

IRF540ZSTRPBF-VB Datasheet Power MOSFET

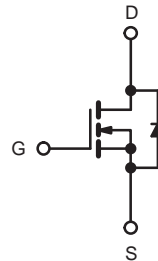
PRODUCT SUMMARY		
V _{DS} (V)	100	
R _{DS(on)} (Ω)	V _{GS} = 10 V	0.020
Q _g (Max.) (nC)	70	
Q _{gs} (nC)	13	
Q _{gd} (nC)	39	
Configuration	Single	

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Surface Mount
- Low-Profile Through-Hole
- Available in Tape and Reel
- Dynamic dV/dt Rating
- 150 °C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Compliant to RoHS Directive 2002/95/EC



RoHS*
COMPLIANT
HALOGEN
FREE
Available



N-Channel MOSFET

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	70	A
		T _C = 100 °C	56	
Pulsed Drain Current ^{a, e}	I _{DM}		250	
Linear Derating Factor			1.0	W/°C
Single Pulse Avalanche Energy ^{b, e}	E _{AS}		580	mJ
Avalanche Current ^a	I _{AR}		20	A
Repetitive Avalanche Energy ^a	E _{AR}		13	mJ
Maximum Power Dissipation	T _C = 25 °C		3.1	W
	T _A = 25 °C		130	
Peak Diode Recovery dV/dt ^{c, e}	dV/dt		5.0	V/ns
Operating Junction and Storage Temperature Range	T _J , T _{stg}		- 55 to + 150	°C
Soldering Recommendations (Peak Temperature)	for 10 s		300 ^d	

Notes


- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- V_{DD} = 50 V, starting T_J = 25 °C, L = 2.7 mH, R_g = 25 Ω, I_{AS} = 18 A (see fig. 12).
- I_{SD} ≤ 20 A, di/dt ≤ 150 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 150 °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 (PCB Mounted, Steady-State) ^a	R _{thJA}	-	40	°C/W
Maximum Junction-to-Case (Drain)	R _{thJC}	-	1.0	

Note

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

SPECIFICATIONS (T _J = 25 °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 ^c		-	0.29	-	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 V		-	-	± 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 = 125 °C		-	-	250	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 11 A ^b	-	0.020	-	Ω
Forward Transconductance	g _{fs}	V _{DS} = 50 V, I _D = 11 A ^d		6.7	-	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V, f = 1.0 MHz, see fig. 5 ^d		-	1300	-	pF
Output Capacitance	C _{oss}			-	430	-	
Reverse Transfer Capacitance	C _{rss}			-	130	-	
Total Gate Charge	Q _g	V _{GS} = 10 V	I _D = 20 A, V _{DS} = 160 V, see fig. 6 and 13 ^{b, c}	-	-	70	nC
Gate-Source Charge	Q _{gs}			-	-	13	
Gate-Drain Charge	Q _{gd}			-	-	39	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 50 V, I _D = 20 A, R _g = 9.1 Ω, R _D = 5.4 Ω, see fig. 10 ^{b, c}		-	14	-	ns
Rise Time	t _r			-	51	-	
Turn-Off Delay Time	t _{d(off)}			-	45	-	
Fall Time	t _f			-	36	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	20	A
Pulsed Diode Forward Current ^a	I _{SM}			-	-	72	
Body Diode Voltage	V _{SD}	T _J = 25 °C, I _S = 20 A, V _{GS} = 0 V ^b		-	-	2.0	V
Body Diode Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = 20 A, di/dt = 100 A/μs ^{b, c}		-	300	610	ns
Body Diode Reverse Recovery Charge	Q _{rr}			-	3.4	7.1	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 ≤ 300 μs; duty cycle ≤ 2 %.
- c. Uses IRF640/SiHF640 data and test conditions.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

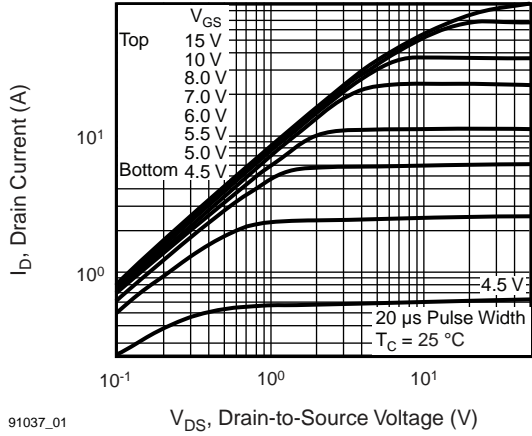


Fig. 1 - Typical Output Characteristics, $T_J = 25\text{ °C}$

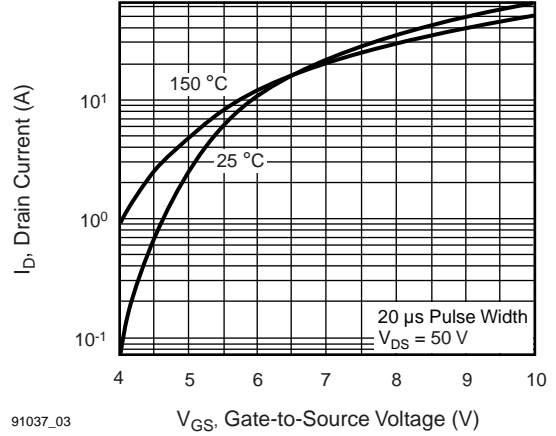


Fig. 3 - Typical Transfer Characteristics

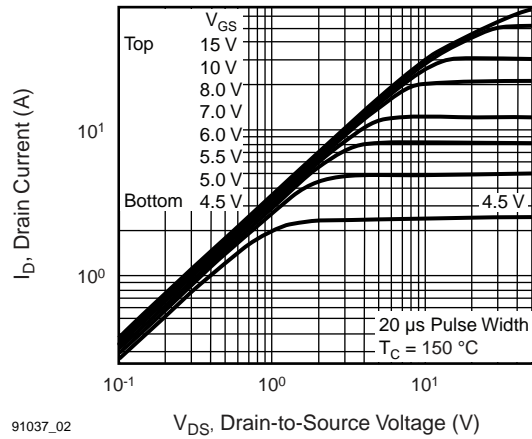


Fig. 2 - Typical Output Characteristics, $T_J = 175\text{ °C}$

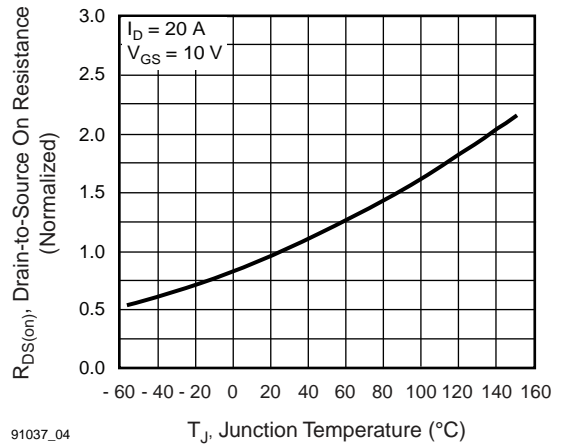


Fig. 4 - Normalized On-Resistance vs. Temperature

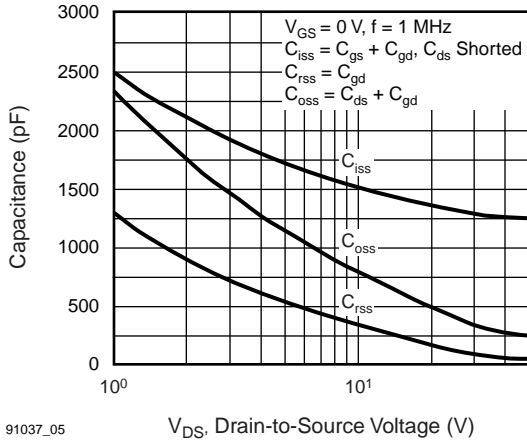


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage



Fig. 7 - Typical Source-Drain Diode Forward Voltage



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

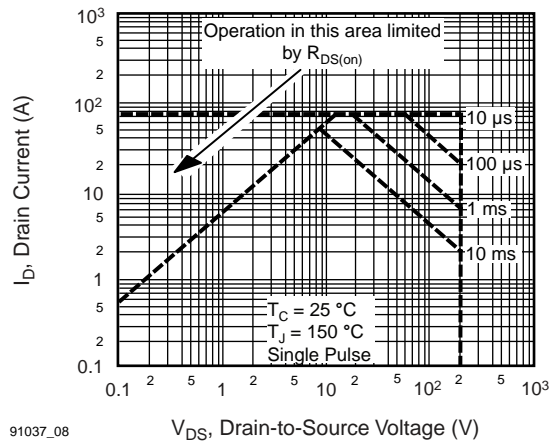


Fig. 8 - Maximum Safe Operating Area

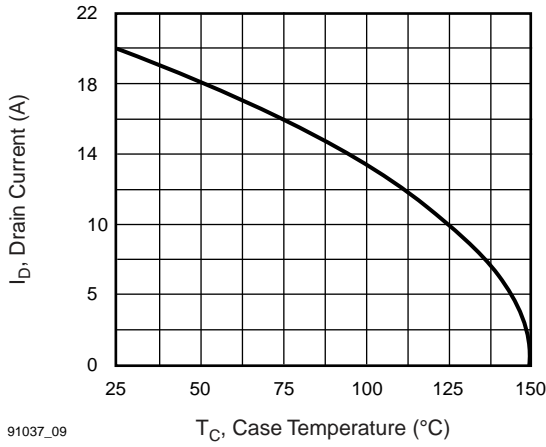


Fig. 9 - Maximum Drain Current vs. Case Temperature

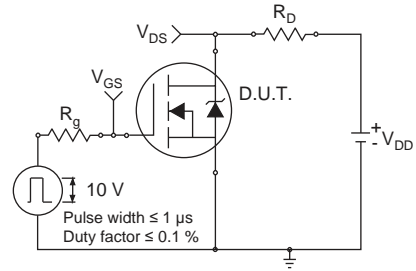


Fig. 10a - Switching Time Test Circuit

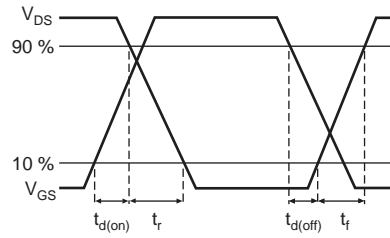


Fig. 10b - Switching Time Waveforms

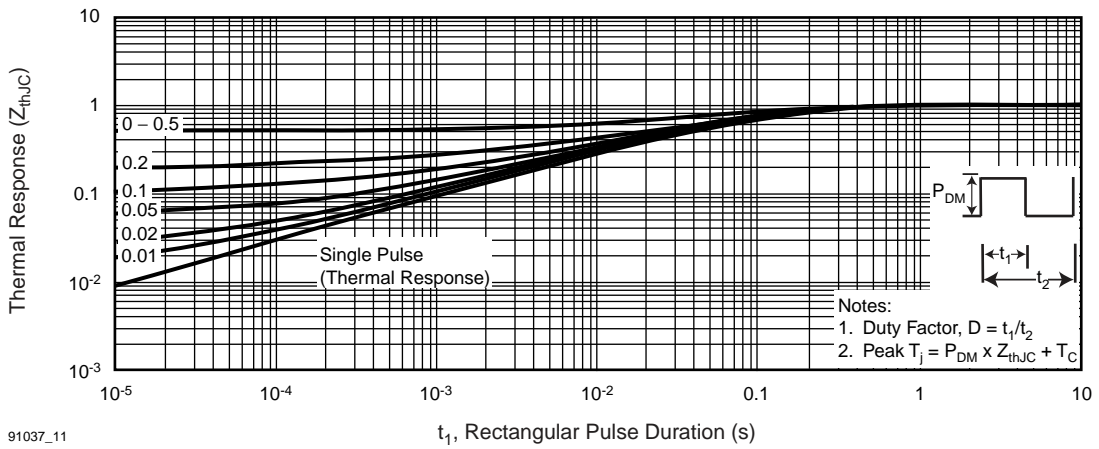


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

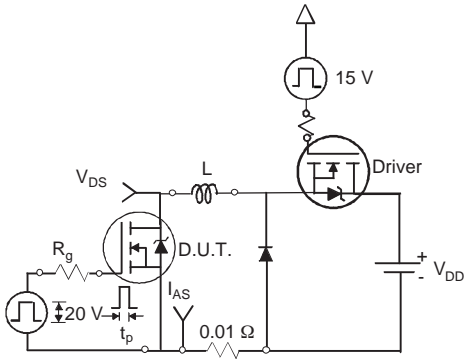


Fig. 12a - Unclamped Inductive Test Circuit

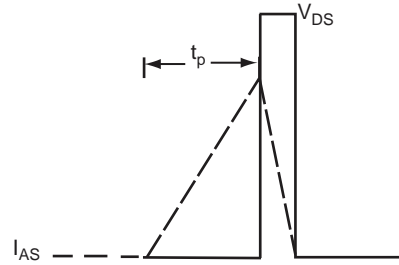


Fig. 12b - Unclamped Inductive Waveforms

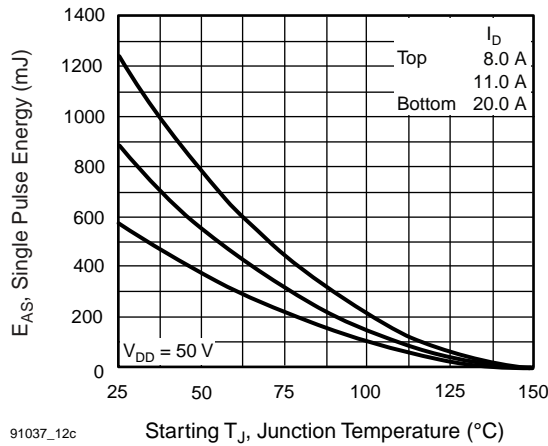


Fig. 12c - Maximum Avalanche Energy vs. Drain Current



Fig. 13a - Basic Gate Charge Waveform

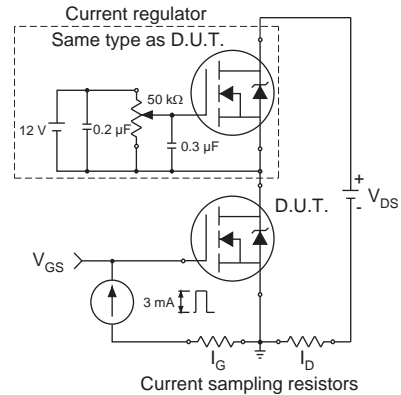
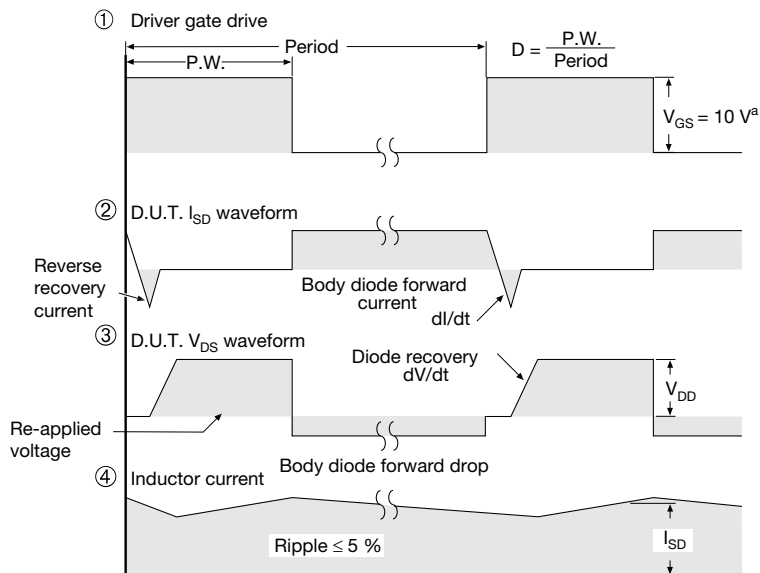
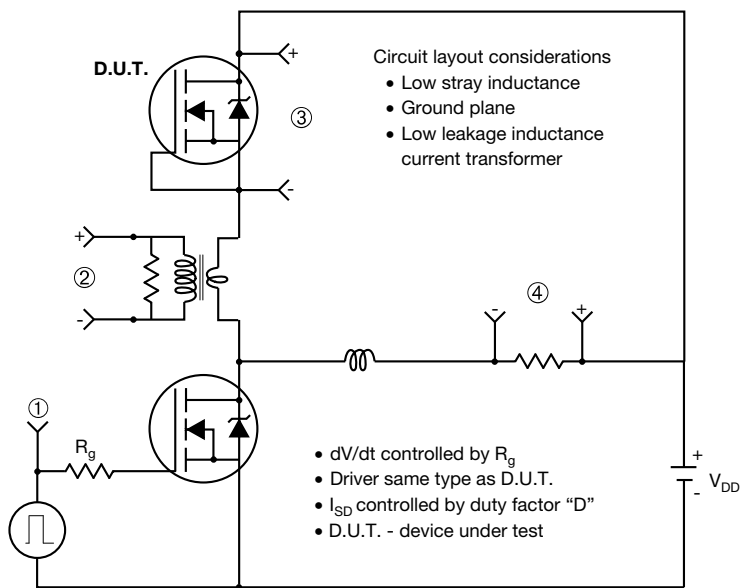


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit

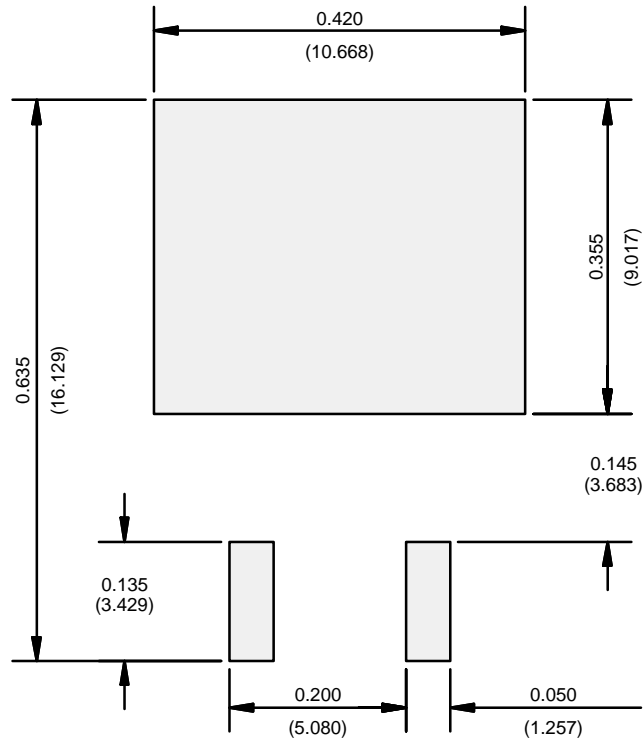


Note

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

Fig. 14 - For N-Channel

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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