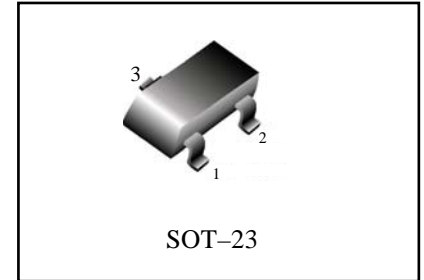


General Purpose Transistors

PNP Silicon

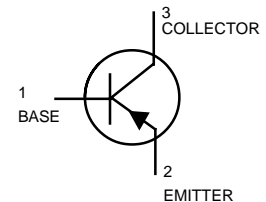
ORDERING INFORMATION

Device	Marking	Shipping
2N4403LT1G	2T	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	– 600	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°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°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	$^\circ\text{C}$

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 (3) ($I_C = -1.0\text{ mAdc}, I_B = 0$)	$V_{(BR)CEO}$	– 40	—	Vdc
Collector–Base Breakdown Voltage ($I_C = -0.1\text{ mAdc}, I_E = 0$)	$V_{(BR)CBO}$	– 40	—	Vdc
Emitter–Base Breakdown Voltage ($I_E = -0.1\text{ mAdc}, I_C = 0$)	$V_{(BR)EBO}$	– 5.0	—	Vdc
Base Cutoff Current ($V_{CE} = -35\text{ Vdc}, V_{EB} = -0.4\text{ Vdc}$)	I_{BEV}	—	– 0.1	μAdc
Collector Cutoff Current ($V_{CE} = -35\text{ Vdc}, V_{EB} = -0.4\text{ Vdc}$)	I_{CEX}	—	– 0.1	μAdc

- FR–5 = 1.0 x 0.75 x 0.062 in.
- Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.
- Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$; Duty Cycle $\leq 2.0\%$.

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

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS				
DC Current Gain ($I_C = -0.1 \text{ mAdc}$, $V_{CE} = -1.0 \text{ Vdc}$)	h_{FE}	30	—	—
($I_C = -1.0 \text{ mAdc}$, $V_{CE} = -1.0 \text{ Vdc}$)		60	—	
($I_C = -10 \text{ mAdc}$, $V_{CE} = -1.0 \text{ Vdc}$)		100	—	
($I_C = -150 \text{ mAdc}$, $V_{CE} = -2.0 \text{ Vdc}$)(3)		100	300	
($I_C = -500 \text{ mAdc}$, $V_{CE} = -2.0 \text{ Vdc}$)(3)		20	—	
Collector–Emitter Saturation Voltage(3) ($I_C = -150 \text{ mAdc}$, $I_B = -15 \text{ mAdc}$)	$V_{CE(sat)}$	—	-0.4	Vdc
($I_C = -500 \text{ mAdc}$, $I_B = -50 \text{ mAdc}$)		—	-0.75	
Base–Emitter Saturation Voltage (3) ($I_C = -150 \text{ mAdc}$, $I_B = -15 \text{ mAdc}$)	$V_{BE(sat)}$	-0.75	-0.95	Vdc
($I_C = -500 \text{ mAdc}$, $I_B = -50 \text{ mAdc}$)		—	-1.3	

SMALL-SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product ($I_C = -20 \text{ mAdc}$, $V_{CE} = -10 \text{ Vdc}$, $f = 100 \text{ MHz}$)	f_T	200	—	MHz
Collector–Base Capacitance ($V_{CB} = -10 \text{ Vdc}$, $I_E = 0$, $f = 1.0 \text{ MHz}$)	C_{cb}	—	8.5	pF
Emitter–Base Capacitance ($V_{BE} = -0.5 \text{ Vdc}$, $I_C = 0$, $f = 1.0 \text{ MHz}$)	C_{eb}	—	30	pF
Input Impedance ($V_{CE} = -10 \text{ Vdc}$, $I_C = -1.0 \text{ mAdc}$, $f = 1.0 \text{ kHz}$)	h_{ie}	1.5	15	$k\Omega$
Voltage Feedback Ratio ($V_{CE} = -10 \text{ Vdc}$, $I_C = -1.0 \text{ mAdc}$, $f = 1.0 \text{ kHz}$)	h_{re}	0.1	8.0	$\times 10^{-4}$
Small–Signal Current Gain ($V_{CE} = -10 \text{ Vdc}$, $I_C = -1.0 \text{ mAdc}$, $f = 1.0 \text{ kHz}$)	h_{fe}	60	500	—
Output Admittance ($V_{CE} = -10 \text{ Vdc}$, $I_C = -1.0 \text{ mAdc}$, $f = 1.0 \text{ kHz}$)	h_{oe}	1.0	100	μmhos

SWITCHING CHARACTERISTICS

Delay Time	$(V_{CC} = -30 \text{ Vdc}$, $V_{EB} = -2.0 \text{ Vdc}$, $I_C = -150 \text{ mAdc}$, $I_{B1} = -15 \text{ mAdc}$)	t_d	—	15	ns
Rise Time		t_r	—	20	
Storage Time	$(V_{CC} = -30 \text{ Vdc}$, $I_C = -150 \text{ mAdc}$, $I_{B1} = I_{B2} = -15 \text{ mAdc}$)	t_s	—	225	ns
Fall Time		t_f	—	30	

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

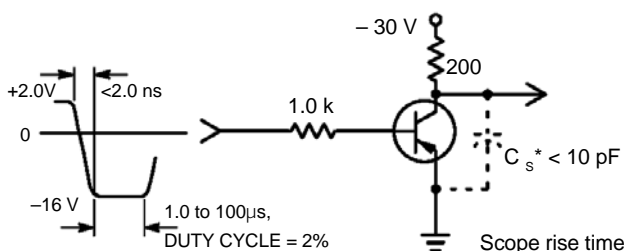
SWITCHING TIME EQUIVALENT TEST CIRCUITS


Figure 1. Turn–On Time

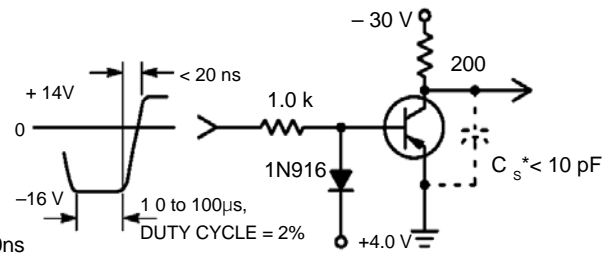


Figure 2. Turn–Off Time

*Total shunt capacitance of test jig connectors, and oscilloscope



TYPICAL TRANSIENT CHARACTERISTICS

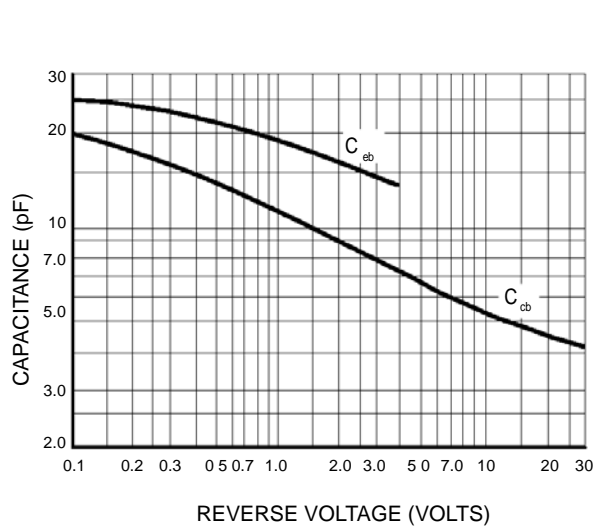


Figure 3. Capacitance

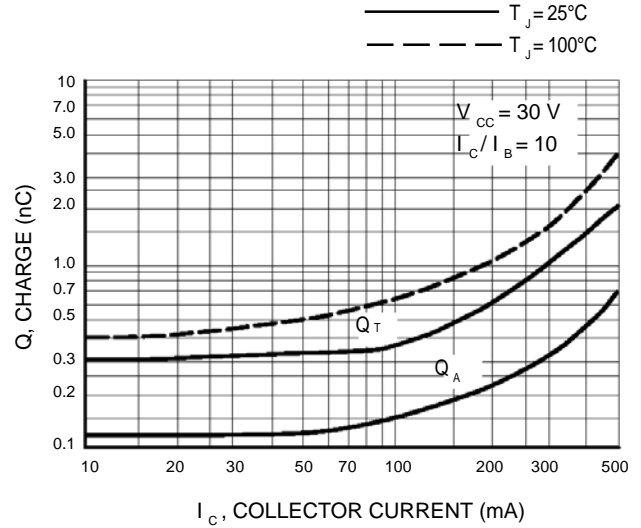


Figure 4. Charge Data

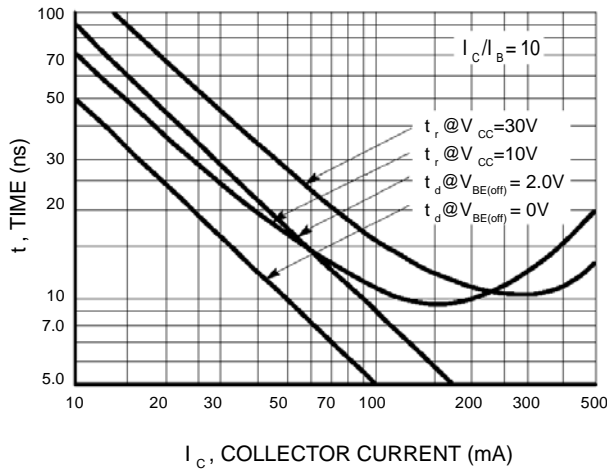


Figure 5. Turn-On Time

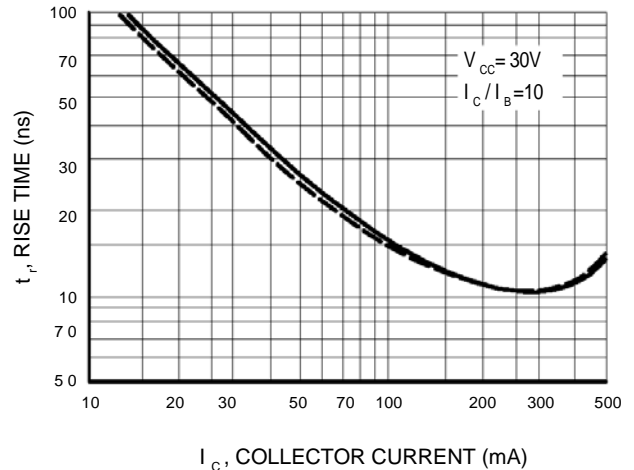


Figure 6. Rise Time

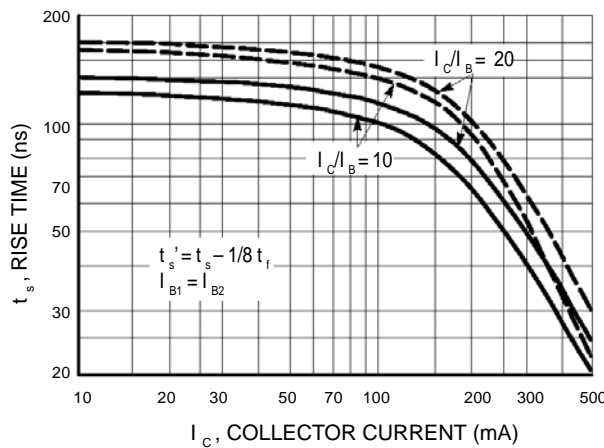


Figure 7. Storage Time

SMALL-SIGNAL CHARACTERISTICS

NOISE FIGURE

$V_{CE} = -10 \text{ Vdc}$, $T_A = 25^\circ\text{C}$

Bandwidth = 1.0 Hz

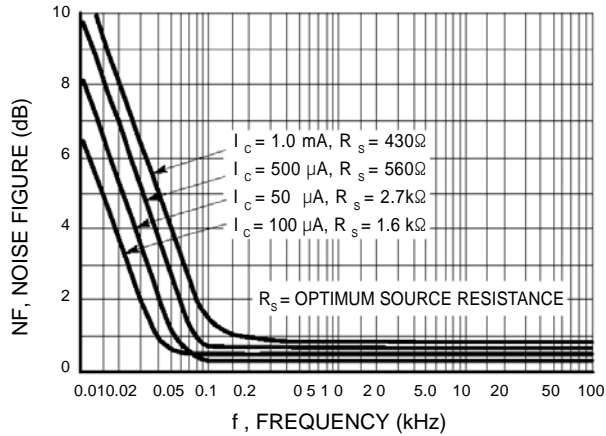


Figure 8. Frequency Effects

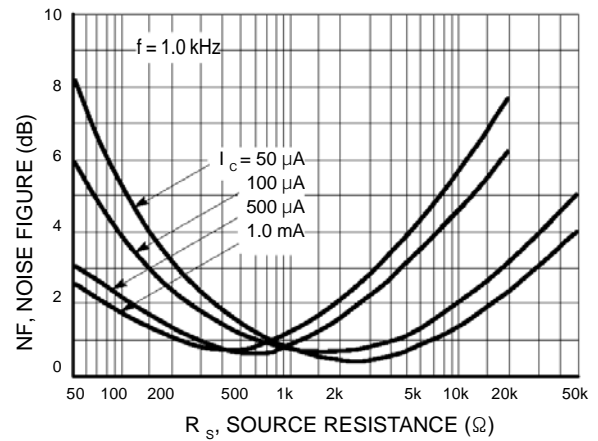


Figure 9. Source Resistance Effects

h PARAMETERS

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

This group of graphs illustrates the relationship between h_{fe} and other "h" parameters for this series of transistors. To obtain these curves, a high-gain and a low-gain unit were selected from the MMBT4401LT1 lines, and the same units were used to develop the correspondingly numbered curves on each graph.

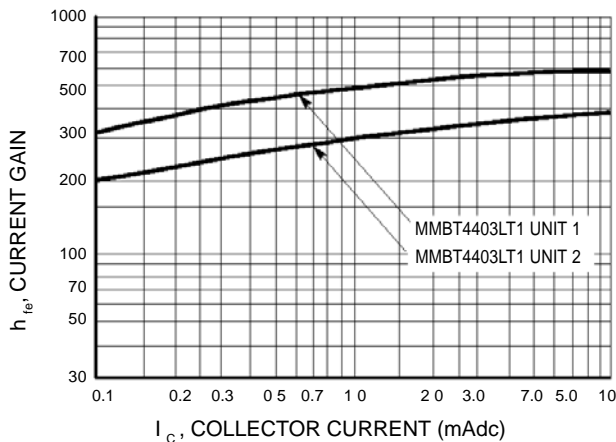


Figure 10. Current Gain

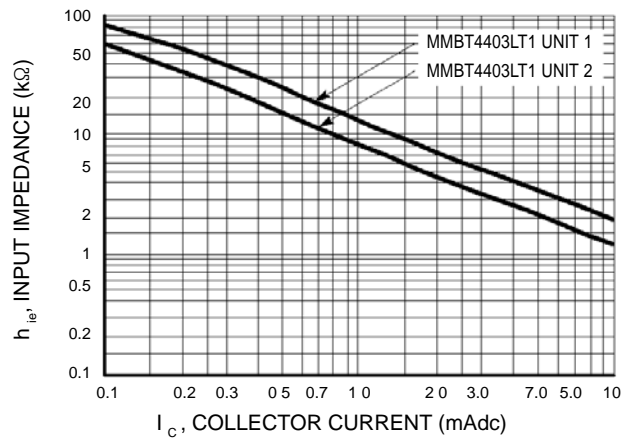


Figure 11. Input Impedance

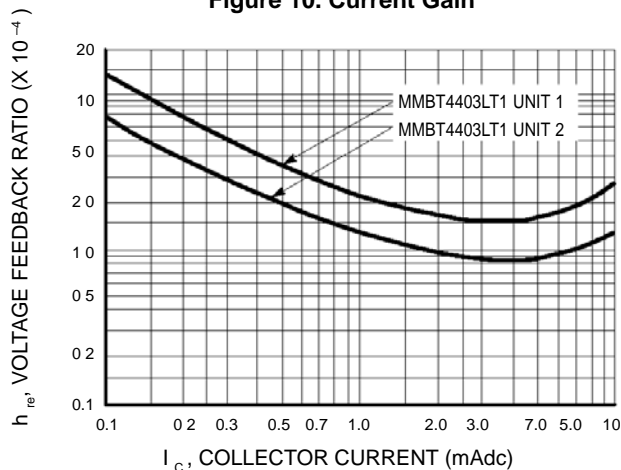


Figure 12. Voltage Feedback Ratio

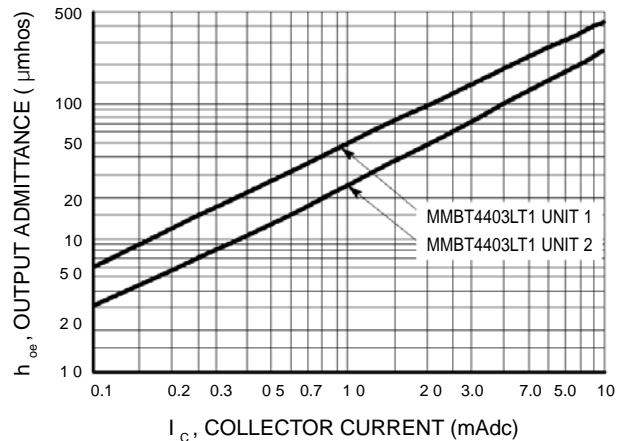


Figure 13. Output Admittance



STATIC CHARACTERISTICS

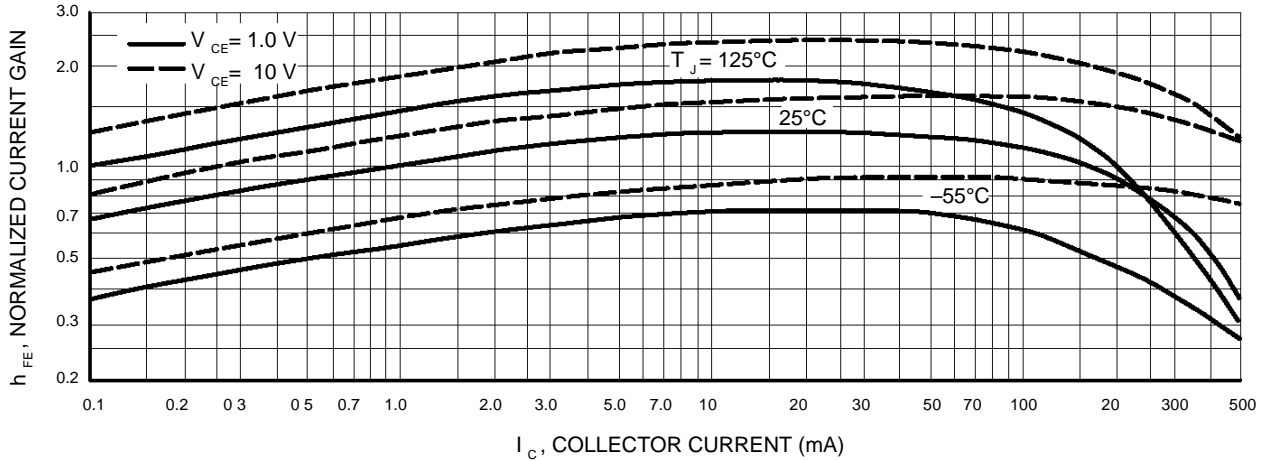


Figure 14. DC Current Gain

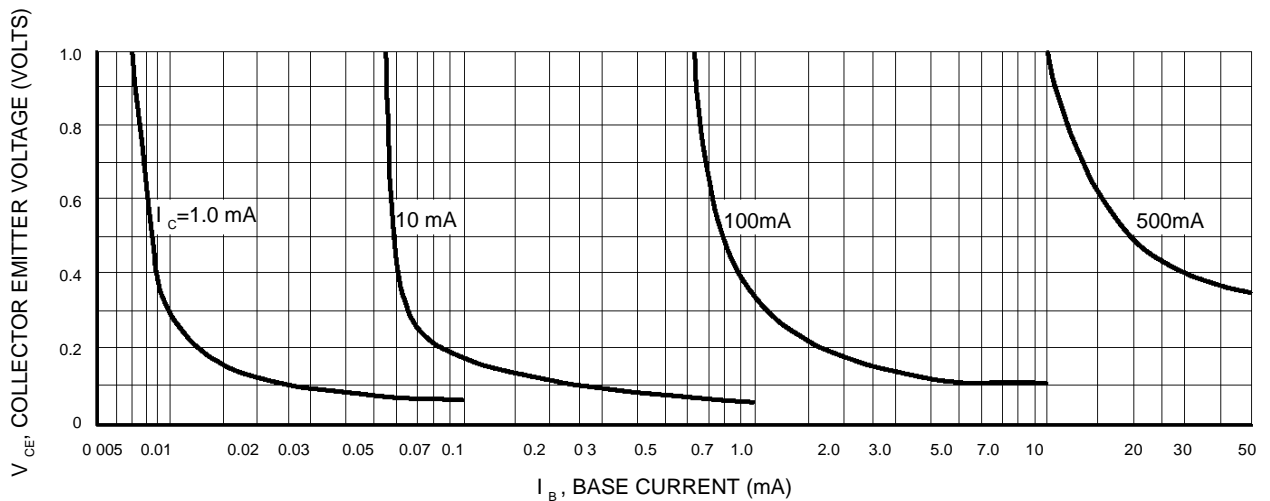


Figure 15. Collector Saturation Region

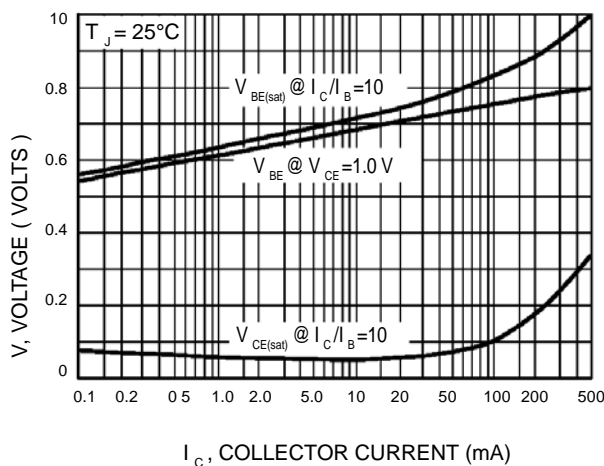


Figure 16. "On" Voltages

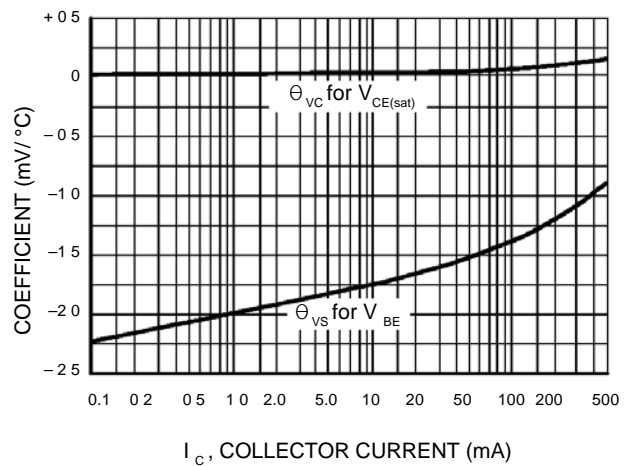
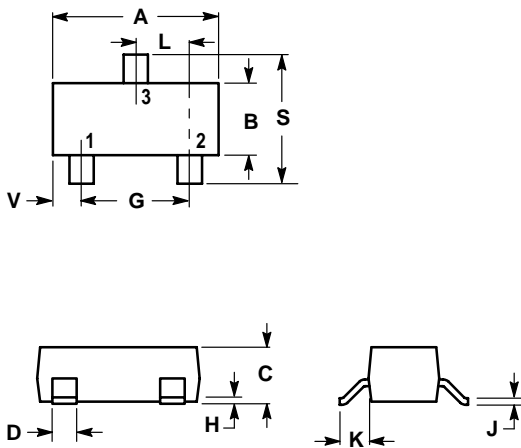


Figure 17. Temperature Coefficients

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

