

Features

- We declare that the material of product compliance with RoHS requirements.

Ordering Information

Device	Marking	Shipping
MMBT3906LTG	2A	3000/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 @ $T_A = 25^\circ\text{C}$ Derate above 25°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, @ $T_A = 25^\circ\text{C}$ Derate above 25°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	$^\circ\text{C}$

Device Marking

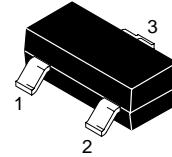
MMBT3906LTG = 2A

Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

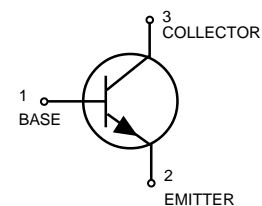
Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector – Emitter Breakdown Voltage ($I_C = -1.0 \text{ mAdc}, I_B = 0$)	$V_{(BR)CEO}$	-40	-	Vdc
Collector – Base Breakdown Voltage ($I_C = -10 \mu\text{Adc}, I_E = 0$)	$V_{(BR)CBO}$	-40	-	Vdc
Emitter – Base Breakdown Voltage ($I_E = -10 \mu\text{Adc}, I_C = 0$)	$V_{(BR)EBO}$	-5.0	-	Vdc
Base Cutoff Current ($V_{CE} = -30 \text{ Vdc}, V_{EB} = -3.0 \text{ Vdc}$)	I_{BL}	-	-50	nAdc
Collector Cutoff Current ($V_{CE} = -30 \text{ Vdc}, V_{EB} = -3.0 \text{ Vdc}$)	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 $\leq 300 \mu\text{s}$; Duty Cycle $\leq 2.0\%$.

Package outline



SOT-23



Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit	
ON CHARACTERISTICS					
DC Current Gain ($I_C = -0.1 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc}$) ($I_C = -1.0 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc}$) ($I_C = -10 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc}$) ($I_C = -50 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc}$) ($I_C = -100 \text{ mAdc}, V_{CE} = -1.0 \text{ Vdc}$)	H_{FE}	60 80 100 60 30	- - 300 - -	-	
Collector - Emitter Saturation Voltage ($I_C = -10 \text{ mAdc}, I_B = -1.0 \text{ mAdc}$) ($I_C = -50 \text{ mAdc}, I_B = -5.0 \text{ mAdc}$)	$V_{CE(sat)}$	- -	-0.25 -0.4	Vdc	
Base - Emitter Saturation Voltage ($I_C = -10 \text{ mAdc}, I_B = -1.0 \text{ mAdc}$) ($I_C = -50 \text{ mAdc}, I_B = -5.0 \text{ mAdc}$)	$V_{BE(sat)}$	-0.65 -	-0.85 -0.95	Vdc	
SMALL-SIGNAL CHARACTERISTICS					
Current - Gain - Bandwidth Product ($I_C = -10 \text{ mAdc}, V_{CE} = -20 \text{ Vdc}, f = 100 \text{ MHz}$)	f_T	250	-	MHz	
Output Capacitance ($V_{CB} = -5.0 \text{ Vdc}, I_E = 0, f = 1.0 \text{ MHz}$)	C_{obo}	-	4.5	pF	
Input Capacitance ($V_{EB} = -0.5 \text{ Vdc}, I_C = 0, f = 1.0 \text{ MHz}$)	C_{ibo}	-	10	pF	
Input Impedance ($I_C = -1.0 \text{ mAdc}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$)	h_{ie}	2.0	12	$k\Omega$	
Voltage Feedback Ratio ($I_C = -1.0 \text{ mAdc}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$)	h_{re}	0.1	10	$\times 10^{-4}$	
Small - Signal Current Gain ($I_C = -1.0 \text{ mAdc}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$)	h_{fe}	100	400	-	
Output Admittance ($I_C = -1.0 \text{ mAdc}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$)	h_{oe}	3.0	60	μmhos	
Noise Figure ($I_C = -100 \mu\text{Adc}, V_{CE} = -5.0 \text{ Vdc}, R_S = 1.0 \text{ k}\Omega, f = 1.0 \text{ kHz}$)	NF	-	4.0	dB	
SWITCHING CHARACTERISTICS					
Delay Time	($V_{CC} = -3.0 \text{ Vdc}, V_{BE} = 0.5 \text{ Vdc},$ $I_C = -10 \text{ mAdc}, I_{B1} = -1.0 \text{ mAdc}$)	t_d	-	35	ns
Rise Time		t_r	-	35	
Storage Time	($V_{CC} = -3.0 \text{ Vdc}, I_C = -10 \text{ mAdc},$ $I_{B1} = I_{B2} = -1.0 \text{ mAdc}$)	t_s	-	225	ns
Fall Time		t_f	-	75	

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

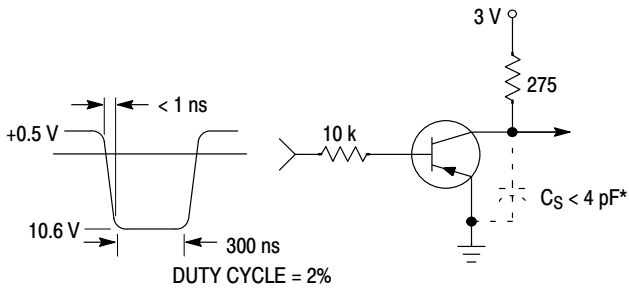


Figure 1. Delay and Rise Time Equivalent Test Circuit

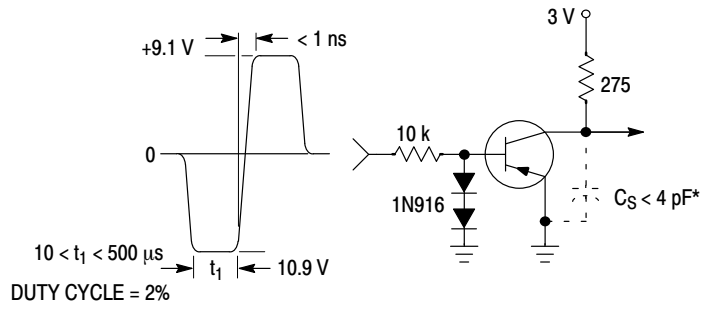


Figure 2. Storage and Fall Time Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

Typical Transient Characteristics

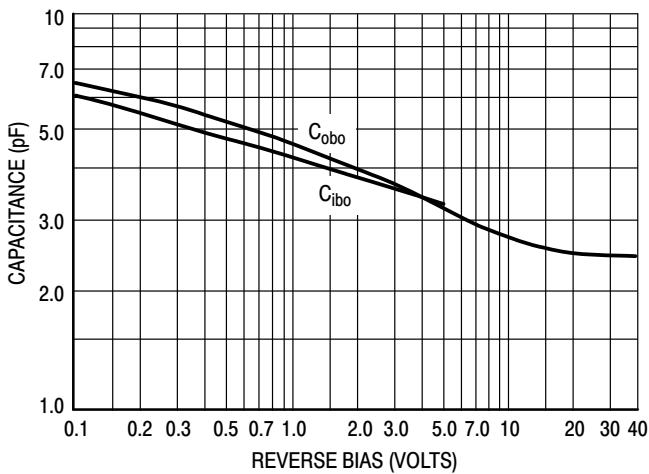


Figure 3. Capacitance

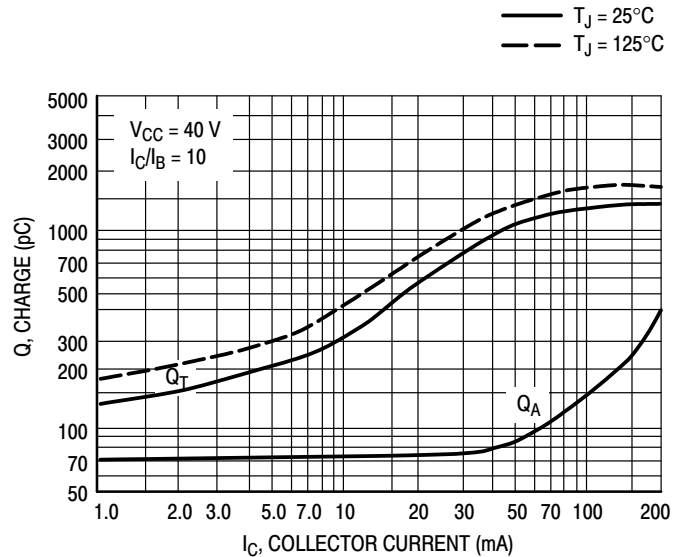


Figure 4. Charge Data

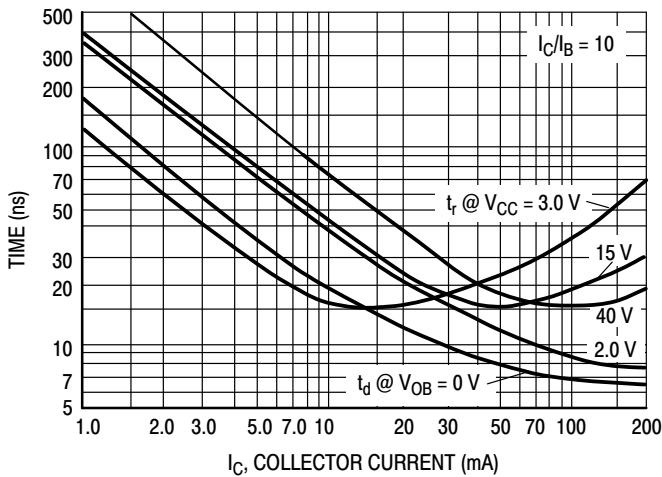


Figure 5. Turn-On Time

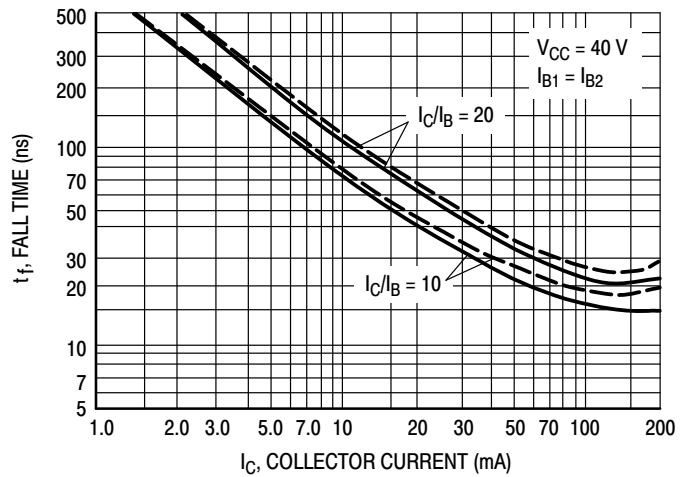


Figure 6. Fall Time

Typical Audio Small-Signal Characteristics Noise Figure Variations

($V_{CE} = 5.0 \text{ Vdc}$, $T_A = 25^\circ\text{C}$, Bandwidth = 1.0 Hz)

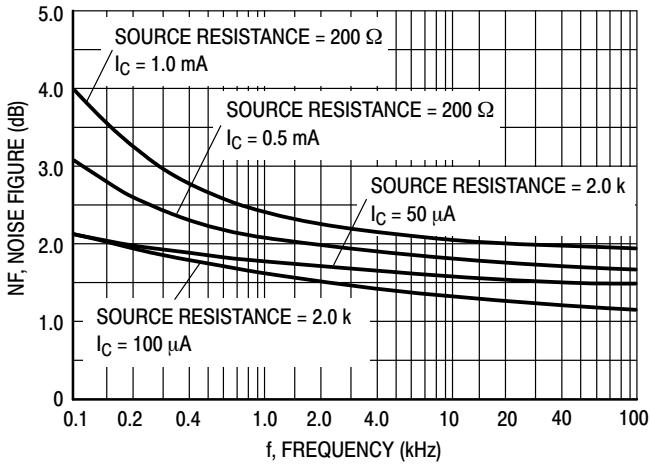


Figure 7.

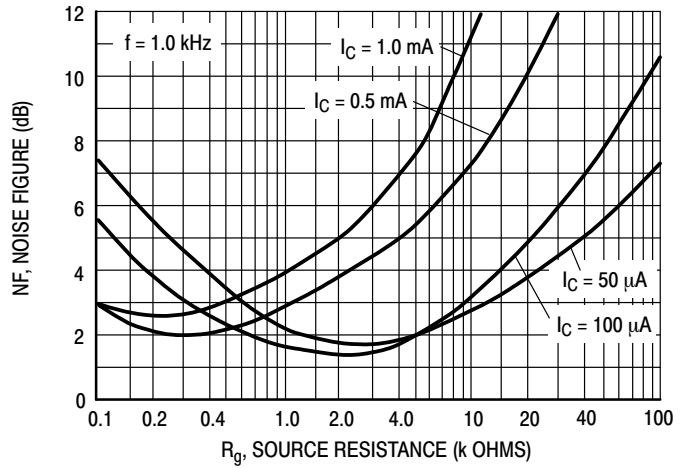


Figure 8.

h PARAMETERS

($V_{CE} = -10 \text{ Vdc}$, $f = 1.0 \text{ kHz}$, $T_A = 25^\circ\text{C}$)

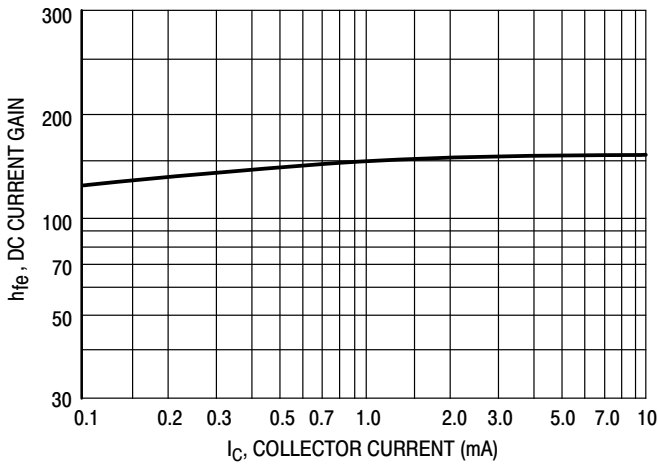


Figure 9. Current Gain

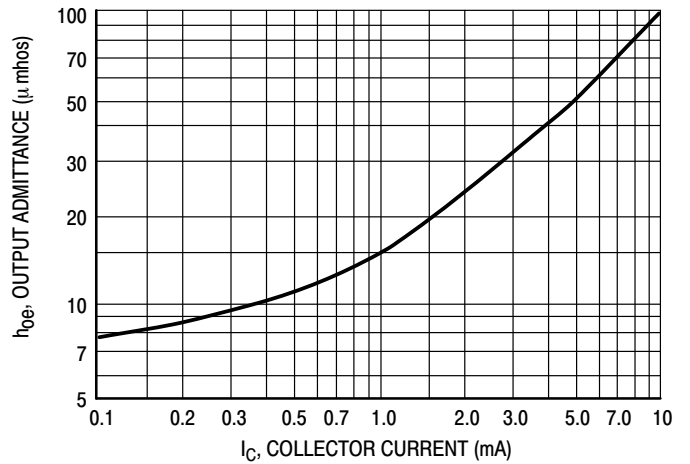


Figure 10. Output Admittance

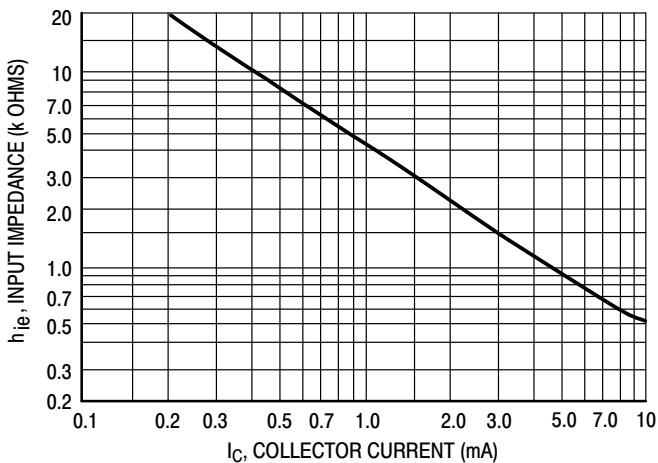


Figure 11. Input Impedance

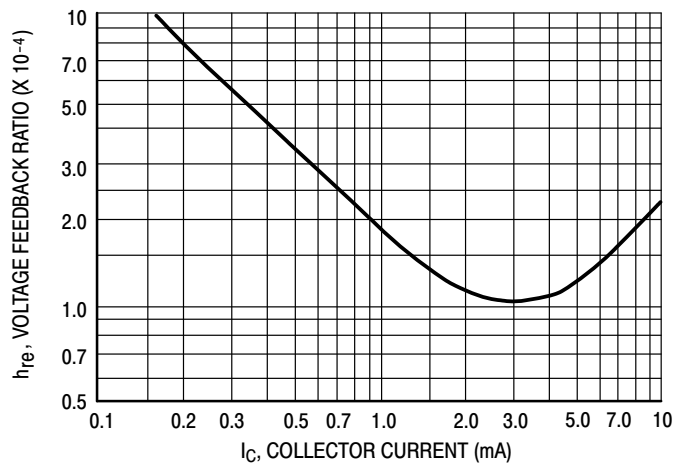
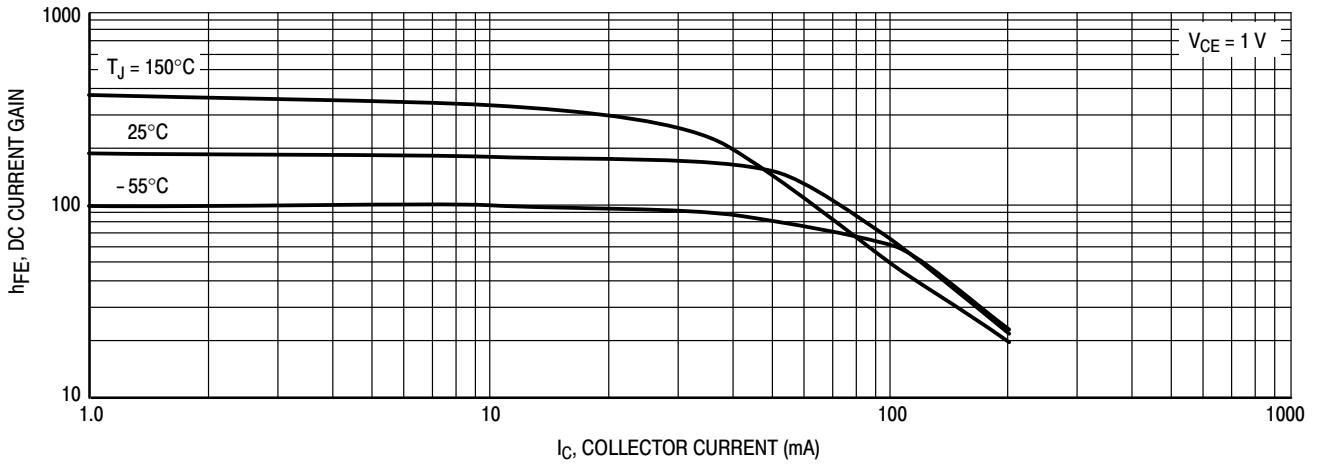
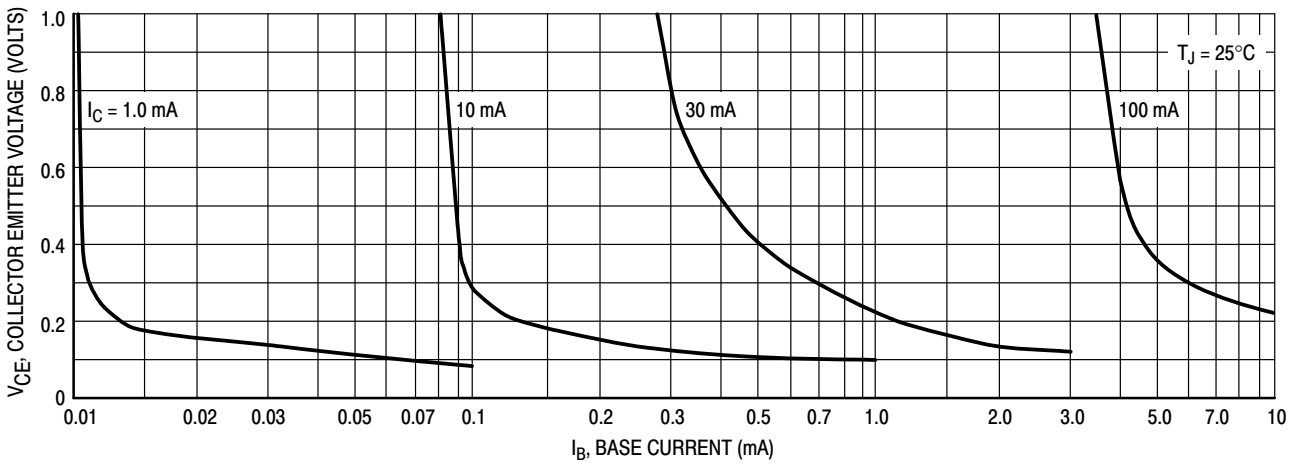


Figure 12. Voltage Feedback Ratio

Typical Static Characteristics

Figure 13. DC Current Gain

Figure 14. Collector Saturation Region

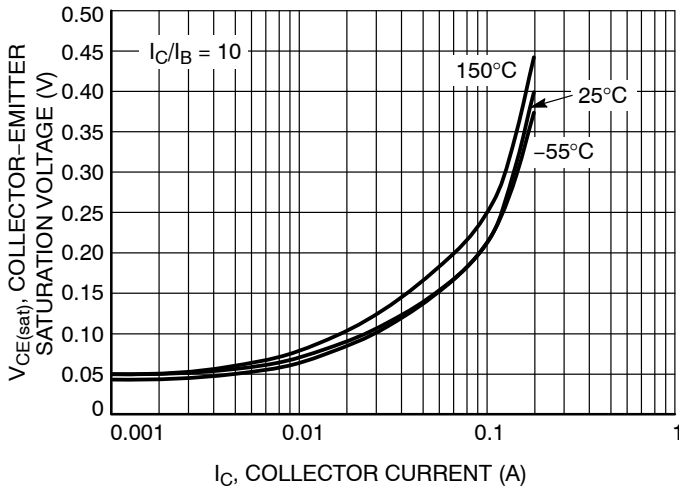


Figure 15. Collector Emitter Saturation Voltage vs. Collector Current

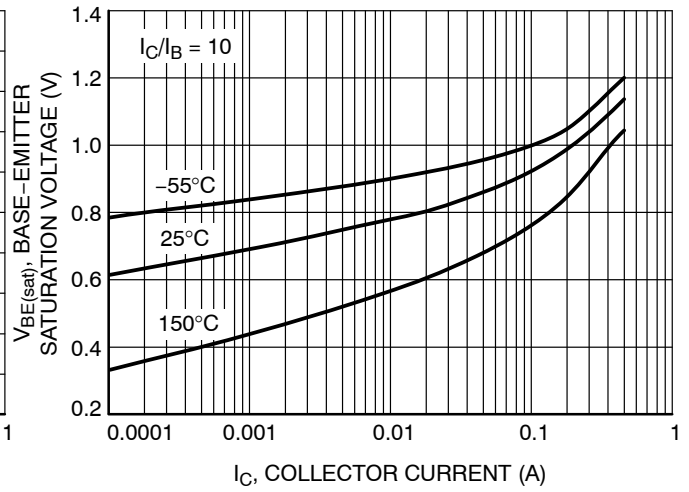


Figure 16. Base Emitter Saturation Voltage vs. Collector Current

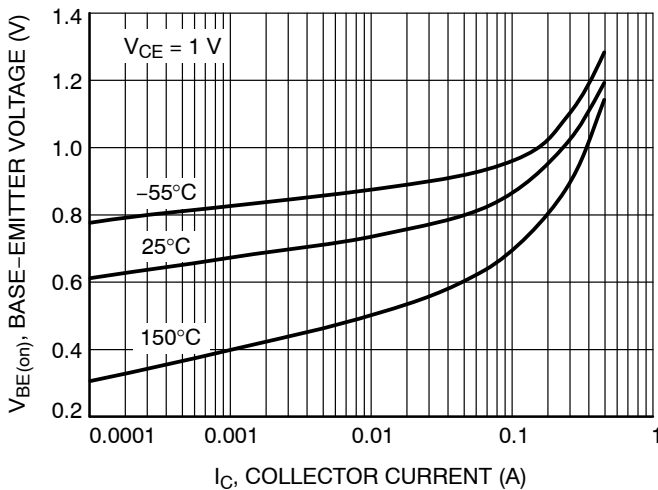


Figure 17. Base Emitter Voltage vs. Collector Current

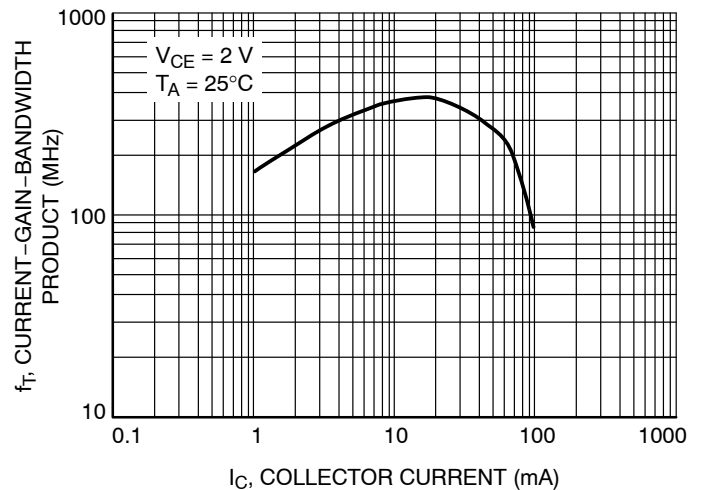


Figure 18. Current Gain Bandwidth vs. Collector Current

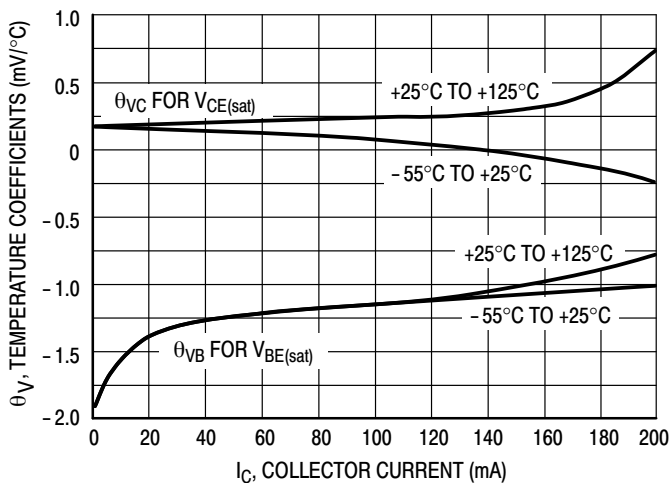


Figure 19. Temperature Coefficients

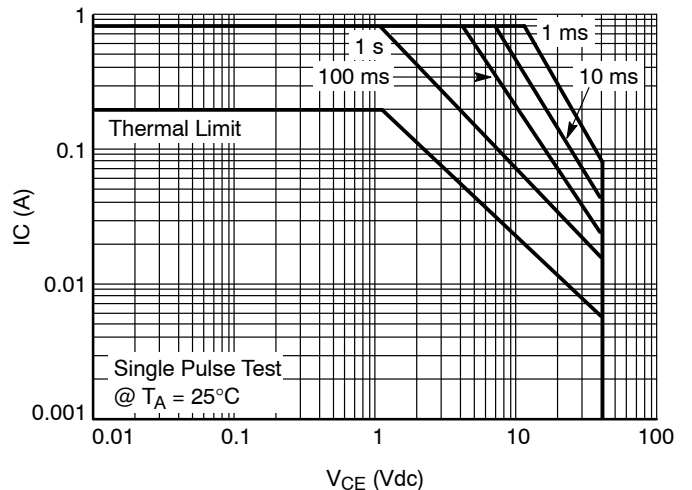
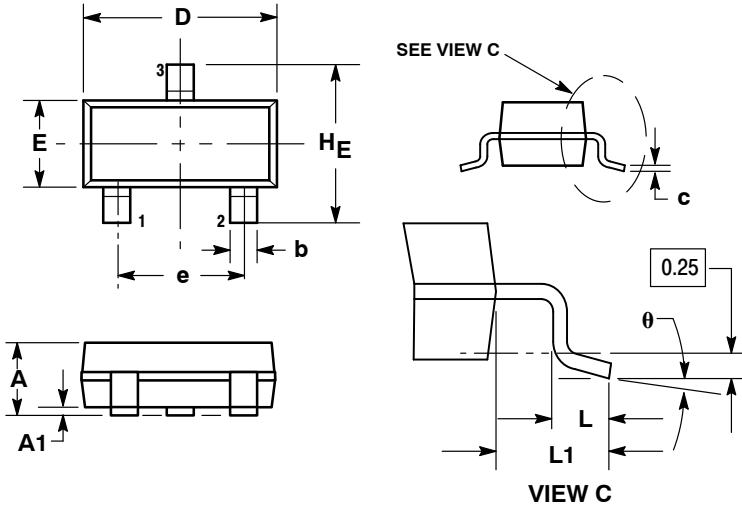


Figure 20. Safe Operating Area

Package Dimensions
SOT-23


- 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:
 PIN 1. BASE
 2. EMITTER
 3. COLLECTOR

SOLDERING FOOTPRINT*
