



N-Channel Enhancement-Mode Vertical DMOS FET

Features

- Free from secondary breakdown
- Low power drive requirement
- Ease of paralleling
- Low C_{iss} and fast switching speeds
- Excellent thermal stability
- Integral source-drain diode
- High input impedance and high gain

Applications

- Motor controls
- Converters
- Amplifiers
- Switches
- Power supply circuits
- Drivers (relays, hammers, solenoids, lamps, memories, displays, bipolar transistors, etc.)

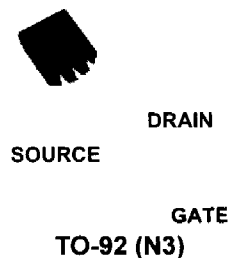
Ordering Information

Device	Package	Wafer / Die Options		
	TO-92	NW (Die in wafer form)	NJ (Die on adhesive tape)	ND (Die in waffle pack)
VN0109	VN0109N3-	VN1509NW	VN1509NJ	VN1509ND

Product Summary

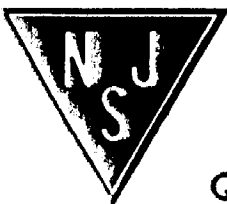
BV_{DSS}/BV_{DGS} (V)	$R_{DS(ON)}$ (max) (Ω)	$I_{D(ON)}$ (min) (A)
90	3.0	2.0

Pin Configuration



Absolute Maximum Ratings

Parameter	Value
Drain-to-source voltage	BV_{DSS}
Drain-to-gate voltage	BV_{DGS}
Gate-to-source voltage	$\pm 20V$
Operating and storage temperature	$-55^{\circ}C$ to $+150^{\circ}C$



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Thermal Characteristics

Package	I_D (continuous) [†] (mA)	I_D (pulsed) (A)	Power Dissipation @ $T_C = 25^\circ\text{C}$ (W)	θ_{jc} ($^\circ\text{C/W}$)	θ_{ja} ($^\circ\text{C/W}$)	$I_{DR}^{\dagger}$ (mA)	I_{DRM} (A)
TO-92	350	2.0	1.0	125	170	350	2.0

Notes:

[†] I_D (continuous) is limited by max rated T_J .

Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise specified)

Sym	Parameter	Min	Typ	Max	Units	Conditions
BV_{DSS}	Drain-to-source breakdown voltage	90	-	-	V	$V_{GS} = 0V, I_D = 1.0\text{mA}$
$V_{GS(th)}$	Gate threshold voltage	0.8	-	2.4	V	$V_{GS} = V_{DS}, I_D = 1.0\text{mA}$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with temperature	-	-3.8	-5.5	mV/ $^\circ\text{C}$	$V_{GS} = V_{DS}, I_D = 1.0\text{mA}$
I_{GSS}	Gate body leakage	-	-	100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
I_{DSS}	Zero gate voltage drain current	-	-	1.0	μA	$V_{GS} = 0V, V_{DS} = \text{Max Rating}$
		-	-	100		$V_{DS} = 0.8 \text{ Max Rating}, V_{GS} = 0V, T_A = 125^\circ\text{C}$
$I_{D(ON)}$	On-state drain current	0.5	1.0	-	A	$V_{GS} = 5.0V, V_{DS} = 25V$
		2.0	2.5	-		$V_{GS} = 10V, V_{DS} = 25V$
$R_{DS(ON)}$	Static drain-to-source on-state resistance	-	3.0	5.0	Ω	$V_{GS} = 5.0V, I_D = 250\text{mA}$
		-	2.5	3.0		$V_{GS} = 10V, I_D = 1.0A$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	0.70	1.0	%/ $^\circ\text{C}$	$V_{GS} = 10V, I_D = 1.0A$
G_{FS}	Forward transconductance	300	450	-	mmho	$V_{DS} = 25V, I_D = 500\text{mA}$
C_{ISS}	Input capacitance	-	55	65	pF	$V_{GS} = 0V, V_{DS} = 25V, f = 1.0\text{MHz}$
C_{OSS}	Common source output capacitance	-	20	25		
C_{RSS}	Reverse transfer capacitance	-	5.0	8.0		
$t_{d(ON)}$	Turn-on delay time	-	3.0	5.0	ns	$V_{DD} = 25V, I_D = 1.0A, R_{GEN} = 25\Omega$
t_r	Rise time	-	5.0	8.0		
$t_{d(OFF)}$	Turn-off delay time	-	6.0	9.0		
t_f	Fall time	-	5.0	8.0		
V_{SD}	Diode forward voltage drop	-	1.2	1.8	V	$V_{GS} = 0V, I_{SD} = 1.0A$
t_{rr}	Reverse recovery time	-	400	-	ns	$V_{GS} = 0V, I_{SD} = 1.0A$

Notes:

1. All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300 μs pulse, 2% duty cycle.)
2. All A.C. parameters sample tested.

Switching Waveforms and Test Circuit

