

# IRFP32N50KS

## SMPS MOSFET

HEXFET® Power MOSFET

### Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High Speed Power Switching
- Hard Switched and High Frequency Circuits

$V_{DSS}$	$R_{DS(on)}$ typ.	$I_D$
500V	0.135Ω	32A

### 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
- Low  $R_{DS(on)}$



### Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D$ @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V	32	A
$I_D$ @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V	20	
$I_{DM}$	Pulsed Drain Current ①	130	
$P_D$ @ $T_C = 25^\circ\text{C}$	Power Dissipation	460	W
	Linear Derating Factor	3.7	W/°C
$V_{GS}$	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ③	13	V/ns
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Soldering Temperature, for 10 seconds (1.6mm from case )	300	
	Mounting torque, 6-32 or M3 screw		

### Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy②	—	450	mJ
$I_{AR}$	Avalanche Current①	—	32	A
$E_{AR}$	Repetitive Avalanche Energy①	—	46	mJ

### Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.26	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	—	
$R_{\theta JA}$	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	500	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.54	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$ ④
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	0.135	0.16	$\Omega$	$V_{GS} = 10V, I_D = 32A$ 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	$\mu A$	$V_{DS} = 500V, V_{GS} = 0V$
		—	—	250	$\mu A$	$V_{DS} = 400V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
$I_{GSS}$	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)

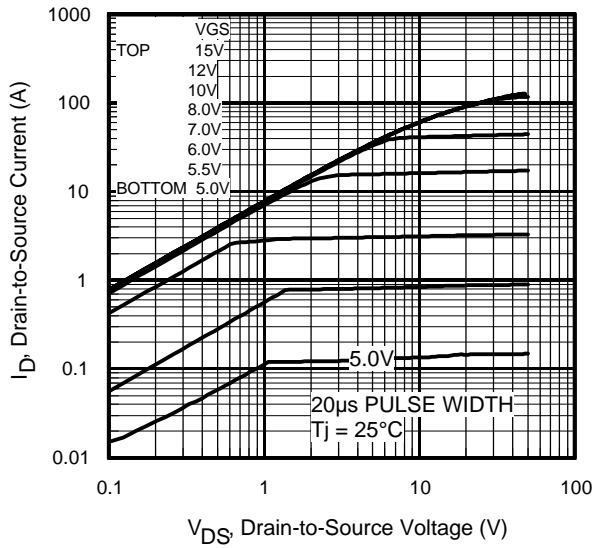
	Parameter	Min.	Typ.	Max.	Units	Conditions
$g_{fs}$	Forward Transconductance	14	—	—	S	$V_{DS} = 50V, I_D = 32A$
$Q_g$	Total Gate Charge	—	—	190	nC	$I_D = 32A$ $V_{DS} = 400V$ $V_{GS} = 10V$ ④
$Q_{gs}$	Gate-to-Source Charge	—	—	59		
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	84		
$t_{d(on)}$	Turn-On Delay Time	—	28	—	ns	$V_{DD} = 250V$ $I_D = 32A$ $R_G = 4.3\Omega$ $V_{GS} = 10V$ ④
$t_r$	Rise Time	—	120	—		
$t_{d(off)}$	Turn-Off Delay Time	—	48	—		
$t_f$	Fall Time	—	54	—		
$C_{iss}$	Input Capacitance	—	5280	—	pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0\text{MHz}$ , See Fig. 5
$C_{oss}$	Output Capacitance	—	550	—		
$C_{rss}$	Reverse Transfer Capacitance	—	45	—		
$C_{oss}$	Output Capacitance	—	5630	—		
$C_{oss}$	Output Capacitance	—	155	—		
$C_{oss\ eff.}$	Effective Output Capacitance	—	265	—		

## Diode Characteristics

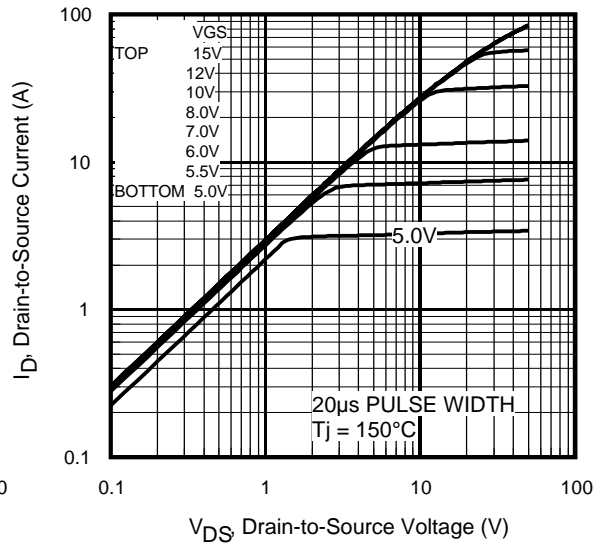
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	32	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	130		
$V_{SD}$	Diode Forward Voltage	—	—	1.5	V	$T_J = 25^\circ\text{C}, I_S = 32A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	530	800	ns	$T_J = 25^\circ\text{C}, I_F = 32A$
$Q_{rr}$	Reverse Recovery Charge	—	9.0	13.5	$\mu C$	$di/dt = 100A/\mu s$ ④
$I_{RRM}$	Reverse Recovery Current	—	30	—	A	
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$ )				

### Notes:

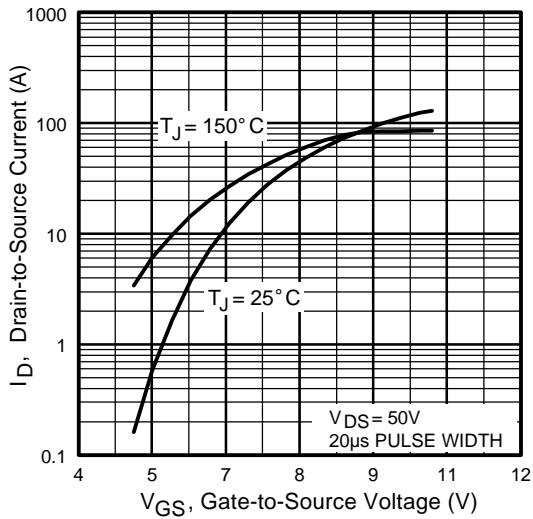
- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.87\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 32A$ ,
- ③  $I_{SD} \leq 32A$ ,  $di/dt \leq 197A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$
- ④ Pulse width  $\leq 400\mu s$ ; 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%  $V_{DSS}$ .



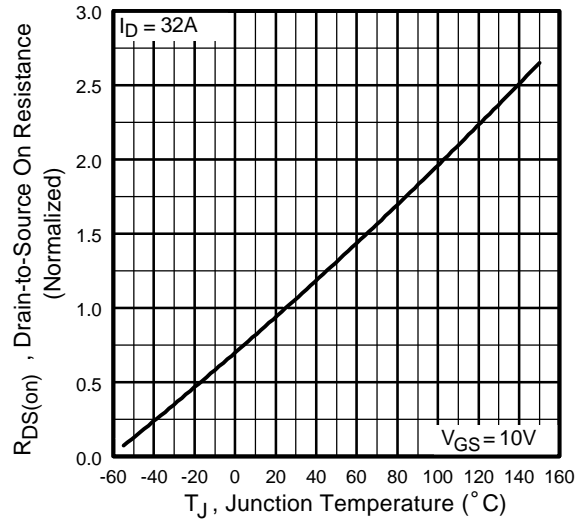
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



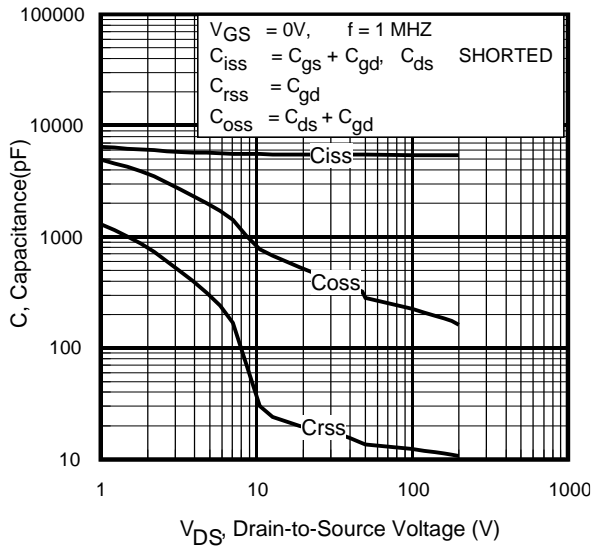
**Fig 3.** Typical Transfer Characteristics



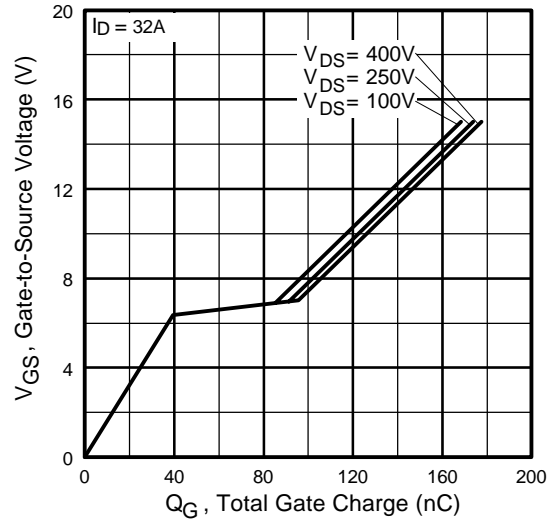
**Fig 4.** Normalized On-Resistance Vs. Temperature

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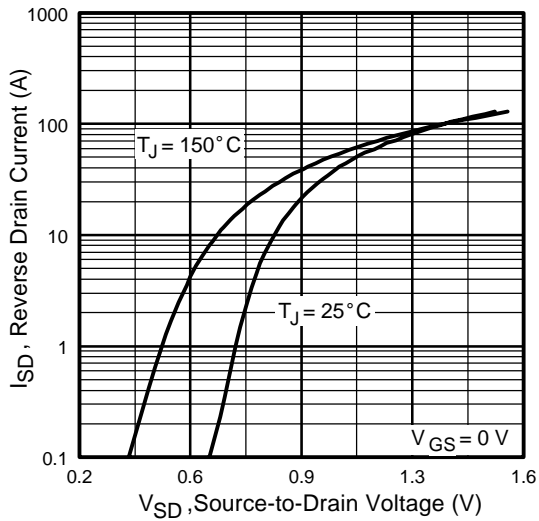
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**IR** Rectifier



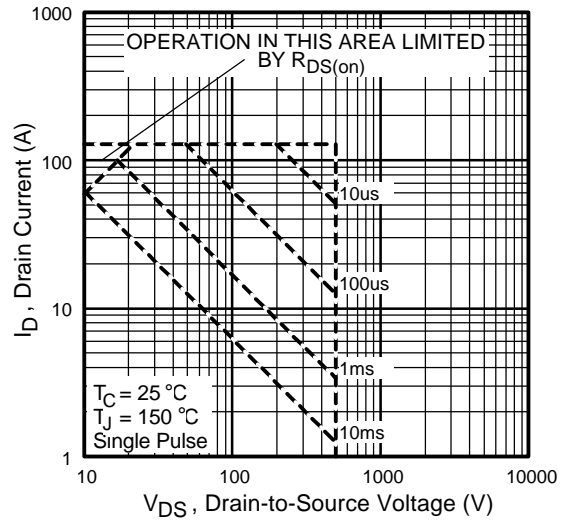
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



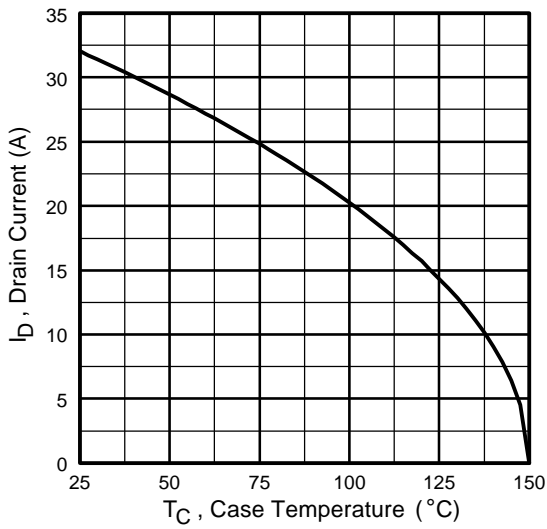
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



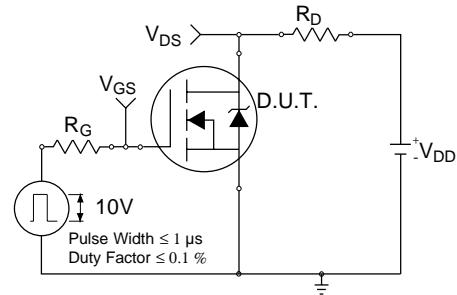
**Fig 7.** Typical Source-Drain Diode Forward Voltage



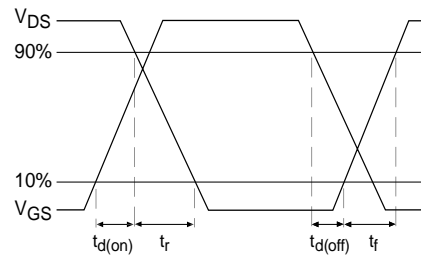
**Fig 8.** Maximum Safe Operating Area



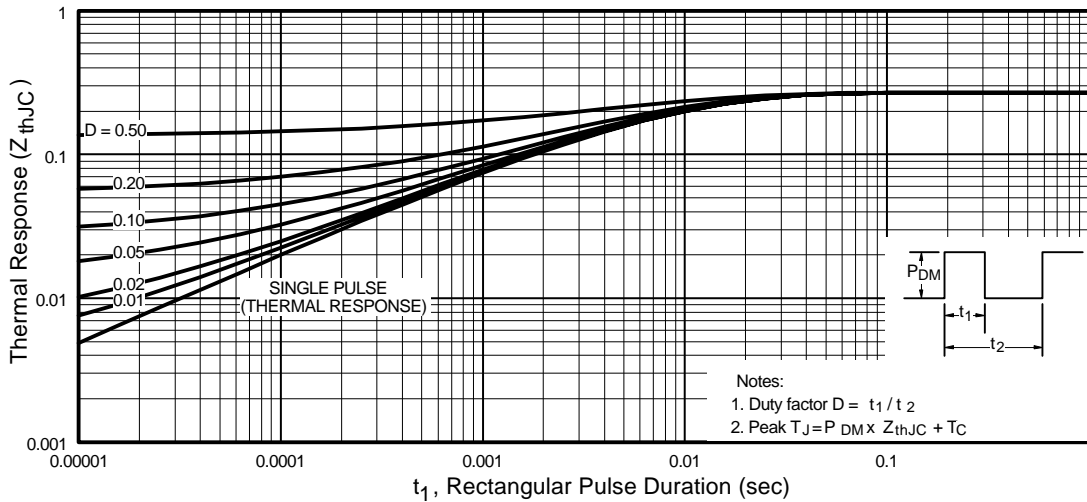
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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

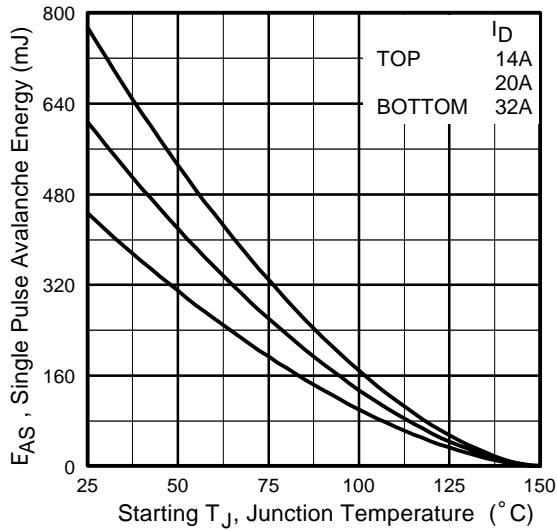


**Fig 10b.** Switching Time Waveforms

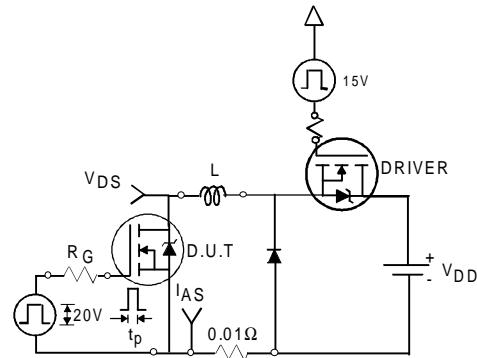


**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

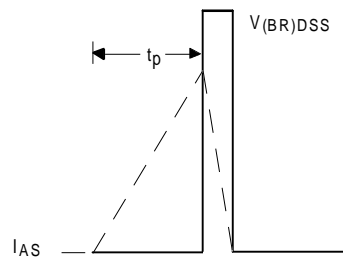
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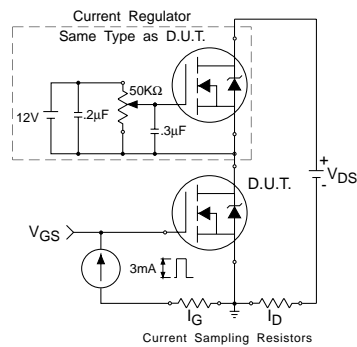
**Fig 12a.** Maximum Avalanche Energy Vs. Drain Current



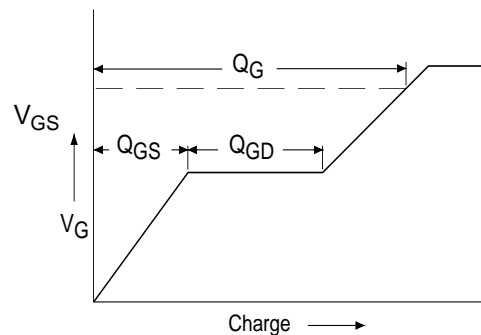
**Fig 12c.** Unclamped Inductive Test Circuit



**Fig 12d.** Unclamped Inductive Waveforms

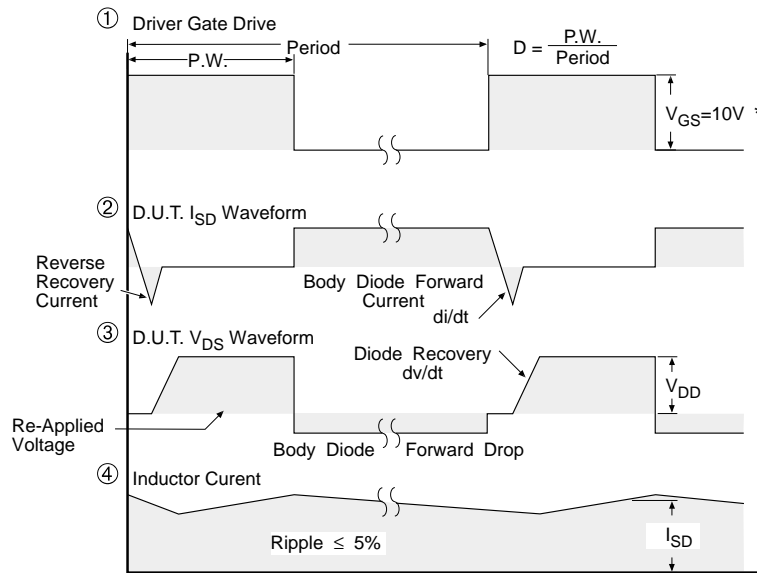
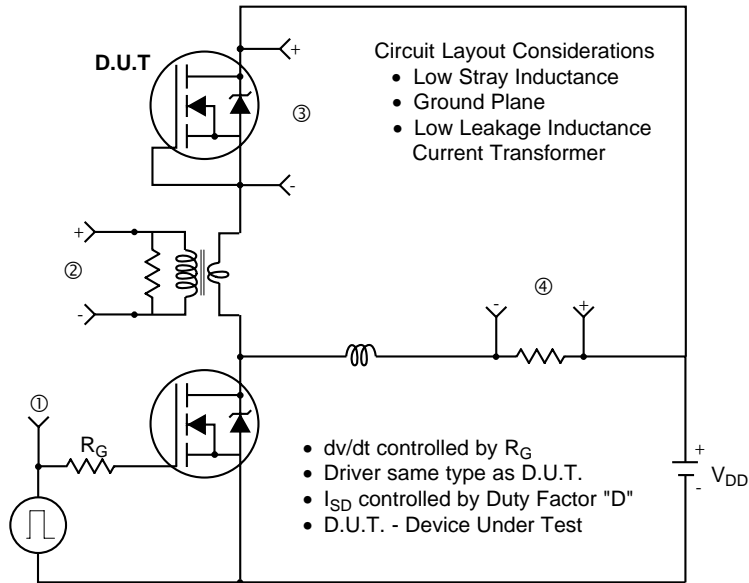


**Fig 13a.** Gate Charge Test Circuit



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

## Peak Diode Recovery dv/dt Test Circuit



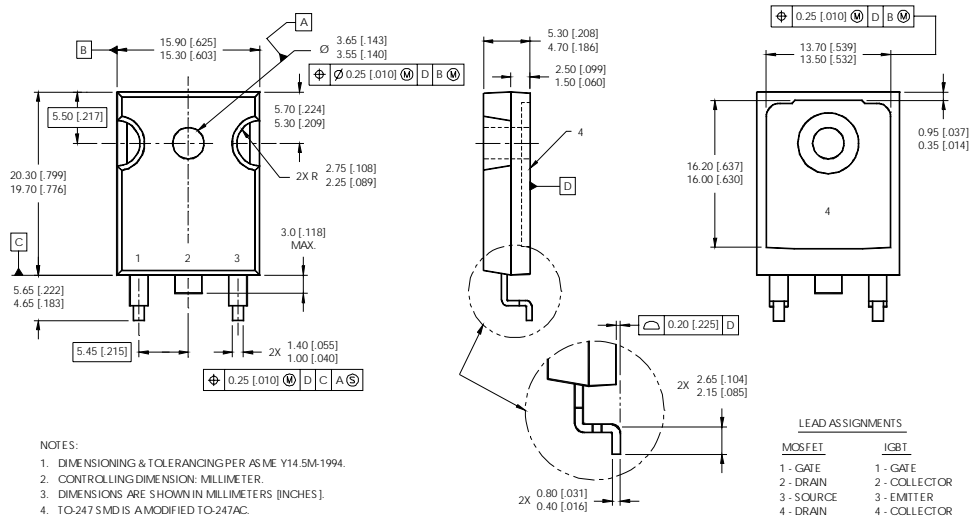
\*  $V_{GS} = 5V$  for Logic Level Devices

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

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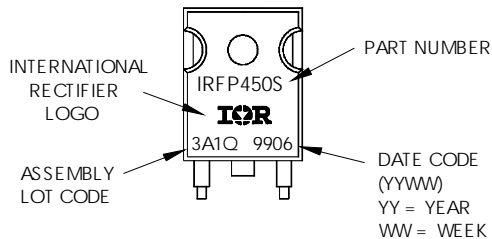
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## SMD-247 Package Outline



## SMD-247 Part Marking Information

EXAMPLE: THIS IS AN IRFP450S WITH  
ASSEMBLY LOT CODE 3A1Q



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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