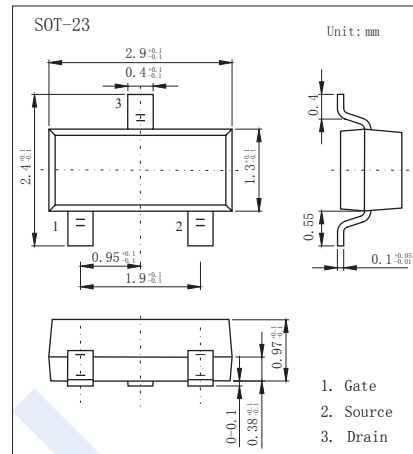


## N-Channel MOSFET

### NTR4501NT1G

#### ■ Features

- $V_{DS} (V) = 20V$
- $I_D = 3.2 A$  ( $V_{GS} = 4.5V$ )
- $R_{DS(ON)} < 70m\Omega$  ( $V_{GS} = 4.5V$ )
- $R_{DS(ON)} < 85m\Omega$  ( $V_{GS} = 2.5V$ )
- Leading Planar Technology for Low Gate Charge / Fast Switching
- 2.5 V Rated for Low Voltage Gate Drive



#### ■ Absolute Maximum Ratings $T_a = 25^\circ C$

| Parameter                                                    | Symbol     | Rating     | Unit         |
|--------------------------------------------------------------|------------|------------|--------------|
| Drain-Source Voltage                                         | $V_{DS}$   | 20         | V            |
| Gate-Source Voltage                                          | $V_{GS}$   | $\pm 12$   |              |
| Continuous Drain Current (Note.1)                            | $I_D$      | 3.2        | A            |
|                                                              |            | 2.4        |              |
| Pulsed Drain Current @ $t_p=10\mu s$                         | $I_{DM}$   | 10         |              |
| Power Dissipation (Note.1)                                   | $P_D$      | 1.25       | W            |
| Thermal Resistance.Junction- to-Ambient (Note.1)<br>(Note.2) | $R_{thJA}$ | 100        | $^\circ C/W$ |
|                                                              |            | 300        |              |
| Lead Temperature for Soldering Purposes (Note.3)             | $T_L$      | 260        | $^\circ C$   |
| Junction Temperature                                         | $T_J$      | 150        |              |
| Storage Temperature Range                                    | $T_{stg}$  | -55 to 150 |              |

Note.1: Surface-mounted on FR4 board using 1 in sq pad size.

Note.2: Surface-mounted on FR4 board using the minimum recommended pad size.

Note.3: 1/8" from case for 10 s.

## N-Channel MOSFET

### NTR4501NT1G

#### ■ Electrical Characteristics Ta = 25°C

| Parameter                             | Symbol              | Test Conditions                                                                                    | Min  | Typ  | Max  | Unit |
|---------------------------------------|---------------------|----------------------------------------------------------------------------------------------------|------|------|------|------|
| Drain-Source Breakdown Voltage        | V <sub>DSS</sub>    | I <sub>D</sub> =250 μA, V <sub>GS</sub> =0V (Note.1)                                               | 20   | 24.5 |      | V    |
| Zero Gate Voltage Drain Current       | I <sub>DSS</sub>    | V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                                    |      |      | 1.5  | μA   |
|                                       |                     | V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =85°C                                    |      |      | 10   |      |
| Gate-Body Leakage Current             | I <sub>GSS</sub>    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V                                                         |      |      | ±100 | nA   |
| Gate Threshold Voltage                | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 μA (Note.1)                                 | 0.65 |      | 1.2  | V    |
| Static Drain-Source On-Resistance     | R <sub>DS(on)</sub> | V <sub>GS</sub> =4.5V, I <sub>D</sub> =3.6A                                                        |      | 70   | 80   | mΩ   |
|                                       |                     | V <sub>GS</sub> =2.5V, I <sub>D</sub> =3.1A                                                        |      | 85   | 105  |      |
| Forward Transconductance              | g <sub>FS</sub>     | V <sub>DS</sub> =5V, I <sub>D</sub> =3.6A                                                          |      | 9    |      | S    |
| Input Capacitance                     | C <sub>iss</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz                                                  |      | 200  |      | pF   |
| Output Capacitance                    | C <sub>oss</sub>    |                                                                                                    |      | 80   |      |      |
| Reverse Transfer Capacitance          | C <sub>rss</sub>    |                                                                                                    |      | 50   |      |      |
| Total Gate Charge                     | Q <sub>g</sub>      | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =3.6A                                  |      | 2.4  | 6    | nC   |
| Gate Source Charge                    | Q <sub>gs</sub>     |                                                                                                    |      | 0.5  |      |      |
| Gate Drain Charge                     | Q <sub>gd</sub>     |                                                                                                    |      | 0.6  |      |      |
| Turn-On DelayTime                     | t <sub>d(on)</sub>  | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =3.6A, R <sub>G</sub> =6 Ω<br>(Note.2) |      | 6.5  |      | ns   |
| Turn-On Rise Time                     | t <sub>r</sub>      |                                                                                                    |      | 12   |      |      |
| Turn-Off DelayTime                    | t <sub>d(off)</sub> |                                                                                                    |      | 12   |      |      |
| Turn-Off Fall Time                    | t <sub>f</sub>      |                                                                                                    |      | 3    |      |      |
| Body Diode Reverse Recovery Time      | t <sub>rr</sub>     |                                                                                                    |      | 7.1  |      |      |
| Charge Time                           | t <sub>a</sub>      | I <sub>S</sub> = 1.6A, di/dt= 100A/μs, V <sub>GS</sub> =0                                          |      | 5    |      | nC   |
| Discharge Time                        | t <sub>b</sub>      |                                                                                                    |      | 1.9  |      |      |
| Body Diode Reverse Recovery Charge    | Q <sub>rr</sub>     |                                                                                                    |      | 3    |      |      |
| Maximum Body-Diode Continuous Current | I <sub>S</sub>      |                                                                                                    |      |      | 1.6  | A    |
| Diode Forward Voltage                 | V <sub>SD</sub>     | I <sub>S</sub> =1.6A, V <sub>GS</sub> =0V                                                          |      | 0.8  | 1.2  | V    |

Note.1: Pulse Test: Pulse width ≤ 300 μs, duty cycle ≤ 2%.

Note.2: Switching characteristics are independent of operating junction temperatures.

#### ■ Marking

|         |      |
|---------|------|
| Marking | TR1* |
|---------|------|

## N-Channel MOSFET

### NTR4501NT1G

#### ■ Typical Characteristics

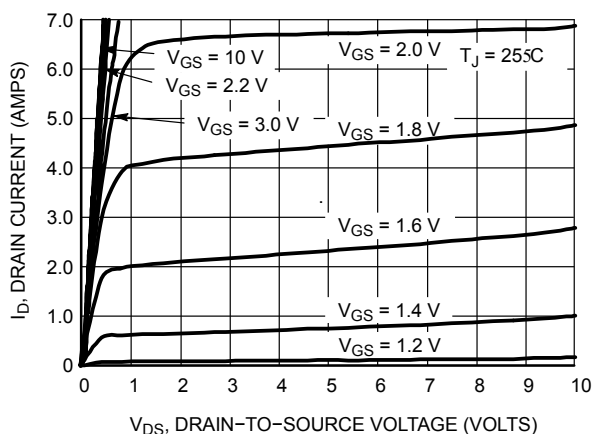


Figure 1. On-Region Characteristics

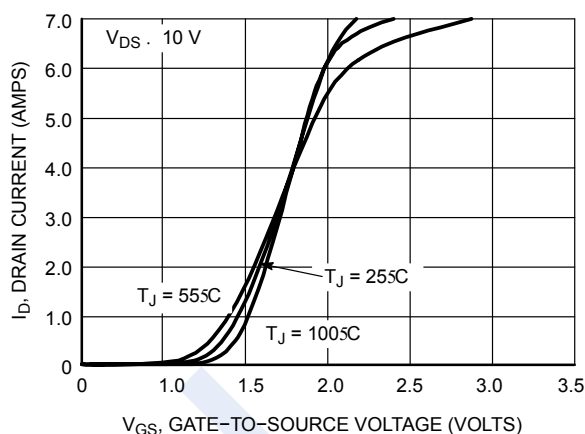


Figure 2. Transfer Characteristics

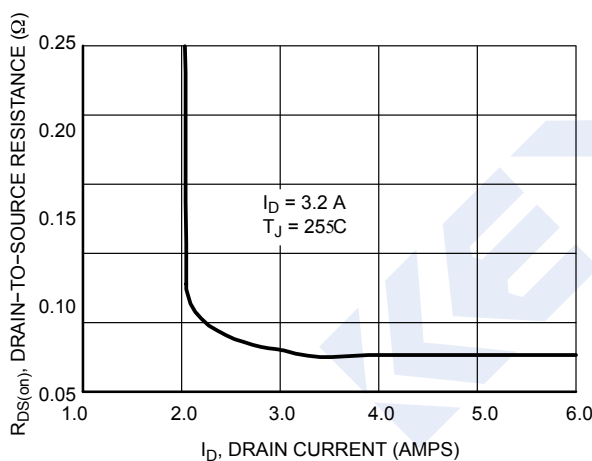


Figure 3. On-Resistance versus Gate-to-Source Voltage

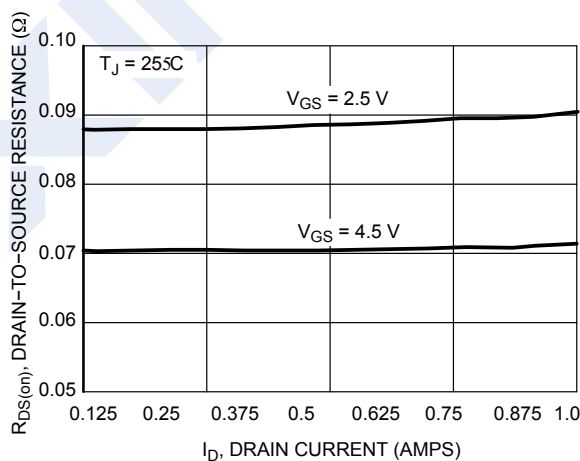


Figure 4. On-Resistance versus Drain Current and Gate Voltage

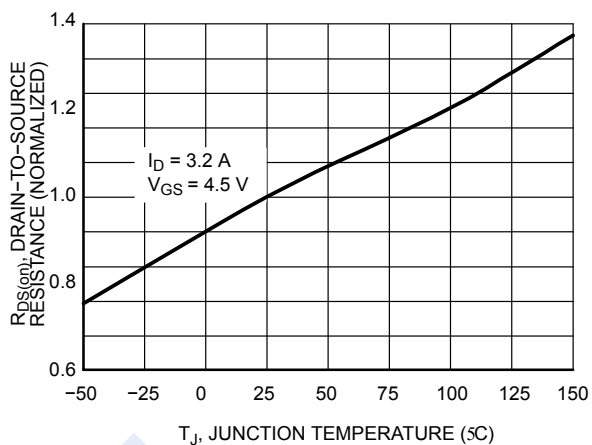


Figure 5. On-Resistance Variation with Temperature

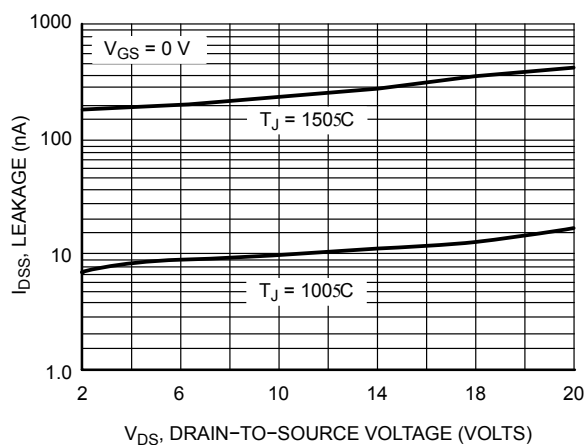


Figure 6. Drain-to-Source Leakage Current versus Voltage

## N-Channel MOSFET

### NTR4501NT1G

#### ■ Typical Characteristics

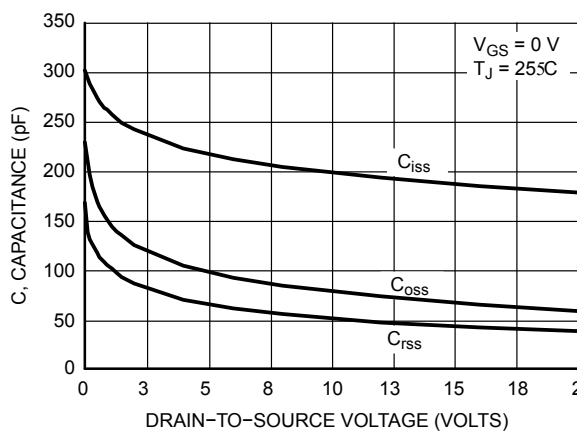


Figure 7. Capacitance Variation

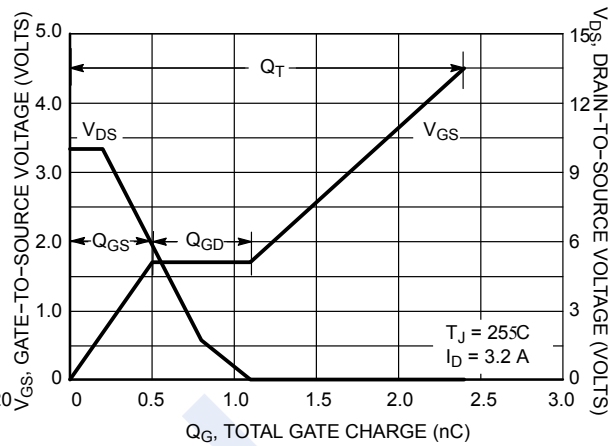


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Gate Charge

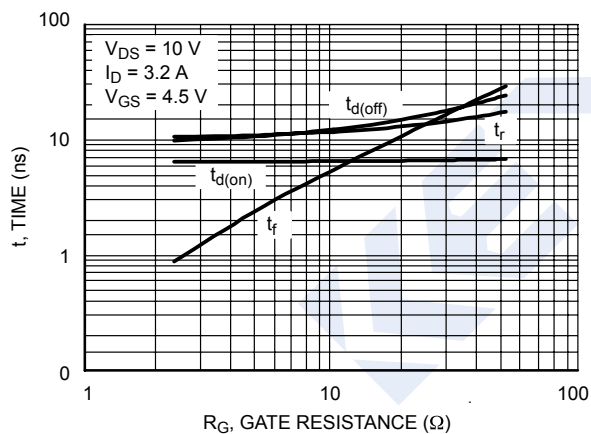


Figure 9. Resistive Switching Time Variation versus Gate Resistance

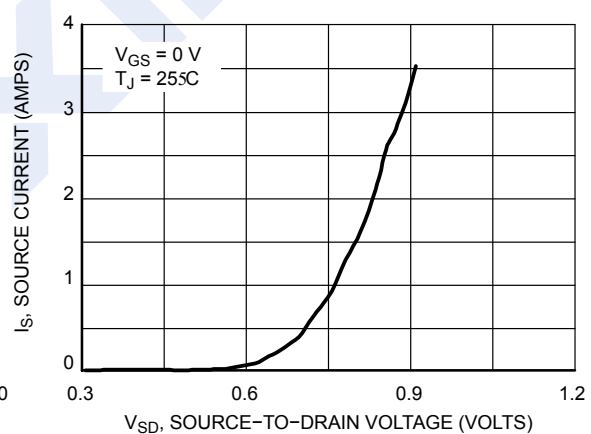


Figure 10. Diode Forward Voltage versus Current