

NTJS3151P

Trench Power MOSFET

12 V, 3.3 A, Single P-Channel,
ESD Protected SC-88



ON Semiconductor®

<http://onsemi.com>

Features

- Leading Trench Technology for Low $R_{DS(ON)}$ Extending Battery Life
- SC-88 Small Outline (2x2 mm, SC70-6 Equivalent)
- Gate Diodes for ESD Protection
- Pb-Free Packages are Available

Applications

- High Side Load Switch
- Cell Phones, Computing, Digital Cameras, MP3s and PDAs

| $V_{(BR)DSS}$ | $R_{DS(on)}$ Typ | I_D Max |
|---------------|------------------|-----------|
| -12 V | 45 mΩ @ -4.5 V | -3.3 A |
| | 67 mΩ @ -2.5 V | |
| | 133 mΩ @ -1.8 V | |

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

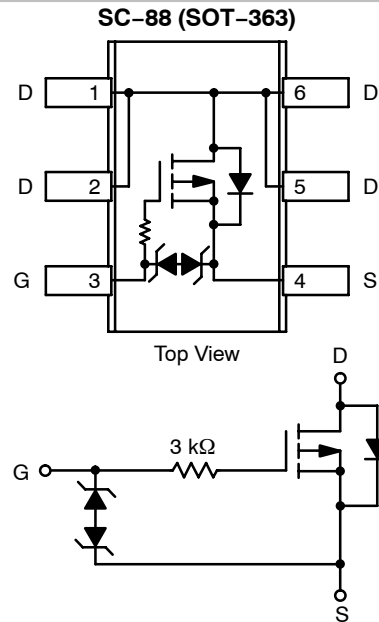
| Parameter | Symbol | Value | Units | |
|---|------------------------|--|------------------|---|
| Drain-to-Source Voltage | V_{DSS} | -12 | V | |
| Gate-to-Source Voltage | V_{GS} | ±12 | V | |
| Continuous Drain Current (Note 1) | I_D | Steady State $T_A = 25^\circ\text{C}$ | -2.7 | A |
| | | $T_A = 85^\circ\text{C}$ | -2.0 | |
| | | $t \leq 5$ s $T_A = 25^\circ\text{C}$ | -3.3 | |
| Power Dissipation (Note 1) | P_D | 0.625 | W | |
| Pulsed Drain Current | $t_p = 10 \mu\text{s}$ | I_{DM} | -8.0 | A |
| Operating Junction and Storage Temperature | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ | |
| Source Current (Body Diode) | I_S | -0.8 | A | |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | T_L | 260 | $^\circ\text{C}$ | |

THERMAL RESISTANCE RATINGS (Note 1)

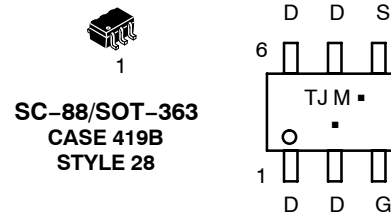
| Parameter | Symbol | Max | Units |
|------------------------------------|-----------------|-----|---------------------------|
| Junction-to-Ambient – Steady State | $R_{\theta JA}$ | 200 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient – $t \leq 5$ s | $R_{\theta JA}$ | 141 | |
| Junction-to-Lead – Steady State | $R_{\theta JL}$ | 102 | |

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).



MARKING DIAGRAM & PIN ASSIGNMENT



TJ = Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

NTJS3151P

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 | -12 | | | 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} = -9.6 V, V _{DS} = 0 V | T _J = 25°C | | -1.0 | μA |
| | | | T _J = 125°C | | -2.5 | |
| Gate-to-Source Leakage Current | I _{GSS} | V _{DS} = 0 V, V _{GS} = ±4.5 V | | | ±1.5 | μA |
| | | V _{DS} = 0 V, V _{GS} = ±12 V | | | ±10 | mA |

ON CHARACTERISTICS (Note 2)

| | | | | | | |
|--|-------------------------------------|---|-------|-----|-----|-------|
| Gate Threshold Voltage | V _{GS(TH)} | V _{GS} = V _{DS} , I _D = 100 μA | -0.40 | | | V |
| Negative Threshold Temperature Coefficient | V _{GS(TH)} /T _J | | | 3.4 | | mV/°C |
| Drain-to-Source On Resistance | R _{DS(on)} | V _{GS} = -4.5 V, I _D = -3.3 A | | 45 | 60 | mΩ |
| | | V _{GS} = -2.5 V, I _D = -2.9 A | | 67 | 90 | |
| | | V _{GS} = -1.8 V, I _D = -1.0 A | | 133 | 160 | |
| Forward Transconductance | g _{FS} | V _{GS} = -10 V, I _D = -3.3 A | | 15 | | S |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|---------------------|--|--|------|--|----|
| Input Capacitance | C _{ISS} | V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = -12 V | | 850 | | pF |
| Output Capacitance | C _{OSS} | | | 170 | | |
| Reverse Transfer Capacitance | C _{RSS} | | | 110 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = -4.5 V, V _{DS} = -5.0 V, I _D = -3.3 A | | 8.6 | | nC |
| Gate-to-Source Charge | Q _{GS} | | | 1.3 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 2.2 | | |
| Gate Resistance | R _G | | | 3000 | | |

SWITCHING CHARACTERISTICS (Note 3)

| | | | | | | |
|---------------------|---------------------|--|--|------|--|----|
| Turn-On Delay Time | t _{d(ON)} | V _{GS} = -4.5 V, V _{DD} = -6.0 V, I _D = -1.0 A, R _G = 6.0 Ω | | 0.86 | | μs |
| Rise Time | t _r | | | 1.5 | | |
| Turn-Off Delay Time | t _{d(OFF)} | | | 3.5 | | |
| Fall Time | t _f | | | 3.9 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS (Note 2)

| | | | | | | |
|-----------------------|-----------------|---|------------------------|-------|------|---|
| Forward Diode Voltage | V _{SD} | V _{GS} = 0 V, I _S = -3.3 A | T _J = 25°C | -0.85 | -1.2 | V |
| | | | T _J = 125°C | -0.7 | | |

2. Pulse Test: pulse width ≤ 300μs, duty cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

NTJS3151P

TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

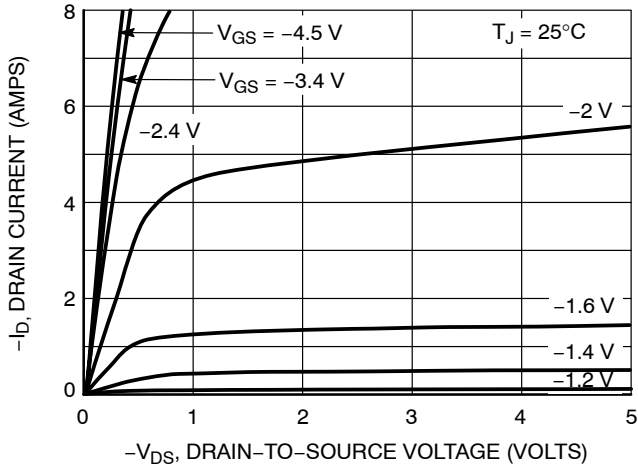


Figure 1. On-Region Characteristics

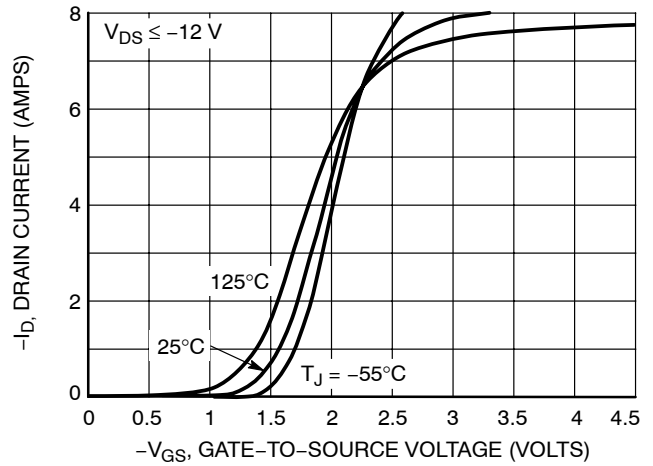


Figure 2. Transfer Characteristics

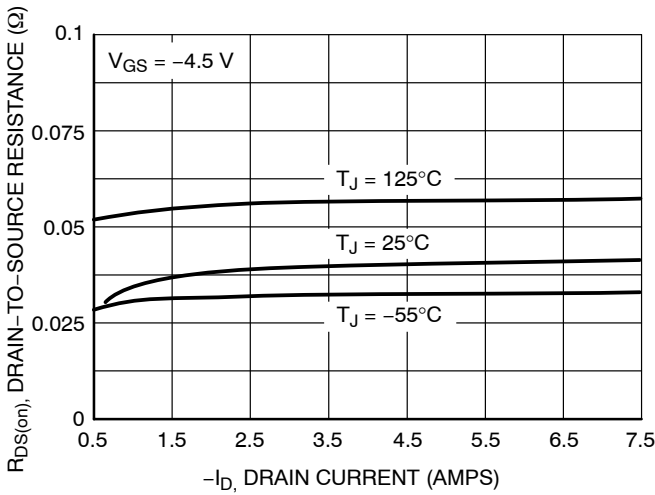


Figure 3. On-Resistance vs. Drain Current and Temperature

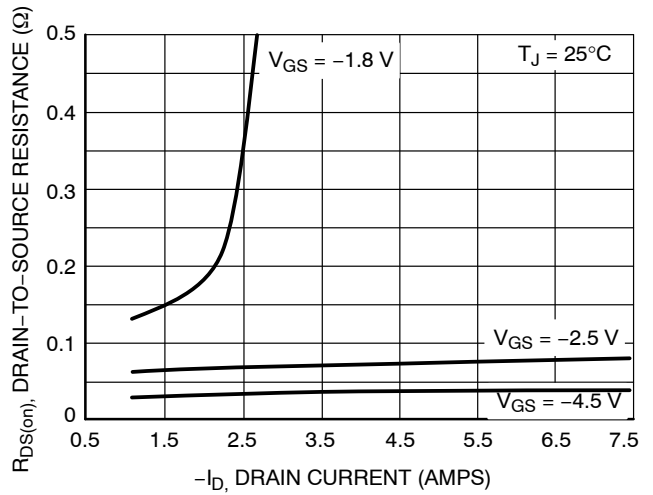


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

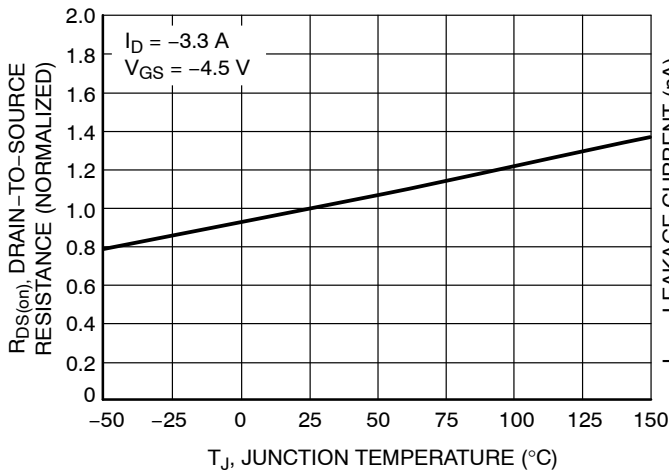


Figure 5. On-Resistance Variation with Temperature

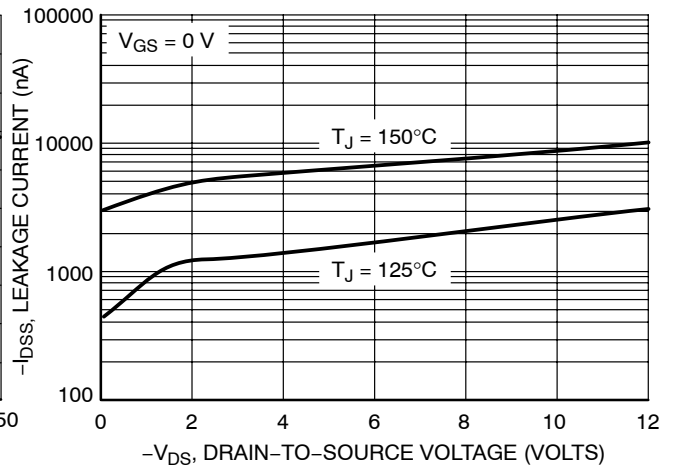


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NTJS3151P

TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

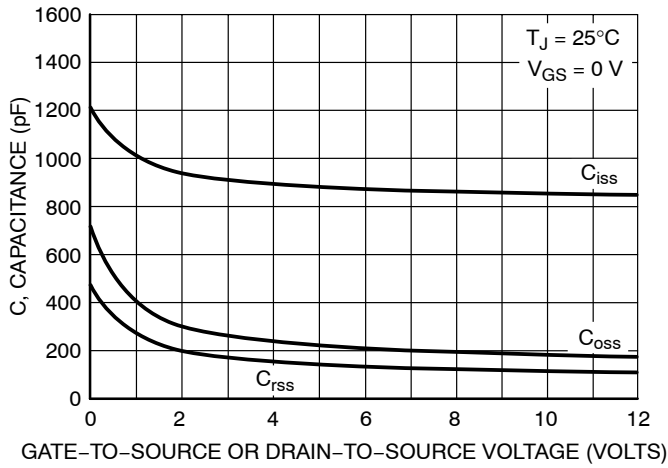


Figure 7. Capacitance Variation

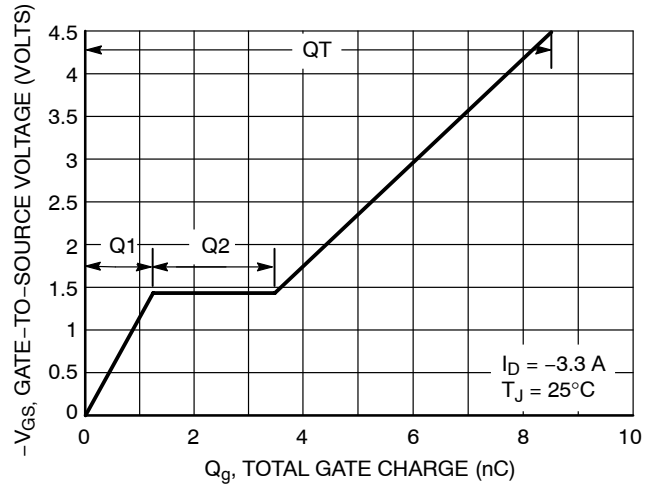


Figure 8. Gate-to-Source Voltage vs. Total Gate Charge

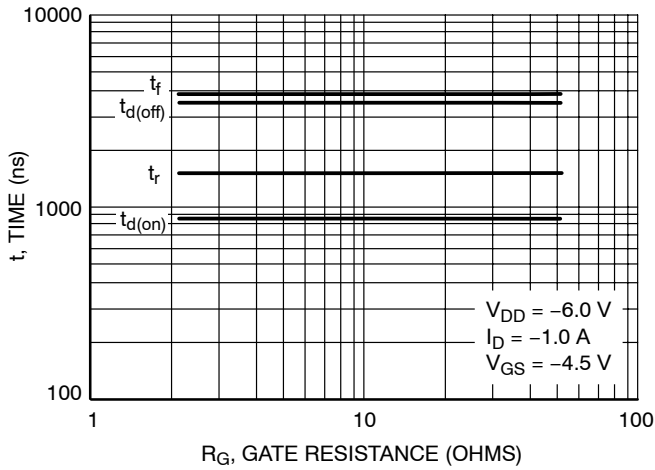


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

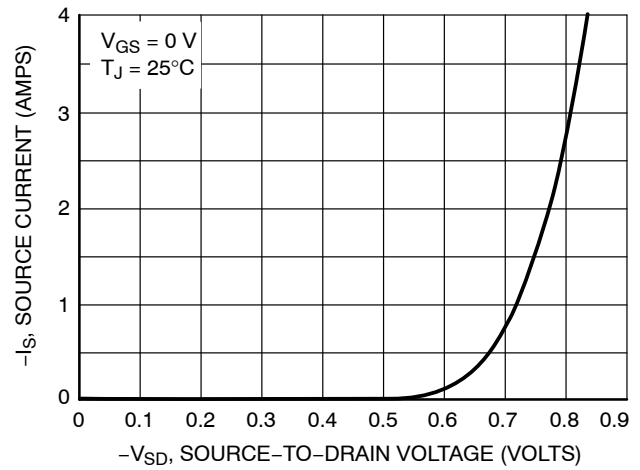


Figure 10. Diode Forward Voltage vs. Current

NTJS3151P

ORDERING INFORMATION

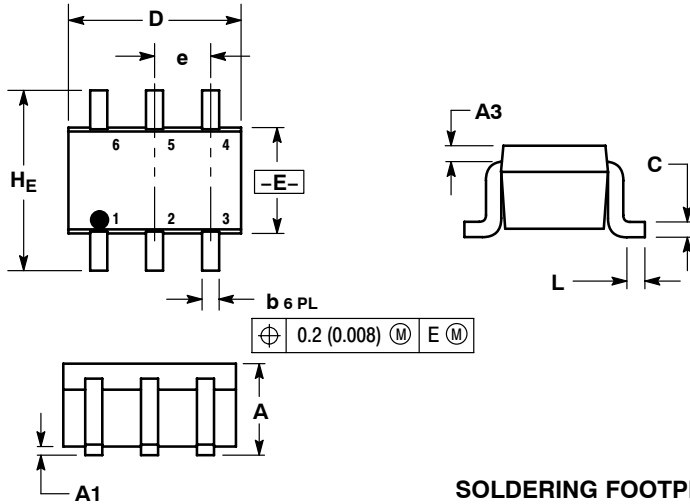
| Device | Package | Shipping† |
|--------------|--------------------|------------------|
| NTJS3151PT1 | SC-88 | 3000 Tape & Reel |
| NTJS3151PT1G | SC-88 (Pb-Free) | 3000 Tape & Reel |
| NTJS3151PT2 | SC-88 | 3000 Tape & Reel |
| NTJS3151PT2G | SC-88 (Pb-Free) | 3000 Tape & Reel |

†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.

NTJS3151P

PACKAGE DIMENSIONS

SC-88/SC70-6/SOT-363
CASE 419B-02
ISSUE W



NOTES:

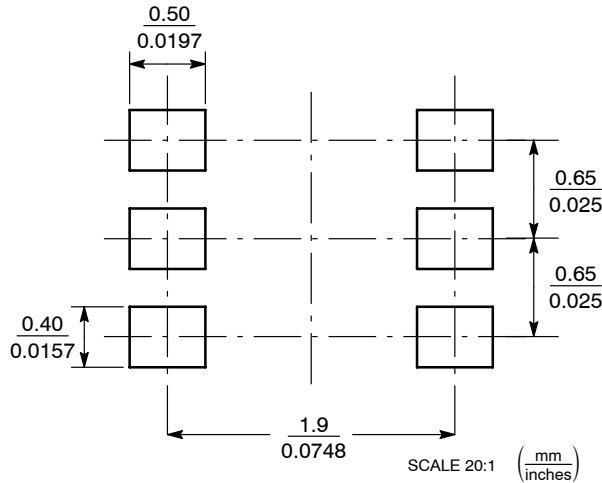
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|-----------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.80 | 0.95 | 1.10 | 0.031 | 0.037 | 0.043 |
| A1 | 0.00 | 0.05 | 0.10 | 0.000 | 0.002 | 0.004 |
| A3 | 0.20 REF | | | 0.008 REF | | |
| b | 0.10 | 0.21 | 0.30 | 0.004 | 0.008 | 0.012 |
| C | 0.10 | 0.14 | 0.25 | 0.004 | 0.005 | 0.010 |
| D | 1.80 | 2.00 | 2.20 | 0.070 | 0.078 | 0.086 |
| E | 1.15 | 1.25 | 1.35 | 0.045 | 0.049 | 0.053 |
| e | 0.65 BSC | | | 0.026 BSC | | |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| HE | 2.00 | 2.10 | 2.20 | 0.078 | 0.082 | 0.086 |

STYLE 28:

- PIN 1. DRAIN
- 2. DRAIN
- 3. GATE
- 4. SOURCE
- 5. DRAIN
- 6. 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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