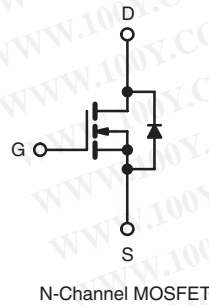




Power MOSFET

PRODUCT SUMMARY		
V <sub>DS</sub> (V)	250	
R <sub>DS(on)</sub> (Ω)	V <sub>GS</sub> = 10 V	0.125
Q <sub>g</sub> (Max.) (nC)	100	
Q <sub>gs</sub> (nC)	17	
Q <sub>gd</sub> (nC)	44	
Configuration	Single	



FEATURES

- Advanced Process Technology
- Dynamic dV/dt Rating
- 175 °C Operating Temperature
- Fully Avalanche Rated
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Lead (Pb)-free Available



DESCRIPTION

Fifth generation Power MOSFETs from Vishay utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that these Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications. The TO-247 package is preferred for commercial-industrial applications where higher power levels preclude the use of TO-220 devices. The TO-247 is similar but superior to the earlier TO-218 package because of its isolated mounting hole.

ORDERING INFORMATION	
Package	TO-247
Lead (Pb)-free	IRFP254NPbF SiHFP254N-E3
SnPb	IRFP254N SiHFP254N



ABSOLUTE MAXIMUM RATINGS T <sub>C</sub> = 25 °C, unless otherwise noted				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	V <sub>DS</sub>	250	V	
Gate-Source Voltage	V <sub>GS</sub>	± 20		
Continuous Drain Current	V <sub>GS</sub> at 10 V	T <sub>C</sub> = 25 °C	23	A
		T <sub>C</sub> = 100 °C	16	
Pulsed Drain Current <sup>a</sup>	I <sub>DM</sub>	92		
Linear Derating Factor		1.5	W/°C	
Single Pulse Avalanche Energy <sup>b</sup>	E <sub>AS</sub>	300	mJ	
Repetitive Avalanche Current <sup>a</sup>	I <sub>AR</sub>	14	A	
Repetitive Avalanche Energy <sup>a</sup>	E <sub>AR</sub>	22	mJ	
Maximum Power Dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	220	W
Peak Diode Recovery dV/dt <sup>c</sup>	dV/dt	7.4	V/ns	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to + 175	°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 = 3.1 mH, R<sub>G</sub> = 25 Ω, I<sub>AS</sub> = 14 A, V<sub>GS</sub> = 10 V.
- I<sub>SD</sub> ≤ 14 A, di/dt ≤ 460 A/μs, V<sub>DD</sub> ≤ V<sub>DS</sub>, T<sub>J</sub> ≤ 175 °C.
- 1.6 mm from case.

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

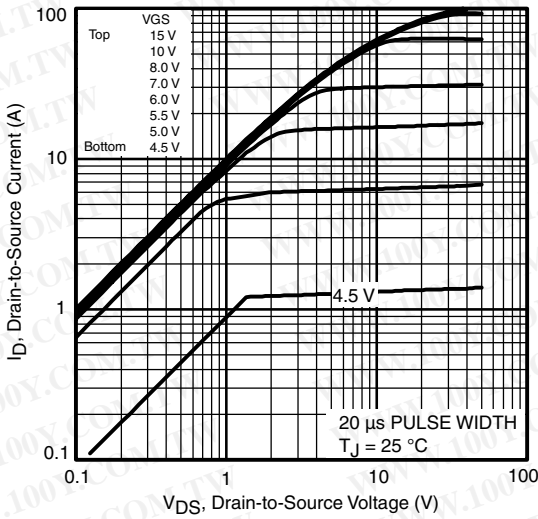
THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	40	°C/W
Case-to-Sink, Flat, Greased Surface	$R_{thCS}$	0.24	-	
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	0.68	

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		250	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1\text{ mA}$		-	0.33	-	V/°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	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}$		-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 250\text{ V}, V_{GS} = 0\text{ V}$		-	-	25	$\mu\text{A}$
		$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 14\text{ A}^b$	-	-	0.125	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 25\text{ V}, I_D = 14\text{ A}$		15	-	-	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		-	2040	-	pF
Output Capacitance	$C_{oss}$			-	260	-	
Reverse Transfer Capacitance	$C_{rss}$			-	62	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{ V}$	$I_D = 14\text{ A}, V_{DS} = 200\text{ V}$ , see fig. 6 and 13 <sup>b</sup>	-	-	100	nC
Gate-Source Charge	$Q_{gs}$			-	-	17	
Gate-Drain Charge	$Q_{gd}$			-	-	44	
Turn-On Delay Time	$t_{d(on)}$			-	14	-	
Rise Time	$t_r$	-	34	-			
Turn-Off Delay Time	$t_{d(off)}$	-	37	-			
Fall Time	$t_f$	-	29	-			
Internal Drain Inductance	$L_D$	Between lead, 6 mm (0.25") from package and center of die contact 		-	5.0	-	nH
Internal Source Inductance	$L_S$			-	13	-	
<b>Drain-Source Body Diode Characteristics</b>							
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	23	A
Pulsed Diode Forward Current <sup>a</sup>	$I_{SM}$			-	-	92	
Body Diode Voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}, I_S = 14\text{ A}, V_{GS} = 0\text{ V}^b$		-	-	1.3	V
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}, I_F = 14\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		-	210	310	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			-	1.7	2.6	nC
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )					

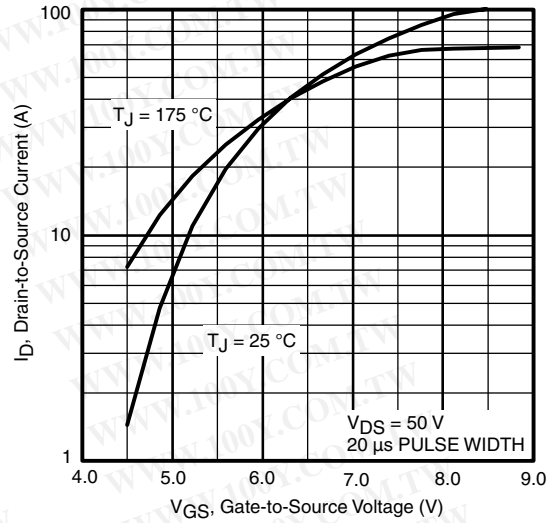
**Notes**

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. Pulse width  $\leq 400\text{ }\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

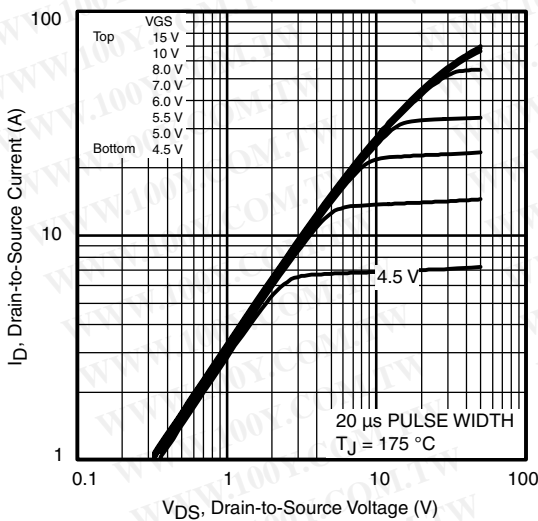
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



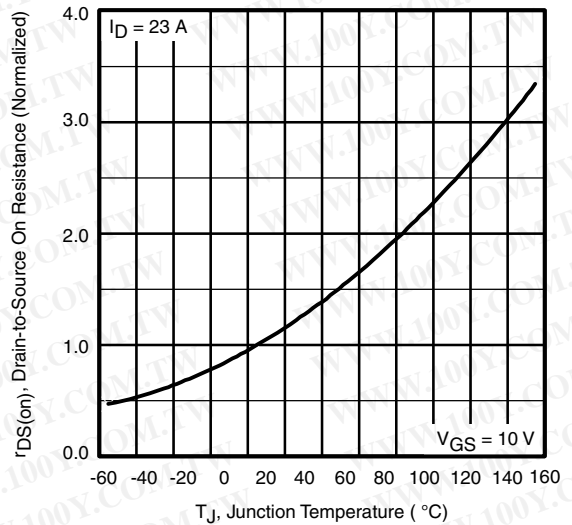
**Fig. 1 - Typical Output Characteristics**



**Fig. 3 - Typical Transfer Characteristics**



**Fig. 2 - Typical Output Characteristics**



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

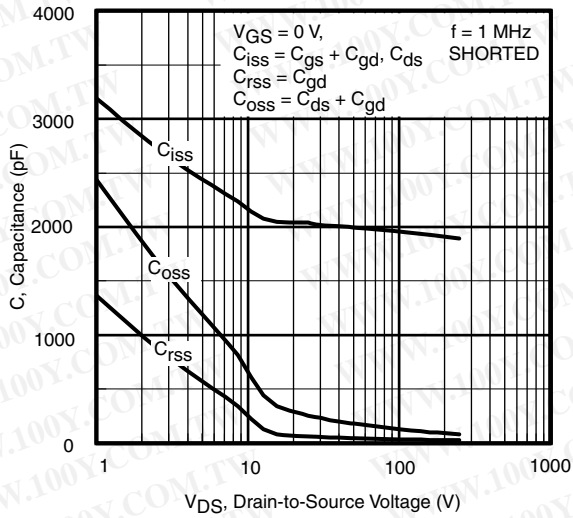


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

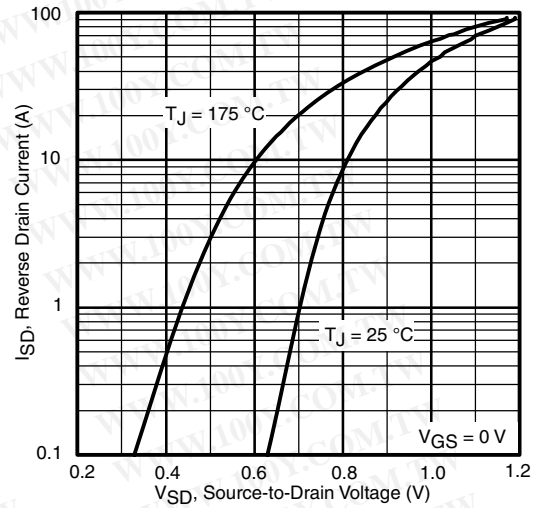


Fig. 7 - Typical Source-Drain Diode Forward Voltage

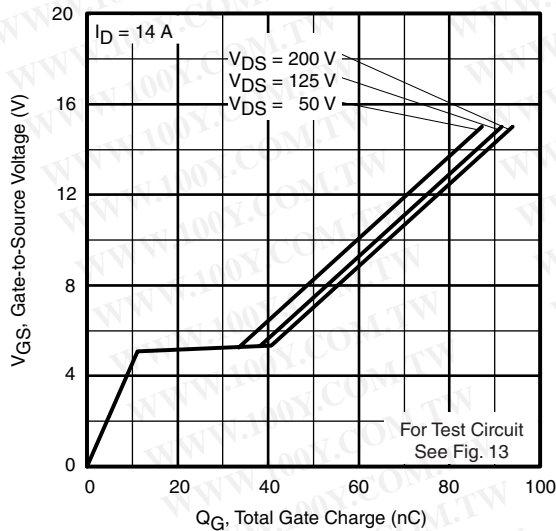


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

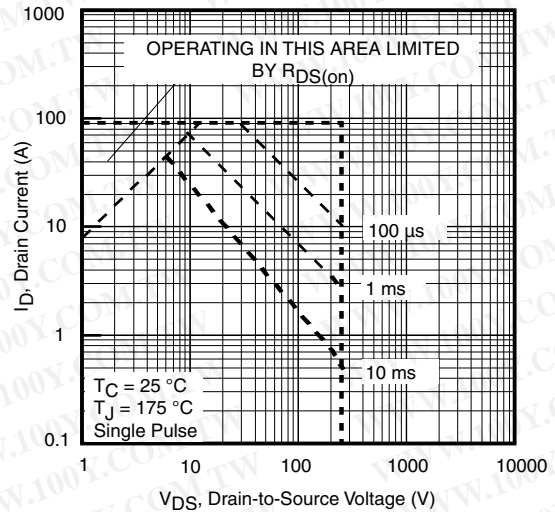


Fig. 8 - Maximum Safe Operating Area

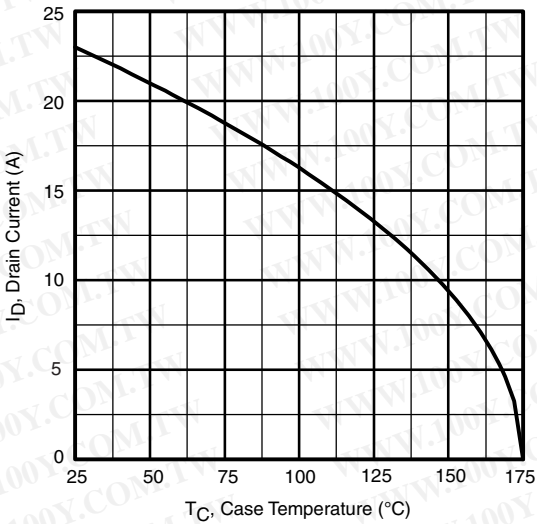


Fig. 9 - Maximum Drain Current vs. Case Temperature

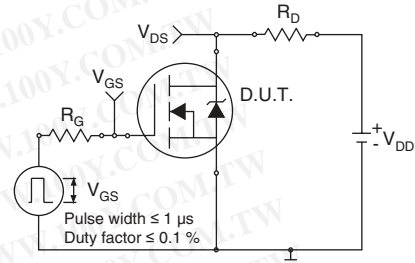


Fig. 10a - Switching Time Test Circuit

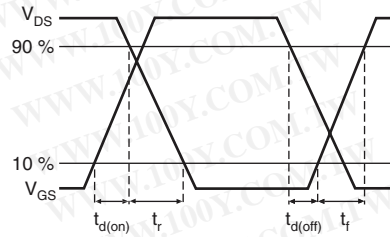


Fig. 10b - Switching Time Waveforms

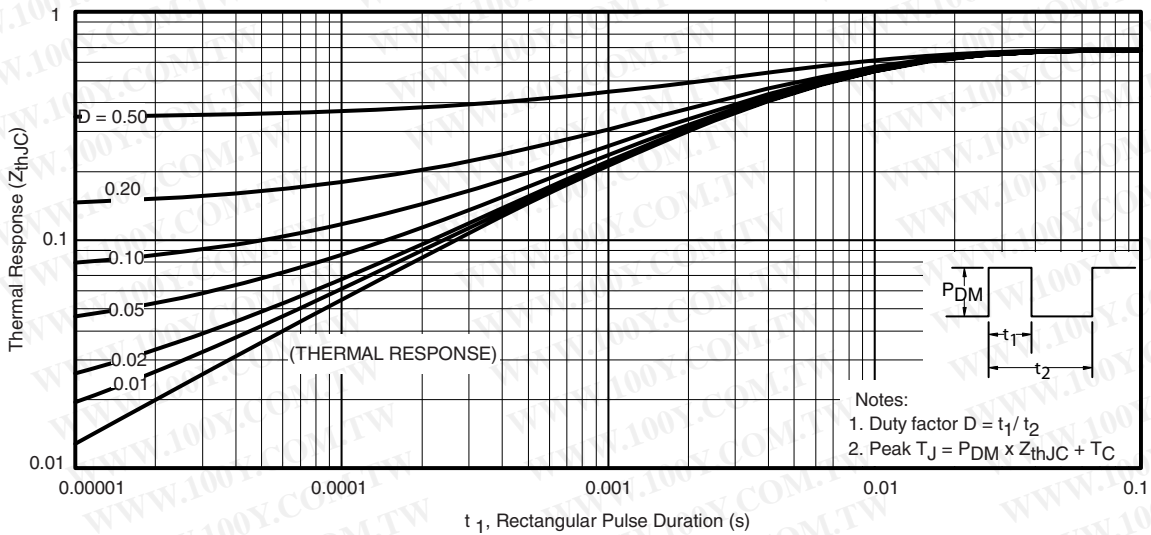


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

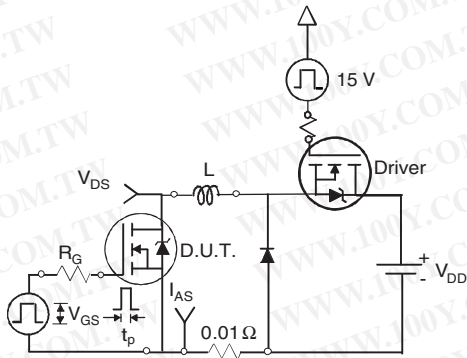


Fig. 12a - Unclamped Inductive Test Circuit

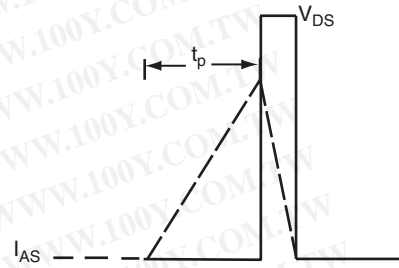


Fig. 12b - Unclamped Inductive Waveforms

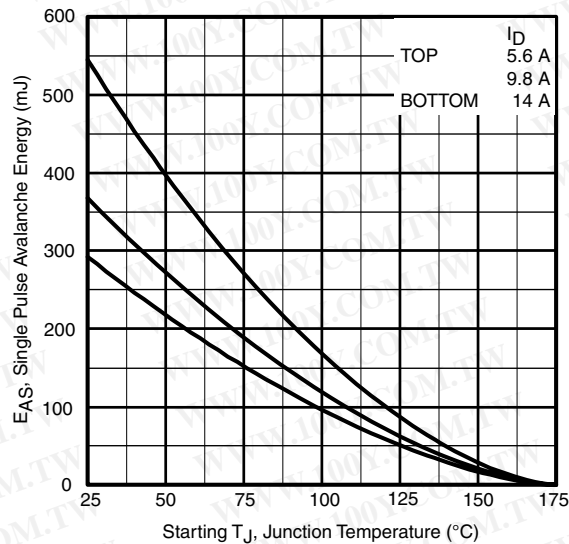


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

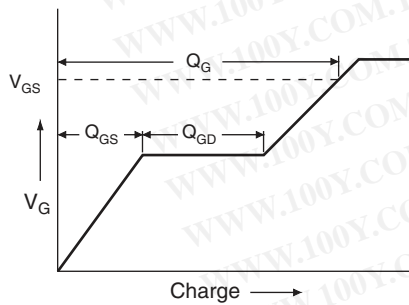


Fig. 13a - Basic Gate Charge Waveform

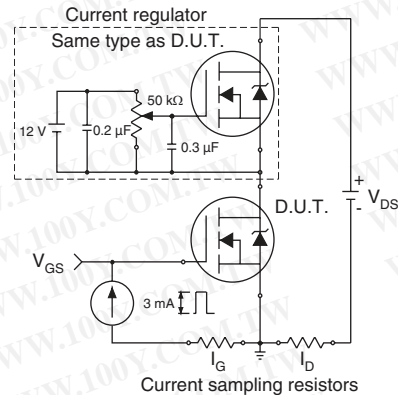
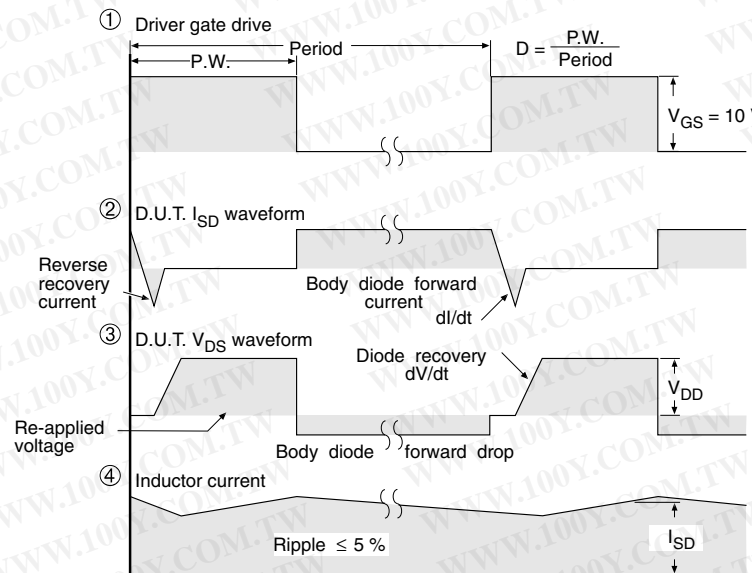
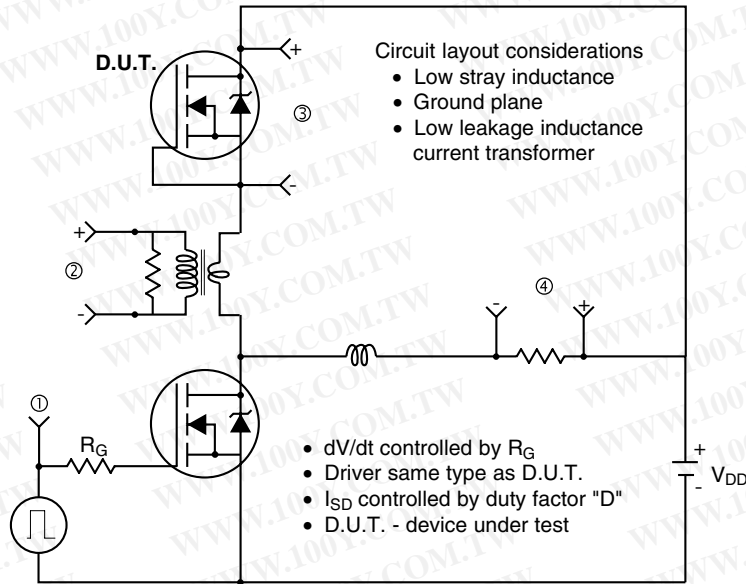


Fig. 13b - Gate Charge Test

## Peak Diode Recovery dV/dt Test Circuit



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

Fig. 14 - For N-Channel

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