# MUN2130, MMUN2130L, MUN5130, DTA113EE, DTA113EM3, NSBA113EF3

# **Digital Transistors (BRT)** R1 = 1 k $\Omega$ , R2 = 1 k $\Omega$

# PNP Transistors with Monolithic Bias Resistor Network

This series of digital transistors is designed to replace a single device and its external resistor bias network. The Bias Resistor Transistor (BRT) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base–emitter resistor. The BRT eliminates these individual components by integrating them into a single device. The use of a BRT can reduce both system cost and board space.

### Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

## **MAXIMUM RATINGS** (T<sub>A</sub> = $25^{\circ}$ C)

| Rating                         | Symbol               | Max | Unit |
|--------------------------------|----------------------|-----|------|
| Collector-Base Voltage         | V <sub>CBO</sub>     | 50  | Vdc  |
| Collector-Emitter Voltage      | V <sub>CEO</sub>     | 50  | Vdc  |
| Collector Current – Continuous | Ι <sub>C</sub>       | 100 | mAdc |
| Input Forward Voltage          | V <sub>IN(fwd)</sub> | 10  | Vdc  |
| Input Reverse Voltage          | V <sub>IN(rev)</sub> | 10  | Vdc  |

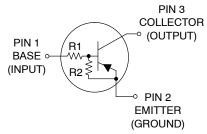
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

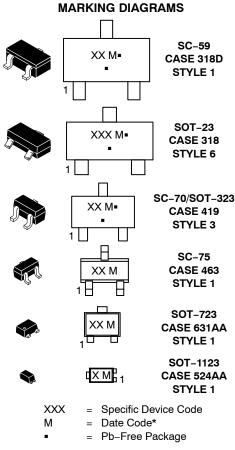


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(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

## ORDERING INFORMATION

See detailed ordering, marking, and shipping information on page 2 of this data sheet.

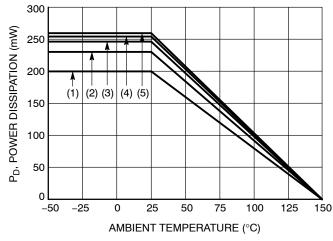
# MUN2130, MMUN2130L, MUN5130, DTA113EE, DTA113EM3, NSBA113EF3

### Table 1. ORDERING INFORMATION

| Device                         | Part Marking | Package                    | Shipping <sup>†</sup> |
|--------------------------------|--------------|----------------------------|-----------------------|
| MUN2130T1G                     | 6G           | SC–59<br>(Pb–Free)         | 3000 / Tape & Reel    |
| MMUN2130LT1G                   | A6G          | SOT-23<br>(Pb-Free)        | 3000 / Tape & Reel    |
| MUN5130T1G                     | 6G           | SC-70/SOT-323<br>(Pb-Free) | 3000 / Tape & Reel    |
| DTA113EET1G                    | 6G           | SC–75<br>(Pb–Free)         | 3000 / Tape & Reel    |
| DTA113EM3T5G, NSVDTA113EM3T5G* | 7E           | SOT-723<br>(Pb-Free)       | 8000 / Tape & Reel    |
| NSBA113EF3T5G                  | L (180°)**   | SOT-1123<br>(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.

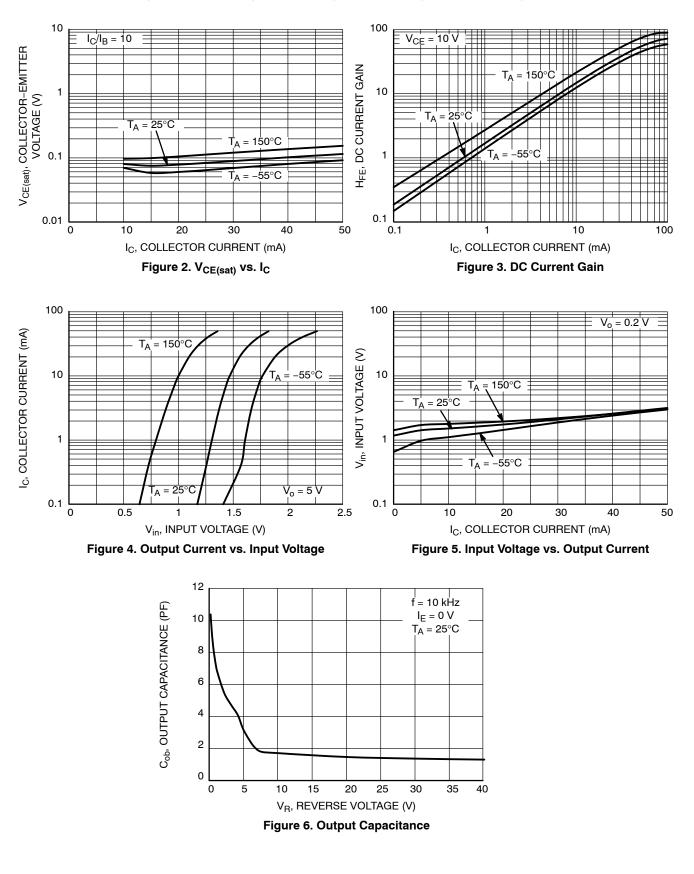
\*\*  $(xx^{\circ})$  = Degree rotation in the clockwise direction.



SC-75 and SC-70/SOT323; Minimum Pad
 SC-59; Minimum Pad
 SOT-23; Minimum Pad
 SOT-1123; 100 mm<sup>2</sup>, 1 oz. copper trace
 SOT-723; Minimum Pad

Figure 1. Derating Curve

## MUN2130, MMUN2130L, MUN5130, DTA113EE, DTA113EM3, NSBA113EF3



## MUN2130, MMUN2130L, MUN5130, DTA113EE, DTA113EM3, NSBA113EF3

### **Table 2. THERMAL CHARACTERISTICS**

| Characteristic   |  | Symbol                            | Max                      | Unit        |
|--|--|-----------------------------------|--------------------------|-------------|
| THERMAL CHARACTERISTICS (SC-59) (MUN2130)                            |  |                                   |                          |             |
| Total Device Dissipation<br>$T_A = 25^{\circ}C$<br>Derate above 25°C | (Note 1)<br>(Note 2)<br>(Note 1)<br>(Note 2) | P <sub>D</sub>                    | 230<br>338<br>1.8<br>2.7 | mW<br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient                           | (Note 1)<br>(Note 2)                         | $R_{\theta JA}$                   | 540<br>370               | °C/W        |
| Thermal Resistance,<br>Junction to Lead                              | (Note 1)<br>(Note 2)                         | $R_{	heta JL}$                    | 264<br>287               | °C/W        |
| Junction and Storage Temperature Range                               |  | T <sub>J</sub> , T <sub>stg</sub> | –55 to +150              | °C          |
| THERMAL CHARACTERISTICS (SOT-23) (MMUN2130L)                         |  |                                   |                          |             |
| Total Device Dissipation<br>$T_A = 25^{\circ}C$<br>Derate above 25°C | (Note 1)<br>(Note 2)<br>(Note 1)<br>(Note 2) | P <sub>D</sub>                    | 246<br>400<br>2.0<br>3.2 | mW<br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient                           | (Note 1)<br>(Note 2)                         | $R_{\thetaJA}$                    | 508<br>311               | °C/W        |
| Thermal Resistance,<br>Junction to Lead                              | (Note 1)<br>(Note 2)                         | $R_{\theta JL}$                   | 174<br>208               | °C/W        |
| Junction and Storage Temperature Range                               |  | T <sub>J</sub> , T <sub>stg</sub> | –55 to +150              | °C          |
| THERMAL CHARACTERISTICS (SC-70/SOT-323) (MUN5130)                    |  |                                   |                          |             |
| Total Device Dissipation<br>$T_A = 25^{\circ}C$<br>Derate above 25°C | (Note 1)<br>(Note 2)<br>(Note 1)<br>(Note 2) | P <sub>D</sub>                    | 202<br>310<br>1.6<br>2.5 | mW<br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient                           | (Note 1)<br>(Note 2)                         | $R_{	hetaJA}$                     | 618<br>403               | °C/W        |
| Thermal Resistance,<br>Junction to Lead                              | (Note 1)<br>(Note 2)                         | $R_{	hetaJL}$                     | 280<br>332               | °C/W        |
| Junction and Storage Temperature Range                               |  | T <sub>J</sub> , T <sub>stg</sub> | –55 to +150              | °C          |
| THERMAL CHARACTERISTICS (SC-75) (DTA113EE)                           |  |                                   |                          |             |
| Total Device Dissipation<br>$T_A = 25^{\circ}C$<br>Derate above 25°C | (Note 1)<br>(Note 2)<br>(Note 1)<br>(Note 2) | P <sub>D</sub>                    | 200<br>300<br>1.6<br>2.4 | mW<br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient                           | (Note 1)<br>(Note 2)                         | $R_{\thetaJA}$                    | 600<br>400               | °C/W        |
| Junction and Storage Temperature Range                               |  | T <sub>J</sub> , T <sub>stg</sub> | -55 to +150              | °C          |
| THERMAL CHARACTERISTICS (SOT-723) (DTA113EM3)                        |  |                                   |                          |             |
| Total Device Dissipation<br>$T_A = 25^{\circ}C$<br>Derate above 25°C | (Note 1)<br>(Note 2)<br>(Note 1)<br>(Note 2) | P <sub>D</sub>                    | 260<br>600<br>2.0<br>4.8 | mW<br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient                           | (Note 1)<br>(Note 2)                         | $R_{	hetaJA}$                     | 480<br>205               | °C/W        |
| Junction and Storage Temperature Range                               |  | T <sub>J</sub> , T <sub>stg</sub> | -55 to +150              | °C          |

FR-4 @ 1.0 x 1.0 Inch Pad.
 FR-4 @ 100 mm<sup>2</sup>, 1 oz. copper traces, still air.
 FR-4 @ 500 mm<sup>2</sup>, 1 oz. copper traces, still air.

### **Table 2. THERMAL CHARACTERISTICS**

| Characteristic   |  | Symbol                            | Max                      | Unit        |
|--|--|-----------------------------------|--------------------------|-------------|
| THERMAL CHARACTERISTICS (SOT-1123) (NSBA113EF3)                      |  |                                   |                          |             |
| Total Device Dissipation<br>$T_A = 25^{\circ}C$<br>Derate above 25°C | (Note 3)<br>(Note 4)<br>(Note 3)<br>(Note 4) | P <sub>D</sub>                    | 254<br>297<br>2.0<br>2.4 | mW<br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient                           | (Note 3)<br>(Note 4)                         | $R_{	hetaJA}$                     | 493<br>421               | °C/W        |
| Thermal Resistance, Junction to Lead                                 | (Note 3)                                     | $R_{	ext{	heta}JL}$               | 193                      | °C/W        |
| Junction and Storage Temperature Range                               |  | T <sub>J</sub> , T <sub>stg</sub> | –55 to +150              | °C          |

1. FR-4 @ Minimum Pad.

FR-4 @ 1.0 x 1.0 Inch Pad.
 FR-4 @ 100 mm<sup>2</sup>, 1 oz. copper traces, still air.
 FR-4 @ 500 mm<sup>2</sup>, 1 oz. copper traces, still air.

### Table 3. ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = $25^{\circ}$ C, unless otherwise noted)

| Characteristic   | Symbol                | Min | Тур | Max  | Unit |
|--|-----------------------|-----|-----|------|------|
| OFF CHARACTERISTICS  | ·                     |     |     |      |      |
| Collector–Base Cutoff Current $(V_{CB} = 50 \text{ V}, I_E = 0)$   | I <sub>CBO</sub>      | _   | _   | 100  | nAdc |
| Collector–Emitter Cutoff Current $(V_{CE} = 50 \text{ V}, I_B = 0)$  | I <sub>CEO</sub>      | _   | _   | 500  | nAdc |
| Emitter-Base Cutoff Current $(V_{EB} = 6.0 \text{ V}, I_C = 0)$  | I <sub>EBO</sub>      | _   | _   | 4.3  | mAdc |
| Collector-Base Breakdown Voltage ( $I_C = 10 \ \mu A, I_E = 0$ )   | V <sub>(BR)CBO</sub>  | 50  | _   | _    | Vdc  |
| Collector–Emitter Breakdown Voltage (Note 5) $(I_{C} = 2.0 \text{ mA}, I_{B} = 0)$                                 | V <sub>(BR)</sub> CEO | 50  | _   | -    | Vdc  |
| ON CHARACTERISTICS   |                       |     |     |      |      |
| DC Current Gain (Note 5)<br>(I <sub>C</sub> = 5.0 mA, V <sub>CE</sub> = 10 V)                                      | h <sub>FE</sub>       | 3.0 | 5.0 | -    |      |
| Collector–Emitter Saturation Voltage (Note 5) $(I_{C} = 10 \text{ mA}, I_{B} = 5.0 \text{ mA})$                    | V <sub>CE(sat)</sub>  | _   | -   | 0.25 | Vdc  |
| Input Voltage (off)<br>(V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 100 μA)  | V <sub>i(off)</sub>   | _   | 1.2 | 0.5  | Vdc  |
| Input Voltage (on)<br>( $V_{CE}$ = 0.3 V, I <sub>C</sub> = 20 mA)  | V <sub>i(on)</sub>    | 2.0 | 1.6 | _    | Vdc  |
| Output Voltage (on) $(V_{CC} = 5.0 \text{ V}, \text{ V}_{B} = 2.5 \text{ V}, \text{ R}_{L} = 1.0 \text{ k}\Omega)$ | V <sub>OL</sub>       | _   | _   | 0.2  | Vdc  |
| Output Voltage (off) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.05 V, R <sub>L</sub> = 1.0 kΩ)                   | V <sub>OH</sub>       | 4.9 | _   | -    | Vdc  |
| Input Resistor   | R1                    | 0.7 | 1.0 | 1.3  | kΩ   |
| Resistor Ratio   | $R_1/R_2$             | 0.8 | 1.0 | 1.2  |      |

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. 5. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle  $\leq 2\%$ .





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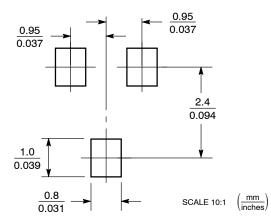




SCALE 2:1



#### **SOLDERING FOOTPRINT\***



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SC-59 CASE 318D-04 ISSUE H

DATE 28 JUN 2012

NOTES:

DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 CONTROLLING DIMENSION: MILLIMETER.

|     | MILLIMETERS |      |      |       | INCHES |       |
|-----|-------------|------|------|-------|--------|-------|
| DIM | MIN         | NOM  | MAX  | MIN   | NOM    | MAX   |
| Α   | 1.00        | 1.15 | 1.30 | 0.039 | 0.045  | 0.051 |
| A1  | 0.01        | 0.06 | 0.10 | 0.001 | 0.002  | 0.004 |
| b   | 0.35        | 0.43 | 0.50 | 0.014 | 0.017  | 0.020 |
| С   | 0.09        | 0.14 | 0.18 | 0.003 | 0.005  | 0.007 |
| D   | 2.70        | 2.90 | 3.10 | 0.106 | 0.114  | 0.122 |
| E   | 1.30        | 1.50 | 1.70 | 0.051 | 0.059  | 0.067 |
| е   | 1.70        | 1.90 | 2.10 | 0.067 | 0.075  | 0.083 |
| L   | 0.20        | 0.40 | 0.60 | 0.008 | 0.016  | 0.024 |
| HE  | 2.50        | 2.80 | 3.00 | 0.099 | 0.110  | 0.118 |

#### GENERIC **MARKING DIAGRAM**



= Specific Device Code XXX Μ = Date Code

= Pb-Free Package\*

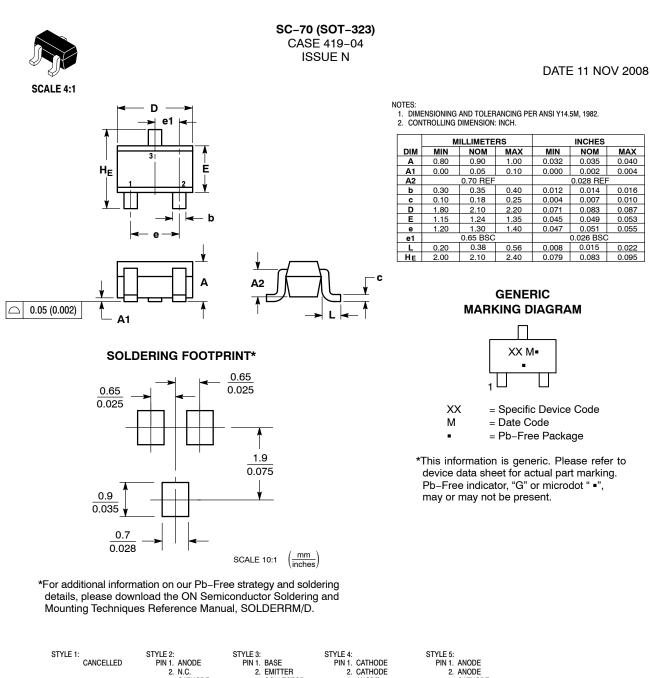
(\*Note: Microdot may be in either location)

\*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.

| STYLE 1:       | STYLE 2:       | STYLE 3:         |
|----------------|----------------|------------------|
| PIN 1. BASE    | PIN 1. ANODE   | PIN 1. ANODE     |
| 2. EMITTER     | 2. N.C.        | 2. ANODE         |
| 3. COLLECTOR   | 3. CATHODE     | 3. CATHODE       |
| Style 4:       | Style 5:       | STYLE 6:         |
| Pin 1. Cathode | Pin 1. Cathode | PIN 1. ANODE     |
| 2. N.C.        | 2. Cathode     | 2. CATHODE       |
| 3. Anode       | 3. Anode       | 3. ANODE/CATHODE |

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|                | 3. CATHODE   | 3. COLLECTOR | 3. ANODE         | 3. CATHODE       |                |
|----------------|--------------|--------------|------------------|------------------|----------------|
| STYLE 6:       | STYLE 7:     | STYLE 8:     | STYLE 9:         | STYLE 10:        | STYLE 11:      |
| PIN 1. EMITTER | Pin 1. Base  | PIN 1. GATE  | PIN 1. ANODE     | PIN 1. CATHODE   | PIN 1. CATHODE |
| 2. BASE        | 2. Emitter   | 2. SOURCE    | 2. CATHODE       | 2. ANODE         | 2. CATHODE     |
| 3. COLLECTOR   | 3. Collector | 3. DRAIN     | 3. CATHODE-ANODE | 3. ANODE-CATHODE | 3. CATHODE     |

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|------------------|-----------------|---|-------------|--|--|
| DESCRIPTION:     | SC-70 (SOT-323) |   | PAGE 1 OF 1 |  |  |
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1.000

0.039

SCALE 10:1

mm

inches

0.508

0.020

 
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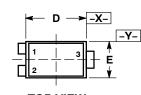
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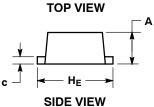


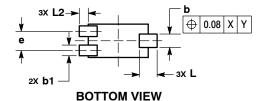


SCALE 8:1

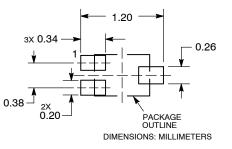


SOT-1123 CASE 524AA ISSUE C





#### SOLDERING FOOTPRINT\*



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| STYLE 1:     | STYLE 2:     | STYLE 3:     | STYLE 4:       | STYLE 5:    |
|--------------|--------------|--------------|----------------|-------------|
| PIN 1. BASE  | PIN 1. ANODE | PIN 1. ANODE | PIN 1. CATHODE | PIN 1. GATE |
| 2. EMITTER   | 2. N/C       | 2. ANODE     | 2. CATHODE     | 2. SOURCE   |
| 3. COLLECTOR | 3. CATHODE   | 3. CATHODE   | 3. ANODE       | 3. DRAIN    |
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DATE 29 NOV 2011

- NOTES:
- NOTES: 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994. 2. CONTROLLING DIMENSION: MILLIMETERS. 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE
- MINIMUM THICKNESS OF BASE MATERIAL. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. 4.

|     | MILLIMETERS |      |
|-----|-------------|------|
| DIM | MIN         | MAX  |
| Α   | 0.34        | 0.40 |
| b   | 0.15        | 0.28 |
| b1  | 0.10        | 0.20 |
| С   | 0.07        | 0.17 |
| D   | 0.75        | 0.85 |
| Е   | 0.55        | 0.65 |
| е   | 0.35        | 0.40 |
| HE  | 0.95        | 1.05 |
| L   | 0.185 REF   |      |
| L2  | 0.05        | 0.15 |

GENERIC **MARKING DIAGRAM\*** 

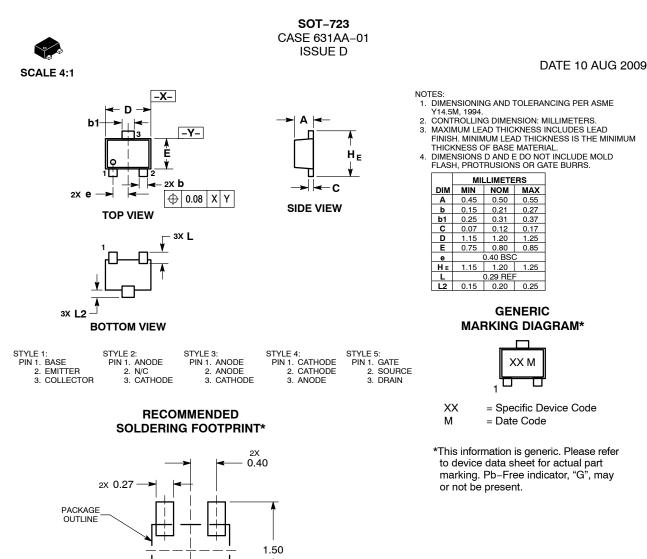
= Specific Device Code Х Μ = Date Code

\*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.

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3X 0.52 - - 0.36 DIMENSIONS: MILLIMETERS

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MUN2130T1 MUN2130T1G MUN5130T1 MUN5130T1G MMUN2130LT1 MMUN2130LT1G DTA113EM3T5G DTA113EET1G NSBA113EF3T5G NSVDTA113EM3T5G