

# MMBTH10LT1G, MMBTH10-4LT1G

## VHF/UHF 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	$V_{CEO}$	25	Vdc
Collector-Base Voltage	$V_{CBO}$	30	Vdc
Emitter-Base Voltage	$V_{EBO}$	3.0	Vdc

#### 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	$^\circ\text{C}$

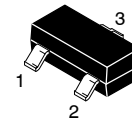
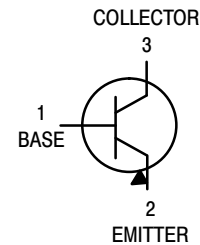
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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



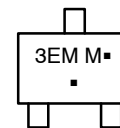
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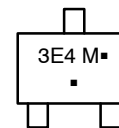


**SOT-23 (TO-236AB)  
CASE 318  
STYLE 6**

#### MARKING DIAGRAMS



MMBTH10LT1G



MMBTH10-04LT1G

3EM, 3E4 = 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†
MMBTH10LT1G	SOT-23 (Pb-Free)	3000/Tape & Reel
MMBTH10LT3G	SOT-23 (Pb-Free)	10000/Tape & Reel
MMBTH10-4LT1G	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.

# MMBTH10LT1G, MMBTH10-4LT1G

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C = 1.0\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	25	-	-	Vdc
Collector-Base Breakdown Voltage ( $I_C = 100\text{ }\mu\text{Adc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	30	-	-	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 10\text{ }\mu\text{Adc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	3.0	-	-	Vdc
Collector Cutoff Current ( $V_{CB} = 25\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	-	-	100	nAdc
Emitter Cutoff Current ( $V_{EB} = 2.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	-	-	100	nAdc

### ON CHARACTERISTICS

DC Current Gain ( $I_C = 4.0\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ )	MMBTH10LT1 MMBTH10-4LT1	$h_{FE}$	60 120	- -	- 240	-
Collector-Emitter Saturation Voltage ( $I_C = 4.0\text{ mAdc}$ , $I_B = 0.4\text{ mAdc}$ )		$V_{CE(sat)}$	-	-	0.5	Vdc
Base-Emitter On Voltage ( $I_C = 4.0\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ )		$V_{BE}$	-	-	0.95	Vdc

### SMALL-SIGNAL CHARACTERISTICS

Current-Gain - Bandwidth Product ( $I_C = 4.0\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 100\text{ MHz}$ )	MMBTH10LT1 MMBTH10-4LT1	$f_T$	650 800	- -	- -	MHz
Collector-Base Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )		$C_{cb}$	-	-	0.7	pF
Common-Base Feedback Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )		$C_{rb}$	-	-	0.65	pF
Collector Base Time Constant ( $I_C = 4.0\text{ mAdc}$ , $V_{CB} = 10\text{ Vdc}$ , $f = 31.8\text{ MHz}$ )		$rb'C_c$	-	-	9.0	ps

# MMBTH10LT1G, MMBTH10-4LT1G

## TYPICAL CHARACTERISTICS

### COMMON-BASE $y$ PARAMETERS versus FREQUENCY

( $V_{CB} = 10$  Vdc,  $I_C = 4.0$  mA,  $T_A = 25^\circ\text{C}$ )

#### $y_{ib}$ , INPUT ADMITTANCE

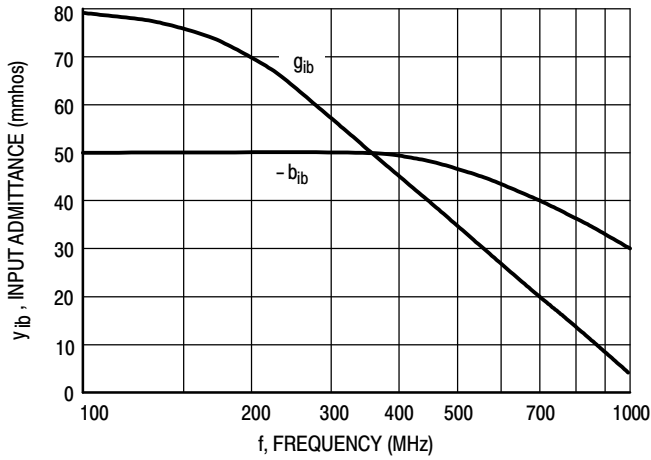


Figure 1. Rectangular Form

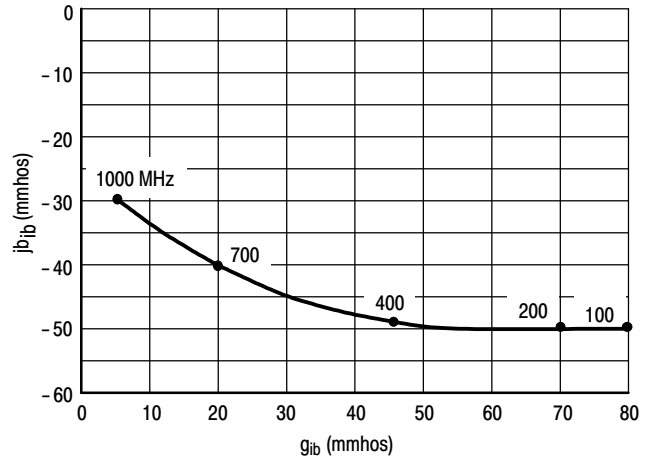


Figure 2. Polar Form

#### $y_{fb}$ , FORWARD TRANSFER ADMITTANCE

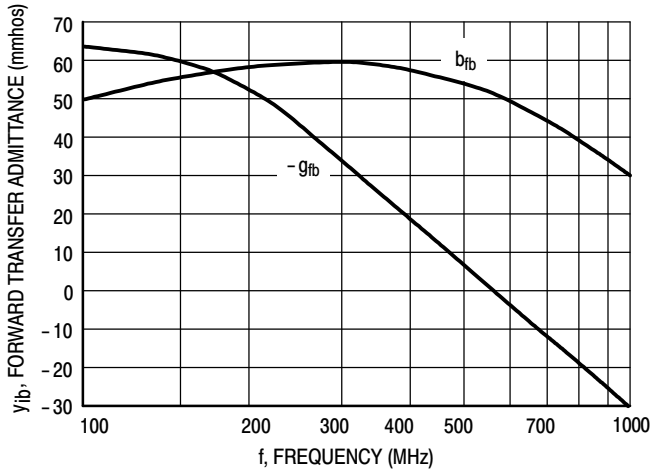


Figure 3. Rectangular Form

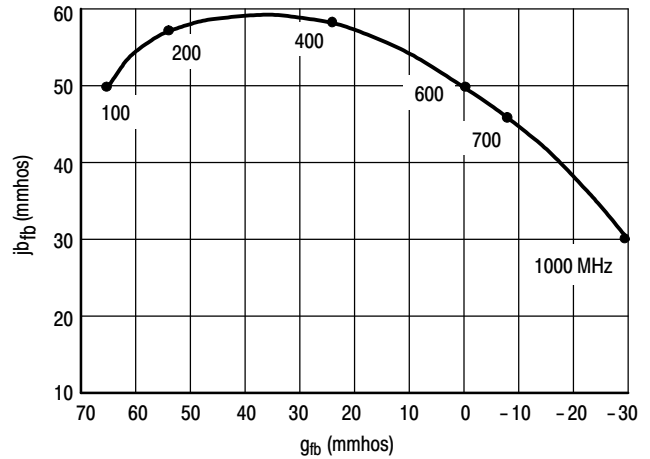


Figure 4. Polar Form

# MMBTH10LT1G, MMBTH10-4LT1G

## TYPICAL CHARACTERISTICS

### COMMON-BASE $y$ PARAMETERS versus FREQUENCY

( $V_{CB} = 10 \text{ Vdc}$ ,  $I_C = 4.0 \text{ mAdc}$ ,  $T_A = 25^\circ\text{C}$ )

#### $y_{rb}$ , REVERSE TRANSFER ADMITTANCE

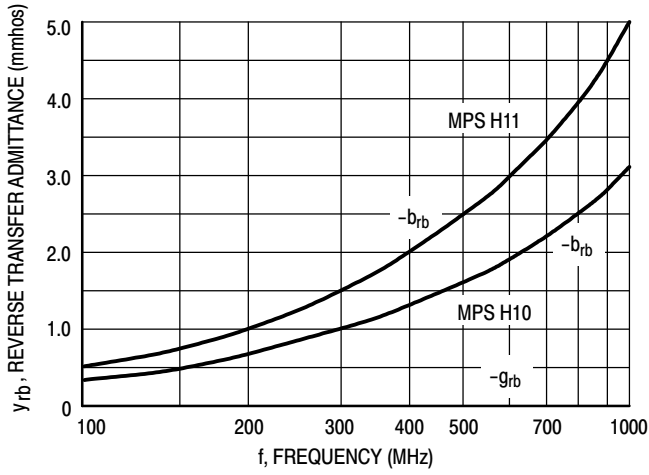


Figure 5. Rectangular Form

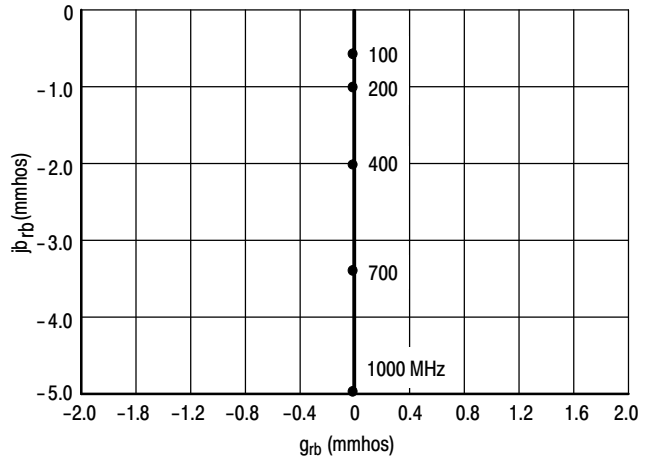


Figure 6. Polar Form

#### $y_{ob}$ , OUTPUT ADMITTANCE

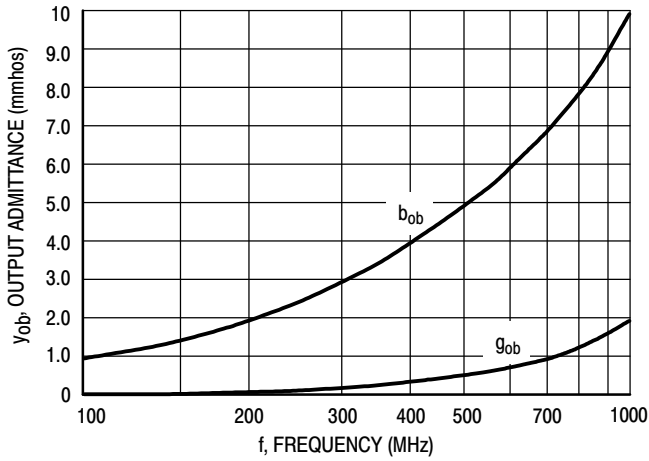


Figure 7. Rectangular Form

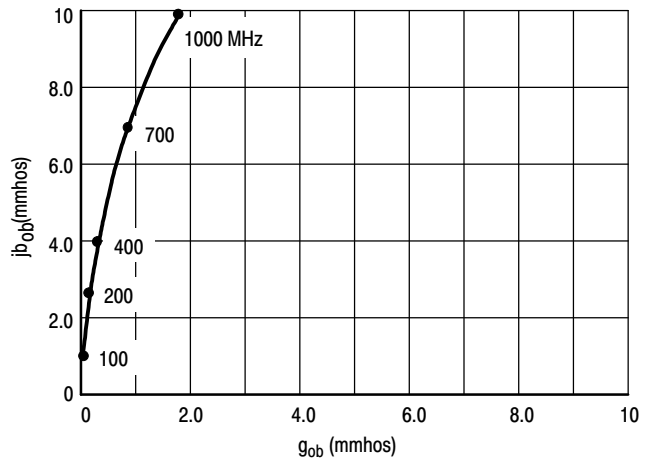
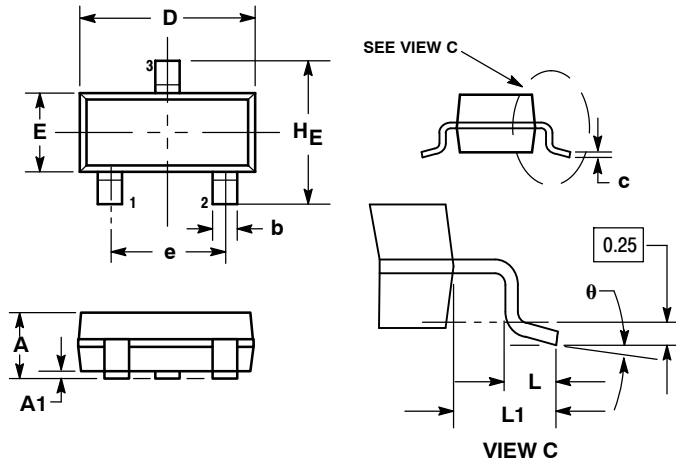


Figure 8. Polar Form

# MMBTH10LT1G, MMBTH10-4LT1G

## PACKAGE DIMENSIONS

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



NOTES:

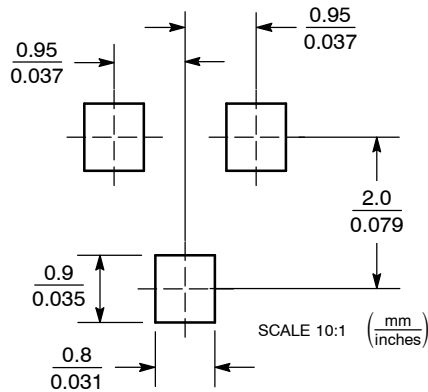
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

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:

- PIN 1. BASE
- EMITTER
- 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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