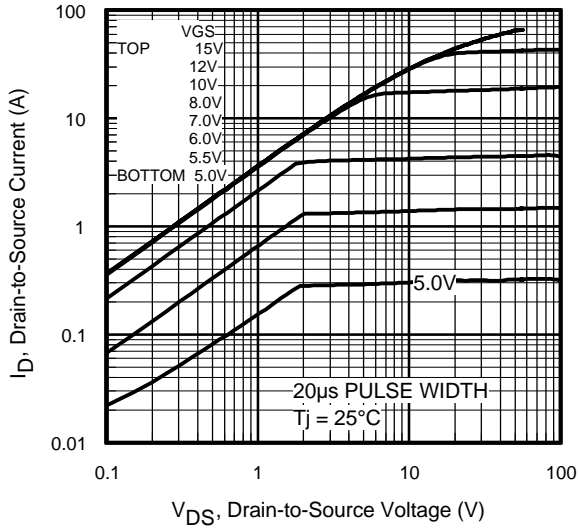
Symbol	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy②	—	390	mJ
$I_{AR}$	Avalanche Current①	—	16	A
$E_{AR}$	Repetitive Avalanche Energy①	—	22	mJ

## Thermal Resistance

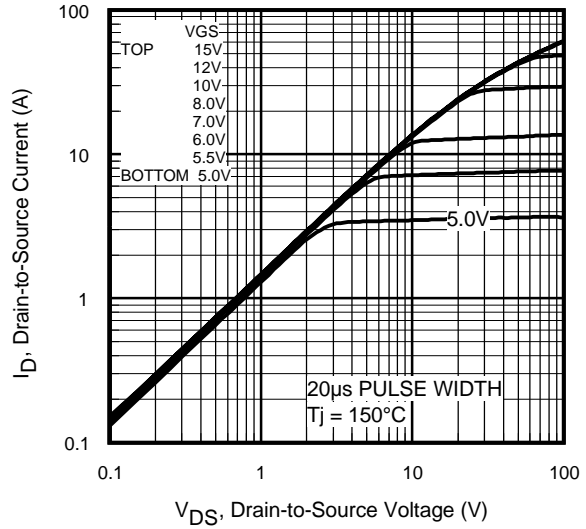
Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.56	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient	—	62	

### Notes:

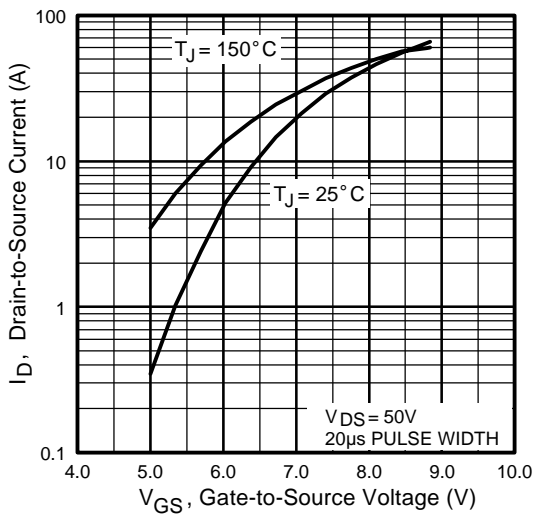
- ① Repetitive rating; pulse width limited by max. junction temperature.      ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3.0\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 16A$ .
- ③  $I_{SD} \leq 16A$ ,  $di/dt \leq 347A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$



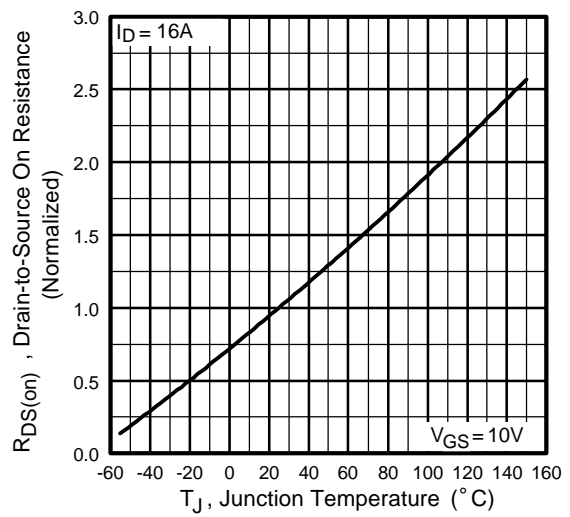
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



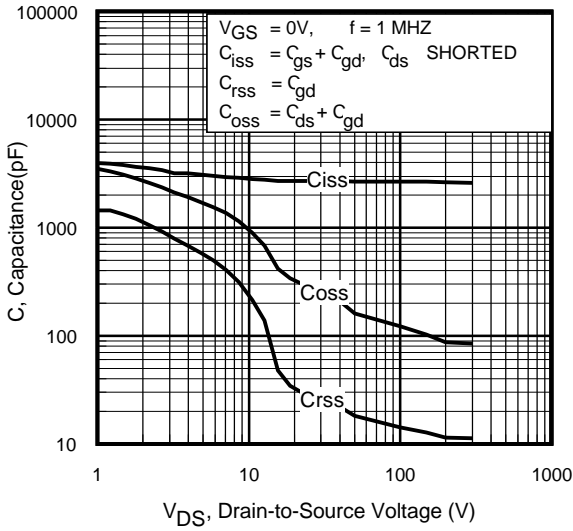
**Fig 3.** Typical Transfer Characteristics



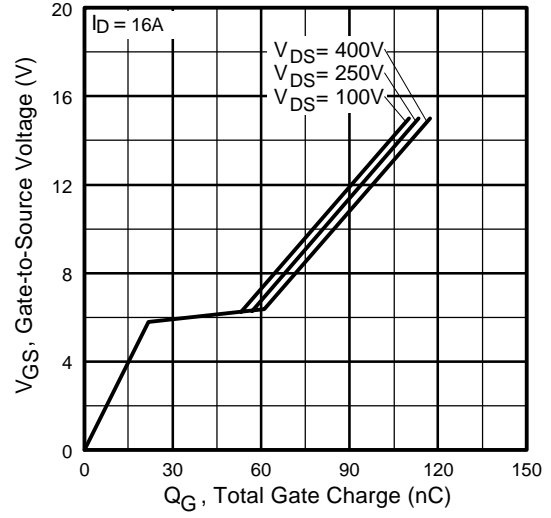
**Fig 4.** Normalized On-Resistance Vs. Temperature

# IRFP17N50L

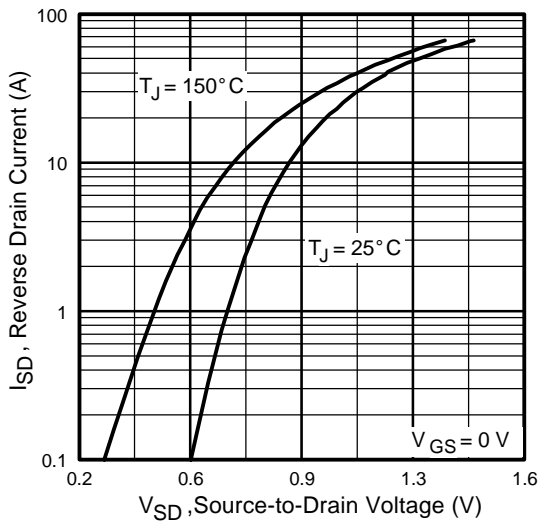
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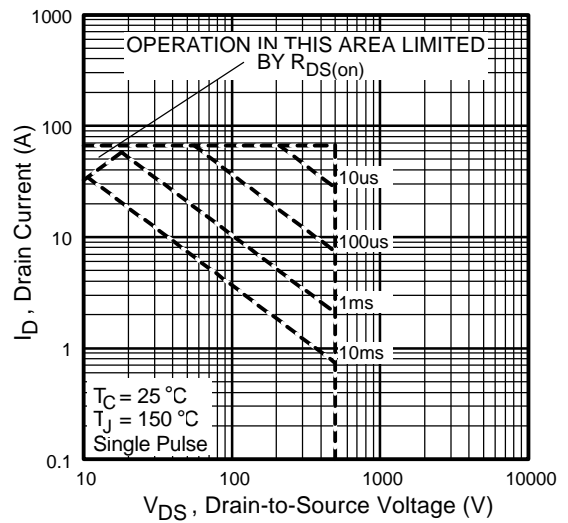
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



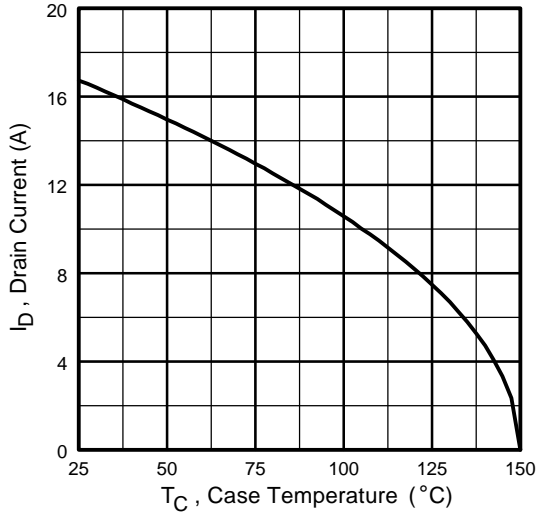
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



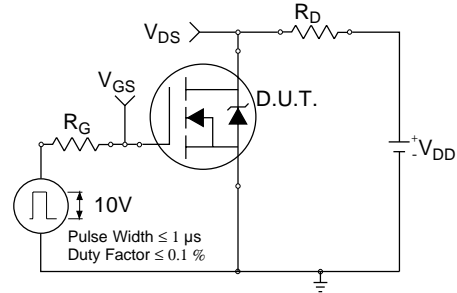
**Fig 7.** Typical Source-Drain Diode Forward Voltage



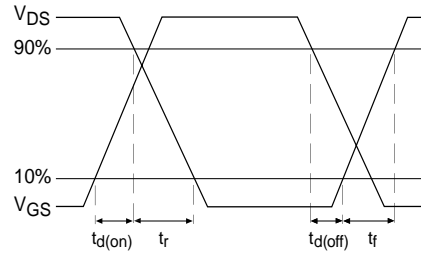
**Fig 8.** Maximum Safe Operating Area



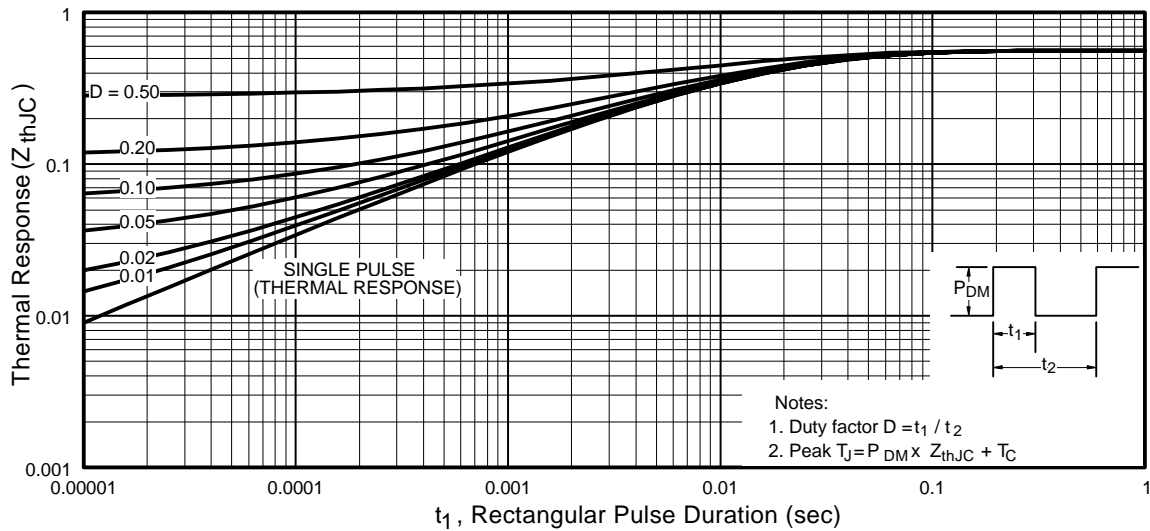
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



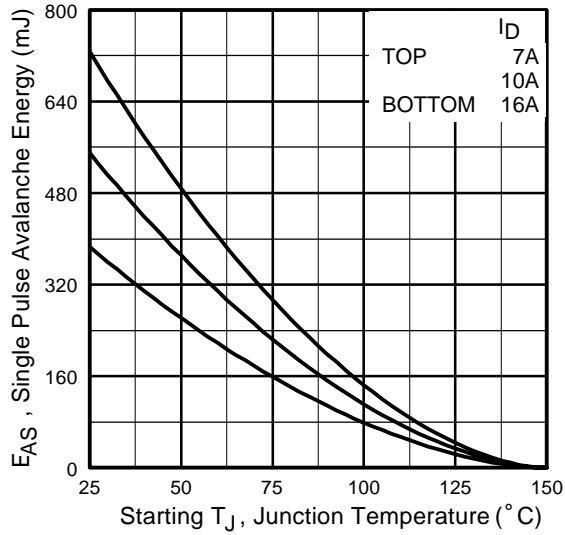
**Fig 10b.** Switching Time Waveforms



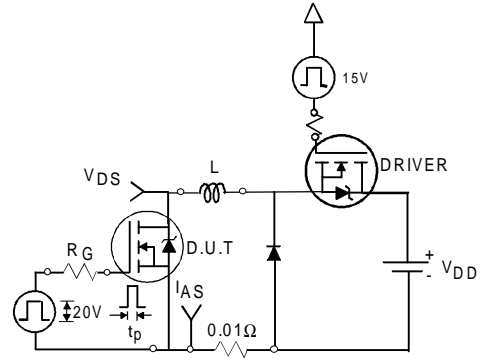
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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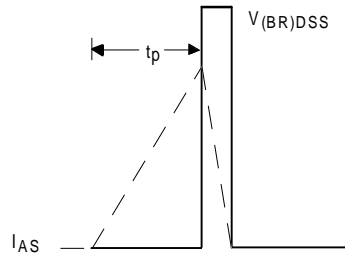
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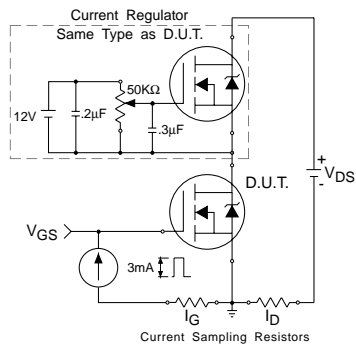
**Fig 12a.** Maximum Avalanche Energy Vs. Drain Current



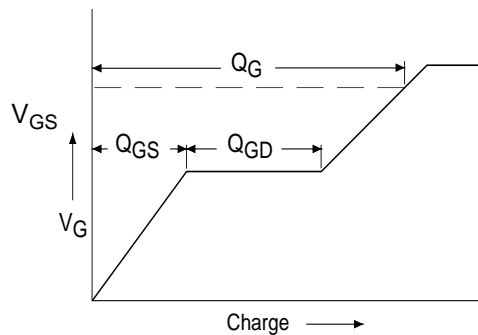
**Fig 12c.** Unclamped Inductive Test Circuit



**Fig 12d.** Unclamped Inductive Waveforms

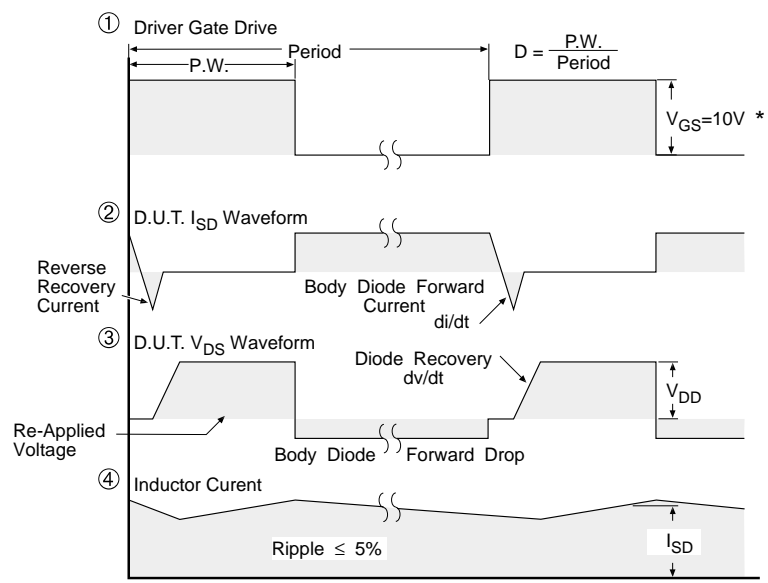
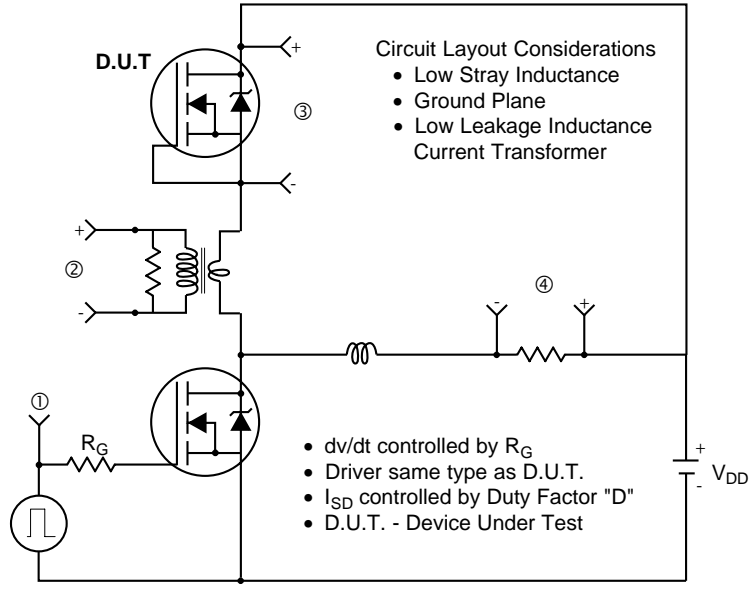


**Fig 13a.** Gate Charge Test Circuit



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

**Peak Diode Recovery dv/dt Test Circuit**



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

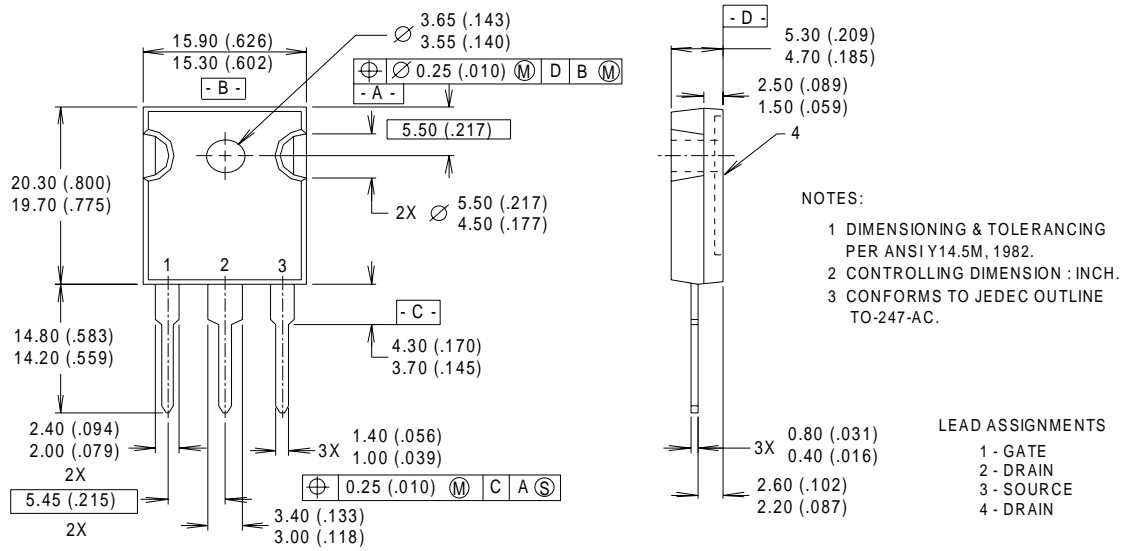
**Fig 14.** For N-Channel HEXFET® Power MOSFETs

# IRFP17N50L

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## TO - 247 Package Outline

Dimensions are shown in millimeters (inches)



Data and specifications subject to change without notice.  
This product has been designed and qualified for the Automotive [Q101] market.  
Qualification Standards can be found on IR's Web site.

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