

ON Semiconductor

Is Now

onsemi™

To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and **onsemi** and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi** product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner. Other names and brands may be claimed as the property of others.

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} | ± 20 | Vdc |
| - Continuous | V_{GSM} | ± 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°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

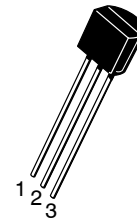
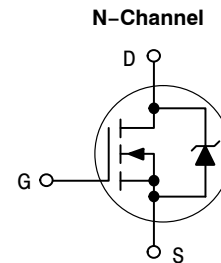
| Characteristic | Symbol | Max | Unit |
|---|-----------------|-------|---------------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 312.5 | $^\circ\text{C}/\text{W}$ |
| Maximum Lead Temperature for Soldering Purposes, 1/16" from case for 10 seconds | T_L | 300 | $^\circ\text{C}$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



ON Semiconductor®

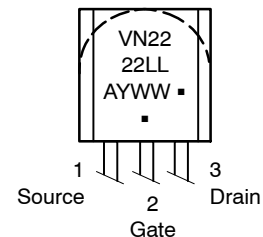
<http://onsemi.com>

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.

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

VN2222LLG

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

OFF CHARACTERISTICS

| | | | | |
|---|----------------------|----|-----------|------|
| Drain-Source Breakdown Voltage (V _{GS} = 0, I _D = 100 μAdc) | V _{(BR)DSS} | 60 | - | Vdc |
| Zero Gate Voltage Drain Current (V _{DS} = 48 Vdc, V _{GS} = 0) (V _{DS} = 48 Vdc, V _{GS} = 0, T _J = 125°C) | I _{DSS} | - | 10 500 | μAdc |
| Gate-Body Leakage Current, Forward (V _{GSF} = 30 Vdc, V _{DS} = 0) | I _{GSSF} | - | -100 | nAdc |

ON CHARACTERISTICS (Note 1)

| | | | | |
|---|---------------------|-----|-------------|-------|
| Gate Threshold Voltage (V _{DS} = V _{GS} , I _D = 1.0 mAdc) | V _{GS(th)} | 0.6 | 2.5 | Vdc |
| Static Drain-Source On-Resistance (V _{GS} = 10 Vdc, I _D = 0.5 Adc) (V _{GS} = 10 Vdc, I _D = 0.5 Vdc, T _C = 125°C) | r _{DS(on)} | - | 7.5 13.5 | Ω |
| Drain-Source On-Voltage (V _{GS} = 5.0 Vdc, I _D = 200 mAdc) (V _{GS} = 10 Vdc, I _D = 500 mAdc) | V _{DS(on)} | - | 1.5 3.75 | Vdc |
| On-State Drain Current (V _{GS} = 10 Vdc, V _{DS} ≥ 2.0 V _{DS(on)}) | I _{D(on)} | 750 | - | mA |
| Forward Transconductance (V _{DS} = 10 Vdc, I _D = 500 mAdc) | g _{fs} | 100 | - | μmhos |

DYNAMIC CHARACTERISTICS

| | | | | | |
|------------------------------|---|------------------|---|-----|----|
| Input Capacitance | (V _{DS} = 25 Vdc, V _{GS} = 0, f = 1.0 MHz) | C _{iss} | - | 60 | pF |
| Output Capacitance | | C _{oss} | - | 25 | |
| Reverse Transfer Capacitance | | C _{rss} | - | 5.0 | |

SWITCHING CHARACTERISTICS (Note 1)

| | | | | | |
|---------------------|--|------------------|---|----|----|
| Turn-On Delay Time | (V _{DD} = 15 Vdc, I _D = 600 mA, R _{gen} = 25 Ω, R _L = 23 Ω) | t _{on} | - | 10 | ns |
| Turn-Off Delay Time | | t _{off} | - | 10 | |

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

ORDERING INFORMATION

| Device | Package | Shipping [†] |
|-----------|--------------------|-----------------------|
| VN2222LLG | TO-92 (Pb-Free) | 1000 Unit / 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.

VN2222LLG

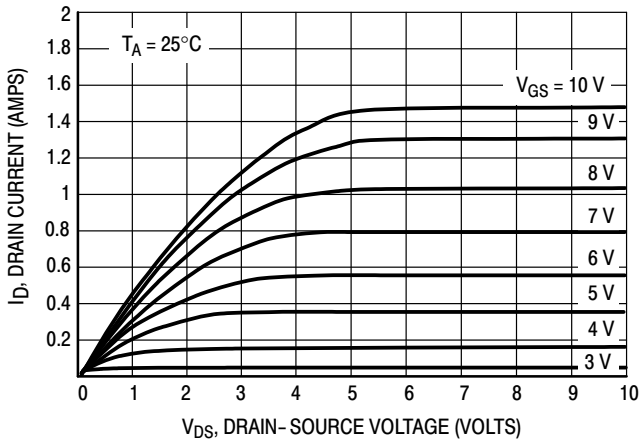


Figure 1. Ohmic Region

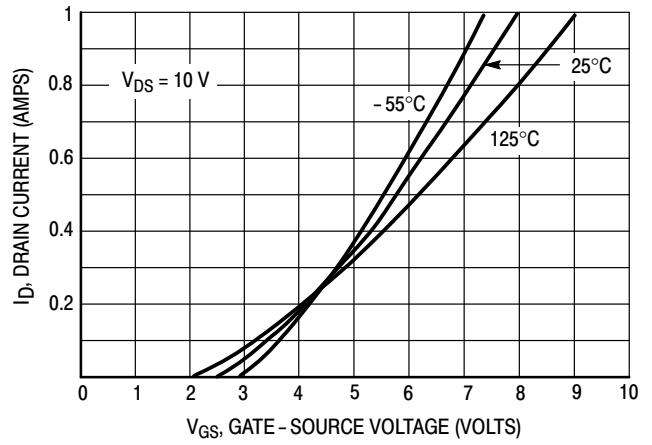


Figure 2. Transfer Characteristics

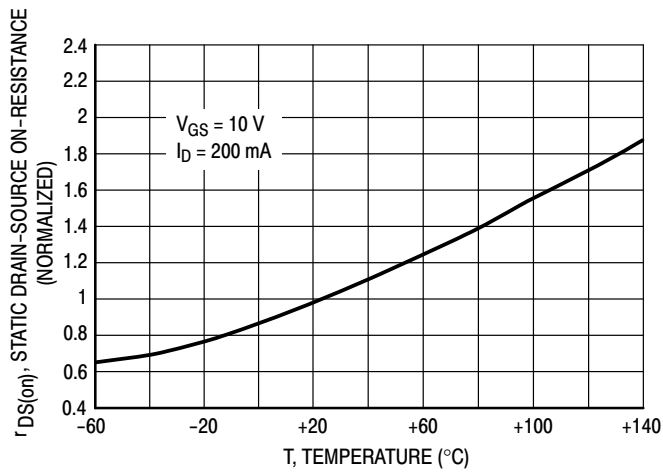


Figure 3. Temperature versus Static Drain-Source On-Resistance

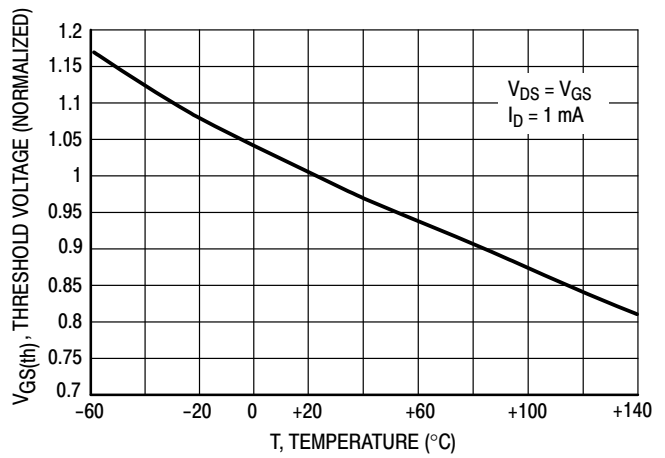
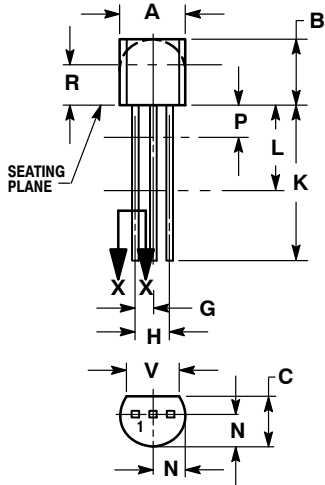


Figure 4. Temperature versus Gate Threshold Voltage

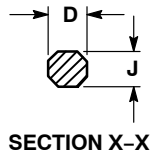
VN2222LLG

PACKAGE DIMENSIONS

TO-92
CASE 29-11
ISSUE AM



STRAIGHT LEAD
BULK PACK

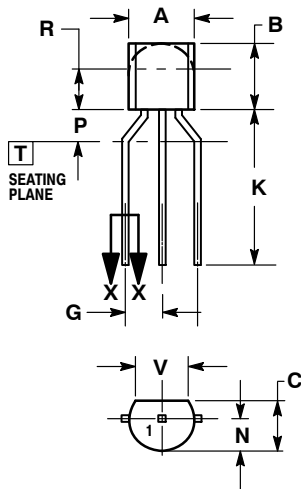


SECTION X-X

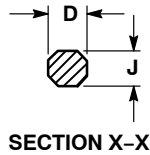
NOTES:

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

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5773-3850

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative