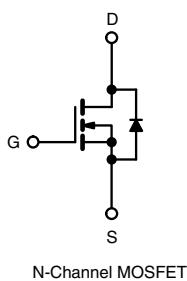
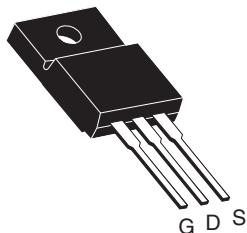


## Power MOSFET

PRODUCT SUMMARY		
$V_{DS}$ (V)	100	
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = 10$ V	0.54
$Q_g$ (Max.) (nC)	8.3	
$Q_{gs}$ (nC)	2.3	
$Q_{gd}$ (nC)	3.8	
Configuration	Single	

### TO-220 FULLPAK



### ORDERING INFORMATION

Package	TO-220 FULLPAK
Lead (Pb)-free	IRFI510GPbF SiHFI510G-E3
SnPb	IRFI510G SiHFI510G

### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current	$I_D$	4.5	A
		3.2	
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	18	
Linear Derating Factor		0.18	W/°C
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	60	mJ
Repetitive Avalanche Current <sup>a</sup>	$I_{AR}$	4.5	A
Repetitive Avalanche Energy <sup>a</sup>	$E_{AR}$	2.7	mJ
Maximum Power Dissipation	$P_D$	27	W
Peak Diode Recovery dV/dt <sup>c</sup>	dV/dt	4.5	V/ns
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 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

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).

b.  $V_{DD} = 25$  V, starting  $T_J = 25$  °C,  $L = 4.4$  mH,  $R_g = 25 \Omega$ ,  $I_{AS} = 4.5$  A (see fig. 12).

c.  $I_{SD} \leq 5.6$  A,  $dI/dt \leq 75$  A/ $\mu$ s,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 175$  °C.

d. 1.6 mm from case.

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



**RoHS**  
COMPLIANT

**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R <sub>thJA</sub>	-	65	°C/W
Maximum Junction-to-Case (Drain)	R <sub>thJC</sub>	-	5.5	

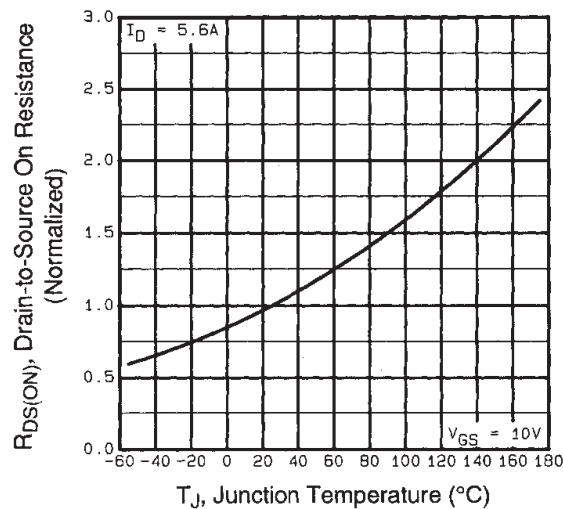
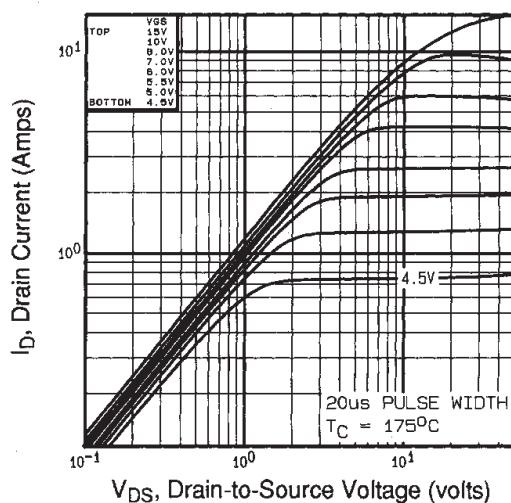
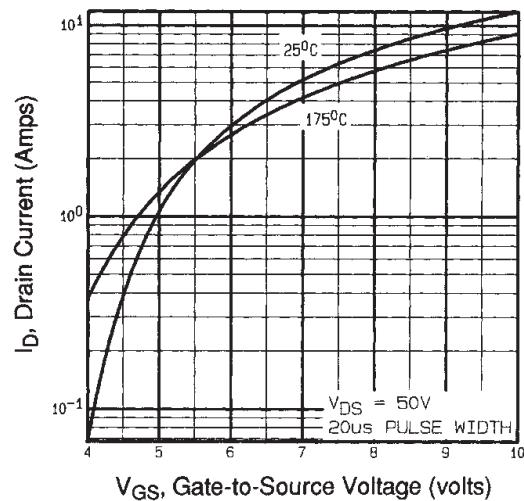
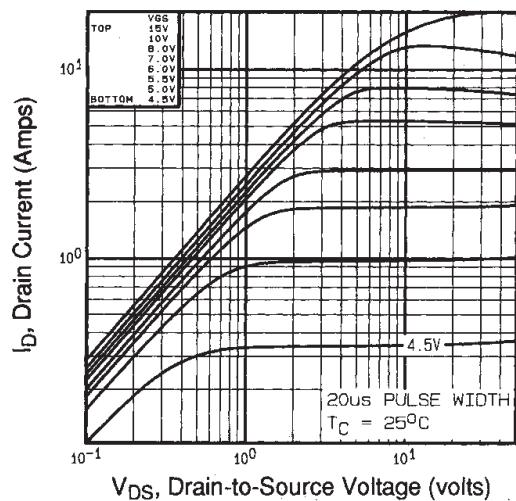
**SPECIFICATIONS** ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
<b>Static</b>								
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA		100	-	-	V	
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	Reference to 25 °C, I <sub>D</sub> = 1 mA		-	0.63	-	V/°C	
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA		2.0	-	4.0	V	
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>GS</sub> = ± 20		-	-	± 100	nA	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V		-	-	25	μA	
		V <sub>DS</sub> = 80 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 150 °C		-	-	250		
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 2.7 A <sup>b</sup>	-	-	0.54	Ω	
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> = 50 V, I <sub>D</sub> = 2.7 A <sup>b</sup>		1.2	-	-	S	
<b>Dynamic</b>								
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V V <sub>DS</sub> = 25 V f = 1.0 MHz, see fig. 5		-	180	-	pF	
Output Capacitance	C <sub>oss</sub>			-	81	-		
Reverse Transfer Capacitance	C <sub>rss</sub>			-	15	-		
Drain to Sink Capacitance	C	f = 1.0 MHz		-	12	-	nC	
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 5.6 A, V <sub>DS</sub> = 80 V, see fig. 6 and 13 <sup>b</sup>	-	-	8.3		
Gate-Source Charge	Q <sub>gs</sub>			-	-	2.3		
Gate-Drain Charge	Q <sub>gd</sub>			-	-	3.8		
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 50 V, I <sub>D</sub> = 5.6 A R <sub>g</sub> = 24 Ω, R <sub>D</sub> = 8.4 Ω, see fig. 10 <sup>b</sup>		-	6.9	-	ns	
Rise Time	t <sub>r</sub>			-	16	-		
Turn-Off Delay Time	t <sub>d(off)</sub>			-	15	-		
Fall Time	t <sub>f</sub>			-	9.4	-		
Internal Drain Inductance	L <sub>D</sub>	Between lead, 6 mm (0.25") from package and center of die contact		-	4.5	-	nH	
Internal Source Inductance	L <sub>S</sub>			-	7.5	-		
<b>Drain-Source Body Diode Characteristics</b>								
Continuous Source-Drain Diode Current	I <sub>S</sub>	MOSFET symbol showing the integral reverse p - n junction diode		-	-	4.5	A	
Pulsed Diode Forward Current <sup>a</sup>	I <sub>SM</sub>			-	-	18		
Body Diode Voltage	V <sub>SD</sub>	T <sub>J</sub> = 25 °C, I <sub>S</sub> = 4.5 A, V <sub>GS</sub> = 0 V <sup>b</sup>		-	-	2.5	V	
Body Diode Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25 °C, I <sub>F</sub> = 5.6 A, di/dt = 100 A/μs <sup>b</sup>		-	100	200	ns	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			-	0.44	0.88	μC	
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> and L <sub>D</sub> )						

**Notes**

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).

b. Pulse width ≤ 300 μs; duty cycle ≤ 2 %.

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


# IRFI510G, SiHFI510G

Vishay Siliconix

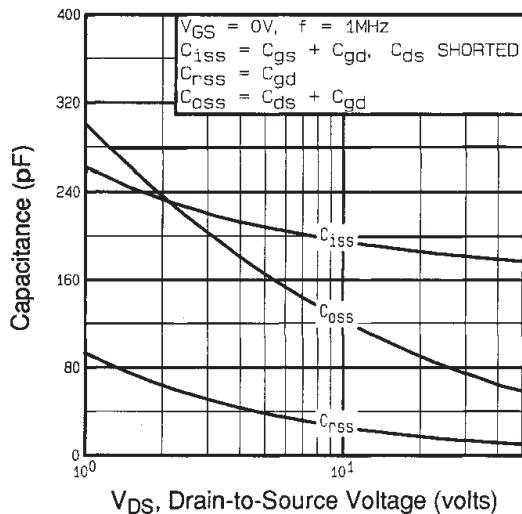


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

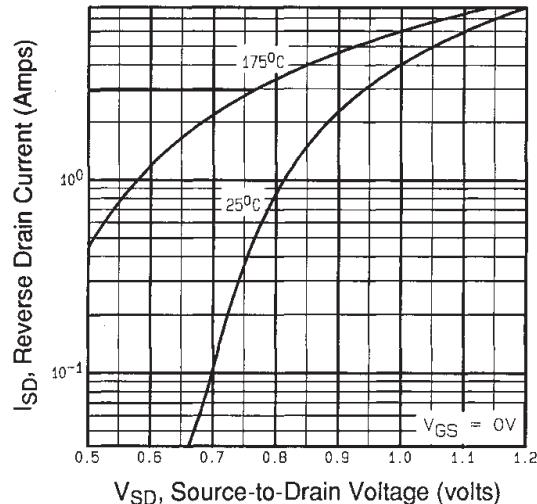


Fig. 7 - Typical Source-Drain Diode Forward Voltage

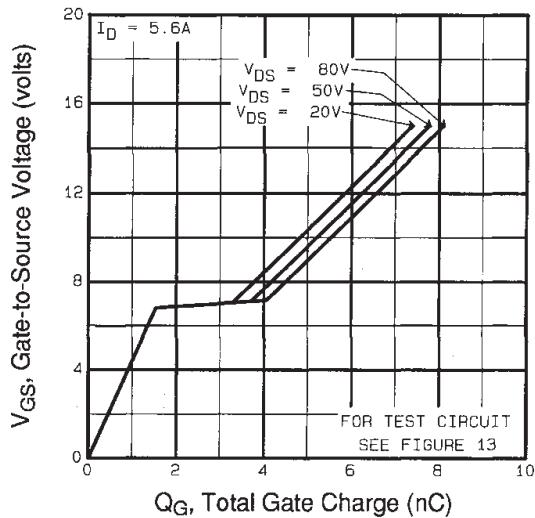


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

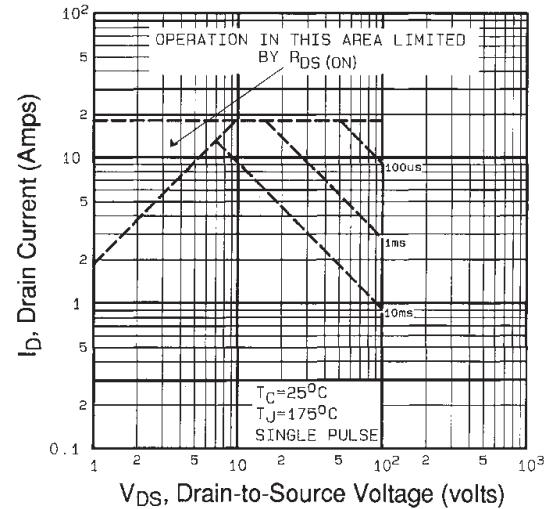


Fig. 8 - Maximum Safe Operating Area

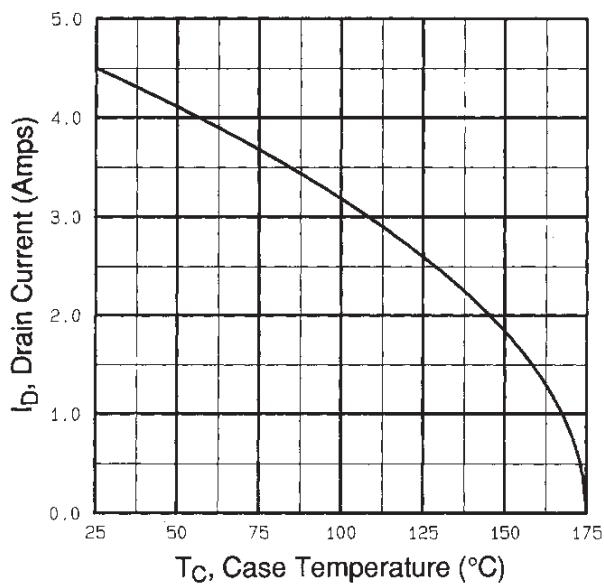


Fig. 9 - Maximum Drain Current vs. Case Temperature

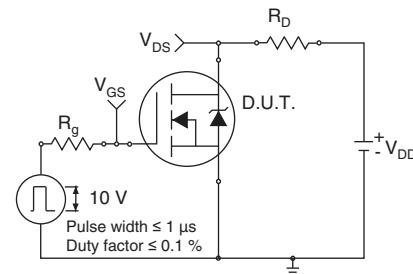


Fig. 10a - Switching Time Test Circuit

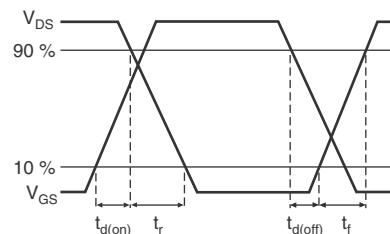


Fig. 10b - Switching Time Waveforms

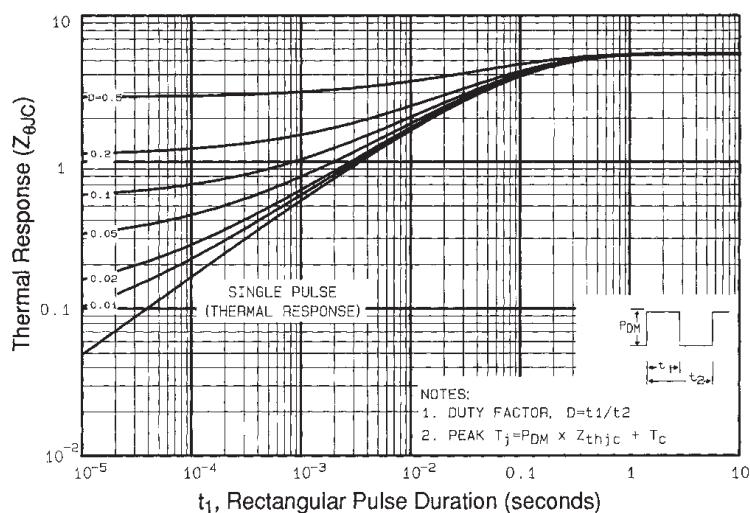


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

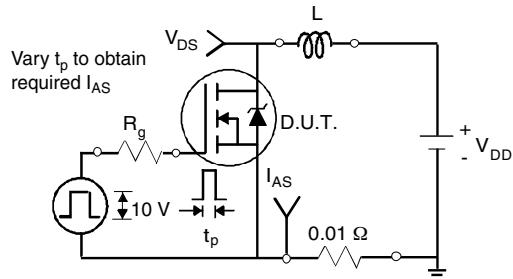


Fig. 12a - Unclamped Inductive Test Circuit

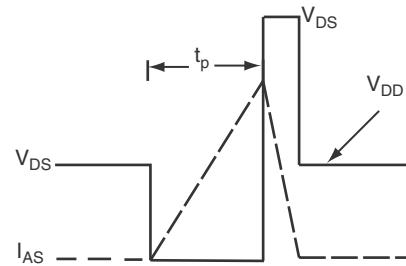


Fig. 12b - Unclamped Inductive Waveforms

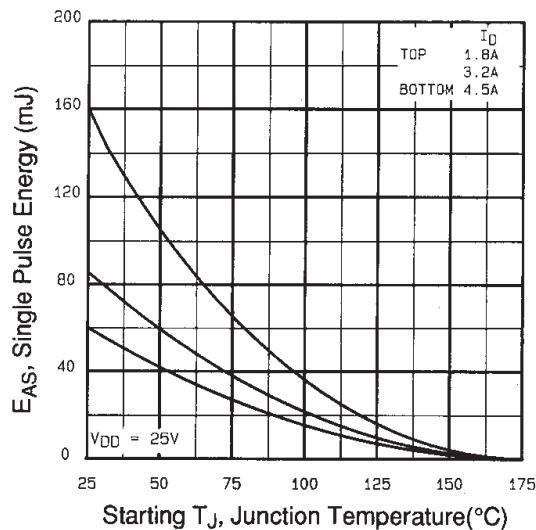


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

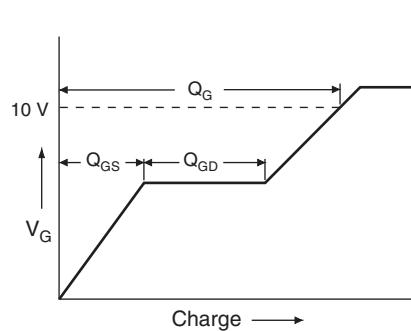


Fig. 13a - Basic Gate Charge Waveform

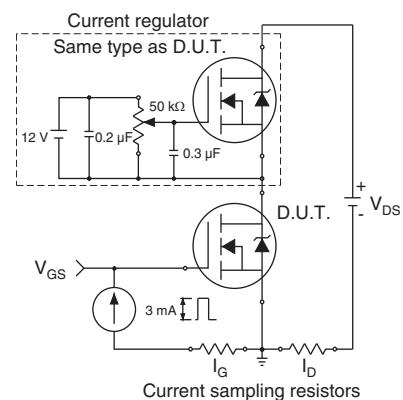
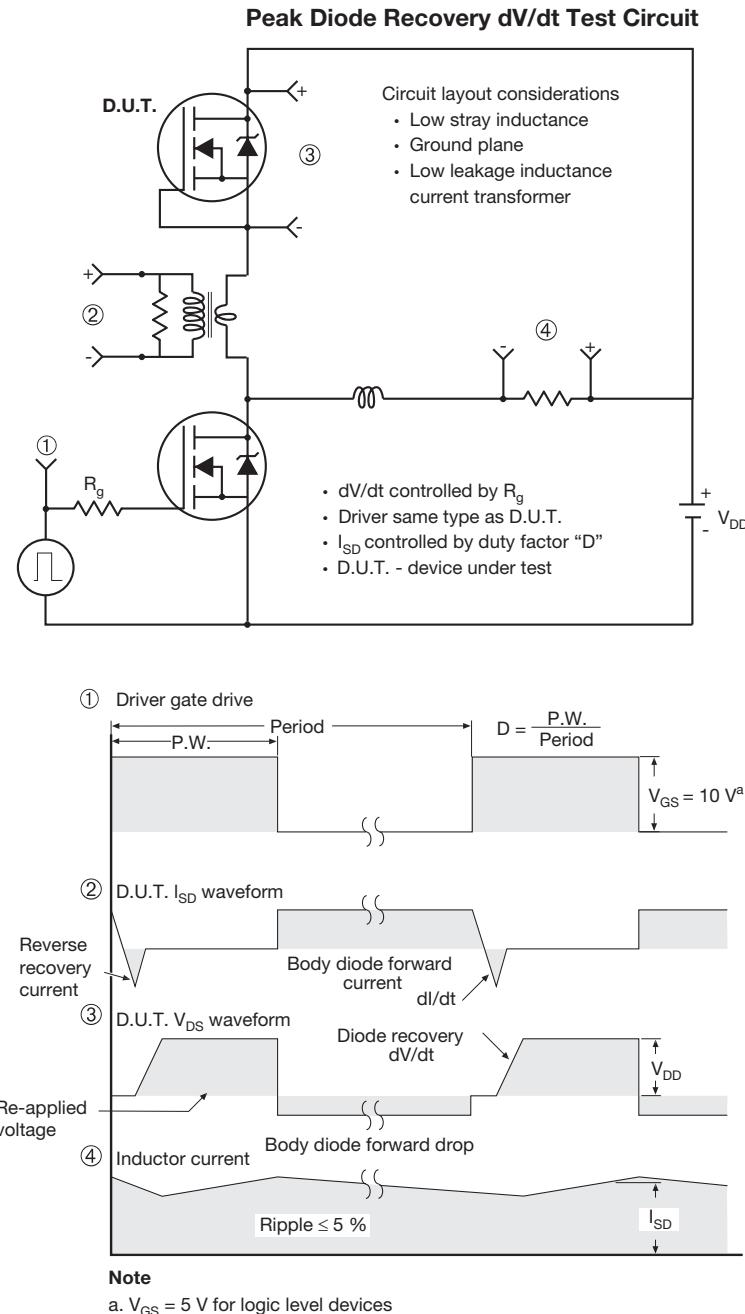


Fig. 13b - Gate Charge Test Circuit


**Fig. 14 - For N-Channel**

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