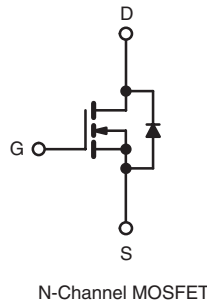


Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	200	
$R_{DS(on)}$ (Ω)	$V_{GS} = 5.0$ V	0.18
Q_g (Max.) (nC)	66	
Q_{gs} (nC)	9.0	
Q_{gd} (nC)	38	
Configuration	Single	

TO-220 FULLPAK


FEATURES

- Isolated Package
- High Voltage Isolation = 2.5 kV_{RMS} ($t = 60$ s; $f = 60$ Hz)
- Sink to Lead Creepage Dist. 4.8 mm
- Logic-Level Gate Drive
- $R_{DS(on)}$ Specified at $V_{GS} = 4$ V and 5 V
- Fast Switching
- Ease of paralleling
- Lead (Pb)-free 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 TO-220 FULLPAK eliminates the need for additional insulating hardware in commercial-industrial applications. The molding compound used provides a high isolation capability and a low thermal resistance between the tab and external heatsink. This isolation is equivalent to using a 100 micron mica barrier with standard TO-220 product. The FULLPAK is mounted to a heatsink using a single clip or by a single screw fixing.

ORDERING INFORMATION	
Package	TO-220 FULLPAK
Lead (Pb)-free	IRLI640GPbF
	SiHLI640G-E3
SnPb	IRLI640G
	SiHLI640G

ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted					
PARAMETER		SYMBOL	LIMIT	UNIT	
Drain-Source Voltage		V_{DS}	200	V	
Gate-Source Voltage		V_{GS}	± 10		
Continuous Drain Current	V_{GS} at 5.0 V	I_D	$T_C = 25$ °C	9.9	A
			$T_C = 100$ °C	6.3	
Pulsed Drain Current ^a		I_{DM}	40		
Linear Derating Factor			0.32	W/°C	
Single Pulse Avalanche Energy ^b		E_{AS}	290	mJ	
Repetitive Avalanche Current ^a		I_{AR}	9.9	A	
Repetitive Avalanche Energy ^a		E_{AR}	4.0	mJ	
Maximum Power Dissipation	$T_C = 25$ °C	P_D	40	W	
Peak Diode Recovery dV/dt^c		dV/dt	5.0	V/ns	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to + 150	°C	
Soldering Recommendations (Peak Temperature)	for 10 s		300 ^d		
Mounting Torque	6-32 or M3 screw		10	lbf · in	
			1.1	N · m	

Notes

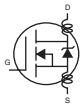
- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 25$ V, starting $T_J = 25$ °C, $L = 4.4$ mH, $R_G = 25$ Ω , $I_{AS} = 9.9$ A (see fig. 12).
- $I_{SD} \leq 17$ A, $dI/dt \leq 150$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 150$ °C.
- 1.6 mm from case.

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

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	65	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	3.1	

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}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	200	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$	-	0.27	-	V/°C	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0	-	2.0	V	
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 10\text{ V}$	-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$	-	-	25	μA	
		$V_{DS} = 160\text{ V}, V_{GS} = 0\text{ V}, T_J = 160\text{ }^\circ\text{C}$	-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 5.0\text{ V}$	-	-	0.18	Ω	
		$V_{GS} = 4.0\text{ V}$	-	-	0.27		
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}, I_D = 10\text{ A}^b$	16	-	-	S	
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V},$ $V_{DS} = 25\text{ V},$ $f = 1.0\text{ MHz}$, see fig. 5	-	1800	-	pF	
Output Capacitance	C_{oss}		-	400	-		
Reverse Transfer Capacitance	C_{rss}		-	120	-		
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 17\text{ A}, V_{DS} = 160\text{ V},$ see fig. 6 and 13 ^b	-	-	66	nC
Gate-Source Charge	Q_{GS}			-	-	9.0	
Gate-Drain Charge	Q_{GD}			-	-	38	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 100\text{ V}, I_D = 17\text{ A},$ $R_G = 4.6\text{ }\Omega, R_D = 5.7\text{ }\Omega,$ see fig. 10 ^b	-	8.0	-	ns	
Rise Time	t_r		-	83	-		
Turn-Off Delay Time	$t_{d(off)}$		-	44	-		
Fall Time	t_f		-	52	-		
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact	-	4.5	-	nH	
Internal Source Inductance	L_S		-	7.5	-		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	9.9	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	40	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 9.9\text{ A}, V_{GS} = 0\text{ V}^b$		-	-	2.0	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = 17\text{ A}, di/dt = 100\text{ A}/\mu\text{s}^b$		-	310	470	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	3.2	4.8	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 °C, unless otherwise noted

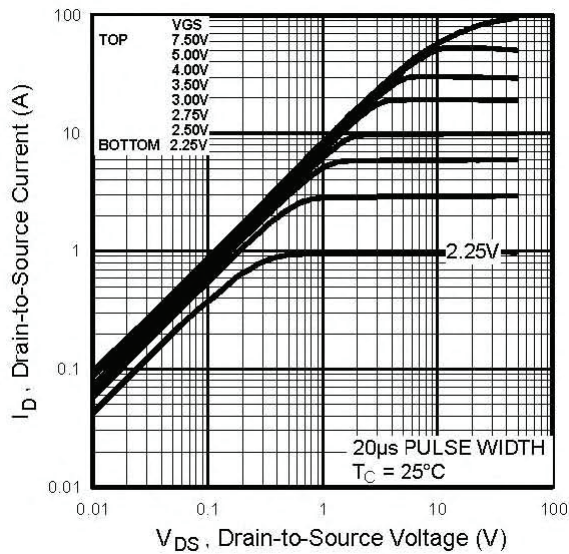


Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

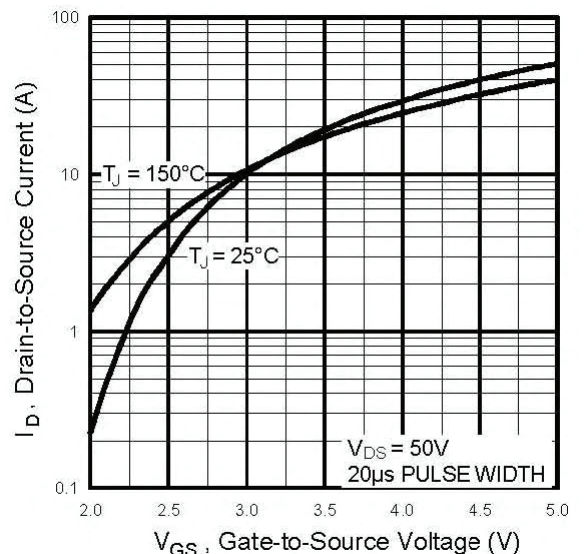


Fig. 3 - Typical Transfer Characteristics

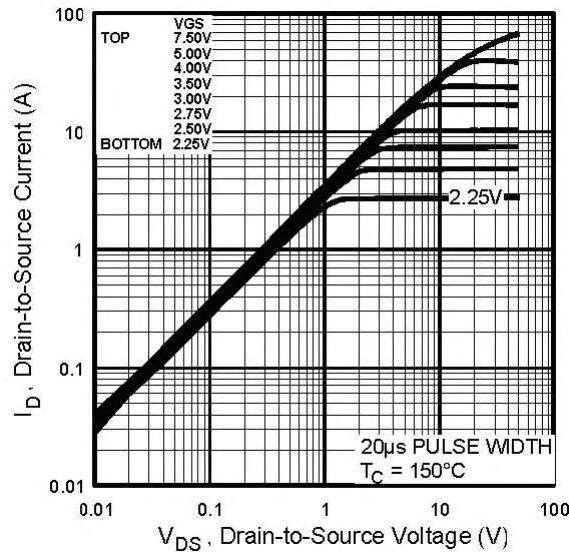


Fig. 2 - Typical Output Characteristics, $T_C = 150^\circ\text{C}$

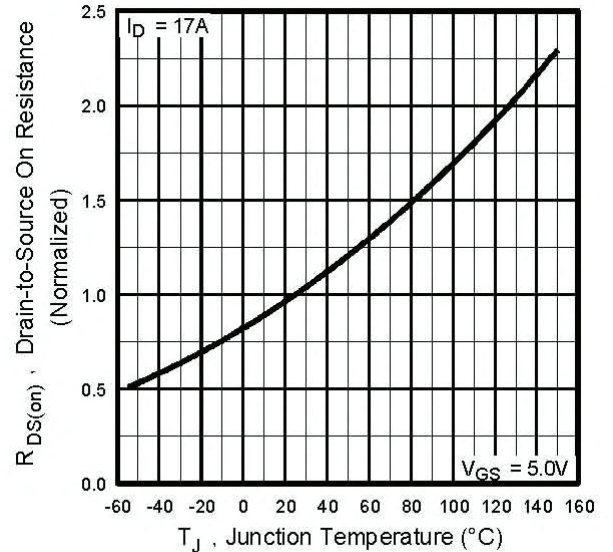


Fig. 4 - Normalized On-Resistance vs. Temperature

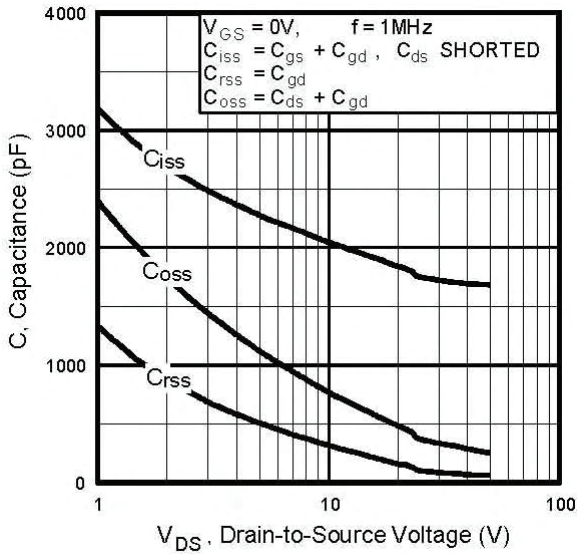


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

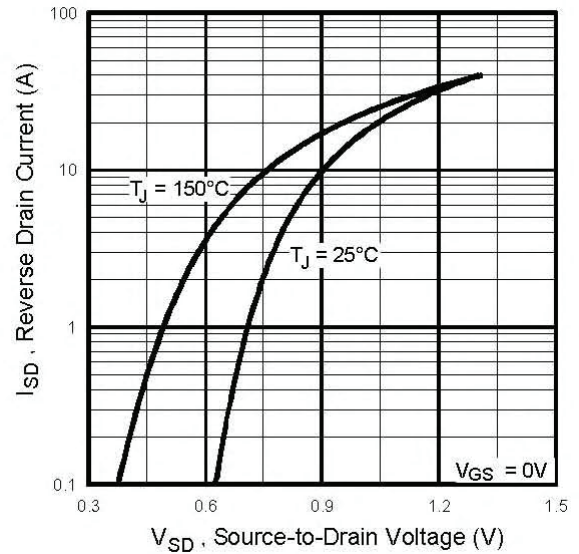


Fig. 7 - Typical Source-Drain Diode Forward Voltage

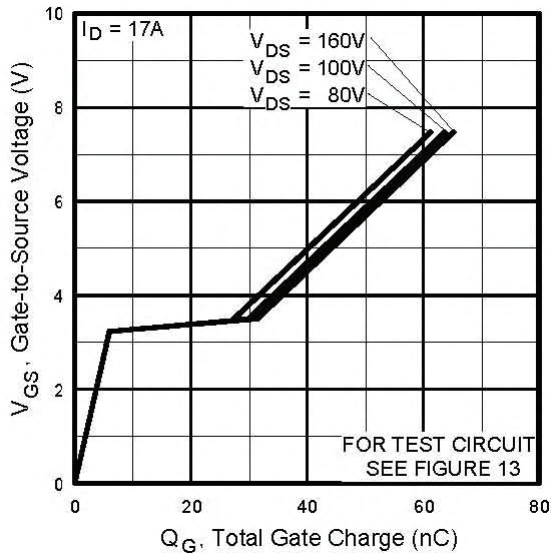


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

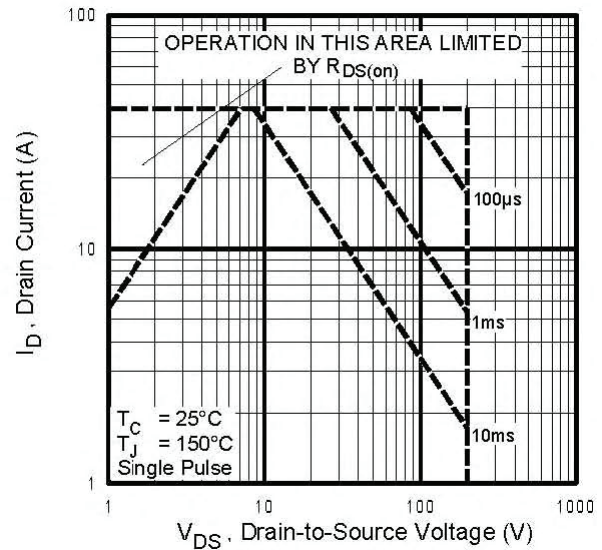


Fig. 8 - Maximum Safe Operating Area

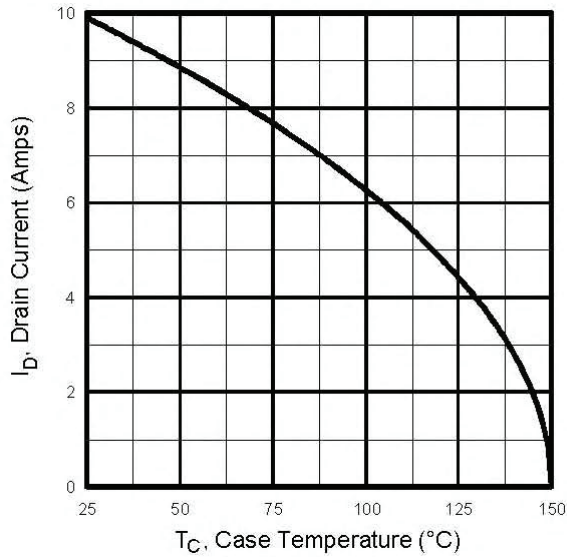


Fig. 9 - Maximum Drain Current vs. Case Temperature

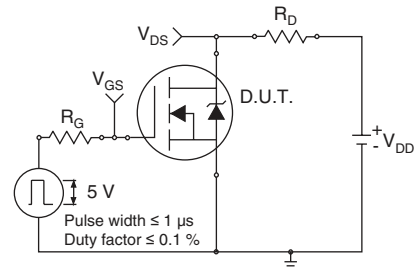


Fig. 10a - Switching Time Test Circuit



Fig. 10b - Switching Time Waveforms

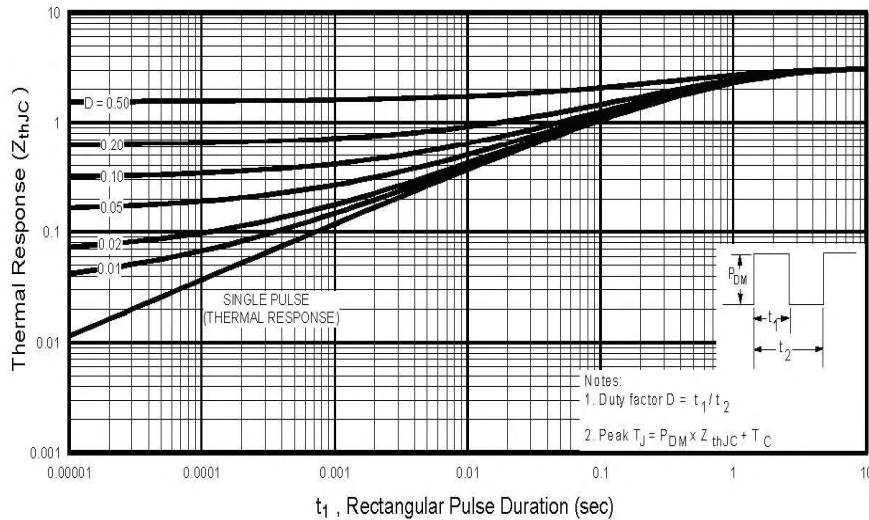


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

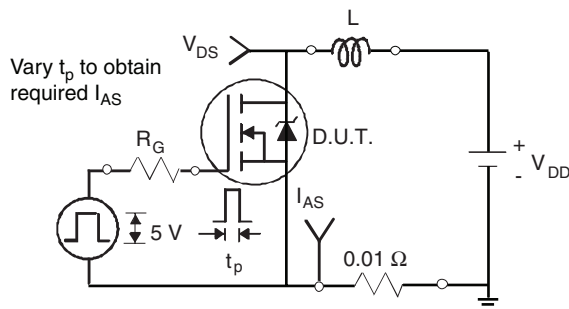


Fig. 12a - Unclamped Inductive Test Circuit

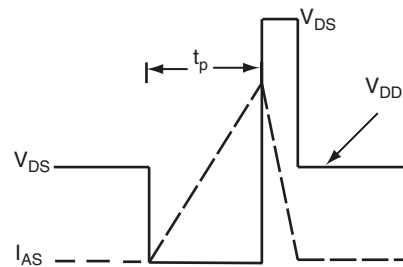


Fig. 12b - Unclamped Inductive Waveforms

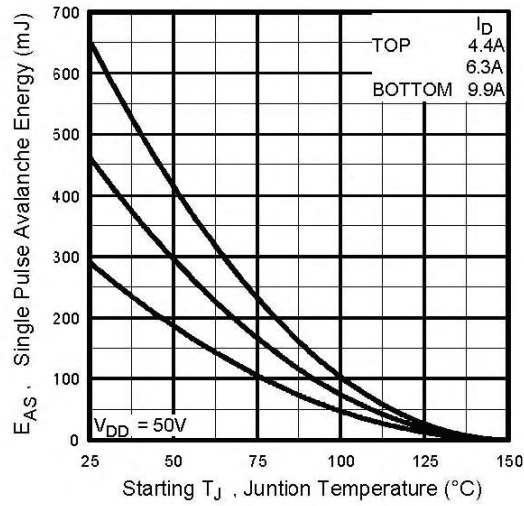


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

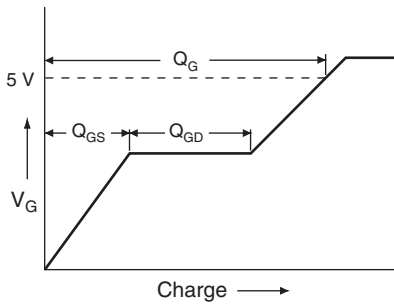


Fig. 13a - Basic Gate Charge Waveform

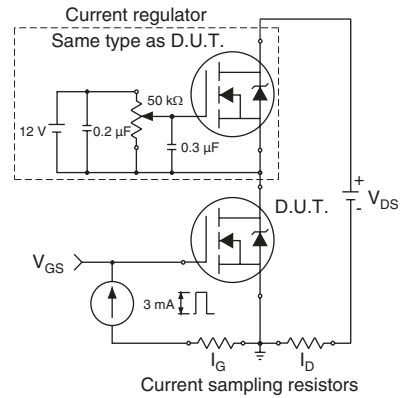
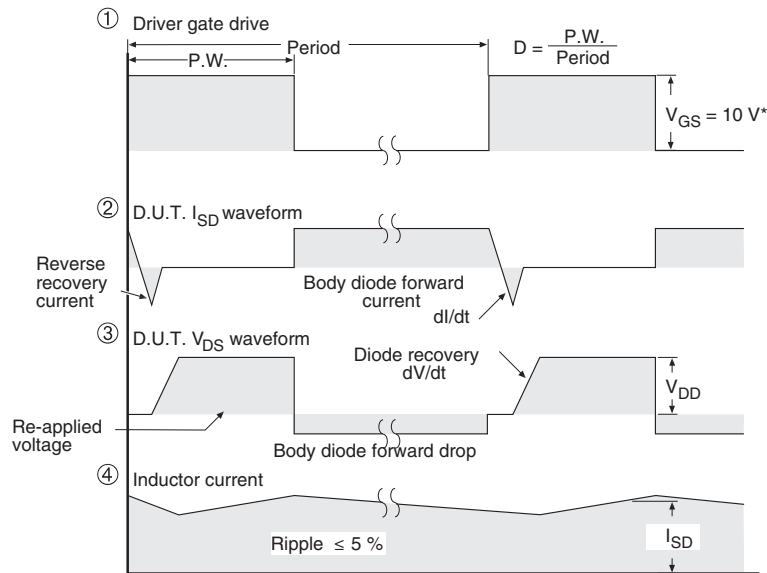
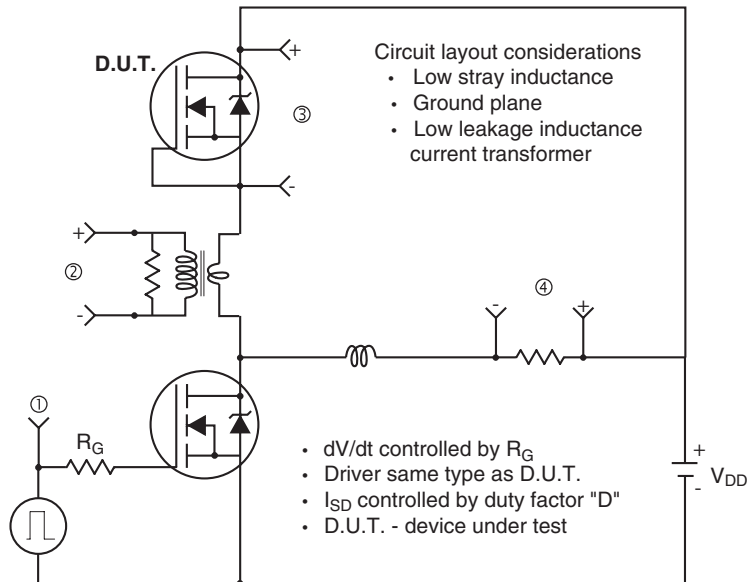


Fig. 13b - Gate Charge Test Circuit

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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