

Darlington Amplifier Transistors

- We declare that the material of product compliance with RoHS requirements.
- S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

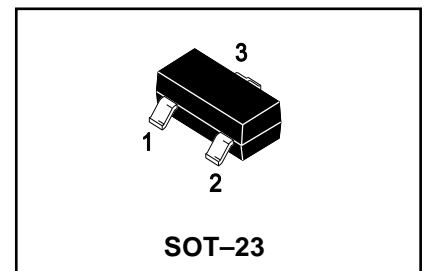
ORDERING INFORMATION

Device	Marking	Shipping
(S-)MBTA13	1M	3000/Tape & Reel
(S-)MBTA14	1N	3000/Tape & Reel

**MBTA13
MBTA14
S-MBTA13
S-MBTA14**

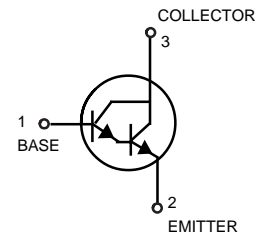
MAXIMUM RATINGS

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, $T_A = 25^\circ\text{C}$	P_D	225	mW
Derate above 25°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, $T_A = 25^\circ\text{C}$	P_D	300	mW
Derate above 25°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_{stg}	–55 to +150	$^\circ\text{C}$



DEVICE MARKING

(S-)MBTA13 = 1M; (S-)MBTA14 = 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 = $1.0 \times 0.75 \times 0.062$ in.
2. Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.



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

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS (3)				
DC Current Gain ($I_C = 10\text{ mAdc}, V_{CE} = 5.0\text{ Vdc}$)	h_{FE}			—
	MBTA13	5,000	—	
	MBTA14	10,000	—	
($I_C = 100\text{ mAdc}, V_{CE} = 5.0\text{ Vdc}$)	MBTA13	10,000	—	
	MBTA14	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. $f_T = |h_{fe}| * f_{test}$.

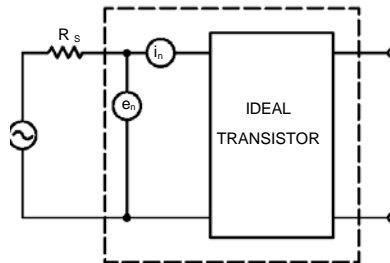


Figure 1. Transistor Noise Model



NOISE CHARACTERISTICS

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

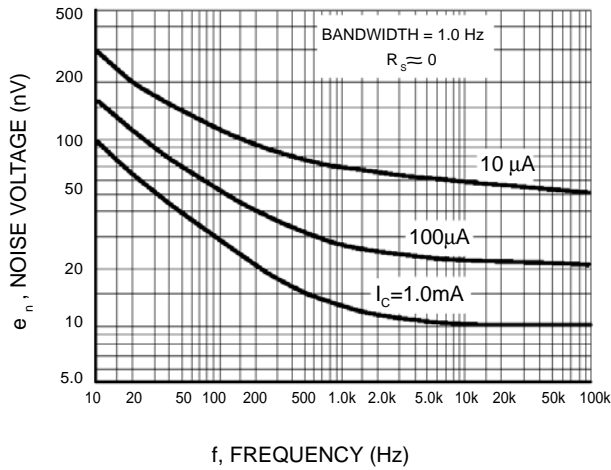


Figure 2. Noise Voltage

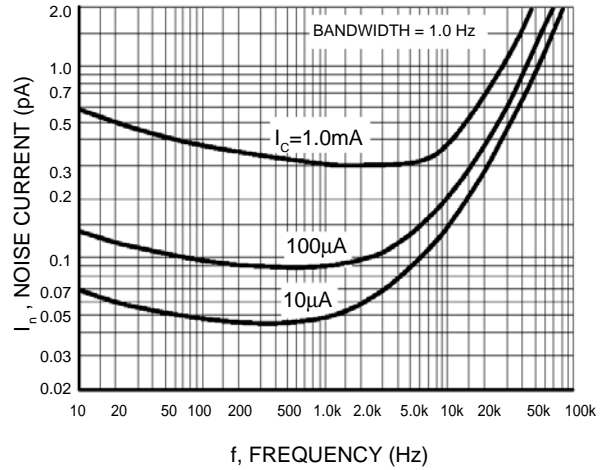


Figure 3. Noise Current

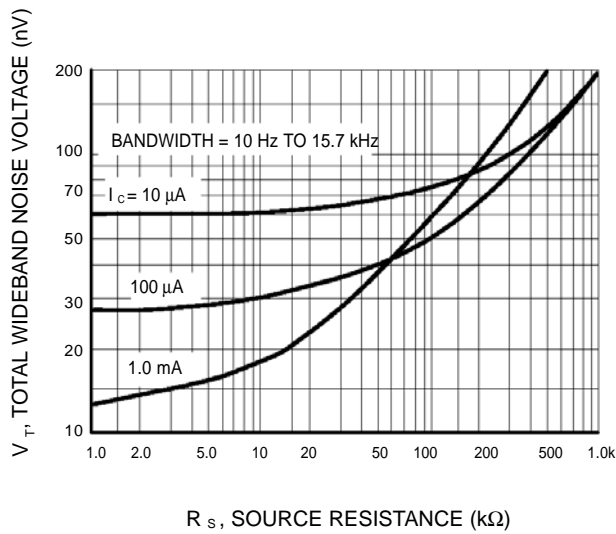


Figure 4. Total Wideband Noise Voltage

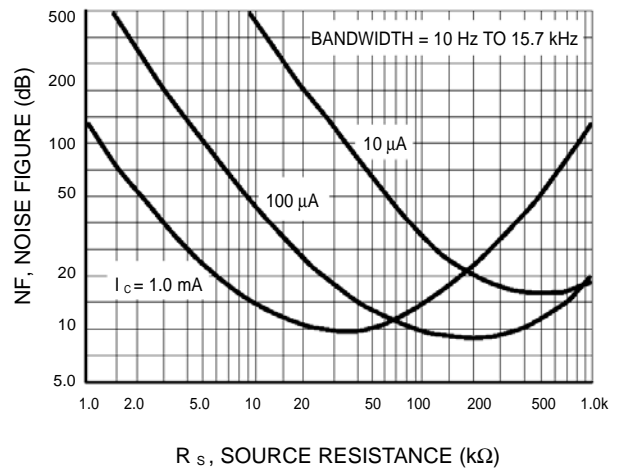
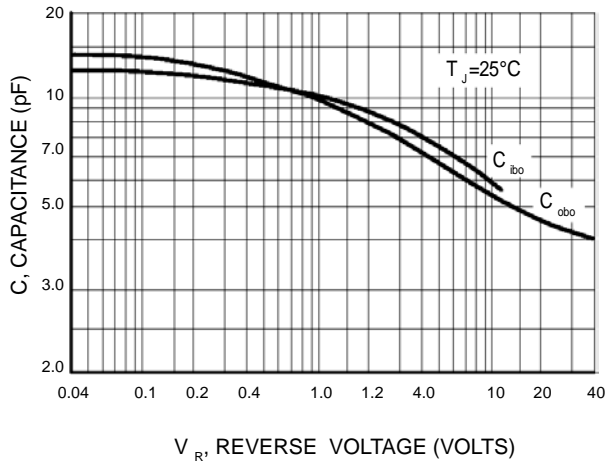


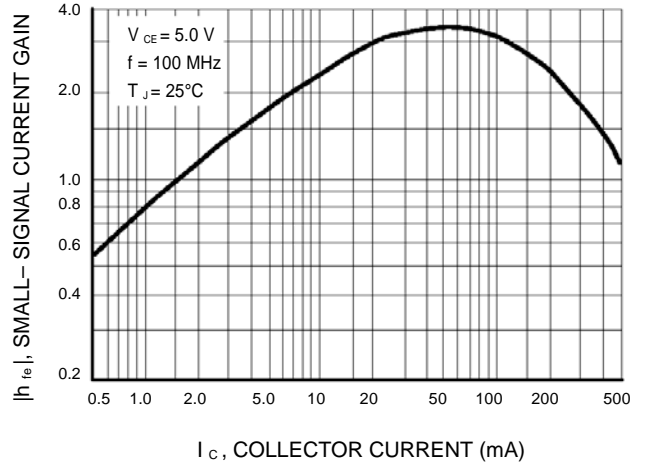
Figure 5. Wideband Noise Figure



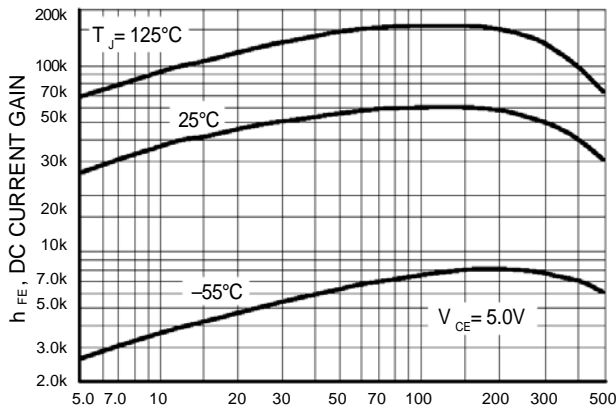
SMALL-SIGNAL CHARACTERISTICS



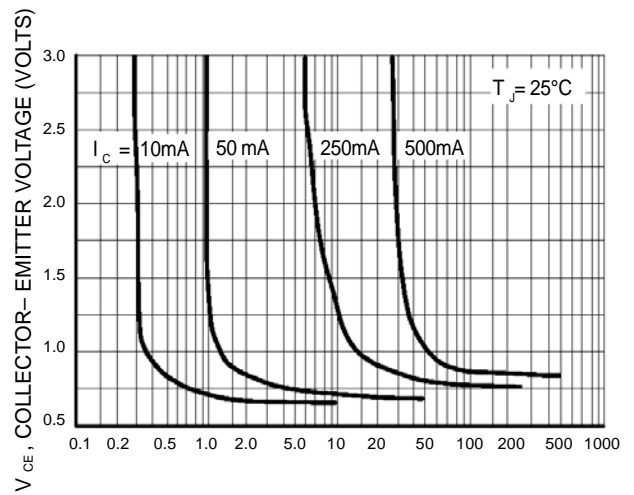
V_{R1} , REVERSE VOLTAGE (VOLTS)
Figure 6. Capacitance



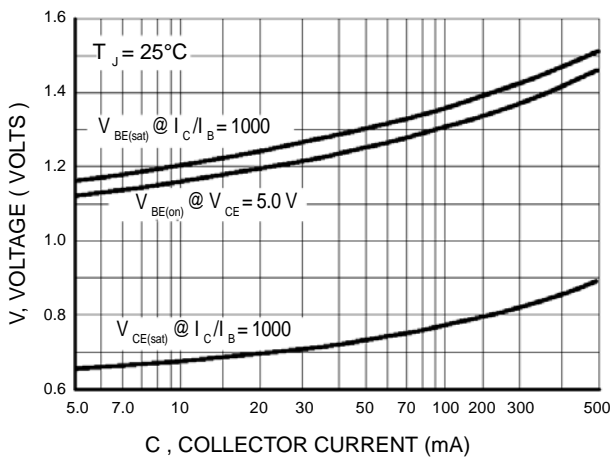
I_C , COLLECTOR CURRENT (mA)
Figure 7. High Frequency Current Gain



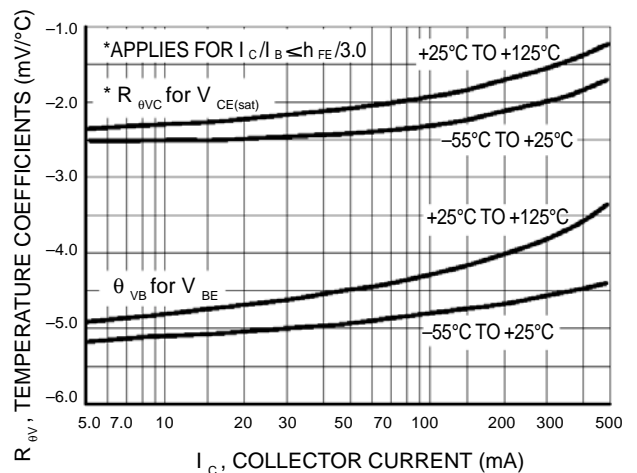
I_C , COLLECTOR CURRENT (mA)
Figure 8. DC Current Gain



I_B , BASE CURRENT (μA)
Figure 9. Collector Saturation Region



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



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



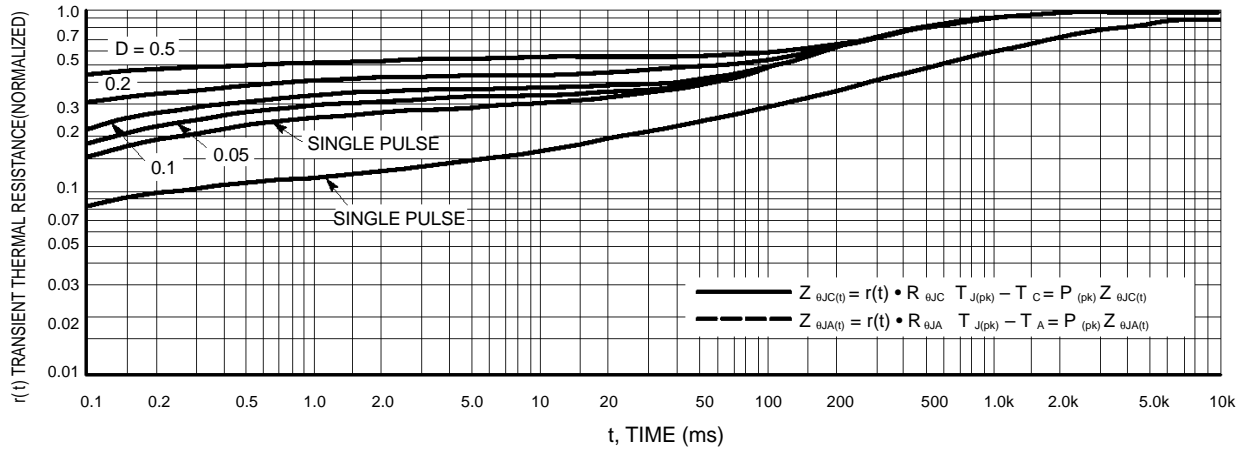


Figure 12. Thermal Response

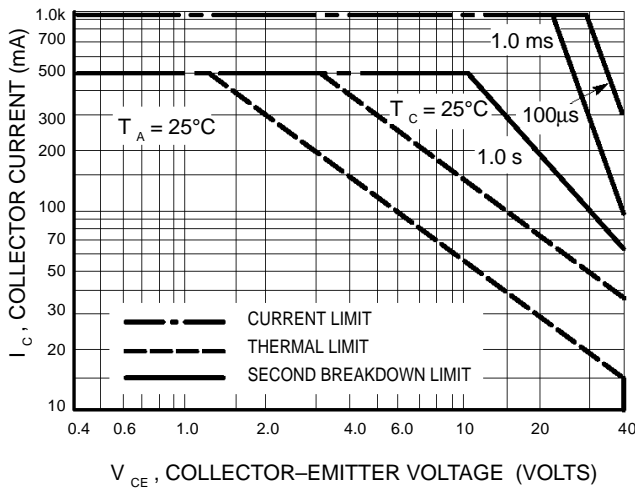
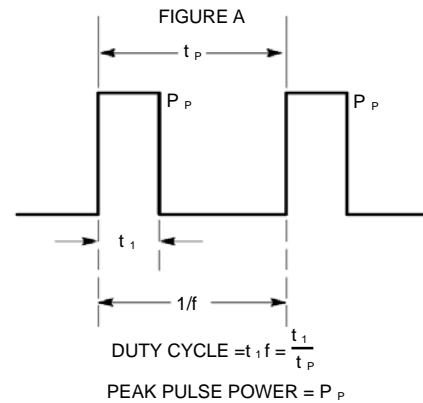


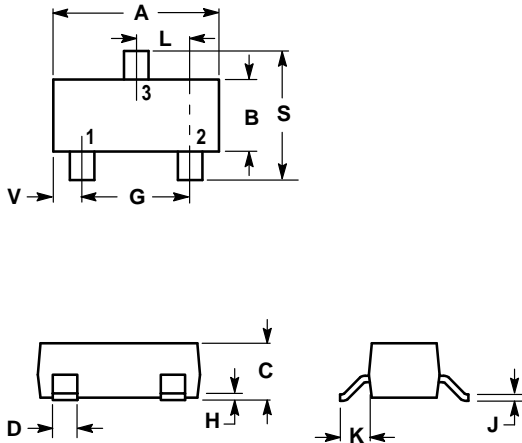
Figure 13. Active Region Safe Operating Area



Design Note: Use of Transient Thermal Resistance Data



SOT-23


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	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

- PIN 1. BASE
 2. EMITTER
 3. COLLECTOR

