

IRFP17N50LPbF

SMPS MOSFET

HEXFET® Power MOSFET

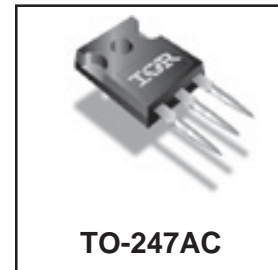
Applications

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

V_{DSS}	$R_{DS(on)}$ typ.	T_{rr} typ.	I_D
500V	0.28Ω	170ns	16A

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 @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	16	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	11	
I_{DM}	Pulsed Drain Current ①	64	
P_D @ $T_C = 25^\circ\text{C}$	Power Dissipation	220	W
	Linear Derating Factor	1.8	W/°C
V_{GS}	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ②	13	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 screw	10lb·in (1.1N·m)	

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	16	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	64		
V_{SD}	Diode Forward Voltage	—	—	1.5	V	$T_J = 25^\circ\text{C}$, $I_S = 16\text{A}$, $V_{GS} = 0\text{V}$ ④
t_{rr}	Reverse Recovery Time	—	170 220	250 330	ns	$T_J = 25^\circ\text{C}$, $I_F = 16\text{A}$ $T_J = 125^\circ\text{C}$, $di/dt = 100\text{A}/\mu\text{s}$ ④
Q_{rr}	Reverse Recovery Charge	—	470 810	710 1210	nC	$T_J = 25^\circ\text{C}$, $I_S = 16\text{A}$, $V_{GS} = 0\text{V}$ ④ $T_J = 125^\circ\text{C}$, $di/dt = 100\text{A}/\mu\text{s}$ ④
I_{RRM}	Reverse Recovery Current	—	7.3	11	A	$T_J = 25^\circ\text{C}$
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

IRFP17N50LPbF

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	500	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.60	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	0.28	0.32	Ω	$V_{GS} = 10V, I_D = 9.9A$ 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	μA	$V_{DS} = 500V, V_{GS} = 0V$
		—	—	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	$V_{GS} = -30V$
R_G	Internal Gate Resistance	—	1.4	—	Ω	$f = 1\text{MHz}, \text{open drain}$

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	$I_D = 16A$ $V_{DS} = 400V$ $V_{GS} = 10V, \text{See Fig. 7 \& 15 } \text{ ④}$
Q_{gs}	Gate-to-Source Charge	—	—	33		
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	59		
$t_{d(on)}$	Turn-On Delay Time	—	21	—	ns	$V_{DD} = 250V$ $I_D = 16A$ $R_G = 7.5\Omega$ $V_{GS} = 10V, \text{See Fig. 14a \& 14b } \text{ ④}$
t_r	Rise Time	—	51	—		
$t_{d(off)}$	Turn-Off Delay Time	—	50	—		
t_f	Fall Time	—	28	—		
C_{iss}	Input Capacitance	—	2760	—	pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0\text{MHz}, \text{See Fig. 5}$ $V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$ $V_{GS} = 0V, V_{DS} = 400V, f = 1.0\text{MHz}$ $V_{GS} = 0V, V_{DS} = 0V \text{ to } 400V \text{ ④}$
C_{oss}	Output Capacitance	—	325	—		
C_{rss}	Reverse Transfer Capacitance	—	37	—		
C_{oss}	Output Capacitance	—	3690	—		
C_{oss}	Output Capacitance	—	84	—		
$C_{oss \text{ eff.}}$	Effective Output Capacitance	—	159	—		
$C_{oss \text{ eff. (ER)}}$	Effective Output Capacitance (Energy Related)	—	120	—		

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ④	—	390	mJ
I_{AR}	Avalanche Current ④	—	16	A
E_{AR}	Repetitive Avalanche Energy ④	—	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. (See Fig. 11)
- ② Starting $T_J = 25^\circ\text{C}$, $L = 3.0\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 16A$. (See Figure 12).
- ③ $I_{SD} = 16A$, $di/dt \leq 347A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 150^\circ\text{C}$.
- 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} .

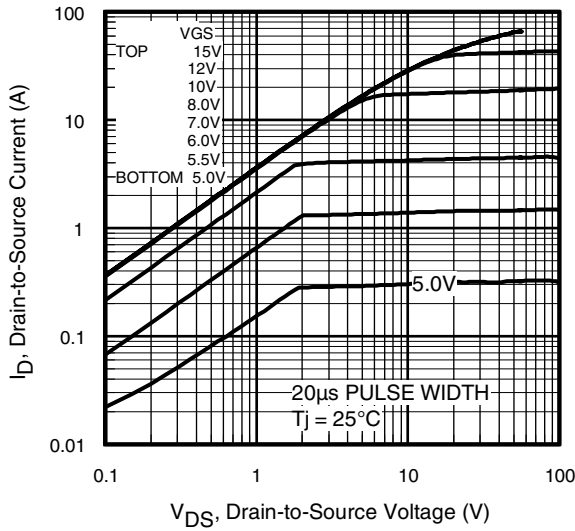


Fig 1. Typical Output Characteristics

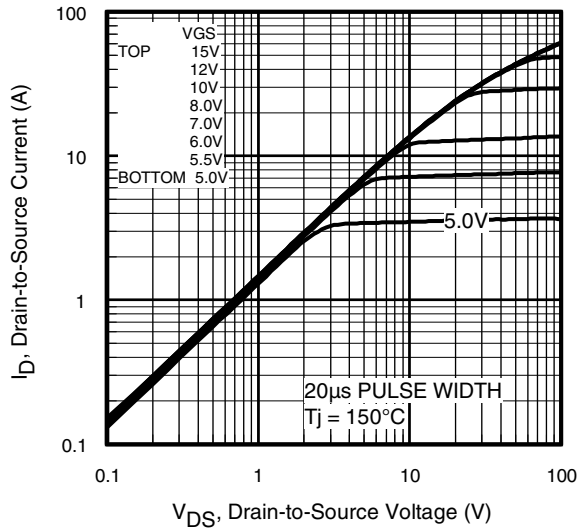


Fig 2. Typical Output Characteristics

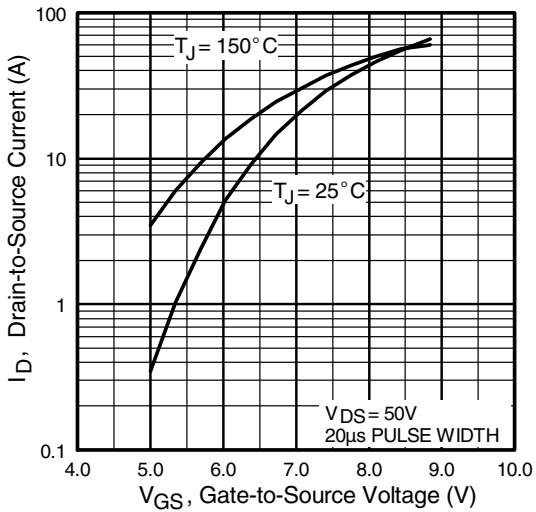


Fig 3. Typical Transfer Characteristics

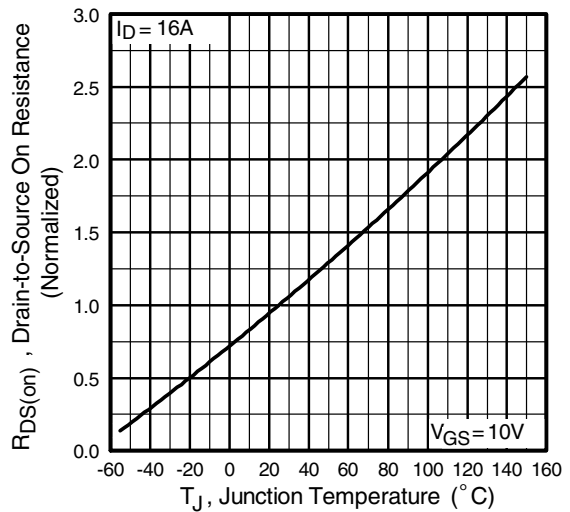


Fig 4. Normalized On-Resistance Vs. Temperature

IRFP17N50LPbF

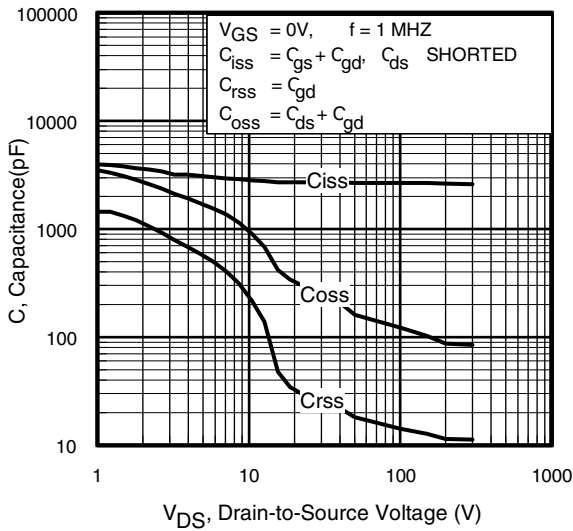


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

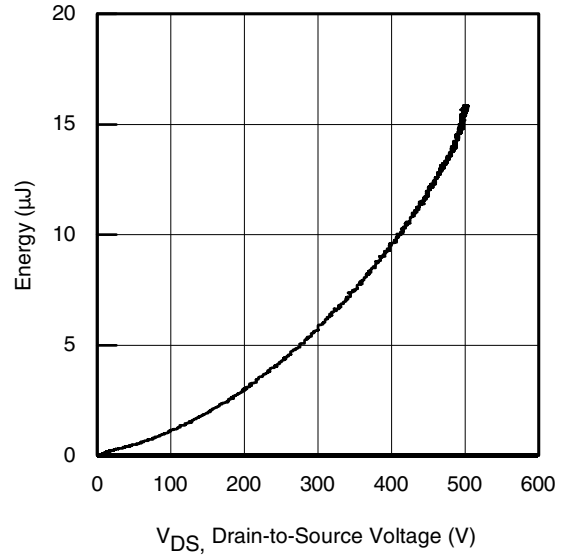


Fig 6. Typ. Output Capacitance Stored Energy vs. V_{DS}

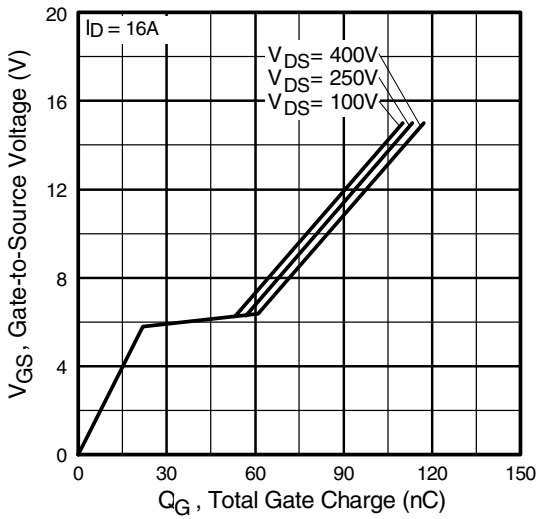


Fig 7. Typical Gate Charge Vs. Gate-to-Source Voltage

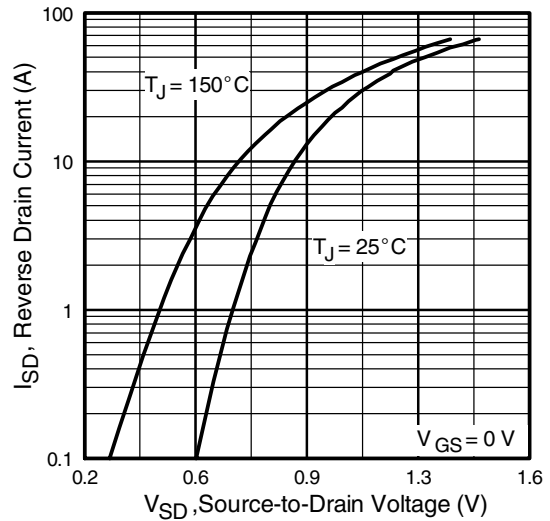


Fig 8. Typical Source-Drain Diode Forward Voltage

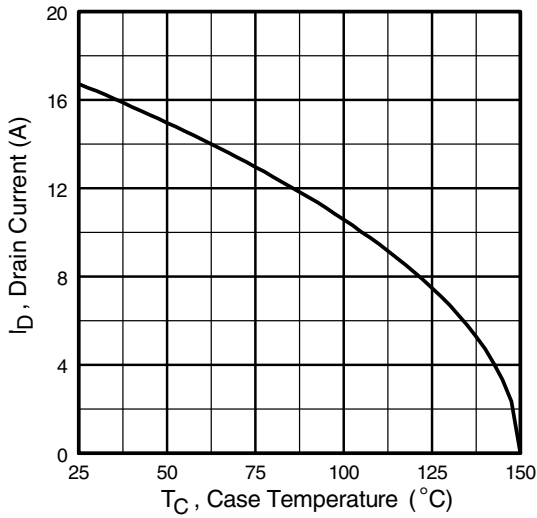


Fig 9. Maximum Drain Current Vs. Case Temperature

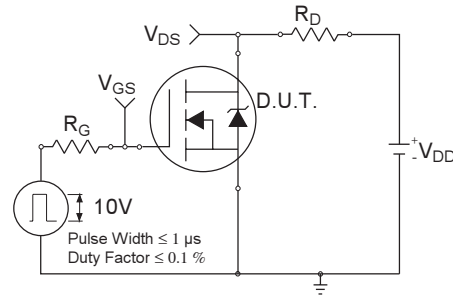


Fig 10a. Switching Time Test Circuit

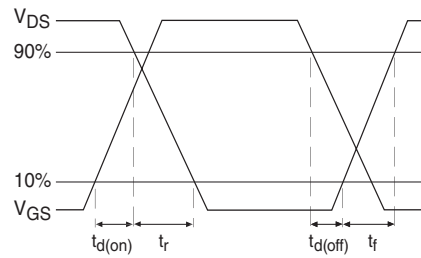


Fig 10b. Switching Time Waveforms

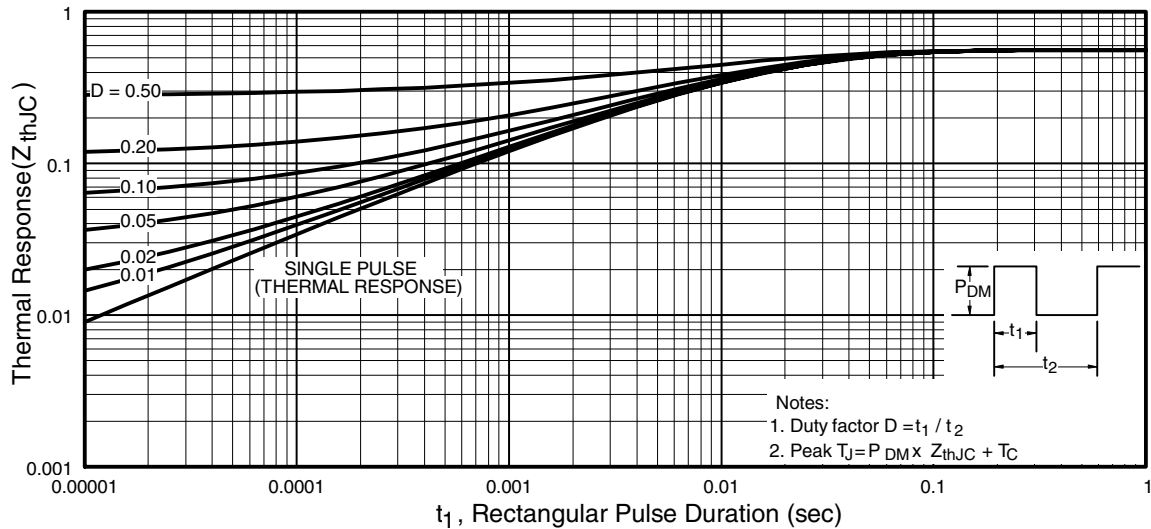


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRFP17N50LPbF

International
IR Rectifier

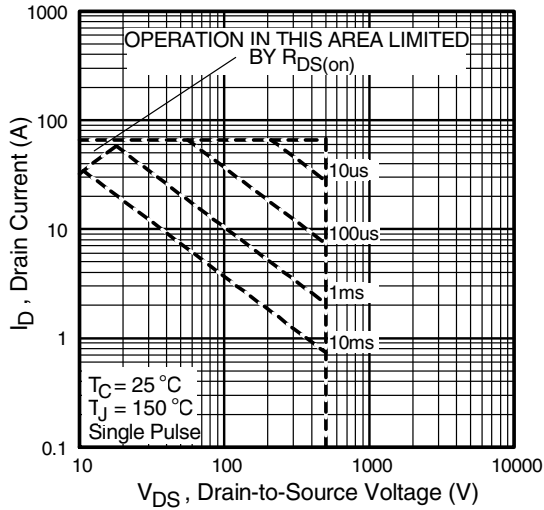


Fig 12. Maximum Safe Operating Area

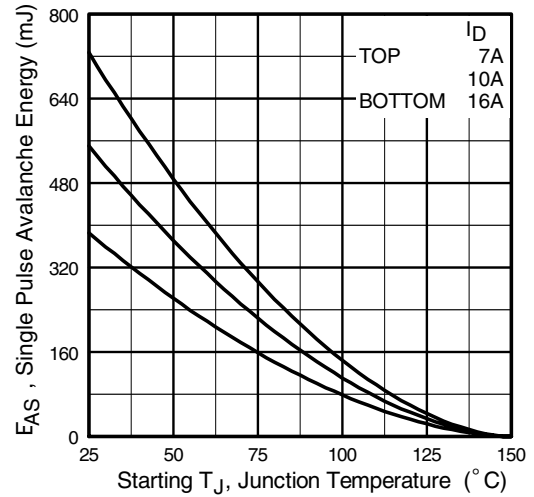


Fig 13. Maximum Avalanche Energy vs. Drain Current

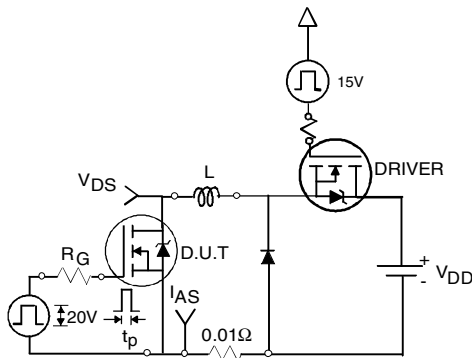


Fig 14a. Unclamped Inductive Test Circuit

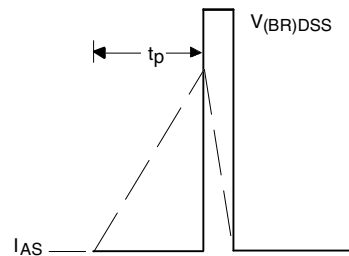


Fig 14b. Unclamped Inductive Waveforms

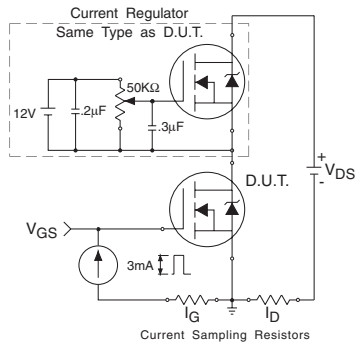


Fig 15a. Gate Charge Test Circuit

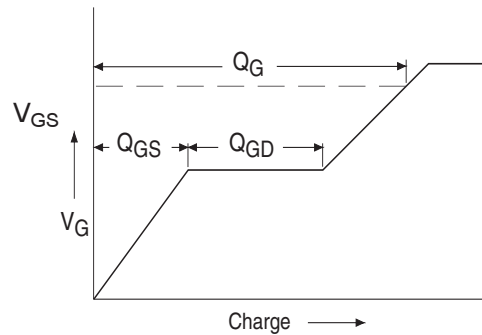
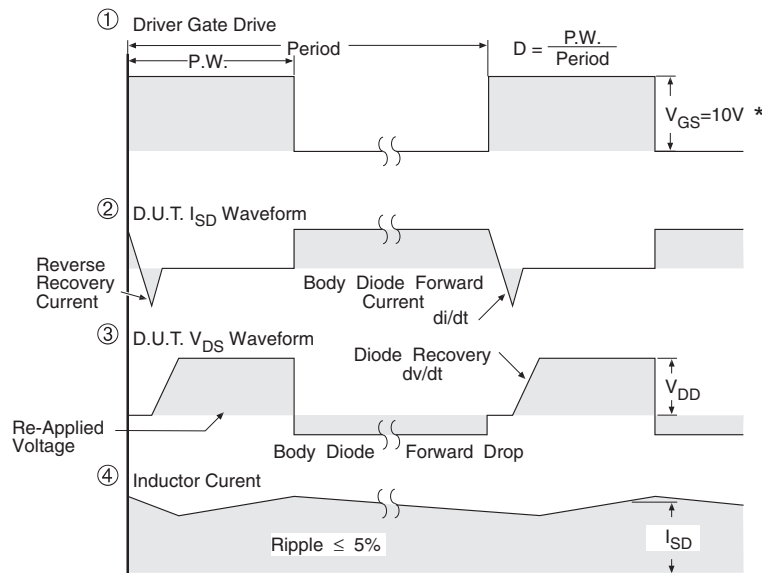
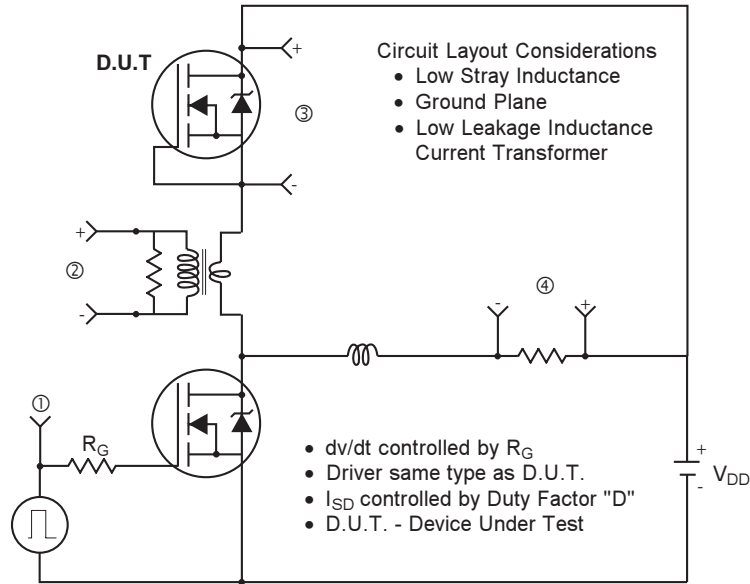


Fig 15b. Basic Gate Charge Waveform

Peak Diode Recovery dv/dt Test Circuit



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

Fig 16. For N-Channel HEXFET® Power MOSFETs



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.