

## Darlington Amplifier Transistors

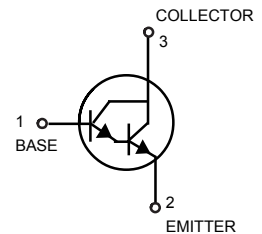
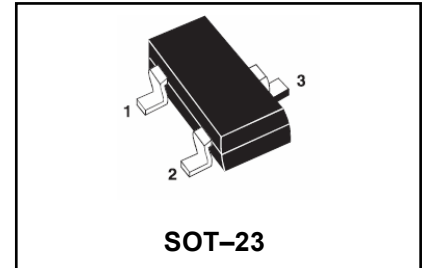
- We declare that the material of product compliance with RoHS requirements.  
**Pb-Free package is available**  
 RoHS product for packing code suffix "G"  
 Halogen free product for packing code suffix "H"

### ORDERING INFORMATION Moisture Sensitivity Level 1

Device	Marking	Shipping
MMBTA13LT1	1M	3000/Tape & Reel
MMBTA14LT1	1N	3000/Tape & Reel

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

### DEVICE MARKING

MMBTA13LT1 = 1M; MMBTA14LT1 = 1N;

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

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ( $I_C = 100 \mu\text{Adc}, V_{BE} = 0$ )	$V_{(BR)CEO}$	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

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

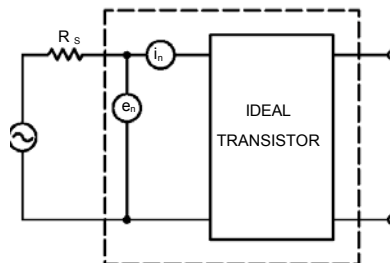
Characteristic	Symbol	Min	Max	Unit
<b>ON CHARACTERISTICS (3)</b>				
DC Current Gain ( $I_C = 10\text{ mAdc}, V_{CE} = 5.0\text{ Vdc}$ )	$h_{FE}$	5,000	—	—
	MMBTA13	5,000	—	—
	MMBTA14	10,000	—	—
( $I_C = 100\text{ mAdc}, V_{CE} = 5.0\text{ Vdc}$ )	MMBTA13	10,000	—	—
	MMBTA14	20,000	—	—
Collector–Emitter Saturation Voltage ( $I_C = 100\text{ mAdc}, I_B = 0.1\text{ mAdc}$ )	$V_{CE(sat)}$	—	1.5	Vdc
Base–Emitter On Voltage ( $I_C = 100\text{ mAdc}, V_{CE} = 5.0\text{ Vdc}$ )	$V_{BE}$	—	2.0	Vdc

**SMALL-SIGNAL CHARACTERISTICS**

Current – Gain–Bandwidth Product(4) ( $V_{CE} = 5.0\text{ Vdc}, I_C = 10\text{ mAdc}, f = 100\text{ MHz}$ )	$f_T$	125	—	MHz
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3. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

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

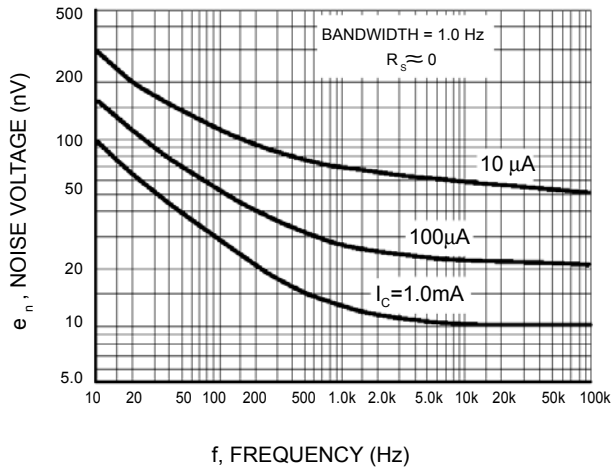


**Figure 1. Transistor Noise Model**

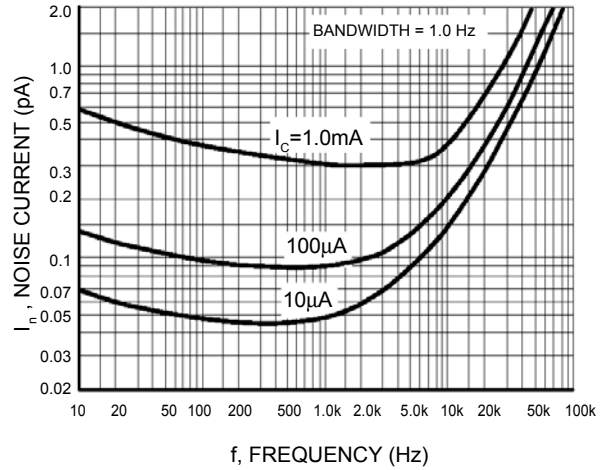
**Darlington Amplifier Transistors**

**NOISE CHARACTERISTICS**

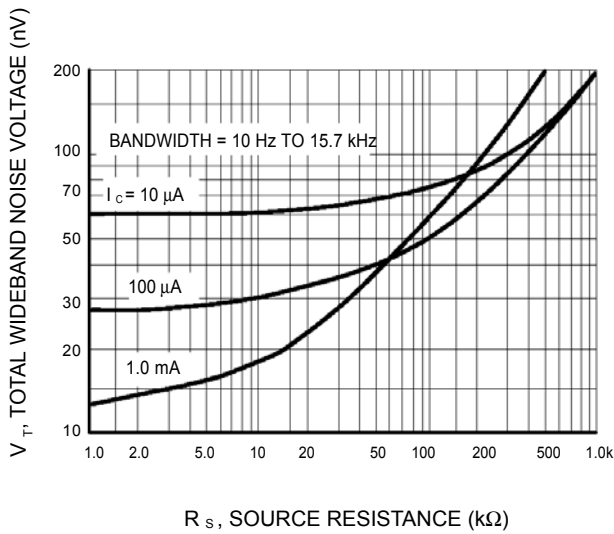
( $V_{CE} = 5.0 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ )



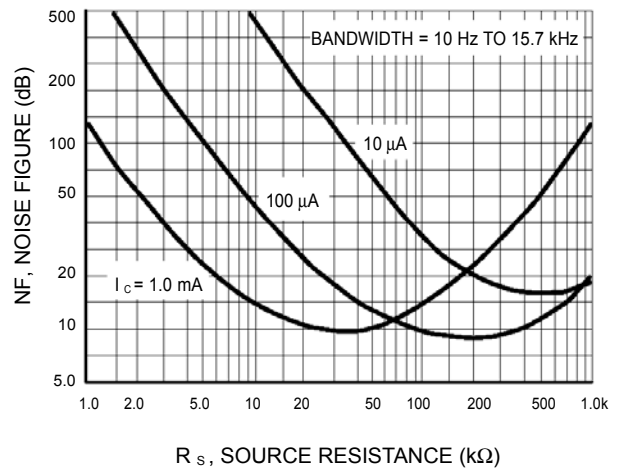
**Figure 2. Noise Voltage**



**Figure 3. Noise Current**



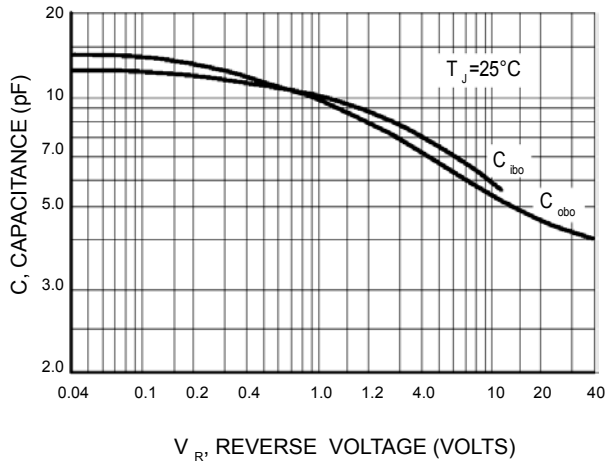
**Figure 4. Total Wideband Noise Voltage**



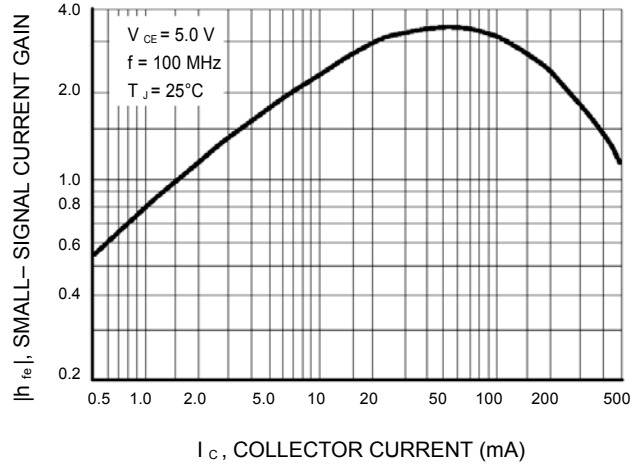
**Figure 5. Wideband Noise Figure**

# Darlington Amplifier Transistors

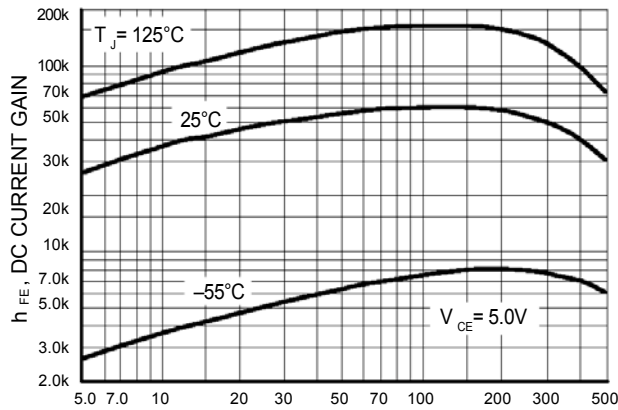
## SMALL-SIGNAL CHARACTERISTICS



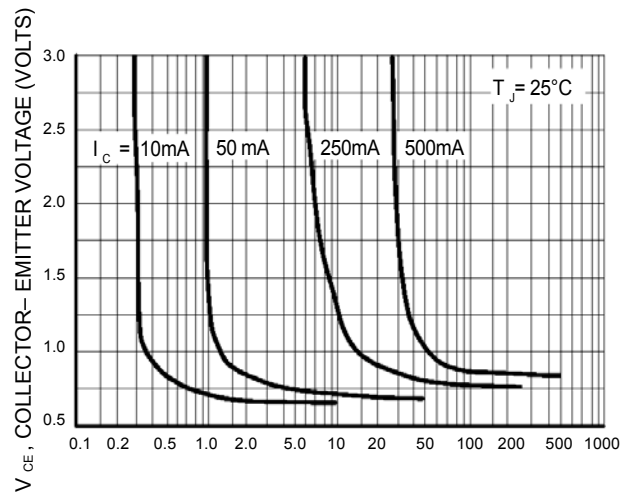
$V_{R1}$ , REVERSE VOLTAGE (VOLTS)  
Figure 6. Capacitance



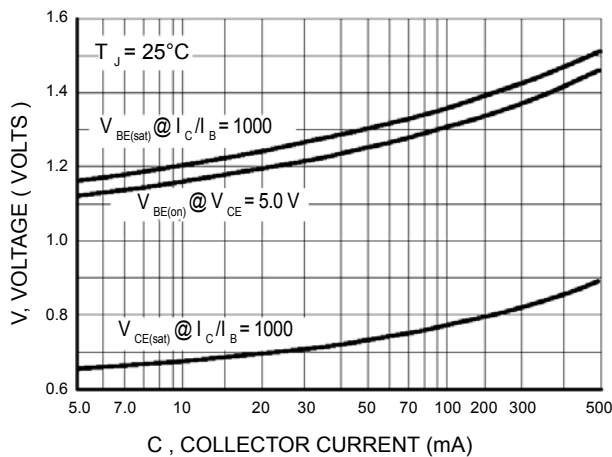
$I_C$ , COLLECTOR CURRENT (mA)  
Figure 7. High Frequency Current Gain



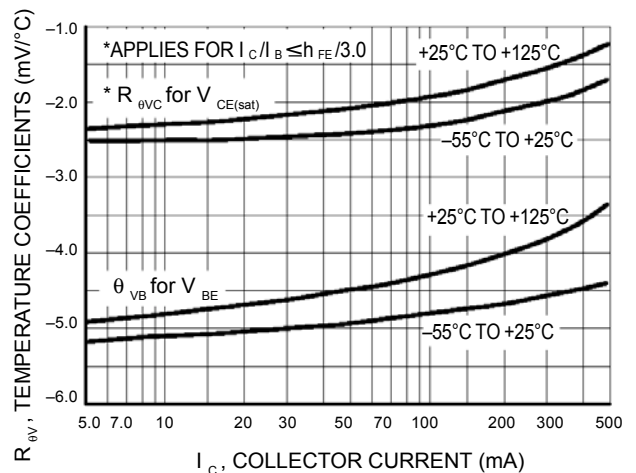
$I_C$ , COLLECTOR CURRENT (mA)  
Figure 8. DC Current Gain



$I_B$ , BASE CURRENT ( $\mu\text{A}$ )  
Figure 9. Collector Saturation Region

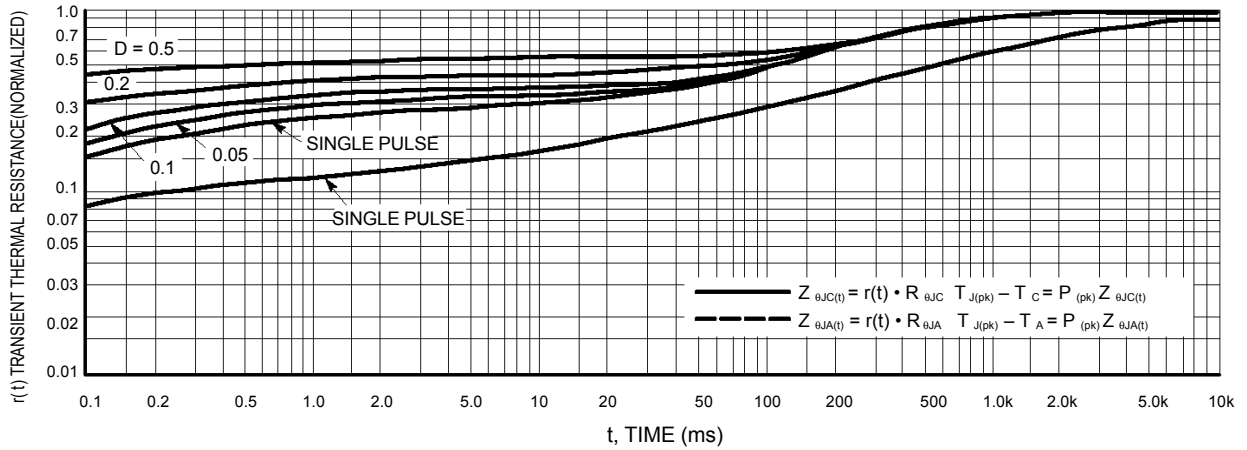


$I_C$ , COLLECTOR CURRENT (mA)  
Figure 17. "ON" Voltages

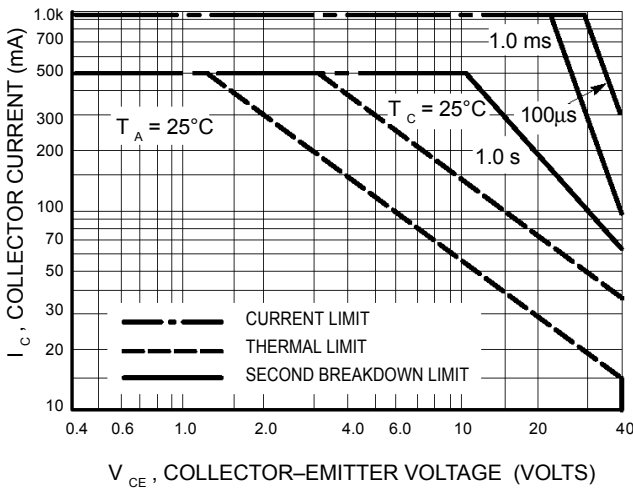


$I_C$ , COLLECTOR CURRENT (mA)  
Figure 18. Temperature Coefficients

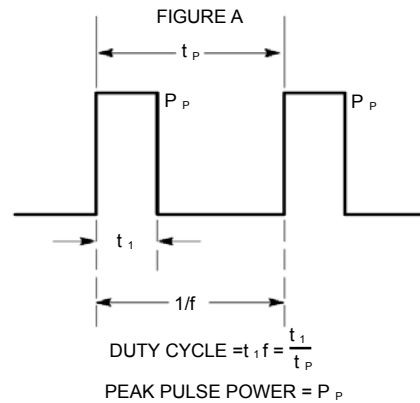
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**Figure 12. Thermal Response**



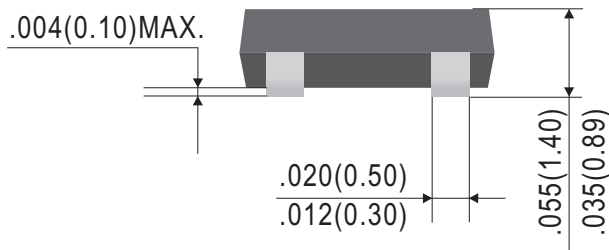
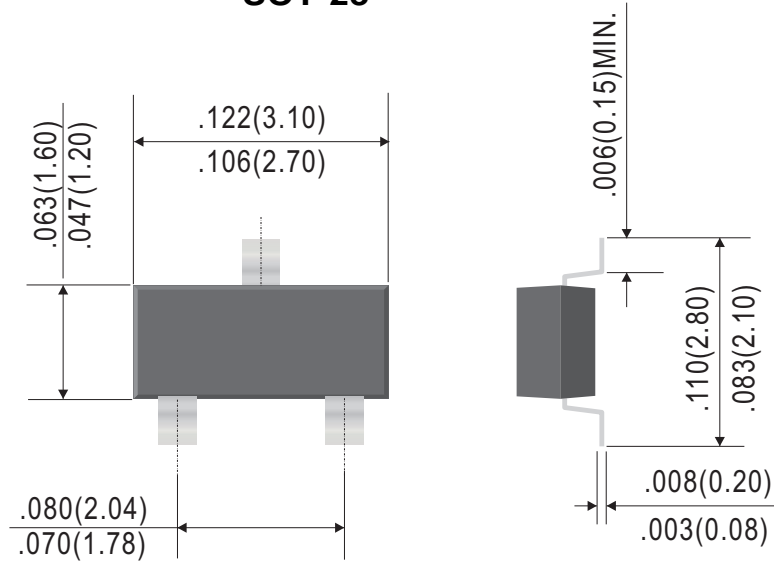
**Figure 13. Active Region Safe Operating Area**



**Design Note: Use of Transient Thermal Resistance Data**

**Darlington Amplifier Transistors**

**SOT-23**



Dimensions in inches and (millimeters)

## Darlington Amplifier Transistors

### Ordering Information:

Device PN	Packing
Part Number G <sup>(1)</sup> -WS	Tape&Reel: 3 Kpcs/Reel

Note: (1) RoHS product for packing code suffix "G" ; Halogen free product for packing code suffix "H"

### **\*\*\*Disclaimer\*\*\***

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