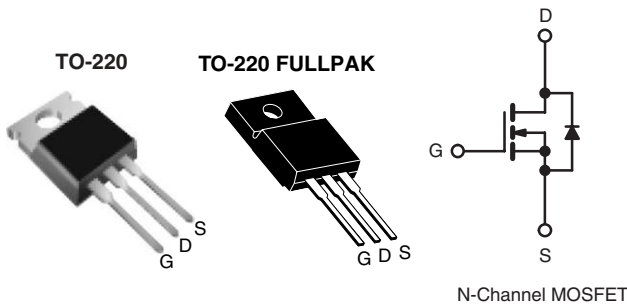


## Power MOSFET

PRODUCT SUMMARY	
$V_{DS}$ (V) at $T_J$ max.	560
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = 10\text{ V}$ 0.225
$Q_g$ (Max.) (nC)	76
$Q_{gs}$ (nC)	21
$Q_{gd}$ (nC)	29
Configuration	Single

### FEATURES

- Low Figure-of-Merit  $R_{on} \times Q_g$
- 100 % Avalanche Tested
- High Peak Current Capability
- dV/dt Ruggedness
- Improved  $t_{rr}/Q_{rr}$
- Improved Gate Charge
- High Power Dissipations Capability
- Compliant to RoHS Directive 2002/95/EC



ORDERING INFORMATION		
Package	TO-220	TO-220 FULLPAK
Lead (Pb)-free	SiHP18N50C-E3	SiHF18N50C-E3


ABSOLUTE MAXIMUM RATINGS $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise noted				
PARAMETER	SYMBOL		LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$		500	V
Gate-Source Voltage	$V_{GS}$		$\pm 30$	
Continuous Drain Current ( $T_J = 150\text{ }^\circ\text{C}$ ) <sup>a</sup>	$V_{GS}$ at 10 V	$T_C = 25\text{ }^\circ\text{C}$	18	A
		$T_C = 100\text{ }^\circ\text{C}$	11	
Pulsed Drain Current <sup>b</sup>	$I_{DM}$		72	
Linear Derating Factor	TO-220		1.8	W/ $^\circ\text{C}$
	FULLPAK		0.3	
Single Pulse Avalanche Energy <sup>c</sup>	$E_{AS}$		361	mJ
Maximum Power Dissipation	TO-220		223	W
	FULLPAK		38	
Peak Diode Recovery dV/dt <sup>d</sup>	dV/dt		5	V/ns
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$		- 55 to + 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature) <sup>d</sup>	for 10 s		300	

### Notes

- Drain current limited by maximum junction temperature.
- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50\text{ V}$ , starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 2.5\text{ mH}$ ,  $R_g = 25\text{ }\Omega$ ,  $I_{AS} = 17\text{ A}$ .
- $I_{SD} \leq 18\text{ A}$ ,  $dI/dt \leq 380\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 150\text{ }^\circ\text{C}$ .
- 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	TO-220	$R_{thJA}$	-	62	°C/W
	FULLPAK		-	65	
Maximum Junction-to-Case (Drain)	TO-220	$R_{thJC}$	-	0.56	
	FULLPAK		-	3.29	

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	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	500	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1\text{ mA}$	-	0.6	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	3.0	-	5.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 30\text{ V}$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 500\text{ V}$ , $V_{GS} = 0\text{ V}$	-	-	25	$\mu\text{A}$
		$V_{DS} = 400\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$   $I_D = 10\text{ A}$	-	0.225	0.270	$\Omega$
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 50\text{ V}$ , $I_D = 10\text{ A}$	-	6.4	-	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1.0\text{ MHz}$	-	2451	2942	pF
Output Capacitance	$C_{oss}$		-	300	360	
Reverse Transfer Capacitance	$C_{rss}$		-	26	32	
Internal Gate Resistance	$R_g$	$f = 1.0\text{ MHz}$ , open drain	-	1.1	-	$\Omega$
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{ V}$   $I_D = 18\text{ A}$ , $V_{DS} = 400\text{ V}$	-	65	76	nC
Gate-Source Charge	$Q_{gs}$		-	21	-	
Gate-Drain Charge	$Q_{gd}$		-	29	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}$ , $I_D = 18\text{ A}$ $R_g = 7.5\text{ }\Omega$ , $V_{GS} = 10\text{ V}$	-	80	-	ns
Rise Time	$t_r$		-	27	-	
Turn-Off Delay Time	$t_{d(off)}$		-	32	-	
Fall Time	$t_f$		-	44	-	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	18	A
Pulsed Diode Forward Current	$I_{SM}$		-	-	72	
Body Diode Voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_S = 18\text{ A}$ , $V_{GS} = 0\text{ V}$	-	-	1.5	V
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_F = I_S$ , $dI/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 35\text{ V}$	-	503	-	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	6.7	-	$\mu\text{C}$
Reverse Recovery Current	$I_{RRM}$		-	30	-	A

**Note**

a. Repetitive rating; pulse width limited by maximum junction temperature.

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## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

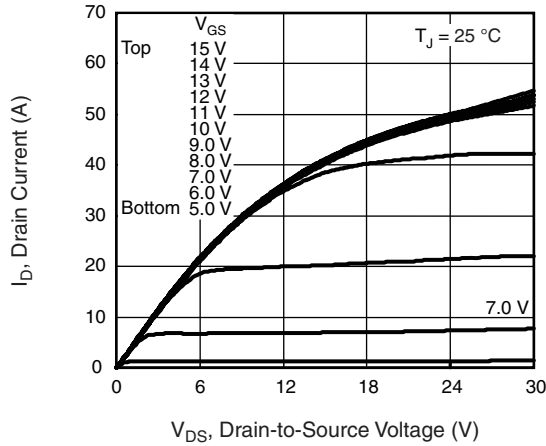


Fig. 1 - Typical Output Characteristics,  $T_C = 150\text{ }^\circ\text{C}$  (TO-220)

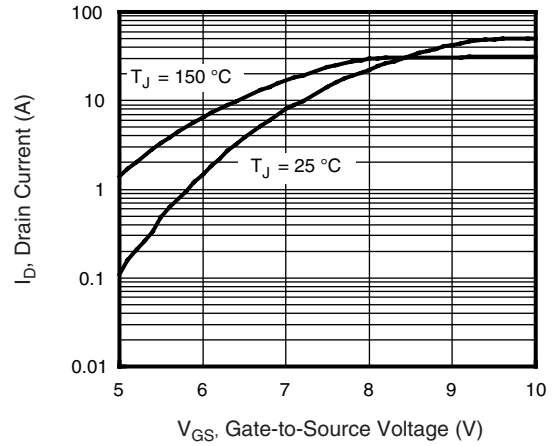


Fig. 3 - Typical Transfer Characteristics

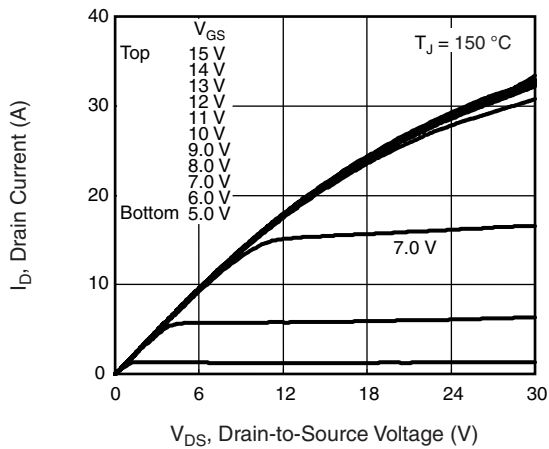


Fig. 2 - Typical Output Characteristics,  $T_C = 150\text{ }^\circ\text{C}$  (TO-220)

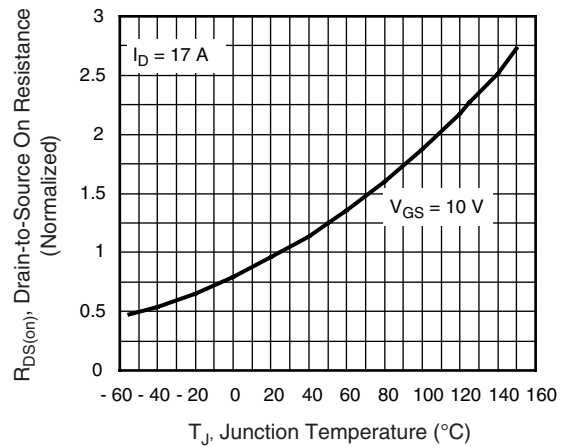


Fig. 4 - Normalized On-Resistance vs. Temperature

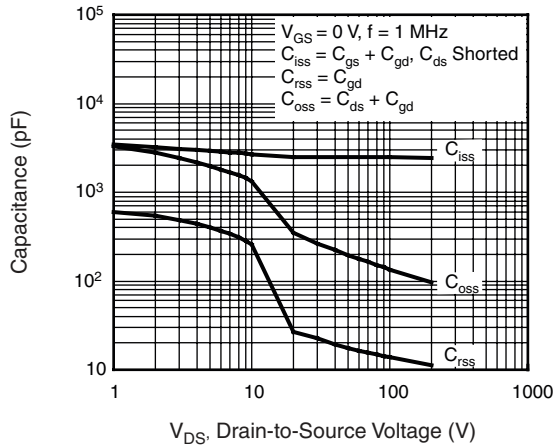


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

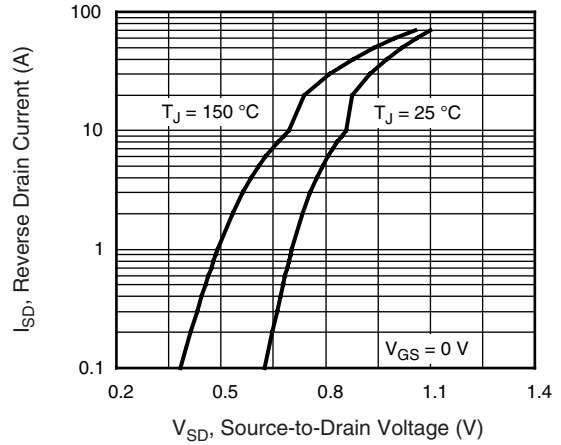


Fig. 7 - Typical Source-Drain Diode Forward Voltage

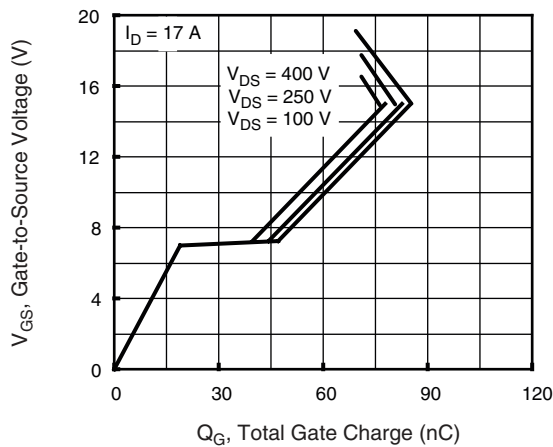


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

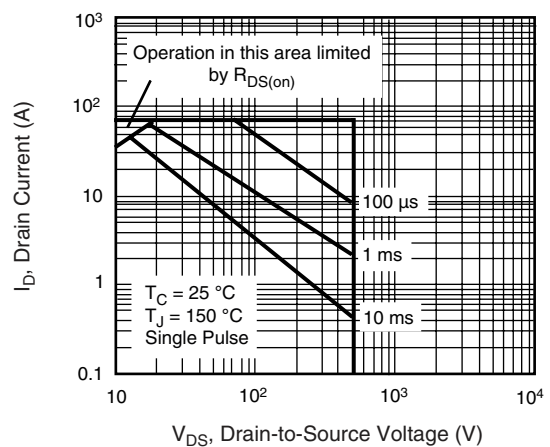


Fig. 8 - Maximum Safe Operating Area

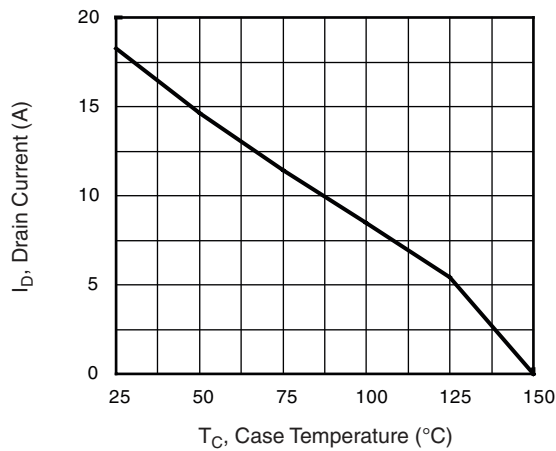
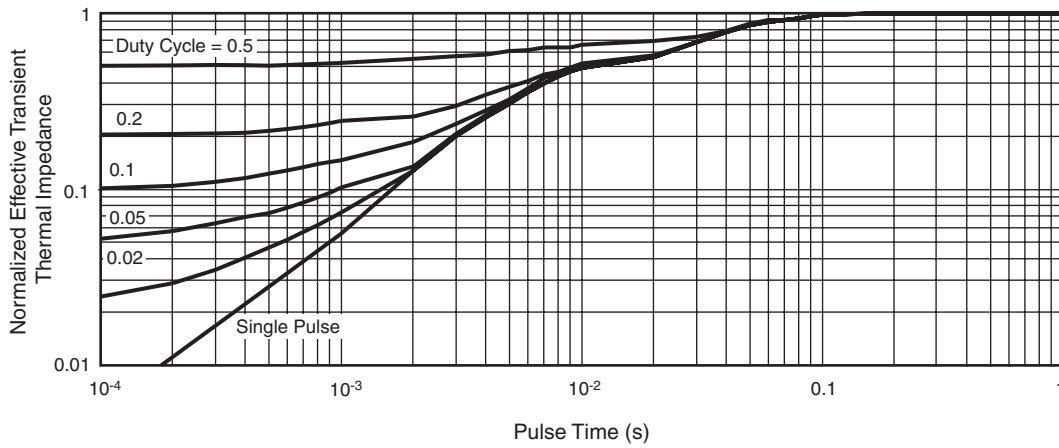
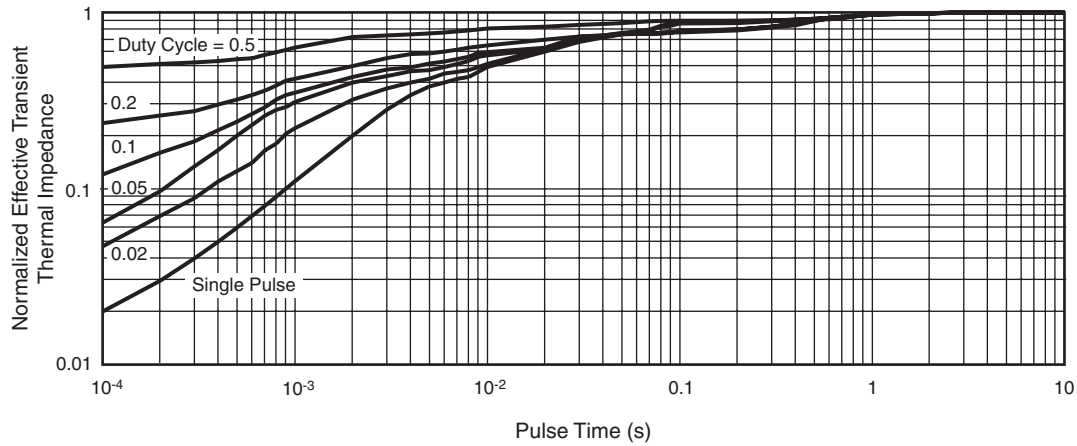


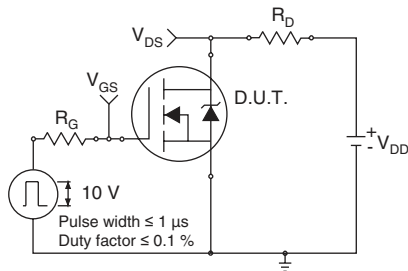
Fig. 9 - Maximum Drain Current vs. Case Temperature (TO-220)



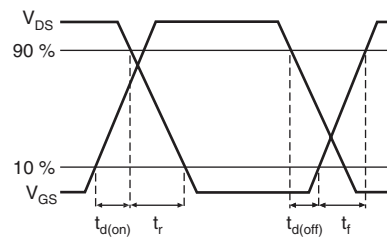
**Fig. 10 - Normalized Thermal Transient Impedance, Junction-to-Case (TO-220)**



**Fig. 11 - Normalized Thermal Transient Impedance, Junction-to-Case (TO-220FP)**



**Fig. 12a - Switching Time Test Circuit**



**Fig. 12b - Switching Time Waveforms**

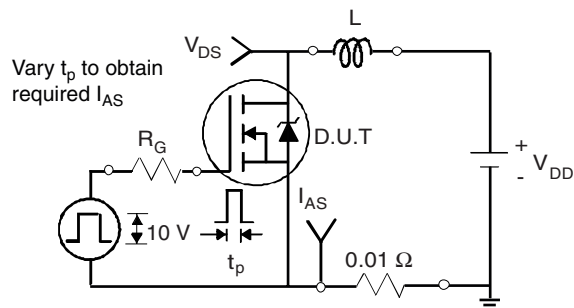


Fig. 13a - Unclamped Inductive Test Circuit

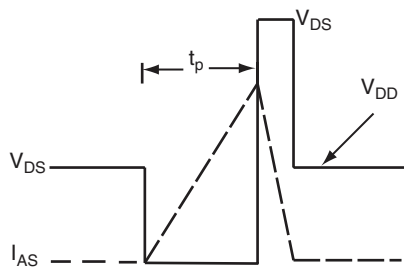


Fig. 13b - Unclamped Inductive Waveforms

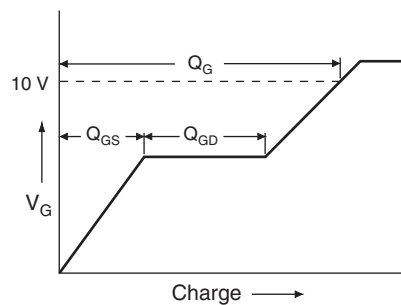


Fig. 14a - Basic Gate Charge Waveform

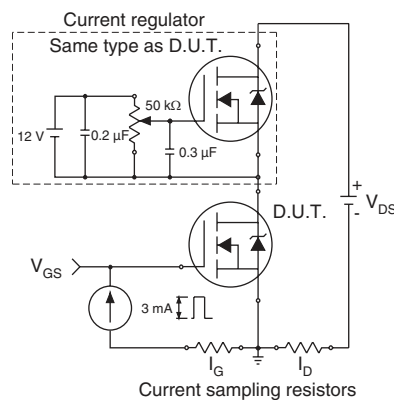
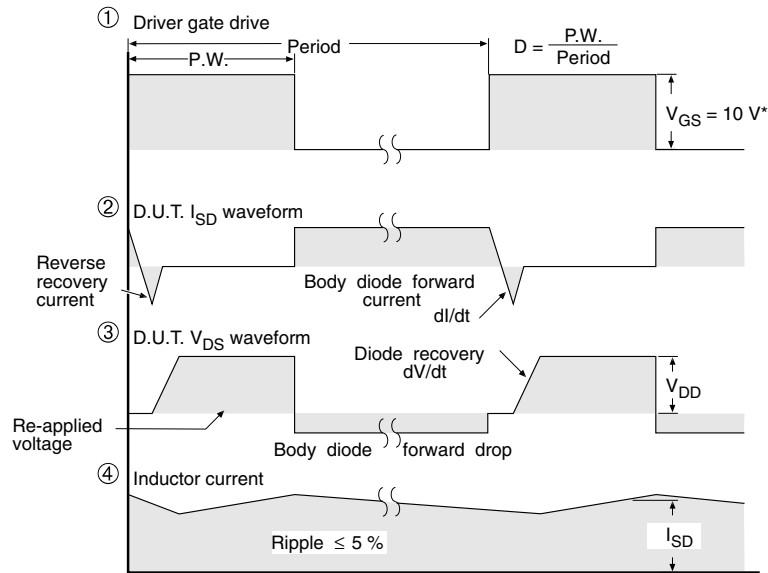
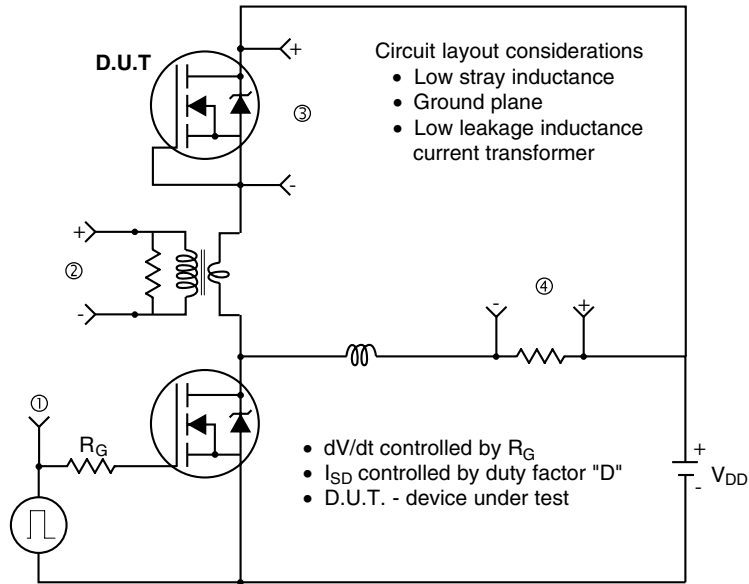


Fig. 14b - Gate Charge Test Circuit

## Peak Diode Recovery dV/dt Test Circuit



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

**Fig. 15 - For N-Channel**

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