

NTA4151P, NTE4151P

Small Signal MOSFET

-20 V, -760 mA, Single P-Channel,
Gate Zener, SC-75, SC-89

Features

- Low $R_{DS(on)}$ for Higher Efficiency and Longer Battery Life
- Small Outline Package (1.6 x 1.6 mm)
- SC-75 Standard Gullwing Package
- ESD Protected Gate
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- High Side Load Switch
- DC-DC Conversion
- Small Drive Circuits
- Battery Operated Systems such as Cell Phones, PDAs, Digital Cameras, etc.

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

| Parameter | | Symbol | Value | Units |
|---|------------------------|----------------|------------|------------------|
| Drain-to-Source Voltage | | V_{DSS} | -20 | V |
| Gate-to-Source Voltage | | V_{GS} | ± 6.0 | V |
| Continuous Drain Current (Note 1) | Steady State | I_D | -760 | mA |
| Power Dissipation (Note 1) | Steady State | P_D | 301 | mW |
| SC-75 SC-89 | | | 313 | |
| Pulsed Drain Current | $t_p = 10 \mu\text{s}$ | I_{DM} | ± 1000 | mA |
| Operating Junction and Storage Temperature | | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ |
| Continuous Source Current (Body Diode) | | I_S | -250 | mA |
| Lead Temperature for Soldering Purposes (1/8 in from case for 10 s) | | T_L | 260 | $^\circ\text{C}$ |
| Gate-to-Source ESD Rating – (Human Body Model, Method 3015) | | ESD | 1800 | V |

THERMAL RESISTANCE RATINGS

| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | | $^\circ\text{C/W}$ |
|---|-----------------|-----|--------------------|
| SC-75 | | 415 | |
| SC-89 | | 400 | |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, 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).

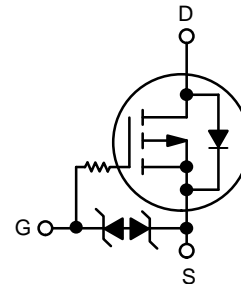


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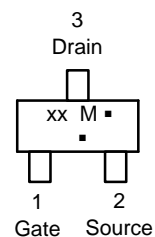
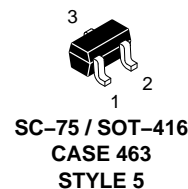
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| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP | I_D MAX |
|---------------|------------------------|-----------|
| -20 V | 0.26 Ω @ -4.5 V | -760 mA |
| | 0.35 Ω @ -2.5 V | |
| | 0.49 Ω @ -1.8 V | |

P-Channel MOSFET



MARKING DIAGRAM & PIN ASSIGNMENT



- xx = Device Code
- M = Date Code*
- = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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ELECTRICAL CHARACTERISTICS (T_J = 25°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 V, I _D = -250 μA | -20 | | | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{GS} = 0 V, V _{DS} = -16 V | | -1.0 | -100 | nA |
| Gate-to-Source Leakage Current | I _{GSS} | V _{DS} = 0 V, V _{GS} = ±4.5 V | | ±1.0 | ±10 | μA |

ON CHARACTERISTICS (Note 2)

| | | | | | | |
|-------------------------------|---------------------|--|-------|------|------|---|
| Gate Threshold Voltage | V _{GS(TH)} | V _{DS} = V _{GS} , I _D = -250 μA | -0.45 | | -1.2 | V |
| Drain-to-Source On Resistance | R _{DS(on)} | V _{GS} = -4.5 V, I _D = -350 mA | | 0.26 | 0.36 | Ω |
| | | V _{GS} = -2.5 V, I _D = -300 mA | | 0.35 | 0.45 | |
| | | V _{GS} = -1.8 V, I _D = -150 mA | | 0.49 | 1.0 | |
| Forward Transconductance | g _{FS} | V _{DS} = -10 V, I _D = -250 mA | | 0.4 | | S |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|---------------------|---|--|-------|--|----|
| Input Capacitance | C _{ISS} | V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = -5.0 V | | 156 | | pF |
| Output Capacitance | C _{OSS} | | | 28 | | |
| Reverse Transfer Capacitance | C _{RSS} | | | 18 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = -4.5 V, V _{DD} = -10 V, I _D = -0.3 A | | 2.1 | | nC |
| Threshold Gate Charge | Q _{G(TH)} | | | 0.125 | | |
| Gate-to-Source Charge | Q _{GS} | | | 0.325 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 0.5 | | |

SWITCHING CHARACTERISTICS (Note 3)

| | | | | | | |
|---------------------|---------------------|---|--|------|--|----|
| Turn-On Delay Time | t _{d(ON)} | V _{GS} = -4.5 V, V _{DD} = -10 V, I _D = -200 mA, R _G = 10 Ω | | 8.0 | | ns |
| Rise Time | t _r | | | 8.2 | | |
| Turn-Off Delay Time | t _{d(OFF)} | | | 29 | | |
| Fall Time | t _f | | | 20.4 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-----------------------|-----------------|---|--|-------|------|---|
| Forward Diode Voltage | V _{SD} | V _{GS} = 0 V, I _S = -250 mA | | -0.72 | -1.1 | V |
|-----------------------|-----------------|---|--|-------|------|---|

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

3. Switching characteristics are independent of operating junction temperatures.

ORDERING INFORMATION

| Device | Marking | Package | Shipping† |
|-------------|---------|--------------------|--------------------|
| NTA4151PT1G | TN | SC-75 (Pb-Free) | 3000 / Tape & Reel |
| NTE4151PT1G | TM | SC-89 (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 Specifications Brochure, BRD8011/D.

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TYPICAL ELECTRICAL CHARACTERISTICS

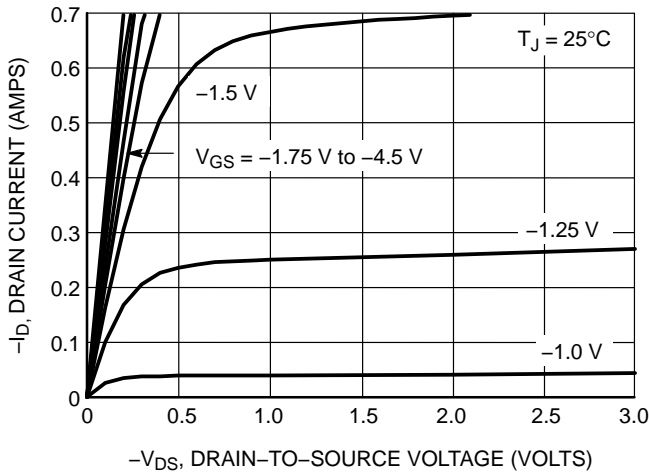


Figure 1. On-Region Characteristics

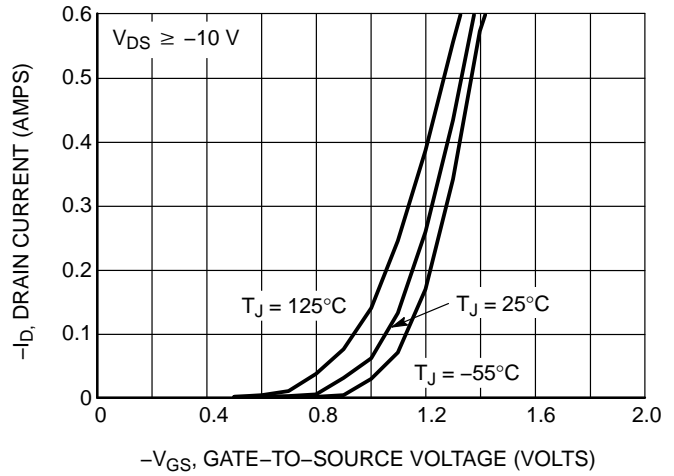


Figure 2. Transfer Characteristics

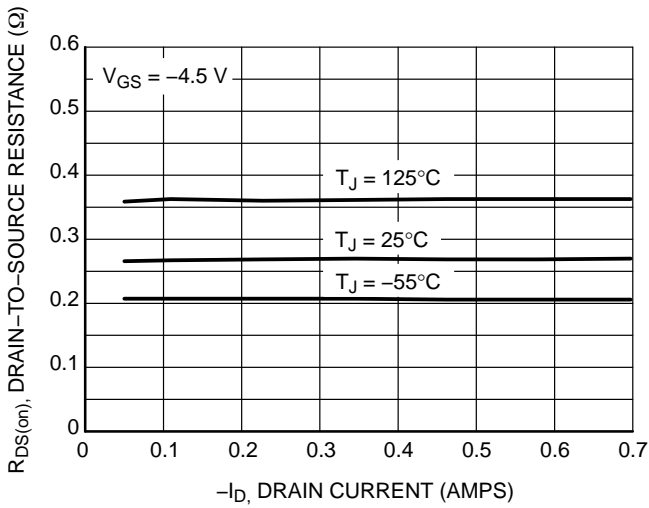


Figure 3. On-Resistance vs. Drain Current and Temperature

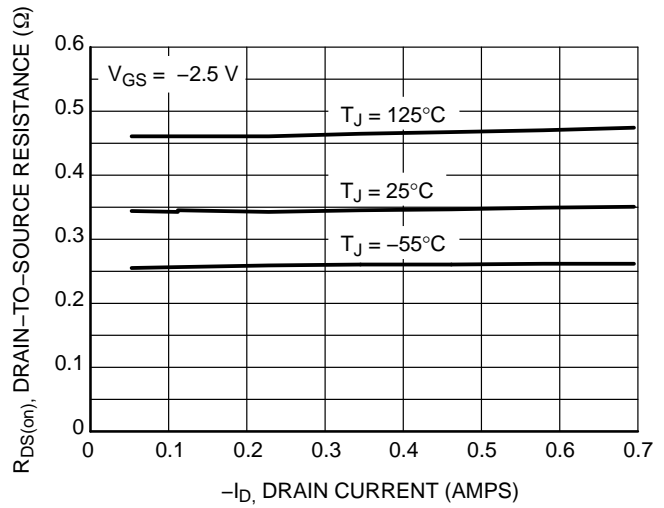


Figure 4. On-Resistance vs. Drain Current and Temperature

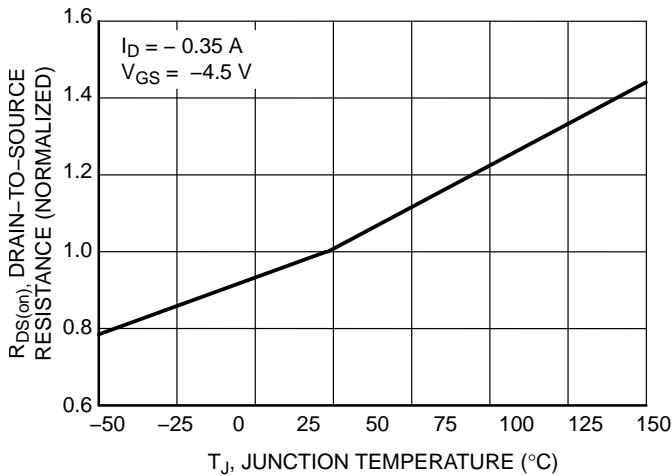


Figure 5. On-Resistance Variation with Temperature

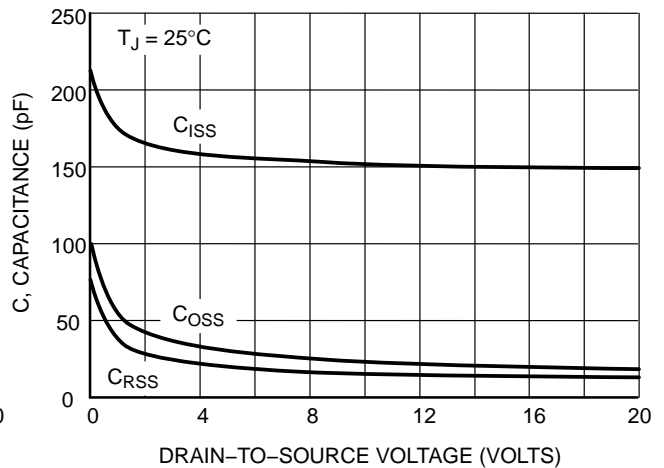


Figure 6. Capacitance Variation

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TYPICAL ELECTRICAL CHARACTERISTICS

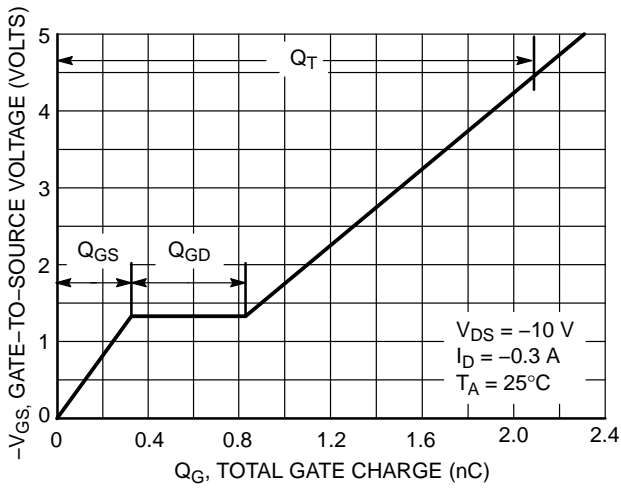


Figure 7. Gate-to-Source Voltage vs. Total Gate Charge

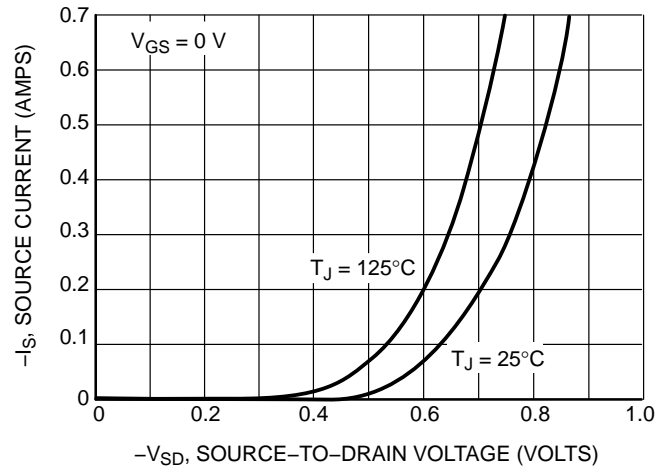


Figure 8. Diode Forward Voltage vs. Current

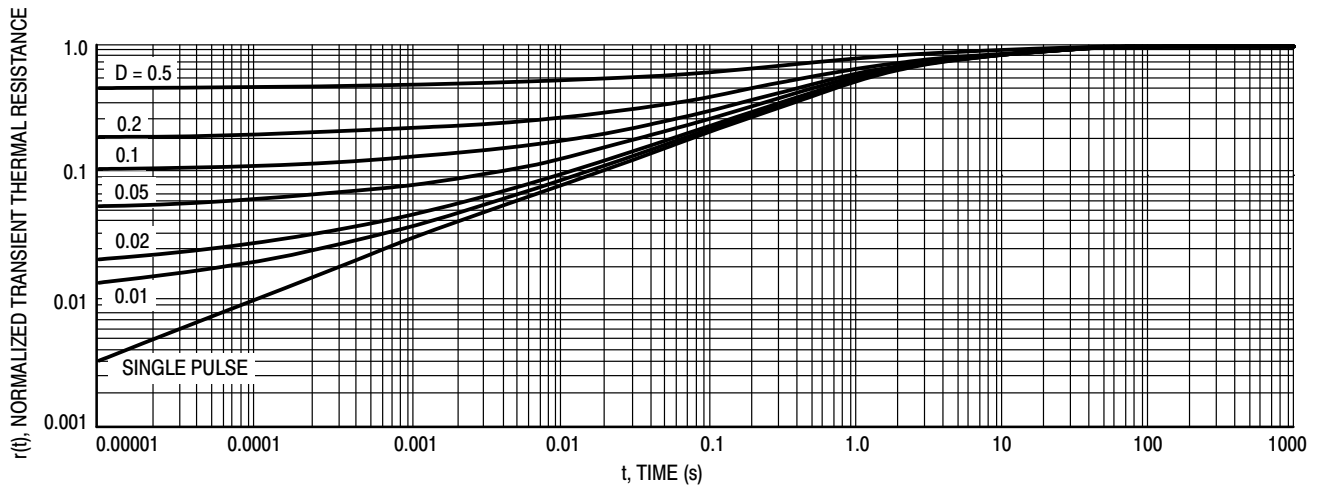
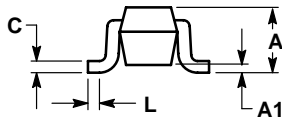
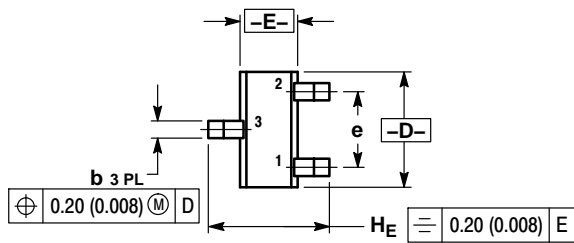


Figure 9. Normalized Thermal Response

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PACKAGE DIMENSIONS

SC-75/SOT-416
CASE 463
ISSUE F

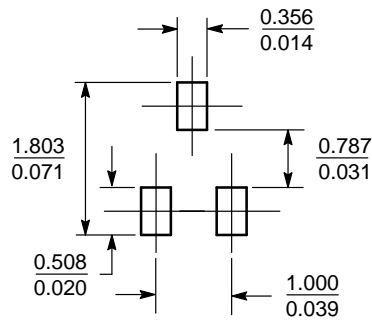


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

| 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 _E | 1.50 | 1.60 | 1.70 | 0.061 | 0.063 | 0.065 |

- STYLE 5:
PIN 1. GATE
2. SOURCE
3. DRAIN

SOLDERING FOOTPRINT*



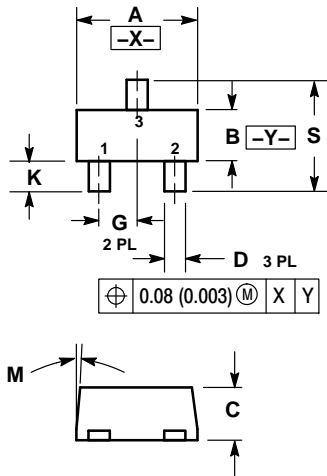
SCALE 10:1 ($\frac{\text{mm}}{\text{inches}}$)

*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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PACKAGE DIMENSIONS

SC-89, 3-LEAD
CASE 463C-03
ISSUE C

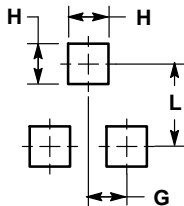


NOTES:


1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|-----------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.50 | 1.60 | 1.70 | 0.059 | 0.063 | 0.067 |
| B | 0.75 | 0.85 | 0.95 | 0.030 | 0.034 | 0.040 |
| C | 0.60 | 0.70 | 0.80 | 0.024 | 0.028 | 0.031 |
| D | 0.23 | 0.28 | 0.33 | 0.009 | 0.011 | 0.013 |
| G | 0.50 BSC | | | 0.020 BSC | | |
| H | 0.53 REF | | | 0.021 REF | | |
| J | 0.10 | 0.15 | 0.20 | 0.004 | 0.006 | 0.008 |
| K | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 |
| L | 1.10 REF | | | 0.043 REF | | |
| M | --- | --- | 10 | --- | --- | 10 |
| N | --- | --- | 10 | --- | --- | 10 |
| S | 1.50 | 1.60 | 1.70 | 0.059 | 0.063 | 0.067 |

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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