

NTZD3152P

MOSFET – Dual, P-Channel with ESD Protection, Small Signal, SOT-563

-20 V, -430 mA

Features

- Low $R_{DS(on)}$ Improving System Efficiency
- Low Threshold Voltage
- ESD Protected Gate
- Small Footprint 1.6 x 1.6 mm
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Load/Power Switches
- Power Supply Converter Circuits
- Battery Management
- Cell Phones, Digital Cameras, PDAs, Pagers, etc.

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

| Parameter | | Symbol | Value | Unit | |
|---|-------------------------|----------------|--------------------------|------------------|----|
| 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 | $T_A = 25^\circ\text{C}$ | -430 | mA |
| | | | $T_A = 85^\circ\text{C}$ | -310 | |
| Power Dissipation (Note 1) | Steady State | P_D | 250 | mW | |
| Continuous Drain Current (Note 1) | $t \leq 5\text{ s}$ | I_D | $T_A = 25^\circ\text{C}$ | -455 | mA |
| | | | $T_A = 85^\circ\text{C}$ | -328 | |
| Power Dissipation (Note 1) | $t \leq 5\text{ s}$ | P_D | 280 | mW | |
| Pulsed Drain Current | $t_p = 10\ \mu\text{s}$ | I_{DM} | -750 | mA | |
| Operating Junction and Storage Temperature | | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ | |
| Source Current (Body Diode) | | I_S | -350 | 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) | $R_{\theta JA}$ | 500 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient – $t \leq 5\text{ s}$ (Note 1) | | 447 | |

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.

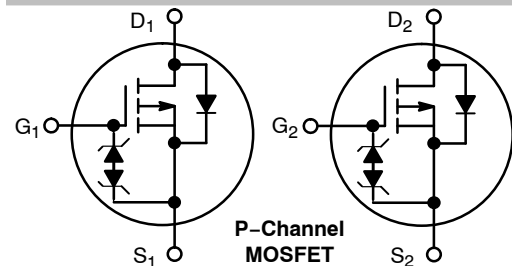
1. Surface mounted on FR4 board using 1 in. sq. pad size (Cu. area = 1.127 in. sq. [1 oz.] including traces).



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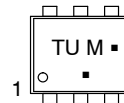
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| $V_{(BR)DSS}$ | $R_{DS(on)}$ Typ | I_D Max |
|---------------|-----------------------|-----------|
| -20 V | 0.5 Ω @ -4.5 V | -430 mA |
| | 0.6 Ω @ -2.5 V | |
| | 1.0 Ω @ -1.8 V | |



SOT-563-6
CASE 463A

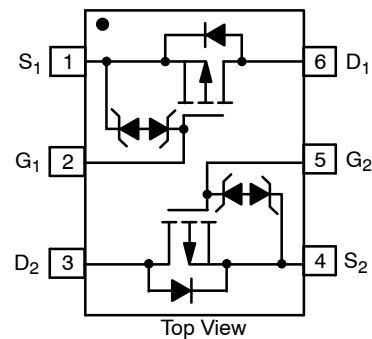
MARKING DIAGRAM



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

(Note: Microdot may be in either location)

PINOUT: SOT-563



ORDERING INFORMATION

| Device | Package | Shipping† |
|--------------|-------------------|--------------------|
| NTZD3152PT1G | SOT-563 | 4000 / Tape & Reel |
| NTZD3152PT1H | (Pb-Free) | |
| NTZD3152PT5H | 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.

NTZD3152P

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted.)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------|--------|----------------|-----|-----|-----|------|
|-----------|--------|----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|---|-------------------|--|---------------------------|----|-----------|---------------|
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$ | -20 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | | | 18 | | mV/°C |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = -16\text{ V}$ | $T_J = 25^\circ\text{C}$ | | -1.0 | μA |
| | | | $T_J = 125^\circ\text{C}$ | | -2.0 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$ | | | ± 2.0 | μA |

ON CHARACTERISTICS (Note 2)

| | | | | | | |
|--|------------------|--|-------|------|------|----------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$ | -0.45 | | -1.0 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | | | -1.9 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = -4.5\text{ V}, I_D = -430\text{ mA}$ | | 0.5 | 0.9 | Ω |
| | | $V_{GS} = -2.5\text{ V}, I_D = -300\text{ mA}$ | | 0.6 | 1.2 | |
| | | $V_{GS} = -1.8\text{ V}, I_D = -150\text{ mA}$ | | 1.0 | 2.0 | |
| Forward Transconductance | g_{FS} | $V_{DS} = -10\text{ V}, I_D = -430\text{ mA}$ | | 1.0 | | S |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|--------------|---|--|-----|-----|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -16\text{ V}$ | | 105 | 175 | pF |
| Output Capacitance | C_{OSS} | | | 15 | 30 | |
| Reverse Transfer Capacitance | C_{RSS} | | | 10 | 20 | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}, I_D = -215\text{ mA}$ | | 1.7 | 2.5 | nC |
| 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 (Note 3)

| | | | | | | |
|---------------------|--------------|---|--|----|--|----|
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS} = -4.5\text{ V}, V_{DD} = -10\text{ V}, I_D = -215\text{ mA}, R_G = 10\ \Omega$ | | 10 | | ns |
| 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} | $V_{GS} = 0\text{ V}, I_S = -350\text{ mA}$ | $T_J = 25^\circ\text{C}$ | | -0.8 | -1.2 | V |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, di_{SD}/dt = 100\text{ A}/\mu\text{s}, I_S = -350\text{ mA}$ | | | 13 | | ns |

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 $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

3. Switching characteristics are independent of operating junction temperatures.

NTZD3152P

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

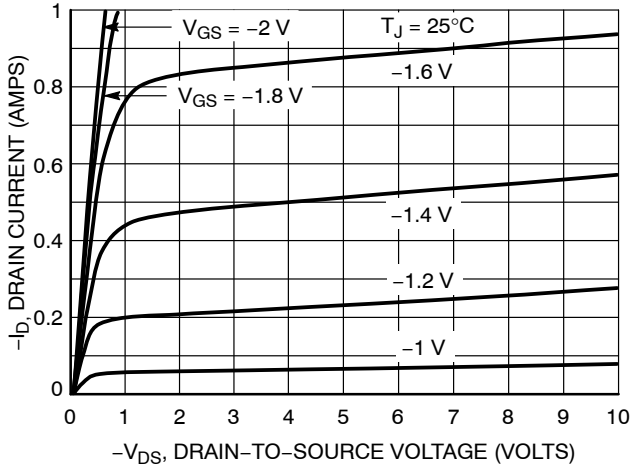


Figure 1. On-Region Characteristics

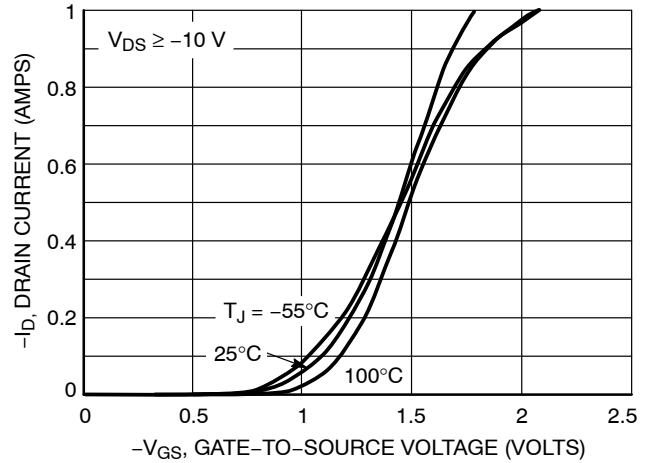


Figure 2. Transfer Characteristics

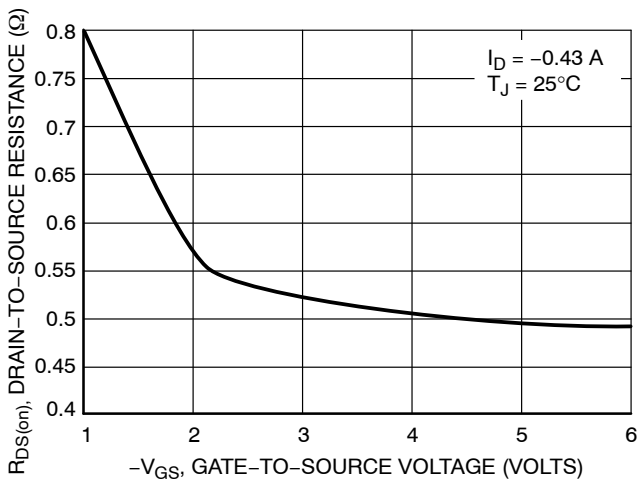


Figure 3. On-Resistance vs. Gate-to-Source Voltage

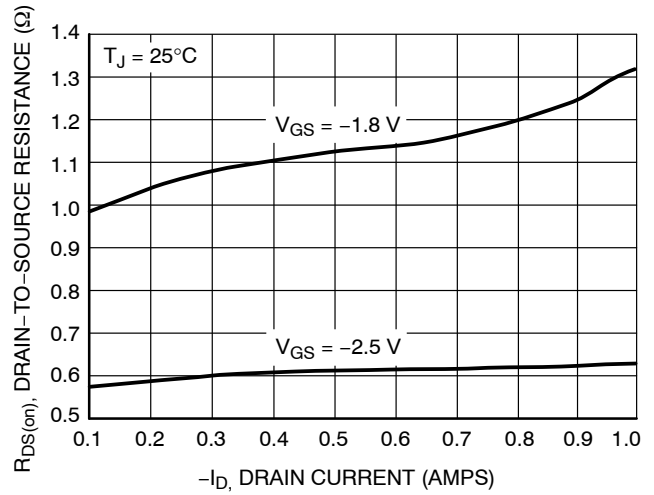


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

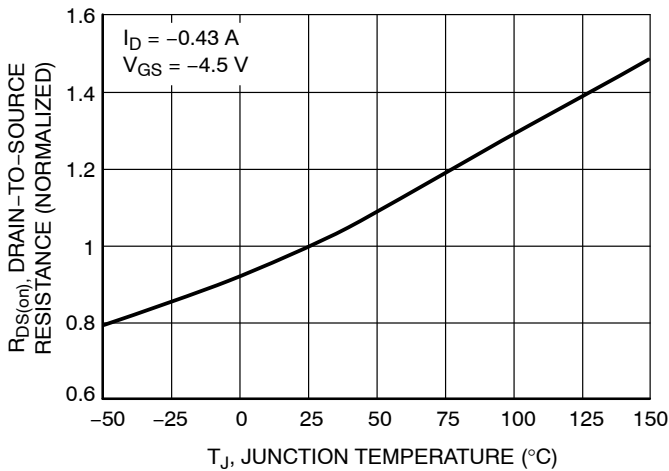


Figure 5. On-Resistance Variation with Temperature

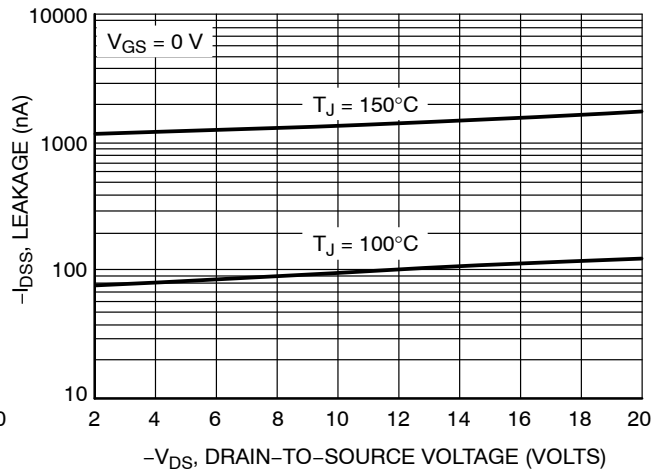


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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

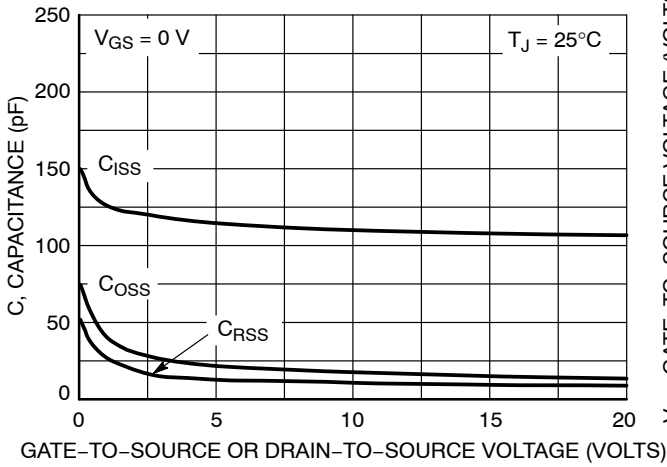


Figure 7. Capacitance Variation

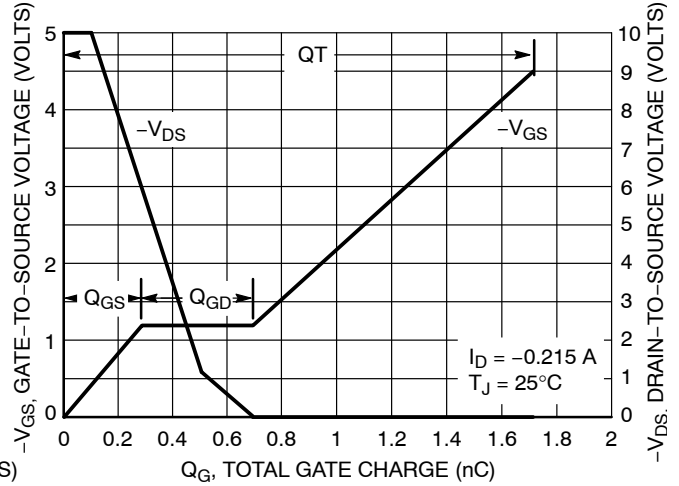


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

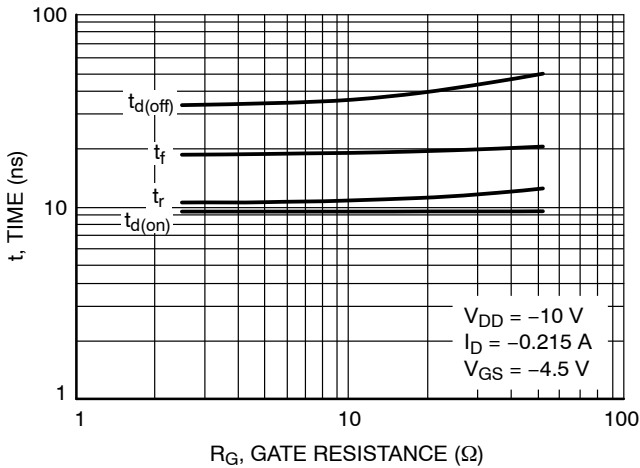


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

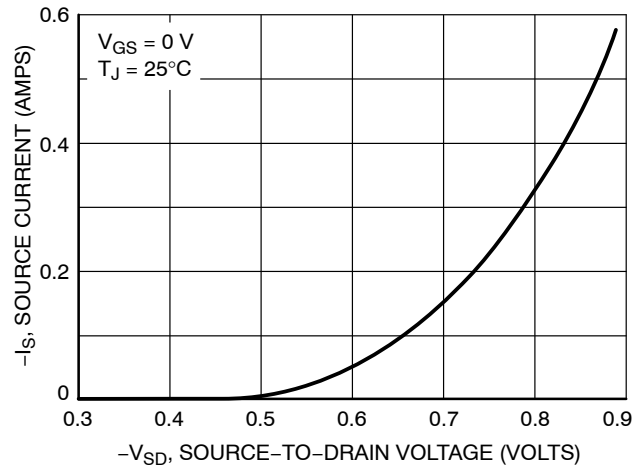


Figure 10. Diode Forward Voltage vs. Current

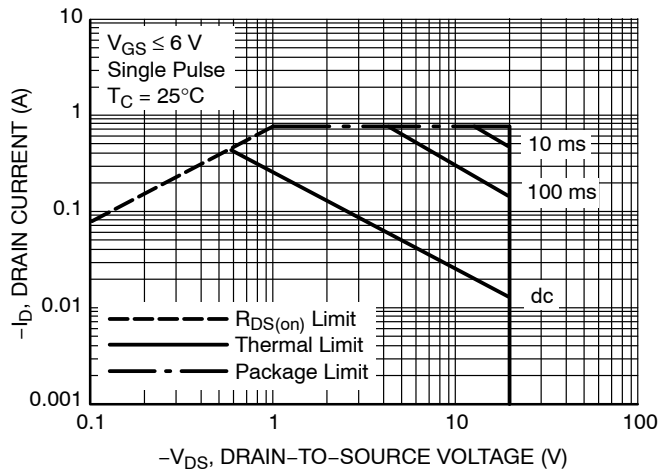


Figure 11. Safe Operating Area

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

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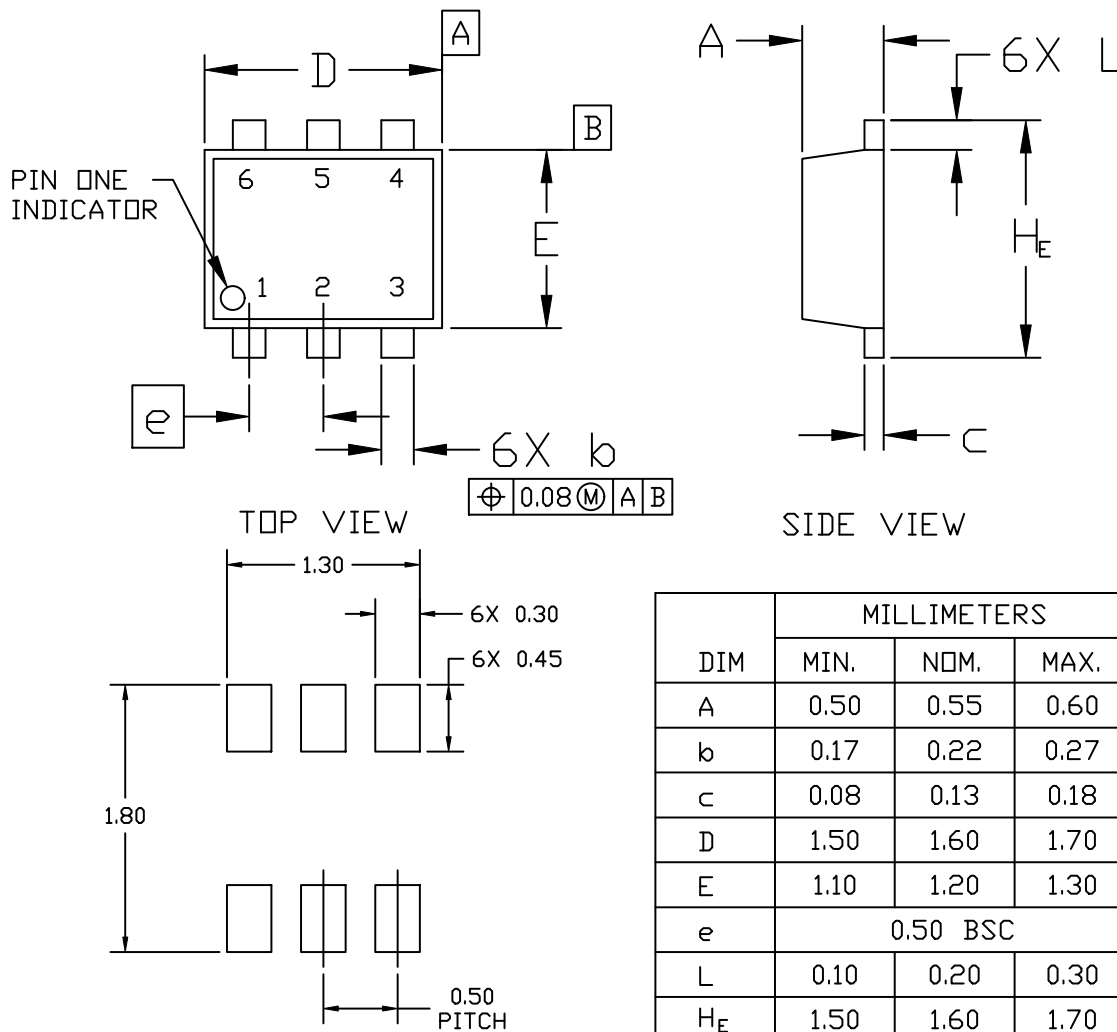
SCALE 4:1

SOT-563, 6 LEAD
CASE 463A
ISSUE H

DATE 26 JAN 2021

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.



| DIM | MILLIMETERS | | |
|----------------|-------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 0.50 | 0.55 | 0.60 |
| b | 0.17 | 0.22 | 0.27 |
| c | 0.08 | 0.13 | 0.18 |
| D | 1.50 | 1.60 | 1.70 |
| E | 1.10 | 1.20 | 1.30 |
| e | 0.50 BSC | | |
| L | 0.10 | 0.20 | 0.30 |
| H _E | 1.50 | 1.60 | 1.70 |

RECOMMENDED MOUNTING 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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ISSUE H

DATE 26 JAN 2021

STYLE 1:
PIN 1. EMITTER 1
2. BASE 1
3. COLLECTOR 2
4. EMITTER 2
5. BASE 2
6. COLLECTOR 1

STYLE 2:
PIN 1. EMITTER 1
2. EMITTER 2
3. BASE 2
4. COLLECTOR 2
5. BASE 1
6. COLLECTOR 1

STYLE 3:
PIN 1. CATHODE 1
2. CATHODE 1
3. ANODE/ANODE 2
4. CATHODE 2
5. CATHODE 2
6. ANODE/ANODE 1

STYLE 4:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. EMITTER
5. COLLECTOR
6. COLLECTOR

STYLE 5:
PIN 1. CATHODE
2. CATHODE
3. ANODE
4. ANODE
5. CATHODE
6. CATHODE

STYLE 6:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. ANODE
6. CATHODE

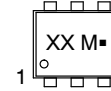
STYLE 8:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

STYLE 9:
PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

STYLE 10:
PIN 1. CATHODE 1
2. N/C
3. CATHODE 2
4. ANODE 2
5. N/C
6. ANODE 1

STYLE 11:
PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2

**GENERIC
MARKING DIAGRAM***



XX = Specific Device Code
M = Month Code
■ = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

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