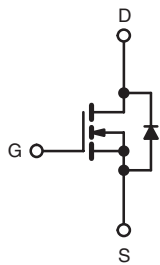




## Power MOSFET

PRODUCT SUMMARY		
V <sub>DS</sub> (V)	500	
R <sub>DS(on)</sub> (Ω)	V <sub>GS</sub> = 10 V	0.125
Q <sub>g</sub> (Max.) (nC)	230	
Q <sub>gs</sub> (nC)	65	
Q <sub>gd</sub> (nC)	110	
Configuration	Single	



N-Channel MOSFET



### FEATURES

- Super Fast 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
- Lead (Pb)-free Available



**RoHS\***  
COMPLIANT

### APPLICATIONS

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

ORDERING INFORMATION	
Package	SUPER-247™
Lead (Pb)-free	IRFPS35N50LPbF
	SiHFPS35N50L-E3
SnPb	IRFPS35N50L
	SiHFPS35N50L

ABSOLUTE MAXIMUM RATINGS T <sub>C</sub> = 25 °C, unless otherwise noted				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	V <sub>DS</sub>	500	V	
Gate-Source Voltage	V <sub>GS</sub>	± 30		
Continuous Drain Current	V <sub>GS</sub> at 10 V	T <sub>C</sub> = 25 °C	34	A
		T <sub>C</sub> = 100 °C	22	
Pulsed Drain Current <sup>a</sup>	I <sub>DM</sub>	140		
Linear Derating Factor		3.6	W/°C	
Single Pulse Avalanche Energy <sup>b</sup>	E <sub>AS</sub>	560	mJ	
Repetitive Avalanche Current <sup>a</sup>	I <sub>AR</sub>	34	A	
Repetitive Avalanche Energy <sup>a</sup>	E <sub>AR</sub>	45	mJ	
Maximum Power Dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	450	W
Peak Diode Recovery dV/dt <sup>c</sup>	dV/dt	15	V/ns	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to + 150	°C	
Soldering Recommendations (Peak Temperature)	for 10 s	300 <sup>d</sup>		
Mounting Torque	6-32 or M3 screw		10	lbf · in
			1.1	N · m

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Starting T<sub>J</sub> = 25 °C, L = 0.97 mH, R<sub>G</sub> = 25 Ω, I<sub>AS</sub> = 34 A (see fig. 12).
- I<sub>SD</sub> ≤ 34 A, dI/dt ≤ 765 A/μs, V<sub>DD</sub> ≤ V<sub>DS</sub>, T<sub>J</sub> ≤ 150 °C.
- 1.6 mm from case.

\* Pb containing terminations are not RoHS compliant, exemptions may apply

# IRFPS35N50L, SiHFPS35N50L



Vishay Siliconix

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	40	°C/W
Case-to-Sink, Flat, Greased Surface	$R_{thCS}$	0.24	-	
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	0.28	

**Note**

a.  $R_{th}$  is measured at  $T_J$  approximately 90 °C.

SPECIFICATIONS $T_J = 25\text{ °C}$ , unless otherwise noted						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	500	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, $I_D = 1\text{ mA}$	-	0.12	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	3.0	-	5.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 30\text{ V}$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$	-	-	50	$\mu\text{A}$
		$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ °C}$	-	-	2.0	mA
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}^b$	-	0.125	0.145	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 50\text{ V}, I_D = 20\text{ A}^b$	18	-	-	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1.0\text{ MHz}$ , see fig. 5	-	5580	-	pF
Output Capacitance	$C_{oss}$		-	590	-	
Reverse Transfer Capacitance	$C_{rss}$		-	58	-	
Output Capacitance	$C_{oss}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 1.0\text{ V}, f = 1.0\text{ MHz}$	-	7290	-
Effective Output Capacitance	$C_{oss\text{ eff.}}$		$V_{DS} = 400\text{ V}, f = 1.0\text{ MHz}$	-	160	-
Effective Output Capacitance (Energy Related)	$C_{oss\text{ eff. (ER)}}$	$V_{DS} = 0\text{ V to }400\text{ V}^c$	-	220	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{ V}, I_D = 34\text{ A}, V_{DS} = 400\text{ V}$ , see fig. 7 and 13 <sup>b</sup>	-	-	230	nC
Gate-Source Charge	$Q_{gs}$		-	-	65	
Gate-Drain Charge	$Q_{gd}$		-	-	110	
Internal Gate Resistance	$R_G$	$f = 1\text{ MHz}$ , open drain	-	1.1	-	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}, I_D = 34\text{ A}, R_G = 1.2\text{ }\Omega$ , see fig. 10 <sup>b</sup>	-	24	-	ns
Rise Time	$t_r$		-	100	-	
Turn-Off Delay Time	$t_{d(off)}$		-	42	-	
Fall Time	$t_f$		-	42	-	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	34	A
Pulsed Diode Forward Current <sup>a</sup>	$I_{SM}$		-	-	140	
Body Diode Voltage	$V_{SD}$	$T_J = 25\text{ °C}, I_S = 34\text{ A}, V_{GS} = 0\text{ V}^b$	-	-	1.5	V
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ °C}, I_F = 34\text{ A}$	-	170	250	ns
		$T_J = 125\text{ °C}, di/dt = 100\text{ A}/\mu\text{s}^b$	-	220	330	
Body Diode Reverse Recovery Charge	$Q_{rr}$	$T_J = 25\text{ °C}, I_S = 34\text{ A}, V_{GS} = 0\text{ V}^b$	-	670	1010	$\mu\text{C}$
		$T_J = 125\text{ °C}, di/dt = 100\text{ A}/\mu\text{s}^b$	-	1500	2200	
Reverse Recovery Current	$I_{RRM}$	$T_J = 25\text{ °C}$	-	8.5	-	A
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )				

**Notes**

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. Pulse width  $\leq 400\text{ }\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- c.  $C_{oss\text{ eff.}}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 80 %  $V_{DS}$ .  $C_{oss\text{ eff. (ER)}}$  is a fixed capacitance that stores the same energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 80 %  $V_{DS}$ .



**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

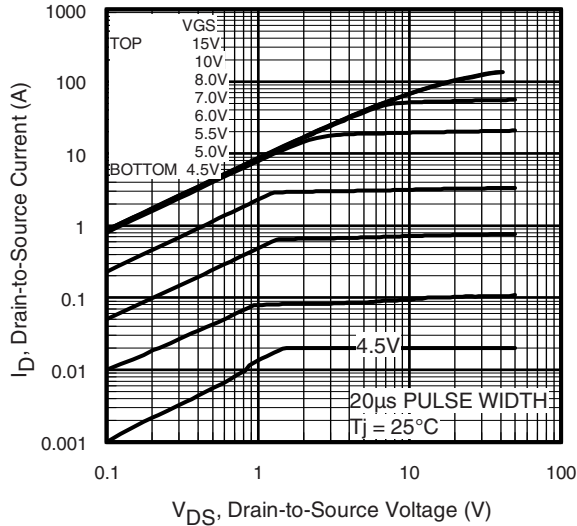


Fig. 1 - Typical Output Characteristics

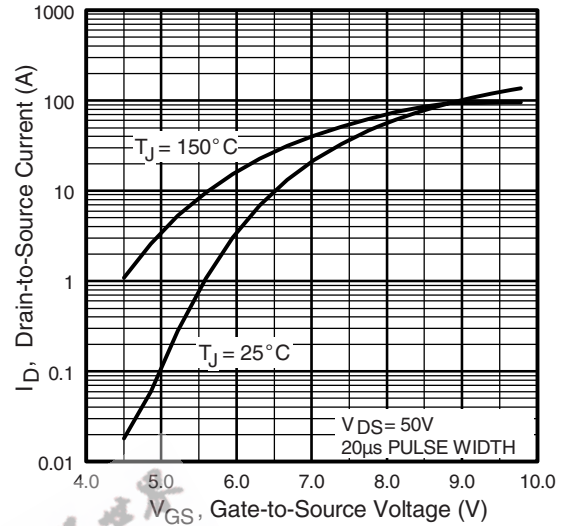


Fig. 3 - Typical Transfer Characteristics

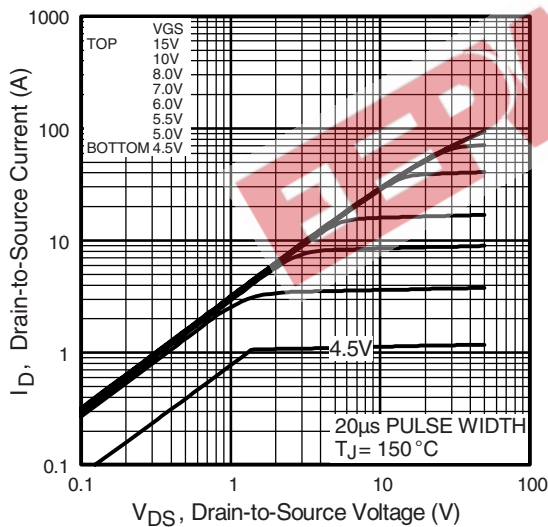


Fig. 2 - Typical Output Characteristics

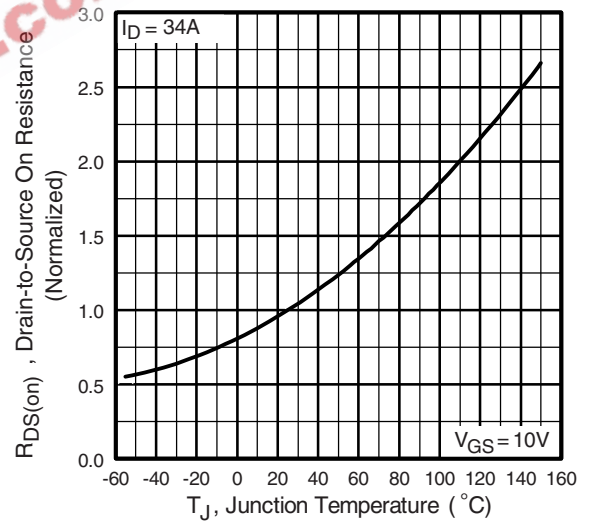


Fig. 4 - Normalized On-Resistance vs. Temperature

# IRFPS35N50L, SiHFPS35N50L



Vishay Siliconix

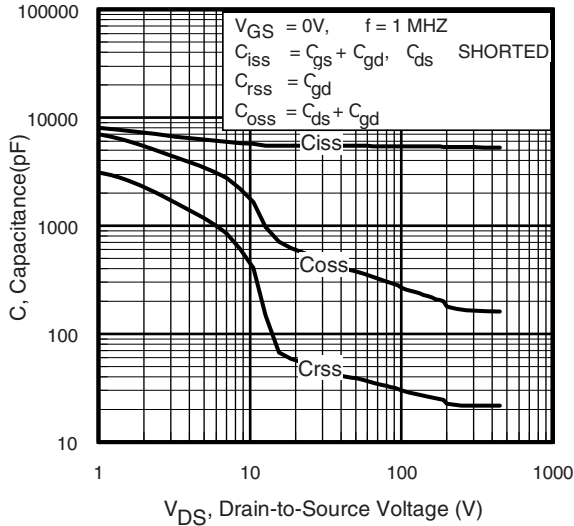


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

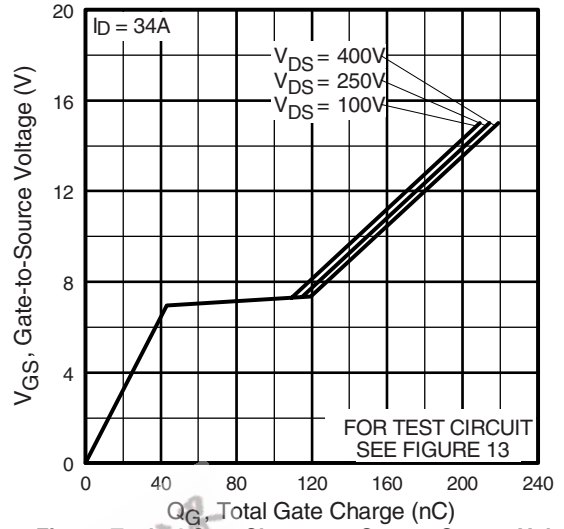


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

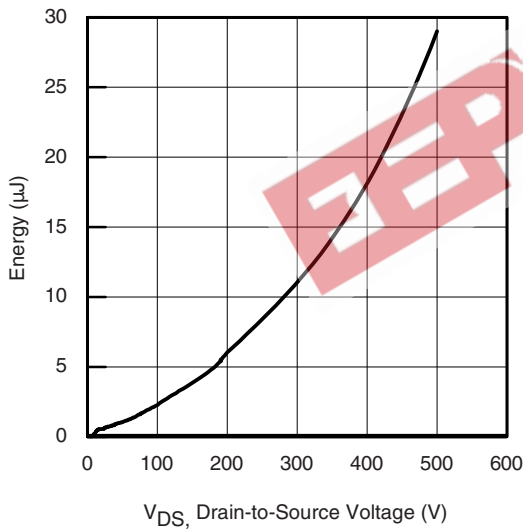


Fig. 6 - Typical Output Capacitance Stored Energy vs.  $V_{DS}$

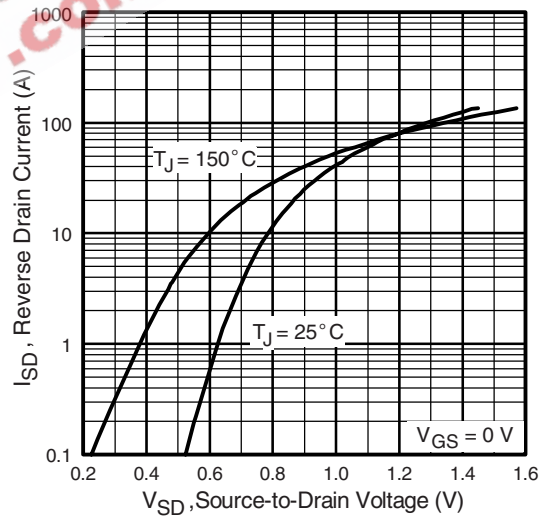


Fig. 8 - Typical Source Drain Diode Forward Voltage

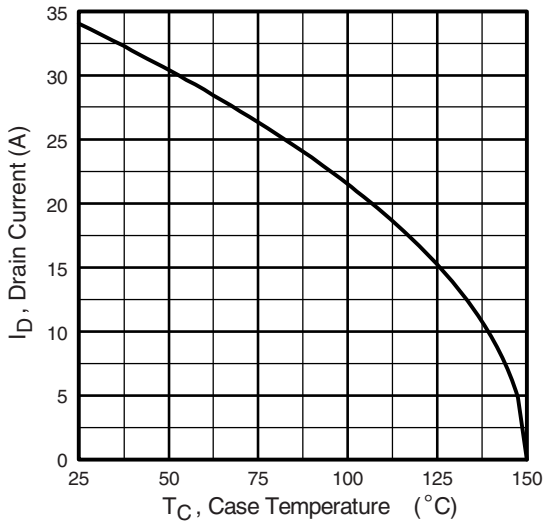


Fig. 9 - Maximum Drain Current vs. Case Temperature

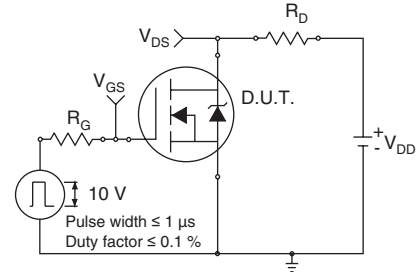


Fig. 10a - Switching Time Test Circuit

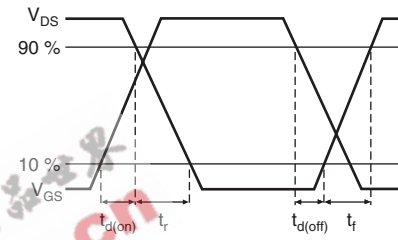


Fig. 10b - Switching Time Waveforms

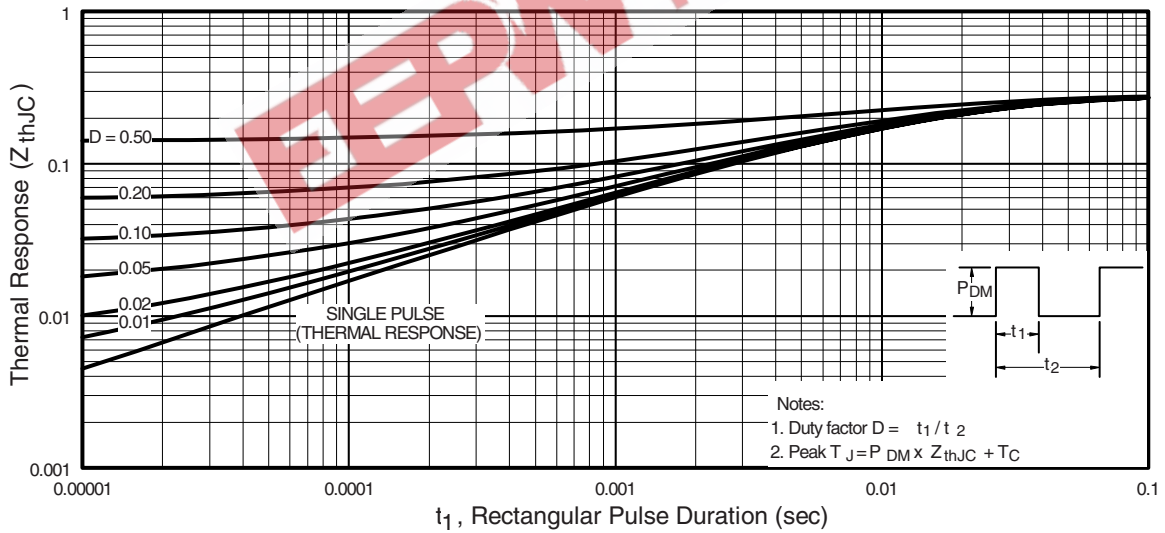


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

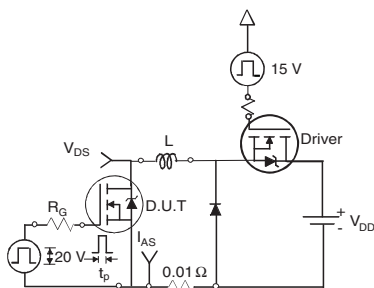


Fig. 12a - Unclamped Inductive Test Circuit

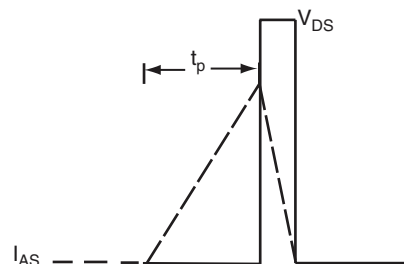


Fig. 12b - Unclamped Inductive Waveforms

# IRFPS35N50L, SiHFPS35N50L



Vishay Siliconix

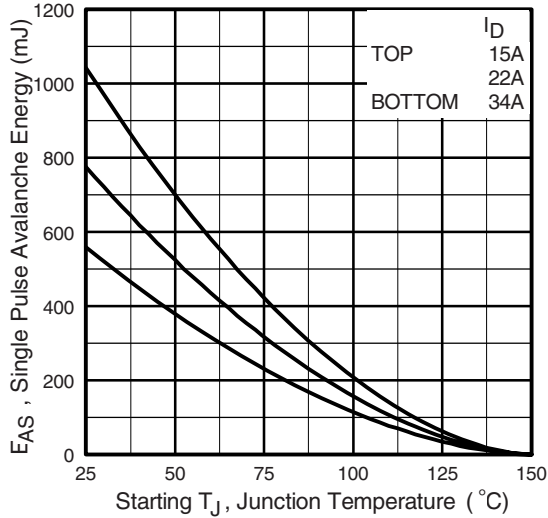


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

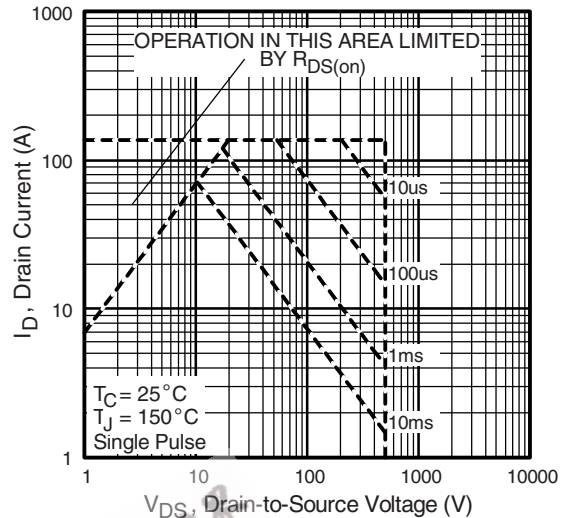


Fig. 12d - Maximum Safe Operating Area

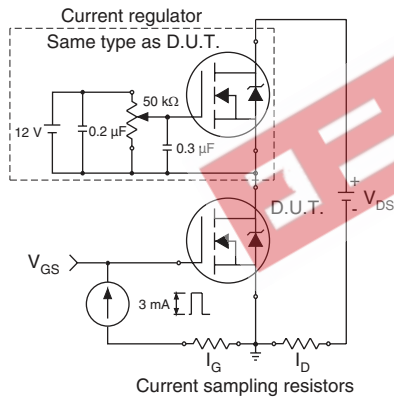


Fig. 13a - Gate Charge Test Circuit

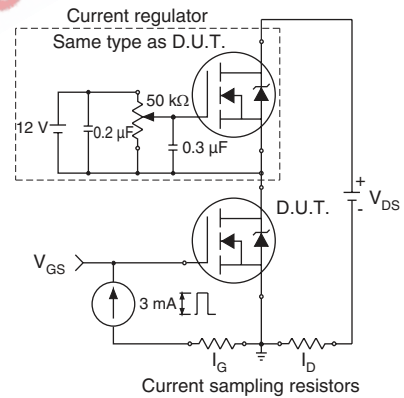
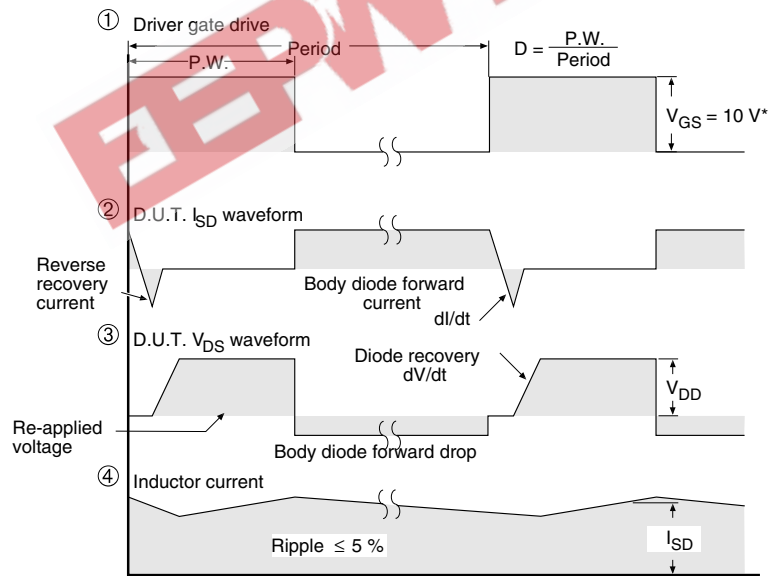
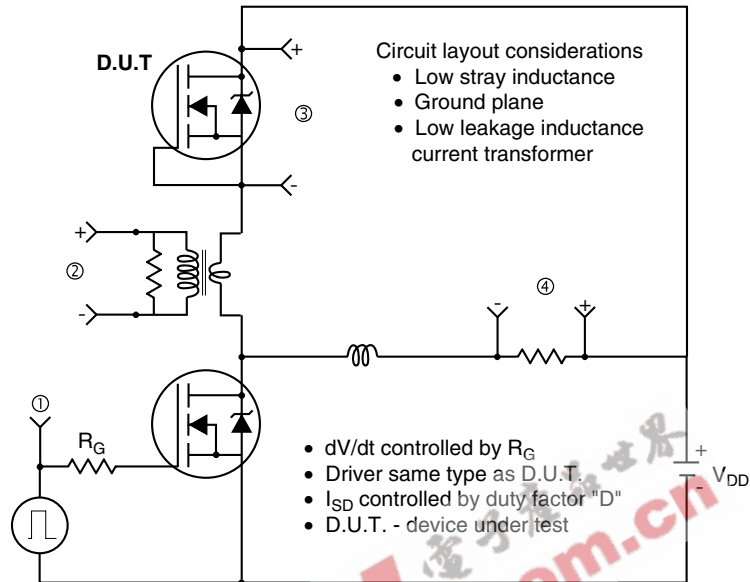


Fig. 13b - Basic Gate Charge Waveform

## Peak Diode Recovery dV/dt Test Circuit



\*  $V_{GS} = 5 V$  for logic level devices

Fig. 14 - For N-Channel

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see <http://www.vishay.com/ppg?91257>.



### Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.