

# MMBTA13LT1G, MMBTA14LT1G

## Darlington Amplifier Transistors

### NPN Silicon



ON Semiconductor®

<http://onsemi.com>

#### Features

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

#### MAXIMUM RATINGS

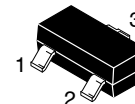
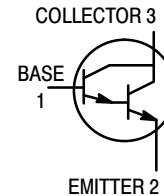
Rating	Symbol	Value	Unit
Collector - Emitter Voltage	$V_{CES}$	30	Vdc
Collector - Base Voltage	$V_{CBO}$	30	Vdc
Emitter - Base Voltage	$V_{EBO}$	10	Vdc
Collector Current - Continuous	$I_C$	300	mAdc

#### 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	$R_{\theta JA}$	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	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

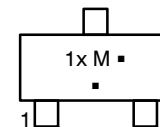
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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



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

#### MARKING DIAGRAM



1x = Device Code  
 x = M for MMBTA13LT1  
 x = N for MMBTA14LT1  
 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†
MMBTA13LT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
MMBTA14LT1G	SOT-23 (Pb-Free)	3,000 / 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.

# MMBTA13LT1G, MMBTA14LT1G

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector - Emitter Breakdown Voltage ( $I_C = 100 \mu\text{A}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	30	-	Vdc
Collector Cutoff Current ( $V_{CB} = 30 \text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	-	100	nAdc
Emitter Cutoff Current ( $V_{EB} = 10 \text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	-	100	nAdc
<b>ON CHARACTERISTICS (Note 3)</b>				
DC Current Gain ( $I_C = 10 \text{ mA}$ , $V_{CE} = 5.0 \text{ Vdc}$ )  ( $I_C = 100 \text{ mA}$ , $V_{CE} = 5.0 \text{ Vdc}$ )	MMBTA13 MMBTA14  MMBTA13 MMBTA14	$h_{FE}$	5000 10,000  10,000 20,000	- -  - -
Collector - Emitter Saturation Voltage ( $I_C = 100 \text{ mA}$ , $I_B = 0.1 \text{ mA}$ )	$V_{CE(sat)}$	-	1.5	Vdc
Base - Emitter On Voltage ( $I_C = 100 \text{ mA}$ , $V_{CE} = 5.0 \text{ Vdc}$ )	$V_{BE}$	-	2.0	Vdc
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current - Gain - Bandwidth Product (Note 4) ( $I_C = 10 \text{ mA}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $f = 100 \text{ MHz}$ )	$f_T$	125	-	MHz

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

4.  $f_T = |h_{fe}| \cdot f_{test}$ .

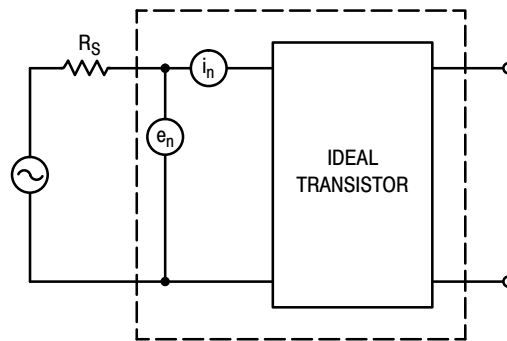


Figure 1. Transistor Noise Model

# MMBTA13LT1G, MMBTA14LT1G

## NOISE CHARACTERISTICS

( $V_{CE} = 5.0 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ )

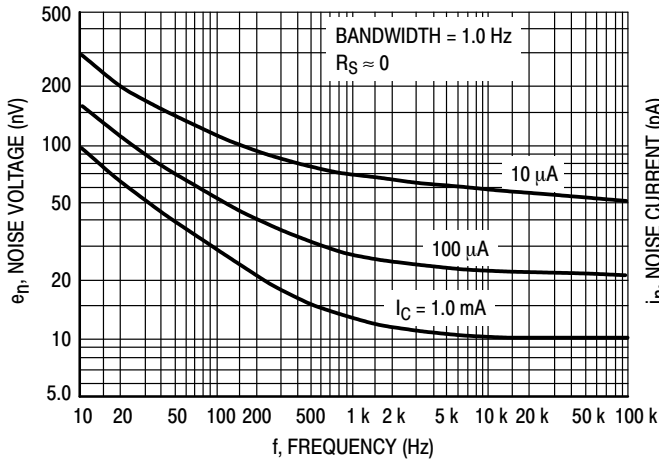


Figure 2. Noise Voltage

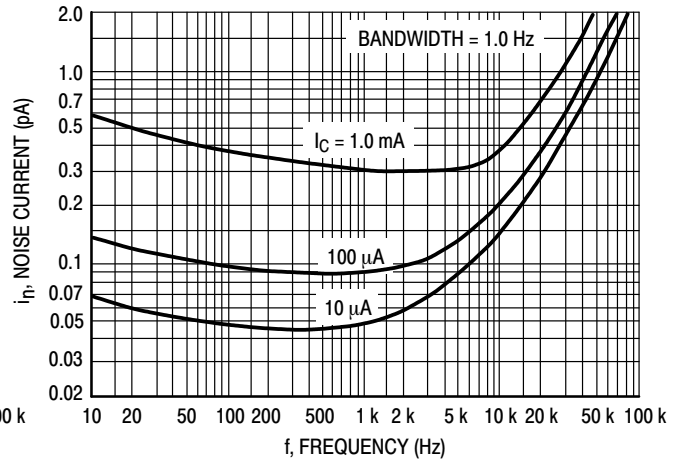


Figure 3. Noise Current

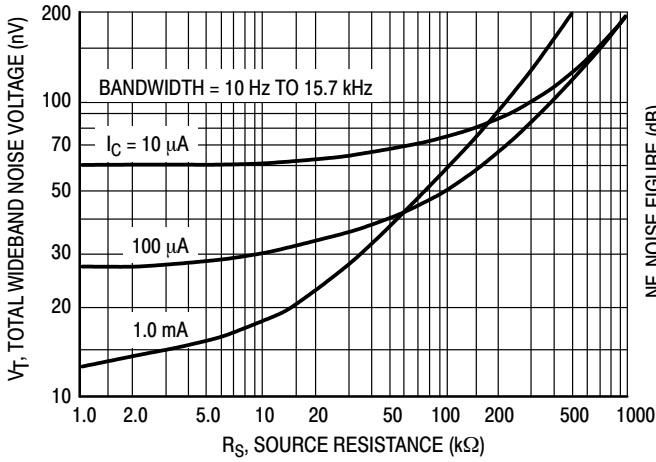


Figure 4. Total Wideband Noise Voltage

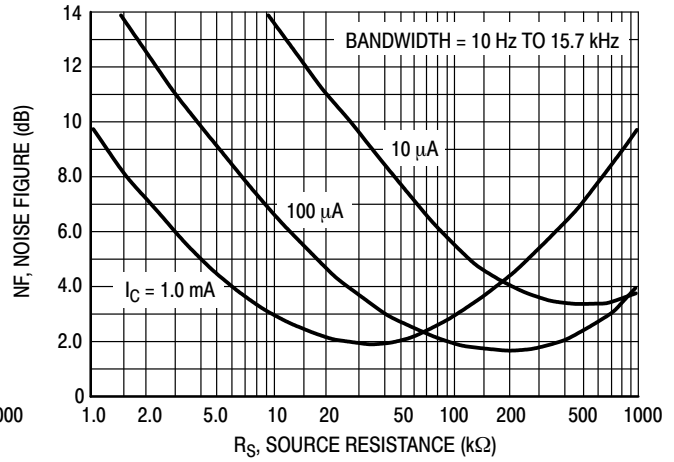


Figure 5. Wideband Noise Figure

# MMBTA13LT1G, MMBTA14LT1G

## SMALL-SIGNAL CHARACTERISTICS

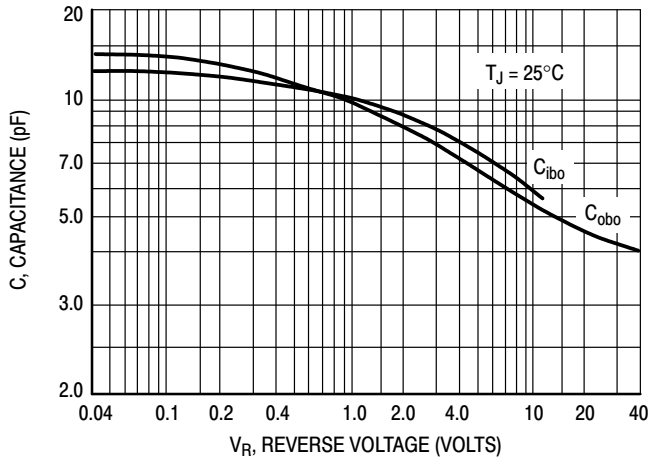


Figure 6. Capacitance

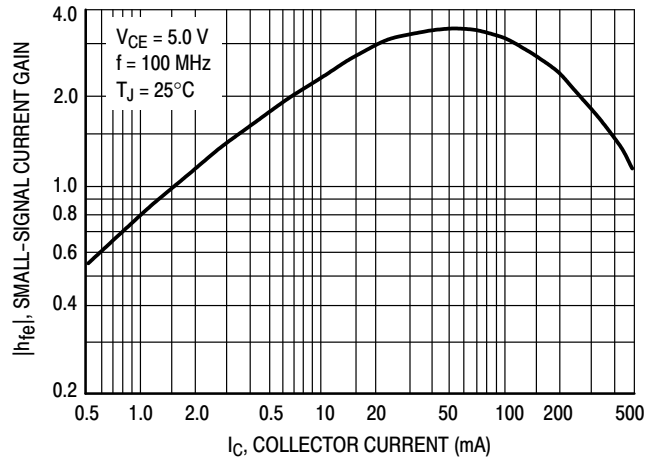


Figure 7. High Frequency Current Gain

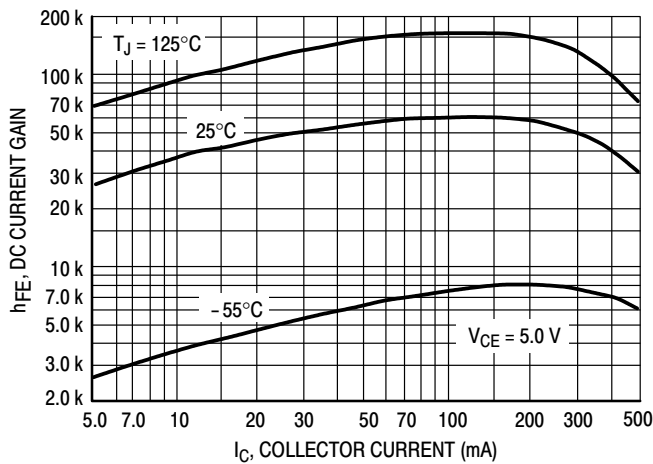


Figure 8. DC Current Gain

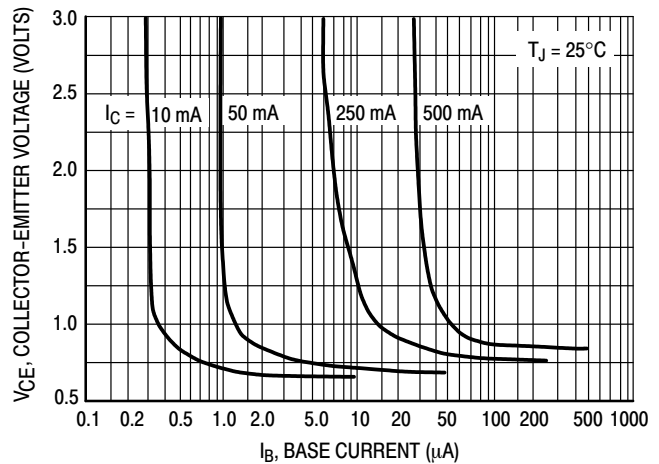


Figure 9. Collector Saturation Region

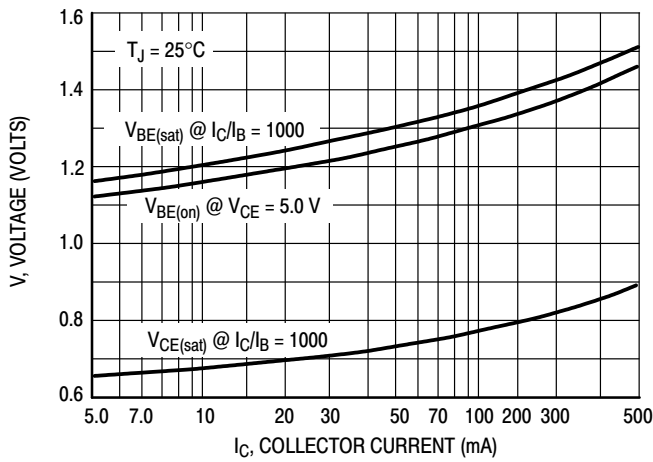


Figure 10. "On" Voltages

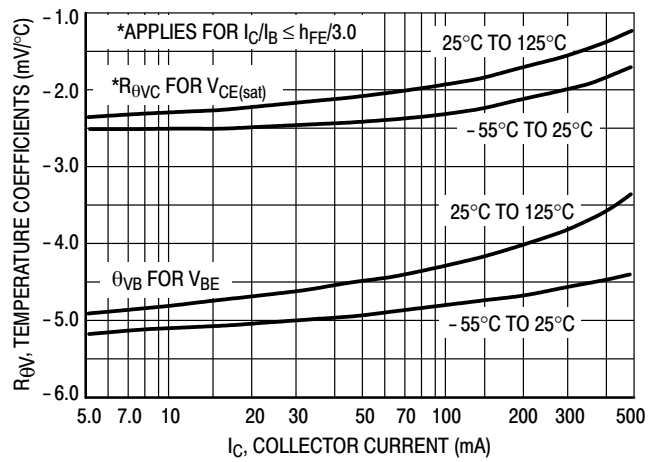


Figure 11. Temperature Coefficients

# MMBTA13LT1G, MMBTA14LT1G

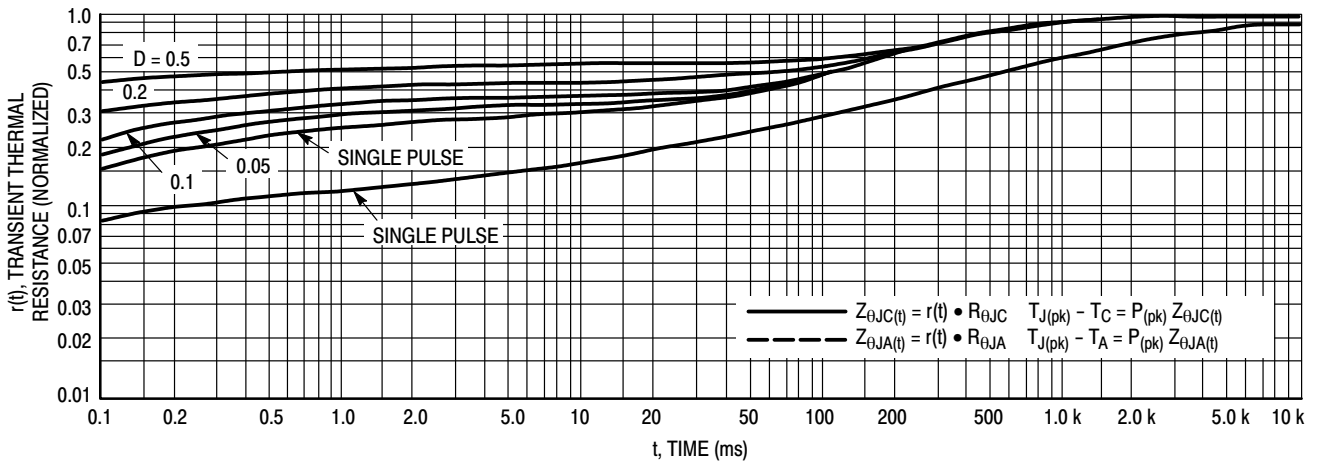


Figure 12. Thermal Response

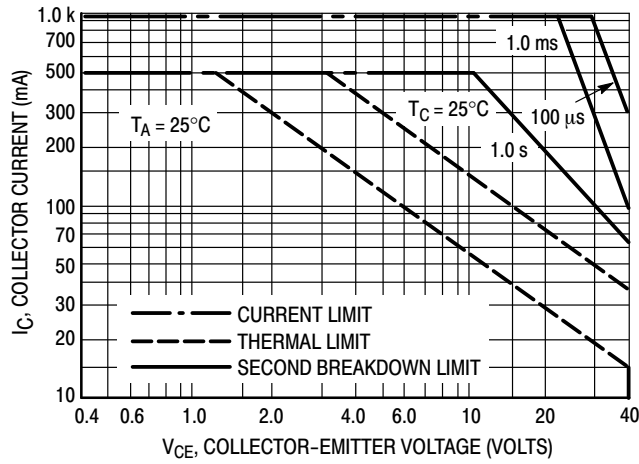


Figure 13. Active Region Safe Operating Area

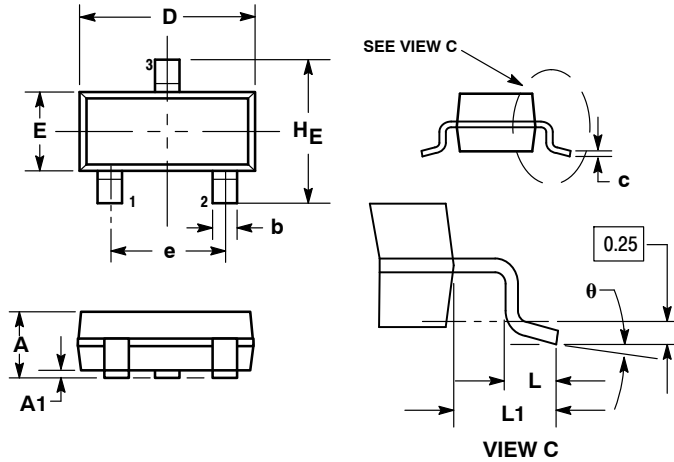


Design Note: Use of Transient Thermal Resistance Data

# MMBTA13LT1G, MMBTA14LT1G

## PACKAGE DIMENSIONS

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



NOTES:

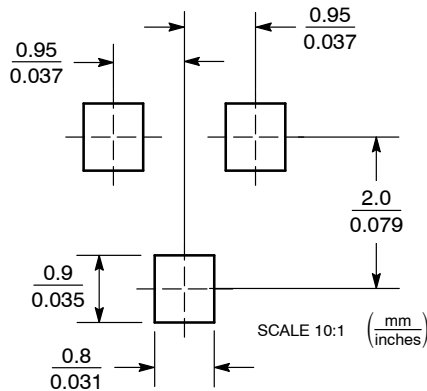
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

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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