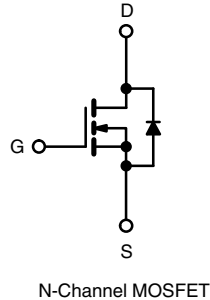
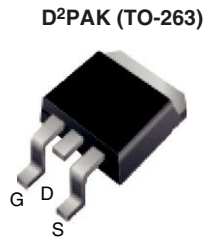


Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	500	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10$ V	0.52
Q_g (Max.) (nC)	52	
Q_{gs} (nC)	13	
Q_{gd} (nC)	18	
Configuration	Single	



FEATURES

- Low Gate Charge Q_g results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dV/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Effective C_{oss} Specified
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912



Note

* This datasheet provides information about parts that are RoHS-compliant and/or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information/tables in this datasheet for details.

APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High Speed Power Switching

TYPICAL SMPS TOPOLOGIES

- Two Transistor Forward
- Half and Full Bridge
- Power Factor Correction Boost

ORDERING INFORMATION			
Package	D ² PAK (TO-263)	D ² PAK (TO-263)	D ² PAK (TO-263)
Lead (Pb)-free and Halogen-free	SiHFS11N50A-GE3	SiHFS11N50ATTR-GE3 ^a	SiHFS11N50ATRL-GE3 ^a
Lead (Pb)-free	IRFS11N50APbF	IRFS11N50ATRRP ^a	IRFS11N50ATRLP ^a

Note

a. See device orientation.


ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)					
PARAMETER	SYMBOL		LIMIT	UNIT	
Drain-Source Voltage	V_{DS}		500	V	
Gate-Source Voltage	V_{GS}		± 30		
Continuous Drain Current	V_{GS} at 10 V	$T_C = 25$ °C	11	A	
		$T_C = 100$ °C	7.0		
Pulsed Drain Current ^a	I_{DM}		44		
Linear Derating Factor			1.3	W/°C	
Single Pulse Avalanche Energy ^b	E_{AS}		275	mJ	
Repetitive Avalanche Current ^a	I_{AR}		11	A	
Repetitive Avalanche Energy ^a	E_{AR}		17	mJ	
Maximum Power Dissipation	$T_C = 25$ °C		P_D	170	W
Peak Diode Recovery dV/dt ^c			dV/dt	6.9	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{stg}		- 55 to + 150	°C	
Soldering Recommendations (Peak Temperature) ^d	for 10 s		300		

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Starting $T_J = 25$ °C, $L = 4.5$ mH, $R_G = 25$ Ω , $I_{AS} = 11$ A (see fig. 12).
- $I_{SD} \leq 11$ A, $dI/dt \leq 140$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 150$ °C.
- 1.6 mm from case.



THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.75	°C/W
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.50	-	
Maximum Junction-to-Ambient	R_{thJA}	-	62	

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}	$V_{GS} = 0, I_D = 250\text{ }\mu\text{A}$	500	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$	-	0.060	-	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}	$V_{GS} = \pm 30\text{ V}$	-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$	-	-	25	μA	
		$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 6.6\text{ A}^b$	-	-	0.52	Ω	
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}, I_D = 6.6\text{ A}$	6.1	-	-	S	
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1.0\text{ MHz}$, see fig. 5	-	1423	-	pF	
Output Capacitance	C_{oss}		-	208	-		
Reverse Transfer Capacitance	C_{rss}		-	8.1	-		
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$	$V_{DS} = 1.0\text{ V}, f = 1.0\text{ MHz}$	-	2000	-	
Effective Output Capacitance	$C_{oss\text{ eff.}}$		$V_{DS} = 400\text{ V}, f = 1.0\text{ MHz}$	-	55	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 11\text{ A}, V_{DS} = 400\text{ V}$ see fig. 6 and 13 ^b	-	-	52	nC
Gate-Source Charge	Q_{gs}			-	-	13	
Gate-Drain Charge	Q_{gd}			-	-	18	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}, I_D = 11\text{ A}$ $R_g = 9.1\text{ }\Omega, R_D = 22\text{ }\Omega$, see fig. 10 ^b	-	14	-	ns	
Rise Time	t_r		-	35	-		
Turn-Off Delay Time	$t_{d(off)}$		-	32	-		
Fall Time	t_f		-	28	-		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p-n junction diode 	-	-	11	A	
Pulsed Diode Forward Current ^a	I_{SM}		-	-	44		
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 11\text{ A}, V_{GS} = 0\text{ V}^b$	-	-	1.5	V	
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = 11\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}^b$	-	510	770	ns	
Body Diode Reverse Recovery Charge	Q_{rr}		-	3.4	5.1	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 $\leq 2\%$.
- 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 % V_{DS} to 80 % V_{DS} .

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

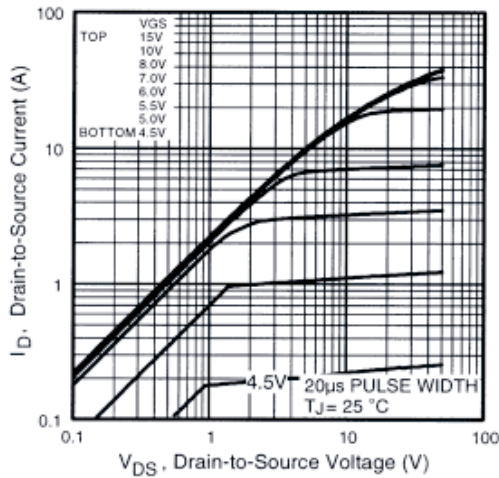


Fig. 1 - Typical Output Characteristics

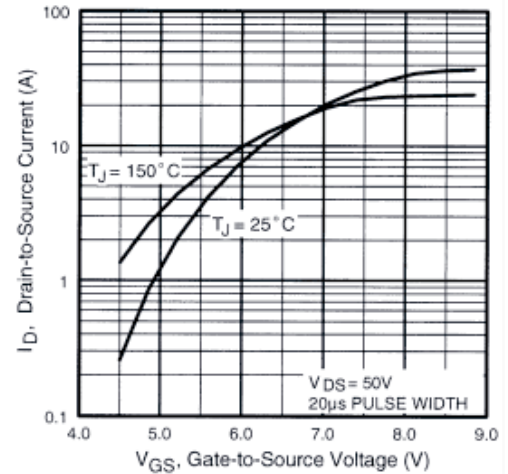


Fig. 3 - Typical Transfer Characteristics

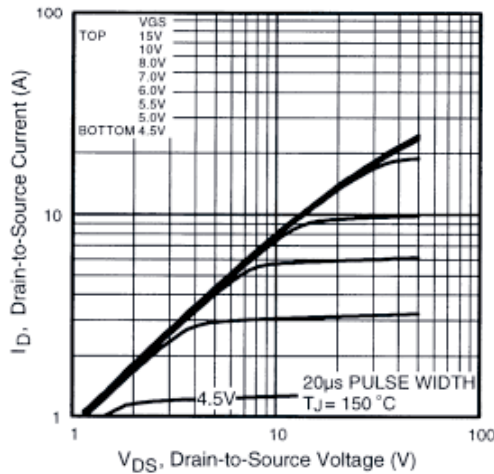


Fig. 2 - Typical Output Characteristics

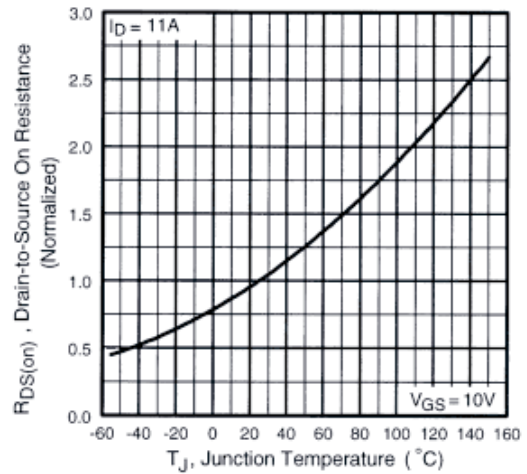


Fig. 4 - Normalized On-Resistance vs. Temperature

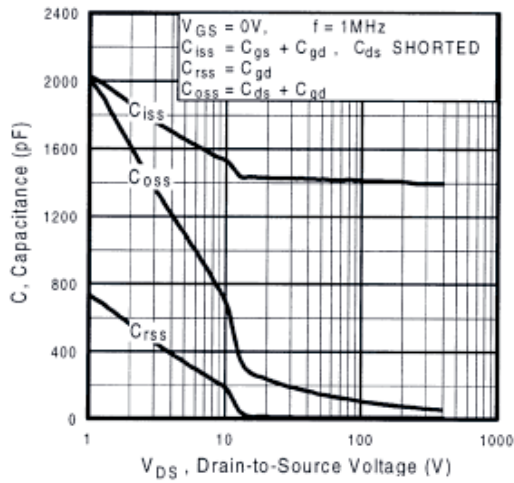


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

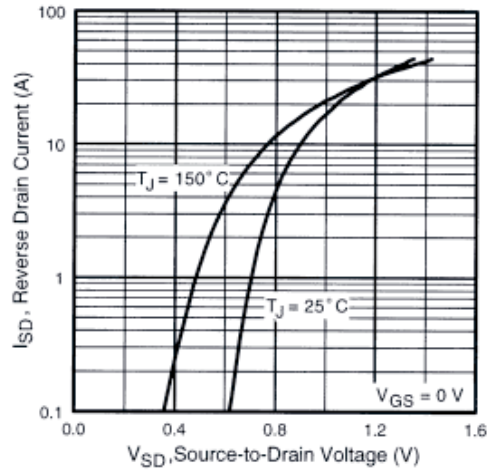


Fig. 7 - Typical Source-Drain Diode Forward Voltage

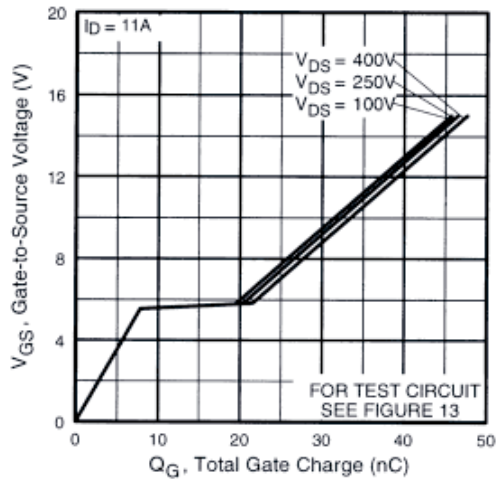


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

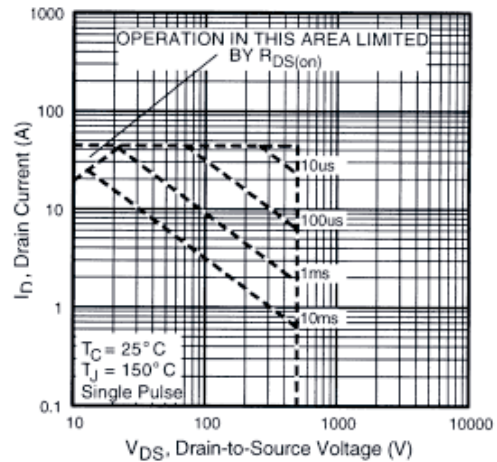


Fig. 8 - Maximum Safe Operating Area

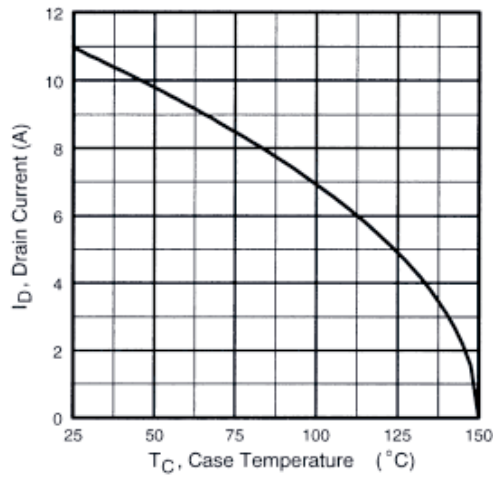


Fig. 9 - Maximum Drain Current vs. Case Temperature

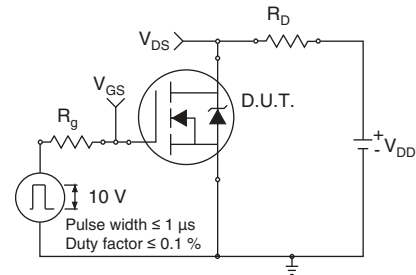


Fig. 10a - Switching Time Test Circuit

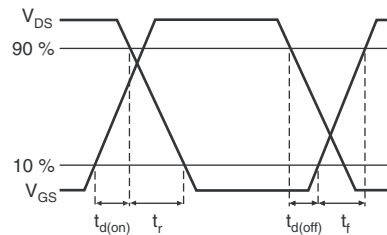


Fig. 10b - Switching Time Waveforms

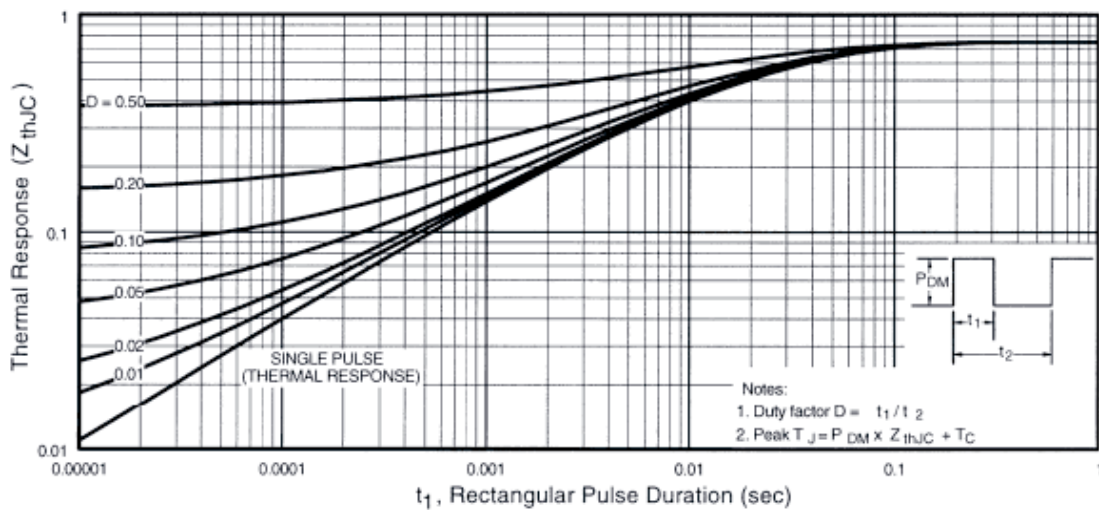


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

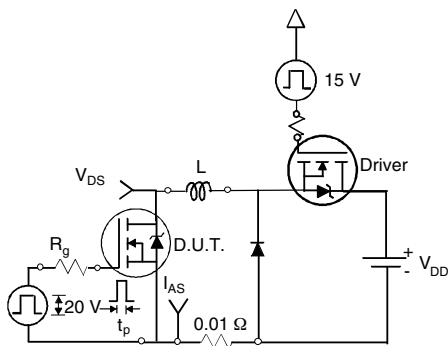


Fig. 12a - Unclamped Inductive Test Circuit

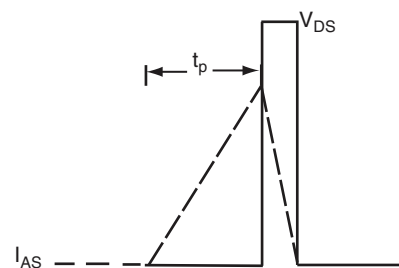


Fig. 12b - Unclamped Inductive Waveforms

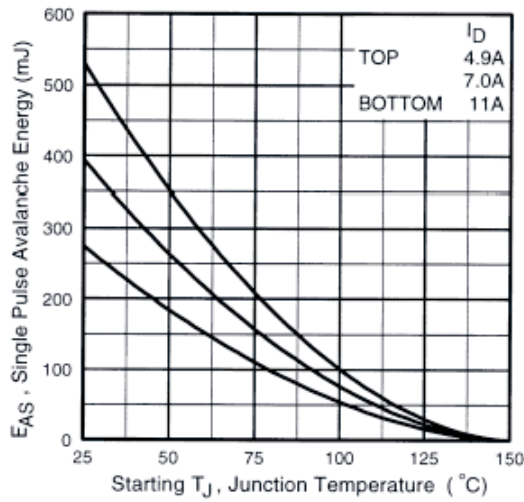


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

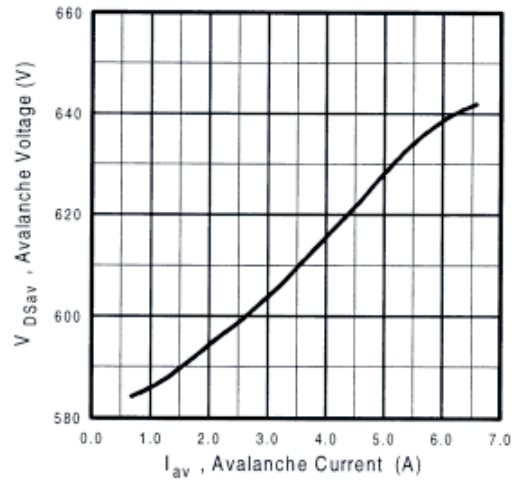


Fig. 12d - Typical Drain-to-Source Voltage vs. Avalanche Current

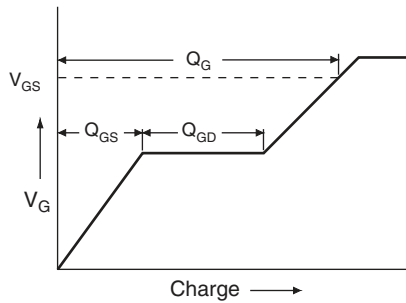


Fig. 13a - Basic Gate Charge Waveform

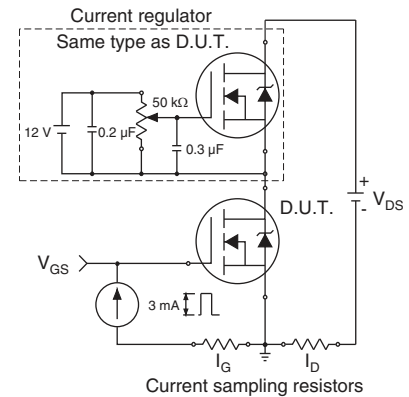
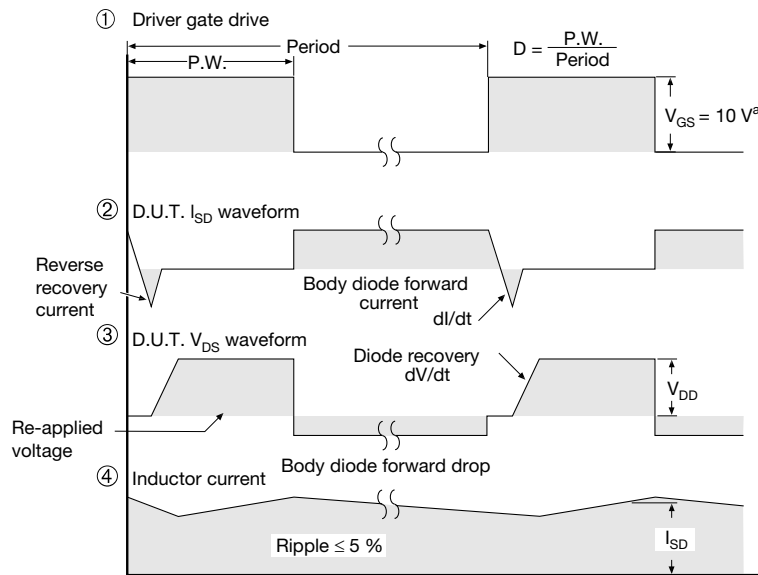
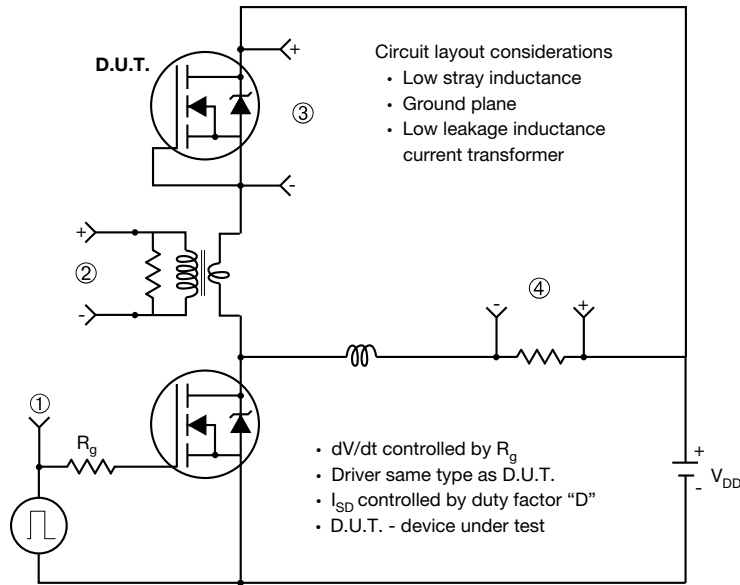


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



Note
a. $V_{GS} = 5\text{ V}$ for logic level devices

Fig. 14 - For N-Channel

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RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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