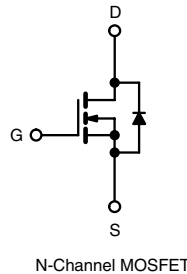
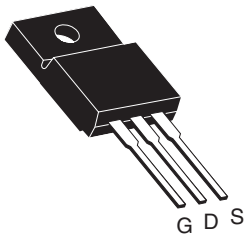


Power MOSFET

PRODUCT SUMMARY

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

TO-220 FULLPAK



FEATURES

- Isolated Package
- High Voltage Isolation = 2.5 kV_{RMS} (t = 60 s; f = 60 Hz)
- Sink to Lead Creepage Distance = 4.8 mm
- 175 °C Operating Temperature
- Dynamic dV/dt Rating
- Low Thermal Resistance
- Lead (Pb)-free Available



Available
RoHS*
COMPLIANT

DESCRIPTION

Third Generation Power MOSFETs from Vishay provides 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 moulding 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	IRFI510GPbF SiHFI510G-E3
SnPb	IRFI510G SiHFI510G

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

PARAMETER	SYMBOL	LIMIT	UNIT
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	4.5	A
V_{GS} at 10 V		3.2	
Pulsed Drain Current ^a	I_{DM}	18	
Linear Derating Factor		0.18	W/°C
Single Pulse Avalanche Energy ^b	E_{AS}	60	mJ
Repetitive Avalanche Current ^a	I_{AR}	4.5	A
Repetitive Avalanche Energy ^a	E_{AR}	2.7	mJ
Maximum Power Dissipation	P_D	27	W
Peak Diode Recovery dV/dt ^c	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 ^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 , $I_{AS} = 4.5$ A (see fig. 12).
- $I_{SD} \leq 5.6$ A, dI/dt ≤ 75 A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 175$ °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}	-	5.5	

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 V, I _D = 250 μA		100	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA		-	0.63	-	V/°C
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		2.0	-	4.0	V
Gate-Source Leakage	I _{GSS}	V _{GS} = ± 20		-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 100 V, V _{GS} = 0 V		-	-	25	μA
		V _{DS} = 80 V, V _{GS} = 0 V, T _J = 150 °C		-	-	250	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 2.7 A ^b	-	-	0.54	Ω
Forward Transconductance	g _{fs}	V _{DS} = 50 V, I _D = 2.7 A ^b		1.2	-	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V V _{DS} = 25 V f = 1.0 MHz, see fig. 5		-	180	-	pF
Output Capacitance	C _{oss}			-	81	-	
Reverse Transfer Capacitance	C _{rss}			-	15	-	
Drain to Sink Capacitance	C	f = 1.0 MHz		-	12	-	
Total Gate Charge	Q _g	V _{GS} = 10 V	I _D = 5.6 A, V _{DS} = 80 V, see fig. 6 and 13 ^b	-	-	8.3	nC
Gate-Source Charge	Q _{gs}			-	-	2.3	
Gate-Drain Charge	Q _{gd}			-	-	3.8	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 50 V, I _D = 5.6 A R _G = 24 Ω, R _D = 8.4 Ω, see fig. 10 ^b		-	6.9	-	ns
Rise Time	t _r			-	16	-	
Turn-Off Delay Time	t _{d(off)}			-	15	-	
Fall Time	t _f			-	9.4	-	
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 		-	-	4.5	A
Pulsed Diode Forward Current ^a	I _{SM}			-	-	18	
Body Diode Voltage	V _{SD}	T _J = 25 °C, I _S = 4.5 A, V _{GS} = 0 V ^b		-	-	2.5	V
Body Diode Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = 5.6 A, di/dt = 100 A/μs ^b		-	100	200	ns
Body Diode Reverse Recovery Charge	Q _{rr}			-	0.44	0.88	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

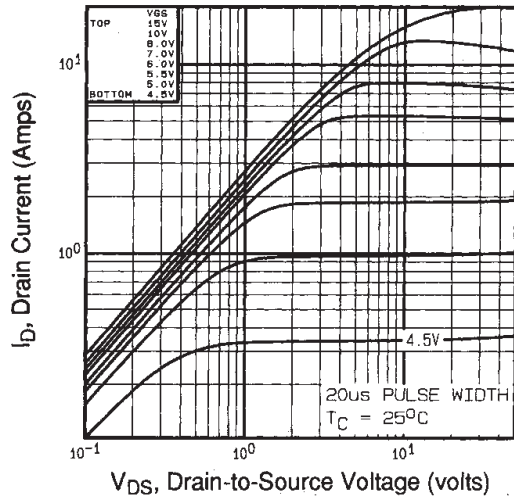


Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

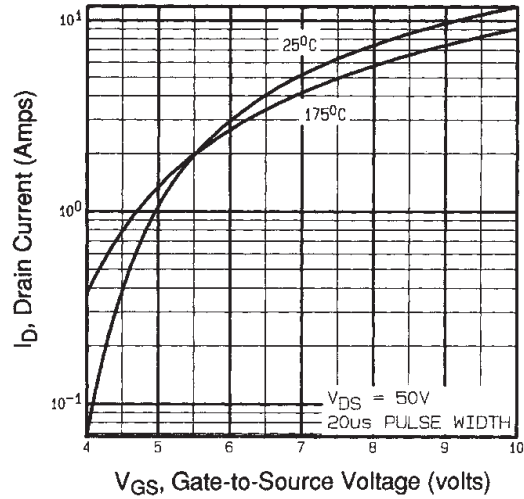


Fig. 3 - Typical Transfer Characteristics

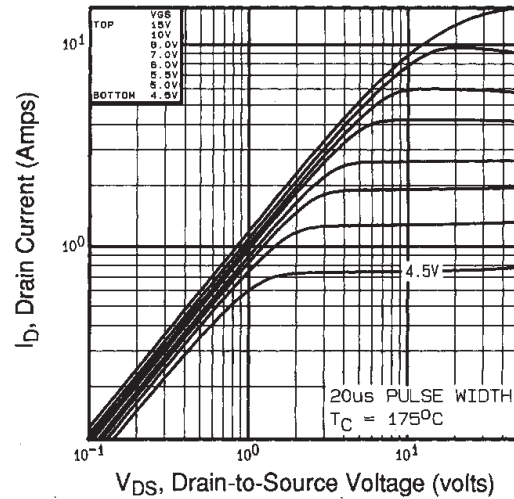


Fig. 2 - Typical Output Characteristics, $T_C = 175^\circ\text{C}$

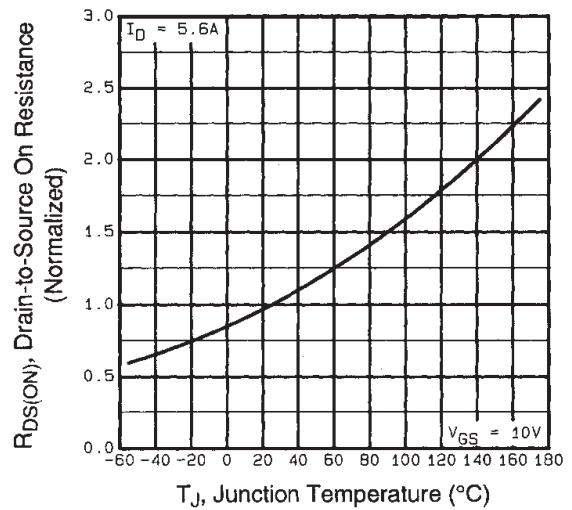


Fig. 4 - Normalized On-Resistance vs. Temperature

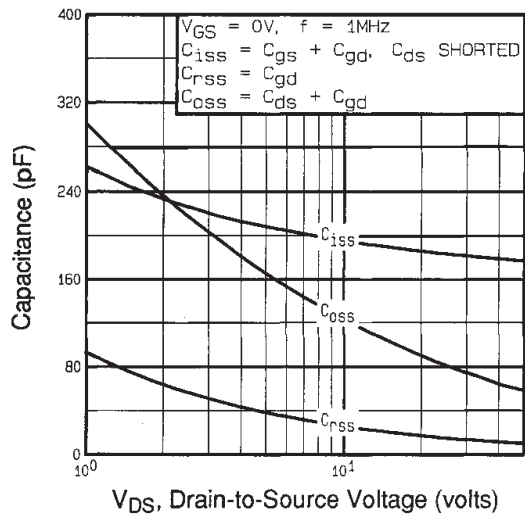


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

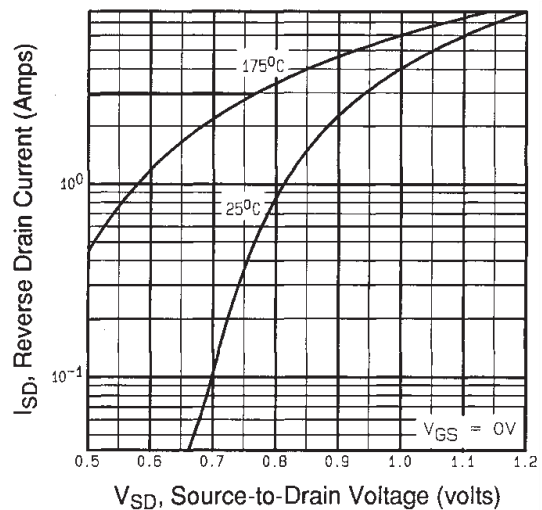


Fig. 7 - Typical Source-Drain Diode Forward Voltage

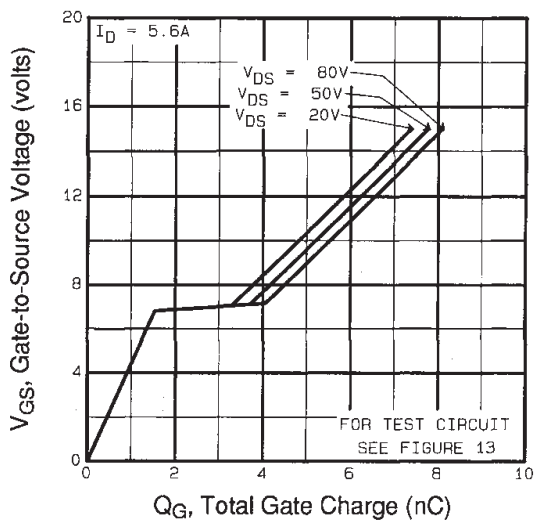


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

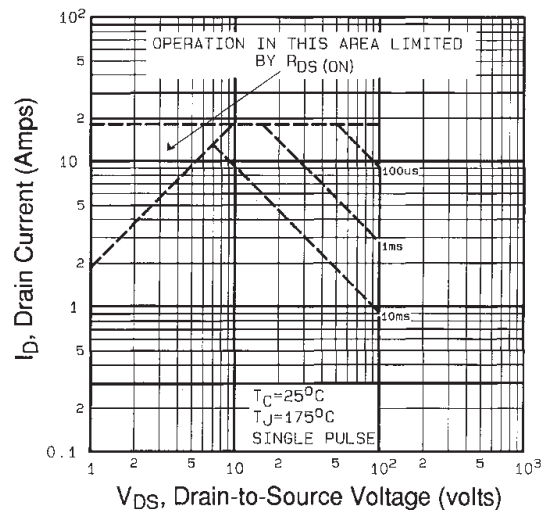


Fig. 8 - Maximum Safe Operating Area

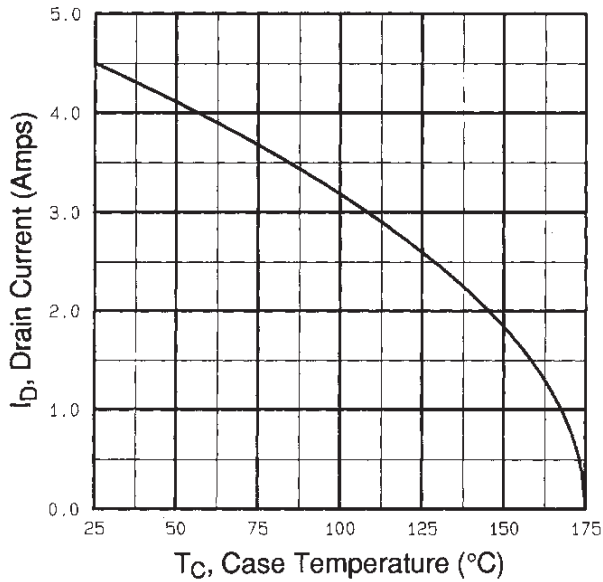


Fig. 9 - Maximum Drain Current vs. Case Temperature

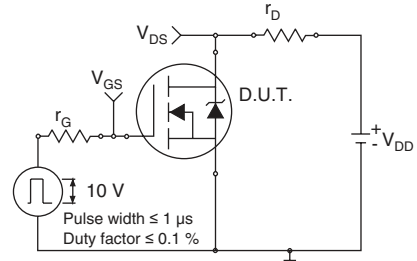


Fig. 10a - Switching Time Test Circuit

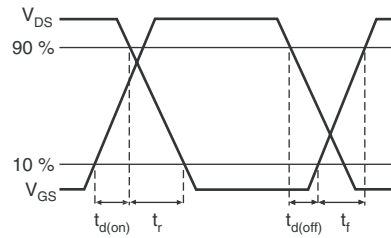


Fig. 10b - Switching Time Waveforms

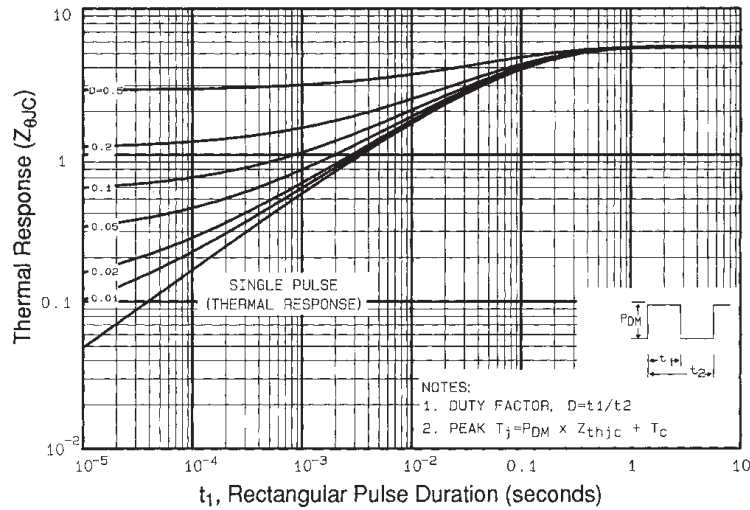


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

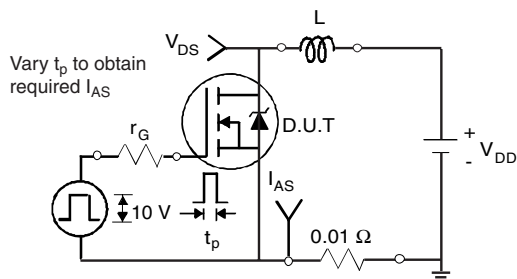


Fig. 12a - Unclamped Inductive Test Circuit

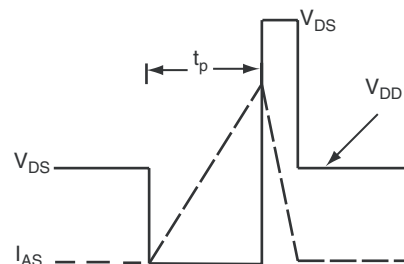


Fig. 12b - Unclamped Inductive Waveforms

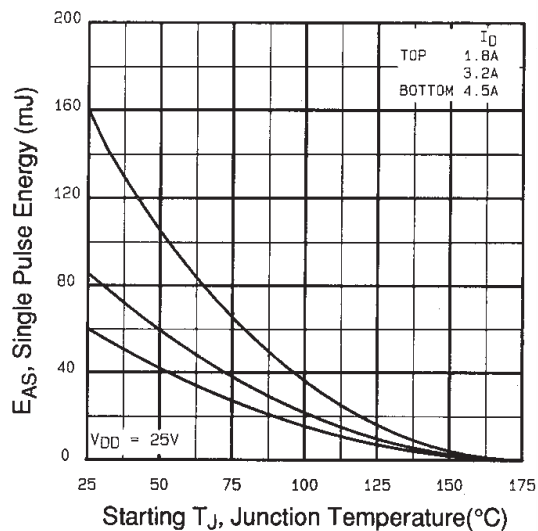


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

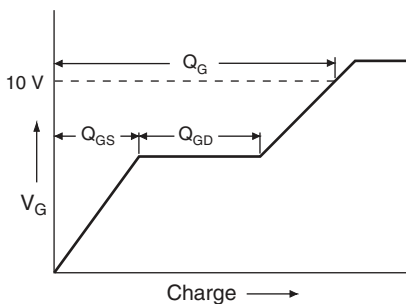


Fig. 13a - Basic Gate Charge Waveform

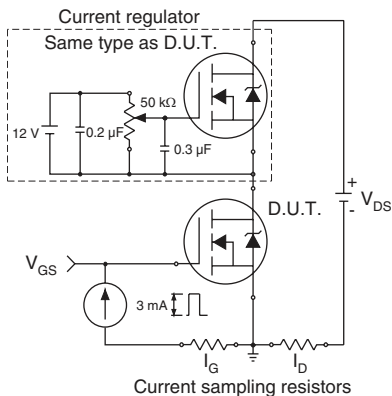
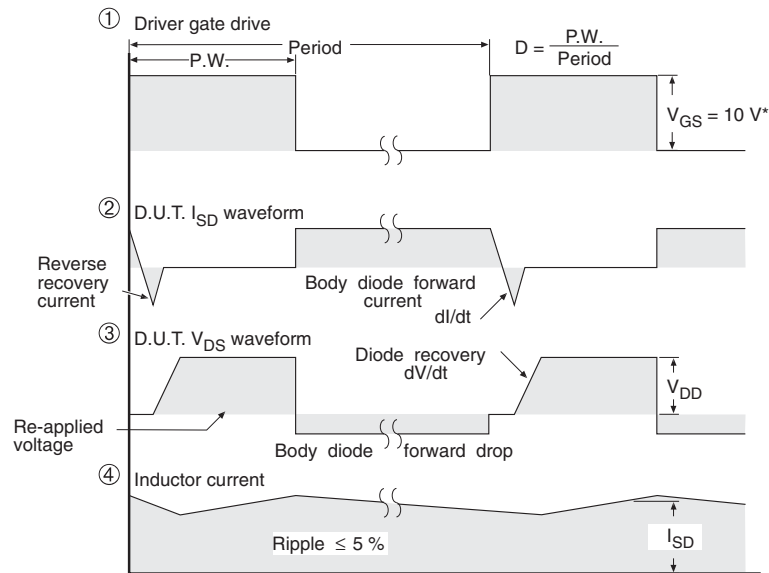
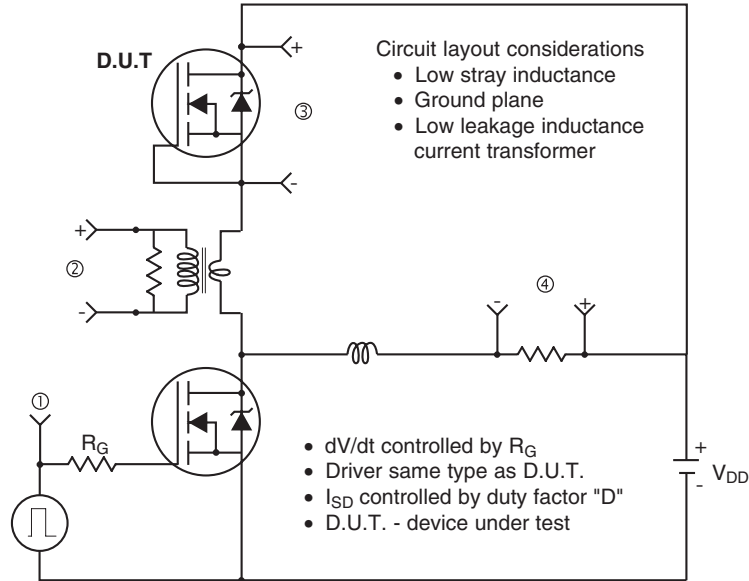


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



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

Fig. 14 - For N-Channel

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