

Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	60	
$R_{DS(on)}$ (Ω)	$V_{GS} = 5\text{ V}$	0.028
Q_g (Max.) (nC)	66	
Q_{gs} (nC)	12	
Q_{gd} (nC)	43	
Configuration	Single	

FEATURES

- Isolated Package
- High Voltage Isolation = 2.5 kV_{RMS} ($t = 60\text{ s}$; $f = 60\text{ Hz}$)
- Sink to Lead Creepage Distance = 4.8 mm
- Logic-Level Gate Drive
- $R_{DS(on)}$ Specified at $V_{GS} = 4\text{ V}$ and 5 V
- Fast Switching
- Ease of Paralleling
- Lead (Pb)-free

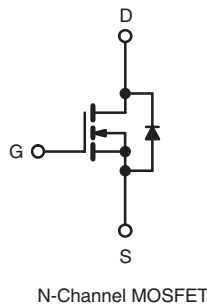
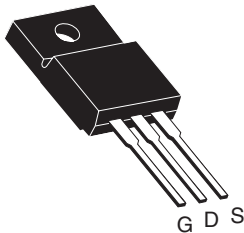


DESCRIPTION

Third generation Power MOSFETs from Vishay provide 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 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.

TO-220 FULLPAK



ORDERING INFORMATION

Package	TO-220 FULLPAK
Lead (Pb)-free	IRLIZ44GPbF
	SiHLIZ44G-E3

ABSOLUTE MAXIMUM RATINGS $T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 10	
Continuous Drain Current	I_D	$T_C = 25\text{ }^\circ\text{C}$	30
		$T_C = 100\text{ }^\circ\text{C}$	21
Pulsed Drain Current ^a	I_{DM}	120	A
Linear Derating Factor		0.32	W/ $^\circ\text{C}$
Single Pulse Avalanche Energy ^b	E_{AS}	400	mJ
Maximum Power Dissipation	P_D	48	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	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature)	for 10 s	300 ^d	
Mounting Torque	6-32 or M3 screw		10
			1.1
			lbf · in
			N · m

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 25\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 518\text{ }\mu\text{H}$, $R_G = 25\text{ }\Omega$, $I_{AS} = 30\text{ A}$ (see fig. 12c).
- $I_{SD} \leq 51\text{ A}$, $dI/dt \leq 250\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 175\text{ }^\circ\text{C}$.
- 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}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		60	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}, I_D = 1\text{ mA}$		-	0.070	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		1.0	-	2.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 10\text{ V}$		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$		-	-	25	μA
		$V_{DS} = 48\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 5.0\text{ V}$	$I_D = 18\text{ A}^b$	-	-	0.028	Ω
		$V_{GS} = 4.0\text{ V}$	$I_D = 15\text{ A}^b$	-	-	0.039	
Forward Transconductance	g_{fs}	$V_{DS} = 25\text{ V}, I_D = 18\text{ A}^b$		22	-	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V},$ $V_{DS} = 25\text{ V},$ $f = 1.0\text{ MHz},$ see fig. 5		-	3300	-	pF
Output Capacitance	C_{oss}			-	1200	-	
Reverse Transfer Capacitance	C_{riss}			-	200	-	
Drain to Sink Capacitance	C	$f = 1.0\text{ MHz}$		-	12	-	
Total Gate Charge	Q_g	$V_{GS} = 5.0\text{ V}$	$I_D = 51\text{ A}, V_{DS} = 48\text{ V},$ see fig. 6 and 13 ^b	-	-	66	nC
Gate-Source Charge	Q_{gs}			-	-	12	
Gate-Drain Charge	Q_{gd}			-	-	43	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, I_D = 51\text{ A},$ $R_G = 4.6\text{ }\Omega, R_D = 0.56\text{ }\Omega,$ see fig. 10 ^b		-	17	-	ns
Rise Time	t_r			-	230	-	
Turn-Off Delay Time	$t_{d(off)}$			-	42	-	
Fall Time	t_f			-	110	-	
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		-	-	30	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	120	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 30\text{ A}, V_{GS} = 0\text{ V}^b$		-	-	2.5	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = 51\text{ A}, di/dt = 100\text{ A}/\mu\text{s}^b$		-	90	180	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	0.65	1.3	μC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

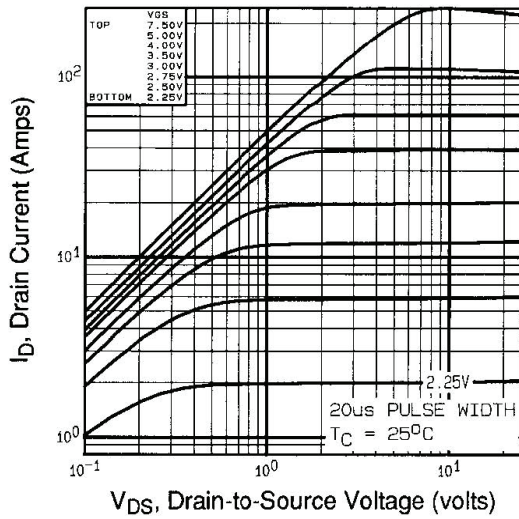


Fig. 1 - Typical Output Characteristics, $T_C = 25\text{ }^\circ\text{C}$

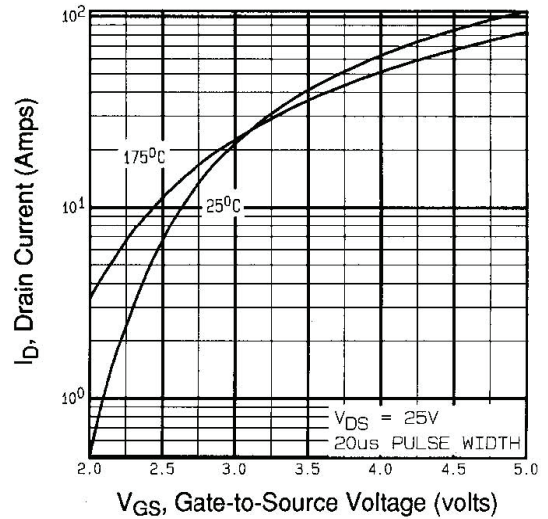


Fig. 3 - Typical Transfer Characteristics

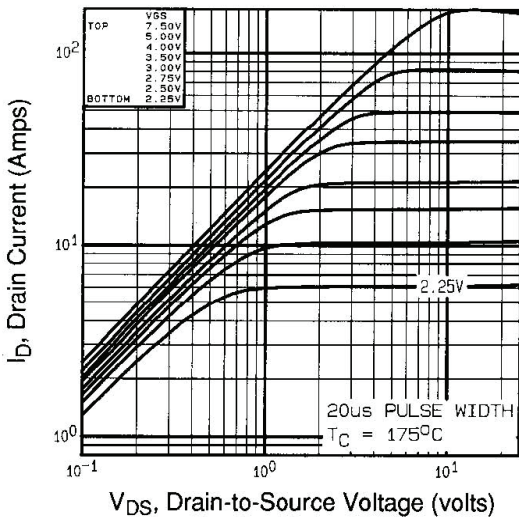


Fig. 2 - Typical Output Characteristics, $T_C = 175\text{ }^\circ\text{C}$

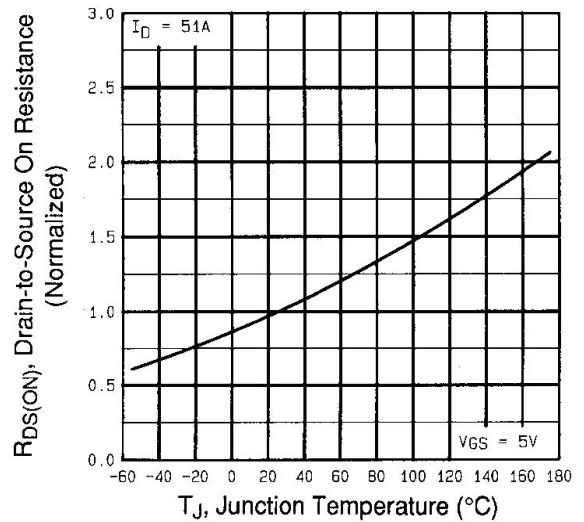


Fig. 4 - Normalized On-Resistance vs. Temperature

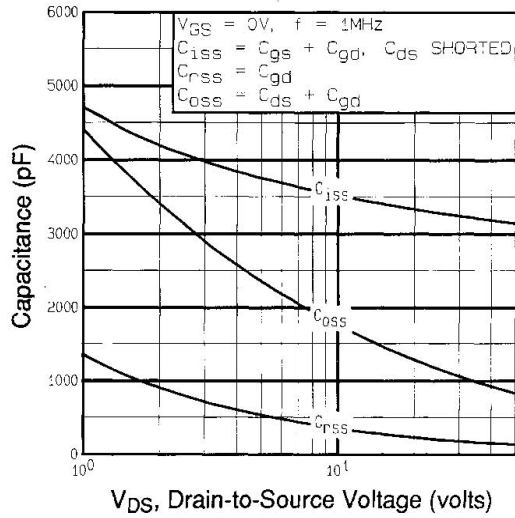


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

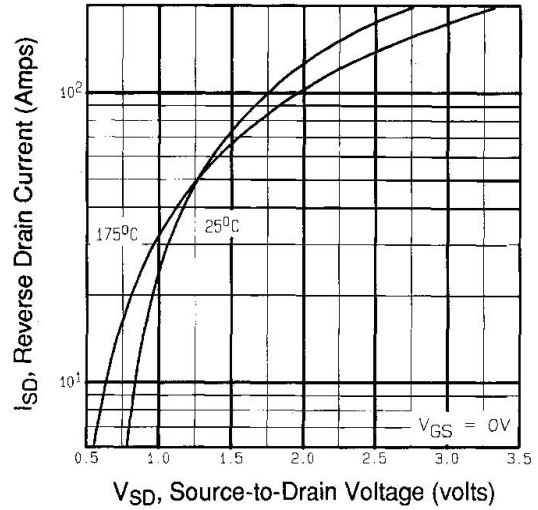


Fig. 7 - Typical Source-Drain Diode Forward Voltage

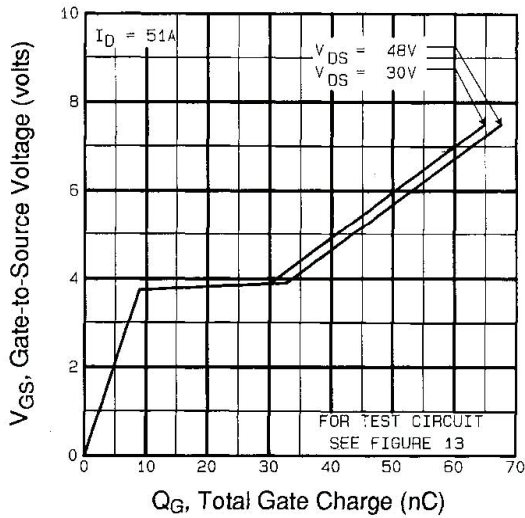


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

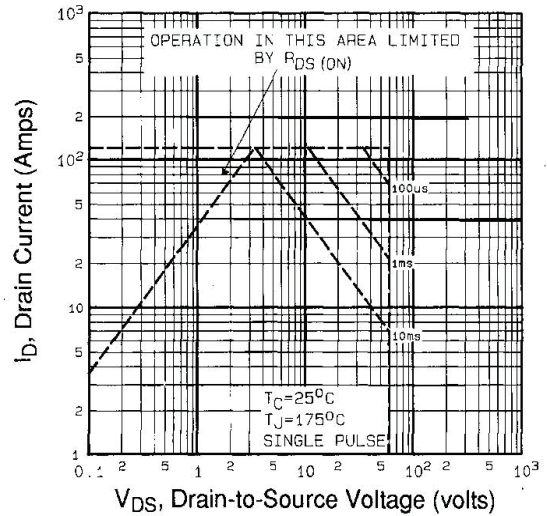


Fig. 8 - Maximum Safe Operating Area

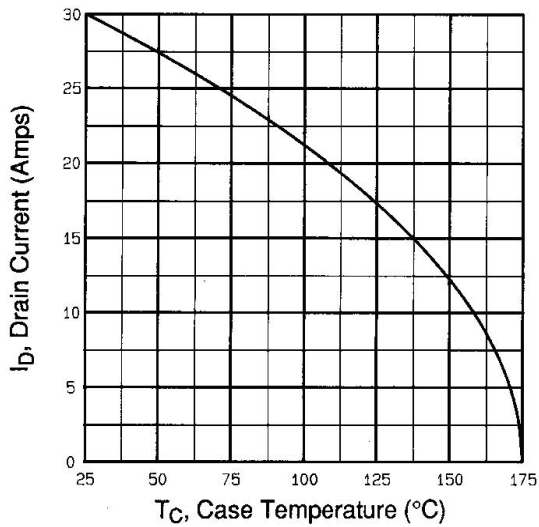


Fig. 9 - Maximum Drain Current vs. Case Temperature

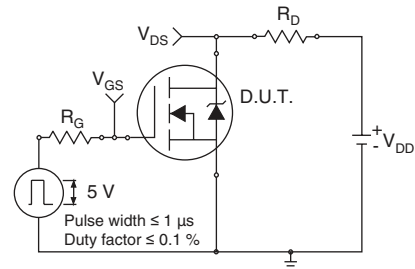


Fig. 10a - Switching Time Test Circuit



Fig. 10b - Switching Time Waveforms

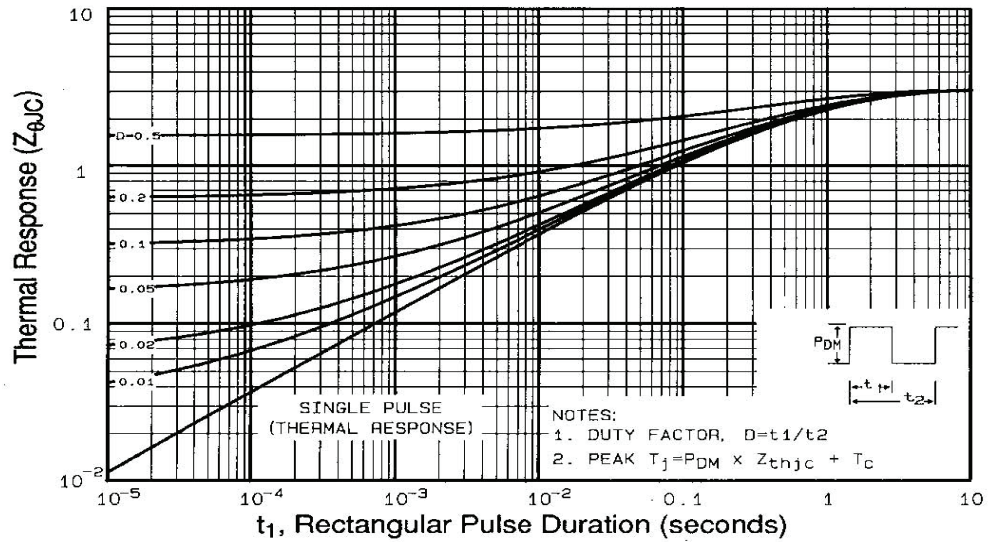


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

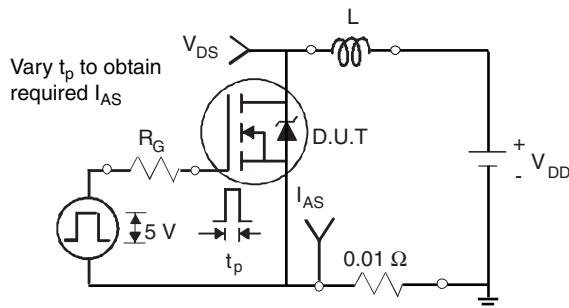


Fig. 12a - Unclamped Inductive Test Circuit

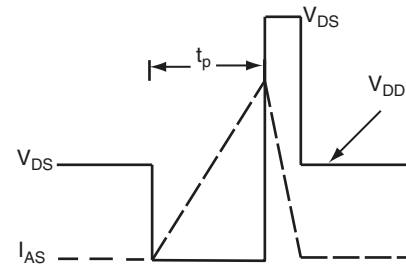


Fig. 12b - Unclamped Inductive Waveforms

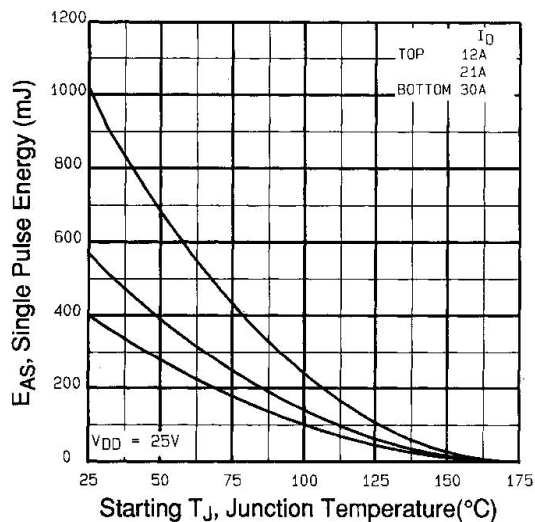


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

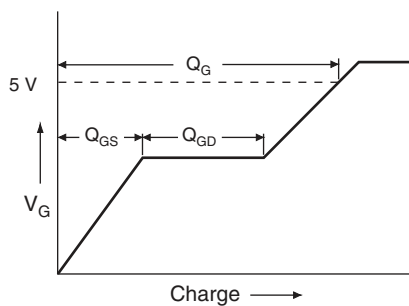
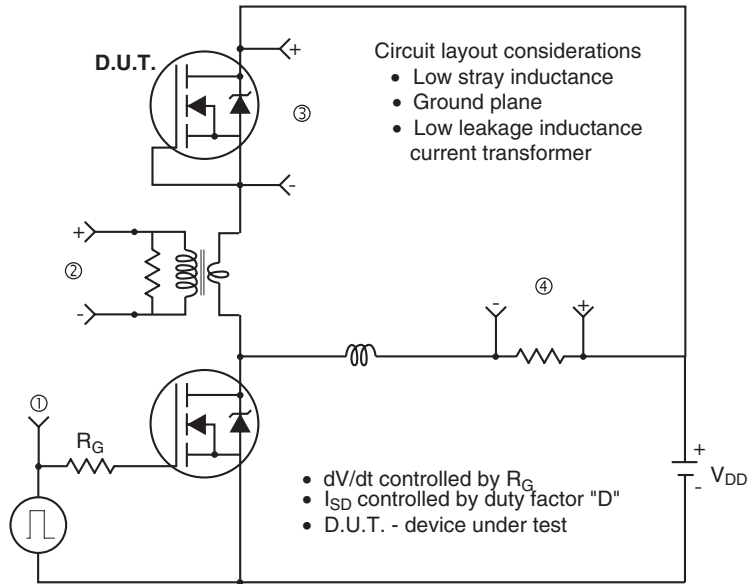


Fig. 13a - Basic Gate Charge Waveform



Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



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

Fig.14 - For N-Channel

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