

# NTA7002N

## Small Signal MOSFET

30 V, 154 mA, Single, N-Channel, Gate  
ESD Protection, SC-75

### Features

- Low Gate Charge for Fast Switching
- Small 1.6 x 1.6 mm Footprint
- ESD Protected Gate
- Pb-Free Package is Available

### Applications

- Power Management Load Switch
- Level Shift
- Portable Applications such as Cell Phones, Media Players, Digital Cameras, PDA's, Video Games, Hand-Held Computers, etc.

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

| Parameter                                                         |                                   | Symbol         | Value      | Unit             |
|-------------------------------------------------------------------|-----------------------------------|----------------|------------|------------------|
| Drain-to-Source Voltage                                           |                                   | $V_{DS}$       | 30         | V                |
| Gate-to-Source Voltage                                            |                                   | $V_{GS}$       | $\pm 10$   | V                |
| Continuous Drain Current (Note 1)                                 | Steady State = $25^\circ\text{C}$ | $I_D$          | 154        | mA               |
| Power Dissipation (Note 1)                                        | Steady State = $25^\circ\text{C}$ | $P_D$          | 300        | mW               |
| Pulsed Drain Current                                              | $t_P \leq 10 \mu\text{s}$         | $I_{DM}$       | 618        | mA               |
| Operating Junction and Storage Temperature                        |                                   | $T_J, T_{STG}$ | -55 to 150 | $^\circ\text{C}$ |
| Continuous Source Current (Body Diode)                            |                                   | $I_{SD}$       | 154        | mA               |
| Lead Temperature for Soldering Purposes (1/8" 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) | $R_{\theta JA}$ | 416 | $^\circ\text{C/W}$ |

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.

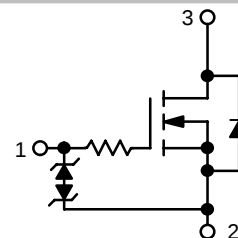
1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).



ON Semiconductor®

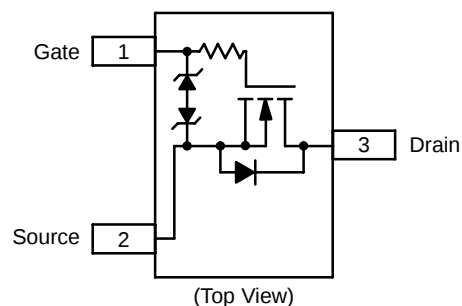
<http://onsemi.com>

| $V_{(BR)DSS}$ | $R_{DS(on)}$<br>Typ @ $V_{GS}$ | $I_D$ MAX<br>(Note 1) |
|---------------|--------------------------------|-----------------------|
| 30 V          | 1.4 $\Omega$ @ 4.5 V           | 154 mA                |
|               | 2.3 $\Omega$ @ 2.5 V           |                       |



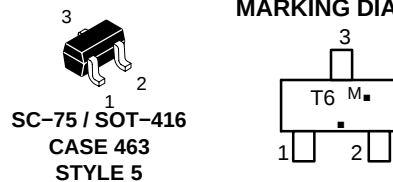
N-Channel

### PIN CONNECTIONS SC-75 (3-Leads)



(Top View)

### MARKING DIAGRAM



T6 = Specific Device Code  
M = Date Code

■ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device      | Package         | Shipping†        |
|-------------|-----------------|------------------|
| NTA7002NT1  | SC-75           | 3000 Tape & Reel |
| NTA7002NT1G | SC-75 (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.

# NTA7002N

## 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 | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$                  | 30 |  |           | V             |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{GS} = 0\text{ V}, V_{DS} = 30\text{ V}$                          |    |  | 1.0       | $\mu\text{A}$ |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}, T = 85^\circ\text{C}$    |    |  | 1.0       | $\mu\text{A}$ |
| Gate-to-Source Leakage Current    | $I_{GSS}$     | $V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$                      |    |  | $\pm 25$  | $\mu\text{A}$ |
| Gate-to-Source Leakage Current    | $I_{GSS}$     | $V_{DS} = 0\text{ V}, V_{GS} = \pm 5\text{ V}$                       |    |  | $\pm 1.0$ | $\mu\text{A}$ |
| Gate-to-Source Leakage Current    | $I_{GSS}$     | $V_{DS} = 0\text{ V}, V_{GS} = \pm 5\text{ V}, T = 85^\circ\text{C}$ |    |  | $\pm 1.0$ | $\mu\text{A}$ |

### ON CHARACTERISTICS (Note 2)

|                               |              |                                                 |     |     |     |          |
|-------------------------------|--------------|-------------------------------------------------|-----|-----|-----|----------|
| Gate Threshold Voltage        | $V_{GS(TH)}$ | $V_{DS} = V_{GS}, I_D = 100\text{ }\mu\text{A}$ | 0.5 | 1.0 | 1.5 | V        |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 4.5\text{ V}, I_D = 154\text{ mA}$    |     | 1.4 | 7.0 | $\Omega$ |
|                               |              | $V_{GS} = 2.5\text{ V}, I_D = 154\text{ mA}$    |     | 2.3 | 7.5 |          |
| Forward Transconductance      | $g_{FS}$     | $V_{DS} = 3\text{ V}, I_D = 154\text{ mA}$      |     | 80  |     | mS       |

### CAPACITANCES

|                              |           |                                                                |  |      |  |    |
|------------------------------|-----------|----------------------------------------------------------------|--|------|--|----|
| Input Capacitance            | $C_{ISS}$ | $V_{DS} = 5.0\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$ |  | 11.5 |  | pF |
| Output Capacitance           | $C_{OSS}$ |                                                                |  | 10   |  |    |
| Reverse Transfer Capacitance | $C_{RSS}$ |                                                                |  | 3.5  |  |    |

### SWITCHING CHARACTERISTICS (Note 3)

|                     |              |                                                                                            |  |    |  |    |
|---------------------|--------------|--------------------------------------------------------------------------------------------|--|----|--|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = 4.5\text{ V}, V_{DS} = 5.0\text{ V}, I_D = 75\text{ mA}, R_G = 10\text{ }\Omega$ |  | 13 |  | ns |
| Rise Time           | $t_r$        |                                                                                            |  | 15 |  | ns |
| Turn-Off Delay Time | $t_{d(OFF)}$ |                                                                                            |  | 98 |  |    |
| Fall Time           | $t_f$        |                                                                                            |  | 60 |  |    |

### Drain-Source Diode Characteristics

|                       |          |                                              |  |      |     |   |
|-----------------------|----------|----------------------------------------------|--|------|-----|---|
| Forward Diode Voltage | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = 0.154\text{ mA}$ |  | 0.77 | 0.9 | V |
|-----------------------|----------|----------------------------------------------|--|------|-----|---|

- Pulse Test: pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

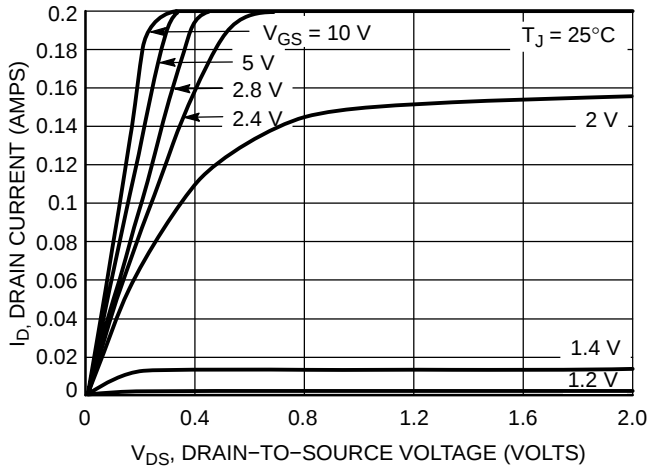


Figure 1. On-Region Characteristics

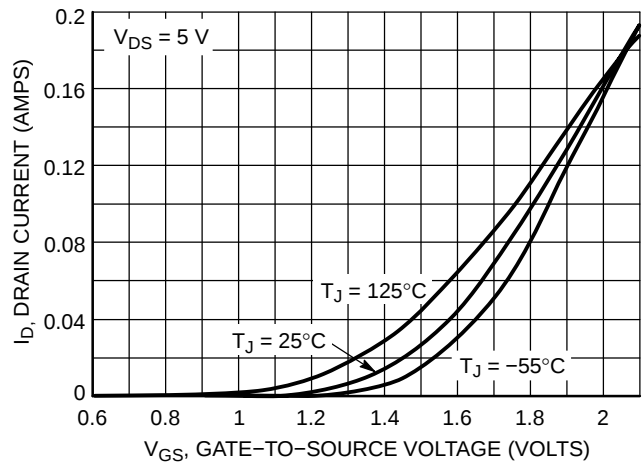


Figure 2. Transfer Characteristics

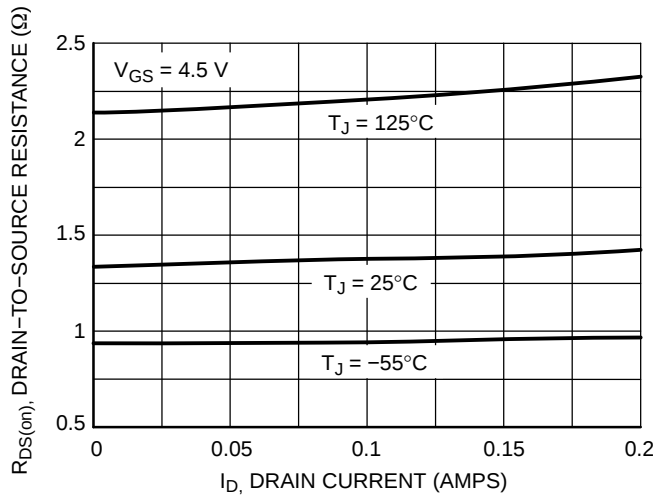


Figure 3. On-Resistance vs. Drain Current and Temperature

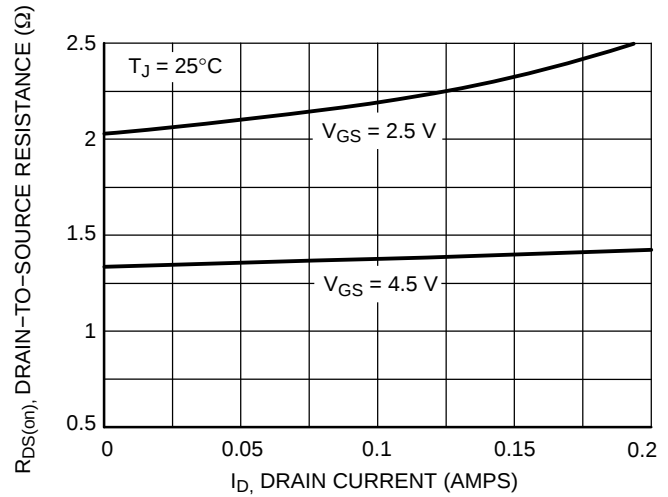


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

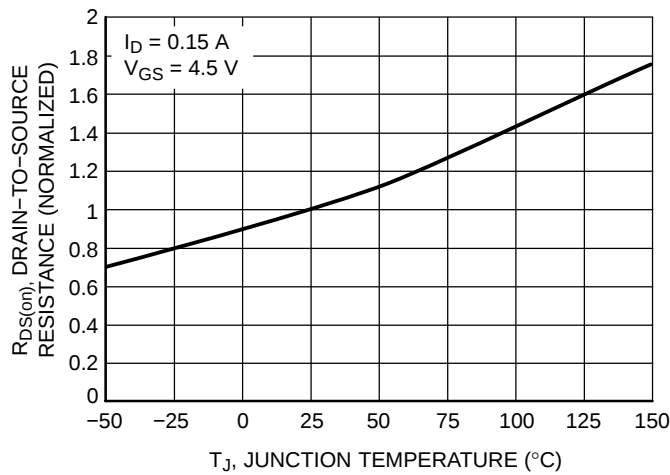


Figure 5. On-Resistance Variation with Temperature

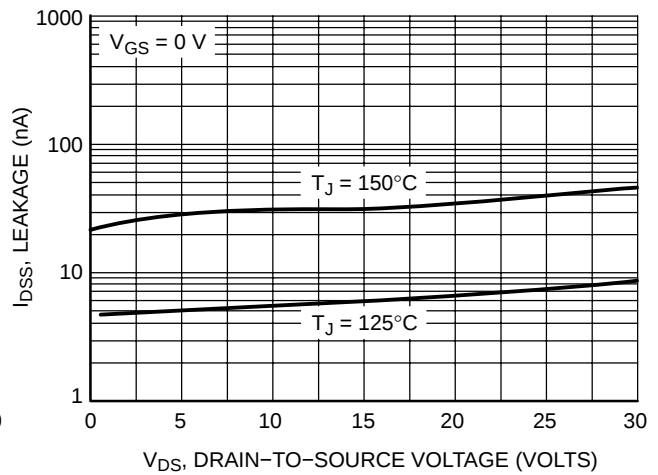


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

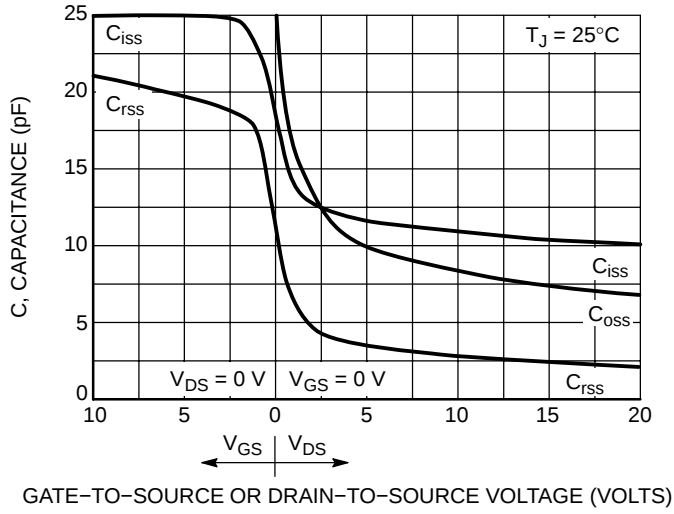


Figure 7. Capacitance Variation

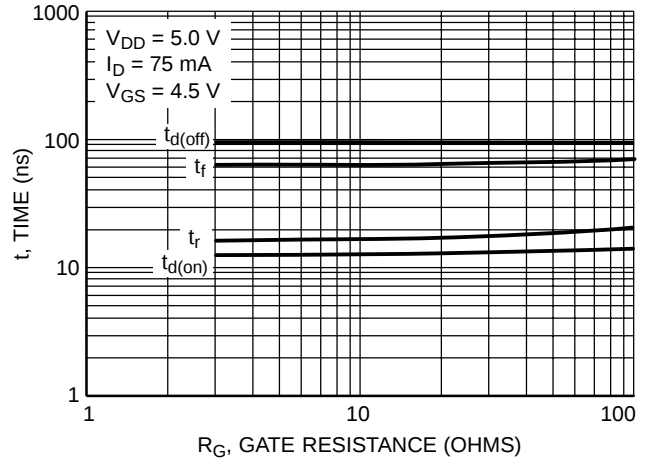


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

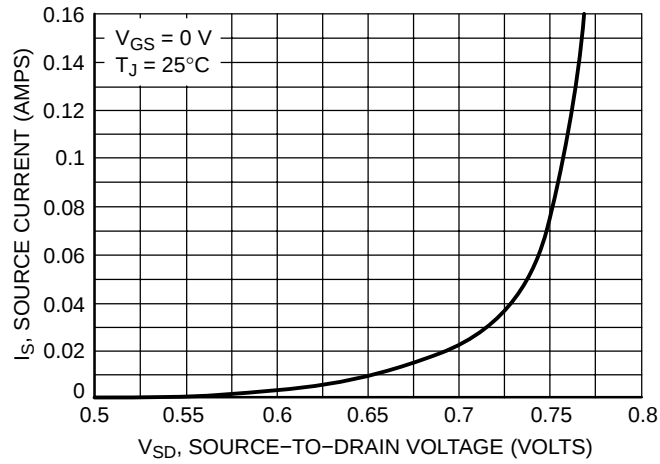
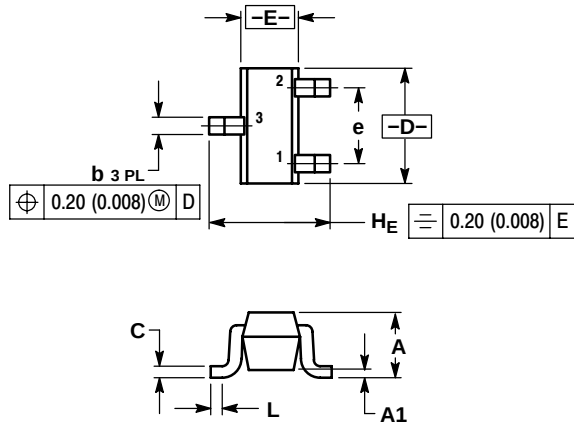


Figure 9. Diode Forward Voltage vs. Current

# NTA7002N

## PACKAGE DIMENSIONS

SC-75 / SOT-416  
CASE 463-01  
ISSUE F

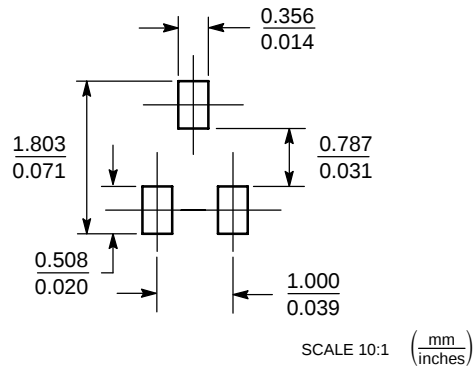


- NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: MILLIMETER.

| DIM            | MILLIMETERS |      |      | INCHES   |       |       |
|----------------|-------------|------|------|----------|-------|-------|
|                | MIN         | NOM  | MAX  | MIN      | NOM   | MAX   |
| A              | 0.70        | 0.80 | 0.90 | 0.027    | 0.031 | 0.035 |
| A1             | 0.00        | 0.05 | 0.10 | 0.000    | 0.002 | 0.004 |
| b              | 0.15        | 0.20 | 0.30 | 0.006    | 0.008 | 0.012 |
| C              | 0.10        | 0.15 | 0.25 | 0.004    | 0.006 | 0.010 |
| D              | 1.55        | 1.60 | 1.65 | 0.059    | 0.063 | 0.067 |
| E              | 0.70        | 0.80 | 0.90 | 0.027    | 0.031 | 0.035 |
| e              | 1.00 BSC    |      |      | 0.04 BSC |       |       |
| L              | 0.10        | 0.15 | 0.20 | 0.004    | 0.006 | 0.008 |
| H <sub>E</sub> | 1.50        | 1.60 | 1.70 | 0.061    | 0.063 | 0.065 |

STYLE 5:  
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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