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# VN2222LL

Preferred Device

## Small Signal MOSFET 150 mAmps, 60 Volts

N-Channel TO-92

### Features

- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	60	Vdc
Drain-Gate Voltage ( $R_{GS} = 1.0 \text{ M}\Omega$ )	$V_{DGR}$	60	Vdc
Gate-Source Voltage	$V_{GS}$	$\pm 20$	Vdc
- Continuous	$V_{GSM}$	$\pm 40$	Vpk
- Non-repetitive ( $t_p \leq 50 \mu\text{s}$ )			
Drain Current	$I_D$	150	mAdc
- Continuous	$I_{DM}$	1000	
- Pulsed			
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	400	mW
Derate above $25^\circ\text{C}$		3.2	mW/ $^\circ\text{C}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

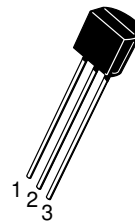
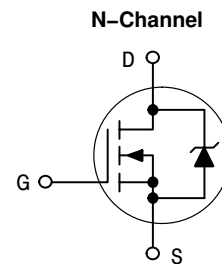
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	312.5	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes, 1/16" from case for 10 seconds	$T_L$	300	$^\circ\text{C}$



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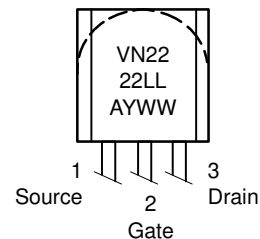
<http://onsemi.com>

150 mA, 60 V  
 $R_{DS(on)} = 7.5 \Omega$



TO-92  
CASE 29  
STYLE 22

### MARKING DIAGRAM & PIN ASSIGNMENT



A = Assembly Location  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# VN2222LL

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Drain–Source Breakdown Voltage (V <sub>GS</sub> = 0, I <sub>D</sub> = 100 μA <sub>dc</sub> )	V <sub>(BR)DSS</sub>	60	–	V <sub>dc</sub>
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 48 V <sub>dc</sub> , V <sub>GS</sub> = 0) (V <sub>DS</sub> = 48 V <sub>dc</sub> , V <sub>GS</sub> = 0, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	–	10 500	μA <sub>dc</sub>
Gate–Body Leakage Current, Forward (V <sub>GSF</sub> = 30 V <sub>dc</sub> , V <sub>DS</sub> = 0)	I <sub>GSSF</sub>	–	–100	nA <sub>dc</sub>

## ON CHARACTERISTICS (Note 1)

Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1.0 mA <sub>dc</sub> )	V <sub>GS(th)</sub>	0.6	2.5	V <sub>dc</sub>
Static Drain–Source On–Resistance (V <sub>GS</sub> = 10 V <sub>dc</sub> , I <sub>D</sub> = 0.5 A <sub>dc</sub> ) (V <sub>GS</sub> = 10 V <sub>dc</sub> , I <sub>D</sub> = 0.5 V <sub>dc</sub> , T <sub>C</sub> = 125°C)	r <sub>DS(on)</sub>	–	7.5 13.5	Ω
Drain–Source On–Voltage (V <sub>GS</sub> = 5.0 V <sub>dc</sub> , I <sub>D</sub> = 200 mA <sub>dc</sub> ) (V <sub>GS</sub> = 10 V <sub>dc</sub> , I <sub>D</sub> = 500 mA <sub>dc</sub> )	V <sub>DS(on)</sub>	–	1.5 3.75	V <sub>dc</sub>
On–State Drain Current (V <sub>GS</sub> = 10 V <sub>dc</sub> , V <sub>DS</sub> ≥ 2.0 V <sub>DS(on)</sub> )	I <sub>D(on)</sub>	750	–	mA
Forward Transconductance (V <sub>DS</sub> = 10 V <sub>dc</sub> , I <sub>D</sub> = 500 mA <sub>dc</sub> )	g <sub>fs</sub>	100	–	μmhos

## DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 25 V <sub>dc</sub> , V <sub>GS</sub> = 0, f = 1.0 MHz)	C <sub>iss</sub>	–	60	pF
Output Capacitance		C <sub>oss</sub>	–	25	
Reverse Transfer Capacitance		C <sub>rss</sub>	–	5.0	

## SWITCHING CHARACTERISTICS (Note 1)

Turn–On Delay Time	(V <sub>DD</sub> = 15 V <sub>dc</sub> , I <sub>D</sub> = 600 mA, R <sub>gen</sub> = 25 Ω, R <sub>L</sub> = 23 Ω)	t <sub>on</sub>	–	10	ns
Turn–Off Delay Time		t <sub>off</sub>	–	10	

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

## ORDERING INFORMATION

Device	Package	Shipping†
VN2222LL	TO–92	1000 Unit / Box
VN2222LLG	TO–92 (Pb–Free)	1000 Unit / Box
VN2222LLRL	TO–92	1000 Unit / Box
VN2222LLRLRA	TO–92	2000 Tape & Reel
VN2222LLRLRAG	TO–92 (Pb–Free)	2000 Tape & Reel
VN2222LLRLRM	TO–92	2000 Unit / Ammo Box

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# VN2222LL

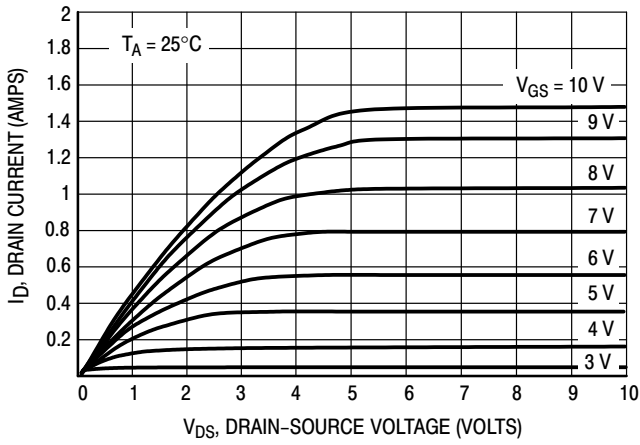


Figure 1. Ohmic Region

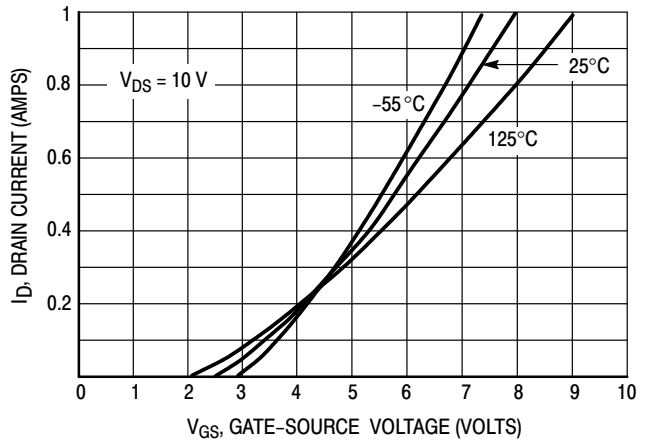


Figure 2. Transfer Characteristics

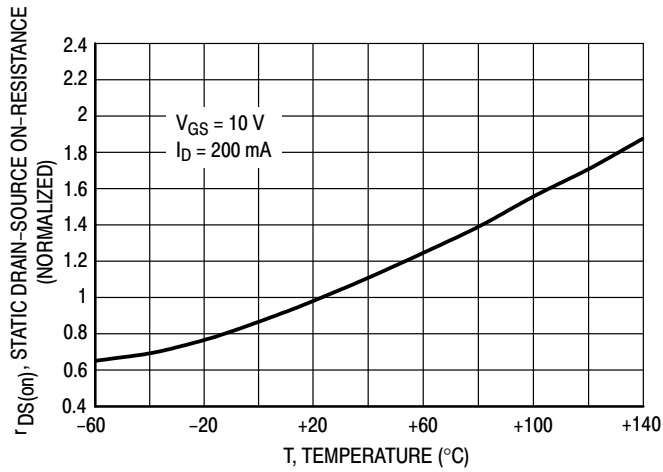


Figure 3. Temperature versus Static Drain-Source On-Resistance

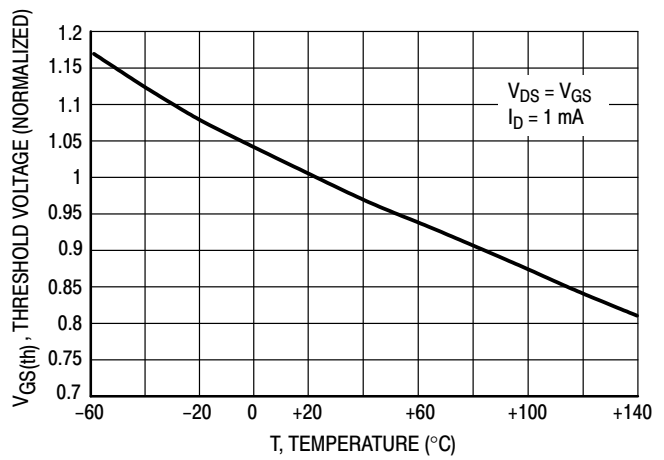
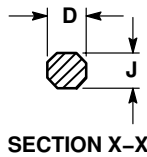
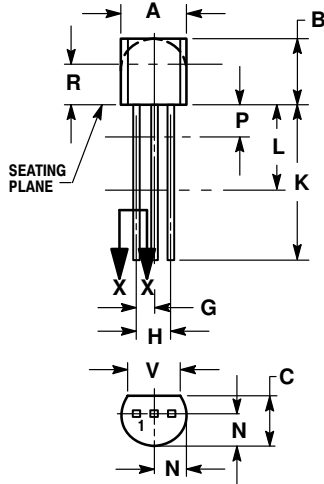


Figure 4. Temperature versus Gate Threshold Voltage

# VN2222LL

## PACKAGE DIMENSIONS

TO-92  
CASE 29-11  
ISSUE AL




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---

STYLE 22:

1. SOURCE
2. GATE
3. DRAIN

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