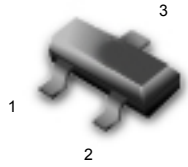
General Purpose Transistors

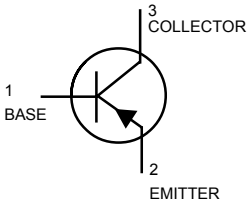
PNP Silicon

- 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.

MMBT3906LT1
S-MMBT3906LT1



SOT– 23 (TO–236AB)



ORDERING INFORMATION

Device	Marking	Shipping
MMBT3906LT1 S-MMBT3906LT1	2A 2A	3000/Tape & Reel
MMBT3906LT3 S-MMBT3906LT3	2A 2A	10000/Tape & Reel

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	– 40	Vdc
Collector–Base Voltage	V_{CBO}	– 40	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(1) T_A =25 °C	P_D	225	mW
Derate above 25°C		1.8	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate, (2) T_A = 25°C	P_D	300	mW
Derate above 25°C		2.4	mW/°C
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	T_J , T_{stg}	–55 to +150	°C

DEVICE MARKING

MMBT3906LT1 = 2A

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Breakdown Voltage (3) (I_C = –1.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	– 40	—	Vdc
Collector–Base Breakdown Voltage (I_C = –10 µAdc, I_E = 0)	$V_{(BR)CBO}$	– 40	—	Vdc
Emitter–Base Breakdown Voltage (I_E = –10 µAdc, I_C = 0)	$V_{(BR)EBO}$	– 5.0	—	Vdc
Base Cutoff Current (V_{CE} = –30 Vdc, V_{EB} = –3.0 Vdc)	I_{BL}	—	– 50	nAdc
Collector Cutoff Current (V_{CE} = –30 Vdc, V_{EB} = –3.0 Vdc)	I_{CEX}	—	– 50	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.
3. Pulse Width ≤300 µs; Duty Cycle ≤2.0%.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS (2)				
DC Current Gain	h_{FE}			—
(I_C = –0.1 mAdc, V_{CE} = –1.0 Vdc)		60	—	
(I_C = –1.0 mAdc, V_{CE} = –1.0 Vdc)		80	—	
(I_C = –10 mAdc, V_{CE} = –1.0 Vdc)		100	300	
(I_C = –50 mAdc, V_{CE} = –1.0 Vdc)		60	—	
(I_C = –100 mAdc, V_{CE} = –1.0 Vdc)		30	—	
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$			Vdc
(I_C = –10 mAdc, I_B = –1.0 mAdc)		—	– 0.25	
(I_C = –50 mAdc, I_B = –5.0 mAdc)		—	– 0.4	
Base–Emitter Saturation Voltage	$V_{BE(sat)}$			Vdc
(I_C = –10 mAdc, I_B = –1.0 mAdc)		– 0.65	– 0.85	
(I_C = –50 mAdc, I_B = –5.0 mAdc)		—	– 0.95	
SMALL–SIGNAL CHARACTERISTICS				
Current–Gain — Bandwidth Product	f_T			MHz
(I_C = –10 mAdc, V_{CE}= –20 Vdc, f = 100 MHz)		250	—	
Output Capacitance	C_{obo}			pF
(V_{CB}= –5.0 Vdc, I_E = 0, f = 1.0 MHz)		—	4.5	
Input Capacitance	C_{ibo}			pF
(V_{EB} = –0.5 Vdc, I_C = 0, f = 1.0 MHz)		—	10	
Input Impedance	h_{ie}			kΩ
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		2.0	12	
Voltage Feedback Ratio	h_{re}			X 10^{-4}
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		0.1	10	
Small–Signal Current Gain	h_{fe}			—
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		100	400	
Output Admittance	* h_{oe}			µmhos
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		3.0	60	
Noise Figure	NF			dB
(V_{CE}= –5.0Vdc, I_C = –100 µAdc, R_S =1.0 kΩ, f =1.0kHz)		—	4.0	

SWITCHING CHARACTERISTICS

Delay Time	(V_{CC} = – 3.0 Vdc, V_{BE} = 0.5 Vdc,	t_d	—	35	
Rise Time	I_C = –10 mAdc, I_{B1} = –1.0 mAdc)	t_d	—	35	ns
Storage Time	(V_{CC} = –3.0 Vdc, I_C = –10 mAdc,	t_s	—	225	ns
Fall Time	I_{B1} = I_{B2} = –1.0 mAdc)	t_f	—	75	

3. Pulse Test: Pulse Width ≤300 µs; Duty Cycle ≤2.0%.

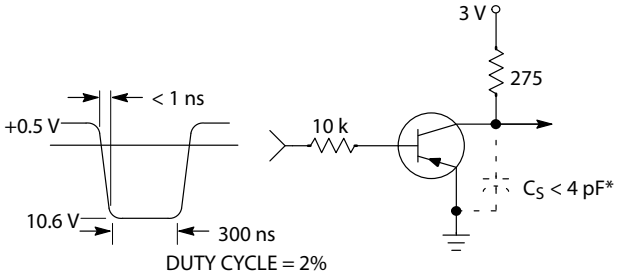


Figure 1. Delay and Rise Time
Equivalent Test Circuit

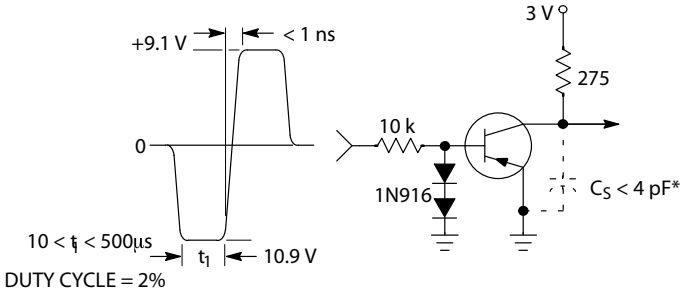


Figure 2. Storage and Fall Time
Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

TYPICAL TRANSIENT CHARACTERISTICS

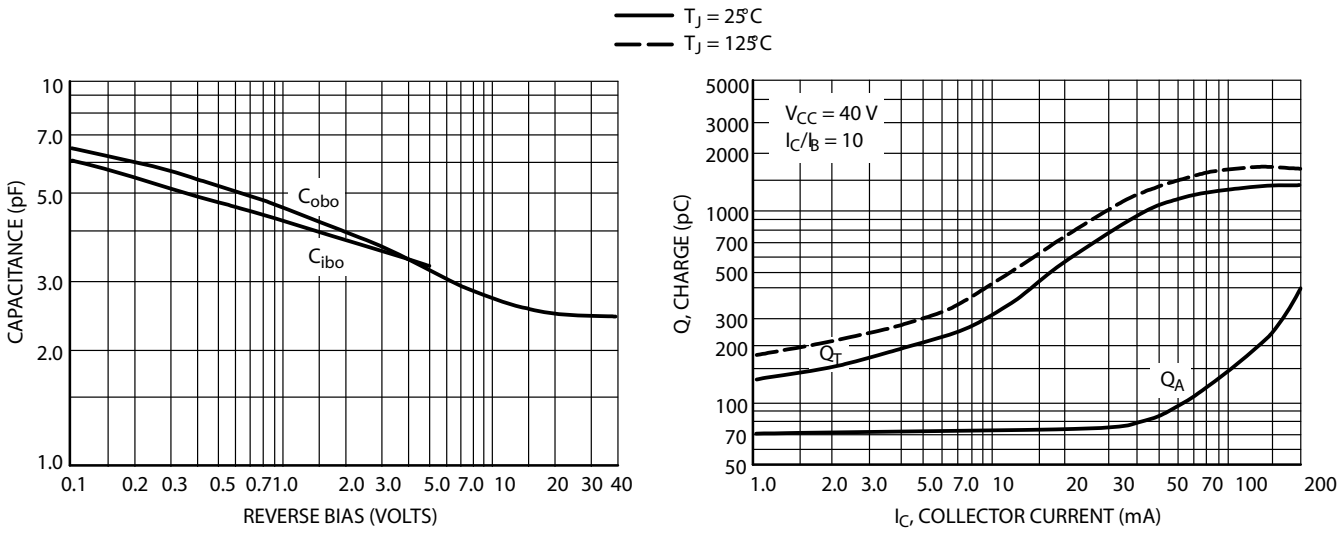


Figure 3. Capacitance

Figure 4. Charge Data

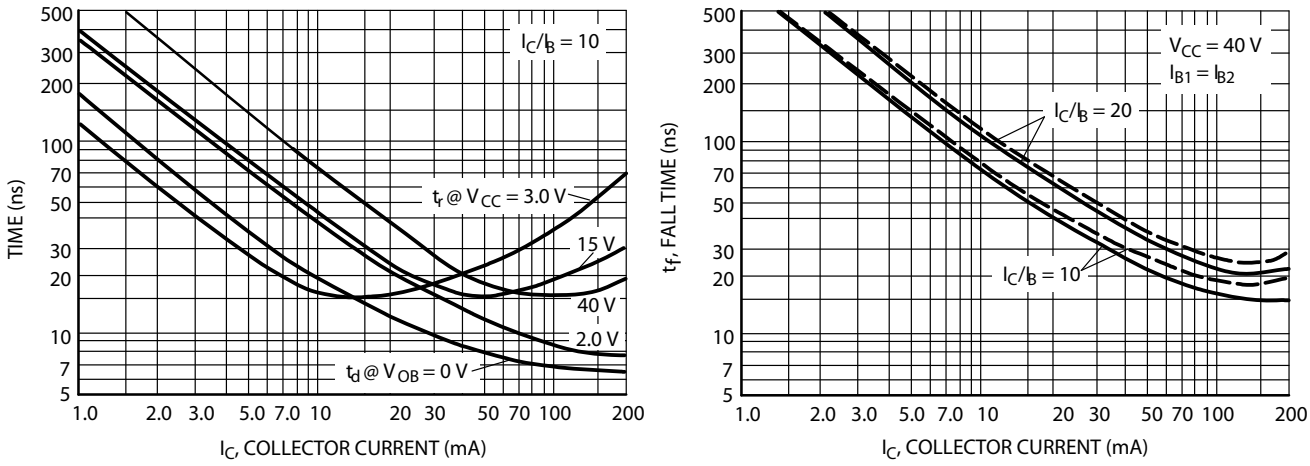


Figure 5. Turn –On Time

Figure 6. Fall Time

TYPICAL AUDIO SMALL – SIGNAL CHARACTERISTICS
NOISE FIGURE VARIATIONS
(V_{CE} = −5.0 Vdc, T_A = 25 °C, Bandwidth = 1.0 Hz)

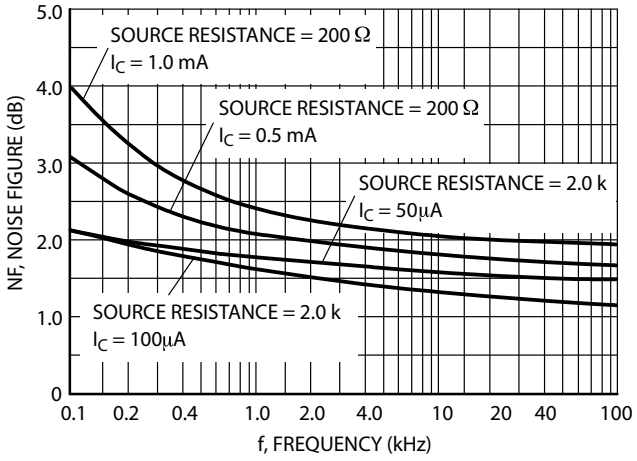


Figure 7.

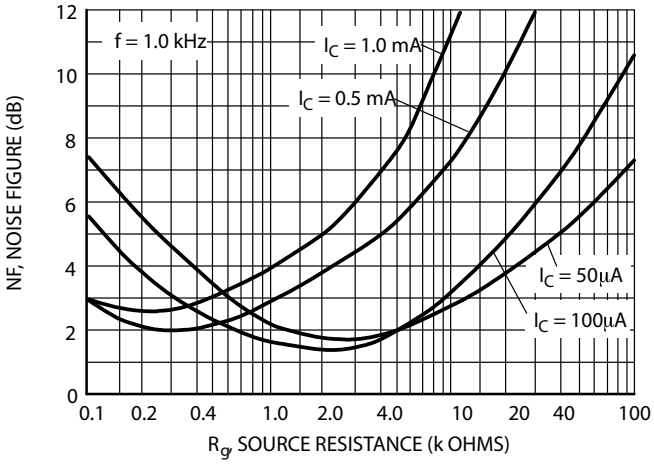


Figure 8.

h PARAMETERS
(V_{CE} = −10 Vdc, f = 1.0 kHz, T_A = 25 °C)

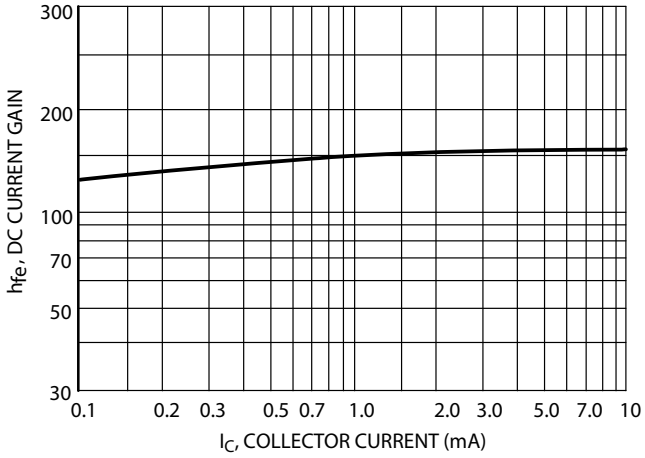


Figure 9. Current Gain

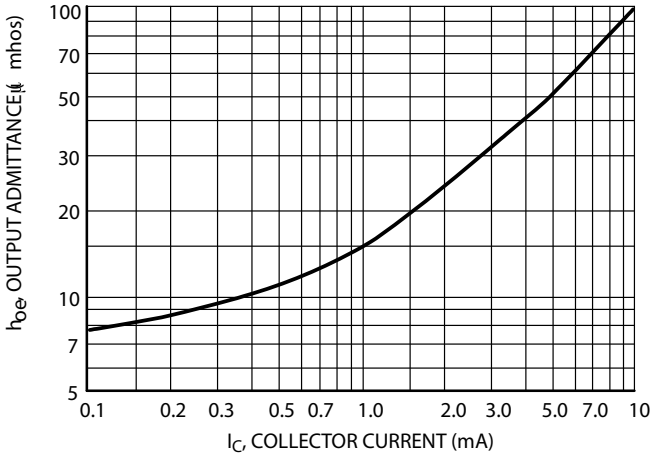


Figure 10. Output Admittance

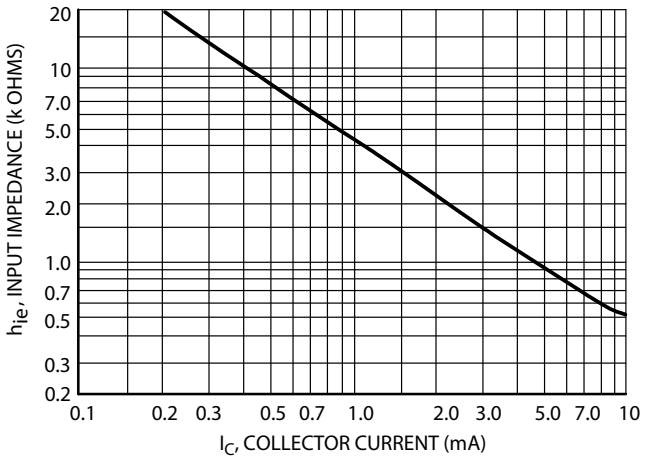


Figure 11. Input Impedance

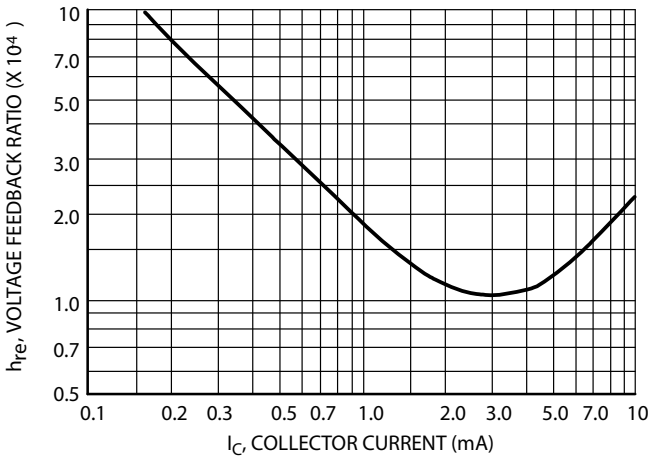


Figure 12. Voltage Feedback Ratio

TYPICAL STATIC CHARACTERISTICS

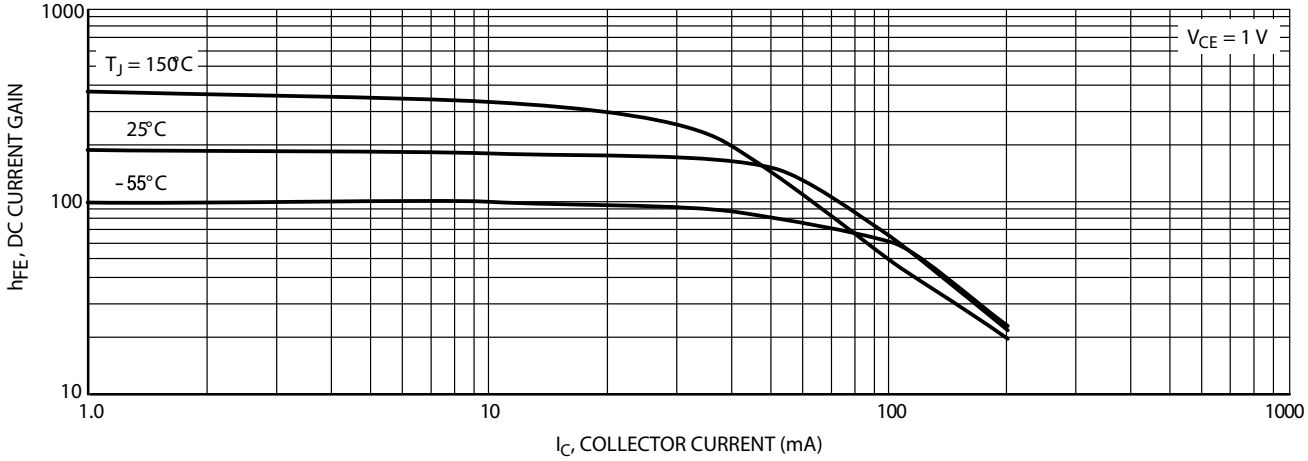


Figure 13. DC Current Gain

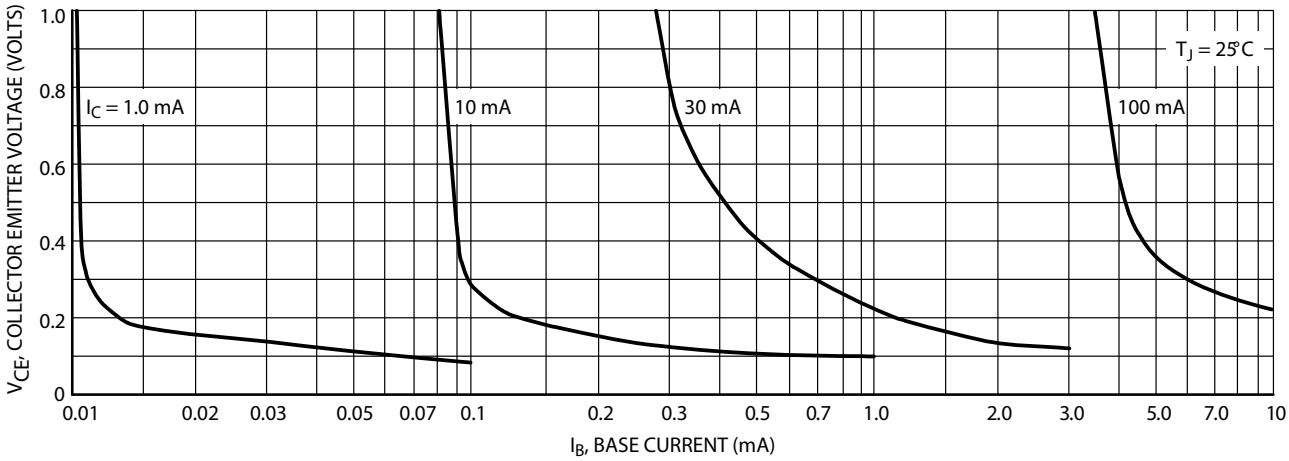


Figure 14. Collector Saturation Region

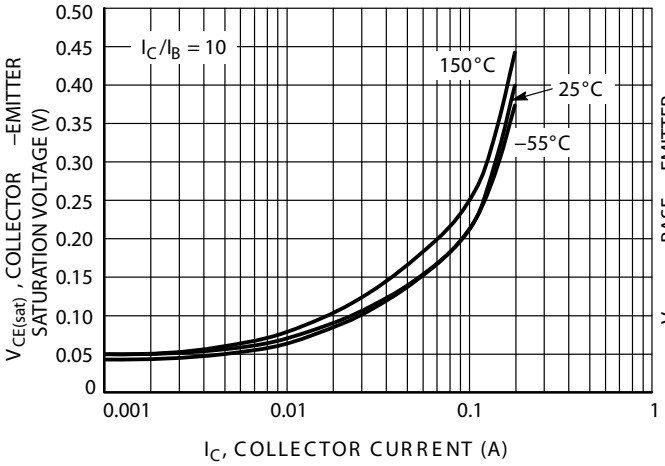


Figure 15. Collector Emitter Saturation Voltage vs. Collector Current

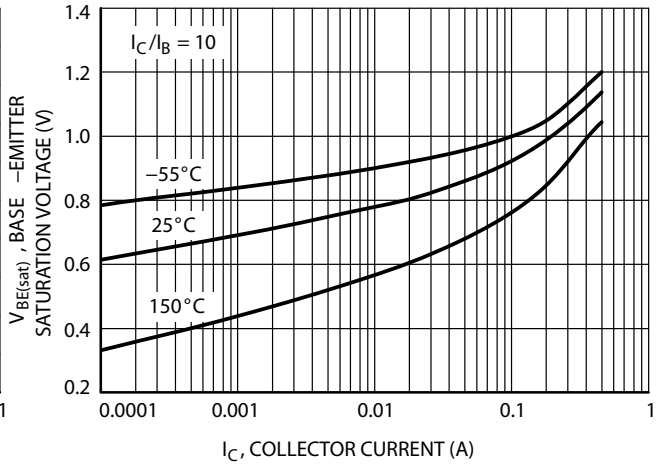


Figure 16. Base Emitter Saturation Voltage vs. Collector Current

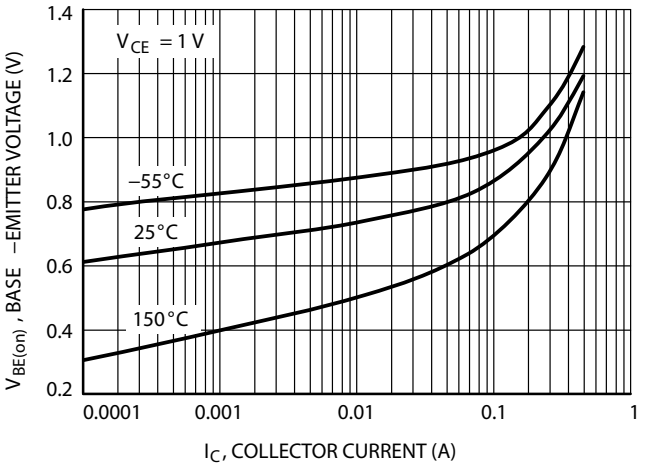


Figure 17. Base Emitter Voltage vs. Collector Current

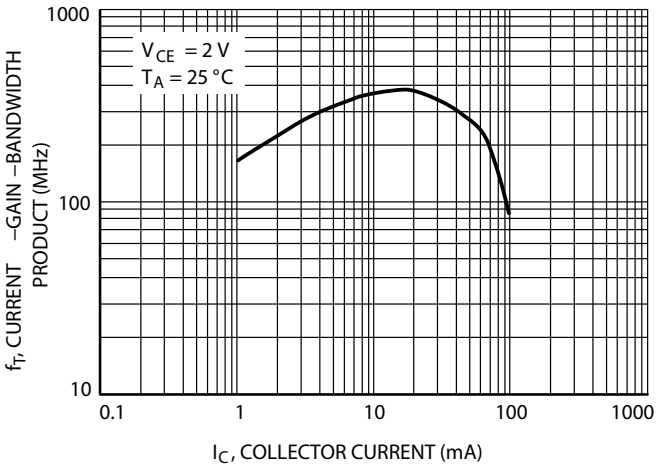


Figure 18. Current Gain Bandwidth vs. Collector Current

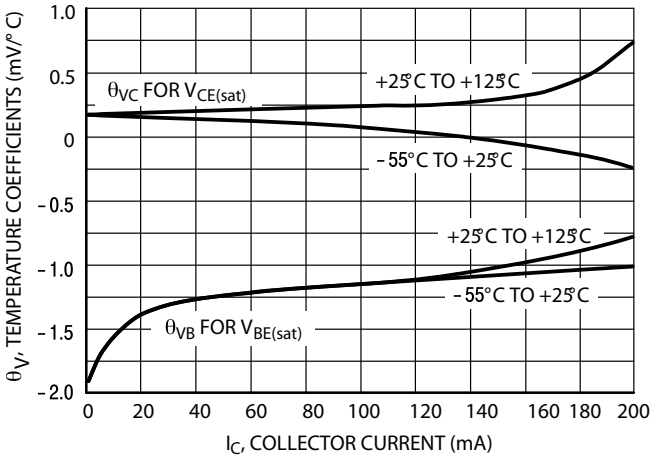


Figure 19. Temperature Coefficients

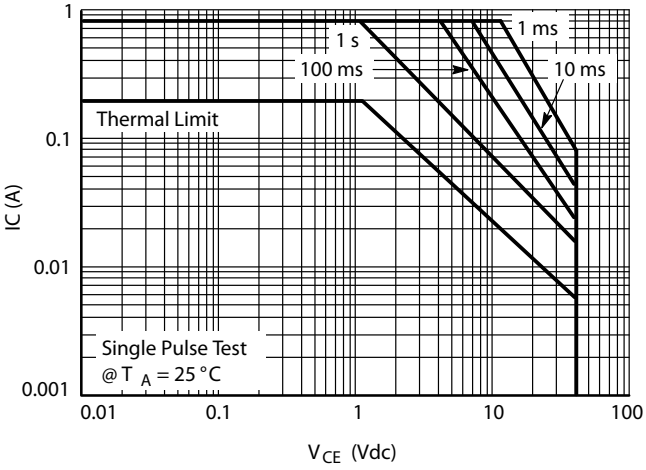
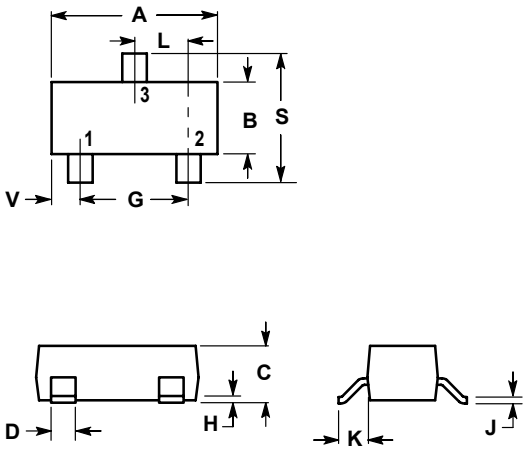


Figure 20. Safe Operating Area

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