

NTR2101P

Small Signal MOSFET

-8.0 V, -3.7 A, Single P-Channel, SOT-23



ON Semiconductor®

<http://onsemi.com>

Features

- Leading Trench Technology for Low $R_{DS(on)}$
- -1.8 V Rated for Low Voltage Gate Drive
- SOT-23 Surface Mount for Small Footprint (3 x 3 mm)
- This is a Pb-Free Device

Applications

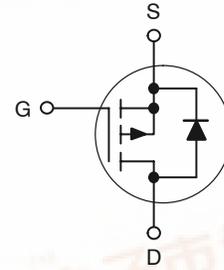
- High Side Load Switch
- DC-DC Conversion
- Cell Phone, Notebook, PDAs, etc.

| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP | I_D Max |
|---------------|------------------|-----------|
| -8.0 V | 39 mΩ @ -4.5 V | -3.7 A |
| | 52 mΩ @ -2.5 V | |
| | 79 mΩ @ -1.8 V | |

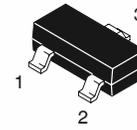
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

| Parameter | Symbol | Value | Unit | |
|---|----------------|--------------------------|------------------|---|
| Drain-to-Source Voltage | V_{DSS} | -8.0 | V | |
| Gate-to-Source Voltage | V_{GS} | ±8.0 | V | |
| Continuous Drain Current (Note 1) | I_D | $T_A = 25^\circ\text{C}$ | -3.7 | A |
| | | $T_A = 70^\circ\text{C}$ | -3.0 | |
| Power Dissipation (Note 1) | P_D | 0.96 | W | |
| Pulsed Drain Current | I_{DM} | -11 | A | |
| Operating Junction and Storage Temperature | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ | |
| Source Current (Body Diode) | I_S | -1.2 | A | |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | T_L | 260 | $^\circ\text{C}$ | |

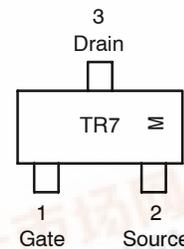
P-Channel MOSFET



MARKING DIAGRAM & PIN ASSIGNMENT



SOT-23
CASE 318
STYLE 21



TR7 = Device Code
M = Date Code

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|-------------------------------------|-----------------|-----|--------------------|
| Junction-to-Ambient - Steady State | $R_{\theta JA}$ | 160 | $^\circ\text{C/W}$ |
| Junction-to-Ambient - $t \leq 10$ s | $R_{\theta JA}$ | 130 | |

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.

1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|------------------|------------------|
| NTR2101PT1 | SOT-23 | 3000/Tape & Reel |
| NTR2101PT1G | SOT-23 (Pb-Free) | 3000/Tape & Reel |

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



NTR2101P

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------|--------|----------------|-----|-----|-----|------|
|-----------|--------|----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|---|-------------------|--|---------------------------|----|-----------|---------------|
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$ | -8.0 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | | | 10 | | mV/°C |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = -6.4\text{ V}$ | $T_J = 25^\circ\text{C}$ | | -1.0 | μA |
| | | | $T_J = 125^\circ\text{C}$ | | -100 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 8.0\text{ V}$ | | | ± 100 | nA |

ON CHARACTERISTICS (Note 2)

| | | | | | | |
|--|------------------|---|-------|--------|------|------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$ | -0.40 | | -1.0 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | | | 0.0027 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = -4.5\text{ V}, I_D = -3.5\text{ A}$ | | 39 | 52 | m Ω |
| | | $V_{GS} = -2.5\text{ V}, I_D = -3.0\text{ A}$ | | 52 | 72 | |
| | | $V_{GS} = -1.8\text{ V}, I_D = -2.0\text{ A}$ | | 79 | 120 | |
| Forward Transconductance | g_{FS} | $V_{GS} = -5.0\text{ V}, I_D = -3.5\text{ A}$ | | 9.0 | | S |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|--------------|---|--|------|----|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -4.0\text{ V}$ | | 1173 | | pF |
| Output Capacitance | C_{OSS} | | | 289 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 218 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = -4.5\text{ V}, V_{DS} = -4.0\text{ V}, I_D = -3.5\text{ A}$ | | 12 | 15 | nC |
| Gate-to-Source Charge | Q_{GS} | | | 3.8 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 2.5 | | |

SWITCHING CHARACTERISTICS (Note 3)

| | | | | | | |
|---------------------|--------------|--|--|-------|----|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = -4.5\text{ V}, V_{DD} = -4.0\text{ V}, I_D = -1.2\text{ A}, R_G = 6.0\ \Omega$ | | 7.4 | 15 | ns |
| Rise Time | t_r | | | 15.75 | 25 | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 38 | 58 | |
| Fall Time | t_f | | | 31 | 51 | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-----------------------|----------|--|--------------------------|--|-------|------|---|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = -1.2\text{ A}$ | $T_J = 25^\circ\text{C}$ | | -0.73 | -1.2 | V |
|-----------------------|----------|--|--------------------------|--|-------|------|---|

2. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

3. Switching characteristics are independent of operating junction temperatures.

NTR2101P

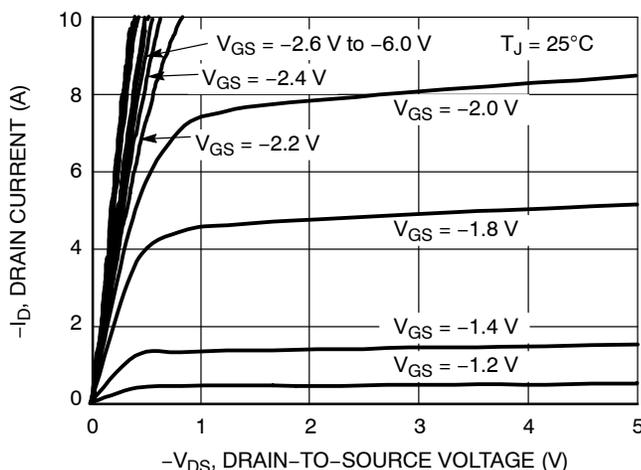


Figure 1. On-Region Characteristics

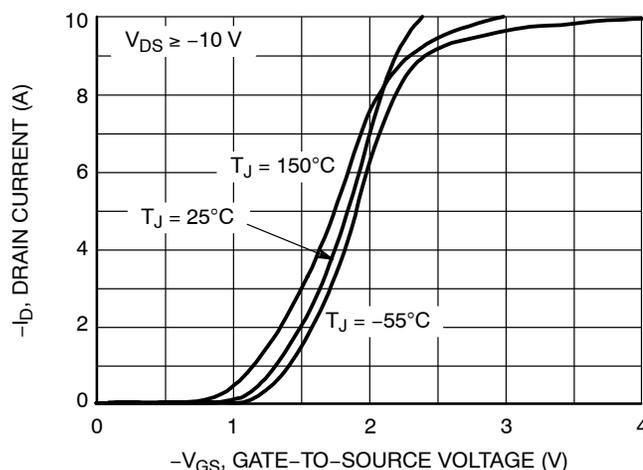


Figure 2. Transfer Characteristics

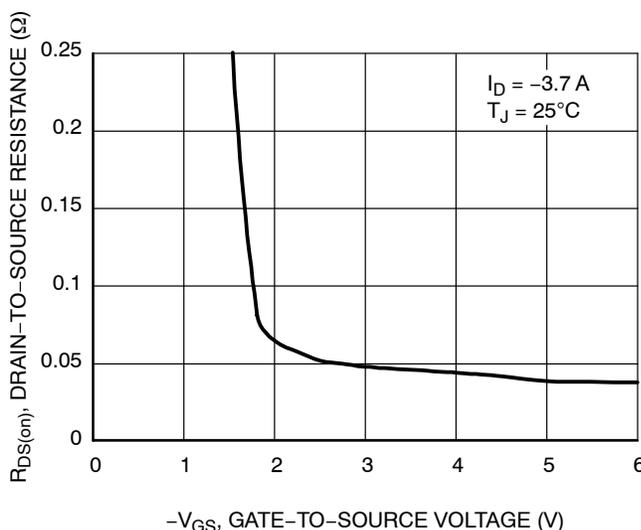


Figure 3. On-Resistance versus Gate-to-Source Voltage

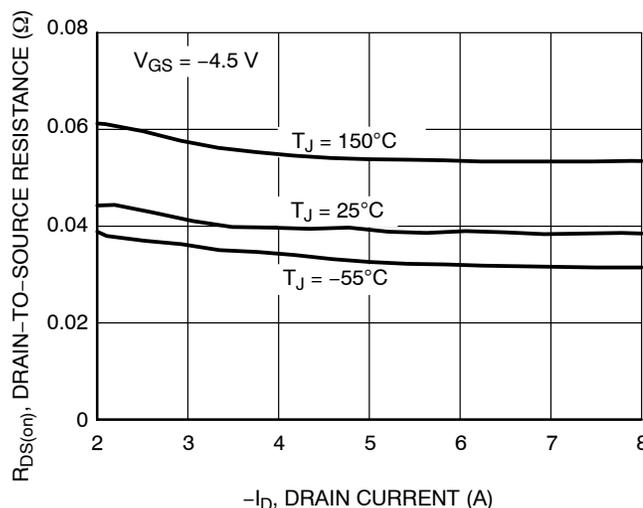


Figure 4. On-Resistance versus Drain Current and Gate Voltage

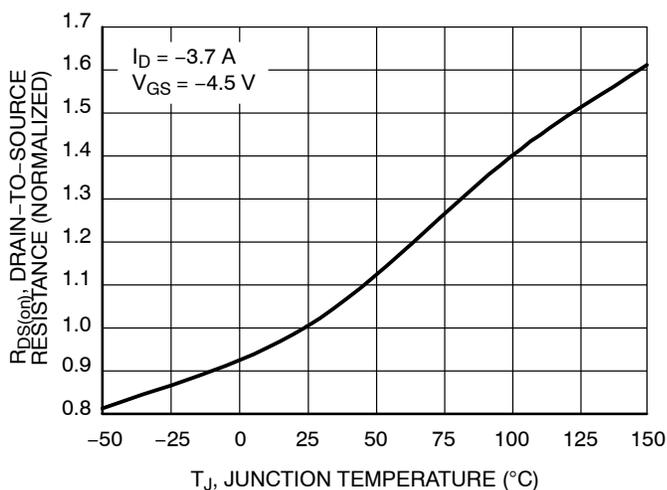


Figure 5. On-Resistance Variation with Temperature

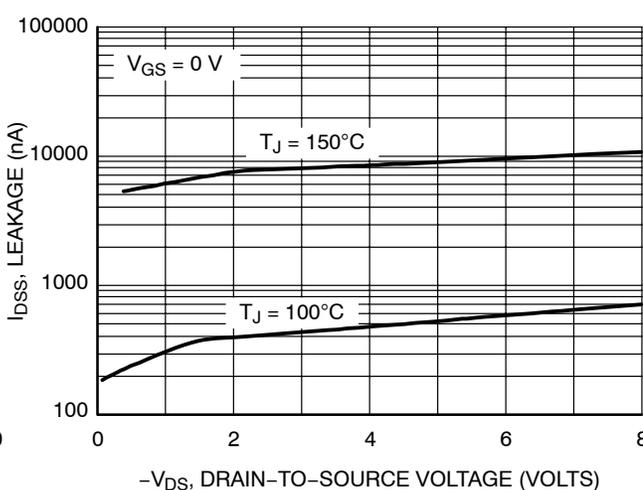


Figure 6. Drain-to-Source Leakage Current versus Voltage

NTR2101P

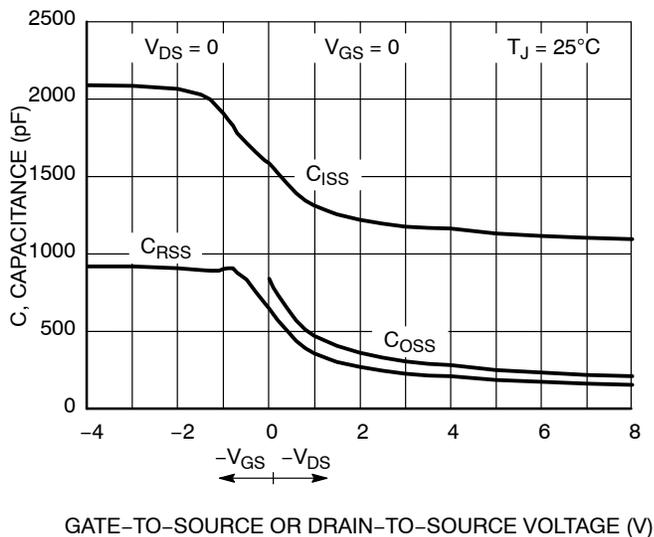


Figure 7. Capacitance Variation

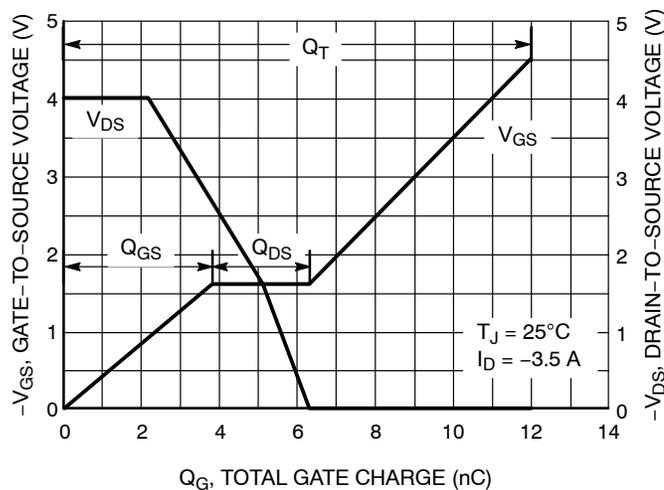


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

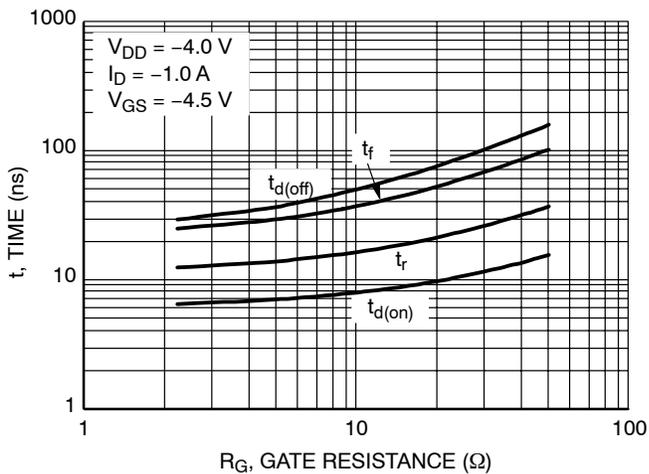


Figure 9. Resistive Switching Time Variation versus Gate Resistance

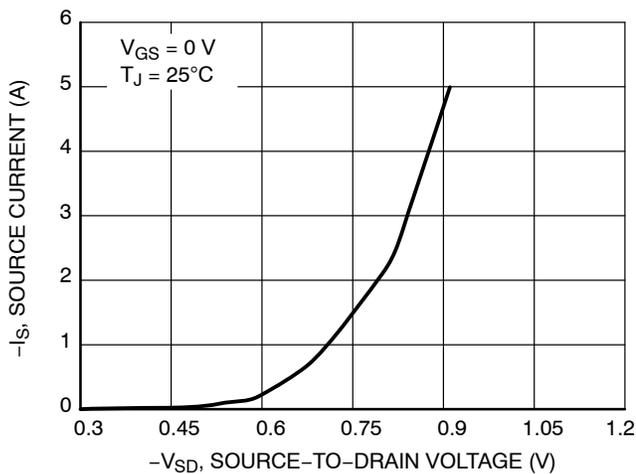
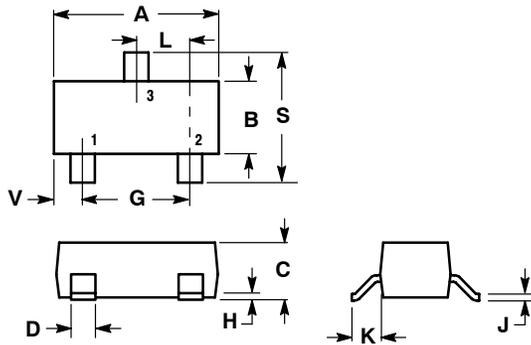


Figure 10. Diode Forward Voltage versus Current

NTR2101P

PACKAGE DIMENSIONS

SOT-23
(TO-236)
CASE 318-08
ISSUE AK



NOTES:

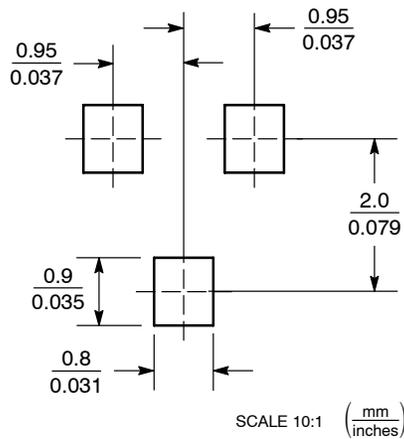
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|--------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.1102 | 0.1197 | 2.80 | 3.04 |
| B | 0.0472 | 0.0551 | 1.20 | 1.40 |
| C | 0.0350 | 0.0440 | 0.89 | 1.11 |
| D | 0.0150 | 0.0200 | 0.37 | 0.50 |
| G | 0.0701 | 0.0807 | 1.78 | 2.04 |
| H | 0.0005 | 0.0040 | 0.013 | 0.100 |
| J | 0.0034 | 0.0070 | 0.085 | 0.177 |
| K | 0.0140 | 0.0285 | 0.35 | 0.69 |
| L | 0.0350 | 0.0401 | 0.89 | 1.02 |
| S | 0.0830 | 0.1039 | 2.10 | 2.64 |
| V | 0.0177 | 0.0236 | 0.45 | 0.60 |

STYLE 21:

1. GATE
2. SOURCE
3. DRAIN

SOLDERING FOOTPRINT*



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

NTR2101P

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 61312, Phoenix, Arizona 85082-1312 USA
Phone: 480-829-7710 or 800-344-3860 Toll Free USA/Canada
Fax: 480-829-7709 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada

Japan: ON Semiconductor, Japan Customer Focus Center
2-9-1 Kamimeguro, Meguro-ku, Tokyo, Japan 153-0051
Phone: 81-3-5773-3850

ON Semiconductor Website: <http://onsemi.com>

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

For additional information, please contact your local Sales Representative.