

# MMBT8099LT1G

## Amplifier Transistor

### NPN Silicon

#### Features

- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

| Rating                         | Symbol    | Value | Unit |
|--------------------------------|-----------|-------|------|
| Collector-Emitter Voltage      | $V_{CEO}$ | 80    | Vdc  |
| Collector-Base Voltage         | $V_{CBO}$ | 80    | Vdc  |
| Emitter-Base Voltage           | $V_{EBO}$ | 6.0   | Vdc  |
| Collector Current – Continuous | $I_C$     | 500   | mAdc |

#### THERMAL CHARACTERISTICS

| Characteristic                                                                                                     | Symbol          | Max         | Unit                       |
|--------------------------------------------------------------------------------------------------------------------|-----------------|-------------|----------------------------|
| Total Device Dissipation FR-5 Board<br>(Note 1) $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$        | $P_D$           | 225<br>1.8  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient<br>(Note 1)                                                                | $R_{\theta JA}$ | 556         | $^\circ\text{C/W}$         |
| Total Device Dissipation Alumina<br>Substrate (Note 2) $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 300<br>2.4  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient<br>(Note 2)                                                                | $R_{\theta JA}$ | 417         | $^\circ\text{C/W}$         |
| Junction and Storage Temperature Range                                                                             | $T_J, T_{stg}$  | -55 to +150 | $^\circ\text{C}$           |

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.

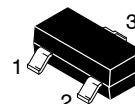
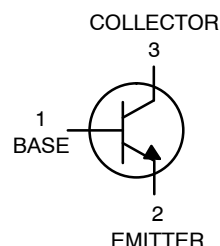
1. FR-5 = 1.0 X 0.75 X 0.062 in.

2. Alumina = 0.4 X 0.3 X 0.024 in. 99.5% alumina.



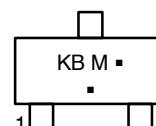
ON Semiconductor®

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SOT-23 (TO-236)  
CASE 318  
STYLE 6

#### MARKING DIAGRAM



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

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

#### ORDERING INFORMATION

| Device       | Package             | Shipping†        |
|--------------|---------------------|------------------|
| MMBT8099LT1G | SOT-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.

# MMBT8099LT1G

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

| Characteristic                                                                                                               | Symbol               | Min    | Max      | Unit |
|------------------------------------------------------------------------------------------------------------------------------|----------------------|--------|----------|------|
| <b>OFF CHARACTERISTICS</b>                                                                                                   |                      |        |          |      |
| Collector – Emitter Breakdown Voltage (Note 3)<br>(I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 0)                             | V <sub>(BR)CEO</sub> | 80     | –        | Vdc  |
| Collector – Base Breakdown Voltage<br>(I <sub>C</sub> = 100 µAdc, I <sub>E</sub> = 0)                                        | V <sub>(BR)CBO</sub> | 80     | –        | Vdc  |
| Emitter – Base Breakdown Voltage<br>(I <sub>E</sub> = 10 µAdc, I <sub>C</sub> = 0)                                           | V <sub>(BR)EBO</sub> | 6.0    | –        | Vdc  |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 60 Vdc, I <sub>B</sub> = 0)                                                   | I <sub>CES</sub>     | –      | 0.1      | µAdc |
| Collector Cutoff Current<br>(V <sub>CB</sub> = 60 Vdc, I <sub>E</sub> = 0)<br>(V <sub>CB</sub> = 80 Vdc, I <sub>E</sub> = 0) | I <sub>CBO</sub>     | –<br>– | 0.1<br>– | µAdc |
| Emitter Cutoff Current<br>(V <sub>EB</sub> = 6.0 Vdc, I <sub>C</sub> = 0)<br>(V <sub>EB</sub> = 4.0 Vdc, I <sub>C</sub> = 0) | I <sub>EBO</sub>     | –<br>– | 0.1<br>– | µAdc |

## ON CHARACTERISTICS (Note 3)

|                                                                                                                                                                                              |                      |                  |               |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|---------------|-----|
| DC Current Gain<br>(I <sub>C</sub> = 1.0 mAdc, V <sub>CE</sub> = 5.0 Vdc)<br>(I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 5.0 Vdc)<br>(I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 5.0 Vdc) | h <sub>FE</sub>      | 100<br>100<br>75 | 300<br>–<br>– | –   |
| Collector – Emitter Saturation Voltage<br>(I <sub>C</sub> = 100 mAdc, I <sub>B</sub> = 5.0 mAdc)<br>(I <sub>C</sub> = 100 mAdc, I <sub>B</sub> = 10 mAdc)                                    | V <sub>CE(sat)</sub> | –<br>–           | 0.4<br>0.3    | Vdc |
| Base–Emitter On Voltage<br>(I <sub>C</sub> = 1.0 mAdc, V <sub>CE</sub> = 5.0 Vdc)<br>(I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 5.0 Vdc)                                                   | V <sub>BE(on)</sub>  | –<br>0.6         | –<br>0.8      | Vdc |

## SMALL – SIGNAL CHARACTERISTICS

|                                                                                                          |                  |     |     |     |
|----------------------------------------------------------------------------------------------------------|------------------|-----|-----|-----|
| Current – Gain – Bandwidth Product<br>(I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 5.0 Vdc, f = 100 MHz) | f <sub>T</sub>   | 150 | –   | MHz |
| Output Capacitance<br>(V <sub>CB</sub> = 5.0 Vdc, I <sub>E</sub> = 0, f = 1.0 MHz)                       | C <sub>obo</sub> | –   | 6.0 | pF  |
| Input Capacitance<br>(V <sub>EB</sub> = 0.5 Vdc, I <sub>C</sub> = 0, f = 1.0 MHz)                        | C <sub>ibo</sub> | –   | 25  | pF  |

3. Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%.

# MMBT8099LT1G

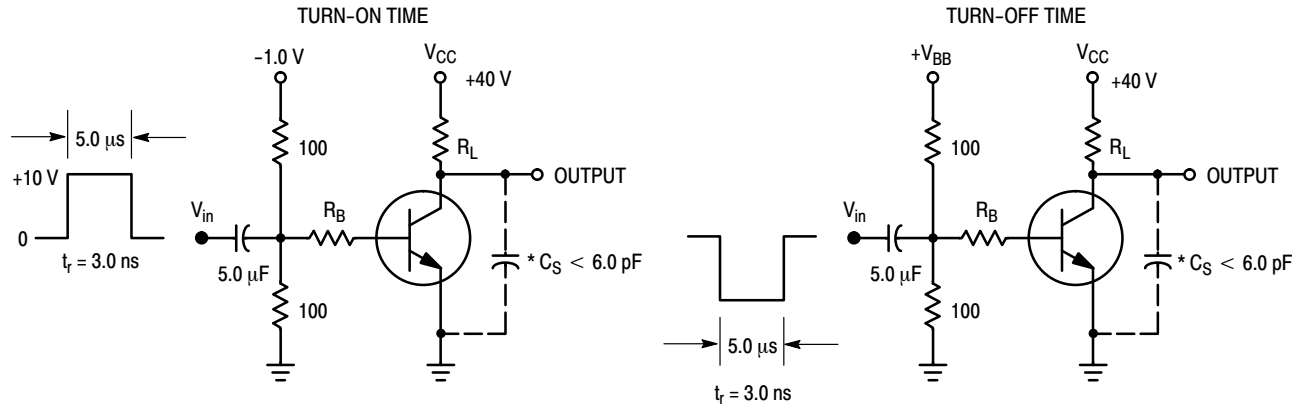


Figure 1. Switching Time Test Circuits

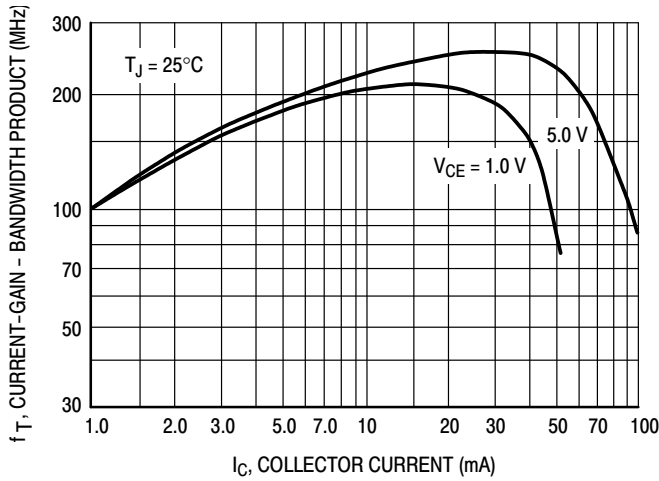


Figure 2. Current-Gain - Bandwidth Product

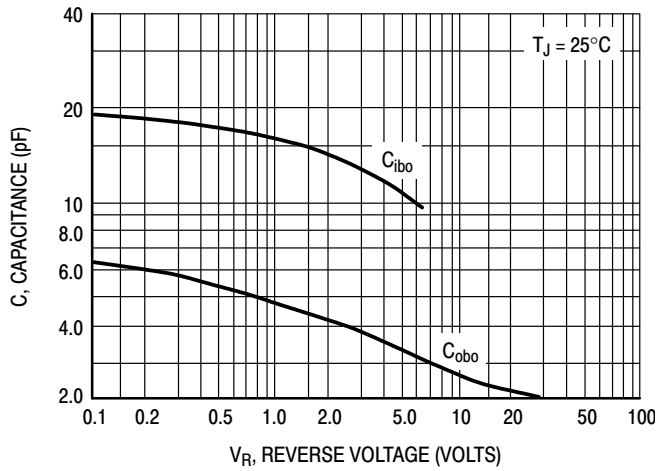


Figure 3. Capacitance

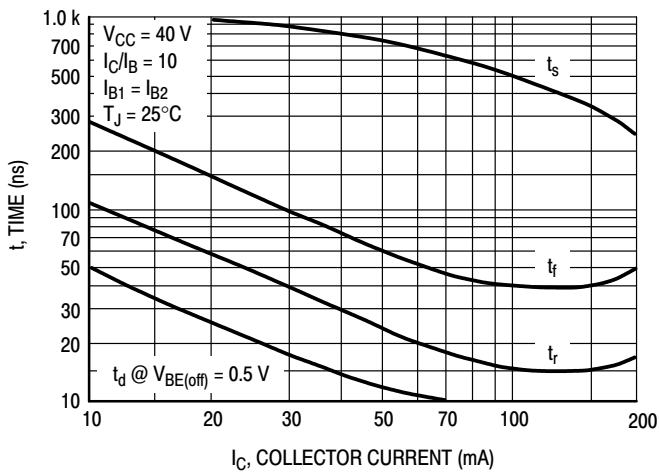


Figure 4. Switching Times

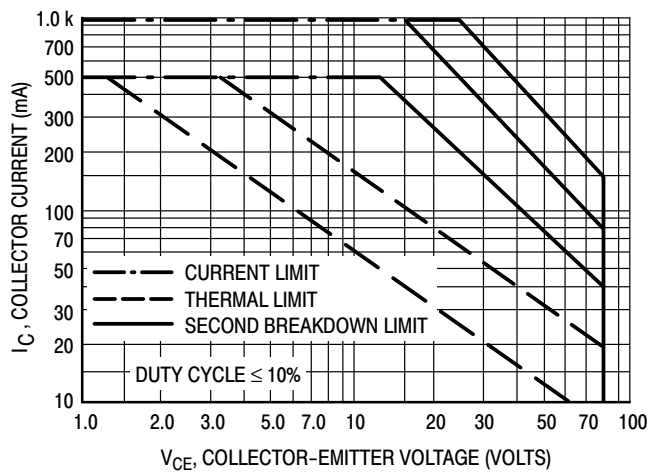


Figure 5. Active-Region Safe Operating Area

# MMBT8099LT1G

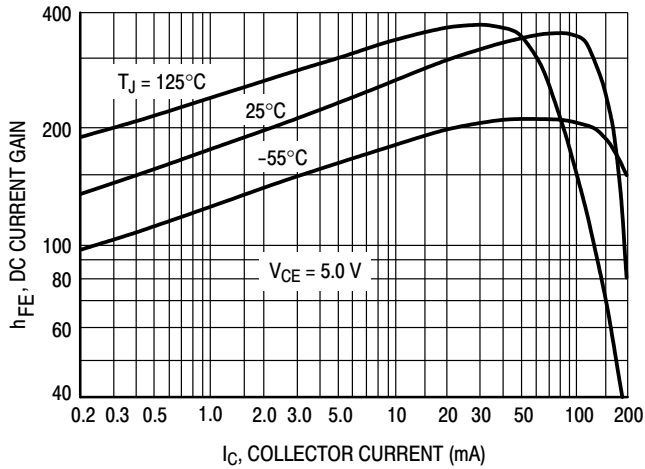


Figure 6. DC Current Gain

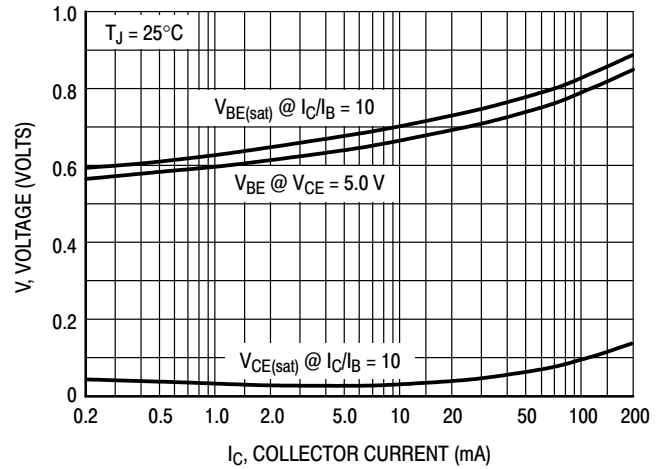


Figure 7. "ON" Voltages

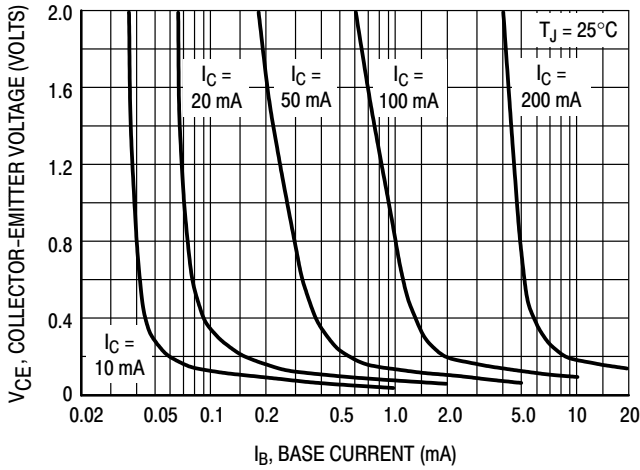


Figure 8. Collector Saturation Region

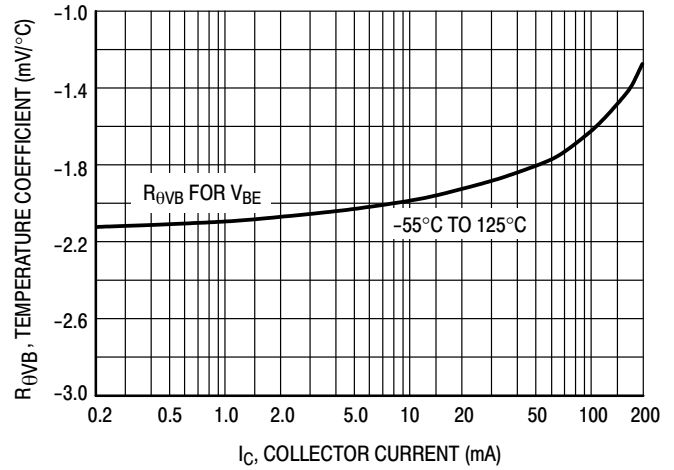


Figure 9. Base-Emitter Temperature Coefficient

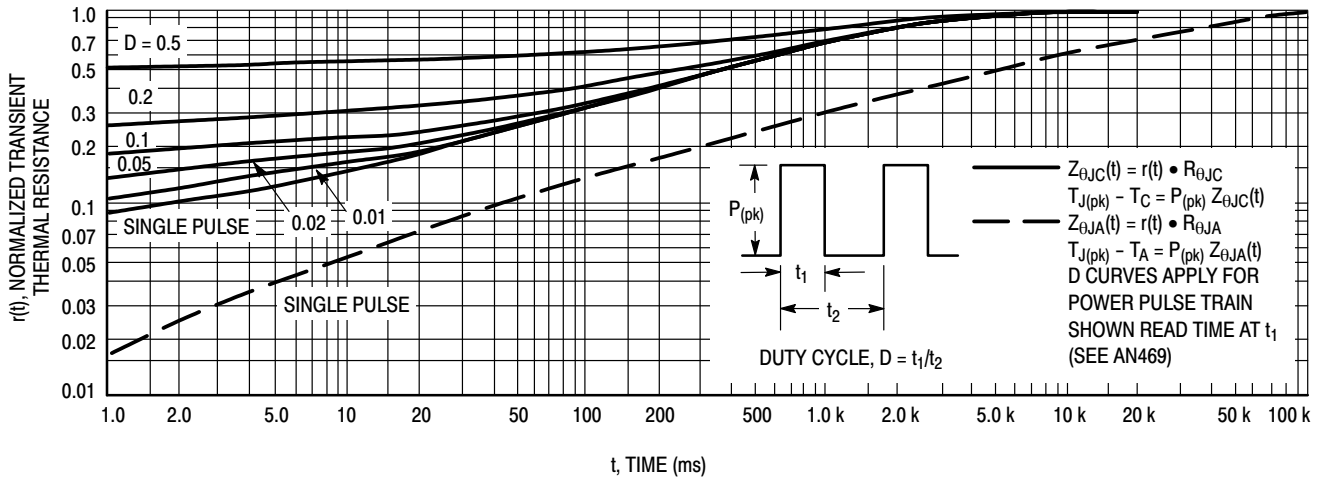
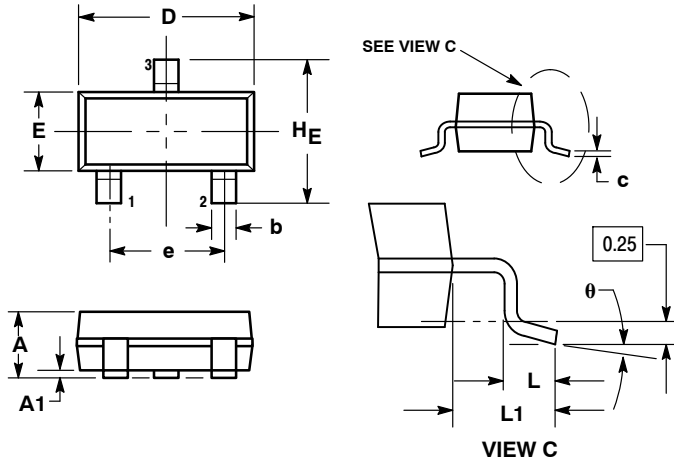


Figure 10. Thermal Response

# MMBT8099LT1G

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AN



### NOTES:

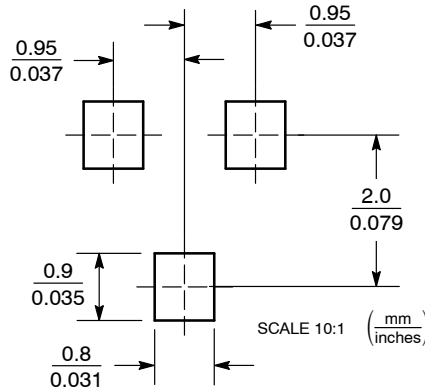
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 0.89        | 1.00 | 1.11 | 0.035  | 0.040 | 0.044 |
| A1  | 0.01        | 0.06 | 0.10 | 0.001  | 0.002 | 0.004 |
| b   | 0.37        | 0.44 | 0.50 | 0.015  | 0.018 | 0.020 |
| c   | 0.09        | 0.13 | 0.18 | 0.003  | 0.005 | 0.007 |
| 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 | 0.081 |
| L   | 0.10        | 0.20 | 0.30 | 0.004  | 0.008 | 0.012 |
| L1  | 0.35        | 0.54 | 0.69 | 0.014  | 0.021 | 0.029 |
| HE  | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |

### STYLE 6:

1. BASE
2. EMITTER
3. COLLECTOR

## SOLDERING 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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