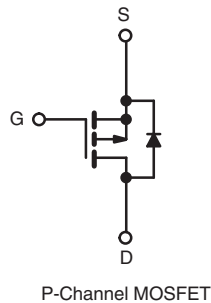
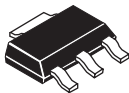


Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	- 60	
$R_{DS(on)}$ (Ω)	$V_{GS} = -10$ V	0.50
Q_g (Max.) (nC)	12	
Q_{gs} (nC)	3.8	
Q_{gd} (nC)	5.1	
Configuration	Single	

SOT-223


FEATURES

- Surface Mount
- Available in Tape and Reel
- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- P-Channel
- Fast Switching
- Ease of Paralleling
- Lead (Pb)-free Available


 Available
RoHS*
 COMPLIANT

DESCRIPTION

Third generation Power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SOT-223 package is designed for surface-mounting using vapor phase, infrared, or wave soldering techniques. Its unique package design allows for easy automatic pick-and-place as with other SOT or SOIC packages but has the added advantage of improved thermal performance due to an enlarged tab for heatsinking. Power dissipation of greater than 1.25 W is possible in a typical surface mount application.

ORDERING INFORMATION

Package	SOT-223	SOT-223
Lead (Pb)-free	IRFL9014PbF	IRFL9014TRPbF ^a
	SiHFL9014-E3	SiHFL9014T-E3 ^a
SnPb	IRFL9014	IRFL9014TR ^a
	SiHFL9014	SiHFL9014T ^a

Note

a. See device orientation.

ABSOLUTE MAXIMUM RATINGS $T_C = 25^\circ\text{C}$, unless otherwise noted

PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	V_{DS}	- 60	V	
Gate-Source Voltage	V_{GS}	± 20		
Continuous Drain Current	V_{GS} at - 10 V	$T_C = 25^\circ\text{C}$	- 1.8	A
		$T_C = 100^\circ\text{C}$	- 1.1	
Pulsed Drain Current ^a	I_{DM}	- 14		
Linear Derating Factor		0.025	W/ $^\circ\text{C}$	
Linear Derating Factor (PCB Mount) ^e		0.017		
Single Pulse Avalanche Energy ^b	E_{AS}	140	mJ	
Repetitive Avalanche Current ^a	I_{AR}	- 1.8	A	
Repetitive Avalanche Energy ^a	E_{AR}	0.31	mJ	

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

ABSOLUTE MAXIMUM RATINGS $T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted				
PARAMETER		SYMBOL	LIMIT	UNIT
Maximum Power Dissipation	$T_C = 25\text{ }^\circ\text{C}$	P_D	3.1	W
Maximum Power Dissipation (PCB Mount) ^e	$T_A = 25\text{ }^\circ\text{C}$		2.0	
Peak Diode Recovery dV/dt^c		dV/dt	- 4.5	V/ns
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to + 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature)	for 10 s		300 ^d	

Notes


- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = -25\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 50\text{ mH}$, $R_G = 25\text{ }\Omega$, $I_{AS} = -1.8\text{ A}$ (see fig. 12).
- $I_{SD} \leq -6.7\text{ A}$, $dI/dt \leq 90\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
- 1.6 mm from case.
- When mounted on 1" square PCB (FR-4 or G-10 material).

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient (PCB Mount) ^a	R_{thJA}	-	60	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Case (Drain)	R_{thJC}	-	40	

Note

- When mounted on 1" square PCB (FR-4 or G-10 material).

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	- 60	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$	-	- 0.059	-	$\text{V}/^\circ\text{C}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	- 2.0	-	- 4.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	- 100	μA
		$V_{DS} = -48\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$	-	-	- 500	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = -10\text{ V}$, $I_D = 1.1\text{ A}^b$	-	-	0.50	Ω
Forward Transconductance	g_{fs}	$V_{DS} = -25\text{ V}$, $I_D = 1.1\text{ A}^b$	1.3	-	-	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5	-	270	-	pF
Output Capacitance	C_{oss}		-	170	-	
Reverse Transfer Capacitance	C_{riss}		-	31	-	
Total Gate Charge	Q_g	$V_{GS} = -10\text{ V}$, $I_D = -6.7\text{ A}$, $V_{DS} = -48\text{ V}$, see fig. 6 and 13 ^b	-	-	12	nC
Gate-Source Charge	Q_{gs}		-	-	3.8	
Gate-Drain Charge	Q_{gd}		-	-	5.1	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -30\text{ V}$, $I_D = -6.7\text{ A}$, $R_G = 24\text{ }\Omega$, $R_D = 4.0\text{ }\Omega$, see fig. 10 ^b	-	11	-	ns
Rise Time	t_r		-	63	-	
Turn-Off Delay Time	$t_{d(off)}$		-	9.6	-	
Fall Time	t_f		-	31	-	
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact	-	4.0	-	nH
Internal Source Inductance	L_S		-	6.0	-	

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	- 1.8	A
Pulsed Diode Forward Current ^a	I_{SM}		-	-	- 14	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}$, $I_S = -1.8\text{ A}$, $V_{GS} = 0\text{ V}^b$	-	-	- 5.5	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}$, $I_F = -6.7\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}^b$	-	80	160	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	0.096	0.19	μC
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 $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS $25\text{ }^\circ\text{C}$, unless otherwise noted

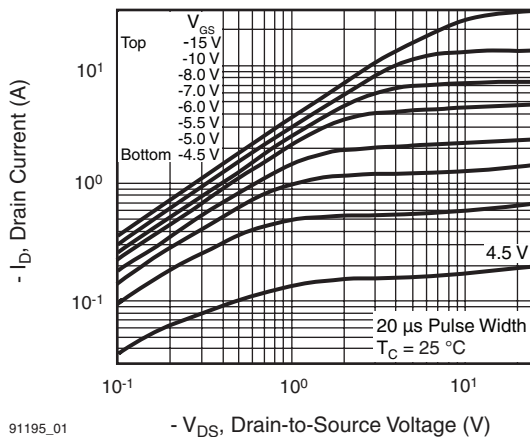


Fig. 1 - Typical Output Characteristics, $T_C = 25\text{ }^\circ\text{C}$

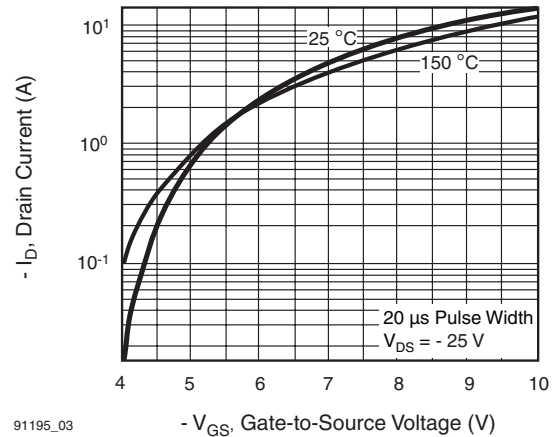


Fig. 3 - Typical Transfer Characteristics

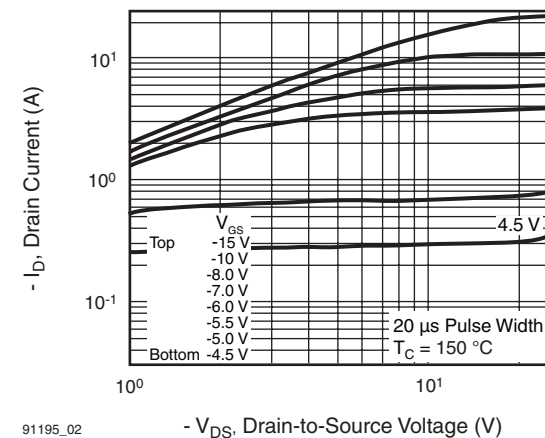


Fig. 2 - Typical Output Characteristics, $T_C = 150\text{ }^\circ\text{C}$

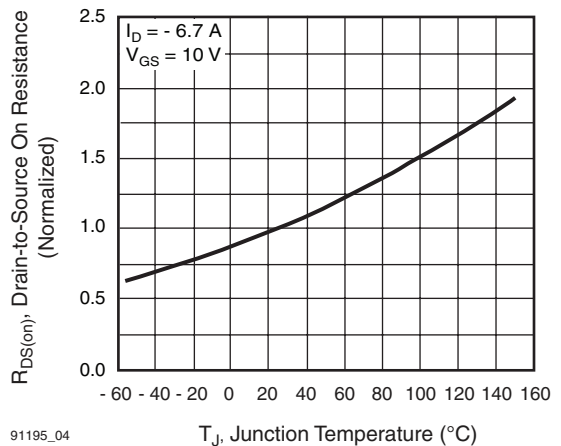
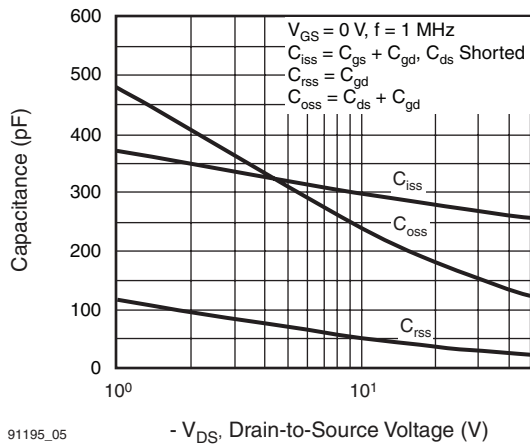
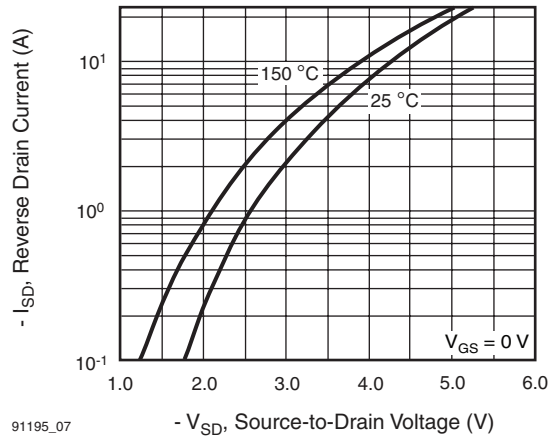


Fig. 4 - Normalized On-Resistance vs. Temperature



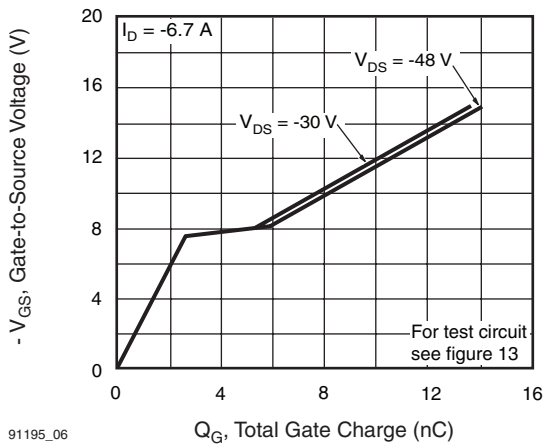
91195_05

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



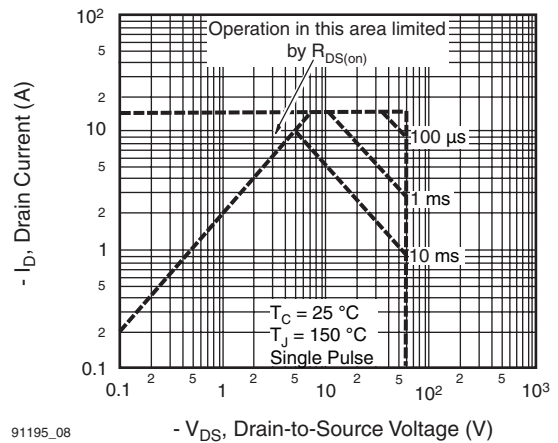
91195_07

Fig. 7 - Typical Source-Drain Diode Forward Voltage



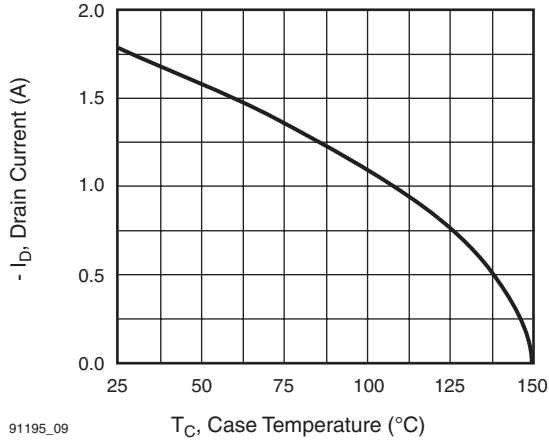
91195_06

Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage



91195_08

Fig. 8 - Maximum Safe Operating Area



91195_09

Fig. 9 - Maximum Drain Current vs. Case Temperature

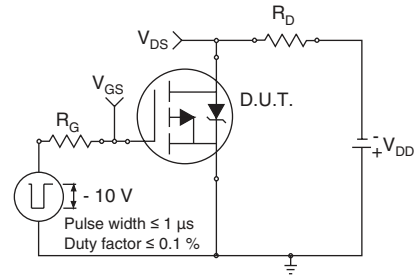


Fig. 10a - Switching Time Test Circuit

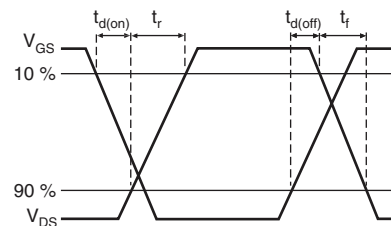
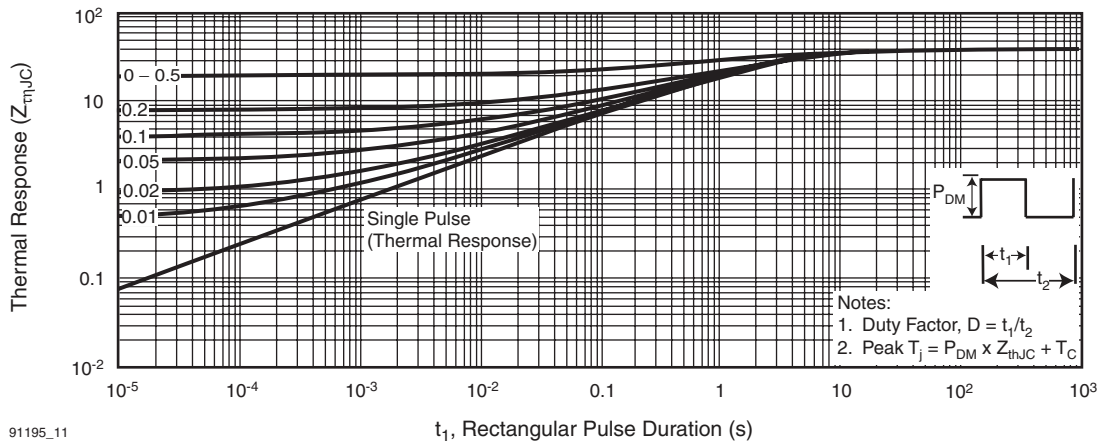


Fig. 10b - Switching Time Waveforms



91195_11

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

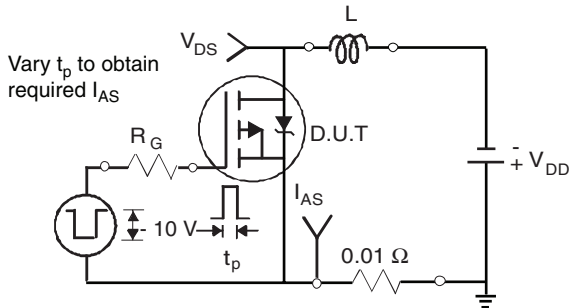


Fig. 12a - Unclamped Inductive Test Circuit

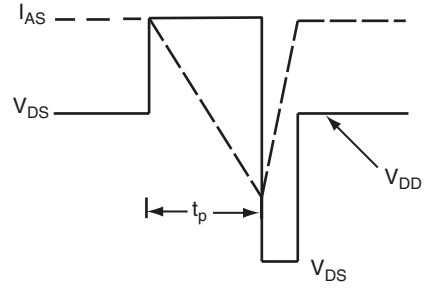


Fig. 12b - Unclamped Inductive Waveforms

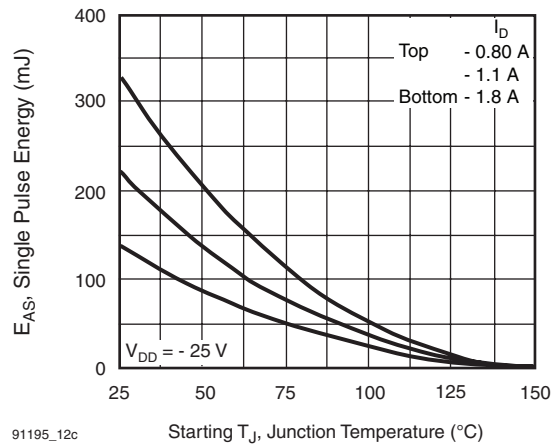


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

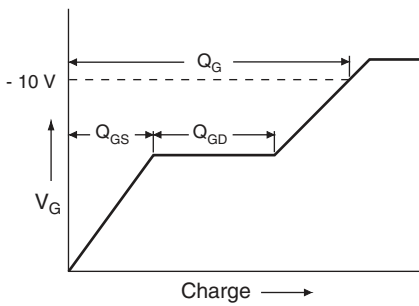


Fig. 13a - Basic Gate Charge Waveform

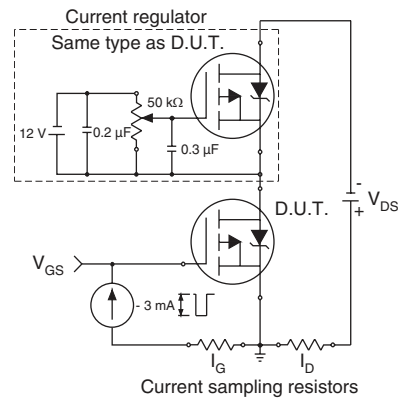
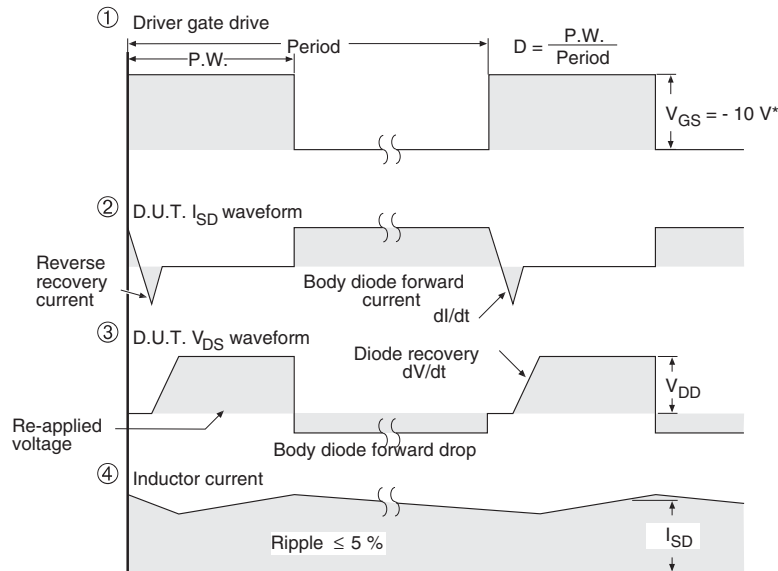
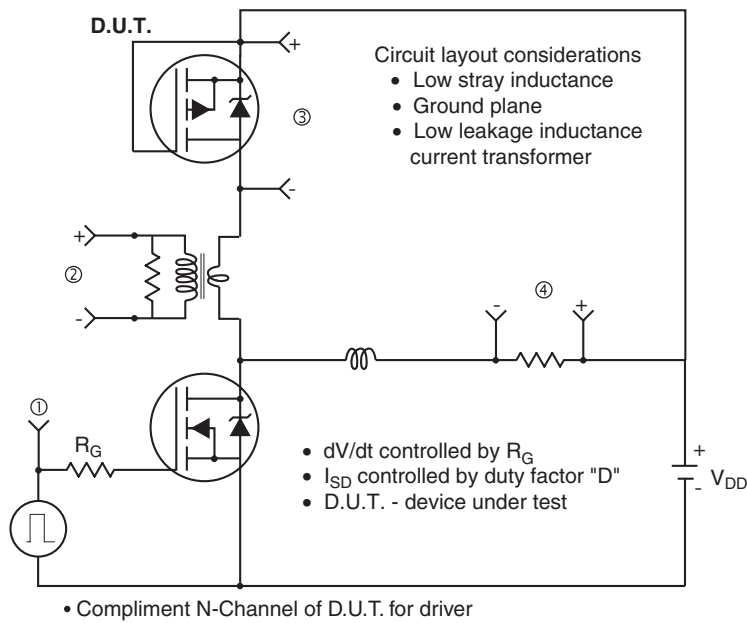


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



* $V_{GS} = -5\text{ V}$ for logic level and -3 V drive devices

Fig.14 - For P-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?91195>.



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.