

# NTZD3154N

## MOSFET – Dual, N-Channel, Small Signal

20 V, 540 mA

### Features

- Low  $R_{DS(on)}$  Improving System Efficiency
- Low Threshold Voltage
- Small Footprint 1.6 x 1.6 mm
- ESD Protected Gate
- 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                                               |                        |                            | $V_{GS}$             | $\pm 7.0$     | V                  |
| Continuous Drain Current<br>(Note 1)                                 | Steady<br>State        | $T_A = 25^{\circ}\text{C}$ | $I_D$                | 540           | mA                 |
|                                                                      |                        | $T_A = 85^{\circ}\text{C}$ |                      | 390           |                    |
| Power Dissipation<br>(Note 1)                                        | Steady State           |                            | $P_D$                | 250           | mW                 |
| Continuous Drain Current<br>(Note 1)                                 | $t \leq 5 \text{ s}$   | $T_A = 25^{\circ}\text{C}$ | $I_D$                | 570           | mA                 |
|                                                                      |                        | $T_A = 85^{\circ}\text{C}$ |                      | 410           |                    |
| Power Dissipation<br>(Note 1)                                        | $t \leq 5 \text{ s}$   |                            | $P_D$                | 280           | mW                 |
| Pulsed Drain Current                                                 | $t_p = 10 \mu\text{s}$ |                            | $I_{DM}$             | 1.5           | A                  |
| Operating Junction and Storage Temperature                           |                        |                            | $T_J$ ,<br>$T_{STG}$ | -55 to<br>150 | $^{\circ}\text{C}$ |
| Source Current (Body Diode)                                          |                        |                            | $I_S$                | 350           | mA                 |
| Lead Temperature for Soldering Purposes<br>(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 | $^\circ\text{C/W}$ |
| 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.

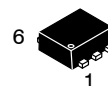
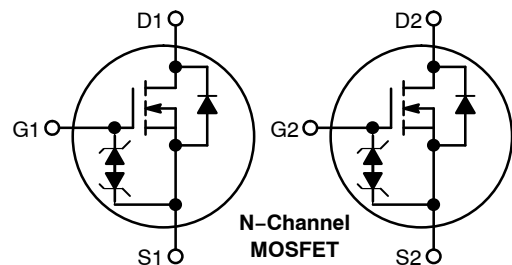
1. Surface mounted on FR4 board using 1 in sq pad size (Cu. area = 1.127 in sq [1 oz] including traces).



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| $V_{(BR)DSS}$ | $R_{DS(on)}$ Typ       | $I_D$ Max (Note 1) |
|---------------|------------------------|--------------------|
| 20            | 400 m $\Omega$ @ 4.5 V | 540 mA             |
|               | 500 m $\Omega$ @ 2.5 V |                    |
|               | 700 m $\Omega$ @ 1.8 V |                    |



SOT-563-6  
CASE 463A

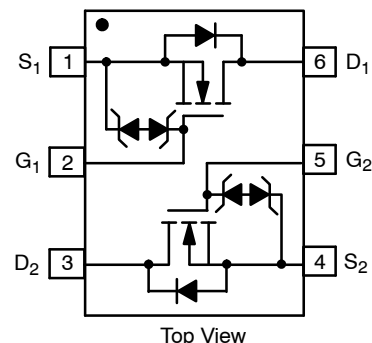
TV = Specific Device Code  
M = Date Code  
■ = Pb-Free Package

(Note: Microdot may be in either location)

### MARKING DIAGRAM



### PINOUT: SOT-563



### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

# NTZD3154N

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted.)

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

### OFF CHARACTERISTICS

|                                                           |                   |                                                     |                           |    |           |               |               |
|-----------------------------------------------------------|-------------------|-----------------------------------------------------|---------------------------|----|-----------|---------------|---------------|
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 20                        | –  | –         | V             |               |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | –                                                   | –                         | 14 | –         | mV/°C         |               |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{GS} = 0\text{ V}$<br>$V_{DS} = 16\text{ V}$     | $T_J = 25^\circ\text{C}$  | –  | –         | 1.0           | $\mu\text{A}$ |
|                                                           |                   |                                                     | $T_J = 125^\circ\text{C}$ | –  | –         | 5.0           |               |
| Gate-to-Source Leakage Current                            | $I_{GSS}$         | $V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$    | –                         | –  | $\pm 5.0$ | $\mu\text{A}$ |               |

### ON CHARACTERISTICS (Note 3)

|                                            |                                     |                                                             |      |     |      |       |
|--------------------------------------------|-------------------------------------|-------------------------------------------------------------|------|-----|------|-------|
| Gate Threshold Voltage                     | V <sub>GS(TH)</sub>                 | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA | 0.45 | –   | 1.0  | V     |
| Negative Threshold Temperature Coefficient | V <sub>GS(TH)</sub> /T <sub>J</sub> | –                                                           | –    | 2.0 | –    | mV/°C |
| Drain-to-Source On Resistance              | R <sub>DS(on)</sub>                 | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 540 mA            | –    | 0.4 | 0.55 | Ω     |
|                                            |                                     | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 500 mA            | –    | 0.5 | 0.7  |       |
|                                            |                                     | V <sub>GS</sub> = 1.8 V, I <sub>D</sub> = 350 mA            | –    | 0.7 | 0.9  |       |
| Forward Transconductance                   | g <sub>FS</sub>                     | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 540 mA             | –    | 1.0 | –    | S     |

### CHARGES AND CAPACITANCES

|                              |                     |                                                                          |   |      |     |    |
|------------------------------|---------------------|--------------------------------------------------------------------------|---|------|-----|----|
| Input Capacitance            | C <sub>ISS</sub>    | V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 16 V               | – | 80   | 150 | pF |
| Output Capacitance           | C <sub>OSS</sub>    |                                                                          | – | 13   | 25  |    |
| Reverse Transfer Capacitance | C <sub>RSS</sub>    |                                                                          | – | 10   | 20  |    |
| Total Gate Charge            | Q <sub>G(TOT)</sub> | V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 10 V; I <sub>D</sub> = 540 mA | – | 1.5  | 2.5 | nC |
| Threshold Gate Charge        | Q <sub>G(TH)</sub>  |                                                                          | – | 0.1  | –   |    |
| Gate-to-Source Charge        | Q <sub>GS</sub>     |                                                                          | – | 0.2  | –   |    |
| Gate-to-Drain Charge         | Q <sub>GD</sub>     |                                                                          | – | 0.35 | –   |    |

### SWITCHING CHARACTERISTICS, V<sub>GS</sub> = V (Note 4)

|                     |                     |                                                                                                    |   |     |   |    |
|---------------------|---------------------|----------------------------------------------------------------------------------------------------|---|-----|---|----|
| Turn-On Delay Time  | t <sub>d(ON)</sub>  | V <sub>GS</sub> = 4.5 V, V <sub>DD</sub> = 10 V, I <sub>D</sub> = 540 mA,<br>R <sub>G</sub> = 10 Ω | – | 6.0 | – | ns |
| Rise Time           | t <sub>r</sub>      |                                                                                                    | – | 4.0 | – |    |
| Turn-Off Delay Time | t <sub>d(OFF)</sub> |                                                                                                    | – | 16  | – |    |
| Fall Time           | t <sub>f</sub>      |                                                                                                    | – | 8.0 | – |    |

### DRAIN-SOURCE DIODE CHARACTERISTICS

|                       |                 |                                                                                 |                        |     |     |     |   |
|-----------------------|-----------------|---------------------------------------------------------------------------------|------------------------|-----|-----|-----|---|
| Forward Diode Voltage | V <sub>SD</sub> | V <sub>GS</sub> = 0 V,<br>I <sub>S</sub> = 350 mA                               | T <sub>J</sub> = 25°C  | –   | 0.7 | 1.2 | V |
|                       |                 |                                                                                 | T <sub>J</sub> = 125°C | –   | 0.6 | –   |   |
| Reverse Recovery Time | t <sub>RR</sub> | V <sub>GS</sub> = 0 V, dI <sub>SD</sub> /dt = 100 A/μs, I <sub>S</sub> = 350 mA | –                      | 6.5 | –   | 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.

- Surface-mounted on FR4 board using 1 in. sq. pad size (Cu. area = 1.127 in sq [1 oz] including traces).
- Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
- Switching characteristics are independent of operating junction temperatures.

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

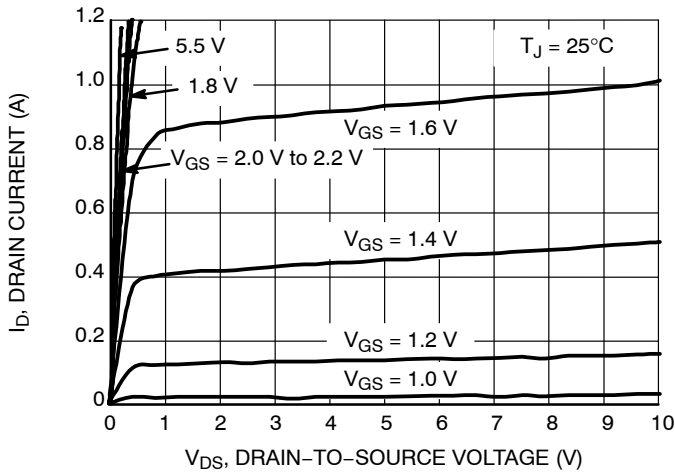


Figure 1. On-Region Characteristics

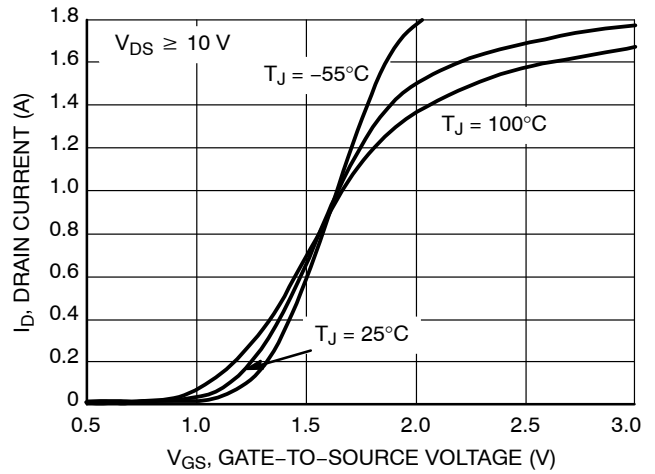


Figure 2. Transfer Characteristics

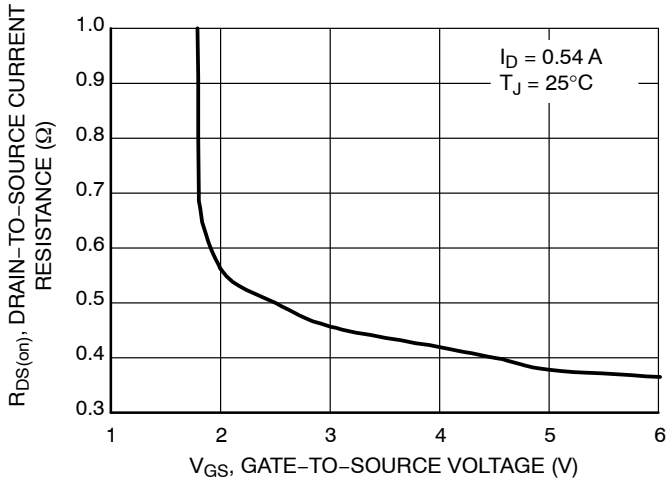


Figure 3. On-Resistance versus Gate-to-Source Voltage

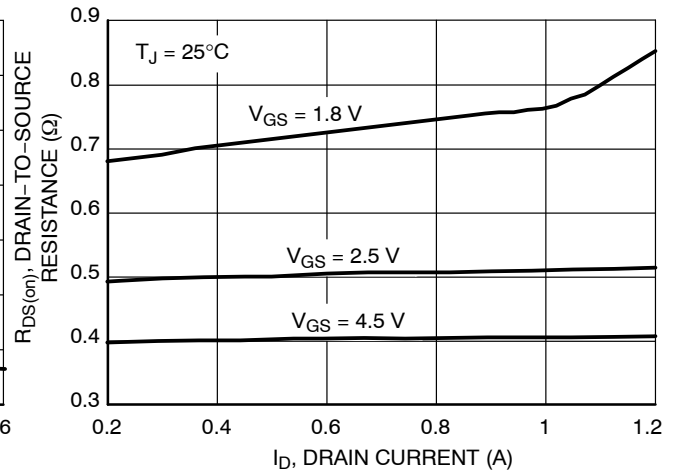


Figure 4. On-Resistance versus Drain Current and Gate Voltage

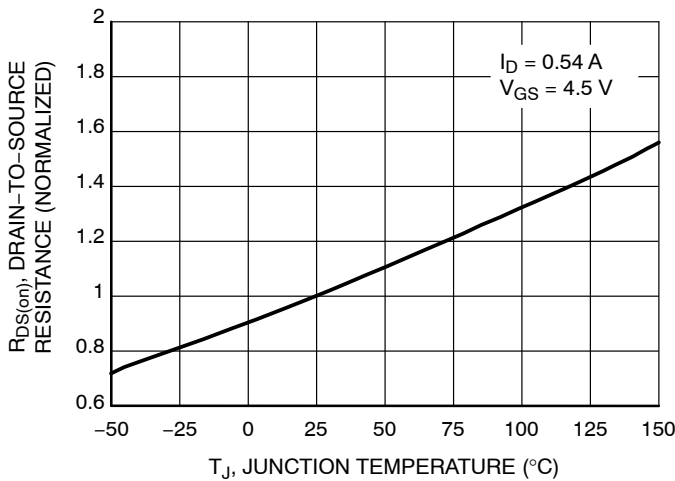


Figure 5. On-Resistance Variation with Temperature

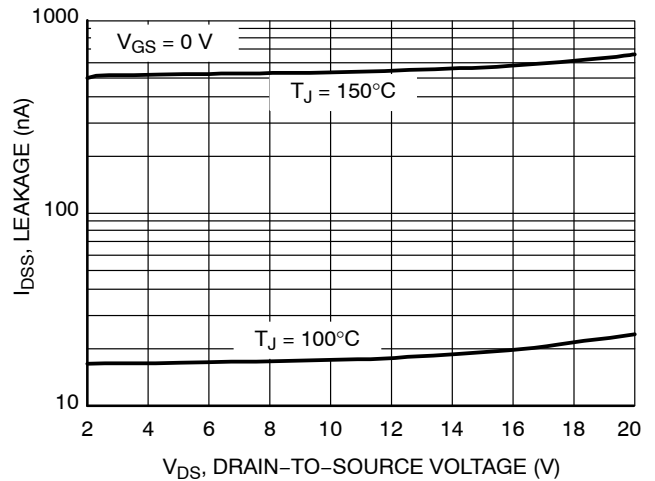
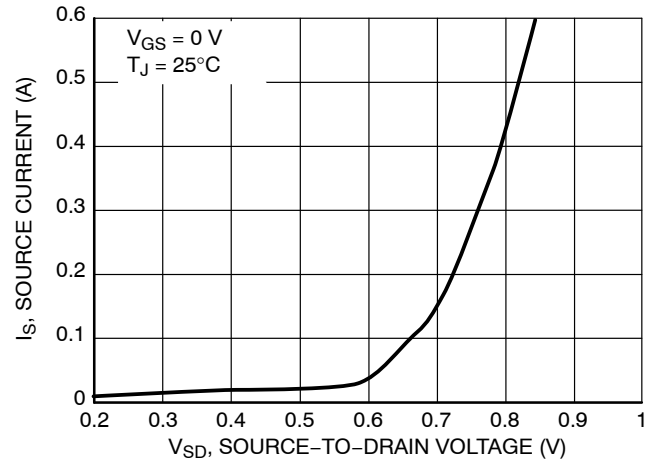
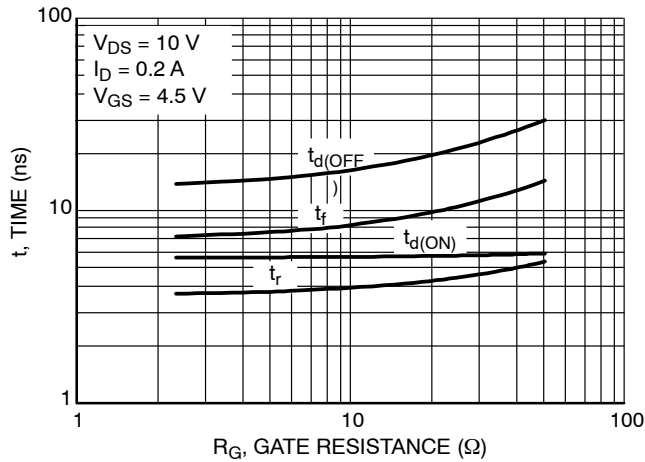
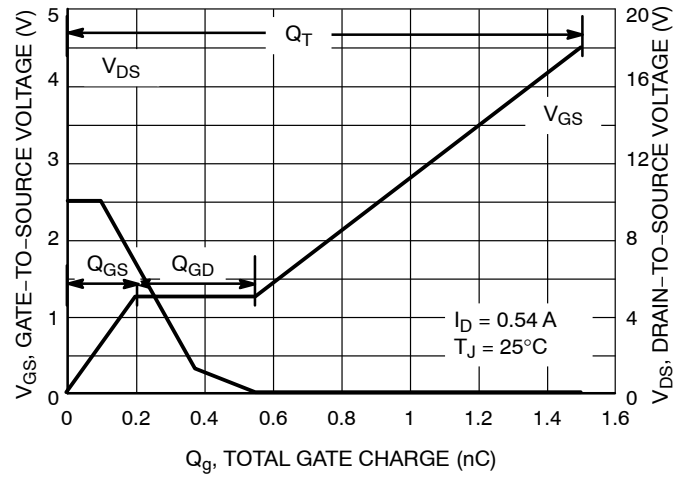
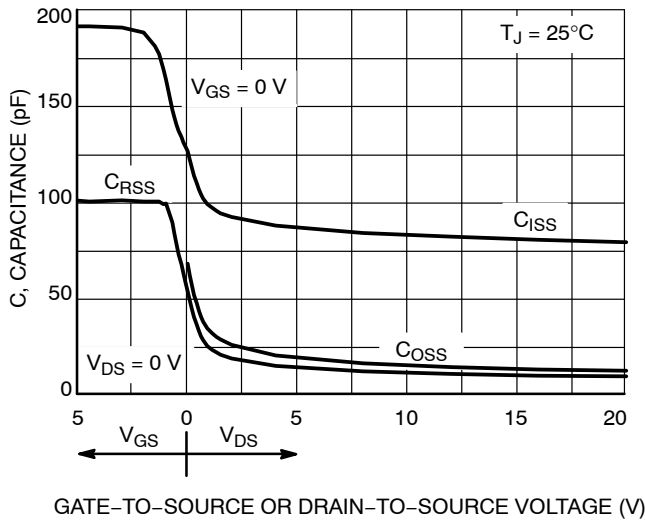


Figure 6. Drain-to-Source Leakage Current versus Voltage

# NTZD3154N

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



### ORDERING INFORMATION

| Device       | Package              | Shipping           |
|--------------|----------------------|--------------------|
| NTZD3154NT1G | SOT-563<br>(Pb-Free) | 4000 / Tape & Reel |
| NTZD3154NT1H |                      |                    |
| NTZD3154NT2G |                      |                    |
| NTZD3154NT2H |                      |                    |
| NTZD3154NT5G |                      | 8000 / Tape & Reel |
| NTZD3154NT5H |                      |                    |

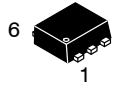
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

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ON



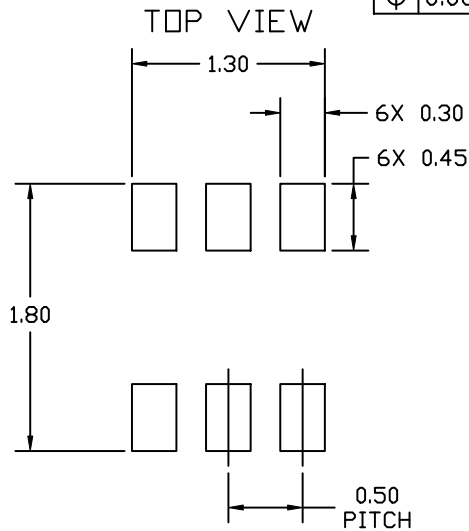
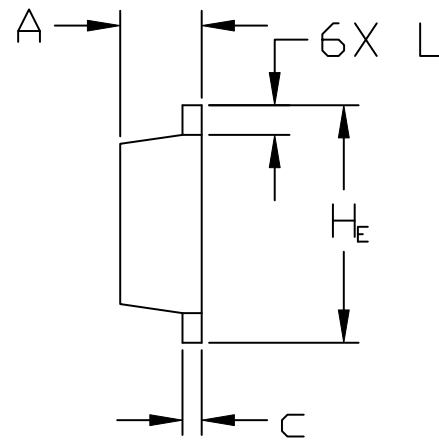
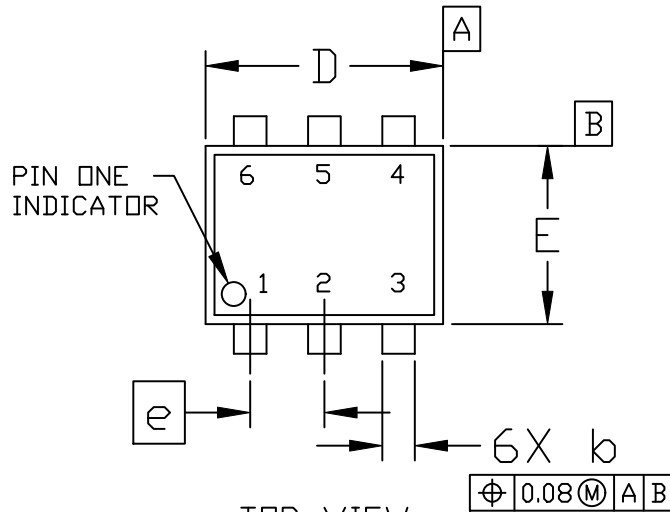
SCALE 4:1

**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.



SIDE VIEW

| 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 <sub>E</sub> | 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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**SOT-563, 6 LEAD**  
CASE 463A  
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

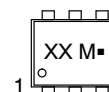
STYLE 8:  
PIN 1. DRAIN  
2. DRAIN  
3. GATE  
4. SOURCE  
5. DRAIN  
6. DRAIN

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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