

# MMBT4124LT1

## General Purpose Transistor

### NPN Silicon

#### Features

- Pb-Free Package is Available

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	25	Vdc
Collector-Base Voltage	$V_{CBO}$	30	Vdc
Emitter-Base Voltage	$V_{EBO}$	5.0	Vdc
Collector Current - Continuous	$I_C$	200	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	W mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	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	W mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

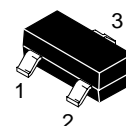
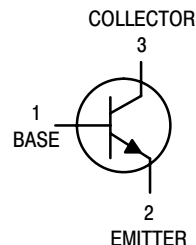
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

- FR-5 =  $1.0 \times 0.75 \times 0.062$  in.
- Alumina =  $0.4 \times 0.3 \times 0.024$  in. 99.5% alumina.



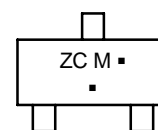
ON Semiconductor®

<http://onsemi.com>



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

#### MARKING DIAGRAM



ZC = 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
MMBT4124LT1	SOT-23	3000 / Tape & Reel
MMBT4124LT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel

# MMBT4124LT1

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Breakdown Voltage (Note 3) ( $I_C = 1.0\text{ mA}$ , $I_E = 0$ )	$V_{(BR)CEO}$	25	–	Vdc
Collector–Base Breakdown Voltage ( $I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ )	$V_{(BR)CBO}$	30	–	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 10\text{ }\mu\text{A}$ , $I_C = 0$ )	$V_{(BR)EBO}$	5.0	–	Vdc
Collector Cutoff Current ( $V_{CB} = 20\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	–	50	nAdc
Emitter Cutoff Current ( $V_{EB} = 3.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	50	nAdc

## ON CHARACTERISTICS

DC Current Gain (Note 3) ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 1.0\text{ Vdc}$ ) ( $I_C = 50\text{ mA}$ , $V_{CE} = 1.0\text{ Vdc}$ )	$h_{FE}$	120 60	360 –	–
Collector–Emitter Saturation Voltage (Note 3) ( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )	$V_{CE(sat)}$	–	0.3	Vdc
Base–Emitter Saturation Voltage (Note 3) ( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )	$V_{BE(sat)}$	–	0.95	Vdc

## SMALL-SIGNAL CHARACTERISTICS

Current–Gain – Bandwidth Product ( $I_C = 10\text{ mA}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	300	–	MHz
Input Capacitance ( $V_{EB} = 0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )	$C_{ibo}$	–	8.0	pF
Collector–Base Capacitance ( $I_E = 0$ , $V_{CB} = 5.0\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{cb}$	–	4.0	pF
Small–Signal Current Gain ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $R_S = 10\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ )	$h_{fe}$	120	480	–
Current Gain – High Frequency ( $I_C = 10\text{ mA}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 100\text{ MHz}$ ) ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ kHz}$ )	$ h_{fe} $	3.0 120	– 480	–
Noise Figure ( $I_C = 100\text{ }\mu\text{A}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 1.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ )	NF	–	5.0	dB

3. Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle = 2.0%.

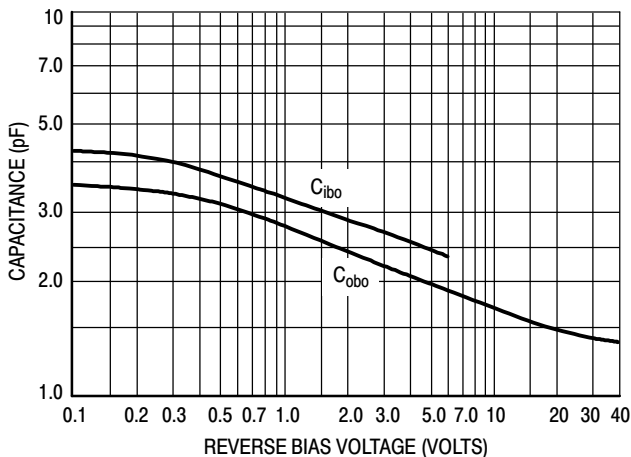


Figure 1. Capacitance

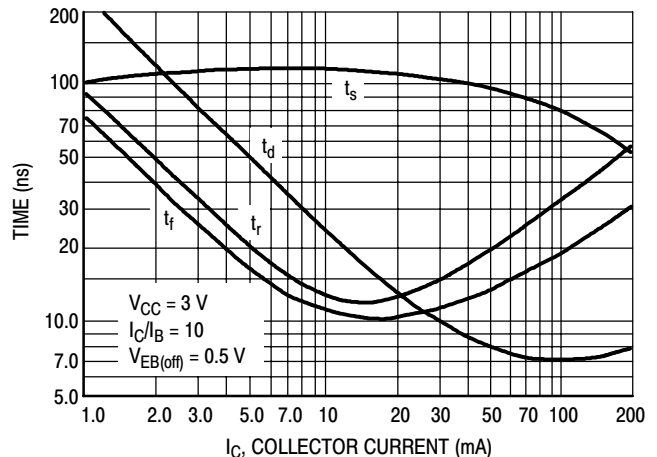


Figure 2. Switching Times

# MMBT4124LT1

## AUDIO SMALL-SIGNAL CHARACTERISTICS

### NOISE FIGURE

( $V_{CE} = 5 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ )

Bandwidth = 1.0 Hz

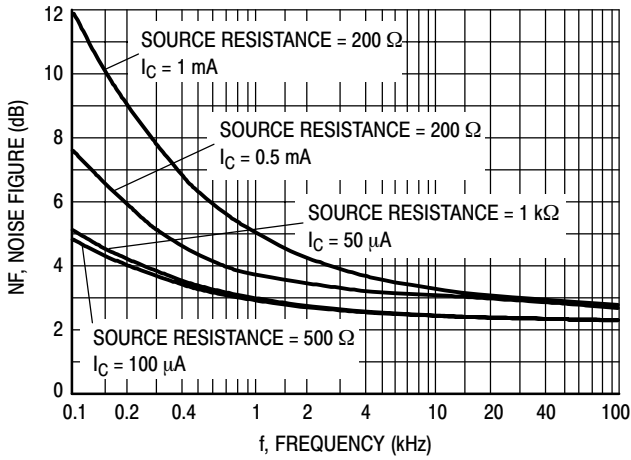


Figure 3. Frequency Variations

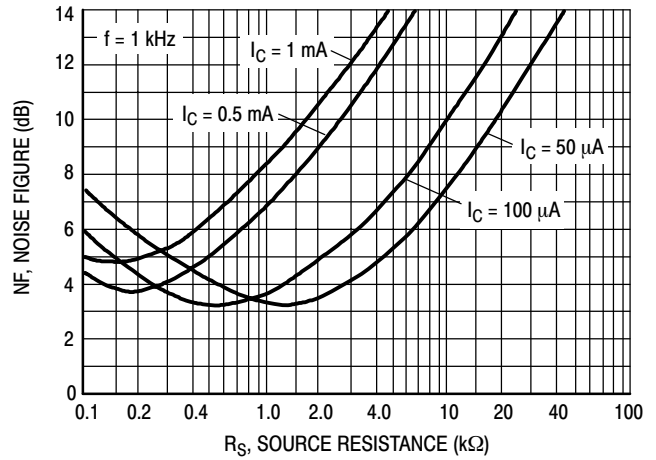


Figure 4. Source Resistance

### h PARAMETERS

( $V_{CE} = 10 \text{ V}$ ,  $f = 1 \text{ kHz}$ ,  $T_A = 25^\circ\text{C}$ )

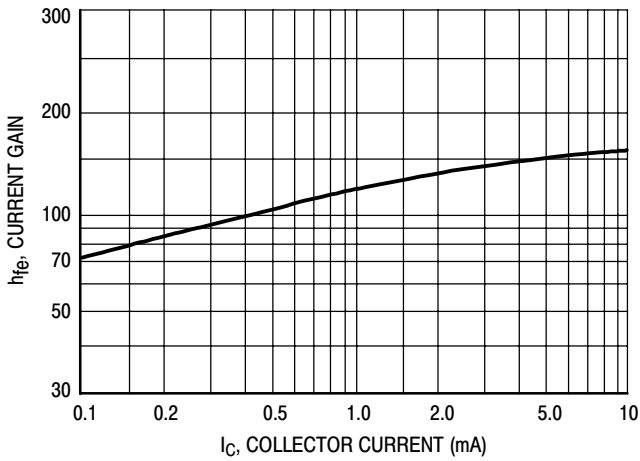


Figure 5. Current Gain

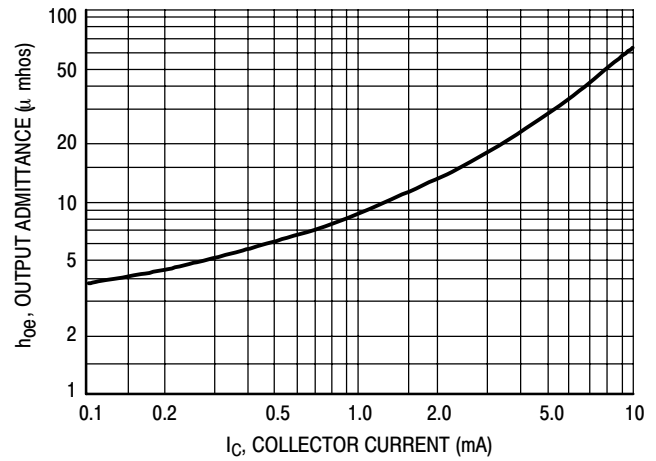


Figure 6. Output Admittance

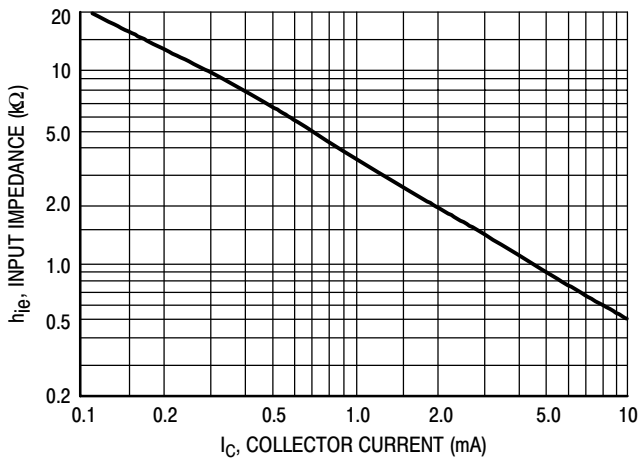


Figure 7. Input Impedance

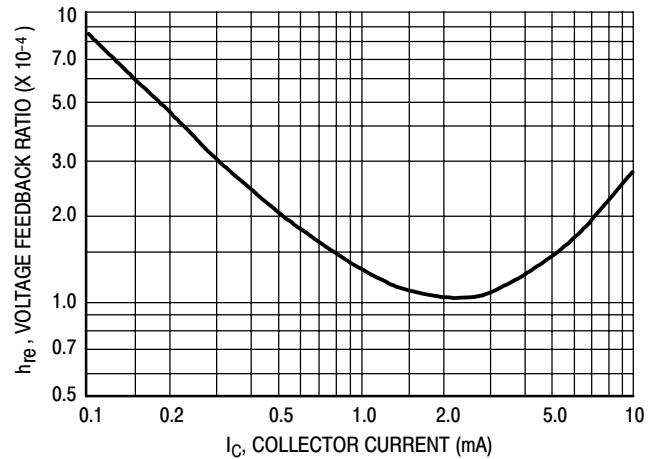


Figure 8. Voltage Feedback Ratio

# MMBT4124LT1

## STATIC CHARACTERISTICS

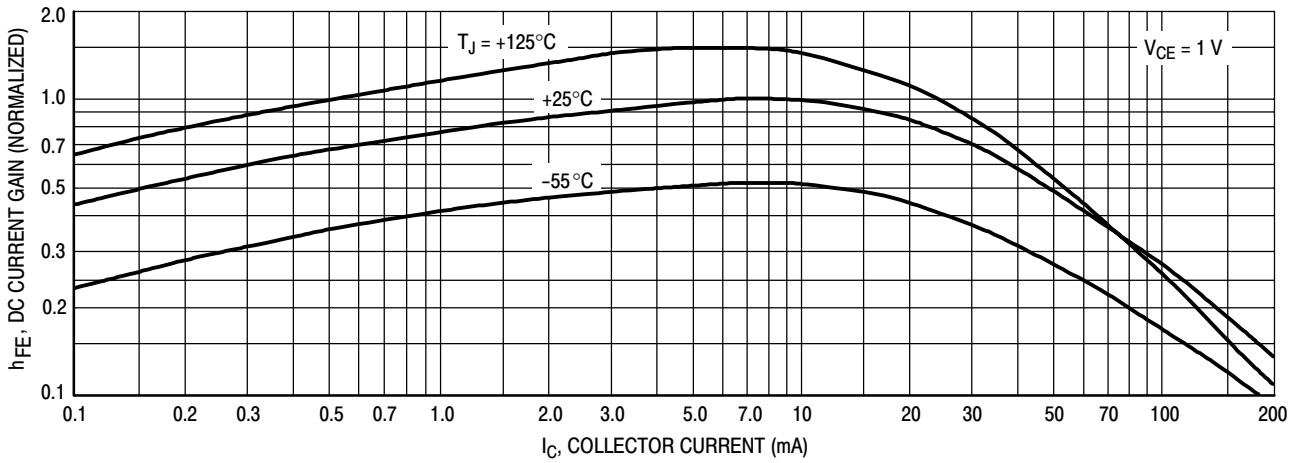


Figure 9. DC Current Gain

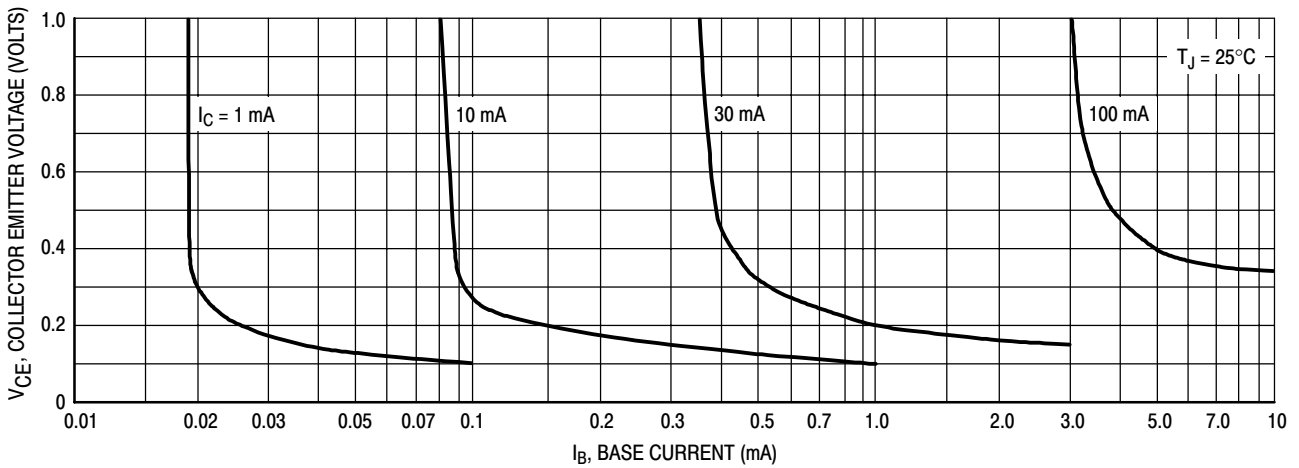


Figure 10. Collector Saturation Region

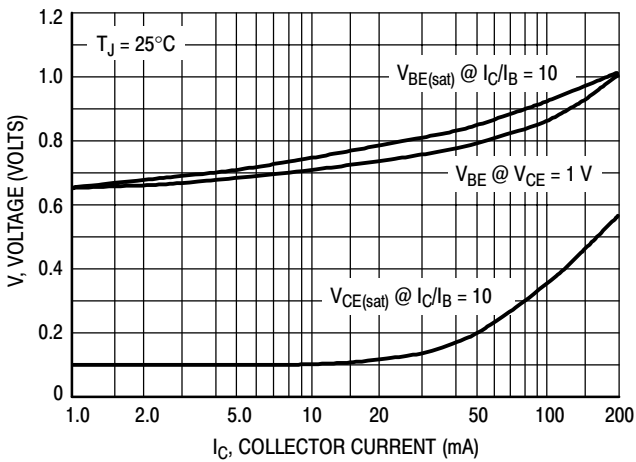


Figure 11. "On" Voltages

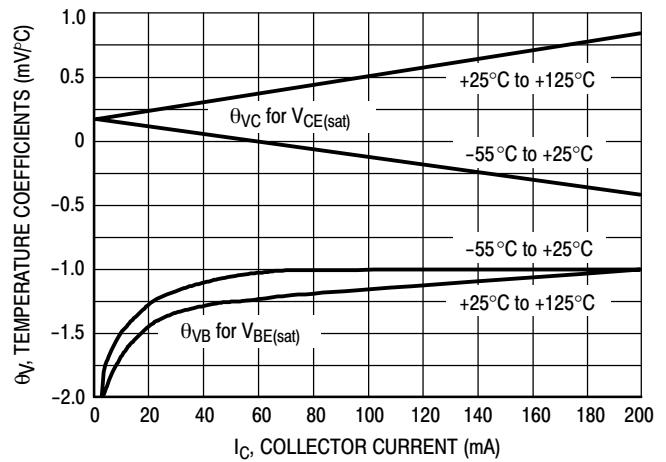
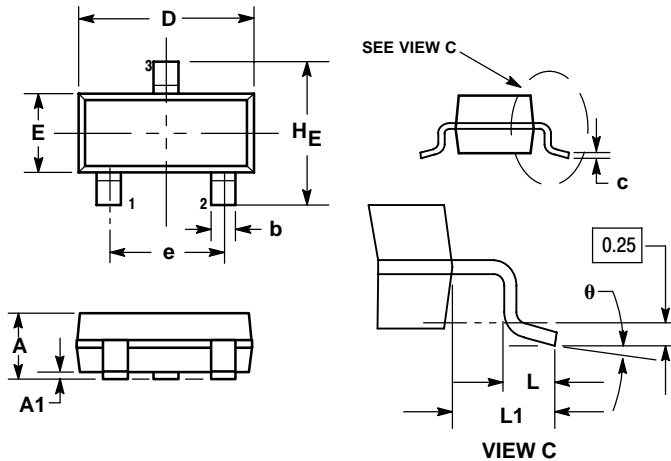


Figure 12. Temperature Coefficients

# MMBT4124LT1

## PACKAGE DIMENSIONS

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



NOTES:

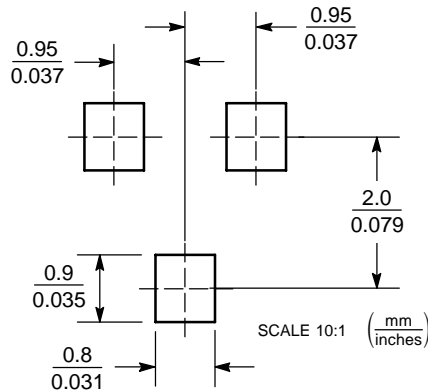
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

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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