

## VSI090N10MS-VB Datasheet

### N-Channel 100 V (D-S) MOSFET

#### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
100	0.036 at $V_{GS} = 10$ V	35

#### FEATURES

- Trench Power MOSFET
- 175 °C Junction Temperature
- PWM Optimized
- 100 %  $R_g$  Tested
- Compliant to RoHS Directive 2002/95/EC

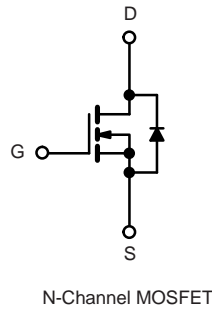
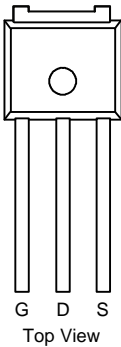


**RoHS**  
COMPLIANT

#### APPLICATIONS

- Primary Side Switch

TO-251



#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V <sub>DS</sub>	100	V
Gate-Source Voltage		V <sub>GS</sub>	± 20	
Continuous Drain Current (T <sub>J</sub> = 175 °C) <sup>b</sup>	T <sub>C</sub> = 25 °C	I <sub>D</sub>	35	A
	T <sub>C</sub> = 125 °C		30	
Pulsed Drain Current		I <sub>DM</sub>	110	
Continuous Source Current (Diode Conduction)		I <sub>S</sub>	23	
Avalanche Current		I <sub>AS</sub>	3	
Single Pulse Avalanche Energy	L = 0.1 mH	E <sub>AS</sub>	18	mJ
Maximum Power Dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	96 <sup>b</sup>	W
	T <sub>A</sub> = 25 °C		3 <sup>a</sup>	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 175	°C

#### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	$t \leq 10$ s	15	°C/W
		Steady State	40	
Junction-to-Case (Drain)	$R_{thJC}$	0.85	1.1	

Notes:

a. Surface mounted on 1" x 1" FR4 board.

b. See SOA curve for voltage derating.

SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	100			V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2		4	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 80 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C			50	
		V <sub>DS</sub> =80 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175 °C			250	
On-State Drain Current <sup>b</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 10 V	35			A
Drain-Source On-State Resistance <sup>b</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3 A		0.036		Ω
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3 A, T <sub>J</sub> = 125 °C		0.040		
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3 A, T <sub>J</sub> = 175 °C		0.050		
		V <sub>GS</sub> = 6 V, I <sub>D</sub> = 3 A		0.039		
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 3 A		35		S
Dynamic <sup>a</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, F = 1 MHz		4000		pF
Output Capacitance	C <sub>oss</sub>			500		
Reverse Transfer Capacitance	C <sub>rss</sub>			180		
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3 A		34		nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			8		
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			12		
Gate Resistance	R <sub>g</sub>		0.5		2.9	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 50 V, R <sub>L</sub> = 5.2 Ω I <sub>D</sub> ≅ 3 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 2.5 Ω		15	25	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			50	75	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			30	45	
Fall Time <sup>c</sup>	t <sub>f</sub>			60	90	
Source-Drain Diode Ratings and Characteristics (T <sub>C</sub> = 25 °C)						
Pulsed Current	I <sub>SM</sub>				5	A
Diode Forward Voltage <sup>b</sup>	V <sub>SD</sub>	I <sub>F</sub> = 3 A, V <sub>GS</sub> = 0 V		0.9	1.5	V
Source-Drain Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 3 A, dI/dt = 100 A/μs		180	250	ns

Notes:

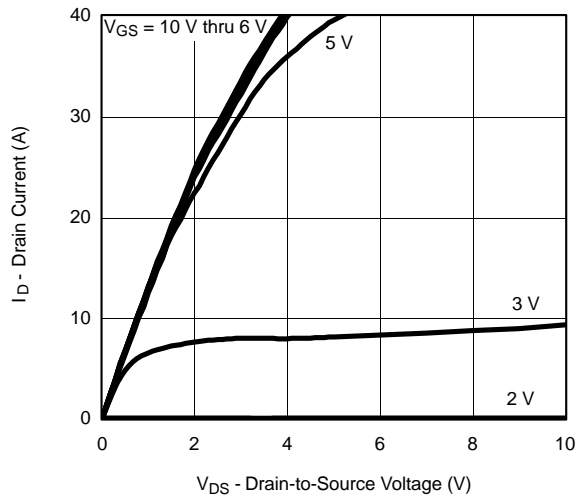
a. Guaranteed by design, not subject to production testing.

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

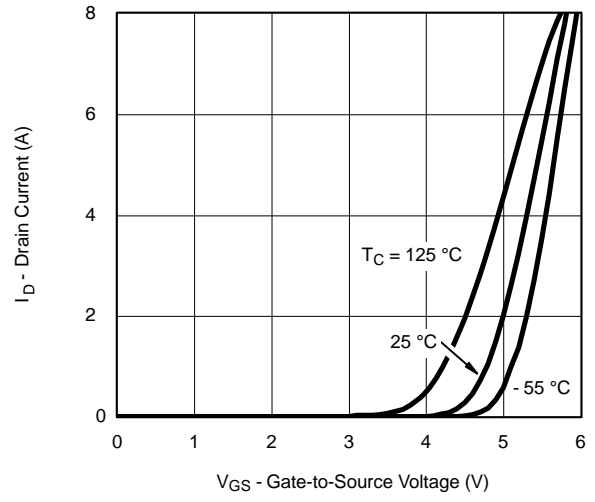
c. Independent of operating temperature.

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)



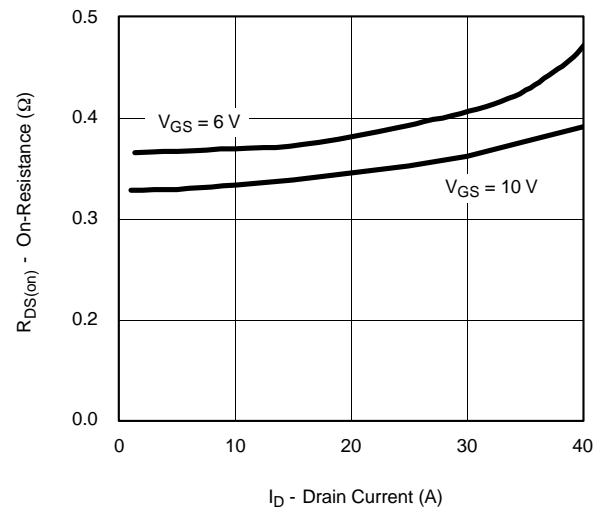
**Output Characteristics**



**Transfer Characteristics**



**Transconductance**



**On-Resistance vs. Drain Current**



**Capacitance**

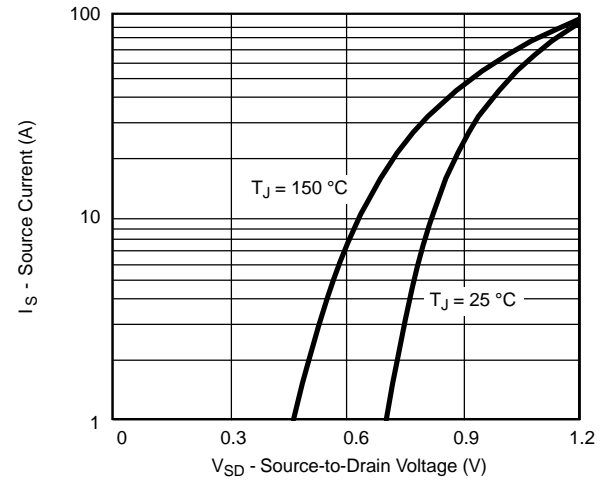


**Gate Charge**

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



On-Resistance vs. Junction Temperature

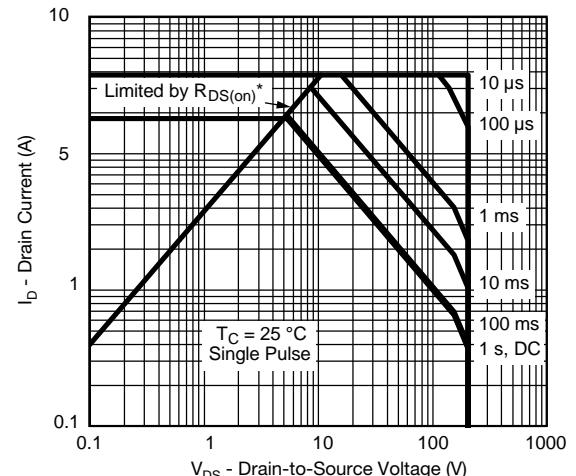


Source-Drain Diode Forward Voltage

**THERMAL RATINGS**

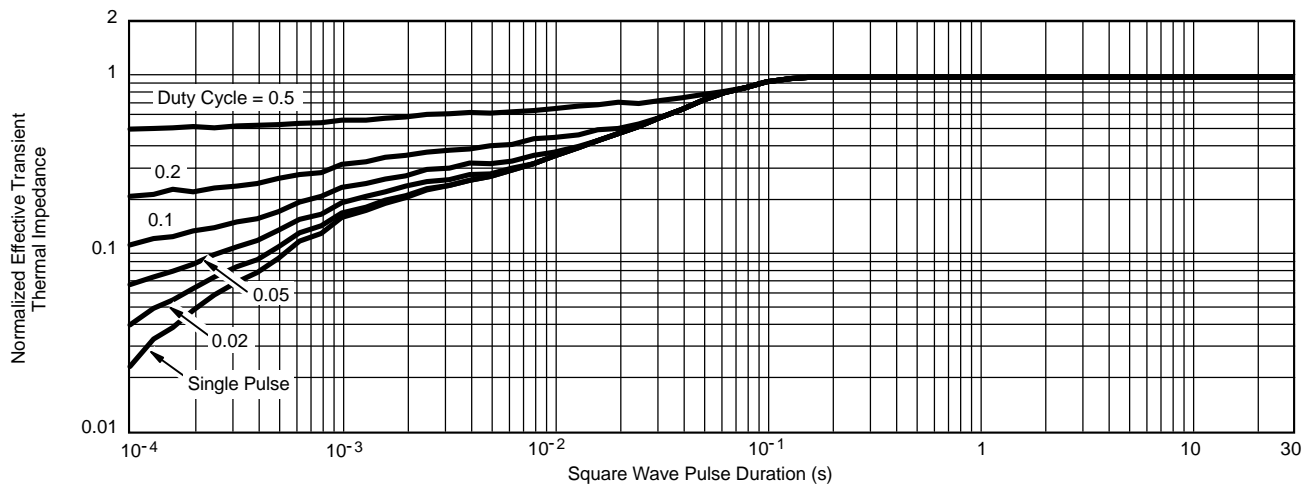


Maximum Avalanche Drain Current vs. Case Temperature



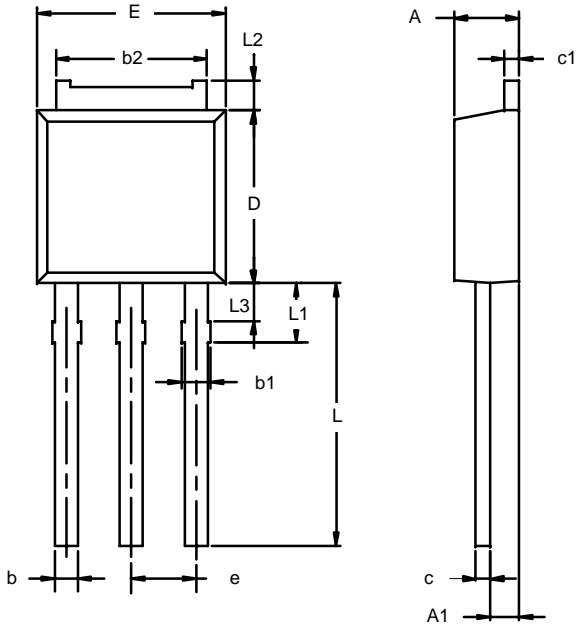
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

TO-251AA (DPAK)



Note: Dimension L3 is for reference only.

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	2.21	2.38	0.087	0.094
A1	0.89	1.14	0.035	0.045
b	0.71	0.89	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.43	0.206	0.214
c	0.46	0.58	0.018	0.023
c1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
E	6.48	6.73	0.255	0.265
e	2.28 BSC		0.090 BSC	
L	8.89	9.53	0.350	0.375
L1	1.91	2.28	0.075	0.090
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.045	0.060
ECN: S-03946—Rev. E, 09-Jul-01 DWG: 5346				

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