IRF1404ZSTRLPBF-VB Datasheet

N-Channel 40 V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a, c]	Q_g (Typ.)
40	0.0017 at V_{GS} = 10 V	150	120 nC
	0.0025 at V_{GS} = 4.5 V	135	

FEATURES

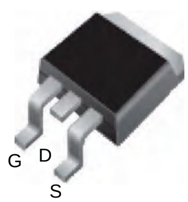
- Trench Power MOSFET
- 100 % R_g and UIS Tested

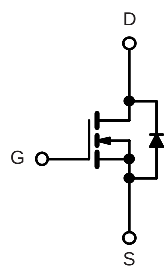
RoHS
COMPLIANT

APPLICATIONS

- Synchronous Rectification
- Power Supplies

D²PAK (TO-263)





N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	± 25	
Continuous Drain Current (T_J = 175 °C)	T_C = 25 °C	I_D	150[a, c]	A
	T_C = 70 °C		120[c]	
	T_A = 25 °C		29[b]	
	T_A = 70 °C		23[b]	
Pulsed Drain Current		I_{DM}	380	
Avalanche Current Pulse	L = 0.1 mH	I_{AS}	80	
Single Pulse Avalanche Energy		E_{AS}	320	mJ
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	110[a, c]	A
	T_A = 25 °C		2.6[b]	
Maximum Power Dissipation	T_C = 25 °C	P_D	312[a]	W
	T_C = 70 °C		200	
	T_A = 25 °C		3.13[b]	
	T_A = 70 °C		2.0[b]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient[b]	Steady State	R_{thJA}	32	40	°C/W
Maximum Junction-to-Case	Steady State	R_{thJC}	0.33	0.4	

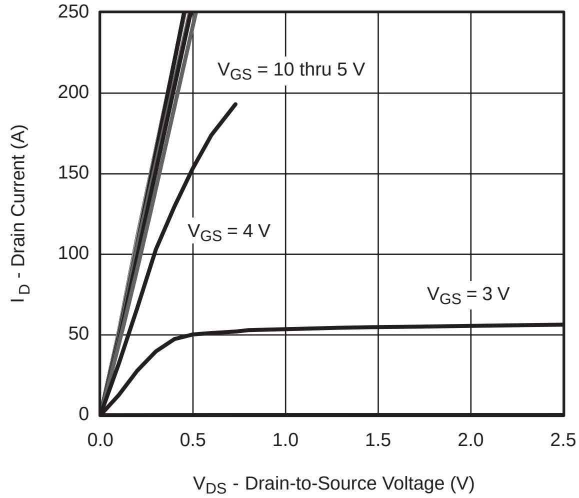
Notes:
a. Based on T_C = 25 °C.
b. Surface Mounted on 1" x 1" FR4 board.
c. Calculated based on maximum junction temperature. Package limitation current is 110 A.

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	45			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		41		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 8		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	1.2		2.5	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 40 V, V_{GS} = 0 V			1	µA
		V_{DS} = 40 V, V_{GS} = 0 V, T_J = 55 °C			10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 10 V	120			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 30 A		0.0017		Ω
		V_{GS} = 4.5 V, I_D = 20 A		0.0025		
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 30 A		180		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 20 V, V_{GS} = 0 V, f = 1 MHz		9000		pF
Output Capacitance	C_{oss}			650		
Reverse Transfer Capacitance	C_{rss}			450		
Total Gate Charge	Q_g	V_{DS} = 20 V, V_{GS} = 10 V, I_D = 20 A		120	180	nC
Gate-Source Charge	Q_{gs}			30		
Gate-Drain Charge	Q_{gd}			16		
Gate Resistance	R_g	f = 1 MHz		0.85	1.3	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 1.0 Ω $I_D \cong$ 20 A, V_{GEN} = 10 V, R_g = 1 Ω		20	30	ns
Rise Time	t_r			11	17	
Turn-Off Delay Time	$t_{d(off)}$			77	115	
Fall Time	t_f			10	15	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 1.0 Ω $I_D \cong$ 20 A, V_{GEN} = 4.5 V, R_g = 1 Ω		102	155	
Rise Time	t_r			62	95	
Turn-Off Delay Time	$t_{d(off)}$			180	270	
Fall Time	t_f			60	90	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			110	A
Pulse Diode Forward Current[a]	I_{SM}				200	
Body Diode Voltage	V_{SD}	I_S = 20 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 20 A, di/dt = 100 A/µs, T_J = 25 °C		50	75	ns
Body Diode Reverse Recovery Charge	Q_{rr}			70	105	nC
Reverse Recovery Fall Time	t_a			30		ns
Reverse Recovery Rise Time	t_b			20		

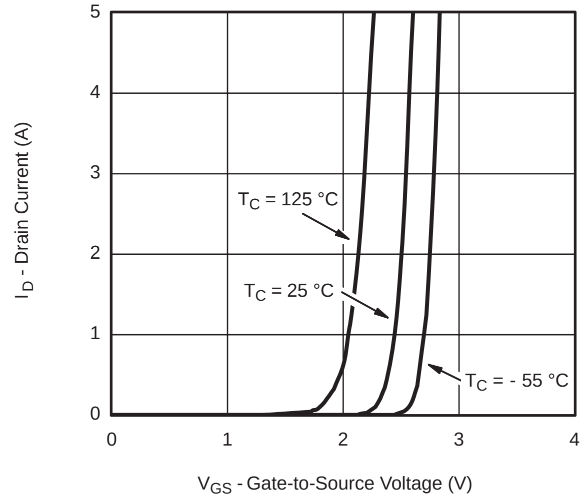
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

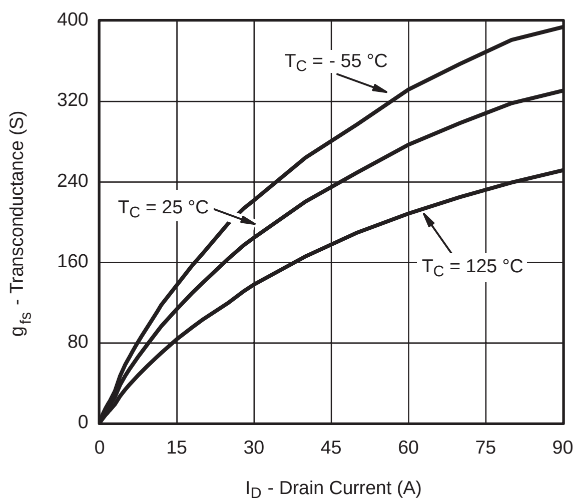
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



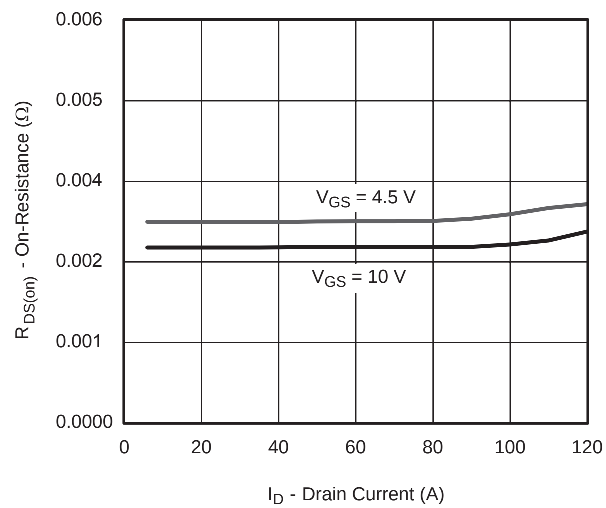
Output Characteristics



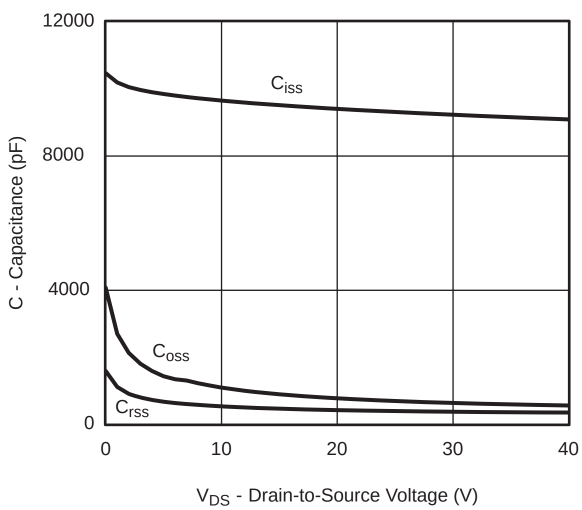
Transfer Characteristics



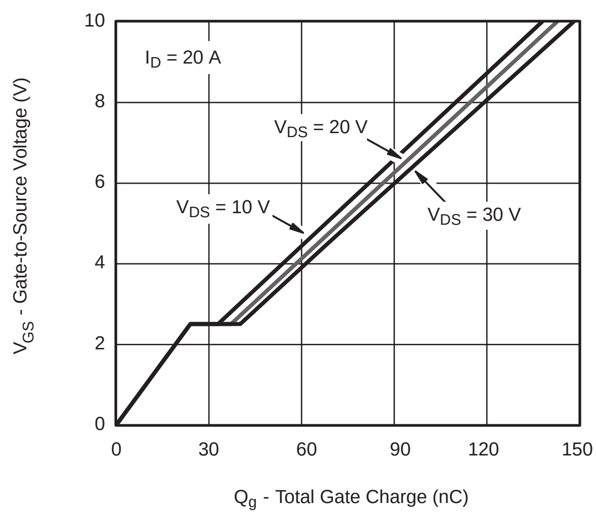
Transconductance



On-Resistance vs. Drain Current

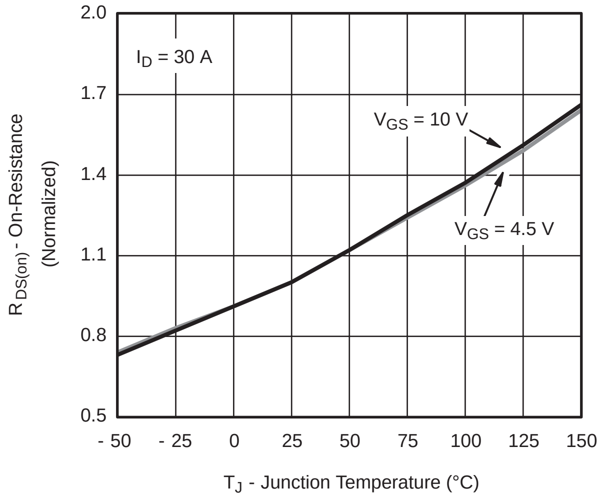


Capacitance

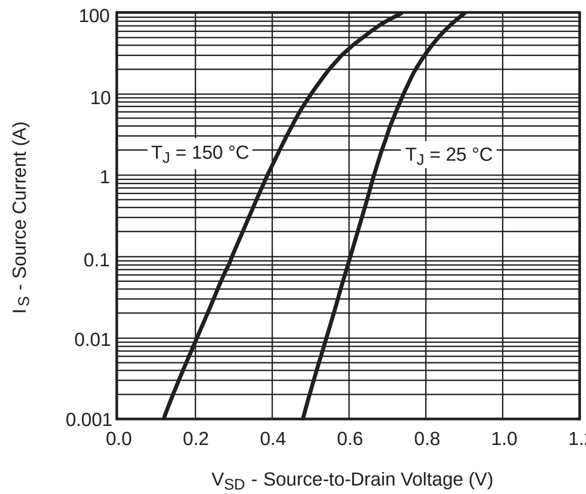


Gate Charge

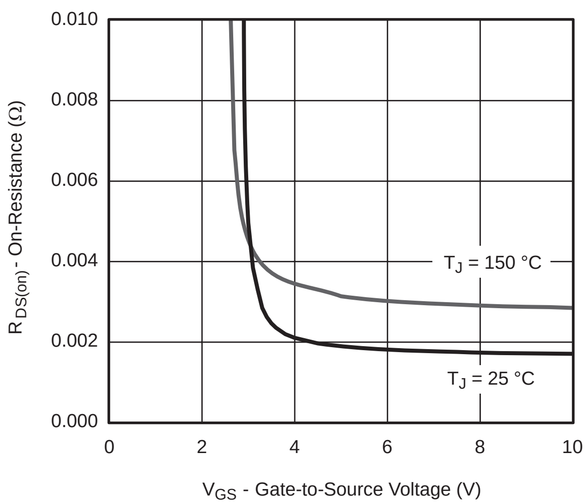
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



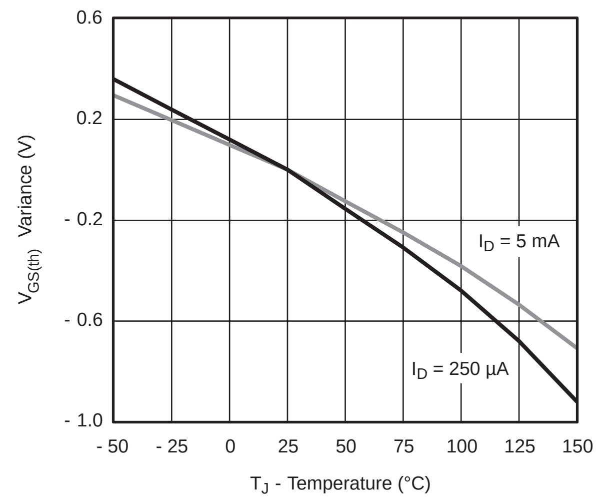
On-Resistance vs. Junction Temperature



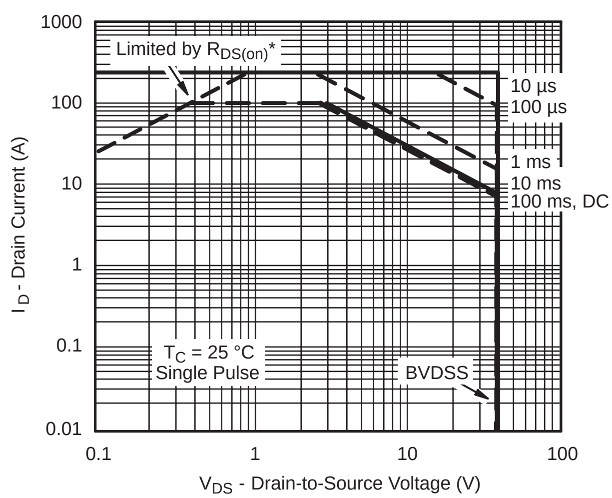
Forward Diode Voltage vs. Temperature



On-Resistance vs. Gate-to-Source Voltage



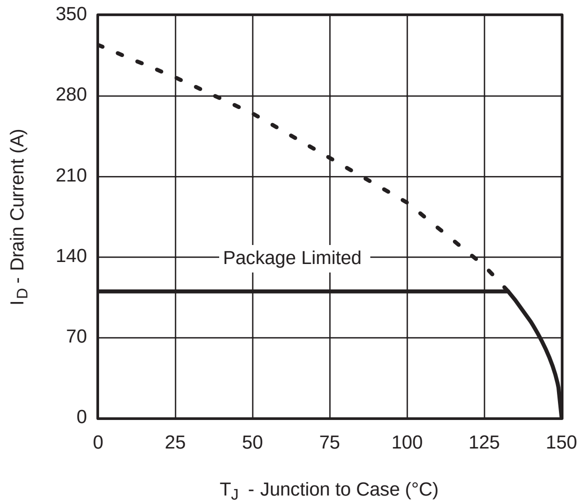
Threshold Voltage



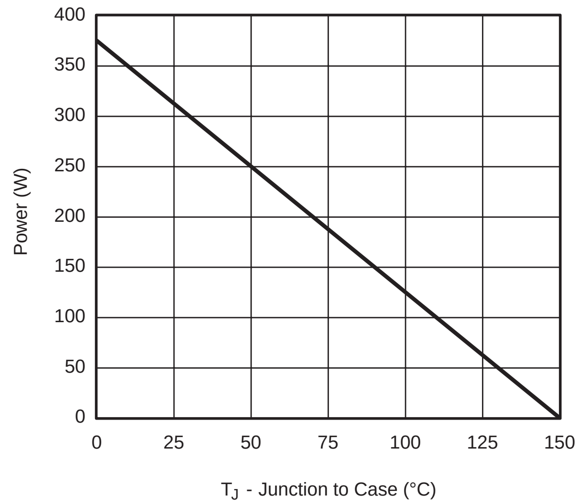
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

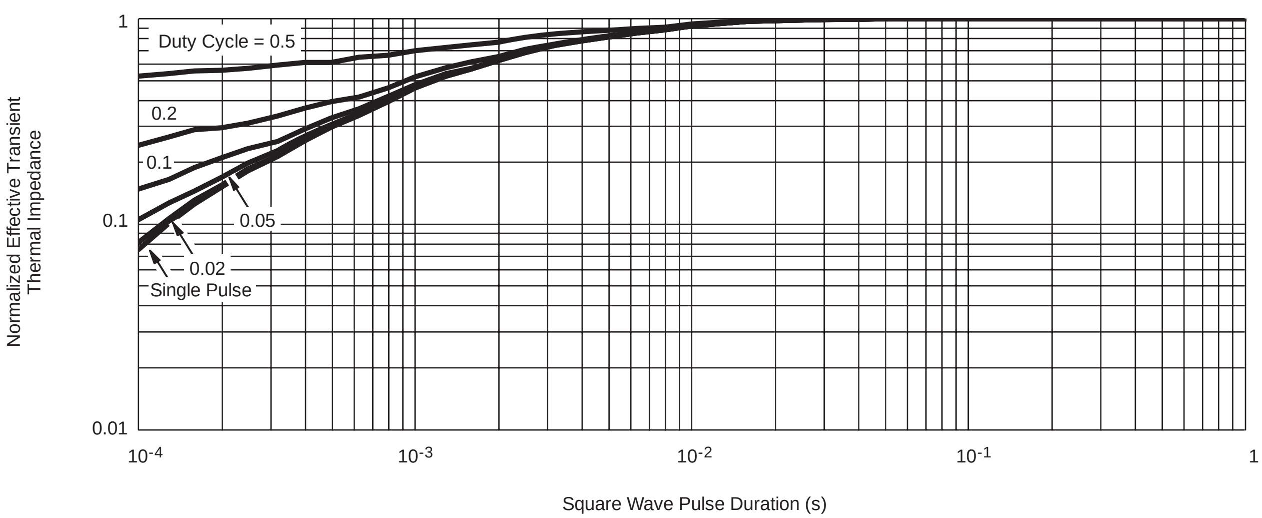


Current Derating*



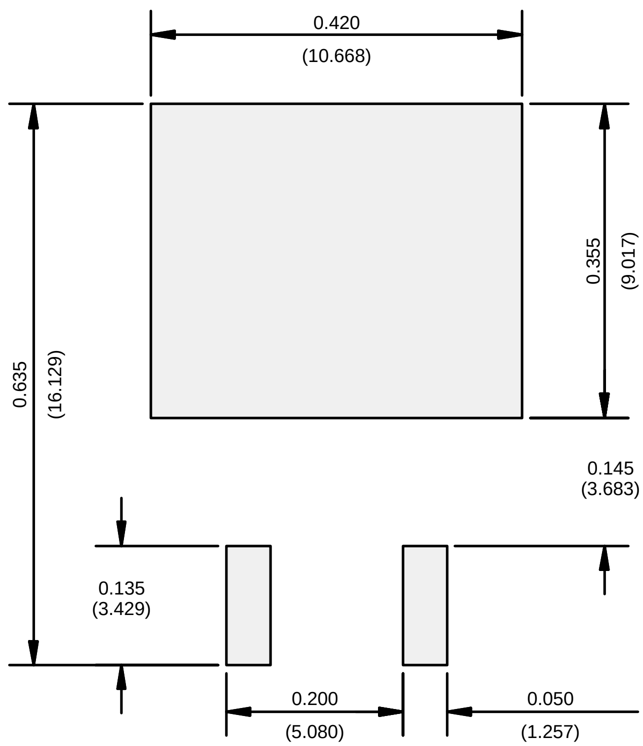
Power Derating

* The power dissipation P_D is based on $T_{J(max)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



Normalized Thermal Transient Impedance, Junction-to-Case

RECOMMENDED MINIMUM PADS FOR D^2PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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