

SMPS MOSFET IRFPS29N60L

HEXFET® Power MOSFET

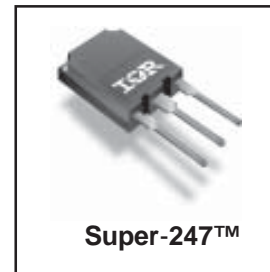
Applications

- Zero Voltage Switching SMPS
- Telecom and Server Power Supplies
- Uninterruptible Power Supplies
- Motor Control applications

V _{DSS}	R _{DS(on) typ.}	T _{rr typ.}	I _D
600V	175mΩ	130ns	29A

Features and Benefits

- SuperFast body diode eliminates the need for external diodes in ZVS applications.
- Lower Gate charge results in simpler drive requirements.
- Enhanced dv/dt capabilities offer improved ruggedness.
- Higher Gate voltage threshold offers improved noise immunity.



Absolute Maximum Ratings

Parameter	Max.	Units
I _D @ T _C = 25°C	29	A
I _D @ T _C = 100°C	18	
I _{DM}	110	
P _D @ T _C = 25°C	480	W
	3.8	W/°C
V _{GS}	±30	V
dv/dt	12	V/ns
T _J	-55 to +150	°C
T _{STG}		
	300 (1.6mm from case)	
	1.1(10)	N•m (lb•in)

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	29	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°C, I _S = 29A, V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time	—	130	190	ns	T _J = 25°C, I _F = 29A T _J = 125°C, di/dt = 100A/μs ④
Q _{rr}	Reverse Recovery Charge	—	630	950		
I _{RRM}	Reverse Recovery Current	—	9.4	14	A	T _J = 25°C
t _{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

IRFPS29N60L

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	—	0.53	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	175	210	m Ω	$V_{GS} = 10V, I_D = 17A$ 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	$V_{DS} = 600V, V_{GS} = 0V$
		—	—	2.0	mA	$V_{DS} = 480V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 30V$
	Gate-to-Source Reverse Leakage	—	—	-100	nA	$V_{GS} = -30V$
R_G	Internal Gate Resistance	—	0.86	—	Ω	$f = 1MHz, \text{open drain}$

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	15	—	—	S	$V_{DS} = 50V, I_D = 17A$
Q_g	Total Gate Charge	—	—	220	nC	$I_D = 29A$
Q_{gs}	Gate-to-Source Charge	—	—	67	nC	$V_{DS} = 480V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	96	nC	$V_{GS} = 10V, \text{See Fig. 7 \& 15 } \textcircled{4}$
$t_{d(on)}$	Turn-On Delay Time	—	34	—	ns	$V_{DD} = 300V$ $I_D = 29A$ $R_G = 4.3\Omega$ $V_{GS} = 10V, \text{See Fig. 11a \& 11b } \textcircled{4}$
t_r	Rise Time	—	100	—		
$t_{d(off)}$	Turn-Off Delay Time	—	66	—		
t_f	Fall Time	—	54	—		
C_{iss}	Input Capacitance	—	6160	—	pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0MHz, \text{See Fig. 5}$ $V_{GS} = 0V, V_{DS} = 0V \text{ to } 480V \textcircled{5}$
C_{oss}	Output Capacitance	—	530	—		
C_{riss}	Reverse Transfer Capacitance	—	44	—		
$C_{oss \text{ eff.}}$	Effective Output Capacitance	—	250	—		
$C_{oss \text{ eff. (ER)}}$	Effective Output Capacitance (Energy Related)	—	190	—		

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	570	mJ
I_{AR}	Avalanche Current ①	—	29	A
E_{AR}	Repetitive Avalanche Energy ①	—	48	mJ

Thermal Resistance

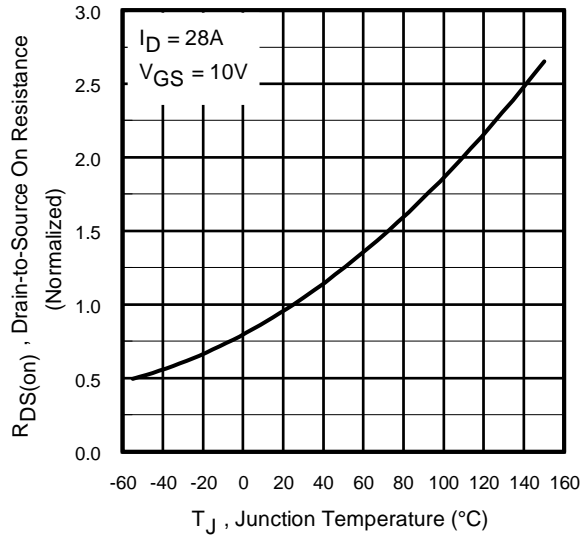
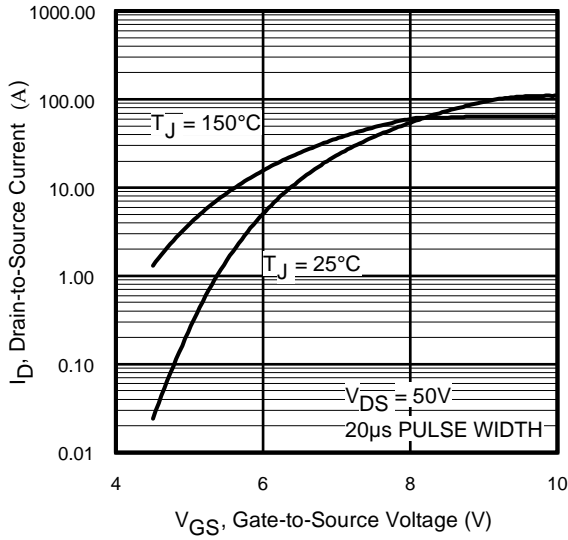
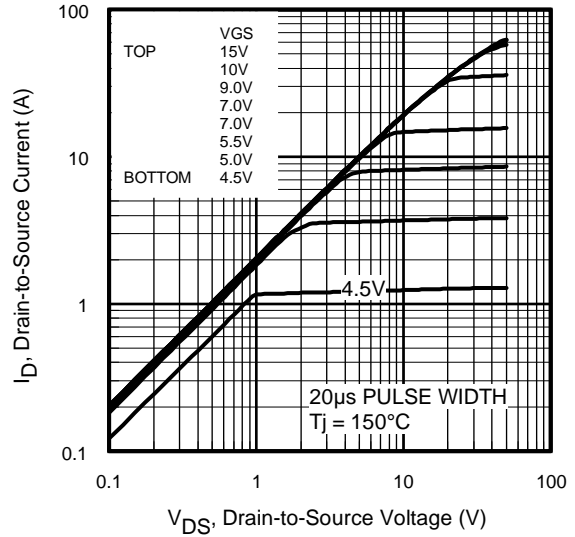
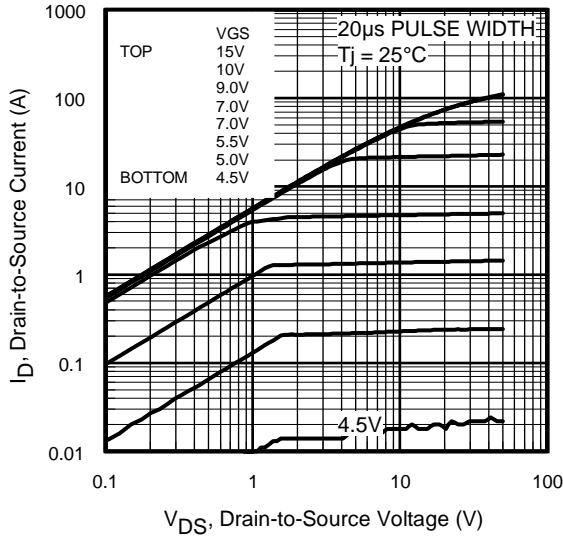
Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.26	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	40	

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See Fig. 11)
- ② Starting $T_J = 25^\circ\text{C}$, $L = 1.5mH$, $R_G = 25\Omega$, $I_{AS} = 29A$. (See Figure 12a)
- ③ $I_{SD} \leq 29A$, $di/dt \leq 560A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 150^\circ\text{C}$.

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} .
 $C_{oss \text{ eff. (ER)}}$ is a fixed capacitance that stores the same energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .



IRFPS29N60L

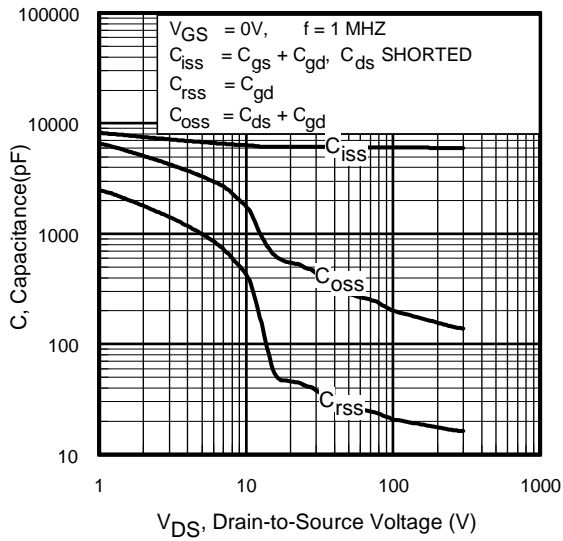


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

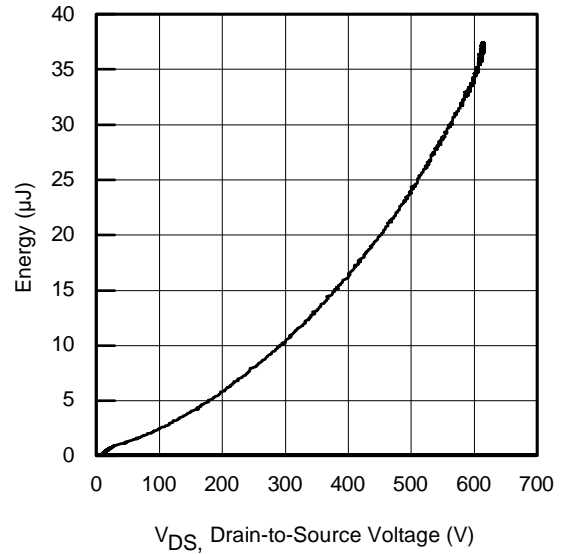


Fig 6. Typ. Output Capacitance Stored Energy vs. V_{DS}

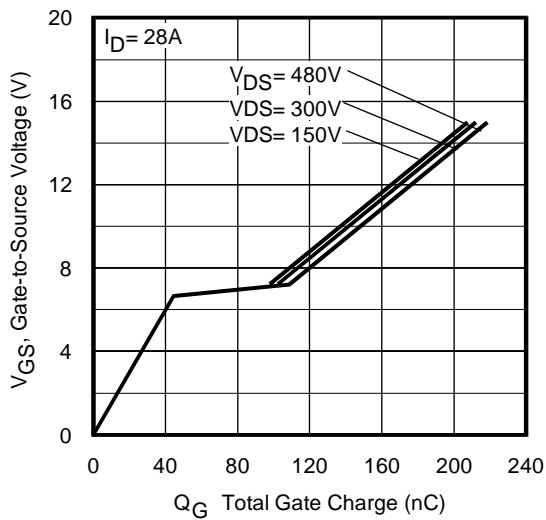


Fig 7. Typical Gate Charge vs. Gate-to-Source Voltage

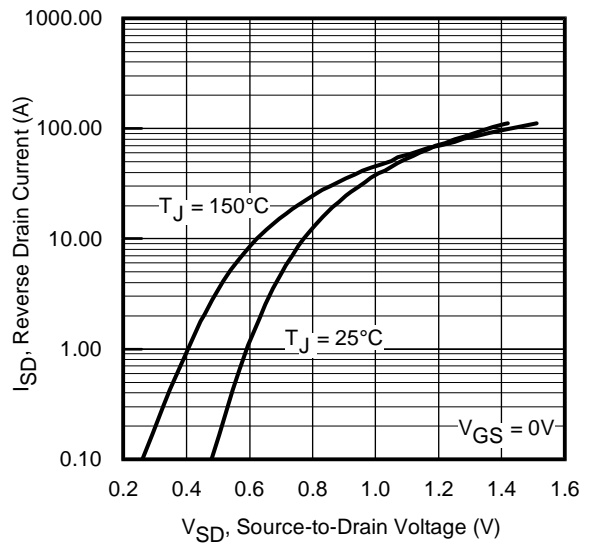


Fig 8. Typical Source-Drain Diode Forward Voltage

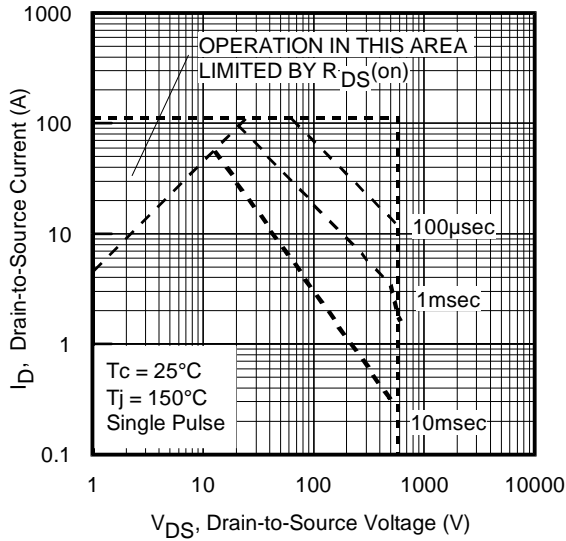


Fig 9. Maximum Safe Operating Area

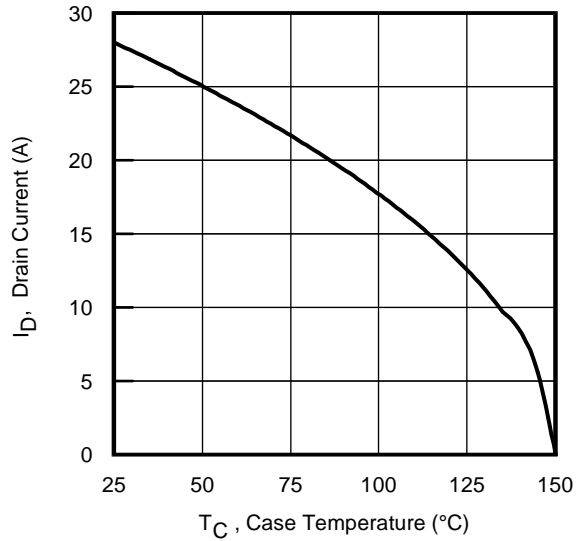


Fig 10. Maximum Drain Current vs. Case Temperature

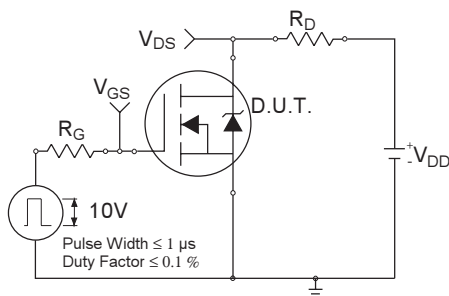


Fig 11a. Switching Time Test Circuit

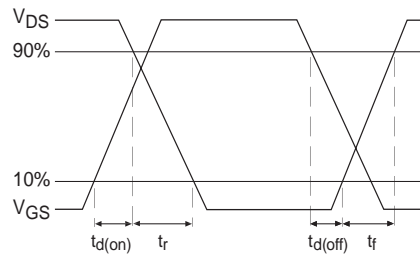


Fig 11b. Switching Time Waveforms

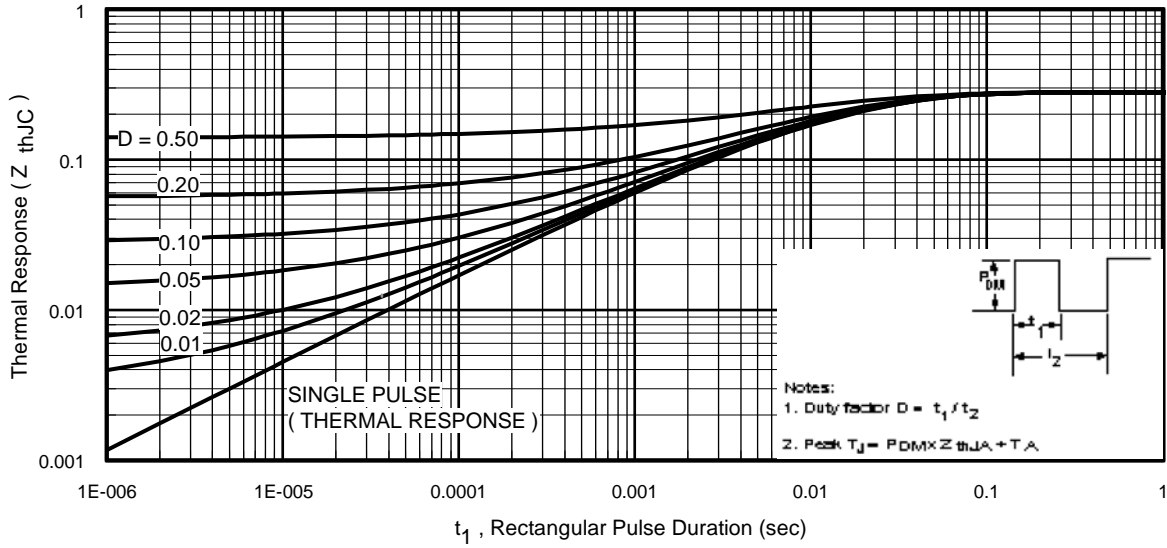


Fig 12. Maximum Effective Transient Thermal Impedance, Junction-to-Case

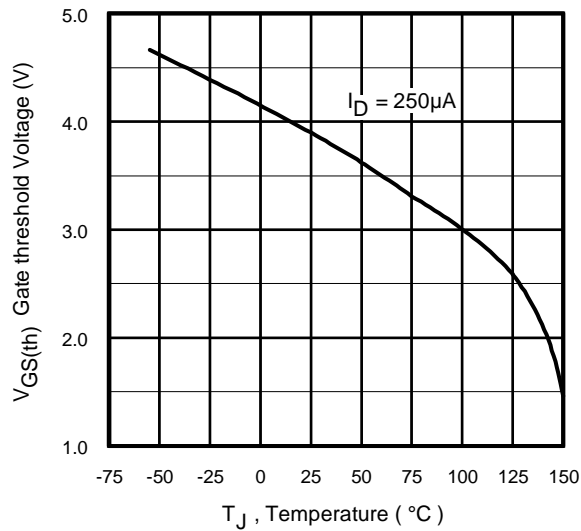


Fig 13. Threshold Voltage vs. Temperature

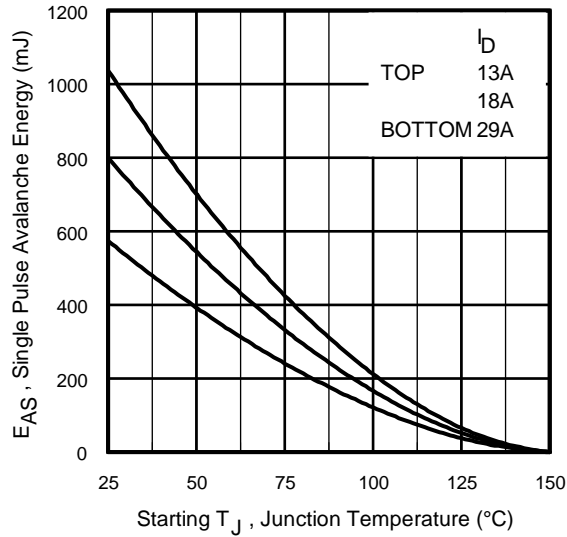


Fig 14a. Maximum Avalanche Energy vs. Drain Current

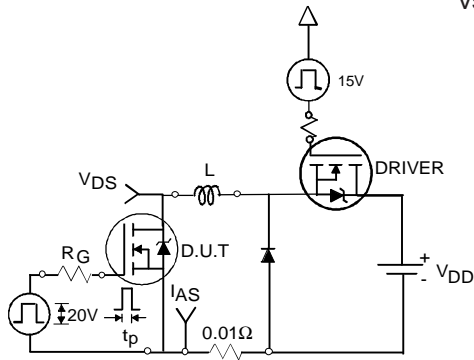


Fig 14b. Unclamped Inductive Test Circuit

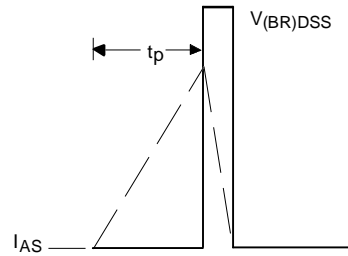


Fig 14c. Unclamped Inductive Waveforms

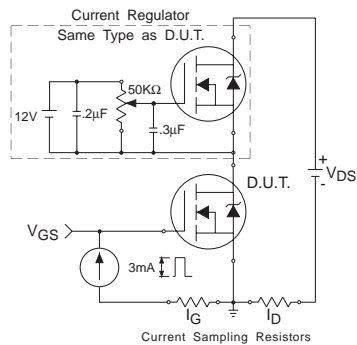


Fig 15a. Gate Charge Test Circuit

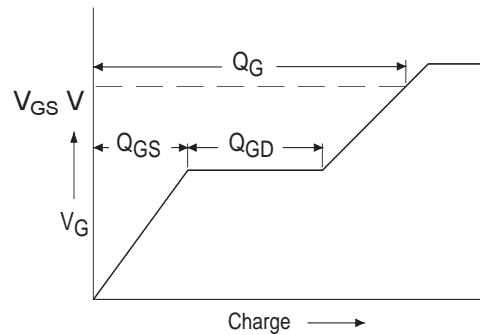
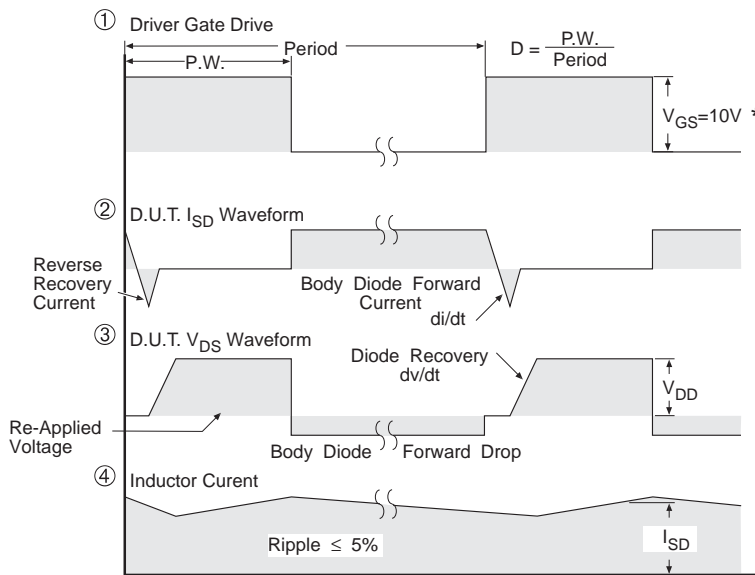
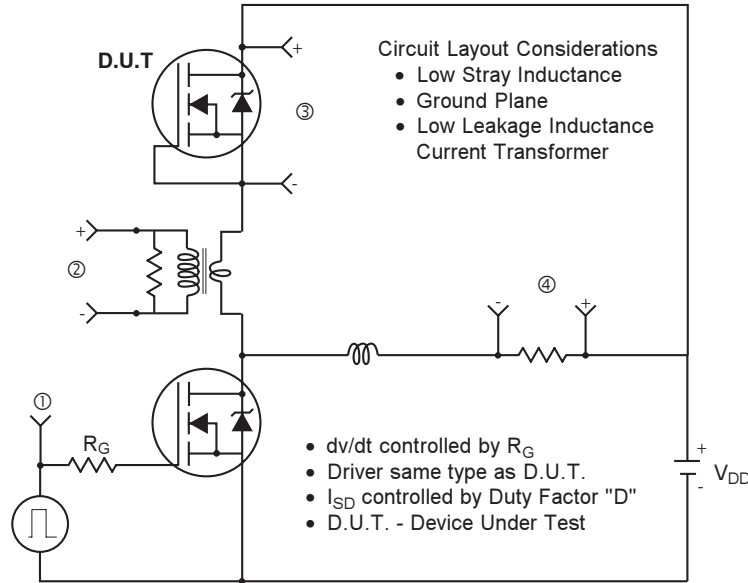


Fig 15b. Basic Gate Charge Waveform

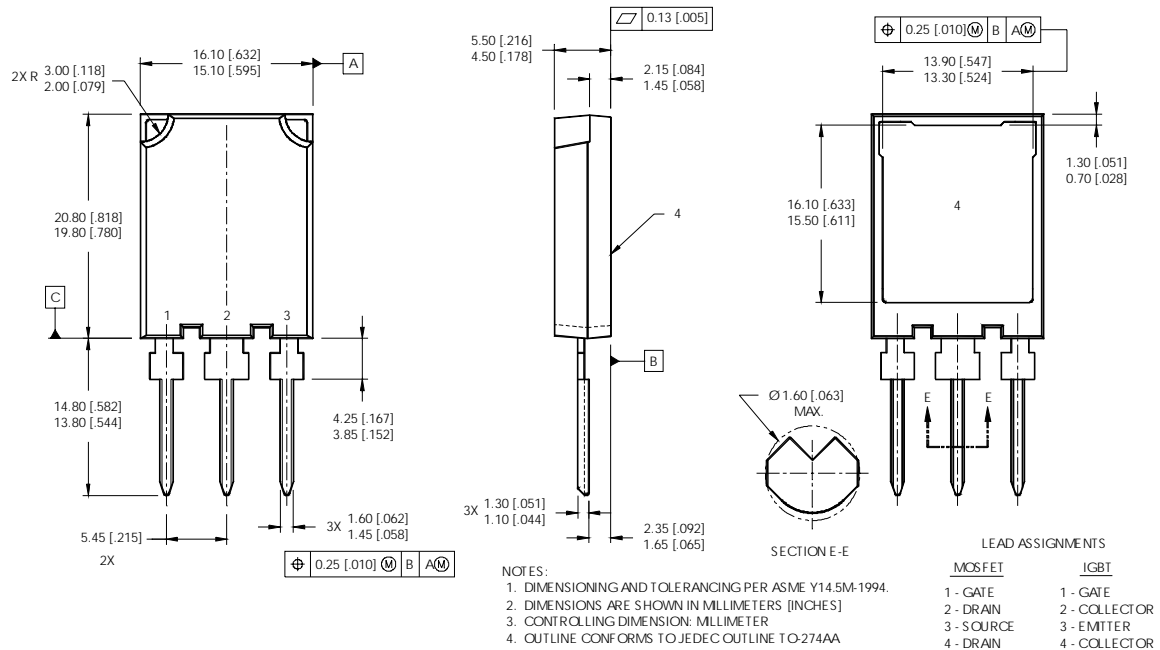
Peak Diode Recovery dv/dt Test Circuit



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

Fig 16. For N-Channel HEXFET® Power MOSFETs

Super-247™ (TO-274AA) Package Outline

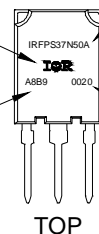


Super-247™ (TO-274AA) Part Marking Information

EXAMPLE: THIS IS AN IRFPS37N50A WITH ASSEMBLY LOT CODE A8B9

INTERNATIONAL RECTIFIER
 LOGO

ASSEMBLY LOT CODE



PART NUMBER

DATE CODE
 (YYWW)
 YY = YEAR
 WW = WEEK

TOP

Super TO-247™ package is not recommended for Surface Mount Application.

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.