

IRF9Z24NS-VB Datasheet

P-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω) Max.	I_D (A)	Q_g (Typ.)
- 60	0.048at $V_{GS} = - 10$ V	- 35	60
	0.060at $V_{GS} = - 4.5$ V	- 30	

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC

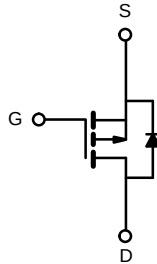
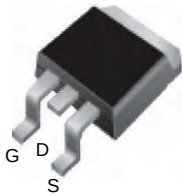


RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Power Switch
- Load Switch in High Current Applications
- DC/DC Converters

D²PAK (TO-263)



P-Channel MOSFET

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}	± 20	
Continuous Drain Current ($T_J = 150\text{ }^{\circ}\text{C}$)	I_D	- 35	A
		- 30	
Pulsed Drain Current ($t = 300\text{ }\mu\text{s}$)	I_{DM}	- 100	
Avalanche Current	I_{AS}	- 32	
Single Avalanche Energy ^a	E_{AS}	51	mJ
Maximum Power Dissipation ^a	P_D	61 ^b	W
		6.1	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	$^{\circ}\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Limit	Unit
Junction-to-Ambient (PCB Mount) ^c	R_{thJA}	60	$^{\circ}\text{C}/\text{W}$
Junction-to-Case (Drain)	R_{thJC}	3	

Notes:

a. Duty cycle $\leq 1\%$.

b. See SOA curve for voltage derating.

c. When mounted on 1" square PCB (FR-4 material).

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}	$V_{DS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	- 60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	- 1		- 2.5	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 250	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$			- 50	
		$V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$			- 250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -10\text{ V}$, $V_{GS} = -10\text{ V}$	- 30			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}$, $I_D = -14\text{ A}$		0.048		Ω
		$V_{GS} = -4.5\text{ V}$, $I_D = -12\text{ A}$		0.060		
Forward Transconductance ^a	g_{fs}	$V_{DS} = -20\text{ V}$, $I_D = -14\text{ A}$		40		S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = -30\text{ V}$, $f = 1\text{ MHz}$		1650		pF
Output Capacitance	C_{oss}			200		
Reverse Transfer Capacitance	C_{rss}			120		
Total Gate Charge ^c	Q_g	$V_{DS} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -14\text{ A}$		67		nC
Gate-Source Charge ^c	Q_{gs}			13.5		
Gate-Drain Charge ^c	Q_{gd}			14		
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.5	2.5	5	Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = -30\text{ V}$, $R_L = 2\text{ }\Omega$ $I_D \cong -10\text{ A}$, $V_{GEN} = -10\text{ V}$, $R_g = 1\text{ }\Omega$		10	20	ns
Rise Time ^c	t_r			11	20	
Turn-Off Delay Time ^c	$t_{d(off)}$			42	63	
Fall Time ^c	t_f			12	20	
Drain-Source Body Diode Ratings and Characteristics $T_C = 25\text{ }^{\circ}\text{C}$ ^b						
Continuous Current	I_S				- 35	A
Pulsed Current	I_{SM}				- 100	
Forward Voltage ^a	V_{SD}	$I_F = -10\text{ A}$, $V_{GS} = 0\text{ V}$		- 0.8	- 1.5	V
Reverse Recovery Time	t_{rr}	$I_F = -10\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$		38	57	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			2.3	3.5	A
Reverse Recovery Charge	Q_{rr}			40	60	nC

Notes:

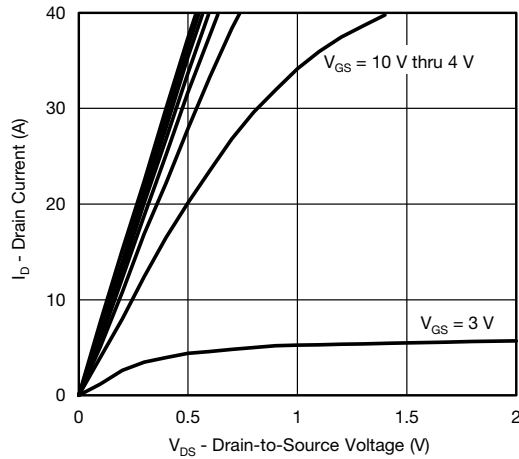
a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

b. Guaranteed by design, not subject to production testing.

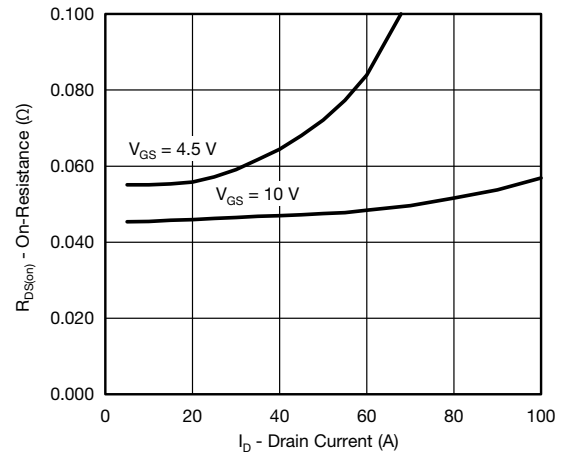
c. Independent of operating temperature.

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.

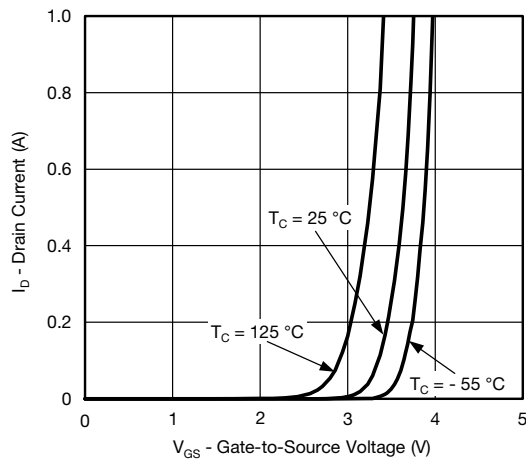
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



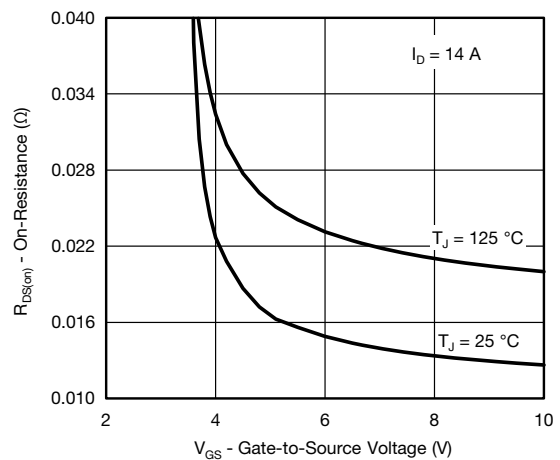
Output Characteristics



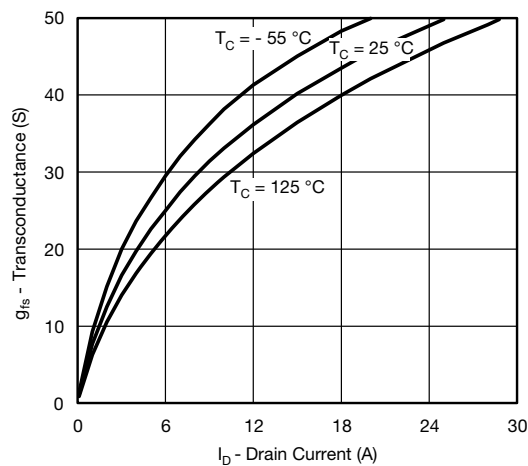
On-Resistance vs. Drain Current



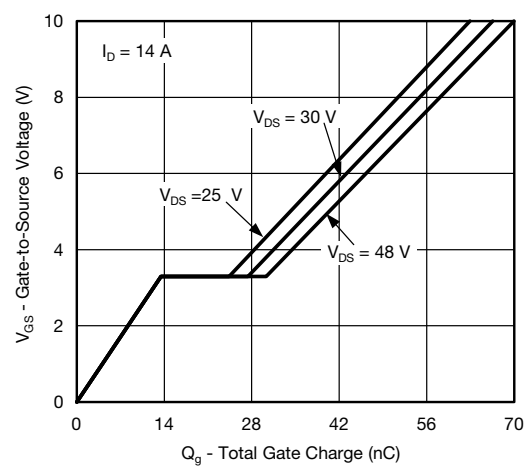
Transfer Characteristics



On-Resistance vs. Gate-to-Source Voltage

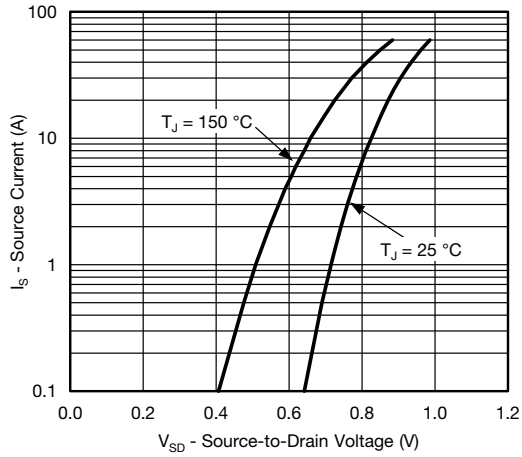


Transconductance

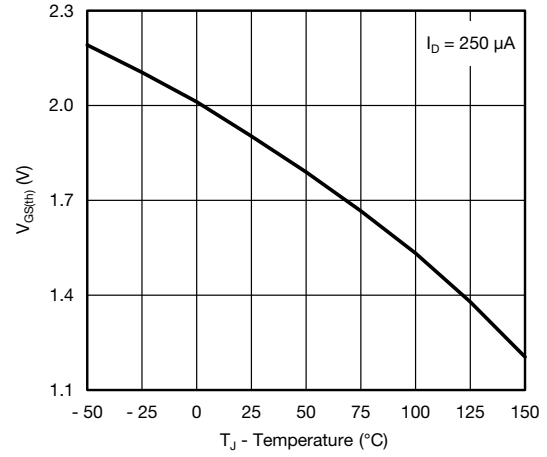


Gate Charge

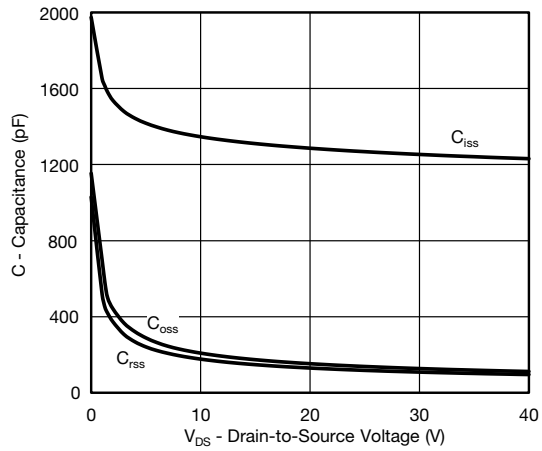
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



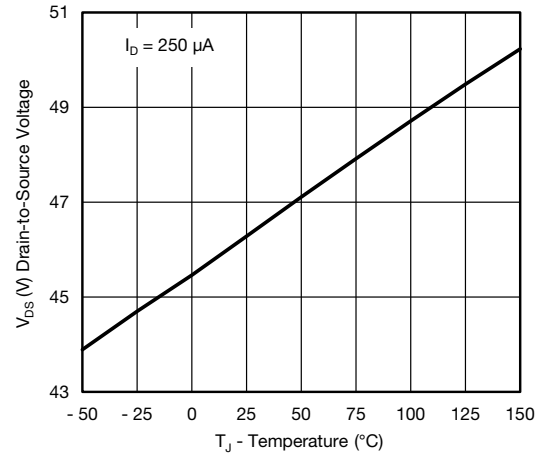
Source-Drain Diode Forward Voltage



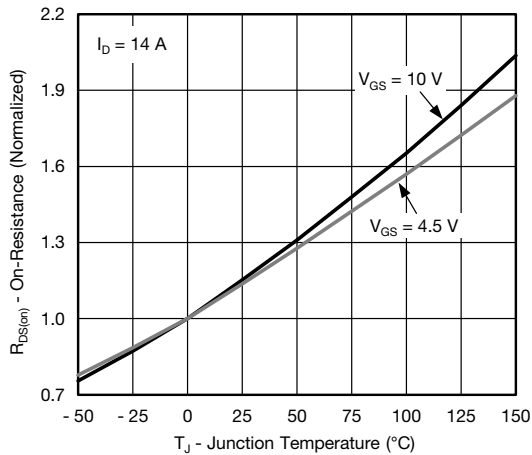
Threshold Voltage



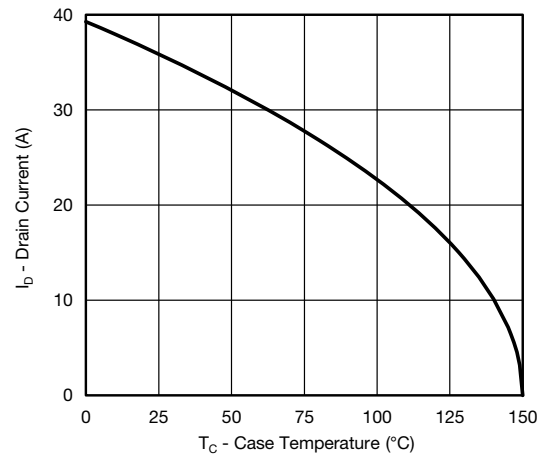
Capacitance



Drain Source Breakdown vs. Junction Temperature

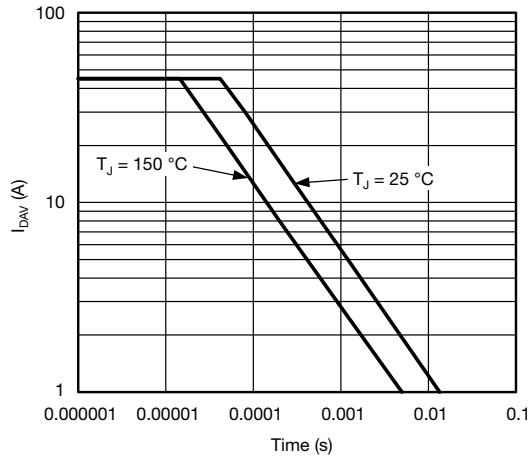


On-Resistance vs. Junction Temperature

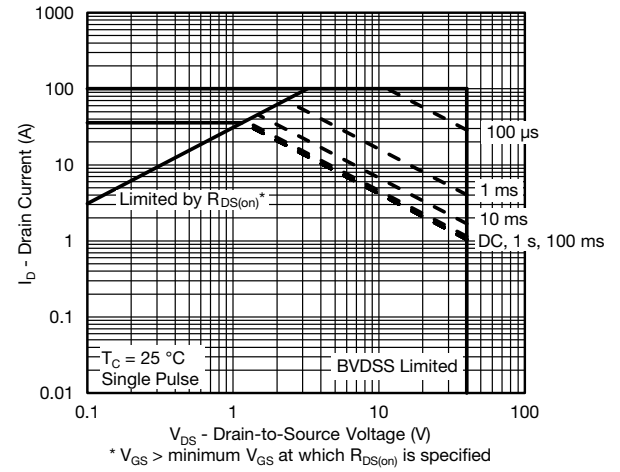


Current Derating

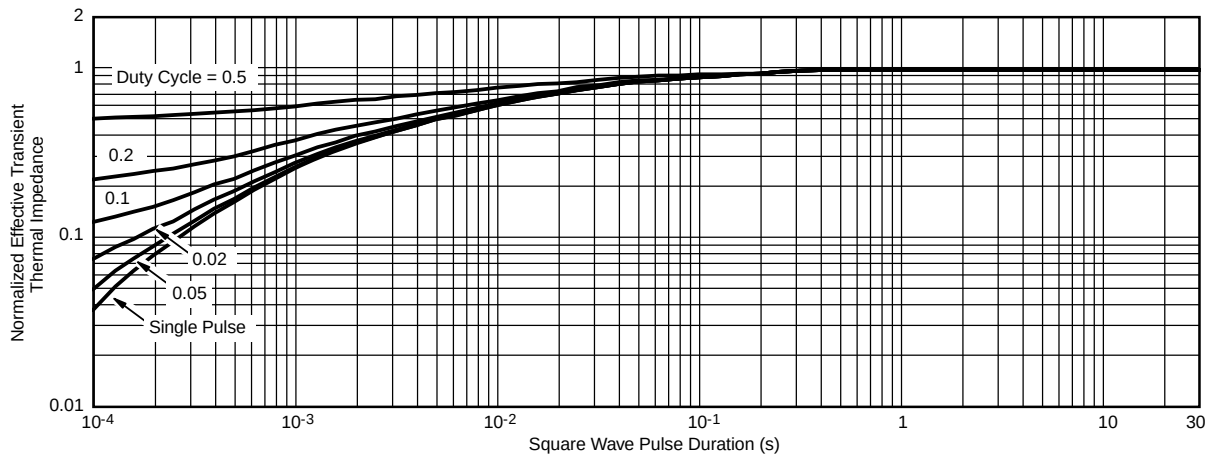
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Single Pulse Avalanche Current Capability vs. Time

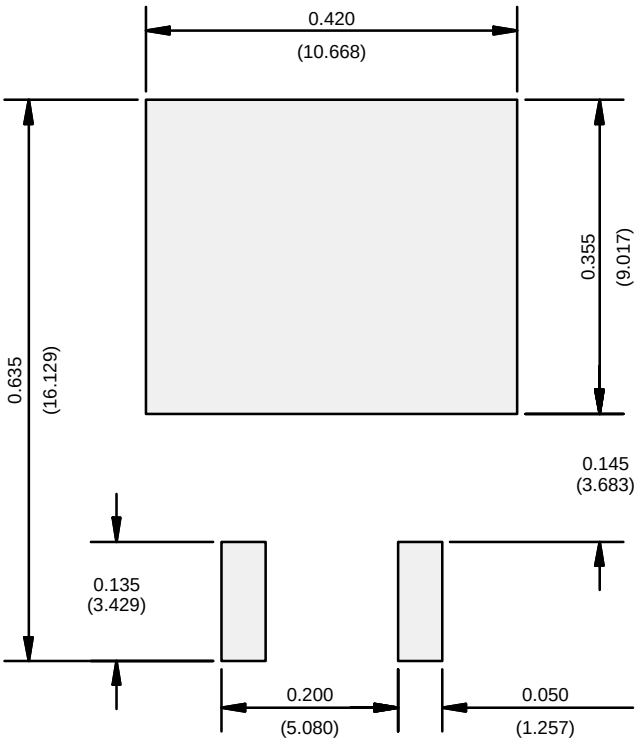


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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