

SI7309DN-VB Datasheet

P-Channel 60 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	-60
$R_{DS(on)}$ (Ω) at $V_{GS} = -10$ V	0.0210
$R_{DS(on)}$ (Ω) at $V_{GS} = -4.5$ V	0.0288
I_D (A)	-36
Configuration	Single
Package	DFN 3X3

FEATURES

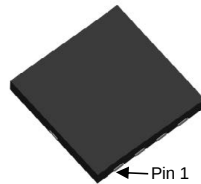
- Trench power MOSFET
- 100 % R_g and UIS tested



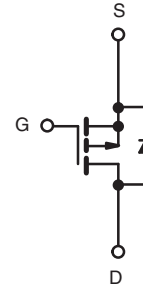
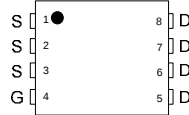
RoHS
COMPLIANT
HALOGEN
FREE

DFN 3x3 EP

Top View



Top View



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	$T_C = 25\text{ }^{\circ}\text{C}$	I_D	-36	A
	$T_C = 125\text{ }^{\circ}\text{C}$		-21	
Continuous Source Current (Diode Conduction) ^a		I_S	-60	
Pulsed Drain Current ^b		I_{DM}	-100	
Single Pulse Avalanche Current	$L = 0.1\text{ mH}$	I_{AS}	-36	mJ
Single Pulse Avalanche Energy		E_{AS}	64.8	
Maximum Power Dissipation ^b	$T_C = 25\text{ }^{\circ}\text{C}$	P_D	68	W
	$T_C = 125\text{ }^{\circ}\text{C}$		22	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +175	$^{\circ}\text{C}$
Soldering Recommendations (Peak Temperature) ^{d, e}			260	

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient	PCB Mount ^c	R_{thJA}	68	$^{\circ}\text{C/W}$
Junction-to-Case (Drain)		R_{thJC}	2.2	

Notes

- Package limited.
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- When mounted on 1" square PCB (FR4 material).
- For DFN3X3, the end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.

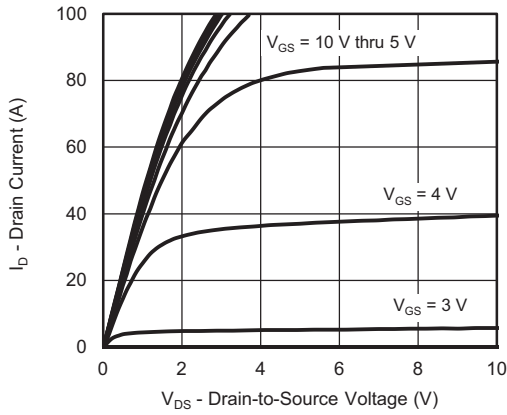
SPECIFICATIONS (T _C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0, I _D = -250 μA		-60	-	-	V
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250 μA		-1.5	-2.0	-2.5	
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V	V _{DS} = -60 V	-	-	-1	μA
		V _{GS} = 0 V	V _{DS} = -60 V, T _J = 125 °C	-	-	-50	
		V _{GS} = 0 V	V _{DS} = -60 V, T _J = 175 °C	-	-	-150	
On-State Drain Current ^a	I _{D(on)}	V _{GS} = -10 V	V _{DS} ≥ -5 V	-30	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = -10 V	I _D = -10 A	-	0.0210	-	Ω
		V _{GS} = -10 V	I _D = -10 A, T _J = 125 °C	-	0.0409	-	
		V _{GS} = -10 V	I _D = -10 A, T _J = 175 °C	-	0.0504	-	
		V _{GS} = -4.5 V	I _D = -5 A	-	0.0288	-	
Forward Transconductance ^b	g _{fs}	V _{DS} = -15 V, I _D = -10 A		-	26	-	S
Dynamic ^b							
Input Capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = -25 V, f = 1 MHz	-	2600	3400	pF
Output Capacitance	C _{oss}			-	310	450	
Reverse Transfer Capacitance	C _{rss}			-	200	275	
Total Gate Charge ^c	Q _g	V _{GS} = -10 V	V _{DS} = -30 V, I _D = -5 A	-	65	100	nC
Gate-Source Charge ^c	Q _{gs}			-	9.5	-	
Gate-Drain Charge ^c	Q _{gd}			-	19	-	
Gate Resistance	R _g	f = 1 MHz		0.50	1.19	1.80	Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = -30 V, R _L = 6 Ω I _D ≅ -5 A, V _{GEN} = -10 V, R _g = 1 Ω		-	15	25	ns
Rise Time ^c	t _r			-	5	10	
Turn-Off Delay Time ^c	t _{d(off)}			-	40	75	
Fall Time ^c	t _f			-	6	12	
Source-Drain Diode Ratings and Characteristics ^b							
Pulsed Current ^a	I _{SM}			-	-	-100	A
Forward Voltage	V _{SD}	I _F = -10 A, V _{GS} = 0 V		-	-0.80	-1.2	V

Notes

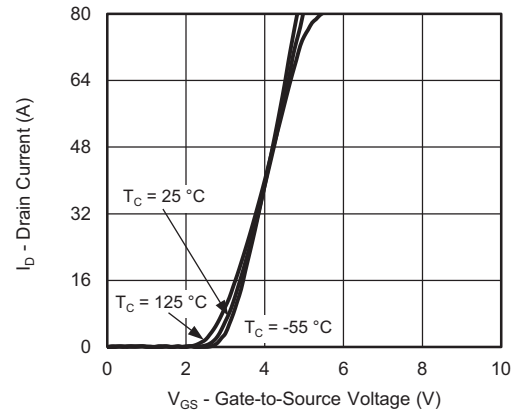
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.
 c. Independent of operating temperature.

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.

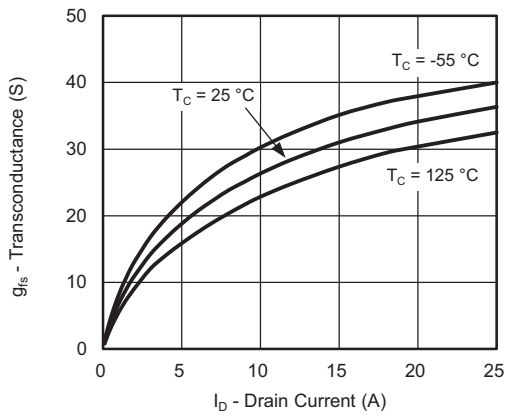
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



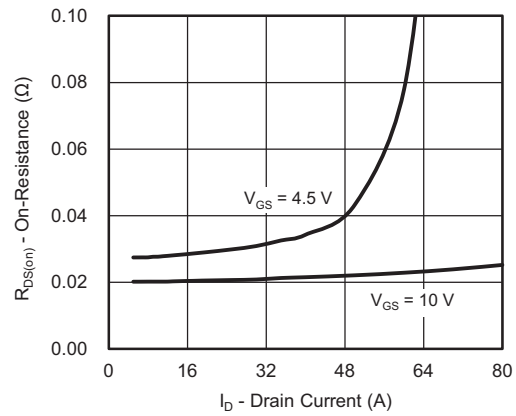
Output Characteristics



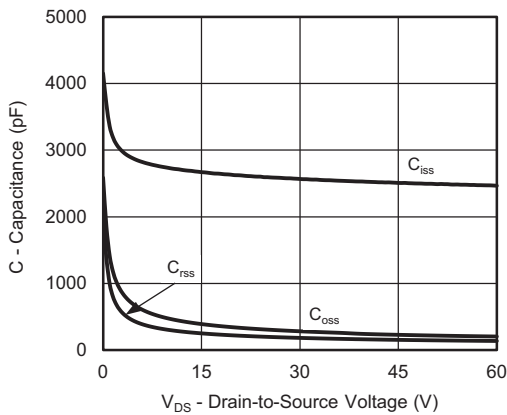
Transfer Characteristics



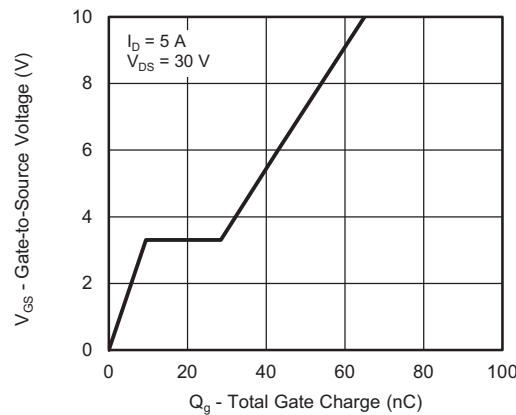
Transconductance



On-Resistance vs. Drain Current

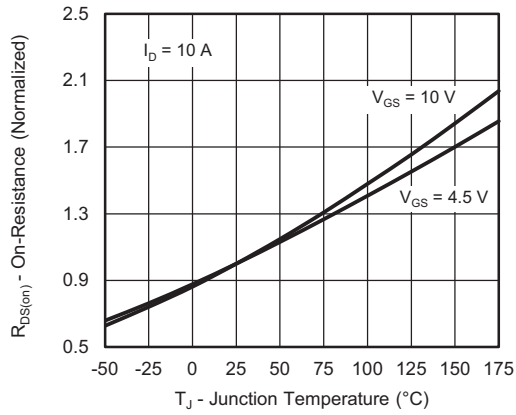


Capacitance

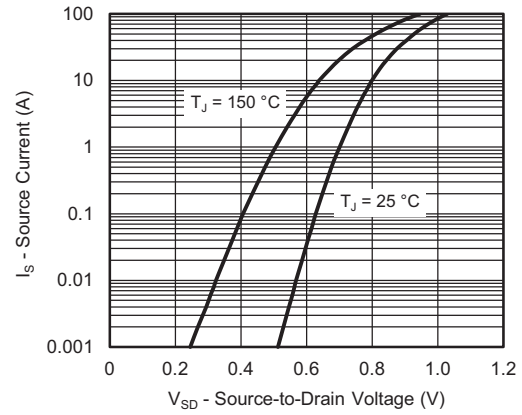


Gate Charge

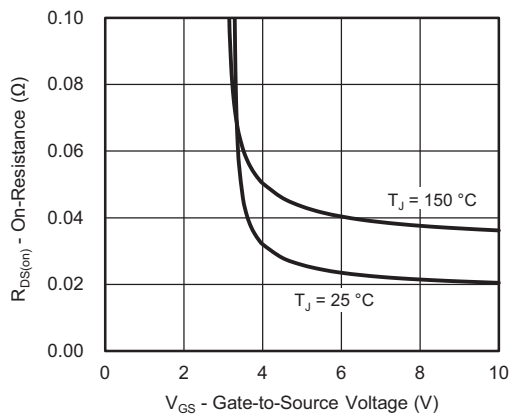
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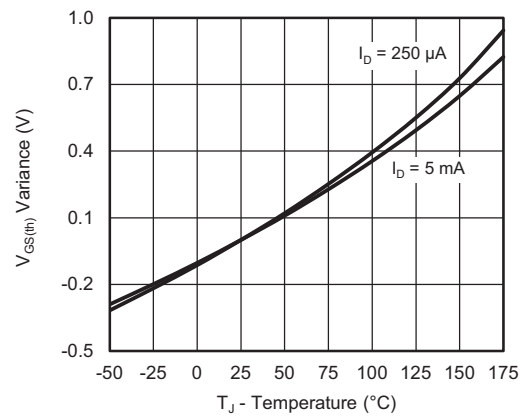
On-Resistance vs. Junction Temperature



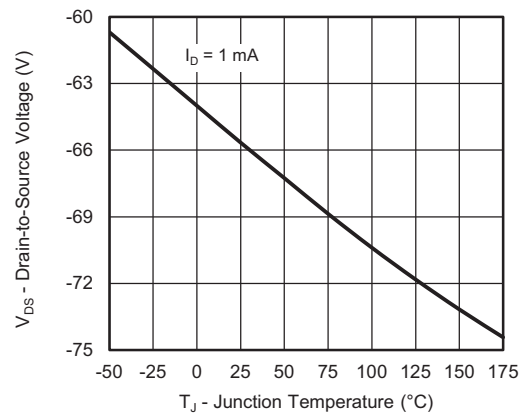
Source Drain Diode Forward Voltage



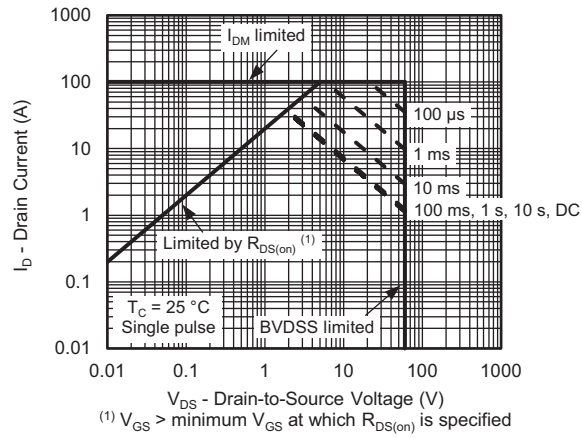
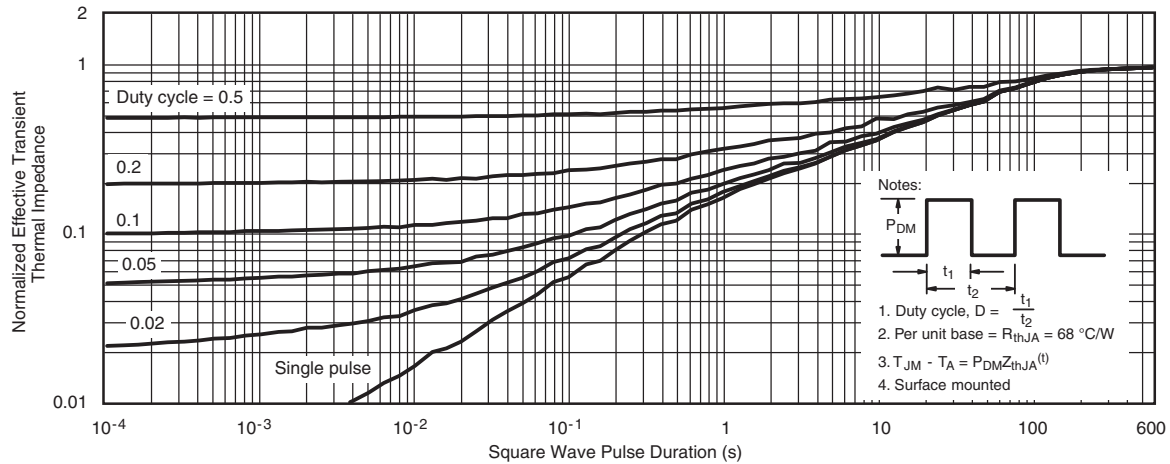
On-Resistance vs. Gate-to-Source Voltage

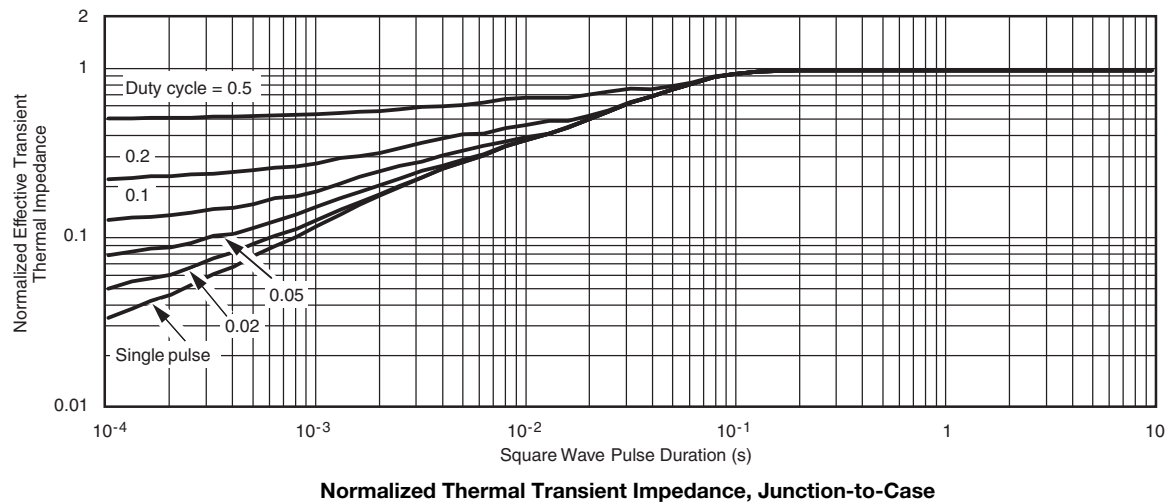


Threshold Voltage

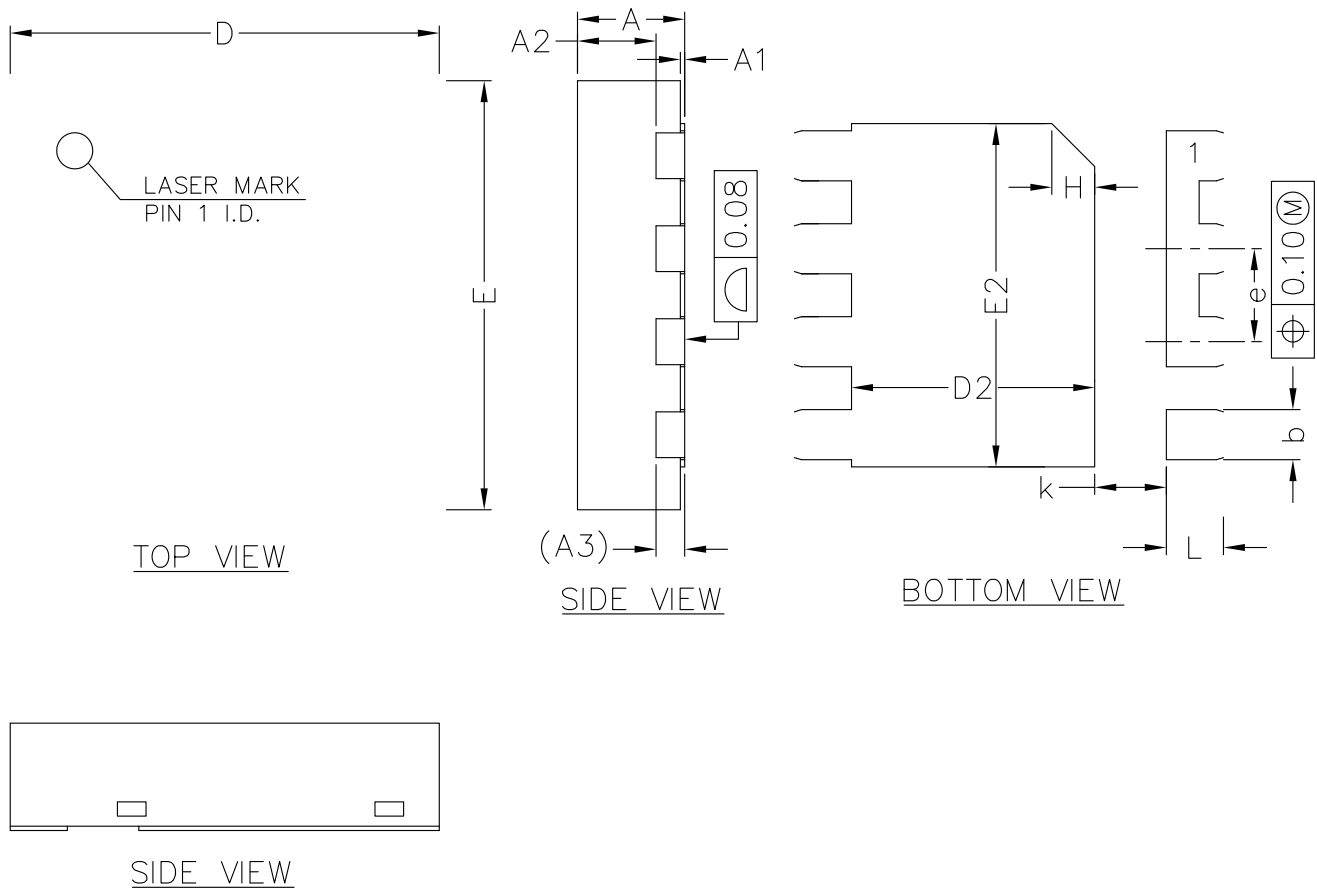


Drain-Source Breakdown vs. Junction Temperature

THERMAL RATINGS ($T_C = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Safe Operating Area

Normalized Thermal Transient Impedance, Junction-to-Ambient

THERMAL RATINGS ($T_C = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction-to-Ambient ($25\text{ }^{\circ}\text{C}$)
 - Normalized Transient Thermal Impedance Junction-to-Case ($25\text{ }^{\circ}\text{C}$)
 are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2	0.50	0.55	0.60
A3	0.20REF		
b	0.30	0.35	0.40
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D2	1.60	1.70	1.80
E2	2.30	2.40	2.50
e	0.55	0.65	0.75
K	0.40	0.50	0.60
L	0.35	0.40	0.45

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