

# NTF3055L175

## Power MOSFET 2.0 A, 60 V, Logic Level

### N-Channel SOT-223

Designed for low voltage, high speed switching applications in power supplies, converters and power motor controls and bridge circuits.

#### Features

- This is a Pb-Free Device

#### Applications

- Power Supplies
- Converters
- Power Motor Controls
- Bridge Circuits

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

| Rating                                                                                                                                                                                                                           | Symbol                             | Value                | Unit                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|----------------------|-------------------------------|
| Drain-to-Source Voltage                                                                                                                                                                                                          | $V_{DS}$                           | 60                   | Vdc                           |
| Drain-to-Gate Voltage ( $R_{GS} = 1.0\text{ M}\Omega$ )                                                                                                                                                                          | $V_{DGR}$                          | 60                   | Vdc                           |
| Gate-to-Source Voltage<br>Continuous<br>Non-repetitive ( $t_p \leq 10\text{ ms}$ )                                                                                                                                               | $V_{GS}$                           | $\pm 15$<br>$\pm 20$ | Vdc<br>Vpk                    |
| Drain Current<br>Continuous @ $T_A = 25^\circ\text{C}$<br>Continuous @ $T_A = 100^\circ\text{C}$<br>Single Pulse ( $t_p \leq 10\text{ }\mu\text{s}$ )                                                                            | $I_D$<br>$I_D$<br>$I_{DM}$         | 2.0<br>1.2<br>6.0    | Adc<br>Adc<br>Apk             |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1)<br>Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 2)<br>Derate above $25^\circ\text{C}$                                                                    | $P_D$                              | 2.1<br>1.3<br>0.014  | W<br>W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Temperature Range                                                                                                                                                                                          | $T_J, T_{stg}$                     | -55 to 175           | $^\circ\text{C}$              |
| Single Pulse Drain-to-Source Avalanche<br>Energy – Starting $T_J = 25^\circ\text{C}$<br>( $V_{DD} = 25\text{ Vdc}$ , $V_{GS} = 5.0\text{ Vdc}$ ,<br>$I_{L(pk)} = 3.6\text{ A}$ , $L = 10\text{ mH}$ , $V_{DS} = 60\text{ Vdc}$ ) | $E_{AS}$                           | 65                   | mJ                            |
| Thermal Resistance<br>Junction-to-Ambient (Note 1)<br>Junction-to-Ambient (Note 2)                                                                                                                                               | $R_{\theta JA}$<br>$R_{\theta JA}$ | 72.3<br>114          | $^\circ\text{C/W}$            |
| Maximum Lead Temperature for Soldering<br>Purposes, 1/8" from case for 10 seconds                                                                                                                                                | $T_L$                              | 260                  | $^\circ\text{C}$              |

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.

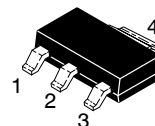
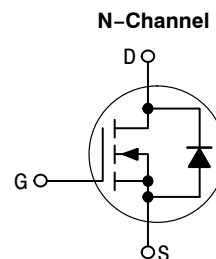
1. When surface mounted to an FR4 board using 1" pad size, 1 oz.  
(Cu. Area 0.995 in<sup>2</sup>).
2. When surface mounted to an FR4 board using minimum recommended pad  
size, 2–2.4 oz. (Cu. Area 0.272 in<sup>2</sup>).



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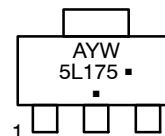
<http://onsemi.com>

**2.0 AMPERES, 60 VOLTS**  
 **$R_{DS(on)} = 175\text{ m}\Omega$**



SOT-223  
CASE 318E  
STYLE 3

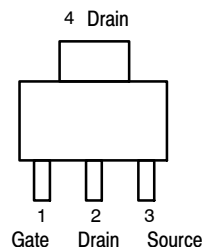
#### MARKING DIAGRAM



A = Assembly Location  
Y = Year  
W = Work Week  
5L175 = Device Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### PIN ASSIGNMENT



#### ORDERING INFORMATION

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

# NTF3055L175

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                                                                                                                                 |               |         |              |           |                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------|--------------|-----------|-----------------------------|
| Drain-to-Source Breakdown Voltage (Note 3)<br>( $V_{GS} = 0\text{ Vdc}$ , $I_D = 250\text{ }\mu\text{Adc}$ )<br>Temperature Coefficient (Positive)                              | $V_{(BR)DSS}$ | 60<br>– | 72.8<br>74.4 | –<br>–    | Vdc<br>mV/ $^\circ\text{C}$ |
| Zero Gate Voltage Drain Current<br>( $V_{DS} = 60\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ )<br>( $V_{DS} = 60\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $T_J = 150^\circ\text{C}$ ) | $I_{DSS}$     | –<br>–  | –<br>–       | 1.0<br>10 | $\mu\text{Adc}$             |
| Gate-Body Leakage Current ( $V_{GS} = \pm 15\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )                                                                                            | $I_{GSS}$     | –       | –            | $\pm 100$ | nAdc                        |

### ON CHARACTERISTICS (Note 3)

|                                                                                                                                                                                               |              |          |              |           |                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------|--------------|-----------|-----------------------------|
| Gate Threshold Voltage (Note 3)<br>( $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{Adc}$ )<br>Threshold Temperature Coefficient (Negative)                                                   | $V_{GS(th)}$ | 1.0<br>– | 1.7<br>4.2   | 2.0<br>–  | Vdc<br>mV/ $^\circ\text{C}$ |
| Static Drain-to-Source On-Resistance (Note 3)<br>( $V_{GS} = 5.0\text{ Vdc}$ , $I_D = 1.0\text{ Adc}$ )                                                                                       | $R_{DS(on)}$ | –        | 155          | 175       | m $\Omega$                  |
| Static Drain-to-Source On-Resistance (Note 3)<br>( $V_{GS} = 5.0\text{ Vdc}$ , $I_D = 2.0\text{ Adc}$ )<br>( $V_{GS} = 5.0\text{ Vdc}$ , $I_D = 1.0\text{ Adc}$ , $T_J = 150^\circ\text{C}$ ) | $V_{DS(on)}$ | –        | 0.32<br>0.57 | 0.42<br>– | Vdc                         |
| Forward Transconductance (Note 3)<br>( $V_{DS} = 8.0\text{ Vdc}$ , $I_D = 1.5\text{ Adc}$ )                                                                                                   | $g_{fs}$     | –        | 3.2          | –         | Mhos                        |

### DYNAMIC CHARACTERISTICS

|                      |                                                                            |           |   |     |     |    |
|----------------------|----------------------------------------------------------------------------|-----------|---|-----|-----|----|
| Input Capacitance    | $(V_{DS} = 25\text{ Vdc}$ , $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$ ) | $C_{iss}$ | – | 194 | 270 | pF |
| Output Capacitance   |                                                                            | $C_{oss}$ | – | 70  | 100 |    |
| Transfer Capacitance |                                                                            | $C_{rss}$ | – | 29  | 40  |    |

### SWITCHING CHARACTERISTICS (Note 4)

|                     |                                                                                                                          |              |   |      |    |    |
|---------------------|--------------------------------------------------------------------------------------------------------------------------|--------------|---|------|----|----|
| Turn-On Delay Time  | $(V_{DD} = 30\text{ Vdc}$ , $I_D = 2.0\text{ Adc}$ ,<br>$V_{GS} = 5.0\text{ Vdc}$ , $R_G = 9.1\text{ }\Omega$ ) (Note 3) | $t_{d(on)}$  | – | 10.2 | 20 | ns |
| Rise Time           |                                                                                                                          | $t_r$        | – | 21   | 40 |    |
| Turn-Off Delay Time |                                                                                                                          | $t_{d(off)}$ | – | 14.3 | 30 |    |
| Fall Time           |                                                                                                                          | $t_f$        | – | 15.3 | 30 |    |
| Gate Charge         | $(V_{DS} = 48\text{ Vdc}$ , $I_D = 2.0\text{ Adc}$ ,<br>$V_{GS} = 5.0\text{ Vdc}$ ) (Note 3)                             | $Q_T$        | – | 5.1  | 10 | nC |
|                     |                                                                                                                          | $Q_1$        | – | 1.4  | –  |    |
|                     |                                                                                                                          | $Q_2$        | – | 2.5  | –  |    |

### SOURCE-DrAIN DIODE CHARACTERISTICS

|                                |                                                                                                                                                    |          |        |              |          |               |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|--------------|----------|---------------|
| Forward On-Voltage             | $(I_S = 2.0\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ )<br>$(I_S = 2.0\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ ,<br>$T_J = 150^\circ\text{C}$ ) (Note 3) | $V_{SD}$ | –<br>– | 0.84<br>0.68 | 1.0<br>– | Vdc           |
| Reverse Recovery Time          | $(I_S = 2.0\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ ,<br>$dI_S/dt = 100\text{ A}/\mu\text{s}$ ) (Note 3)                                             | $t_{rr}$ | –      | 28.3         | –        | ns            |
|                                |                                                                                                                                                    | $t_a$    | –      | 15.6         | –        |               |
|                                |                                                                                                                                                    | $t_b$    | –      | 12.7         | –        |               |
| Reverse Recovery Stored Charge |                                                                                                                                                    | $Q_{RR}$ | –      | 0.027        | –        | $\mu\text{C}$ |

3. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

4. Switching characteristics are independent of operating junction temperatures.

TYPICAL ELECTRICAL CHARACTERISTICS

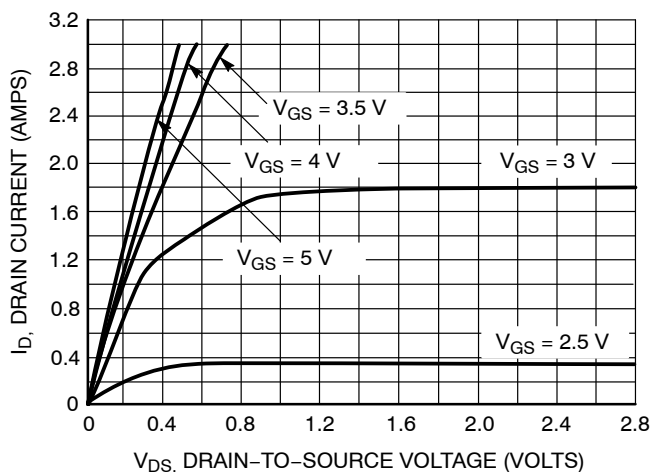


Figure 1. On-Region Characteristics

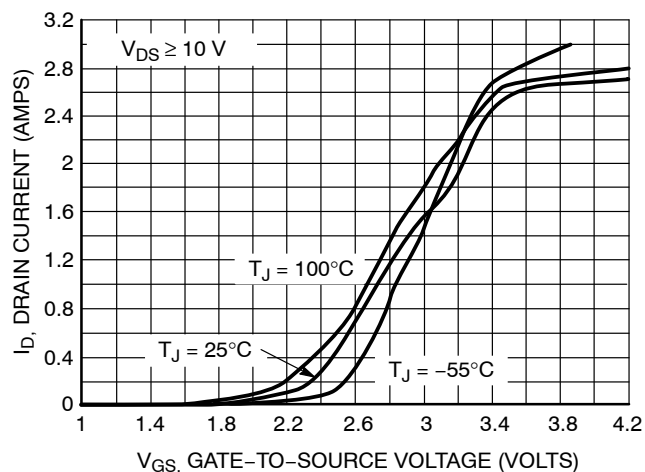


Figure 2. Transfer Characteristics

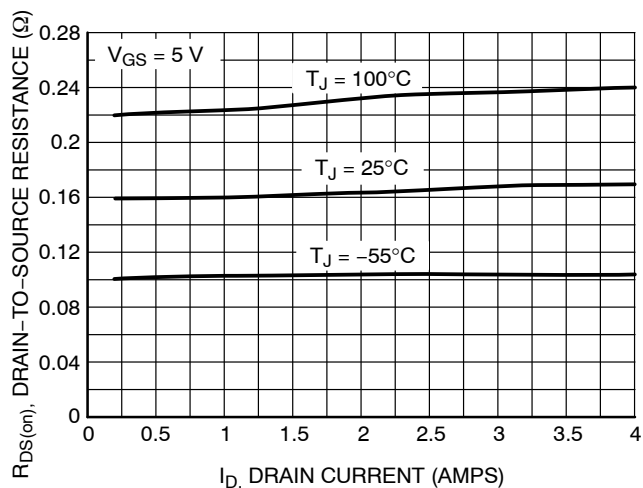


Figure 3. On-Resistance versus Gate-to-Source Voltage

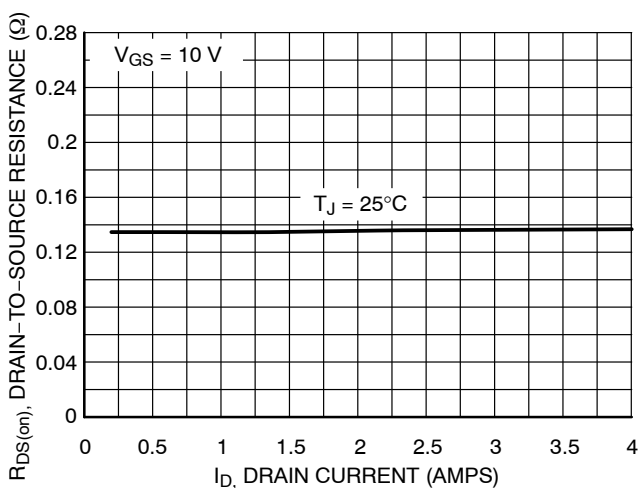


Figure 4. On-Resistance versus Drain Current and Gate Voltage

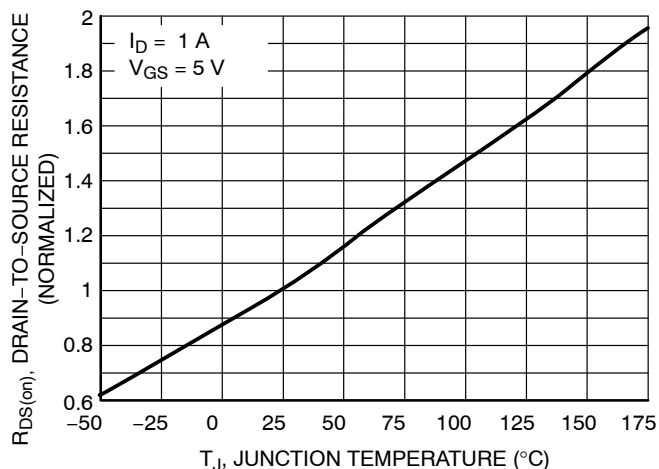


Figure 5. On-Resistance Variation with Temperature

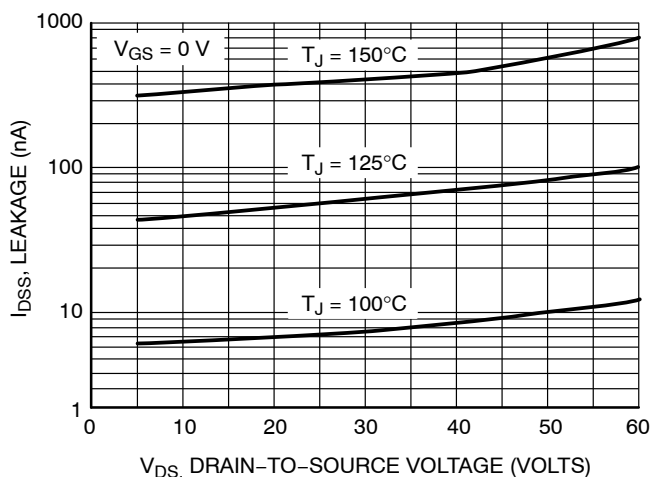


Figure 6. Drain-to-Source Leakage Current versus Voltage

TYPICAL ELECTRICAL CHARACTERISTICS

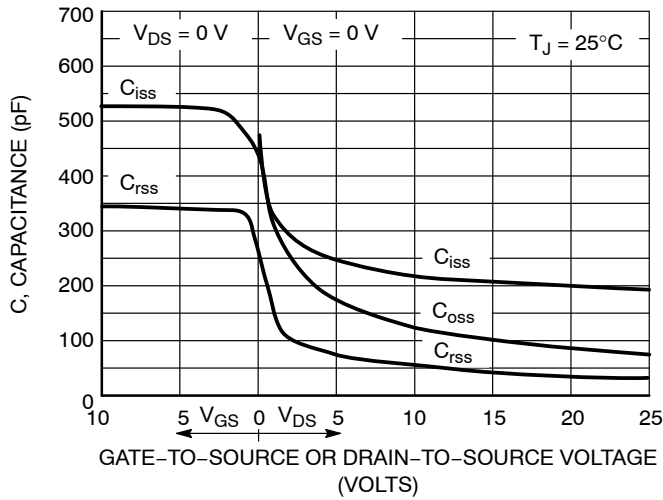


Figure 7. Capacitance Variation

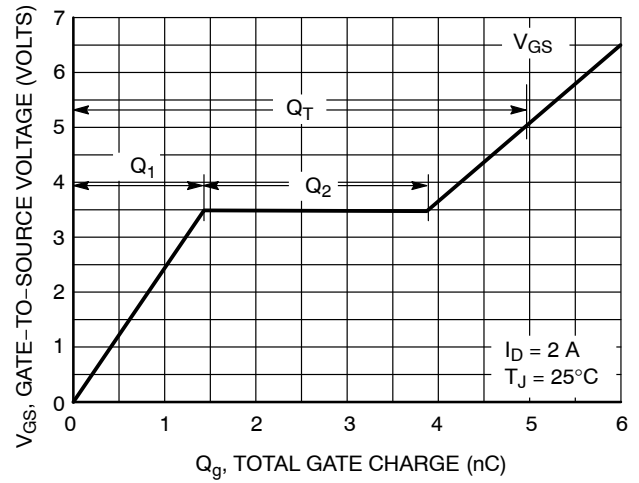


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

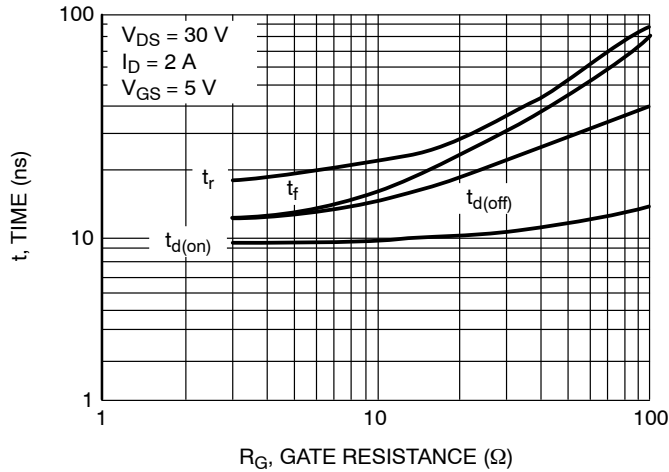


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

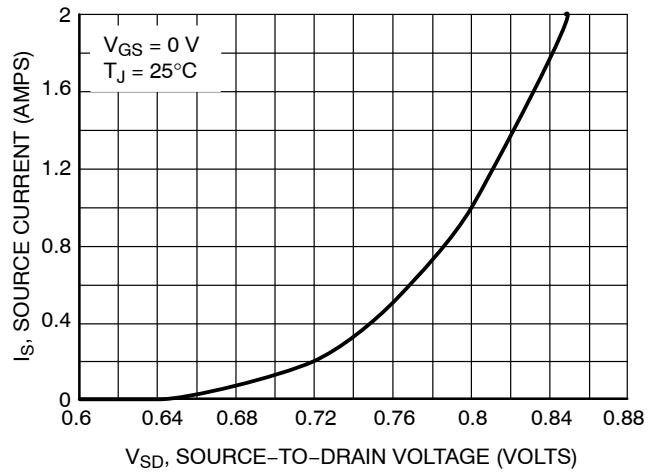


Figure 10. Diode Forward Voltage versus Current

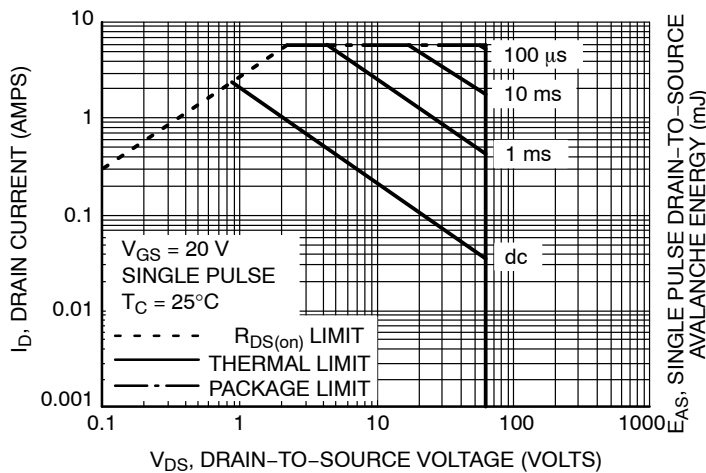


Figure 11. Maximum Rated Forward Biased Safe Operating Area

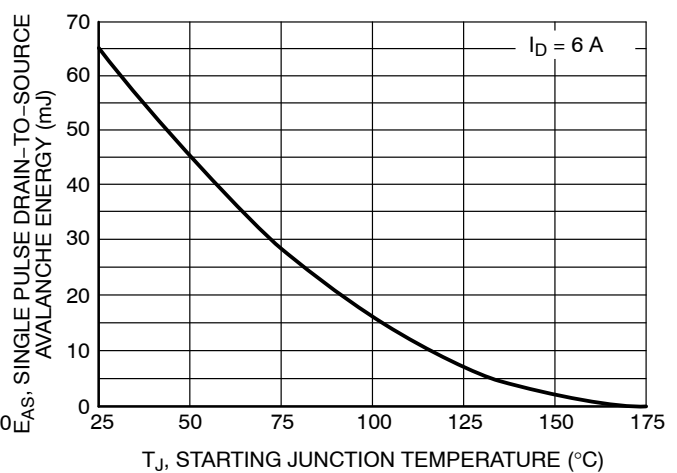


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

# NTF3055L175

## TYPICAL ELECTRICAL CHARACTERISTICS

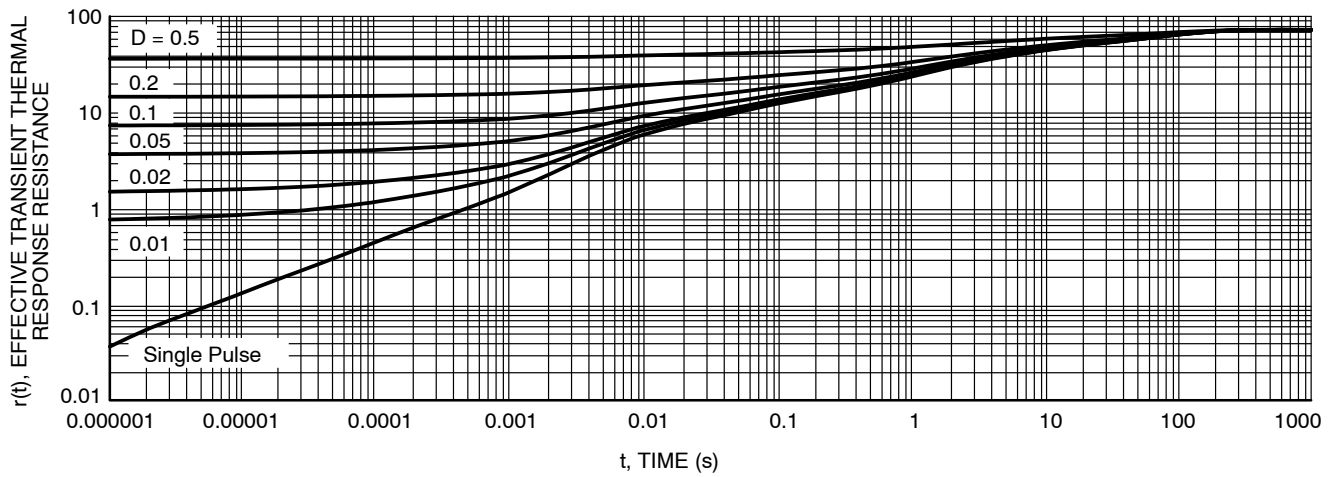


Figure 13. Thermal Response

### ORDERING INFORMATION

| Device         | Package                       | Shipping <sup>†</sup> |
|----------------|-------------------------------|-----------------------|
| NTF3055L175T1G | SOT-223 (TO-261)<br>(Pb-Free) | 1000 / Tape & Reel    |

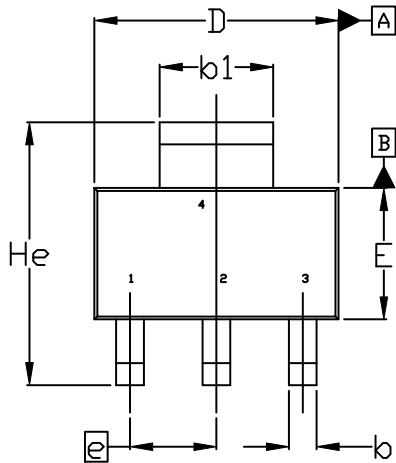
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



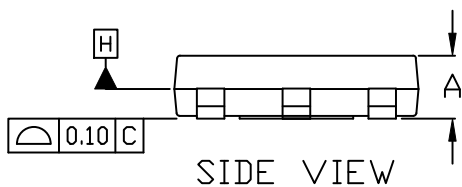
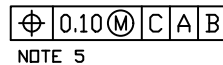
SCALE 1:1

SOT-223 (TO-261)  
CASE 318E-04  
ISSUE R

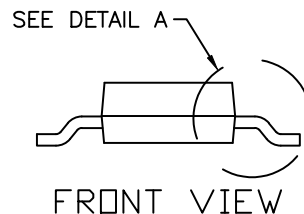
DATE 02 OCT 2018



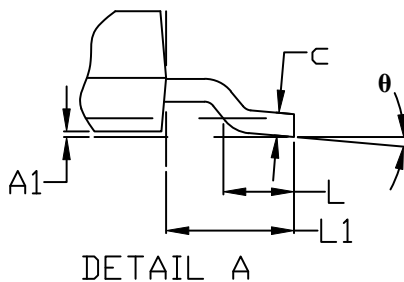
TOP VIEW



SIDE VIEW



FRONT VIEW

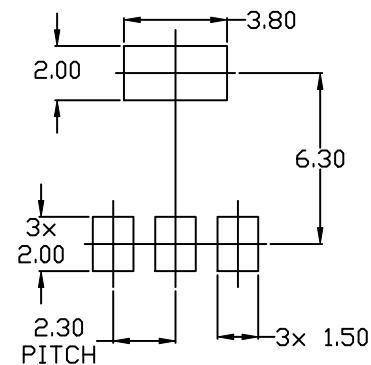


DETAIL A

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D & E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.200MM PER SIDE.
4. DATUMS A AND B ARE DETERMINED AT DATUM H.
5. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE BODY.
6. POSITIONAL TOLERANCE APPLIES TO DIMENSIONS b AND b1.

| MILLIMETERS |          |      |      |
|-------------|----------|------|------|
| DIM         | MIN.     | NOM. | MAX. |
| A           | 1.50     | 1.63 | 1.75 |
| A1          | 0.02     | 0.06 | 0.10 |
| b           | 0.60     | 0.75 | 0.89 |
| b1          | 2.90     | 3.06 | 3.20 |
| c           | 0.24     | 0.29 | 0.35 |
| D           | 6.30     | 6.50 | 6.70 |
| E           | 3.30     | 3.50 | 3.70 |
| e           | 2.30 BSC |      |      |
| L           | 0.20     | ---  | ---  |
| L1          | 1.50     | 1.75 | 2.00 |
| He          | 6.70     | 7.00 | 7.30 |
| θ           | 0°       | ---  | 10°  |



RECOMMENDED MOUNTING  
FOOTPRINT

|                  |                  |                                                                                                                                                                                     |
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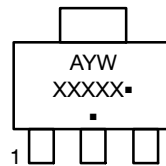
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**SOT-223 (TO-261)**  
**CASE 318E-04**  
**ISSUE R**

DATE 02 OCT 2018

|                                                                              |                                                                             |                                                                               |                                                                       |                                                                       |
|------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>STYLE 1:</b><br>PIN 1. BASE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR | <b>STYLE 2:</b><br>PIN 1. ANODE<br>2. CATHODE<br>3. NC<br>4. CATHODE        | <b>STYLE 3:</b><br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE<br>4. DRAIN           | <b>STYLE 4:</b><br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE<br>4. DRAIN   | <b>STYLE 5:</b><br>PIN 1. DRAIN<br>2. GATE<br>3. SOURCE<br>4. GATE    |
| <b>STYLE 6:</b><br>PIN 1. RETURN<br>2. INPUT<br>3. OUTPUT<br>4. INPUT        | <b>STYLE 7:</b><br>PIN 1. ANODE 1<br>2. CATHODE<br>3. ANODE 2<br>4. CATHODE | <b>STYLE 8:</b><br>CANCELLED                                                  | <b>STYLE 9:</b><br>PIN 1. INPUT<br>2. GROUND<br>3. LOGIC<br>4. GROUND | <b>STYLE 10:</b><br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE<br>4. ANODE |
| <b>STYLE 11:</b><br>PIN 1. MT 1<br>2. MT 2<br>3. GATE<br>4. MT 2             | <b>STYLE 12:</b><br>PIN 1. INPUT<br>2. OUTPUT<br>3. NC<br>4. OUTPUT         | <b>STYLE 13:</b><br>PIN 1. GATE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR |                                                                       |                                                                       |

**GENERIC  
MARKING DIAGRAM\***



A = Assembly Location  
 Y = Year  
 W = Work Week  
 XXXXX = Specific Device Code  
 ▪ = Pb-Free Package

(Note: Microdot may be in either location)  
 \*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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