# MMBTH10LT1, MMBTH10-4LT1

**Preferred Devices**

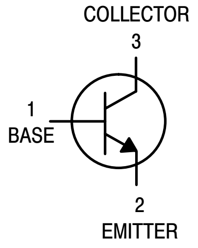
# VHF/UHF Transistor

## NPN Silicon

- Device Marking: 3EM

**ON Semiconductor**®

**http://onsemi.com**



### Features

- Pb−Free Package May be Available. The G−Suffix Denotes a Pb−Free Lead Finish

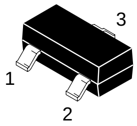
### MAXIMUM RATINGS

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

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



**CASE 318**
**SOT−23**
**STYLE 6**

### ORDERING INFORMATION

| Device | Package | Shipping[†] |
|---|---|---|
| MMBTH10LT1 | SOT−23 | 3000/Tape & Reel |
| MMBTH10LT1G | SOT−23 (Pb−Free) | 3000/Tape & Reel |
| MMBTH10−4LT1 | SOT−23 | 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.

**Preferred** devices are recommended choices for future use and best overall value.

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector−Emitter Breakdown Voltage<br>($I_C$ = 1.0 mAdc, $I_B$ = 0) | $V_{(BR)CEO}$ | 25 | − | − | Vdc |
| Collector−Base Breakdown Voltage<br>($I_C$ = 100 μAdc, $I_E$ = 0) | $V_{(BR)CBO}$ | 30 | − | − | Vdc |
| Emitter−Base Breakdown Voltage<br>($I_E$ = 10 μAdc, $I_C$ = 0) | $V_{(BR)EBO}$ | 3.0 | − | − | Vdc |
| Collector Cutoff Current<br>($V_{CB}$ = 25 Vdc, $I_E$ = 0) | $I_{CBO}$ | − | − | 100 | nAdc |
| Emitter Cutoff Current<br>($V_{EB}$ = 2.0 Vdc, $I_C$ = 0) | $I_{EBO}$ | − | − | 100 | nAdc |
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain<br>($I_C$ = 4.0 mAdc, $V_{CE}$ = 10 Vdc) MMBTH10LT1<br>MMBTH10−4LT1 | $h_{FE}$ | <br>60<br>120 | <br>−<br>− | <br>−<br>240 | − |
| Collector−Emitter Saturation Voltage<br>($I_C$ = 4.0 mAdc, $I_B$ = 0.4 mAdc) | $V_{CE(sat)}$ | − | − | 0.5 | Vdc |
| Base−Emitter On Voltage<br>($I_C$ = 4.0 mAdc, $V_{CE}$ = 10 Vdc) | $V_{BE}$ | − | − | 0.95 | Vdc |
| **SMALL−SIGNAL CHARACTERISTICS** | | | | | |
| Current−Gain − Bandwidth Product<br>($I_C$ = 4.0 mAdc, $V_{CE}$ = 10 Vdc, f = 100 MHz) MMBTH10LT1<br>MMBTH10−4LT1 | $f_T$ | <br>650<br>800 | <br>−<br>− | <br>−<br>− | MHz |
| Collector−Base Capacitance<br>($V_{CB}$= 10 Vdc, $I_E$ = 0, f = 1.0 MHz) | $C_{cb}$ | − | − | 0.7 | pF |
| Common−Base Feedback Capacitance<br>($V_{CB}$= 10 Vdc, $I_E$ = 0, f = 1.0 MHz) | $C_{rb}$ | − | − | 0.65 | pF |
| Collector Base Time Constant<br>($I_C$= 4.0 mAdc, $V_{CB}$ = 10 Vdc, f = 31.8 MHz) | $rb'C_c$ | − | − | 9.0 | ps |

## TYPICAL CHARACTERISTICS

### COMMON−BASE y PARAMETERS versus FREQUENCY

($V_{CB}$ = 10 Vdc, $I_C$ = 4.0 mAdc, $T_A$ = 25°C)

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

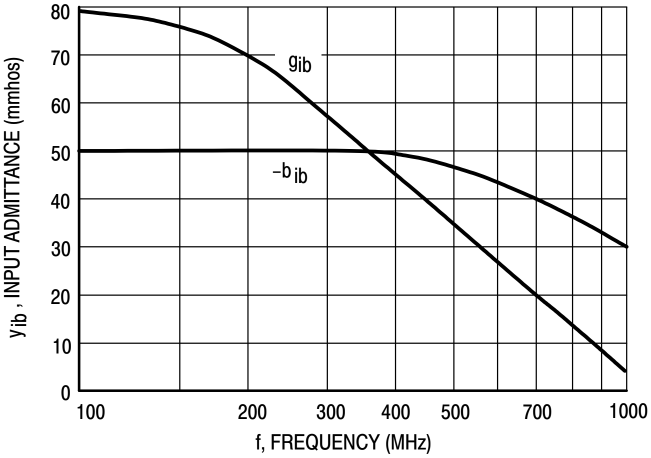


Figure 1. Rectangular Form

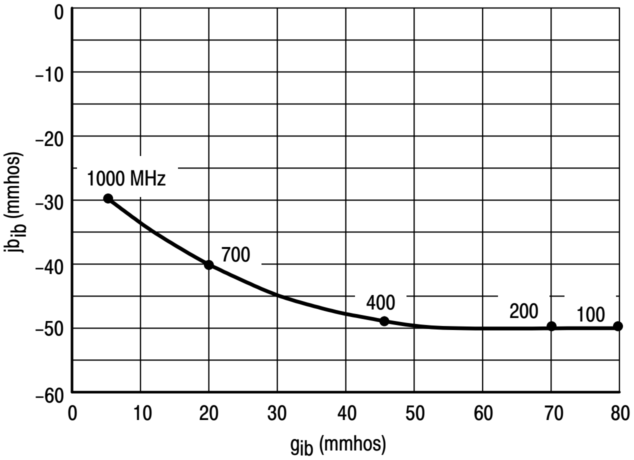


Figure 2. Polar Form

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

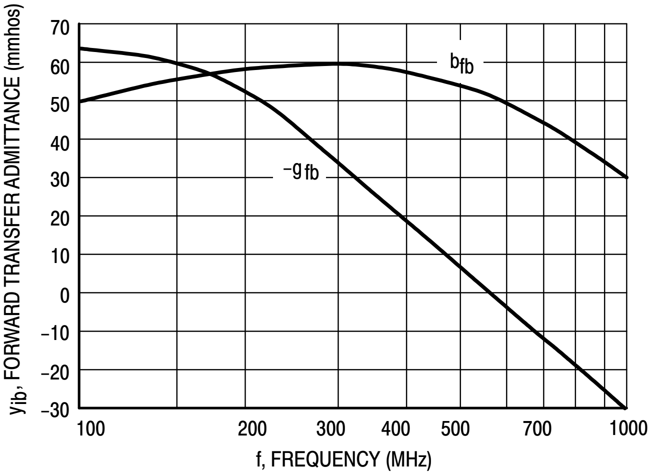


Figure 3. Rectangular Form

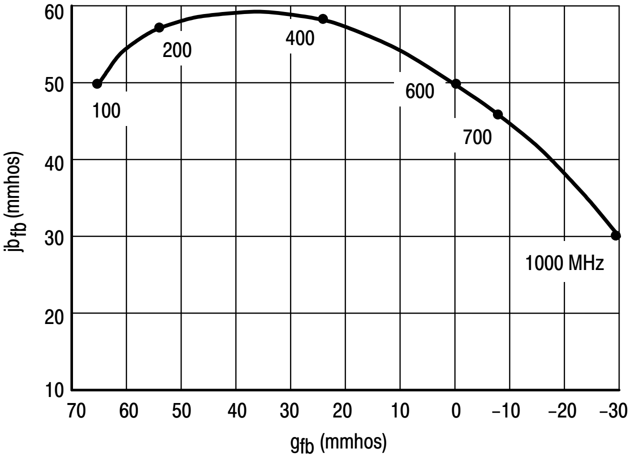


Figure 4. Polar Form

## TYPICAL CHARACTERISTICS

### COMMON−BASE y PARAMETERS versus FREQUENCY

($V_{CB}$ = 10 Vdc, $I_C$ = 4.0 mAdc, $T_A$ = 25°C)

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

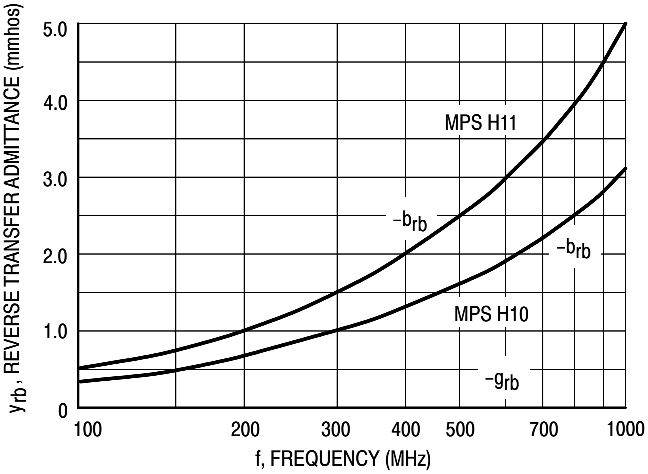


Figure 5. Rectangular Form

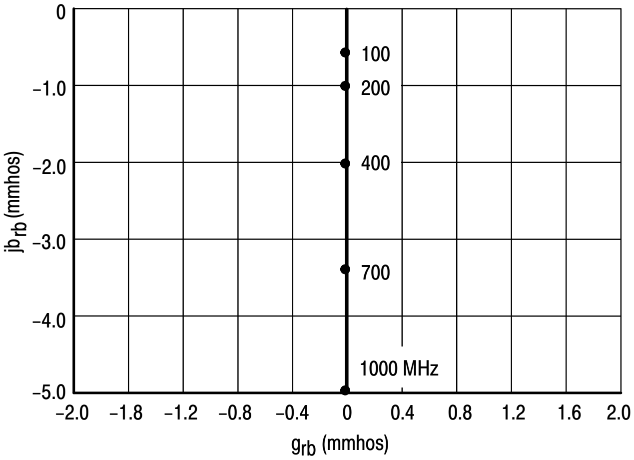


Figure 6. Polar Form

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

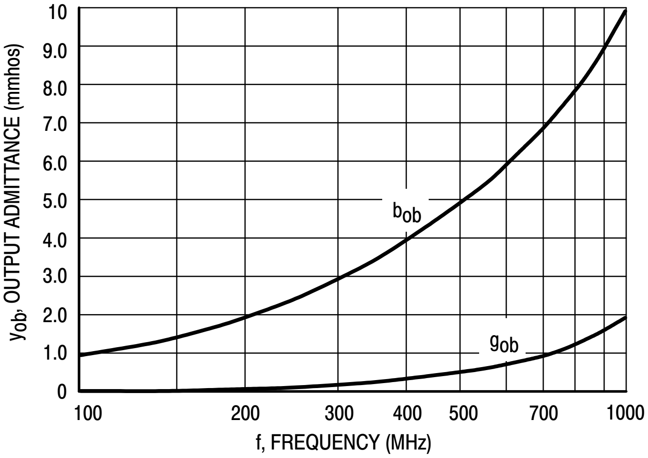


Figure 7. Rectangular Form

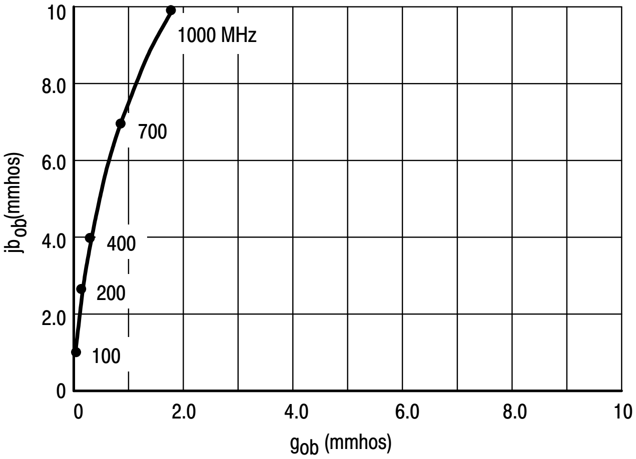
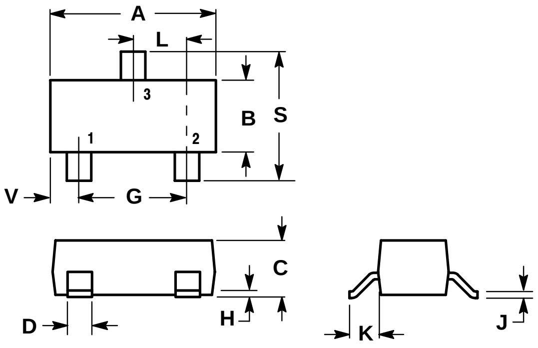


Figure 8. Polar Form

## PACKAGE DIMENSIONS

### SOT−23

(TO−236AB)
CASE 318−08
ISSUE AH



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. 318−03 AND −07 OBSOLETE, NEW STANDARD 318−08.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | 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 |

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

## SOLDERING FOOTPRINT*

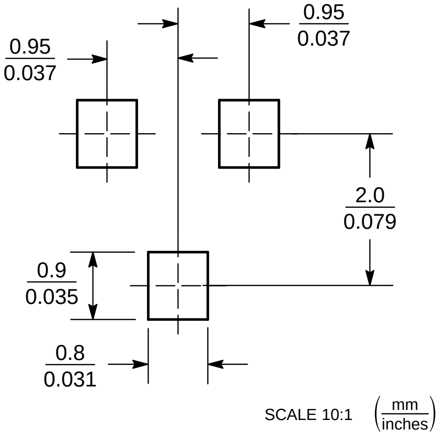


Figure 9. SOT−23

*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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