

# MMUN2217L, NSVMMUN2217L

## Digital Transistors (BRT) R1 = 4.7 kΩ, R2 = 10 kΩ

### NPN 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
- 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°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 | I <sub>C</sub>       | 100 | mAdc |
| Input Forward Voltage          | V <sub>IN(fwd)</sub> | 20  | Vdc  |
| Input Reverse Voltage          | V <sub>IN(rev)</sub> | 7   | Vdc  |

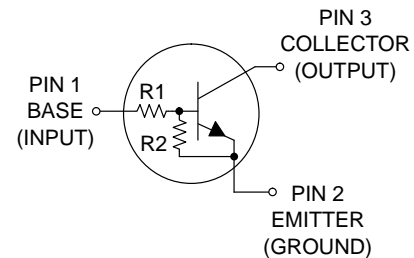
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



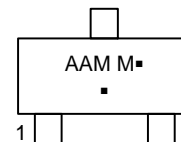
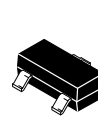
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#### PIN CONNECTIONS



#### MARKING DIAGRAM



SOT-23  
CASE 318  
STYLE 6

AAM Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

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

#### ORDERING INFORMATION

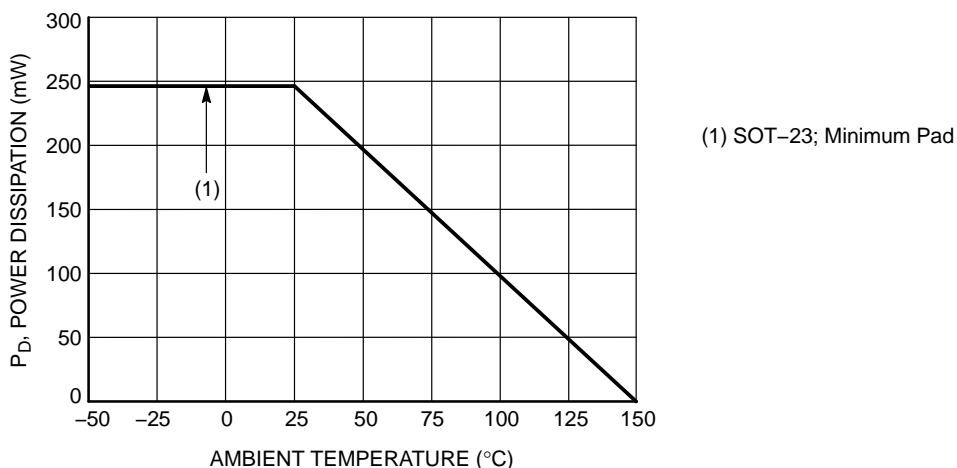
See detailed ordering, marking, and shipping information in the package dimensions section on page 2 of this data sheet.

# MMUN2217L, NSVMMUN2217L

**Table 1. ORDERING INFORMATION**

| Device          | Part Marking | Package            | Shipping†          |
|-----------------|--------------|--------------------|--------------------|
| MMUN2217LT1G    | AAM          | SC-23<br>(Pb-Free) | 3000 / Tape & Reel |
| NSVMMUN2217LT1G | AAM          | SC-23<br>(Pb-Free) | 3000 / 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.



**Figure 1. Derating Curve**

**Table 2. THERMAL CHARACTERISTICS**

| Characteristic  | Symbol  | Max                      | Unit            |
|---|---|--------------------------|-----------------|
| <b>THERMAL CHARACTERISTICS (SOT-23) (MMUN2217L)</b>   |   |                          |                 |
| Total Device Dissipation<br>$T_A = 25^\circ\text{C}$<br><br>Derate above $25^\circ\text{C}$ | $P_D$<br><br><br>(Note 1)<br>(Note 2)<br>(Note 1)<br>(Note 2) | 246<br>400<br>2.0<br>3.2 | mW<br><br>mW/°C |
| Thermal Resistance,<br>Junction to Ambient  | $R_{\theta JA}$<br><br>(Note 1)<br>(Note 2)                   | 508<br>311               | °C/W            |
| Thermal Resistance,<br>Junction to Lead   | $R_{\theta JL}$<br><br>(Note 1)<br>(Note 2)                   | 174<br>208               | °C/W            |
| Junction and Storage Temperature Range  | $T_J, T_{stg}$  | -55 to +150              | °C              |

- FR-4 @ Minimum Pad.
- FR-4 @ 1.0 x 1.0 Inch Pad.

# MMUN2217L, NSVMMUN2217L

**Table 3. ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

| Characteristic  | Symbol        | Min  | Typ  | Max  | Unit             |
|---|---------------|------|------|------|------------------|
| <b>OFF CHARACTERISTICS</b>  |               |      |      |      |                  |
| Collector–Base Cutoff Current<br>( $V_{CB} = 50\text{ V}$ , $I_E = 0$ )                                 | $I_{CBO}$     | –    | –    | 100  | nAdc             |
| Collector–Emitter Cutoff Current<br>( $V_{CE} = 50\text{ V}$ , $I_B = 0$ )                              | $I_{CEO}$     | –    | –    | 500  | nAdc             |
| Emitter–Base Cutoff Current<br>( $V_{EB} = 6.0\text{ V}$ , $I_C = 0$ )                                  | $I_{EBO}$     | –    | –    | 0.5  | mAdc             |
| Collector–Base Breakdown Voltage<br>( $I_C = 10\ \mu\text{A}$ , $I_E = 0$ )                             | $V_{(BR)CBO}$ | 50   | –    | –    | Vdc              |
| Collector–Emitter Breakdown Voltage (Note 3)<br>( $I_C = 2.0\text{ mA}$ , $I_B = 0$ )                   | $V_{(BR)CEO}$ | 50   | –    | –    | Vdc              |
| <b>ON CHARACTERISTICS</b>   |               |      |      |      |                  |
| DC Current Gain (Note 3)<br>( $I_C = 5.0\text{ mA}$ , $V_{CE} = 10\text{ V}$ )                          | $h_{FE}$      | 35   | 60   | –    |                  |
| Collector – Emitter Saturation Voltage (Note 3)<br>( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ )     | $V_{CE(sat)}$ | –    | –    | 0.25 | Vdc              |
| Input Voltage (off)<br>( $V_{CE} = 5.0\text{ V}$ , $I_C = 100\ \mu\text{A}$ )                           | $V_{i(off)}$  | –    | 0.9  | 0.3  | Vdc              |
| Input Voltage (on)<br>( $V_{CE} = 0.3\text{ V}$ , $I_C = 20\text{ mA}$ )                                | $V_{i(on)}$   | 2.5  | 2.0  | –    | Vdc              |
| Output Voltage (on)<br>( $V_{CC} = 5.0\text{ V}$ , $V_B = 2.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )  | $V_{OL}$      | –    | –    | 0.2  | Vdc              |
| Output Voltage (off)<br>( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) | $V_{OH}$      | 4.9  | –    | –    | Vdc              |
| Input Resistor  | $R_1$         | 3.3  | 4.7  | 6.1  | $\text{k}\Omega$ |
| Resistor Ratio  | $R_1/R_2$     | 0.38 | 0.47 | 0.56 |                  |

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.

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

TYPICAL CHARACTERISTICS  
MMUN2217L

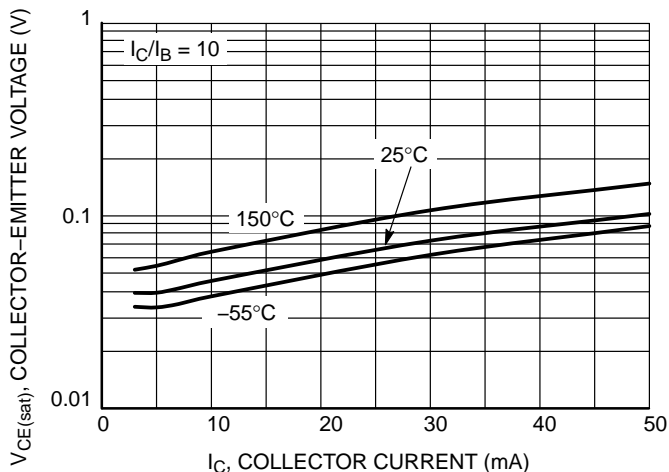


Figure 2.  $V_{CE(sat)}$  vs.  $I_C$

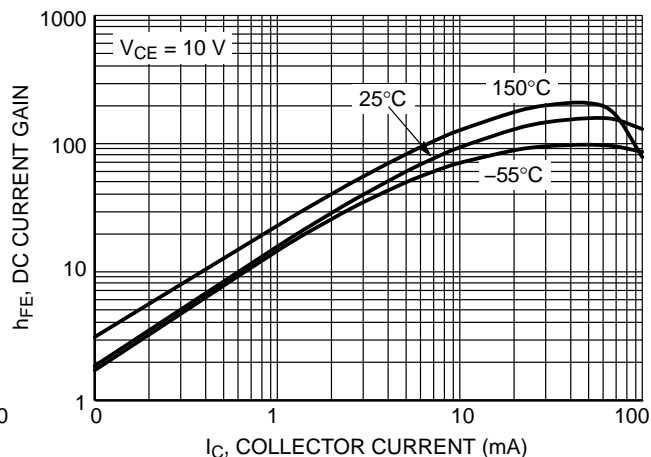


Figure 3. DC Current Gain

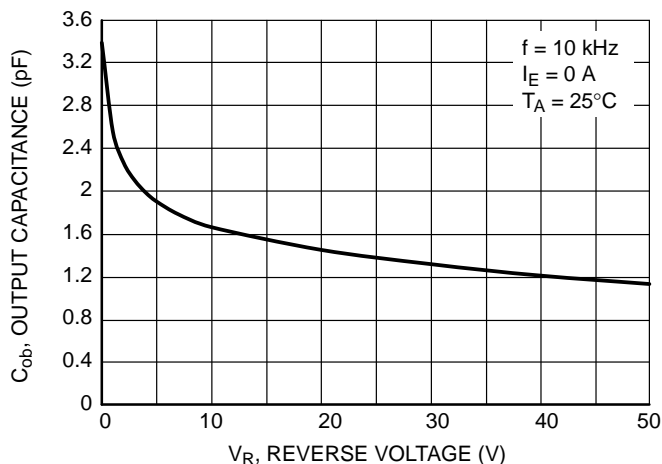


Figure 4. Output Capacitance

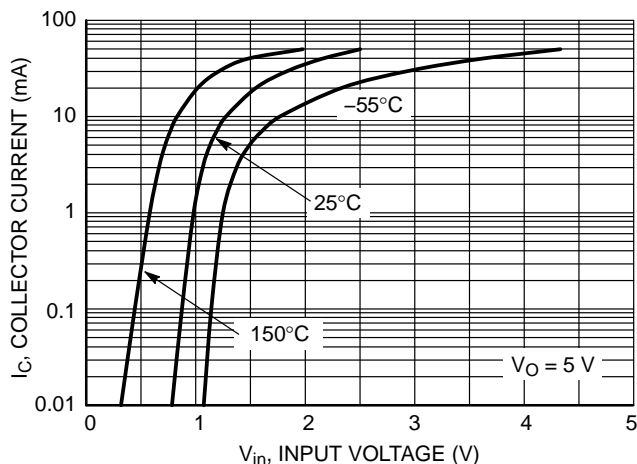


Figure 5. Output Current vs. Input Voltage

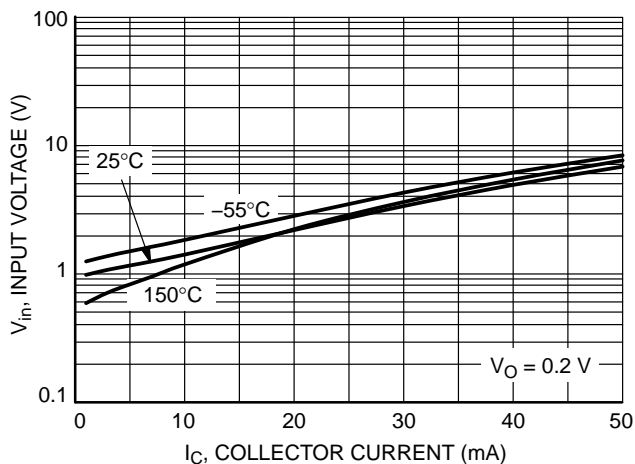


Figure 6. Input Voltage vs. Output Current

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



**SOT-23 (TO-236)**  
CASE 318  
ISSUE AT

DATE 01 MAR 2023

SCALE 4:1



**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 THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM            | MILLIMETERS |      |      | INCHES |       |       |
|----------------|-------------|------|------|--------|-------|-------|
|                | MIN.        | NOM. | MAX. | MIN.   | NOM.  | MAX.  |
| A              | 0.89        | 1.00 | 1.11 | 0.035  | 0.039 | 0.044 |
| A1             | 0.01        | 0.06 | 0.10 | 0.000  | 0.002 | 0.004 |
| b              | 0.37        | 0.44 | 0.50 | 0.015  | 0.017 | 0.020 |
| c              | 0.08        | 0.14 | 0.20 | 0.003  | 0.006 | 0.008 |
| D              | 2.80        | 2.90 | 3.04 | 0.110  | 0.114 | 0.120 |
| E              | 1.20        | 1.30 | 1.40 | 0.047  | 0.051 | 0.055 |
| e              | 1.78        | 1.90 | 2.04 | 0.070  | 0.075 | 0.080 |
| L              | 0.30        | 0.43 | 0.55 | 0.012  | 0.017 | 0.022 |
| L1             | 0.35        | 0.54 | 0.69 | 0.014  | 0.021 | 0.027 |
| H <sub>E</sub> | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |
| T              | 0°          | ---  | 10°  | 0°     | ---   | 10°   |

**GENERIC MARKING DIAGRAM\***



- XXX = Specific Device Code
- M = Date 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.



**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.

**STYLES ON PAGE 2**

|                         |                        |  |
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**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**



**SOT-23 (TO-236)**  
**CASE 318**  
**ISSUE AT**

DATE 01 MAR 2023

- |   |   |   |   |   |   |
|---|---|---|---|---|---|
| STYLE 1 THRU 5:<br>CANCELLED                            | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE  |   |   |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE      | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE     | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE      | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE | STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE          |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN       | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT   | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE           | STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION |
| STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE     |   |   |   |   |

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