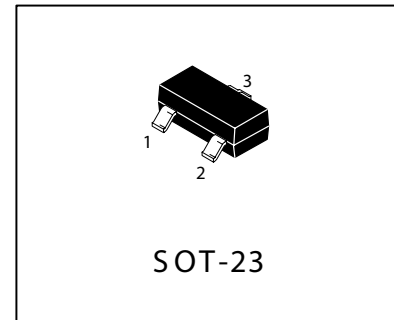
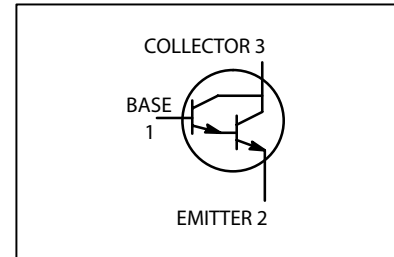


NPN Transistors Darlington Amplifier

 Lead(Pb)-Free



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⁾ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	225	mW
		1.8	$\text{mW}/^\circ\text{C}$
Thermal Resistance Junction to Ambient	R_{JA}	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate, ⁽²⁾ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	300	mW
		2.4	$\text{mW}/^\circ\text{C}$
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

MMBTA13 = 1M; MMBTA14LT1 = 1N

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

Characteristic	Symbol	Min	Max	Unit
----------------	--------	-----	-----	------

OFF CHARACTERISTICS

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

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 ($I_C = 10\text{ mAdc}$, $V_{CE} = 5.0\text{ Vdc}$)	MMBTA13	5000	-	-
	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) ($I_C = 10\text{ mAdc}$, $V_{CE} = 5.0\text{ Vdc}$, $f = 100\text{ MHz}$)	f_T	125	-	MHz
--	-------	-----	---	-----

- Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.
- $f_T = |h_{fe}| \cdot f_{test}$

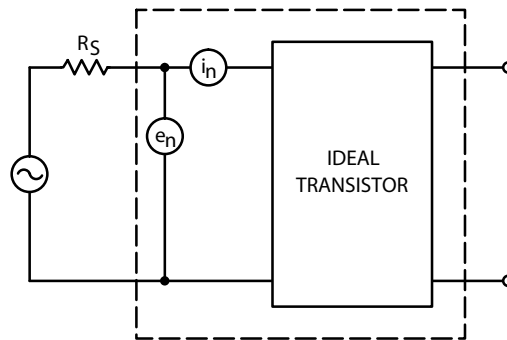


FIG.1. Transistor Noise Model

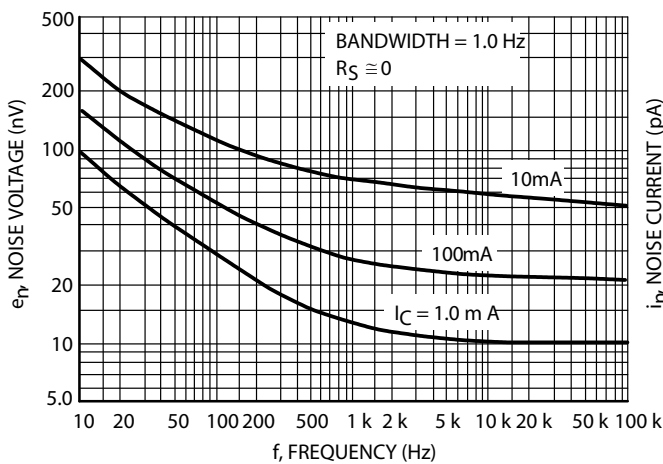


FIG.2 Noise Voltage

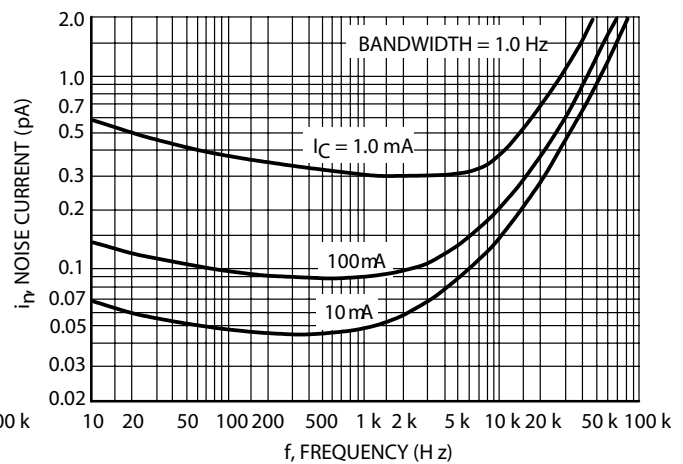


FIG.3 Noise Current

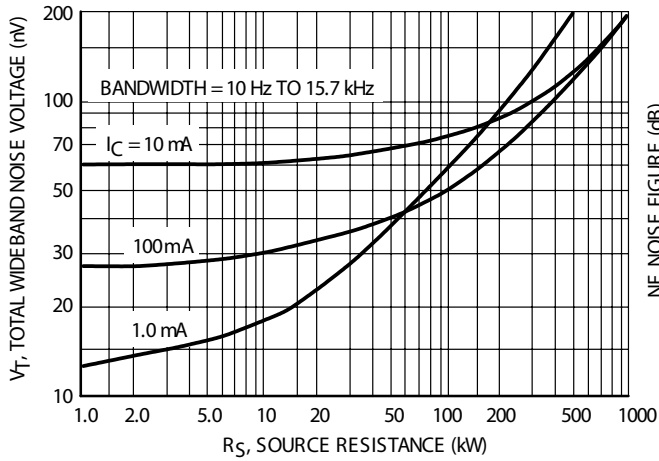


FIG.4 Total Wideband Noise Voltage

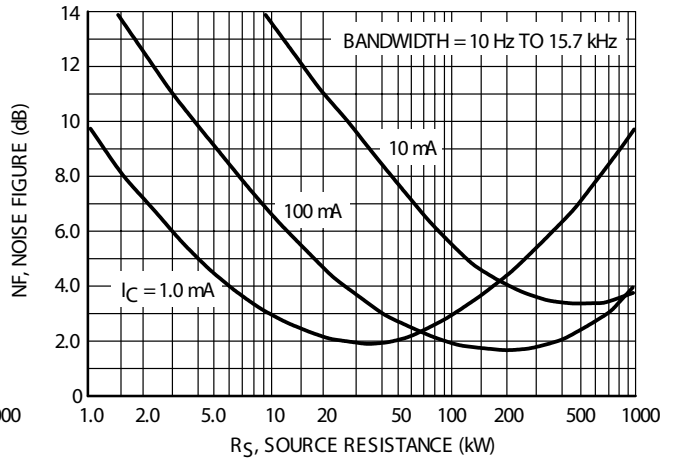


FIG.5 Wideband Noise Figure

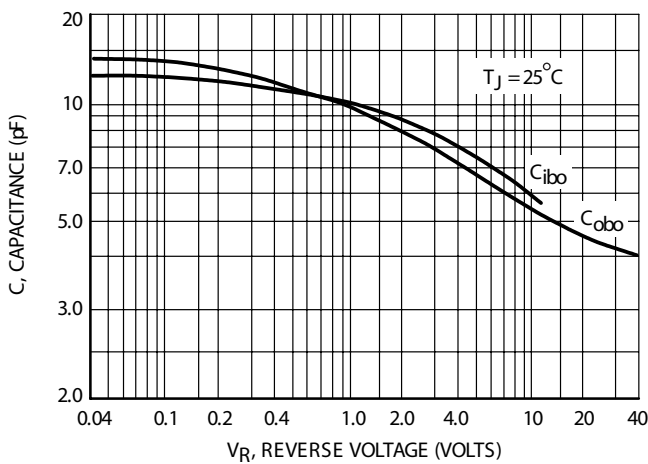


FIG.6 Capacitance

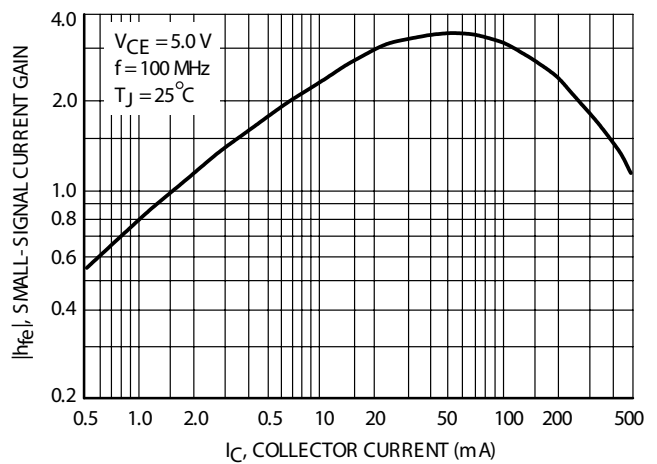


FIG.7 High Frequency Current Gain

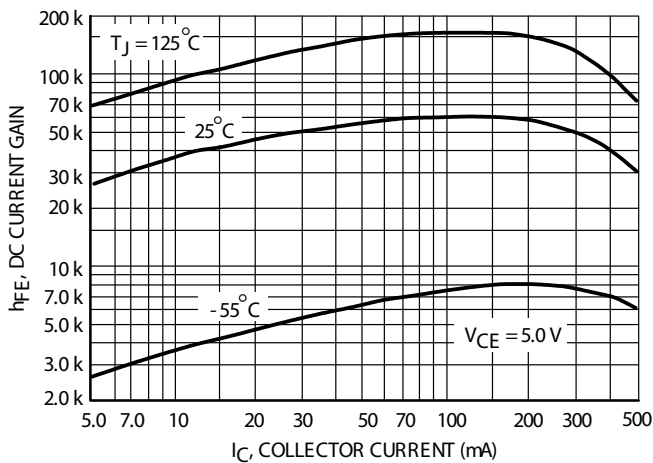


FIG.8 DC Current Gain

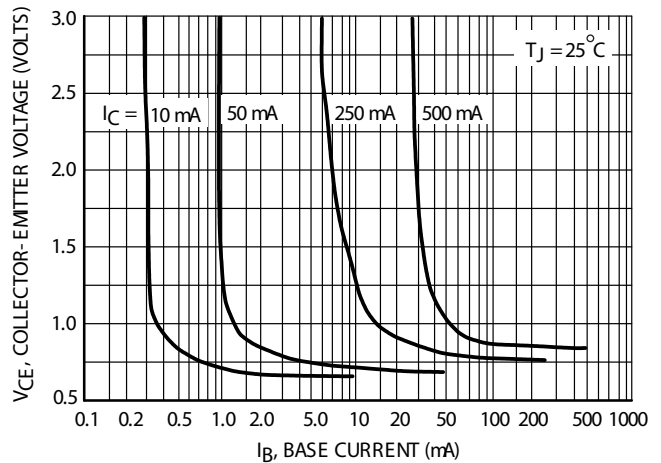


FIG.9 Collector Saturation Region

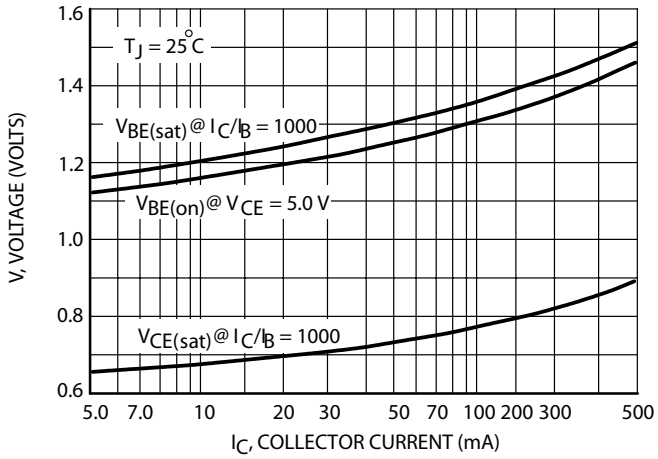


FIG.10. "On" Voltages

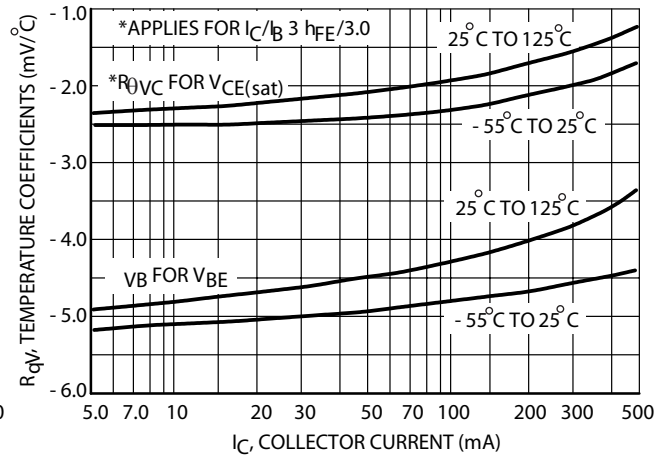


FIG.11 Temperature Coefficients

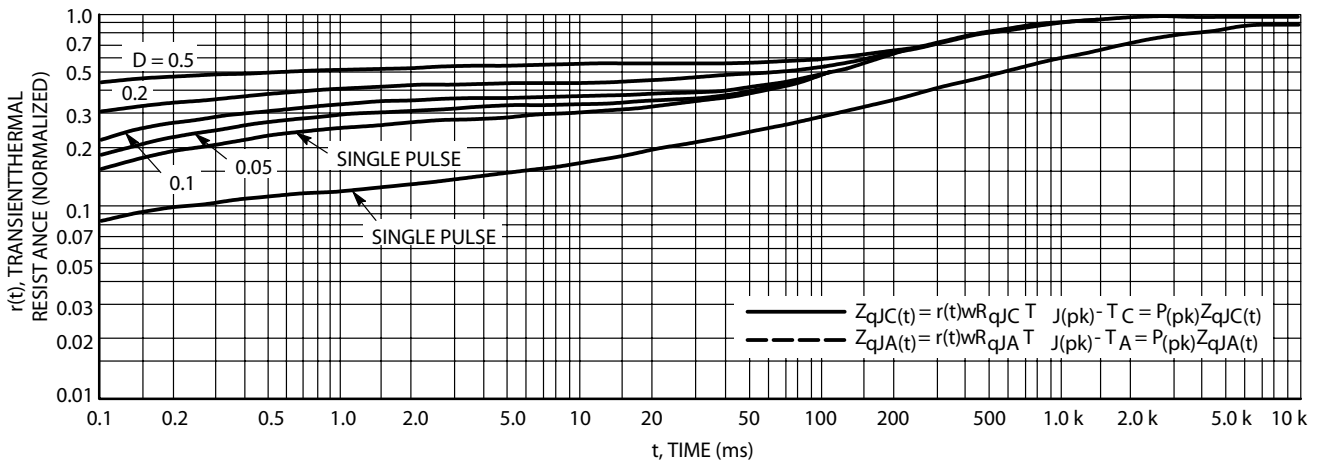


FIG.12 Thermal Response

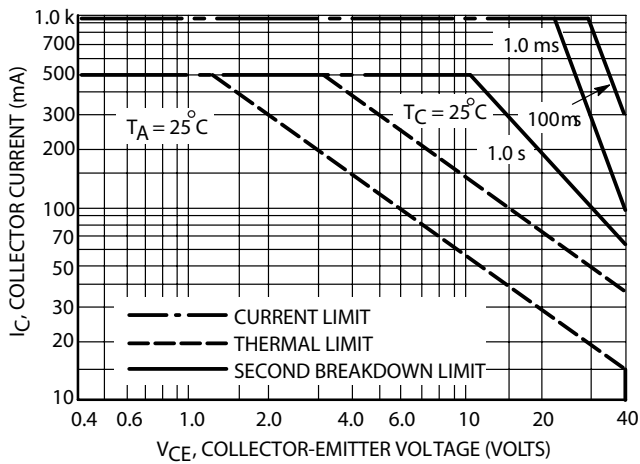
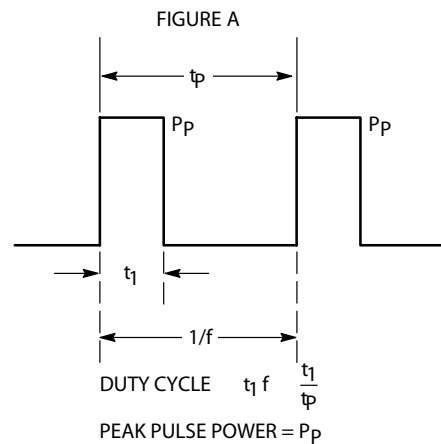


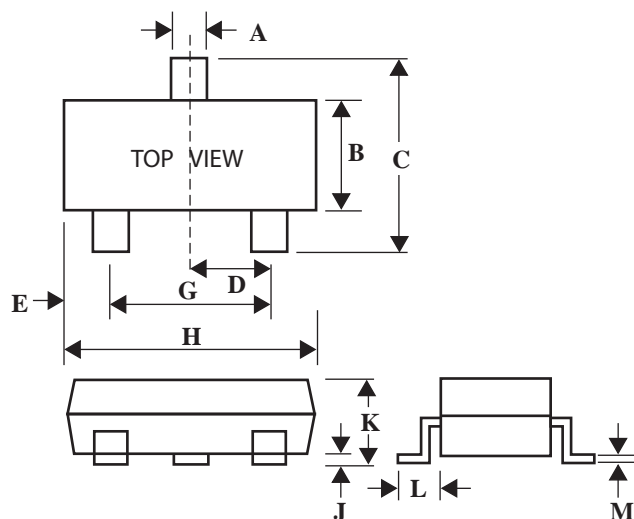
FIG.13 Active Region Safe Operating Area



Design Note: Use of Transient Thermal Resistance Data

SOT-23 Package Outline Dimensions

Unit:mm



Dim	Min	Max
A	0.35	0.51
B	1.19	1.80
C	2.10	3.00
D	0.85	1.05
E	0.46	1.00
G	1.70	2.10
H	2.70	3.10
J	0.01	0.13
K	0.89	1.60
L	0.30	0.61
M	0.076	0.25