# NTZD3155C

# Small Signal MOSFET

## Complementary 20 V, 540 mA / -430 mA, with ESD protection, SOT-563 package.

ON Semiconductor®

http://onsemi.com

### Features

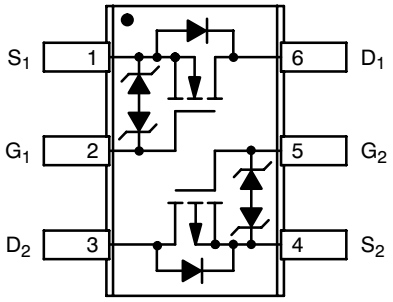
- Leading Trench Technology for Low $R_{DS(on)}$ Performance
- High Efficiency System Performance
- Low Threshold Voltage
- ESD Protected Gate
- Small Footprint 1.6 x 1.6 mm
- These are Pb-Free Devices

### Applications

- DC-DC Conversion Circuits
- Load/Power Switching with Level Shift
- Single or Dual Cell Li-Ion Battery Operated Systems
- High Speed Circuits
- Cell Phones, MP3s, Digital Cameras, and PDAs

| $V_{(BR)DSS}$ | $R_{DS(on)}$ Typ | $I_D$ Max (Note 1) |
|---|---|---|
| N-Channel 20 V | 0.4 Ω @ 4.5 V | 540 mA |
| | 0.5 Ω @ 2.5 V | |
| | 0.7 Ω @ 1.8 V | |
| P-Channel -20 V | 0.5 Ω @ -4.5 V | -430 mA |
| | 0.6 Ω @ -2.5 V | |
| | 1.0 Ω @ -1.8 V | |

**PINOUT: SOT-563**



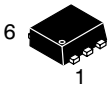

Top View

**MAXIMUM RATINGS** ($T_J$ = 25°C unless otherwise specified)

| Parameter | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-to-Source Voltage | | | $V_{DSS}$ | 20 | V |
| Gate-to-Source Voltage | | | $V_{GS}$ | ±6 | V |
| N-Channel Continuous Drain Current (Note 1) | Steady State | $T_A$ = 25°C | $I_D$ | 540 | mA |
| | | $T_A$ = 85°C | | 390 | |
| | t ≤ 5 s | $T_A$ = 25°C | | 570 | |
| P-Channel Continuous Drain Current (Note 1) | Steady State | $T_A$ = 25°C | | -430 | |
| | | $T_A$ = 85°C | | -310 | |
| | t ≤ 5 s | $T_A$ = 25°C | | -455 | |
| Power Dissipation (Note 1) | Steady State | $T_A$ = 25°C | $P_D$ | 250 | mW |
| | t ≤ 5 s | | | 280 | |
| Pulsed Drain Current | N-Channel | $t_p$ = 10 μs | $I_{DM}$ | 1500 | mA |
| | P-Channel | | | -750 | |
| Operating Junction and Storage Temperature | | | $T_J$, $T_{STG}$ | -55 to 150 | °C |
| Source Current (Body Diode) | | | $I_S$ | 350 | mA |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | | $T_L$ | 260 | °C |

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).




**SOT-563-6**
**CASE 463A**

**MARKING DIAGRAM**


TW = Specific Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

**ORDERING INFORMATION**

| Device | Package | Shipping† |
|---|---|---|
| NTZD3155CT1G | SOT-563 (Pb-Free) | 4000 / Tape & Reel |
| NTZD3155CT2G | SOT-563 (Pb-Free) | 4000 / Tape & Reel |
| NTZD3155CT5G | SOT-563 (Pb-Free) | 8000 / 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.

### Thermal Resistance Ratings

| Parameter | Symbol | Max | Unit |
|---|---|---|---|
| Junction-to-Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 500 | °C/W |
| Junction-to-Ambient – t = 5 s (Note 2) | | 447 | |

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

### ELECTRICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise specified)

| Parameter | Symbol | N/P | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | | |
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | N | $V_{GS}$ = 0 V | $I_D$ = 250 μA | 20 | | | V |
| | | P | | $I_D$ = -250 μA | -20 | | | |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | | | | | 18 | | mV/°C |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | N | $V_{GS}$ = 0 V, $V_{DS}$ = 16 V | $T_J$ = 25°C | | | 1.0 | μA |
| | | P | $V_{GS}$ = 0 V, $V_{DS}$= -16 V | | | | -1.0 | |
| | | N | $V_{GS}$ = 0 V, $V_{DS}$ = 16 V | $T_J$ = 125°C | | | 2.0 | μA |
| | | P | $V_{GS}$ = 0 V, $V_{DS}$= - 16V | | | | -5.0 | |
| Gate-to-Source Leakage Current | $I_{GSS}$ | P | $V_{DS}$ = 0 V, $V_{GS}$ = ±4.5 V | | | | ±2.0 | μA |
| | | N | | | | | ±5.0 | |
| **ON CHARACTERISTICS** (Note 3) | | | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | N | $V_{GS}$ = $V_{DS}$ | $I_D$ = 250 μA | 0.45 | | 1.0 | V |
| | | P | | $I_D$ = -250 μA | -0.45 | | -1.0 | |
| Gate Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | | | | | -1.9 | | -mV/ °C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | N | $V_{GS}$ = 4.5 V, $I_D$ = 540 mA | | | 0.4 | 0.55 | Ω |
| | | P | $V_{GS}$ = -4.5V, $I_D$ = -430 mA | | | 0.5 | 0.9 | |
| | | N | $V_{GS}$ = 2.5 V, $I_D$ = 500 mA | | | 0.5 | 0.7 | |
| | | P | $V_{GS}$ = -2.5V, $I_D$ = -300 mA | | | 0.6 | 1.2 | |
| | | N | $V_{GS}$ = 1.8 V, $I_D$ = 350 mA | | | 0.7 | 0.9 | |
| | | P | $V_{GS}$ = -1.8V, $I_D$ = -150 mA | | | 1.0 | 2.0 | |
| Forward Transconductance | $g_{FS}$ | N | $V_{DS}$ = 10 V, $I_D$ = 540 mA | | | 1.0 | | S |
| | | P | $V_{DS}$ = -10 V, $I_D$ = -430 mA | | | 1.0 | | |
| **CHARGES, CAPACITANCES AND GATE RESISTANCE** | | | | | | | | |
| Input Capacitance | $C_{ISS}$ | N | f = 1 MHz, $V_{GS}$ = 0 V $V_{DS}$ = 16 V | | | 80 | 150 | pF |
| Output Capacitance | $C_{OSS}$ | | | | | 13 | 25 | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | | | 10 | 20 | |
| Input Capacitance | $C_{ISS}$ | P | f = 1 MHz, $V_{GS}$ = 0 V $V_{DS}$ = -16 V | | | 105 | 175 | |
| Output Capacitance | $C_{OSS}$ | | | | | 15 | 30 | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | | | 10 | 20 | |

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

**ELECTRICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise specified)

| Parameter | Symbol | N/P | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **CHARGES, CAPACITANCES AND GATE RESISTANCE** | | | | | | | |
| Total Gate Charge | $Q_{G(TOT)}$ | N | $V_{GS}$ = 4.5 V, $V_{DS}$ = -10 V; $I_D$ = 540 mA | | 1.5 | 2.5 | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | | 0.1 | | |
| Gate-to-Source Charge | $Q_{GS}$ | | | | 0.2 | | |
| Gate-to-Drain Charge | $Q_{GD}$ | | | | 0.35 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | P | $V_{GS}$ = -4.5 V, $V_{DS}$ = 10 V; $I_D$ = -380 mA | | 1.7 | 2.5 | |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | | 0.1 | | |
| Gate-to-Source Charge | $Q_{GS}$ | | | | 0.3 | | |
| Gate-to-Drain Charge | $Q_{GD}$ | | | | 0.4 | | |
| **SWITCHING CHARACTERISTICS ($V_{GS}$ = V)** (Note 4) | | | | | | | |
| Turn-On Delay Time | $t_{d(ON)}$ | N | $V_{GS}$ = 4.5 V, $V_{DD}$ = -10 V, $I_D$ = 540 mA, $R_G$ = 10 Ω | | 6.0 | | ns |
| Rise Time | $t_r$ | | | | 4.0 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | | 16 | | |
| Fall Time | $t_f$ | | | | 8.0 | | |
| Turn-On Delay Time | $t_{d(ON)}$ | P | $V_{GS}$ = -4.5 V, $V_{DD}$ = 10 V, $I_D$ = -215 mA, $R_G$ = 10 Ω | | 10 | | |
| Rise Time | $t_r$ | | | | 12 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | | 35 | | |
| Fall Time | $t_f$ | | | | 19 | | |
| **Drain-Source Diode Characteristics** | | | | | | | |
| Forward Diode Voltage | $V_{SD}$ | N | $V_{GS}$ = 0 V, $T_J$ = 25°C | $I_S$ = 350 mA | | 0.7 | 1.2 | V |
| | | P | | $I_S$ = -350 mA | | -0.8 | -1.2 | |
| Reverse Recovery Time | $t_{RR}$ | N | $V_{GS}$ = 0 V, dIS/dt = 100 A/μs | $I_S$ = 350 mA | | 6.5 | | ns |
| | | P | | $I_S$ = -350 mA | | 13 | | |

4. Switching characteristics are independent of operating junction temperatures

## N-CHANNEL TYPICAL PERFORMANCE CURVES ($T_J$ = 25°C unless otherwise noted)

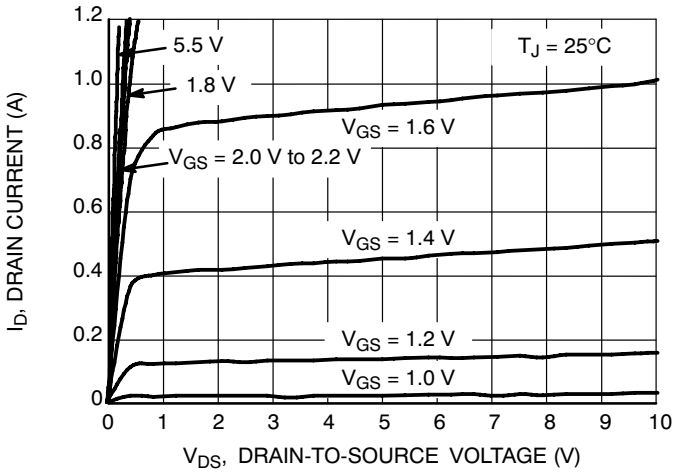



**Figure 1. On-Region Characteristics**

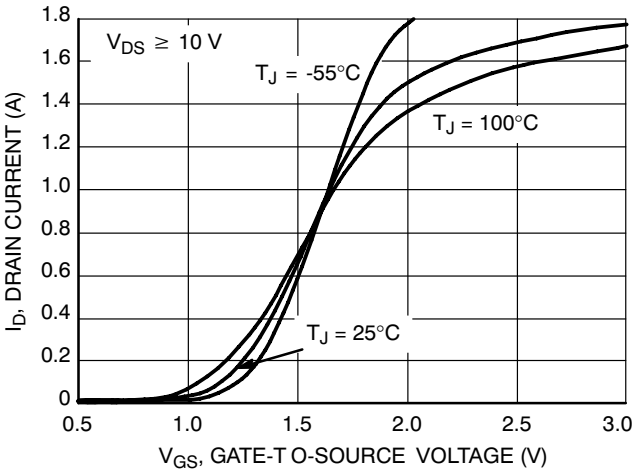



**Figure 2. Transfer Characteristics**

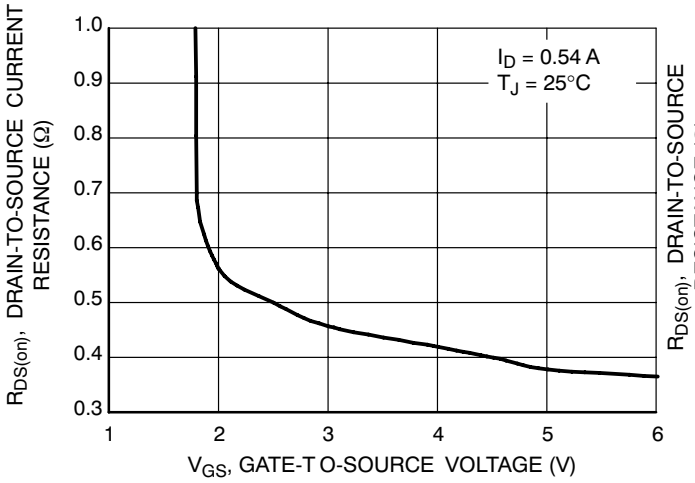



**Figure 3. On-Resistance versus Gate-to-Source Voltage**

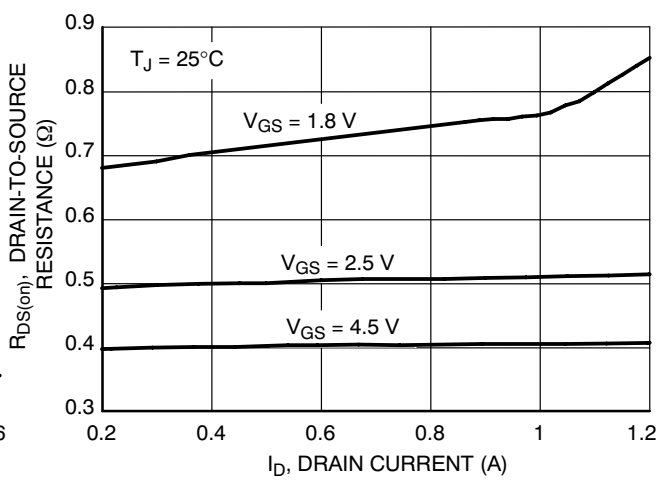



**Figure 4. On-Resistance versus Drain Current and Gate Voltage**

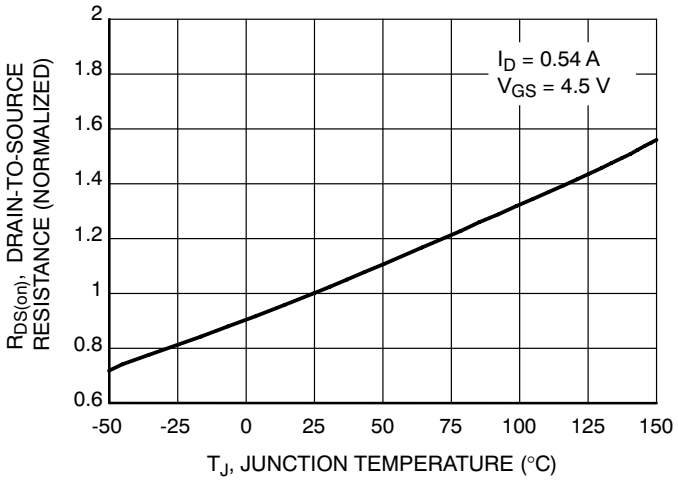



**Figure 5. On-Resistance Variation with Temperature**

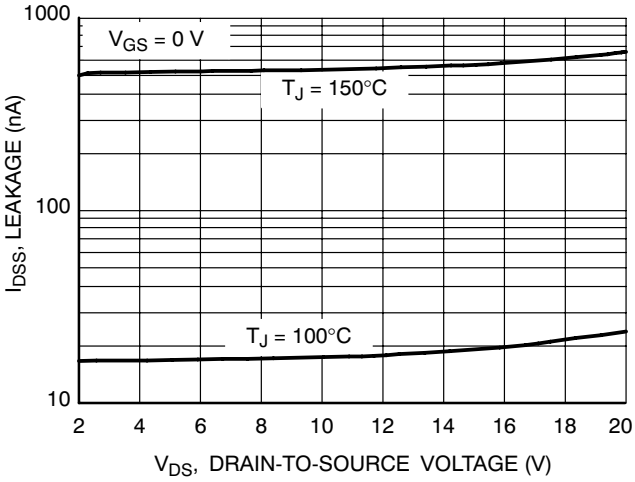



**Figure 6. Drain-to-Source Leakage Current versus Voltage**

## N-CHANNEL TYPICAL PERFORMANCE CURVES ($T_J$ = 25°C unless otherwise noted)

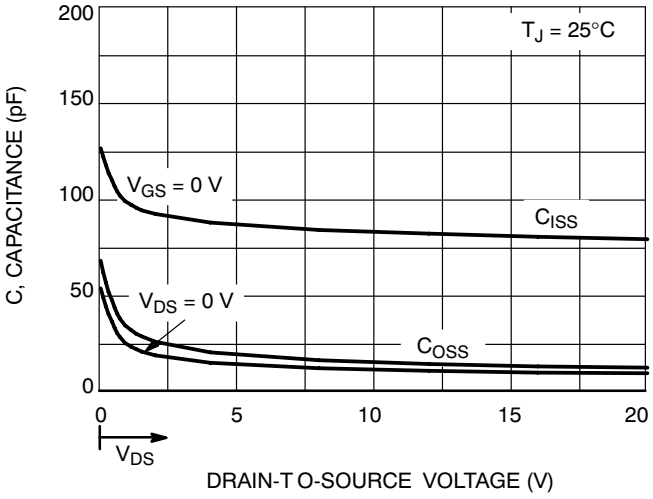



**Figure 7. Capacitance Variation**

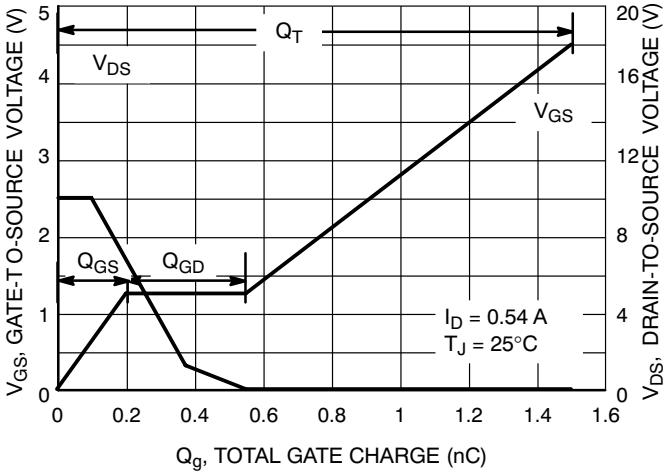



**Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge**

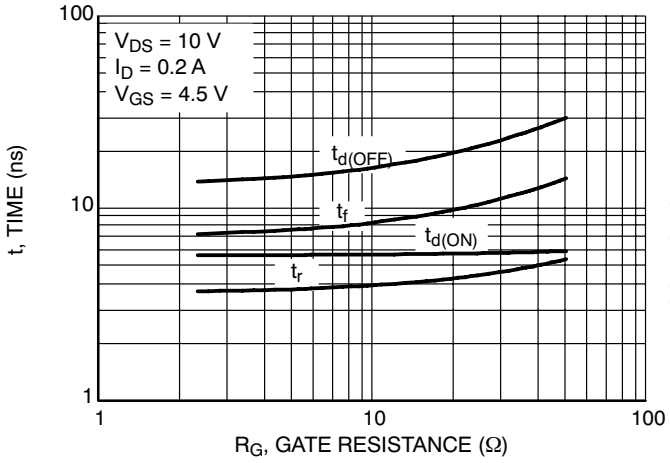



**Figure 9. Resistive Switching Time Variation versus Gate Resistance**

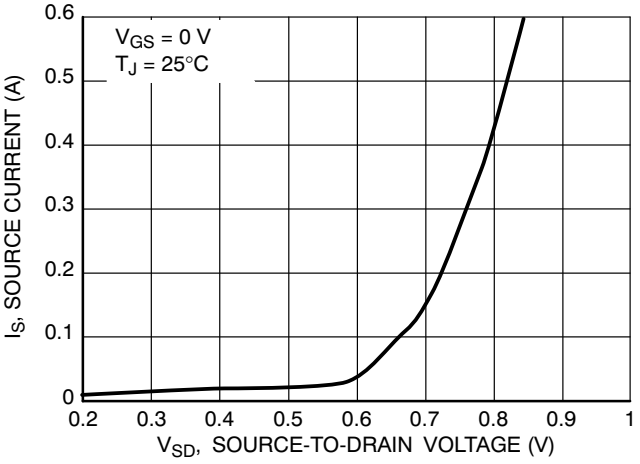



**Figure 10. Diode Forward Voltage versus Current**

## P-CHANNEL TYPICAL PERFORMANCE CURVES ($T_J$ = 25°C unless otherwise noted)

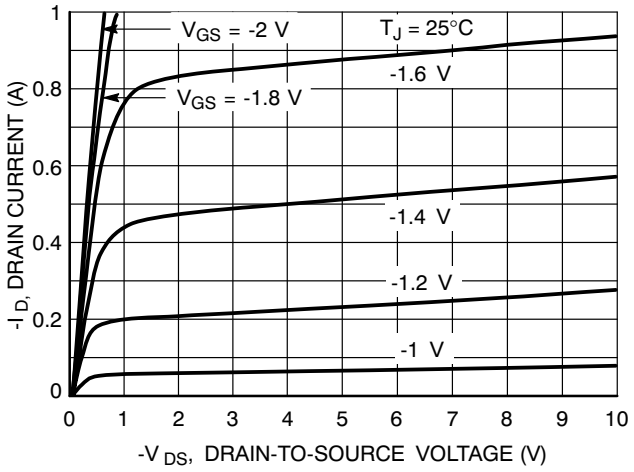



**Figure 1. On-Region Characteristics**

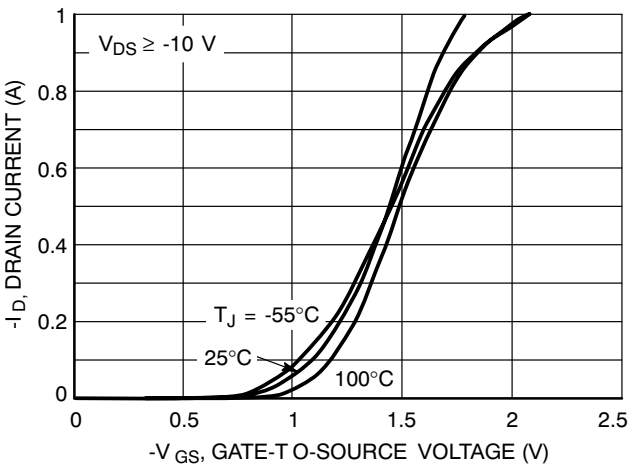



**Figure 2. Transfer Characteristics**

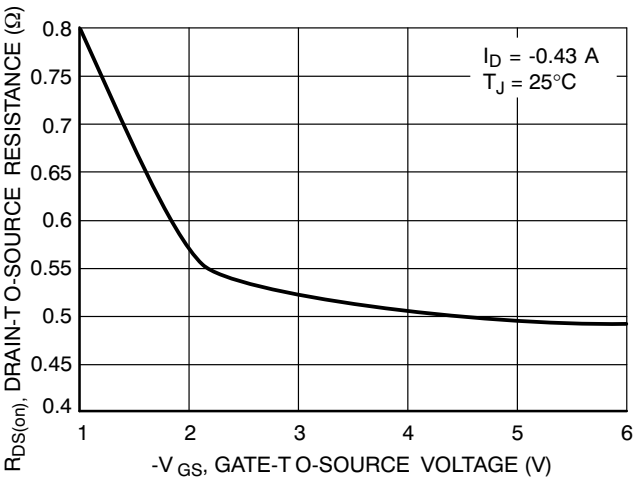



**Figure 3. On-Resistance vs. Gate-to-Source Voltage**

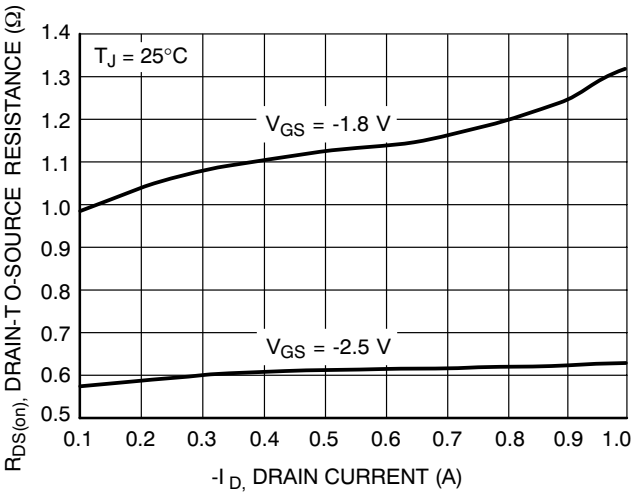



**Figure 4. On-Resistance vs. Drain Current and Gate Voltage**

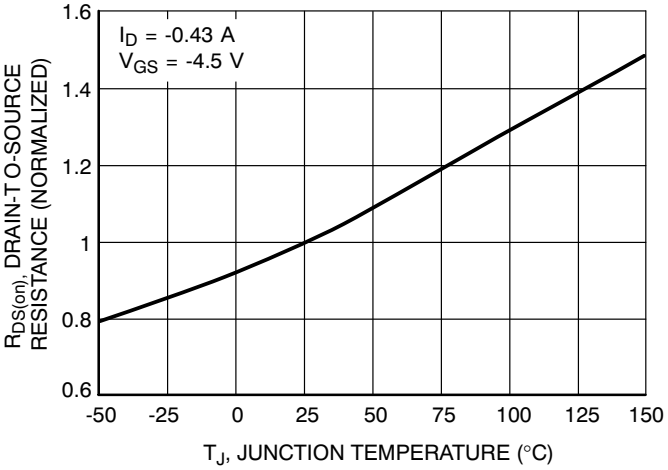



**Figure 5. On-Resistance Variation with Temperature**

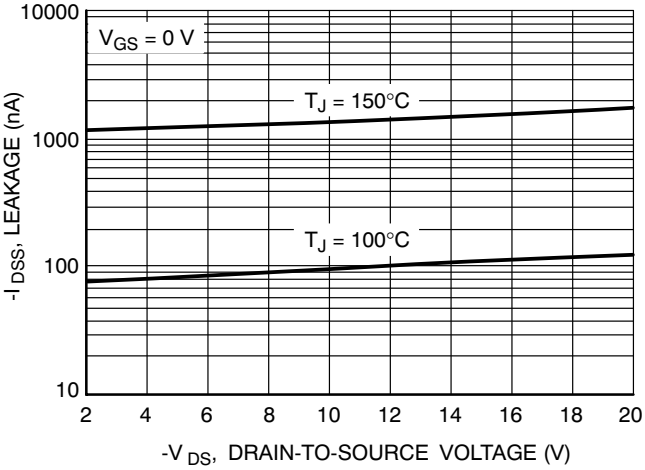



**Figure 6. Drain-to-Source Leakage Current vs. Voltage**

## P-CHANNEL TYPICAL PERFORMANCE CURVES ($T_J$ = 25°C unless otherwise noted)

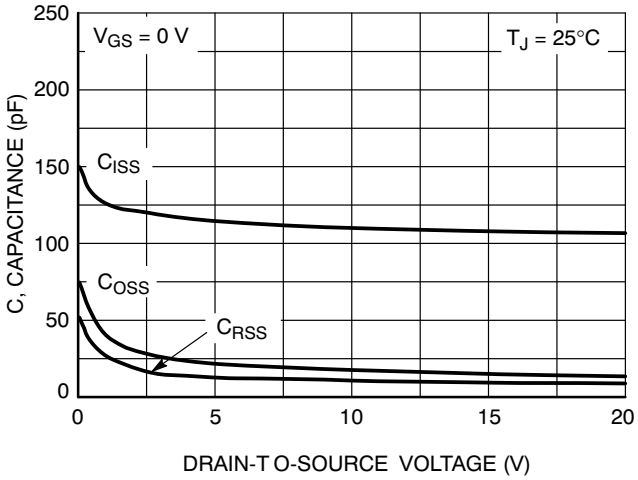



**Figure 7. Capacitance Variation**

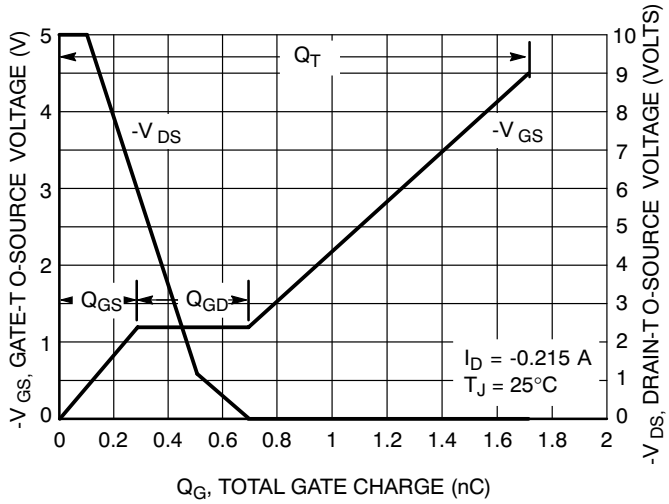



**Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge**

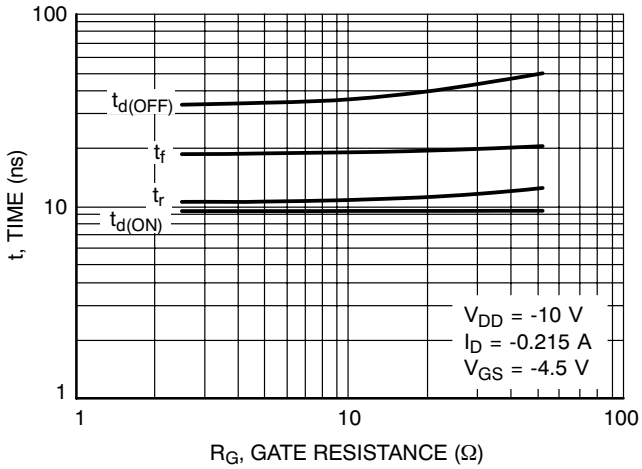



**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**

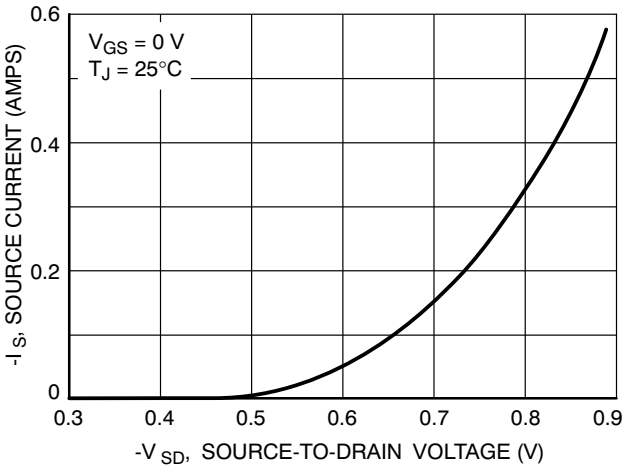
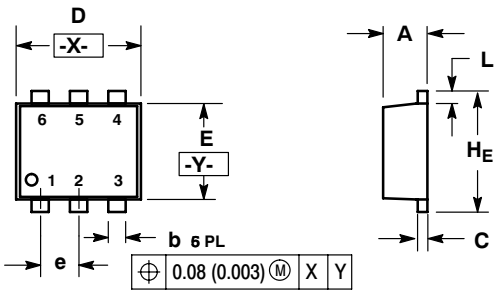



**Figure 10. Diode Forward Voltage vs. Current**

# NTZD3155C

## PACKAGE DIMENSIONS

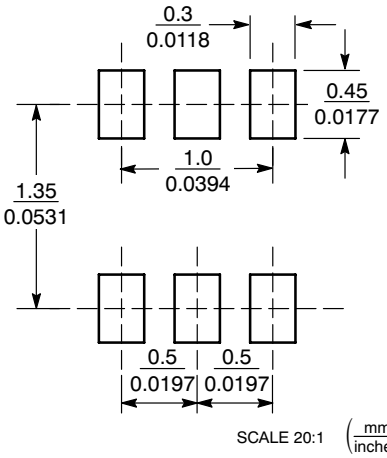
**SOT-563, 6 LEAD**
CASE 463A-01
ISSUE F




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.

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.50 | 0.55 | 0.60 | 0.020 | 0.021 | 0.023 |
| b | 0.17 | 0.22 | 0.27 | 0.007 | 0.009 | 0.011 |
| C | 0.08 | 0.12 | 0.18 | 0.003 | 0.005 | 0.007 |
| D | 1.50 | 1.60 | 1.70 | 0.059 | 0.062 | 0.066 |
| E | 1.10 | 1.20 | 1.30 | 0.043 | 0.047 | 0.051 |
| e | 0.5 BSC | | | 0.02 BSC | | |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| $H_E$ | 1.50 | 1.60 | 1.70 | 0.059 | 0.062 | 0.066 |

## 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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**NTZD3155C/D**