

# Amplifier Transistor

## NPN Silicon

### MMBT8099LT1G

#### 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

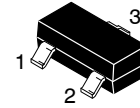
#### THERMAL CHARACTERISTICS

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

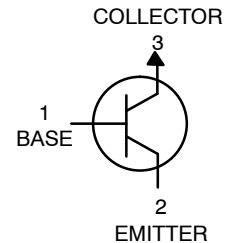
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

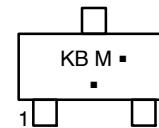
2. Alumina = 0.4 X 0.3 X 0.024 in. 99.5% alumina.



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 (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](http://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) (I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	80	–	Vdc
Collector – Base Breakdown Voltage (I <sub>C</sub> = 100 µAdc, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	80	–	Vdc
Emitter – Base Breakdown Voltage (I <sub>E</sub> = 10 µAdc, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	6.0	–	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 60 Vdc, I <sub>B</sub> = 0)	I <sub>CES</sub>	–	0.1	µAdc
Collector Cutoff Current (V <sub>CB</sub> = 60 Vdc, I <sub>E</sub> = 0) (V <sub>CB</sub> = 80 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	– –	0.1 –	µAdc
Emitter Cutoff Current (V <sub>EB</sub> = 6.0 Vdc, I <sub>C</sub> = 0) (V <sub>EB</sub> = 4.0 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	– –	0.1 –	µAdc

## ON CHARACTERISTICS (Note 3)

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

## SMALL – SIGNAL CHARACTERISTICS

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

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

# MMBT8099LT1G

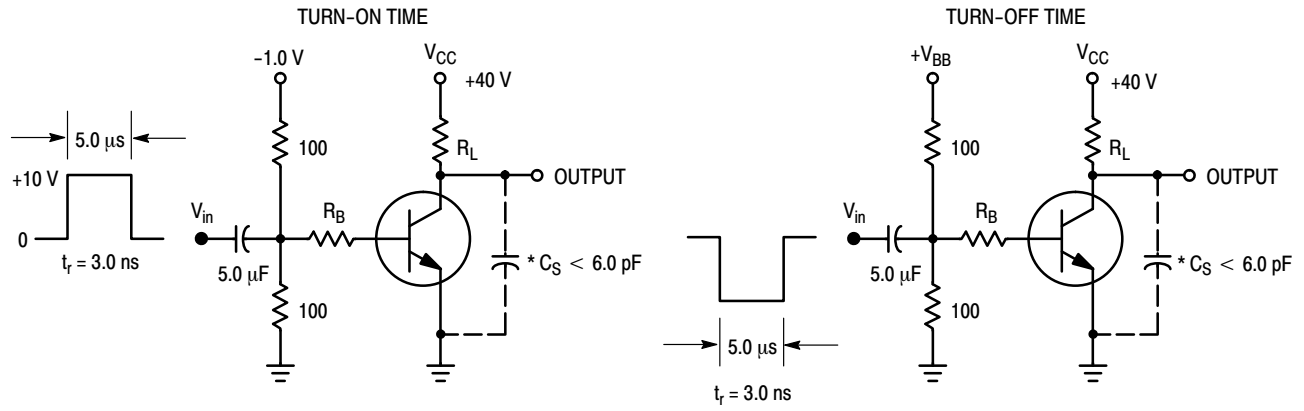


Figure 1. Switching Time Test Circuits

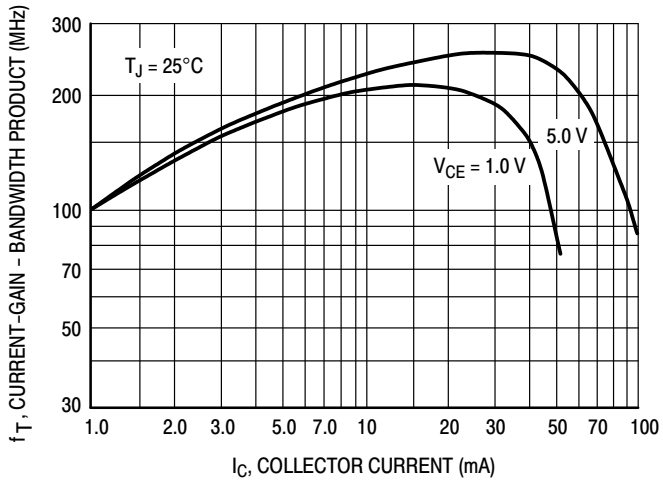


Figure 2. Current-Gain - Bandwidth Product

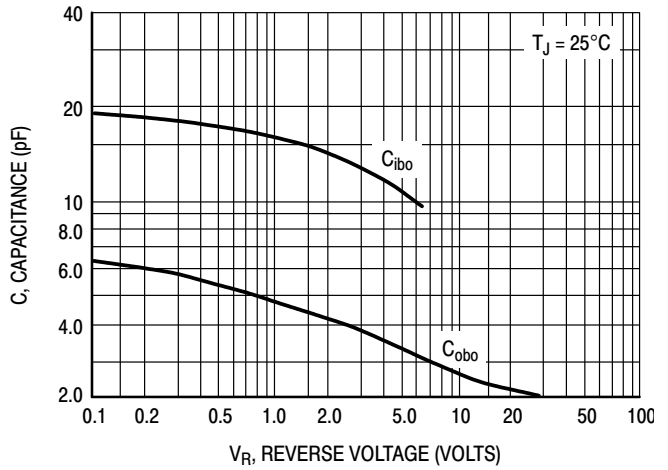


Figure 3. Capacitance

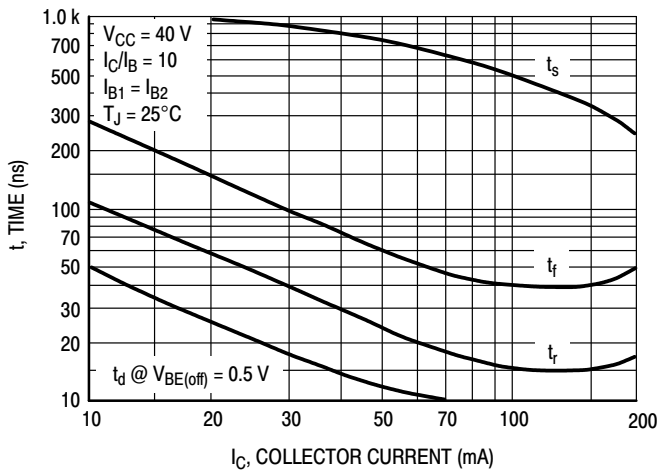


Figure 4. Switching Times

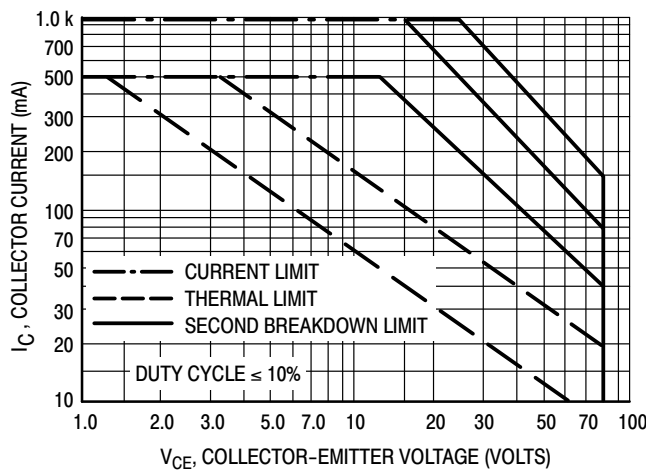


Figure 5. Active-Region Safe Operating Area

# MMBT8099LT1G

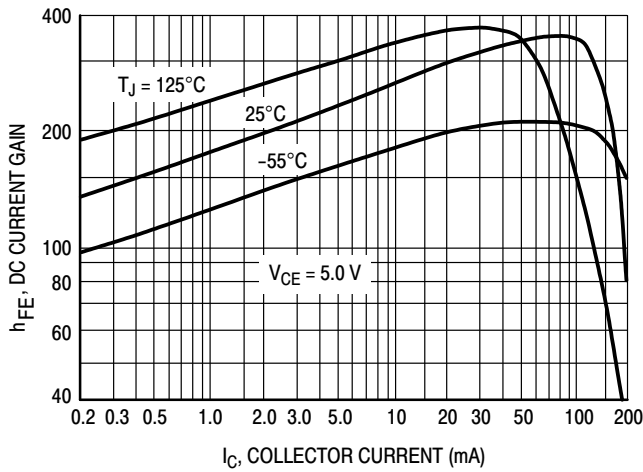


Figure 6. DC Current Gain

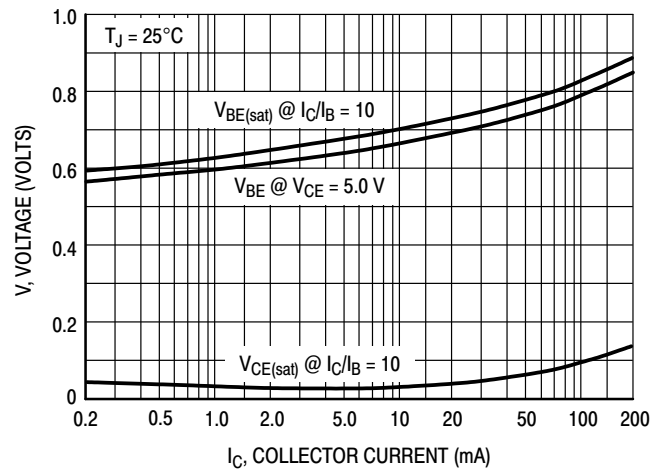


Figure 7. "ON" Voltages

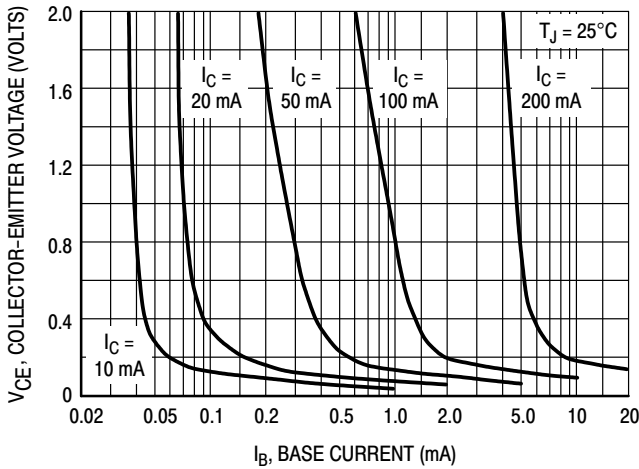


Figure 8. Collector Saturation Region

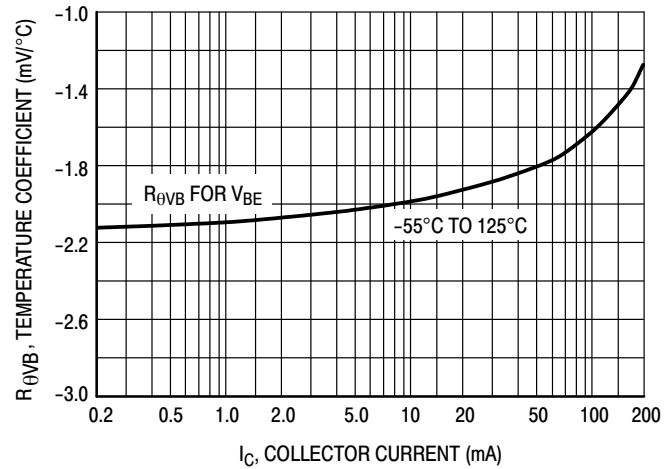


Figure 9. Base-Emitter Temperature Coefficient

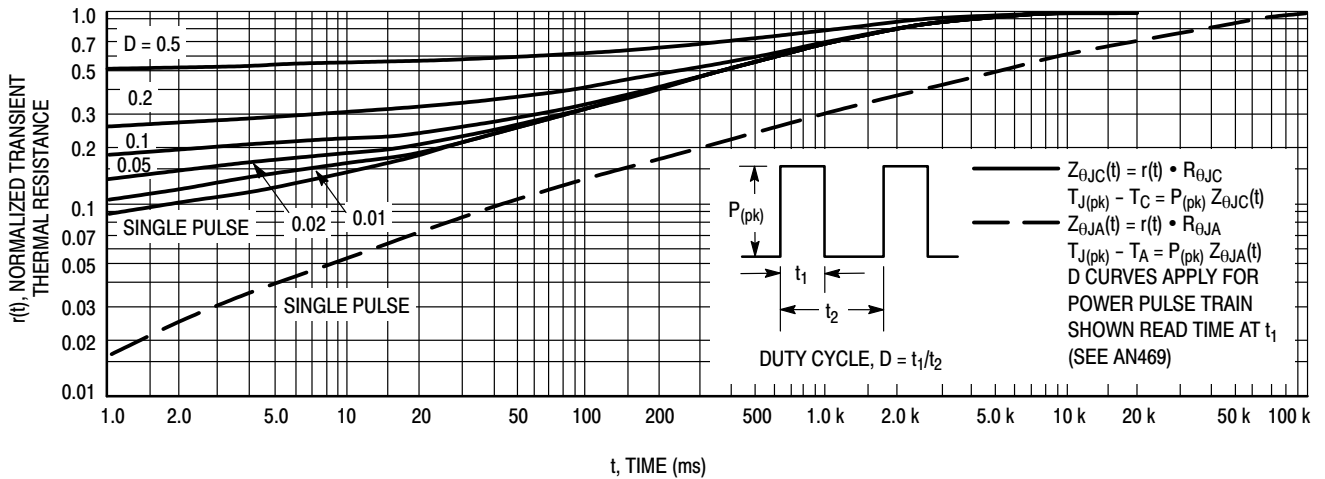
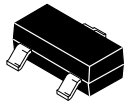


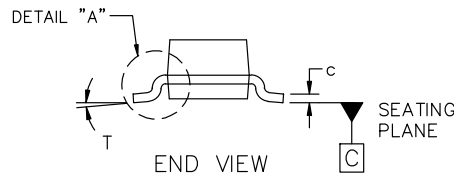
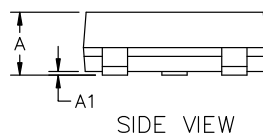
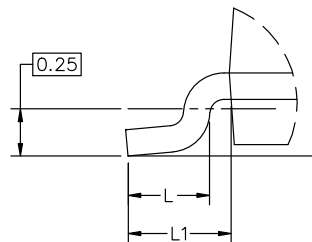
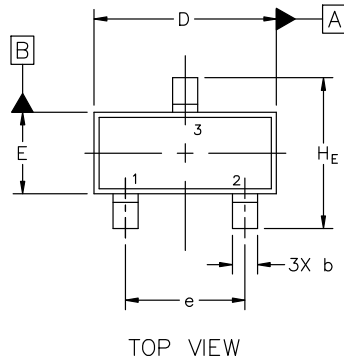
Figure 10. Thermal Response



SCALE 4:1

**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

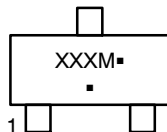


MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

NOTES:

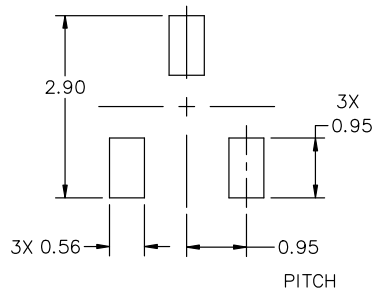
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

**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.



\* For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

**STYLES ON PAGE 2**

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**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

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

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