

# VN222LLG

## Small Signal MOSFET 150 mAmps, 60 Volts

N-Channel TO-92

### Features

- This is a Pb-Free Device\*

### 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 | $^\circ\text{C}$     |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

### 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   | $^\circ\text{C}$          |

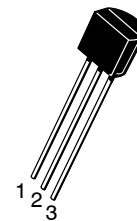
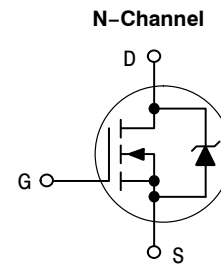
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



ON Semiconductor®

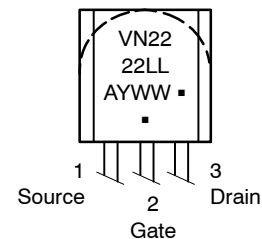
<http://onsemi.com>

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  
▪ = Pb-Free Package  
(Note: Microdot may be in either location)

### ORDERING INFORMATION

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

# VN2222LLG

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

| Characteristic  | Symbol               | Min | Max       | Unit             |
|---|----------------------|-----|-----------|------------------|
| <b>OFF CHARACTERISTICS</b>  |                      |     |           |                  |
| Drain-Source Breakdown Voltage<br>(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<br>(V <sub>DS</sub> = 48 V <sub>dc</sub> , V <sub>GS</sub> = 0)<br>(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<br>500 | μA <sub>dc</sub> |
| Gate-Body Leakage Current, Forward<br>(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<br>(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<br>(V <sub>GS</sub> = 10 V <sub>dc</sub> , I <sub>D</sub> = 0.5 A <sub>dc</sub> )<br>(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<br>13.5 | Ω               |
| Drain-Source On-Voltage<br>(V <sub>GS</sub> = 5.0 V <sub>dc</sub> , I <sub>D</sub> = 200 mA <sub>dc</sub> )<br>(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<br>3.75 | V <sub>dc</sub> |
| On-State Drain Current<br>(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<br>(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,<br>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,<br>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 <sup>†</sup> |
|-----------|--------------------|-----------------------|
| VN2222LLG | TO-92<br>(Pb-Free) | 1000 Unit / Box       |

<sup>†</sup>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.

# VN222LLG

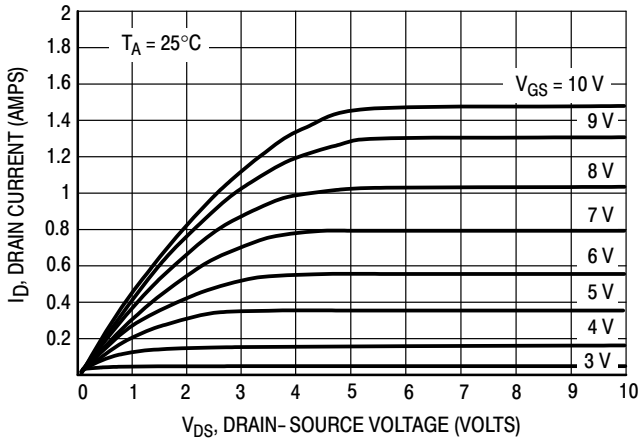


Figure 1. Ohmic Region

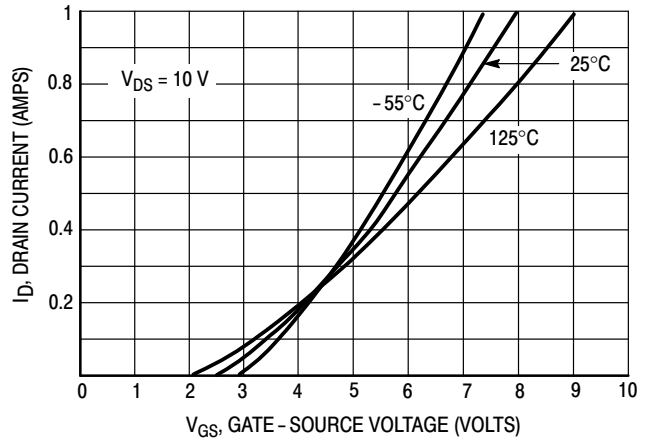


Figure 2. Transfer Characteristics

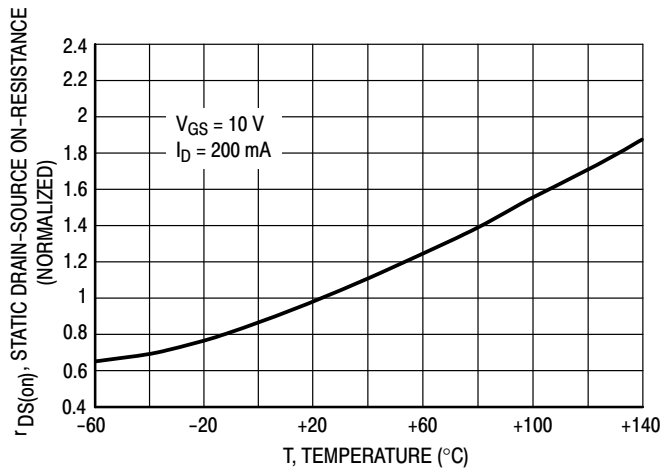


Figure 3. Temperature versus Static Drain-Source On-Resistance

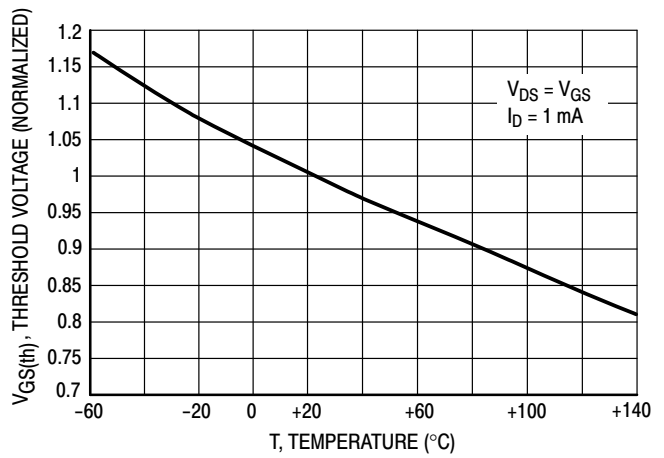
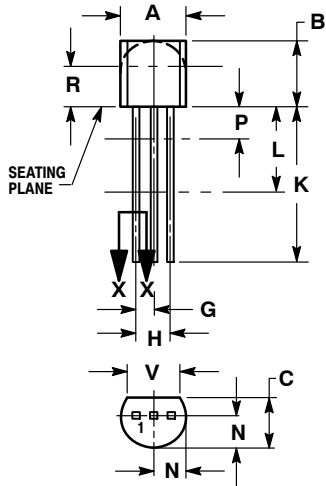


Figure 4. Temperature versus Gate Threshold Voltage

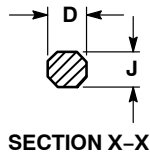
# VN2222LLG

## PACKAGE DIMENSIONS

TO-92  
CASE 29-11  
ISSUE AM



STRAIGHT LEAD  
BULK PACK

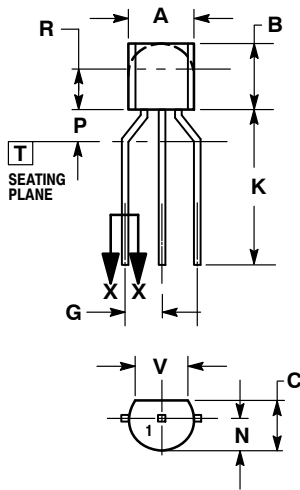


SECTION X-X

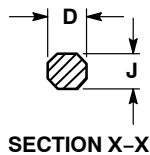
NOTES:

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        | ---   |



BENT LEAD  
TAPE & REEL  
AMMO PACK



SECTION X-X

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 4.45        | 5.20 |
| B   | 4.32        | 5.33 |
| C   | 3.18        | 4.19 |
| D   | 0.40        | 0.54 |
| G   | 2.40        | 2.80 |
| J   | 0.39        | 0.50 |
| K   | 12.70       | ---  |
| N   | 2.04        | 2.66 |
| P   | 1.50        | 4.00 |
| R   | 2.93        | ---  |
| V   | 3.43        | ---  |

STYLE 22:

1. SOURCE
2. GATE
3. DRAIN

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