# Bias Resistor Transistors

## NPN Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

This new series of digital transistors is designed to replace a single device and its external resistor bias network. The BRT (Bias Resistor Transistor) 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. The device is housed in the SOT-23 package which is designed for low power surface mount applications.

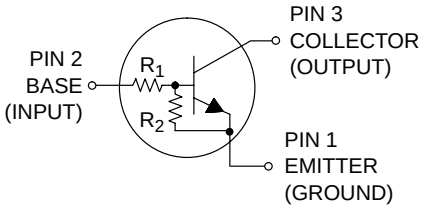
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count

**LMUN2237LT1**



CASE 318–08, STYLE 6
SOT– 23 (TO–236AB)

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**MAXIMUM RATINGS** ($T_A$ = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 50 | Vdc |
| Collector-Emitter Voltage | $V_{CEO}$ | 50 | Vdc |
| Collector Current | $I_C$ | 100 | mAdc |

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Total Device Dissipation<br>$T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 230 (Note 1)<br>338 (Note 2)<br>1.8 (Note 1)<br>2.7 (Note 2) | mW<br><br>°C/W |
| Thermal Resistance – Junction-to-Ambient | $R_{\theta JA}$ | 540 (Note 1)<br>370 (Note 2) | °C/W |
| Thermal Resistance – Junction-to-Lead | $R_{\theta JL}$ | 264 (Note 1)<br>287 (Note 2) | °C/W |
| Junction and Storage Temperature Range | $T_J$, $T_{stg}$ | –55 to +150 | °C |

1. FR–4 @ Minimum Pad
2. FR–4 @ 1.0 x 1.0 inch Pad

**DEVICE MARKING AND RESISTOR VALUES**

| Device | Package | Marking | R1 (K) | R2 (K) |
|---|---|---|---|---|
| LMUN2237LT1 | SOT-23 | **A8P** | 47 | 22 |

3. New devices. Updated curves to follow in subsequent data sheets.

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted) (Continued)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector-Base Cutoff Current ($V_{CB}$ = 40 V, $I_E$ = 0) | $I_{CBO}$ | – | – | 50 | nAdc |
| Collector-Emitter Cutoff Current ($V_{CE}$ = 40 V, $I_B$ = 0) | $I_{CEO}$ | – | – | 50 | nAdc |
| Emitter-Base Cutoff Current ($V_{BE}$ = 6.0 V, $I_C$ = 0) | $I_{EBO}$ | – | – | 0.13 | mAdc |
| Collector-Base Breakdown Voltage ($I_C$ = 10 μA, $I_E$ = 0) | $V_{(BR)CBO}$ | 50 | – | – | Vdc |
| Collector-Emitter Breakdown Voltage (Note 4) ($I_C$ = 2.0 mA, $I_B$ = 0) | $V_{(BR)CEO}$ | 50 | – | – | Vdc |
| **ON CHARACTERISTICS** (Note 4) | | | | | |
| DC Current Gain ($V_{CE}$ = 10 V, $I_C$ = 5.0 mA) | $h_{FE}$ | 80 | 140 | – | |
| Collector-Emitter Saturation Voltage ($I_C$ = 10 mA, $I_B$ = 5 mA) | $V_{CE(sat)}$ | – | – | 0.25 | Vdc |
| Output Voltage (on) ($V_{CC}$ = 5.0 V, $V_B$ = 4.0 V, $R_L$ = 1.0 kΩ) | $V_{OL}$ | – | – | 0.2 | Vdc |
| Input Resistor | $R_1$ | 32.9 | 47 | 61.1 | kΩ |
| Resistor Ratio | $R_1/R_2$ | 1.7 | 2.1 | 2.6 | |

4. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

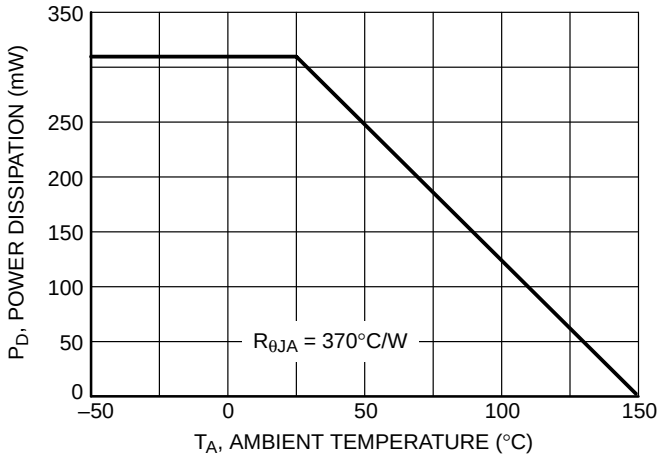



**Figure 1. Derating Curve**

## TYPICAL ELECTRICAL CHARACTERISTICS – LMUN2237LT1

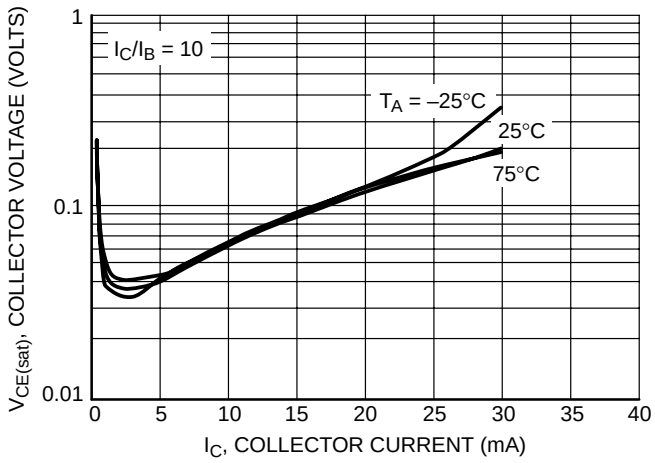



**Figure 2. $V_{CE(sat)}$ versus $I_C$**

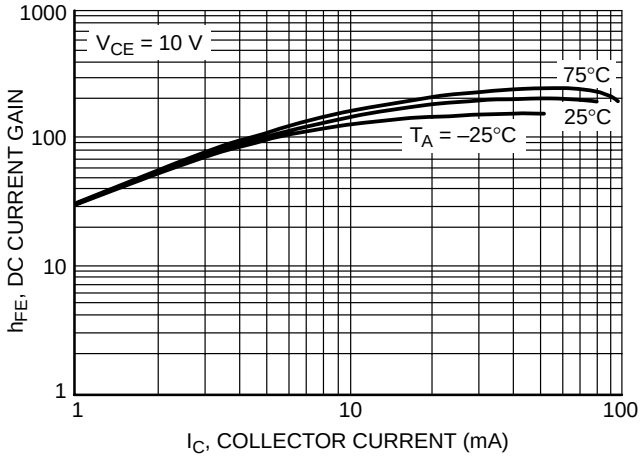



**Figure 3. DC Current Gain**

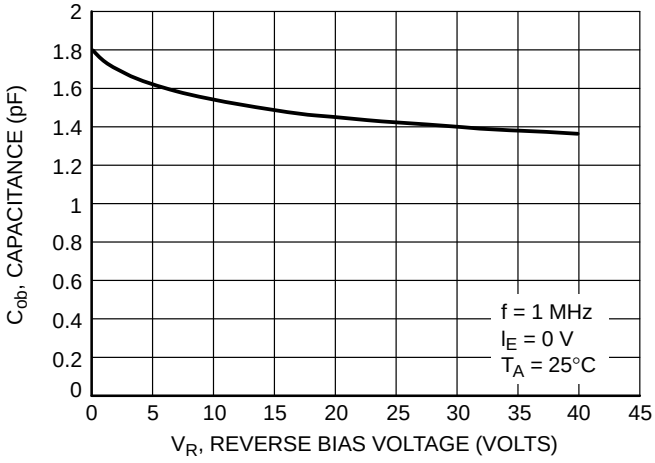



**Figure 4. Output Capacitance**

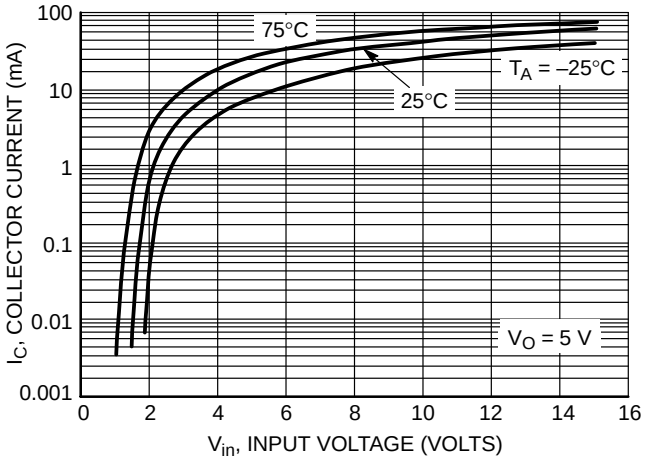



**Figure 5. Output Current versus Input Voltage**

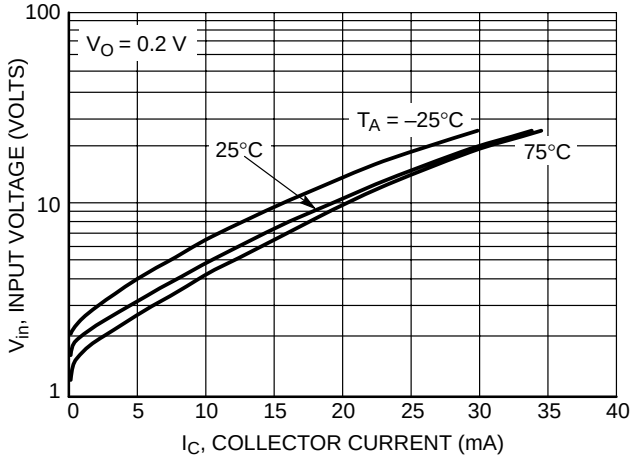
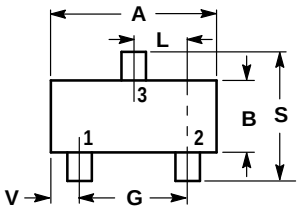
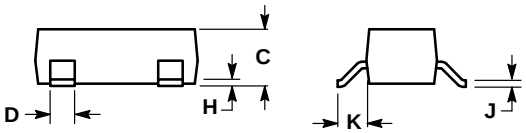



**Figure 6. Input Voltage versus Output Current**

# SOT-23




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.1102 | 0.1197 | 2.80 | 3.04 |
| B | 0.0472 | 0.0551 | 1.20 | 1.40 |
| C | 0.0350 | 0.0440 | 0.89 | 1.11 |
| D | 0.0150 | 0.0200 | 0.37 | 0.50 |
| G | 0.0701 | 0.0807 | 1.78 | 2.04 |
| H | 0.0005 | 0.0040 | 0.013 | 0.100 |
| J | 0.0034 | 0.0070 | 0.085 | 0.177 |
| K | 0.0140 | 0.0285 | 0.35 | 0.69 |
| L | 0.0350 | 0.0401 | 0.89 | 1.02 |
| S | 0.0830 | 0.1039 | 2.10 | 2.64 |
| V | 0.0177 | 0.0236 | 0.45 | 0.60 |

PIN 1. BASE
2. EMITTER
3. COLLECTOR

