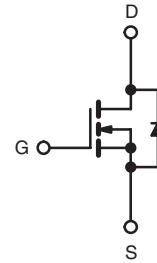


Power MOSFET

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

TO-220 FULLPAK

N-Channel MOSFET

DESCRIPTION

The TO-220 FULLPAK eliminates the need for additional insulating hardware in commercial-industrial applications. The molding 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.

PRODUCT SUMMARY

V _{DS} (V)	100	
R _{DS(on)} (Ω)	V _{GS} = 10 V	0.077
Q _g (Max.) (nC)	72	
Q _{gs} (nC)	11	
Q _{gd} (nC)	32	
Configuration	Single	

ORDERING INFORMATION

Package	TO-220 FULLPAK
Lead (Pb)-free	IRFI540GPbF SiHFI540G-E3
SnPb	IRFI540G SiHFI540G

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}	± 20	
Continuous Drain Current	V _{GS} at 10 V	T _C = 25 °C	17
		T _C = 100 °C	12
Pulsed Drain Current ^a	I _{DM}	68	A
Linear Derating Factor		0.32	W/°C
Single Pulse Avalanche Energy ^b	E _{AS}	720	mJ
Repetitive Avalanche Current ^a	I _{AR}	17	A
Repetitive Avalanche Energy ^a	E _{AR}	4.8	mJ
Maximum Power Dissipation	P _D	48	W
Peak Diode Recovery dV/dt ^c	dV/dt	5.5	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 = 3.7 mH, R_G = 25 Ω, I_{AS} = 17 A (see fig. 12).
- I_{SD} ≤ 17 A, dI/dt ≤ 200 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 175 °C.
- 1.6 mm from case.

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	65	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	3.1	

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}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		100	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$		-	0.13	-	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}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$		-	-	25	μA
		$V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 10\text{ A}^b$	-	-	0.077	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}, I_D = 10\text{ A}^b$		9.1	-	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V},$ $V_{DS} = 25\text{ V},$ $f = 1.0\text{ MHz}$, see fig. 5		-	1700	-	pF
Output Capacitance	C_{oss}			-	560	-	
Reverse Transfer Capacitance	C_{rss}			-	120	-	
Drain to Sink Capacitance	C	$f = 1.0\text{ MHz}$		-	12	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 17\text{ A}, V_{DS} = 80\text{ V},$ see fig. 6 and 13 ^b	-	-	72	nC
Gate-Source Charge	Q_{GS}			-	-	11	
Gate-Drain Charge	Q_{GD}			-	-	32	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 50\text{ V}, I_D = 17\text{ A},$ $R_G = 9.1\text{ }\Omega, R_D = 2.9\text{ }\Omega,$ see fig. 10 ^b		-	11	-	ns
Rise Time	t_r			-	44	-	
Turn-Off Delay Time	$t_{d(off)}$			-	53	-	
Fall Time	t_f			-	43	-	
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		-	-	17	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	68	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 17\text{ A}, V_{GS} = 0\text{ V}^b$		-	-	2.5	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = 17\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}^b$		-	180	360	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	1.3	2.6	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

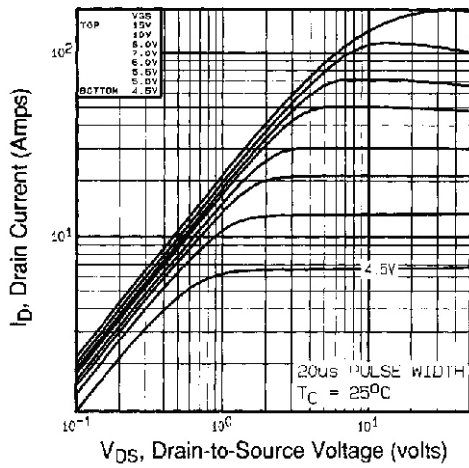


Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

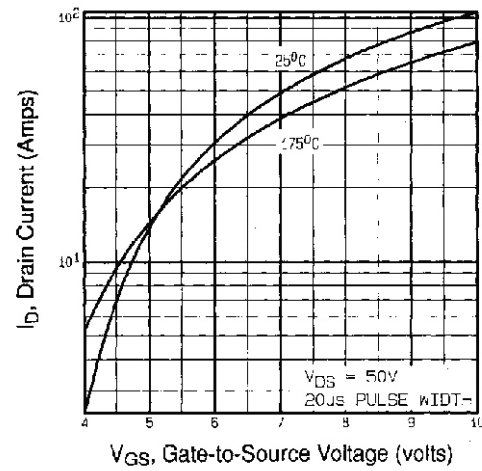


Fig. 3 - Typical Transfer Characteristics

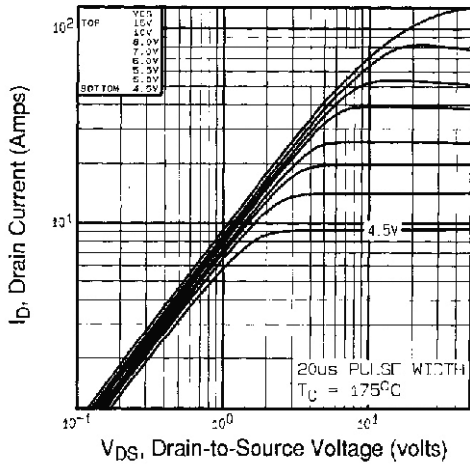


Fig. 2 - Typical Output Characteristics, $T_C = 175^\circ\text{C}$

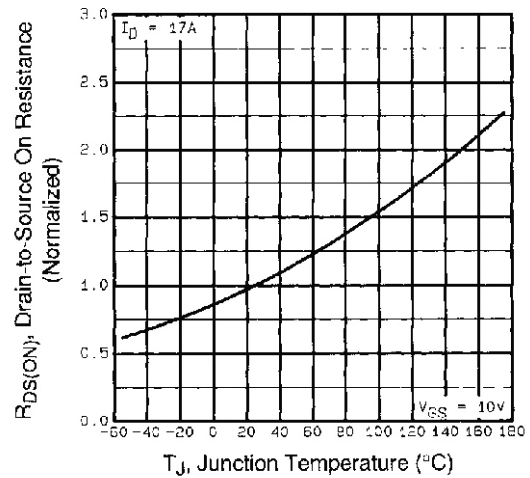


Fig. 4 - Normalized On-Resistance vs. Temperature

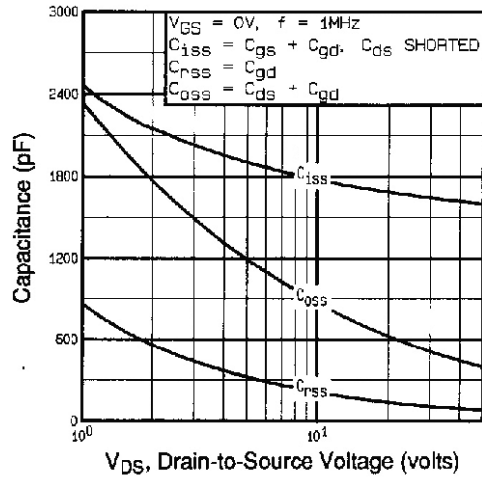


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

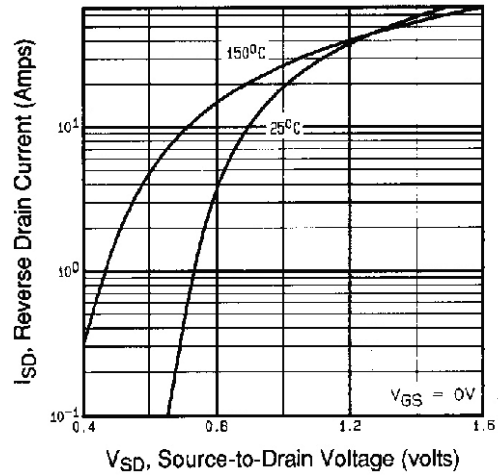


Fig. 7 - Typical Source-Drain Diode Forward Voltage

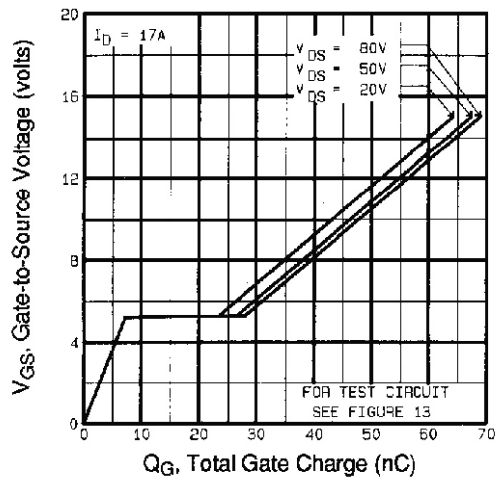


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

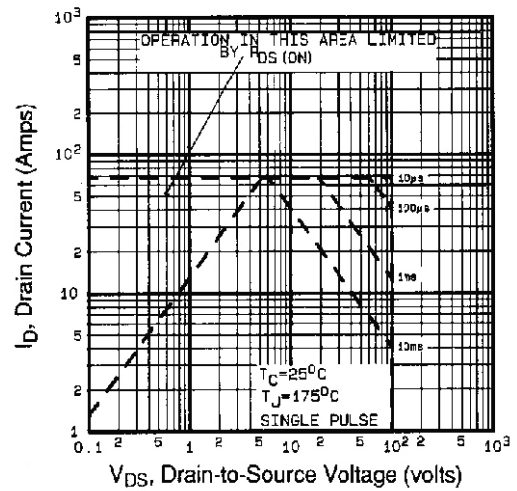


Fig. 8 - Maximum Safe Operating Area

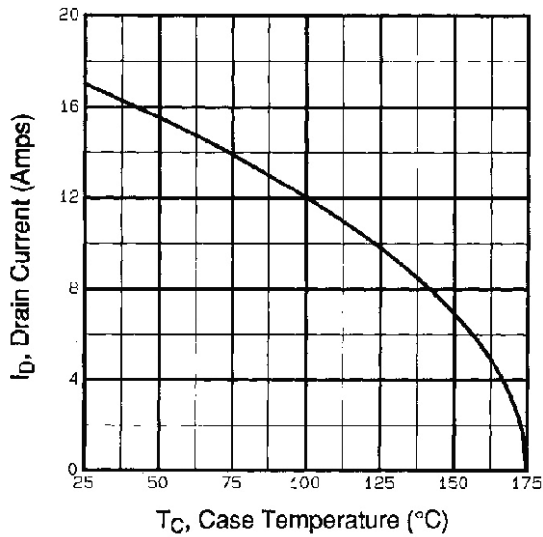


Fig. 9 - Maximum Drain Current vs. Case Temperature

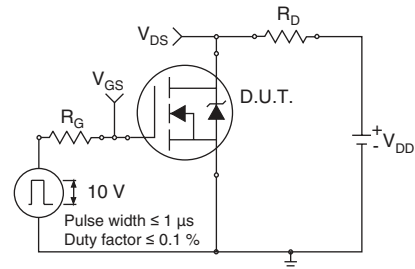


Fig. 10a - Switching Time Test Circuit

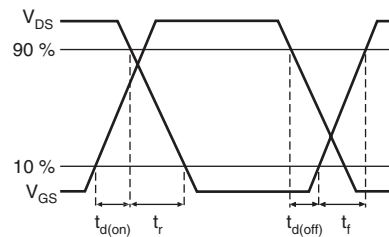


Fig. 10b - Switching Time Waveforms

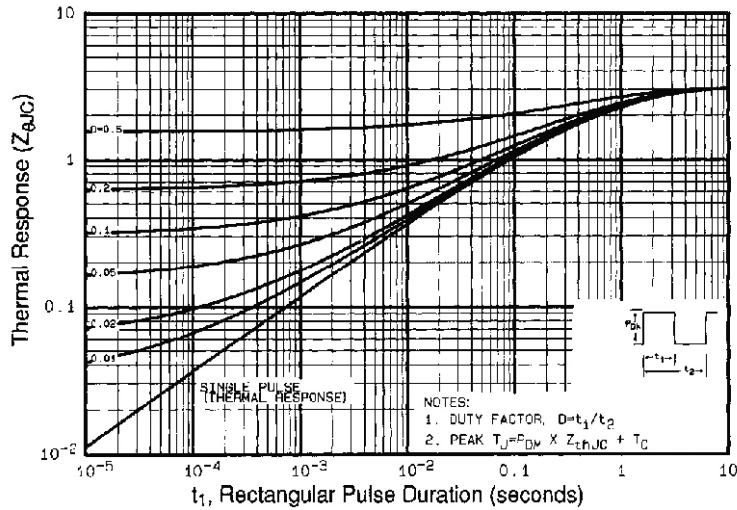


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

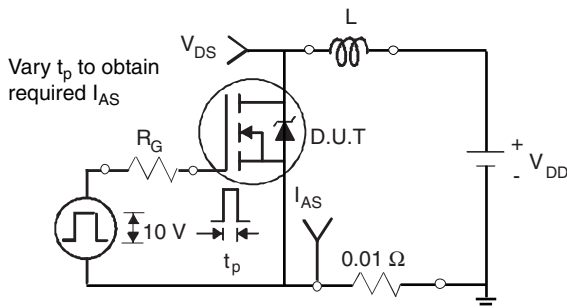


Fig. 12a - Unclamped Inductive Test Circuit

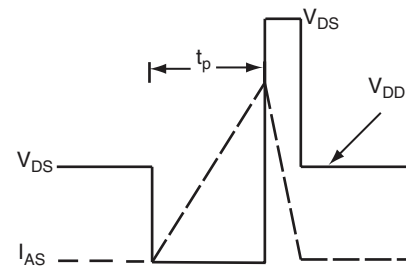


Fig. 12b - Unclamped Inductive Waveforms

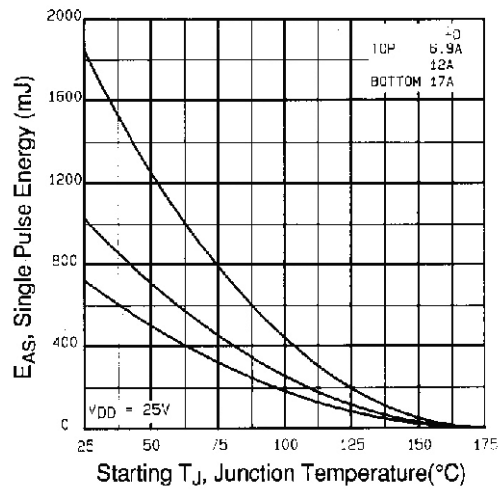


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

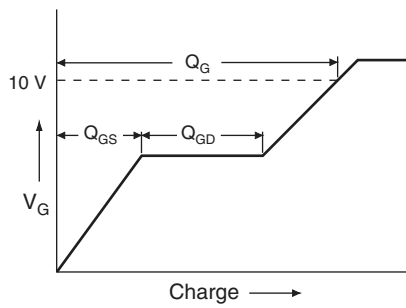


Fig. 13a - Basic Gate Charge Waveform

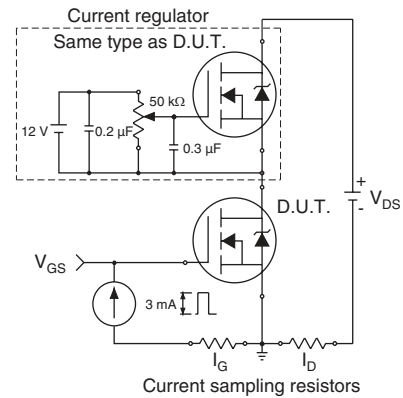
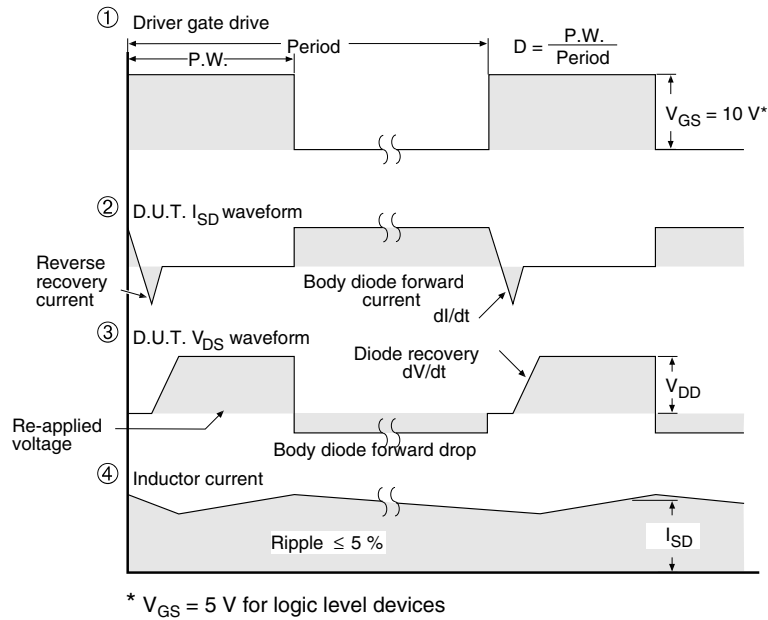
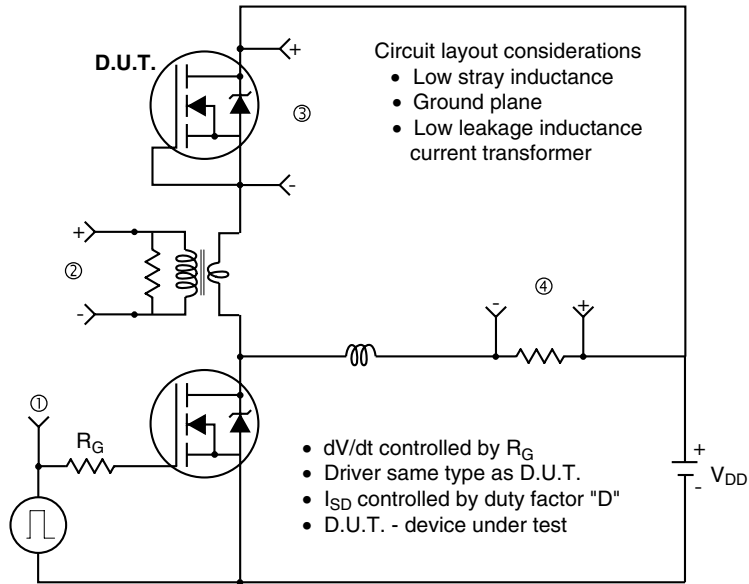


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit

Fig.14 - For N-Channel