

NTR4502P

Power MOSFET

-30 V, -1.95 A, Single, P-Channel, SOT-23

Features

- Leading Planar Technology for Low Gate Charge / Fast Switching
- Low $R_{DS(on)}$ for Low Conduction Losses
- SOT-23 Surface Mount for Small Footprint (3 X 3 mm)
- Pb-Free Packages are Available

Applications

- DC to DC Conversion
- Load/Power Switch for Portables and Computing
- Motherboard, Notebooks, Camcorders, Digital Camera's, etc.
- Battery Charging Circuits

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

| Parameter | Symbol | Value | Unit |
|---|--------------------------|--------------------------|------------------|
| Drain-to-Source Voltage | V_{DS} | -30 | V |
| Gate-to-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current (Note 1) | $t < 10$ s | $T_A = 25^\circ\text{C}$ | I_D -1.95 A |
| | | $T_A = 70^\circ\text{C}$ | -1.56 |
| Power Dissipation (Note 1) | $t < 10$ s | P_D 1.25 | W |
| Continuous Drain Current (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | I_D -1.13 A |
| | | $T_A = 70^\circ\text{C}$ | -0.90 |
| Power Dissipation (Note 1) | Steady State | P_D 0.4 | W |
| Pulsed Drain Current | $t_p = 10$ μs | I_{DM} -6.8 | A |
| Operating Junction and Storage Temperature | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ |
| Source Current (Body Diode) | I_S | -1.25 | A |
| Lead Temperature for Soldering Purposes (1/8 in from case for 10 s) | T_L | 260 | $^\circ\text{C}$ |

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|---|-----------------|-----|---------------------------|
| Junction-to-Ambient - Steady State (Note 1) | $R_{\theta JA}$ | 300 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient - $t = 10$ s (Note 1) | $R_{\theta JA}$ | 100 | |

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.

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

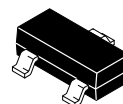
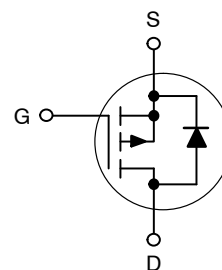


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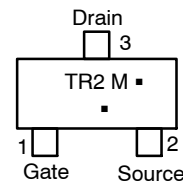
| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP | I_D Max (Note 1) |
|---------------|-------------------------|--------------------|
| -30 V | 155 m Ω @ -10 V | -1.95 A |
| | 240 m Ω @ -4.5 V | |

P-Channel MOSFET



SOT-23
CASE 318
STYLE 21

MARKING DIAGRAM/ PIN ASSIGNMENT



TR2 = Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|---------------------|---------------------|
| NTR4502PT1 | SOT-23 | 3000 / Tape & Reel |
| NTR4502PT1G | SOT-23 (Pb-Free) | 3000 / Tape & Reel |
| NTR4502PT3 | SOT-23 | 10000 / Tape & Reel |
| NTR4502PT3G | SOT-23 (Pb-Free) | 10000 / Tape & Reel |

†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.

NTR4502P

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

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

OFF CHARACTERISTICS

| | | | | | | |
|-----------------------------------|---------------|---|--------------------------|--|-----------|---------------|
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$ | -30 | | | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = -30\text{ V}$ | $T_J = 25^\circ\text{C}$ | | -1 | μA |
| | | | $T_J = 55^\circ\text{C}$ | | -10 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |

ON CHARACTERISTICS (Note 3)

| | | | | | | |
|-------------------------------|--------------|---|------|-----|------|------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$ | -1.0 | | -3.0 | V |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = -10\text{ V}, I_D = -1.95\text{ A}$ | | 155 | 200 | m Ω |
| | | $V_{GS} = -4.5\text{ V}, I_D = -1.5\text{ A}$ | | 240 | 350 | |
| Forward Transconductance | g_{FS} | $V_{DS} = -10\text{ V}, I_D = -1.25\text{ A}$ | | 3 | | S |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|--------------|--|--|-----|----|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = -15\text{ V}$ | | 200 | | pF |
| Output Capacitance | C_{OSS} | | | 80 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 50 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = -10\text{ V}, V_{DS} = -15\text{ V}; I_D = -1.95\text{ A}$ | | 6 | 10 | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 0.3 | | |
| Gate-to-Source Charge | Q_{GS} | | | 1 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 1.7 | | |

SWITCHING CHARACTERISTICS (Note 4)

| | | | | | | |
|---------------------|--------------|---|--|------|----|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = -10\text{ V}, V_{DD} = -15\text{ V}, I_D = -1.95\text{ A}, R_G = 6\ \Omega$ | | 5.2 | 10 | ns |
| Rise Time | t_r | | | 12 | 20 | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 19 | 35 | |
| Fall Time | t_f | | | 17.5 | 30 | |

DRAIN-SOURCE DIODE CHARACTERISTICS (Note 3)

| | | | | | | |
|-----------------------|----------|--|--|------|------|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = -1.25\text{ A}$ | | -0.8 | -1.2 | V |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, dI_{SD}/dt = 100\text{ A}/\mu\text{s}, I_S = -1.25\text{ A}$ | | 23 | | ns |

2. Surface-mounted on FR4 board using 1 in sq. pad size (Cu area = 1.127 in sq. [1 oz] including traces).
3. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
4. Switching characteristics are independent of operating junction temperatures.

NTR4502P

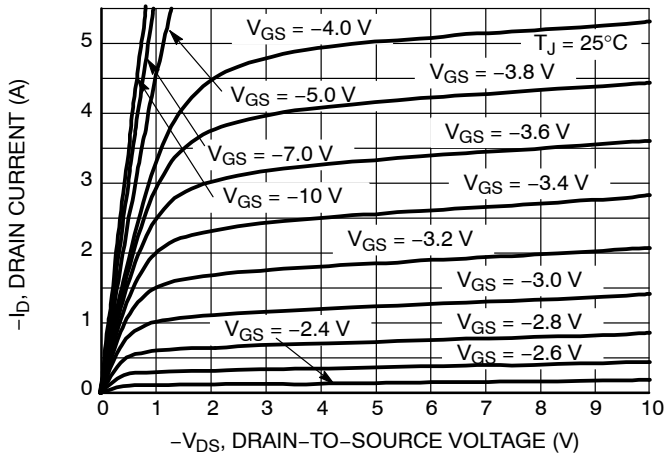


Figure 1. On-Region Characteristics

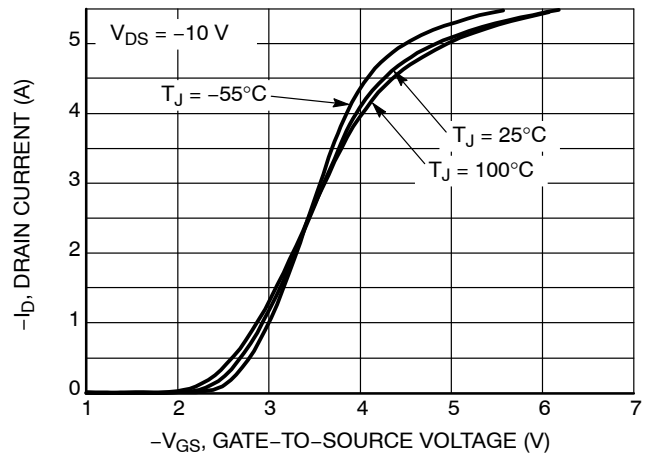


Figure 2. Transfer Characteristics

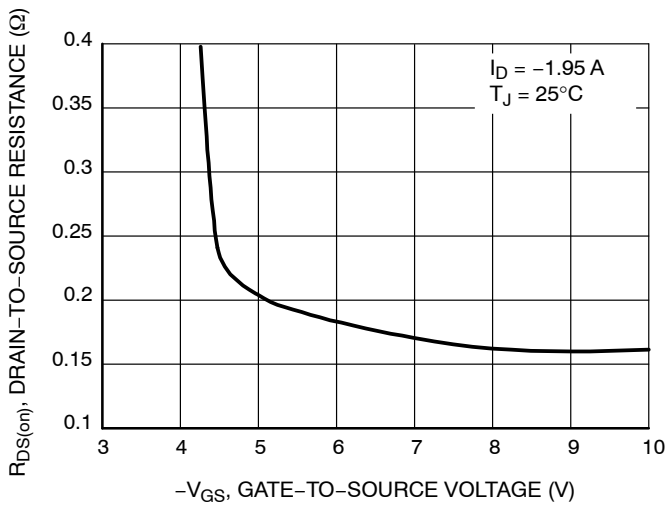


Figure 3. On-Resistance versus Gate-to-Source Voltage

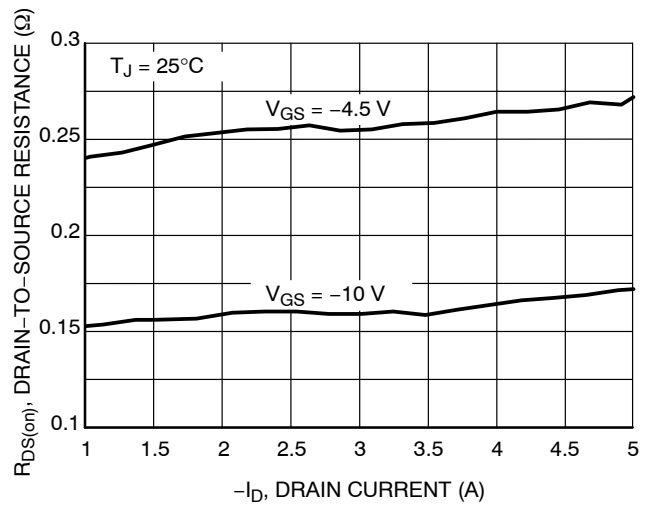


Figure 4. On-Resistance versus Drain Current and Gate Voltage

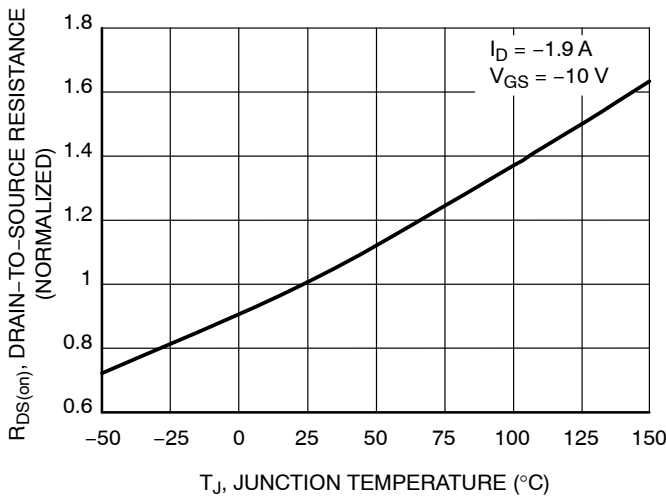


Figure 5. On-Resistance Variation with Temperature

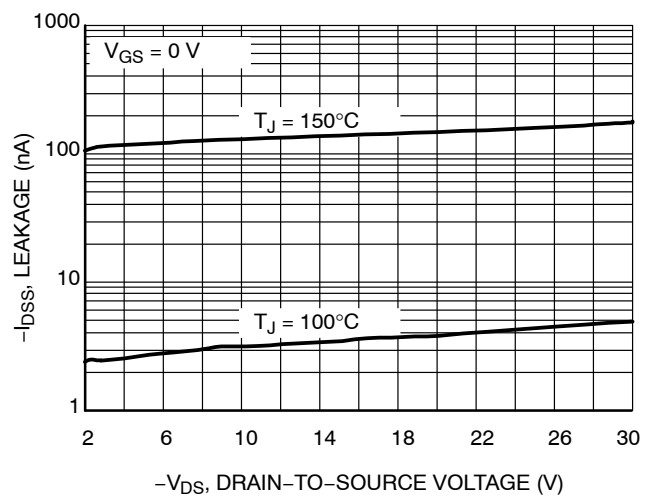
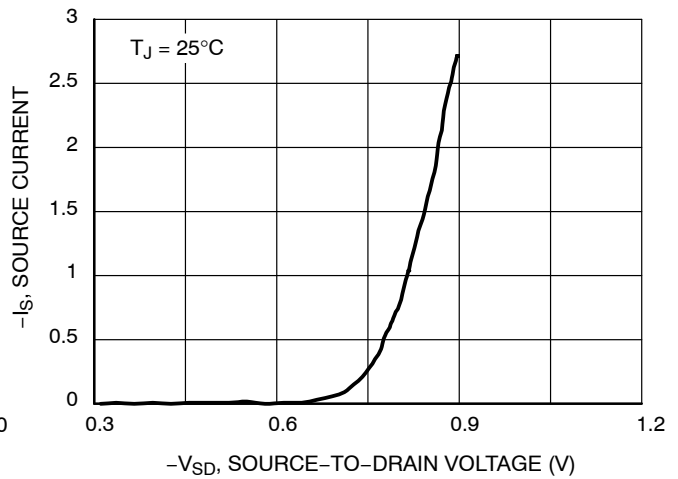
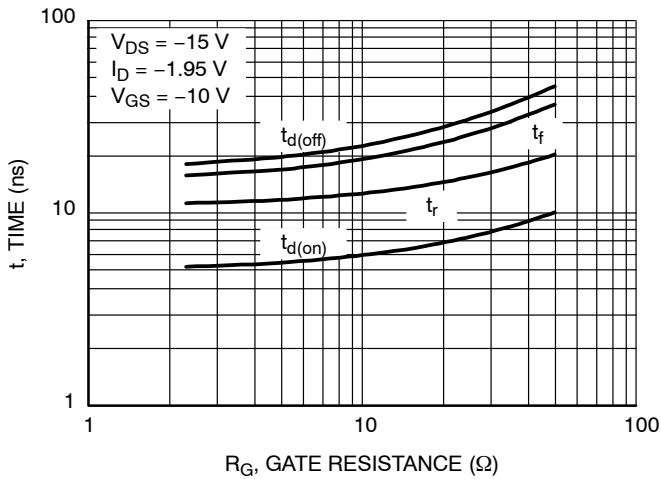
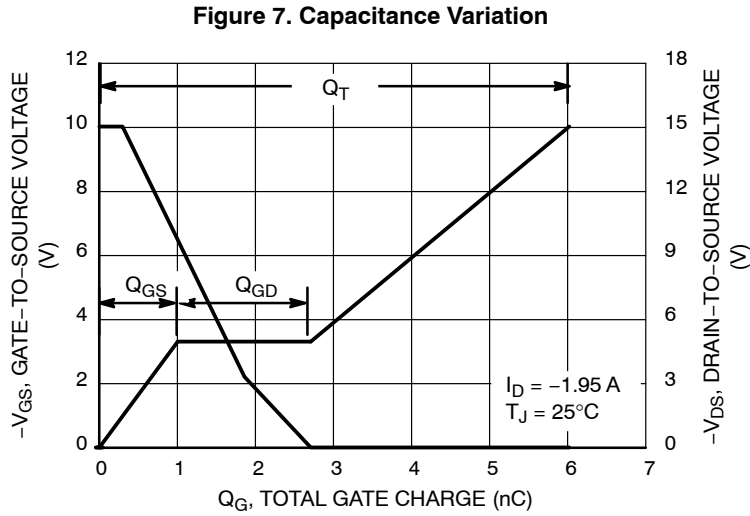
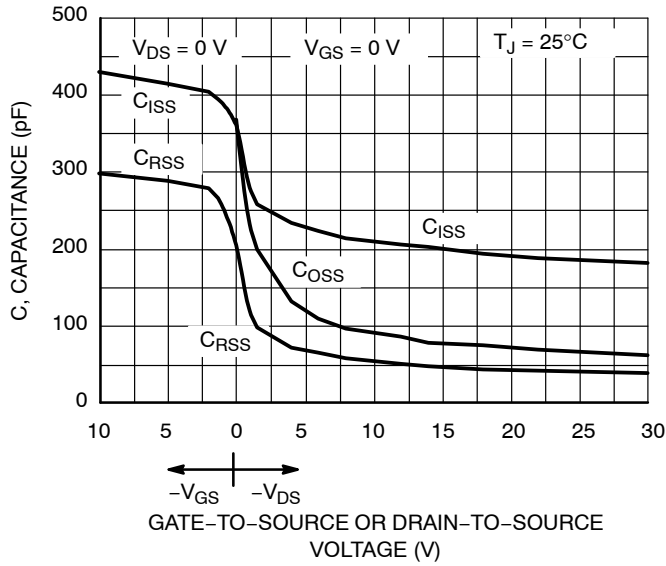


Figure 6. Drain-to-Source Leakage Current versus Voltage

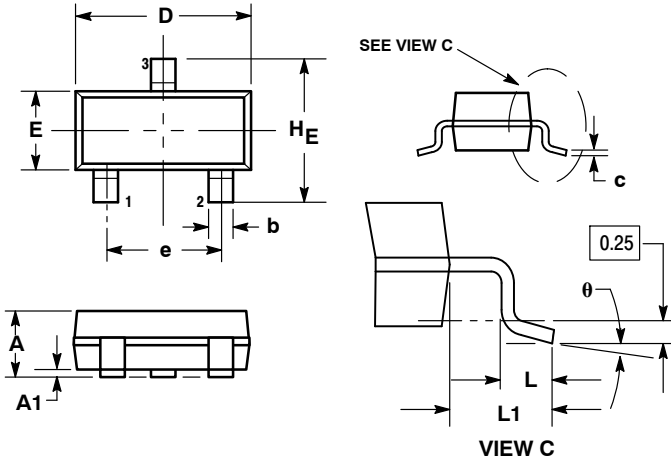
NTR4502P



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PACKAGE DIMENSIONS

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

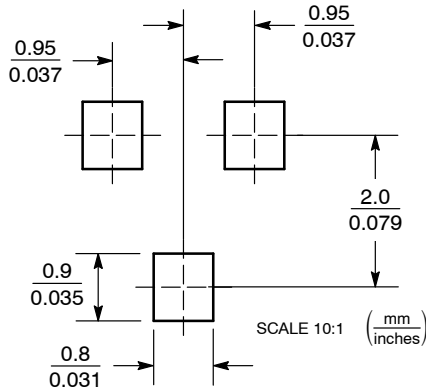


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
 4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.040 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.001 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.018 | 0.020 |
| c | 0.09 | 0.13 | 0.18 | 0.003 | 0.005 | 0.007 |
| D | 2.80 | 2.90 | 3.04 | 0.110 | 0.114 | 0.120 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e | 1.78 | 1.90 | 2.04 | 0.070 | 0.075 | 0.081 |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.029 |
| HE | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |

- STYLE 1:
PIN 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.

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