

## Power MOSFET

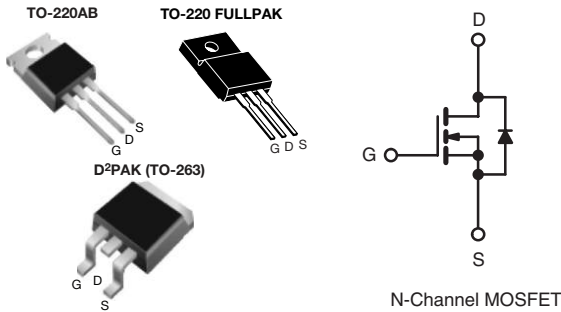
PRODUCT SUMMARY	
$V_{DS}$ (V) at $T_J$ max.	560 V
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = 10$ V   0.38
$Q_g$ (Max.) (nC)	68
$Q_{gs}$ (nC)	17.6
$Q_{gd}$ (nC)	21.8
Configuration	Single

### FEATURES

- Low Figure-of-Merit  $R_{on} \times Q_g$
- 100 % Avalanche Tested
- Gate Charge Improved
- $T_{rr}/Q_{rr}$  Improved
- Compliant to RoHS Directive 2002/95/EC



**RoHS\***  
COMPLIANT



ORDERING INFORMATION			
Package	TO-220AB	D <sup>2</sup> PAK (TO-263)	TO-220 FULLPAK
Lead (Pb)-free	SiHP16N50C-E3	SiHB16N50C-E3	SiHF16N50C-E3

ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted				
PARAMETER	SYMBOL	LIMIT		UNIT
		TO220-AB D <sup>2</sup> PAK (TO-263)	TO-220 FULLPAK	
Drain-Source Voltage	$V_{DS}$	500		V
Gate-Source Voltage	$V_{GS}$	$\pm 30$		
Continuous Drain Current ( $T_J = 150$ °C) <sup>a</sup>	$V_{GS}$ at 10 V	$T_C = 25$ °C	16	A
		$T_C = 100$ °C	10	
Pulsed Drain Current <sup>c</sup>	$I_{DM}$	40		
Linear Derating Factor		2		W/°C
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	320		mJ
Maximum Power Dissipation	$P_D$	250	38	W
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 150		°C
Soldering Recommendations (Peak Temperature) <sup>d</sup>	for 10 s	300		

### Notes


- Limited by maximum junction temperature.
- $V_{DD} = 50$  V, starting  $T_J = 25$  °C,  $L = 2.5$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 16$  A.
- Repetitive rating; pulse width limited by maximum junction temperature.
- 1.6 mm from case.

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

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TO220-AB D <sup>2</sup> PAK (TO-263)	TO-220 FULLPAK	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	62	65	°C/W
Maximum Junction-to-Case (Drain)	$R_{thJC}$	0.5	3.3	
Junction-to-Ambient (PCB mount) <sup>a</sup>	$R_{thJA}$	40	-	

**Note**

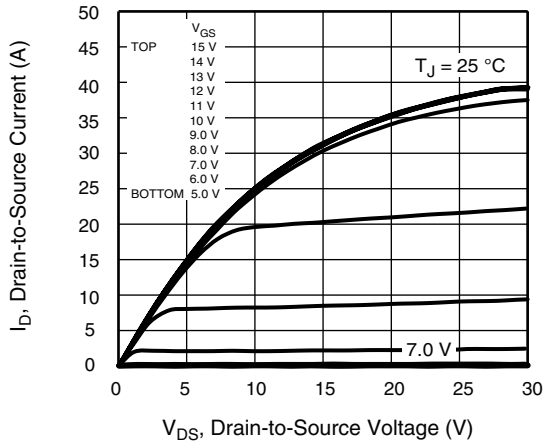
a. When mounted on 1" square PCB (FR-4 or G-10 material).

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<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	$I_{DSS}$	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$		-	-	50	$\mu\text{A}$
		$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 8\text{ A}$	-	0.31	0.38	$\Omega$
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 50\text{ V}, I_D = 3\text{ A}$		-	3	-	S
<b>Dynamic</b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1.0\text{ MHz}$		-	1900	-	pF
Output Capacitance	$C_{oss}$			-	230	-	
Reverse Transfer Capacitance	$C_{rss}$			-	24	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{ V}$	$I_D = 16\text{ A}, V_{DS} = 400\text{ V}$	-	45	68	nC
Gate-Source Charge	$Q_{gs}$			-	18	-	
Gate-Drain Charge	$Q_{gd}$			-	22	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}, I_D = 16\text{ A}, R_g = 9.1\text{ }\Omega, V_{GS} = 10\text{ V}$		-	27	-	ns
Rise Time	$t_r$			-	156	-	
Turn-Off Delay Time	$t_{d(off)}$			-	29	-	
Fall Time	$t_f$			-	31	-	
Gate Input Resistance	$R_g$	$f = 1\text{ MHz}, \text{open drain}$		-	1.6	-	$\Omega$
<b>Drain-Source Body Diode Characteristics</b>							
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	16	A
Pulsed Diode Forward Current	$I_{SM}$			-	-	30	
Body Diode Voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}, I_S = 10\text{ A}, V_{GS} = 0\text{ V}$		-	-	1.8	V
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}, I_F = I_S, dI/dt = 100\text{ A}/\mu\text{s}, V_R = 20\text{ V}$		-	555	-	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			-	5.5	-	$\mu\text{C}$
Body Diode Reverse Recovery Current	$I_{RRM}$			-	18	-	A

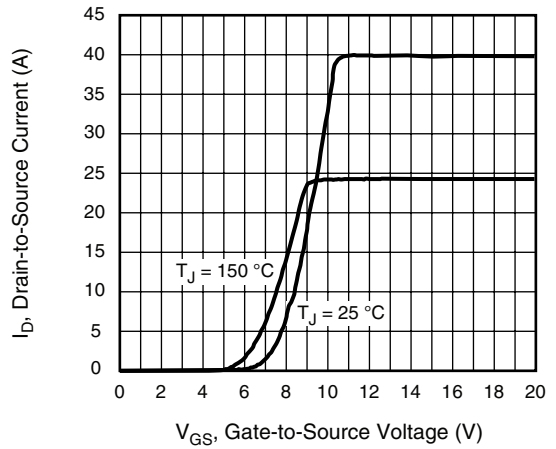
**Note**

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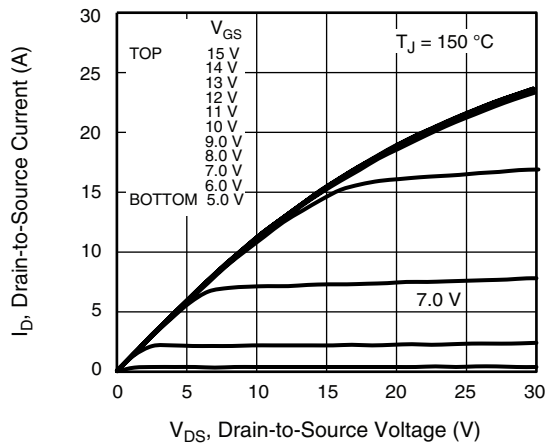
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



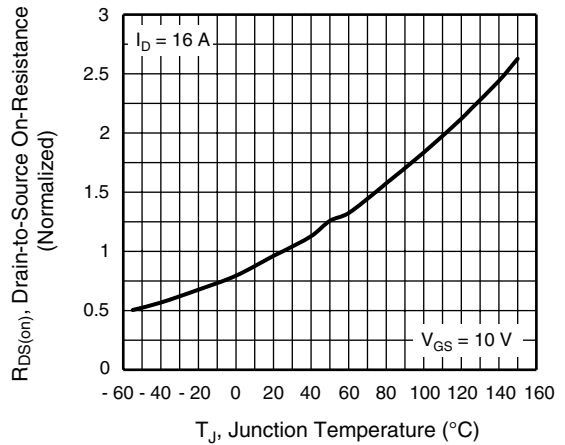
**Fig. 1 - Typical Output Characteristics (TO-220)**



**Fig. 3 - Typical Transfer Characteristics**



**Fig. 2 - Typical Output Characteristics (TO-220)**



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

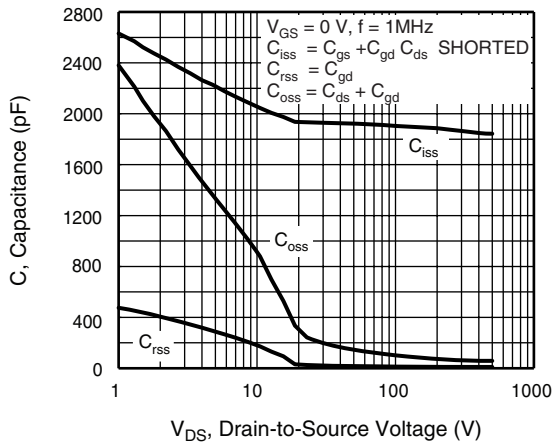


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

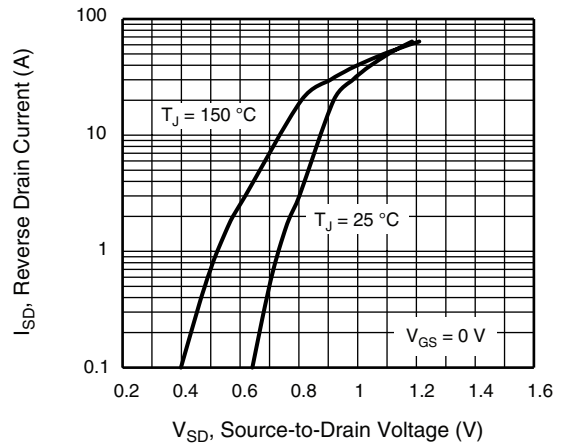


Fig. 7 - Typical Source-Drain Diode Forward Voltage

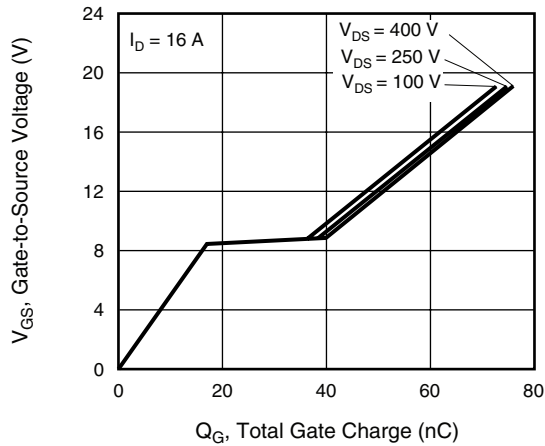


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

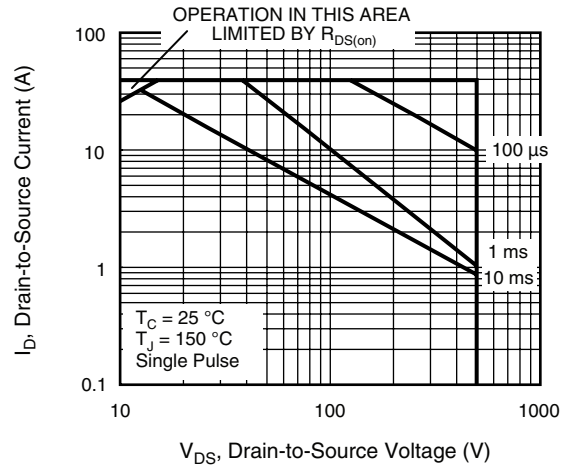


Fig. 8 - Maximum Safe Operating Area (TO-220AB, D<sup>2</sup>PAK)

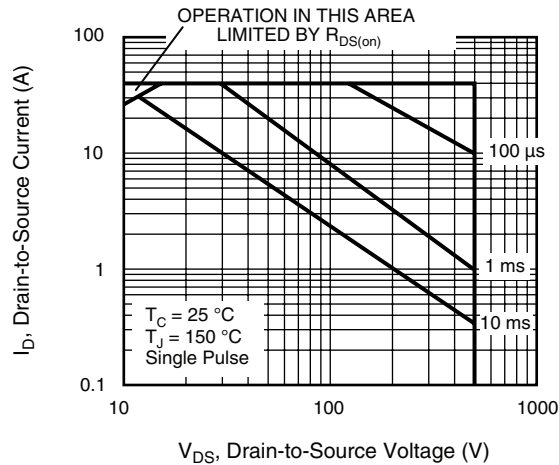


Fig. 9 - Maximum Safe Operating Area (TO-220 FULLPAK)

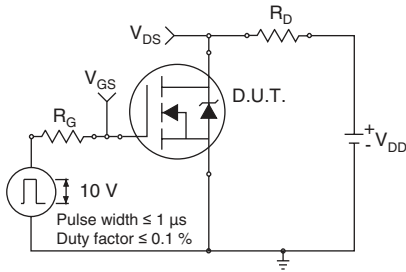


Fig. 10a - Switching Time Test Circuit

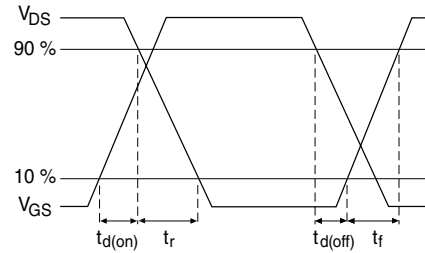


Fig. 10b - Switching Time Waveforms

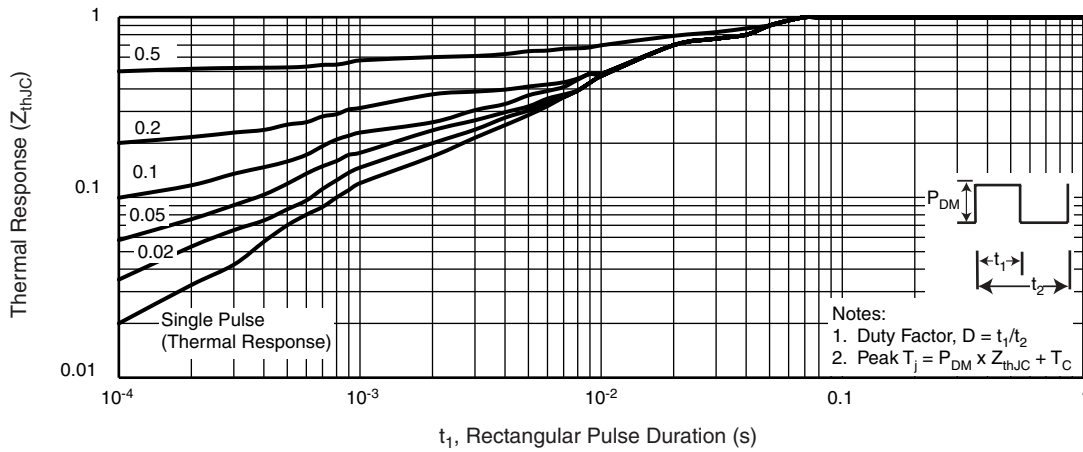


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-220AB, D<sup>2</sup>PAK)

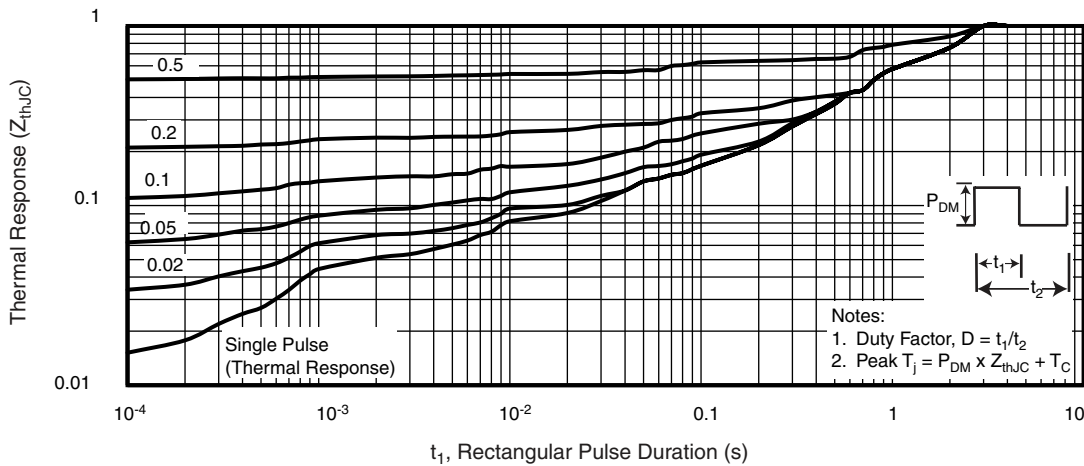


Fig. 12 - Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-220 FULLPAK)

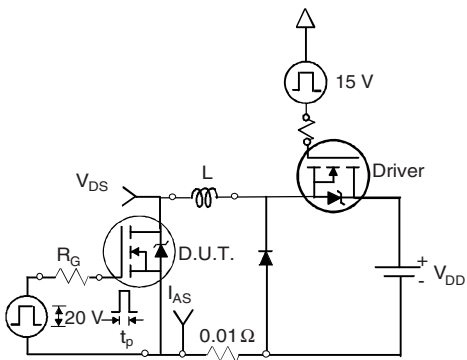


Fig. 13a - Unclamped Inductive Test Circuit

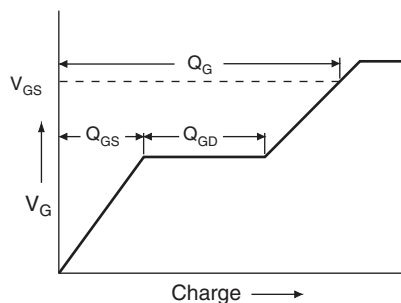


Fig. 14a - Basic Gate Charge Waveform

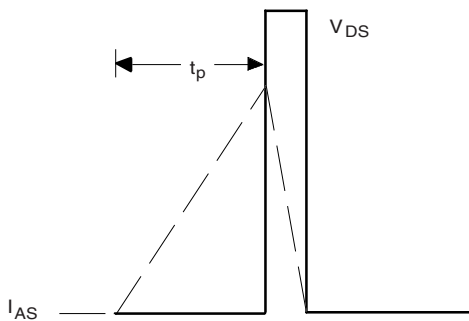


Fig. 13b - Unclamped Inductive Waveforms

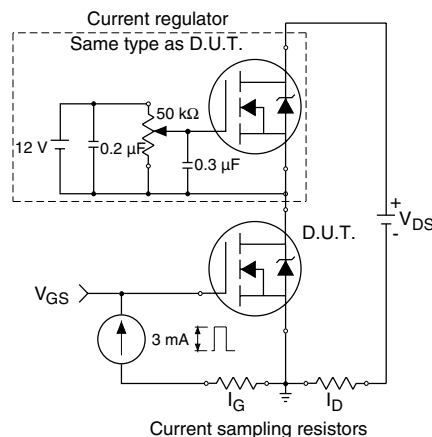
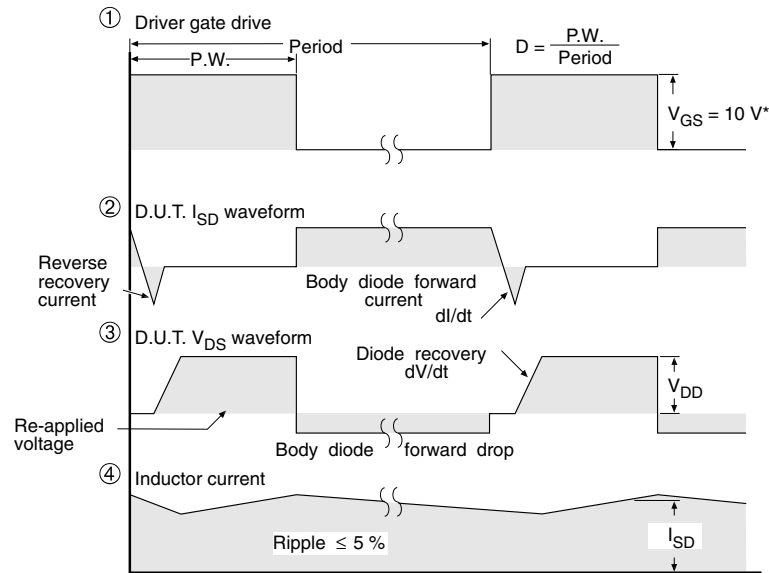
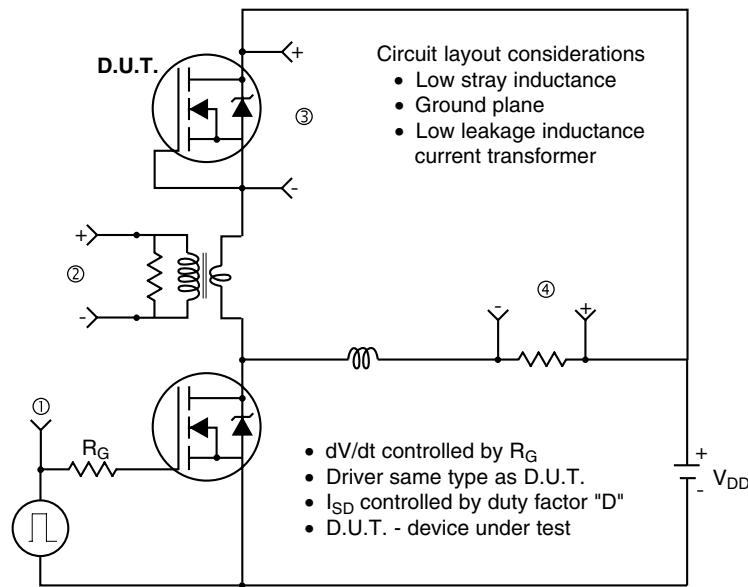


Fig. 14b - Gate Charge Test Circuit

## Peak Diode Recovery dV/dt Test Circuit



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

Fig. 15 - For N-Channel

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А