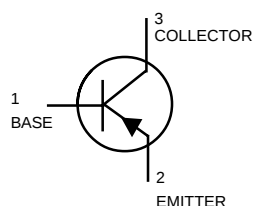
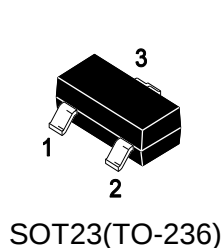


General Purpose Transistors PNP Silicon

FEATURES:

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

Circuit Diagram & Pin Configuration:



DEVICE MARKING AND ORDERING INFORMATION

Device	Marking	Shipping
TMBT4403	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	$^\circ\text{C/W}$
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	$^\circ\text{C/W}$
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
----------------	--------	-----	-----	------

OFF CHARACTERISTICS

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

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

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

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS				
DC Current Gain (I _C = -0.1 mAdc, V _{CE} = -1.0 Vdc)	h _{FE}	30	—	—
(I _C = -1.0 mAdc, V _{CE} = -1.0 Vdc)		60	—	
(I _C = -10 mAdc, V _{CE} = -1.0 Vdc)		100	—	
(I _C = -150 mAdc, V _{CE} = -2.0 Vdc)(3)		100	300	
(I _C = -500 mAdc, V _{CE} = -2.0 Vdc)(3)		20	—	
Collector-Emitter Saturation Voltage(3) (I _C = -150mAdc, I _B = -15 mAdc)	V _{CE(sat)}	—	- 0.4	Vdc
(I _C = -500 mAdc, I _B = -50 mAdc)		—	- 0.75	
Base-Emitter Saturation Voltage (3) (I _C = -150 mAdc, I _B = -15 mAdc)	V _{BE(sat)}	- 0.75	- 0.95	Vdc
(I _C = -500 mAdc, I _B = -50 mAdc)		—	- 1.3	

SMALL-SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product (I _C = -20mAdc, V _{CE} = -10 Vdc, f = 100 MHz)	f _T	200	—	MHz
Collector-Base Capacitance (V _{CB} = -10 Vdc, I _E = 0, f = 1.0 MHz)	C _{cb}	—	8.5	pF
Emitter-Base Capacitance (V _{BE} = -0.5 Vdc, I _C = 0, f = 1.0 MHz)	C _{eb}	—	30	pF
Input Impedance (V _{CE} = -10 Vdc, I _C = -1.0 mAdc, f = 1.0 kHz)	h _{ie}	1.5	15	kΩ
Voltage Feedback Ratio (V _{CE} = -10 Vdc, I _C = -1.0 mAdc, f = 1.0 kHz)	h _{re}	0.1	8.0	X 10 ⁻⁴
Small-Signal Current Gain (V _{CE} = -10 Vdc, I _C = -1.0 mAdc, f = 1.0 kHz)	h _{fe}	60	500	—
Output Admittance (V _{CE} = -10 Vdc, I _C = -1.0 mAdc, f = 1.0 kHz)	h _{oe}	1.0	100	μmhos

SWITCHING CHARACTERISTICS

Delay Time	(V _{CC} = -30 Vdc, V _{EB} = -2.0 Vdc,	t _d	—	15	ns
Rise Time	I _C = -150mAdc, I _{B1} = -15 mAdc)	t _d	—	20	
Storage Time	(V _{CC} = -30 Vdc, I _C = -150 mAdc,	t _s	—	225	ns
Fall Time	I _{B1} = I _{B2} = -15 mAdc)	t _f	—	30	

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

SWITCHING TIME EQUIVALENT TEST CIRCUITS

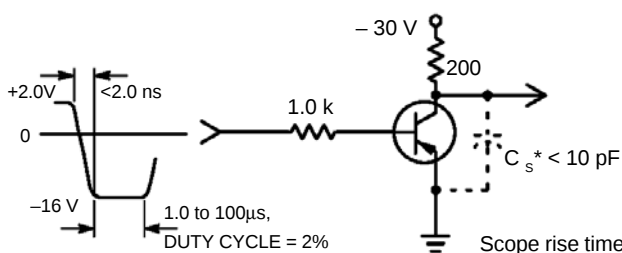


Figure 1. Turn-On Time

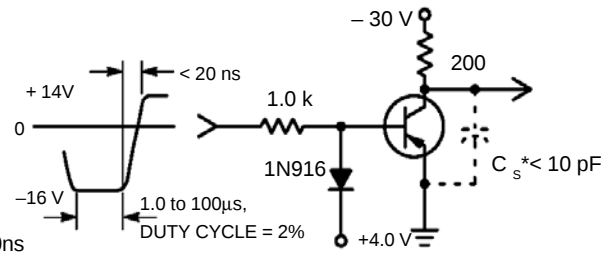


Figure 2. Turn-Off Time

*Total shunt capacitance of test jig connectors, and oscilloscope

TYPICAL TRANSIENT CHARACTERISTICS

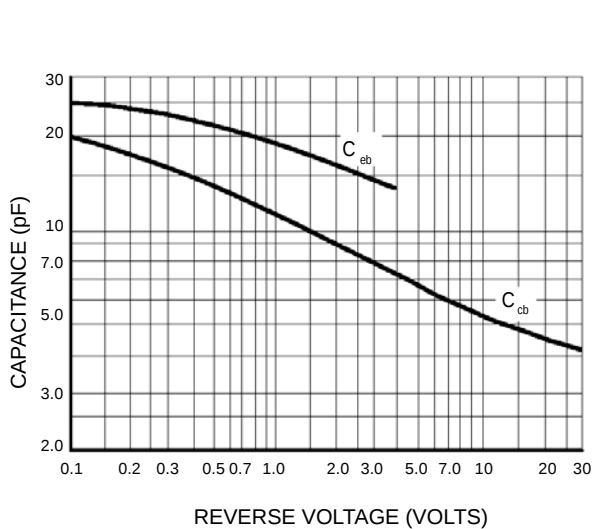


Figure 3. Capacitance

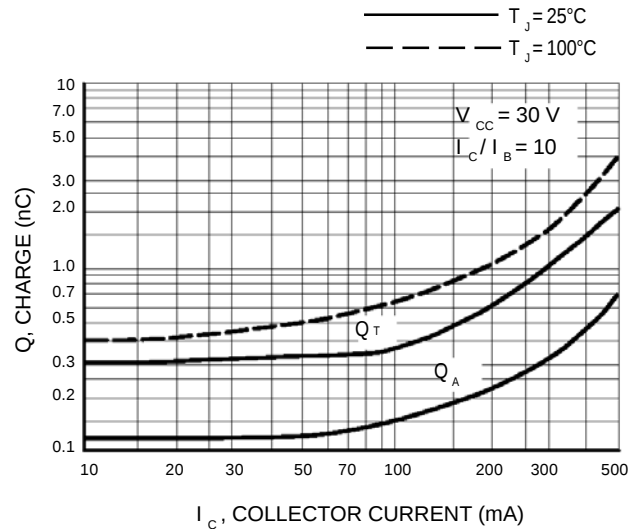


Figure 4. Charge Data

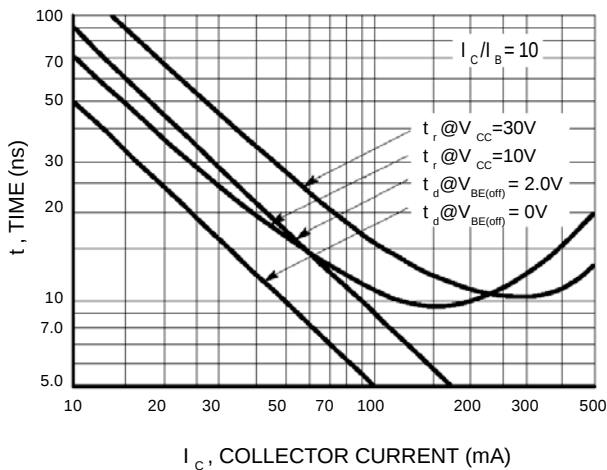


Figure 5. Turn-On Time

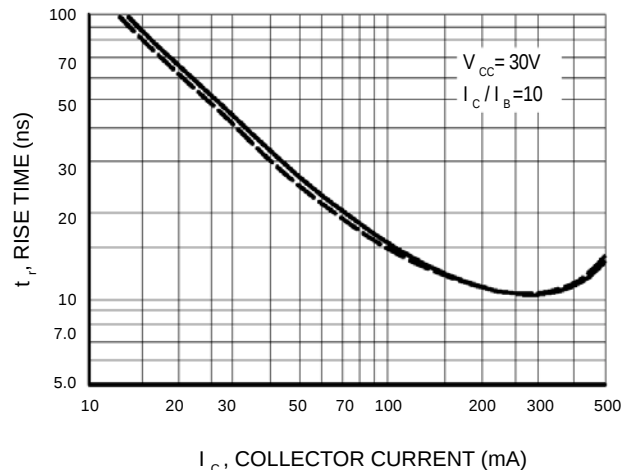


Figure 6. Rise Time

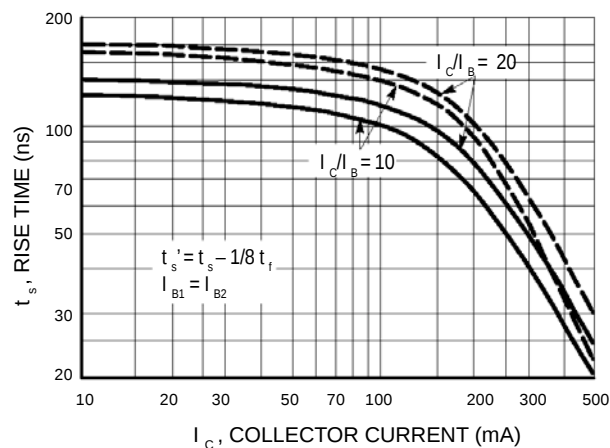


Figure 7. Storage Time

SMALL-SIGNAL CHARACTERISTICS

NOISE FIGURE

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

Bandwidth = 1.0 Hz

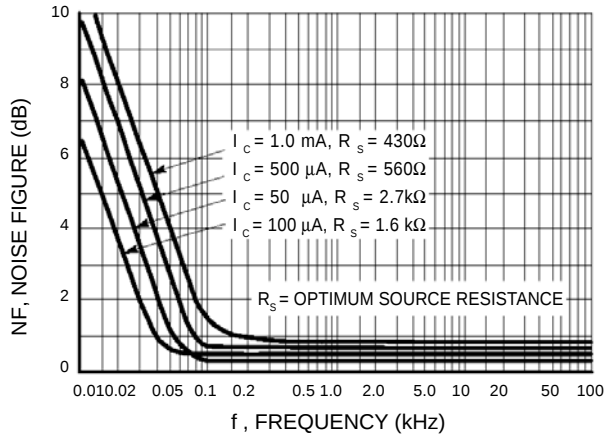


Figure 8. Frequency Effects

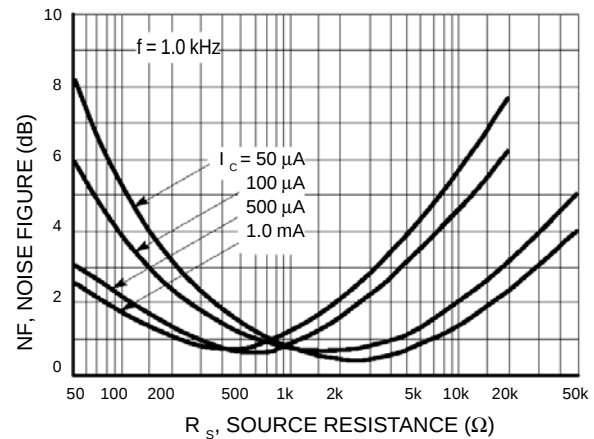


Figure 9. Source Resistance Effects

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.

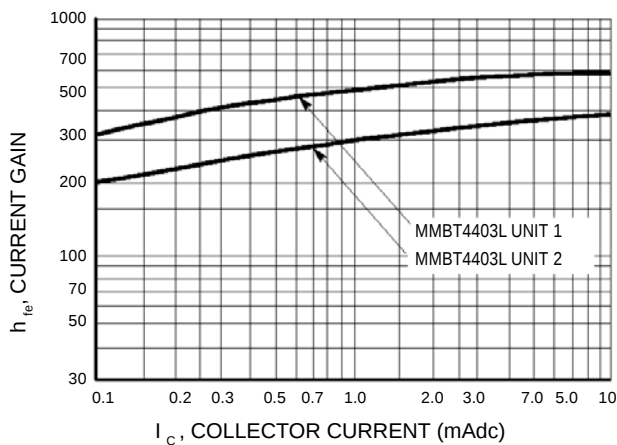


Figure 10. Current Gain

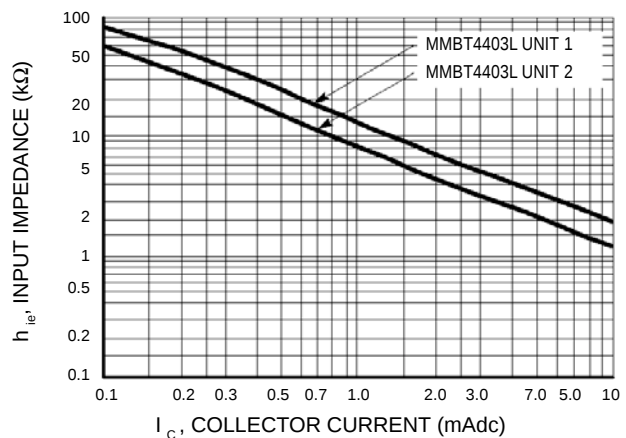


Figure 11. Input Impedance

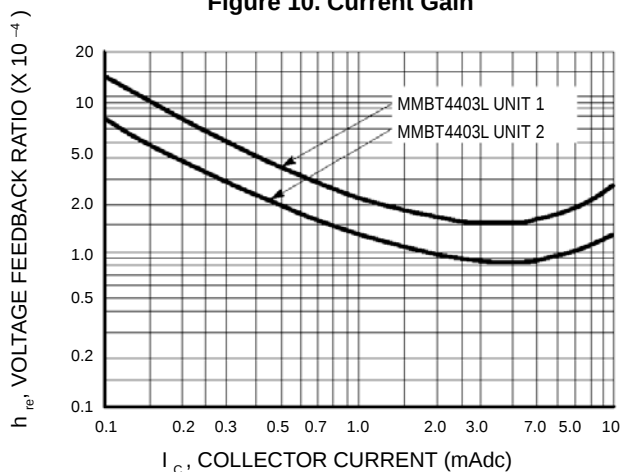


Figure 12. Voltage Feedback Ratio

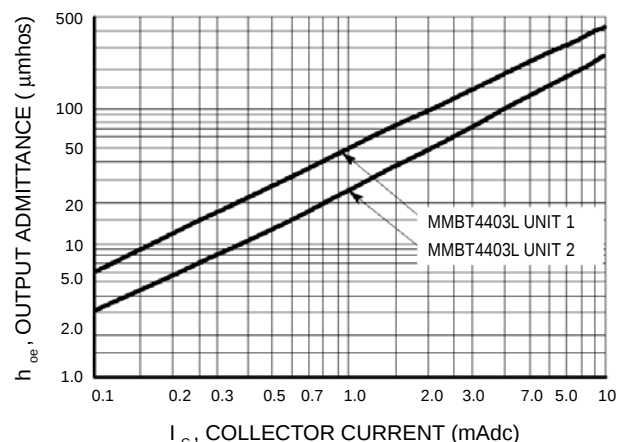


Figure 13. Output Admittance

STATIC CHARACTERISTICS

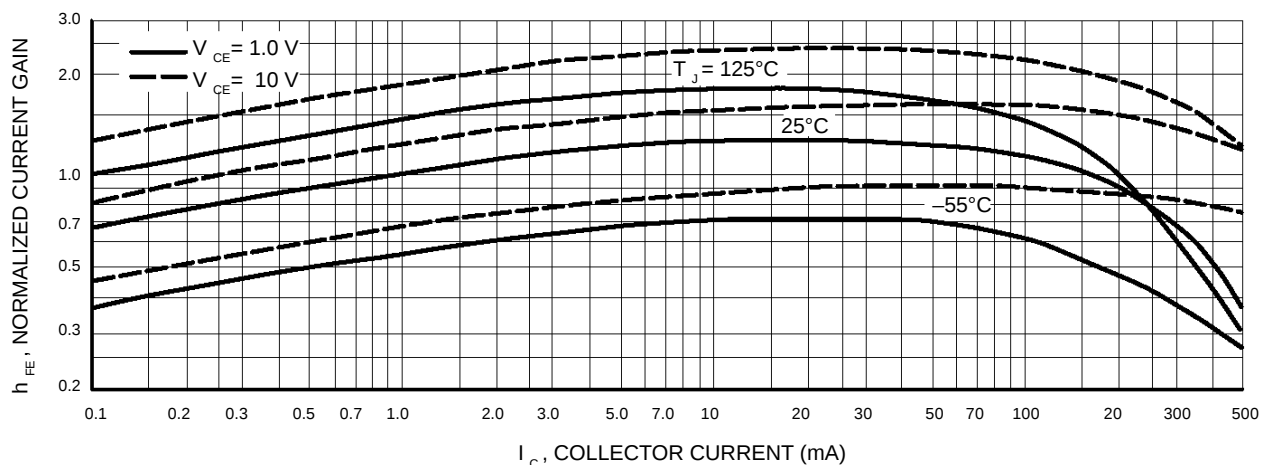


Figure 14. DC Current Gain

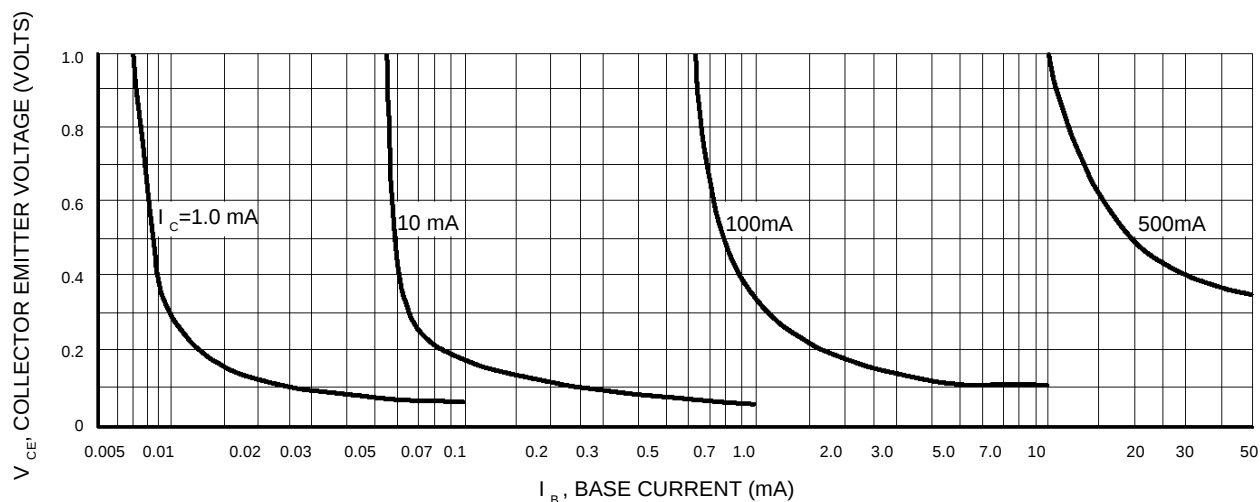


Figure 15. Collector Saturation Region

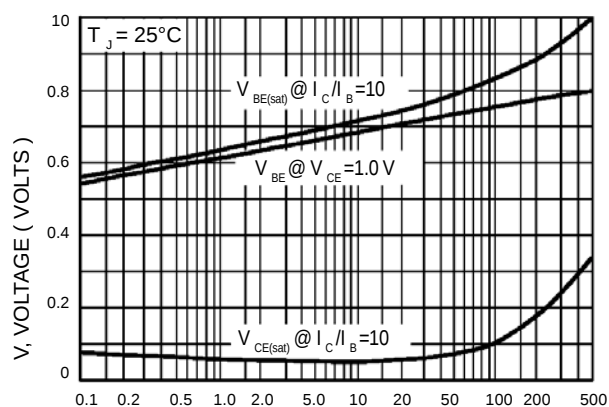


Figure 16. "On" Voltages

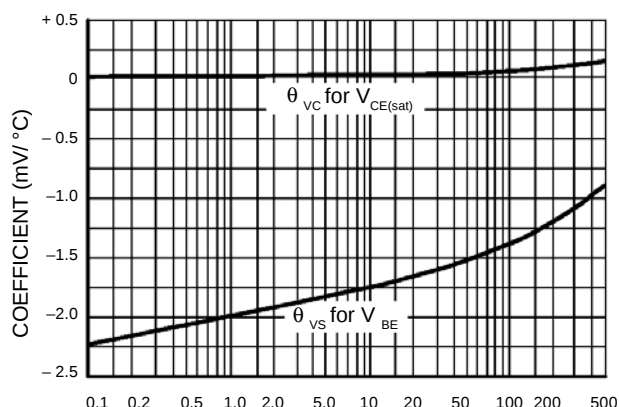
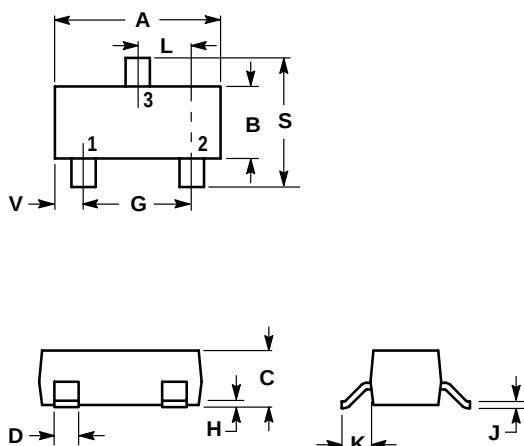


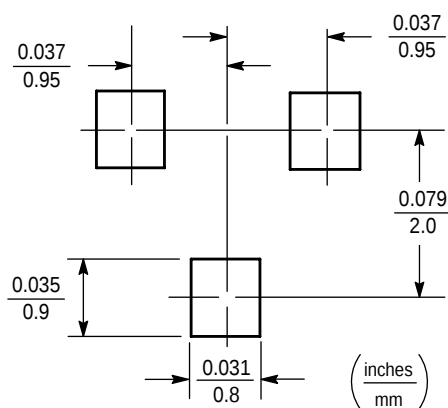
Figure 17. Temperature Coefficients

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



NOTICE

The information presented in this document is for reference only. Tinysemi reserves the right to make changes without notice for the specification of the products displayed herein.

The product listed herein is designed to be used with ordinary electronic equipment or devices, and not designed to be used with equipment or devices which require high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), Tinysemi elec Co., Ltd., or anyone on its behalf, assumes no responsibility or liability for any damages resulting from such improper use of sale.

This publication supersedes & replaces all information previously supplied. For additional information, please visit our website <http://www.tinysemi.com> , or consult your nearest Tinysemi' s sales office for further assistance.