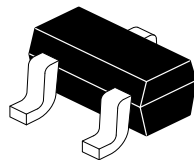


General Purpose Transistors PNP Silicon

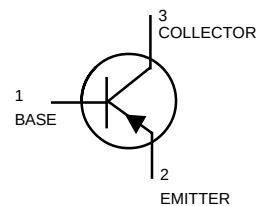
FEATURES:

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

Circuit Diagram & Pin Configuration:



SOT-323/SC-70



DEVICE MARKING AND ORDERING INFORMATION

Device	Marking	Shipping
TMBT4403W	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 $T_A = 25^{\circ}\text{C}$	P_D	150	mW
Thermal Resistance, Junction–to–Ambient	$R_{\theta JA}$	833	$^{\circ}\text{C}/\text{W}$
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) ($I_C = -1.0\text{ mA}$, $I_E = 0$)	$V_{(BR)CEO}$	- 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 x 0.75 x 0.062 in.
2. Alumina = 0.4 x 0.3 x 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 mA _{dc} , V _{CE} = -1.0 V _{dc}) (I _C = -1.0 mA _{dc} , V _{CE} = -1.0 V _{dc}) (I _C = -10 mA _{dc} , V _{CE} = -1.0 V _{dc}) (I _C = -150 mA _{dc} , V _{CE} = -2.0 V _{dc})(3) (I _C = -500 mA _{dc} , V _{CE} = -2.0 V _{dc})(3)	h _{FE}	30 60 100 100 20	— — — 300 —	—
Collector-Emitter Saturation Voltage(3) (I _C = -150mA _{dc} , I _B = -15 mA _{dc}) (I _C = -500 mA _{dc} , I _B = -50 mA _{dc})	V _{CE(sat)}	— —	- 0.4 - 0.75	V _{dc}
Base-Emitter Saturation Voltage (3) (I _C = -150 mA _{dc} , I _B = -15 mA _{dc}) (I _C = -500 mA _{dc} , I _B = -50 mA _{dc})	V _{BE(sat)}	- 0.75 —	- 0.95 - 1.3	V _{dc}

SMALL-SIGNAL CHARACTERISTICS

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

SWITCHING CHARACTERISTICS

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

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

SWITCHING TIME EQUIVALENT TEST CIRCUITS

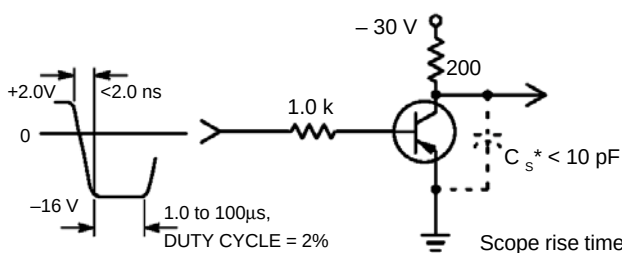


Figure 1. Turn-On Time

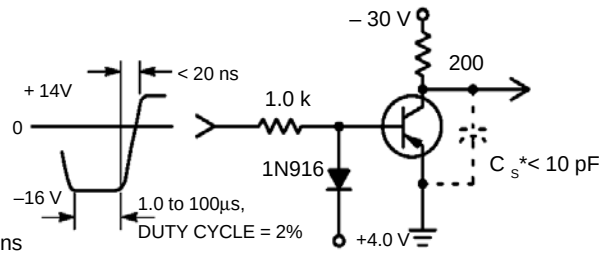


Figure 2. Turn-Off Time

TYPICAL TRANSIENT CHARACTERISTICS

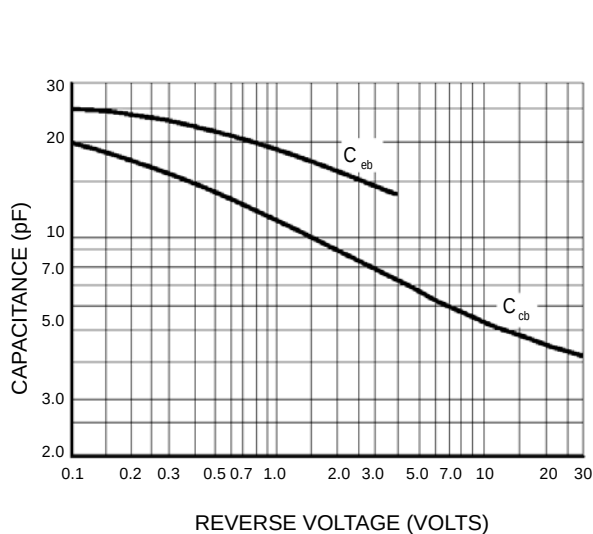


Figure 3. Capacitance

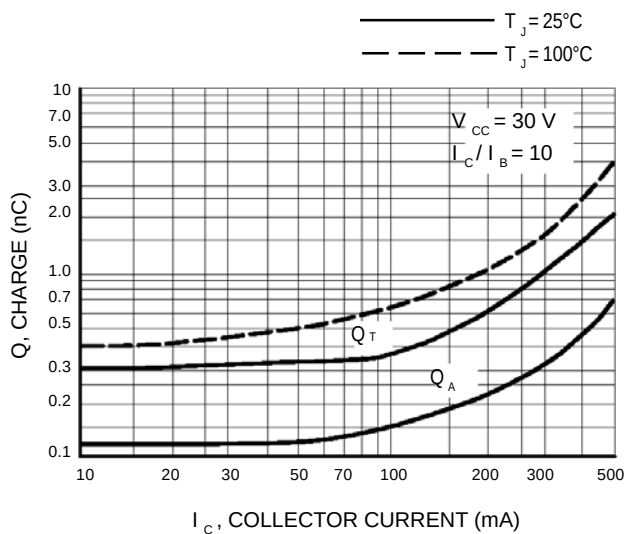


Figure 4. Charge Data

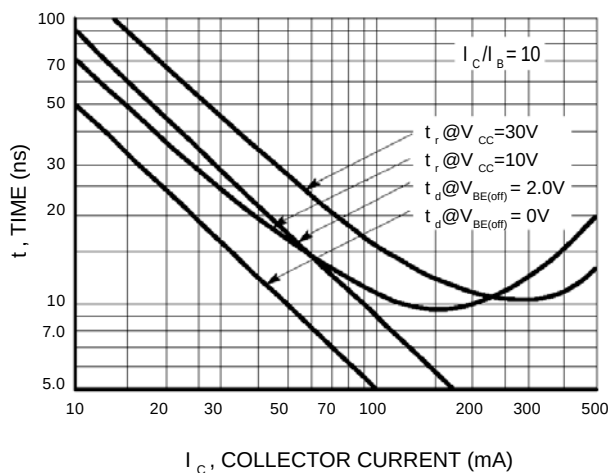


Figure 5. Turn-On Time

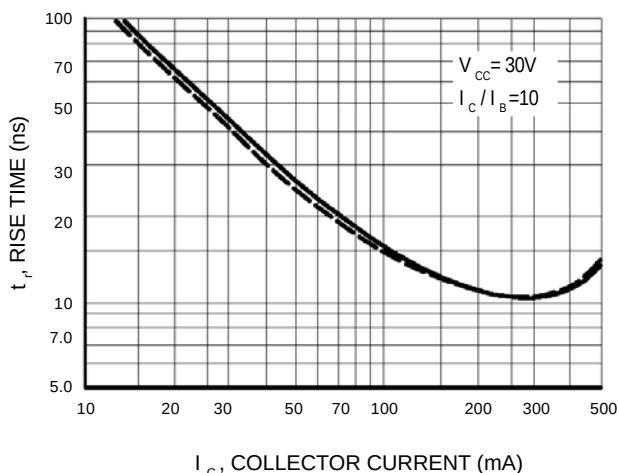


Figure 6. Rise Time

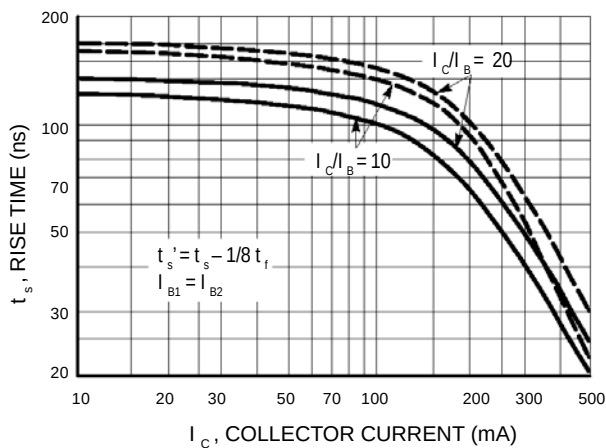


Figure 7. Storage Time

SMALL-SIGNAL CHARACTERISTICS

NOISE FIGURE

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

Bandwidth = 1.0 Hz

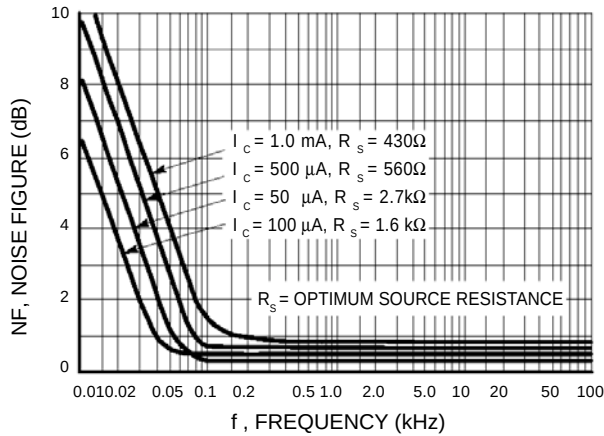


Figure 8. Frequency Effects

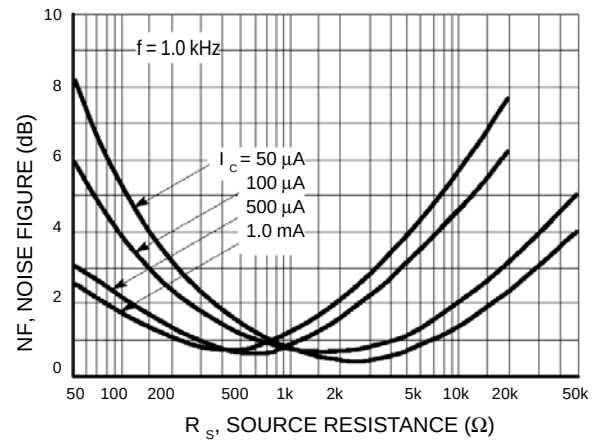


Figure 9. Source Resistance Effects

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 MMBT4403W lines, and the same units were used to develop the correspondingly numbered curves on each graph.

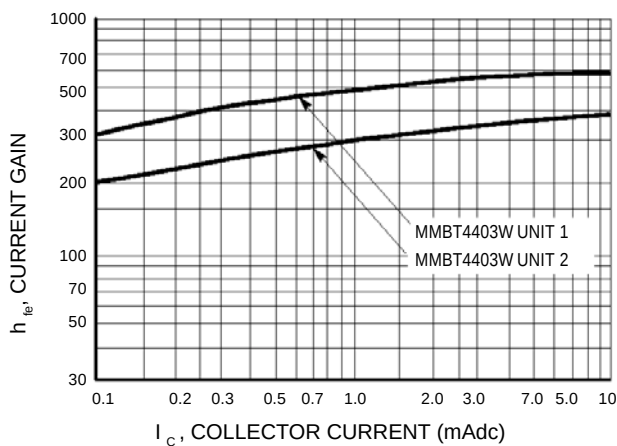


Figure 10. Current Gain

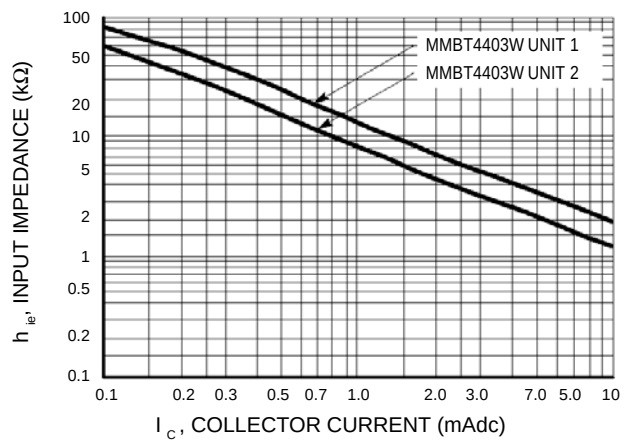


Figure 11. Input Impedance

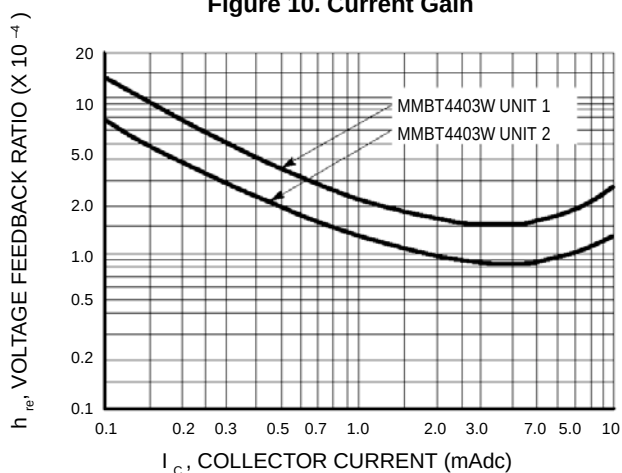


Figure 12. Voltage Feedback Ratio

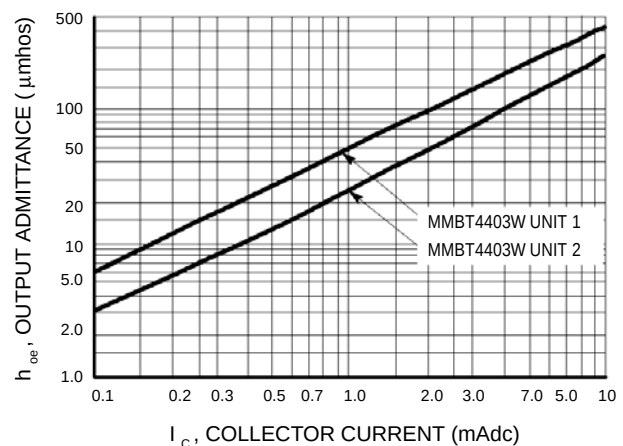


Figure 13. Output Admittance

STATIC CHARACTERISTICS

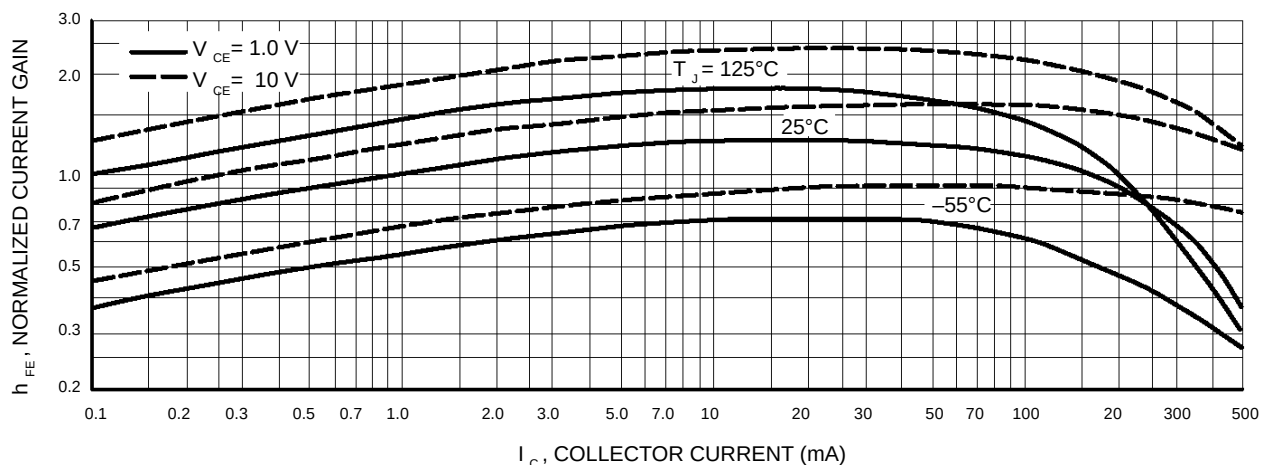


Figure 14. DC Current Gain

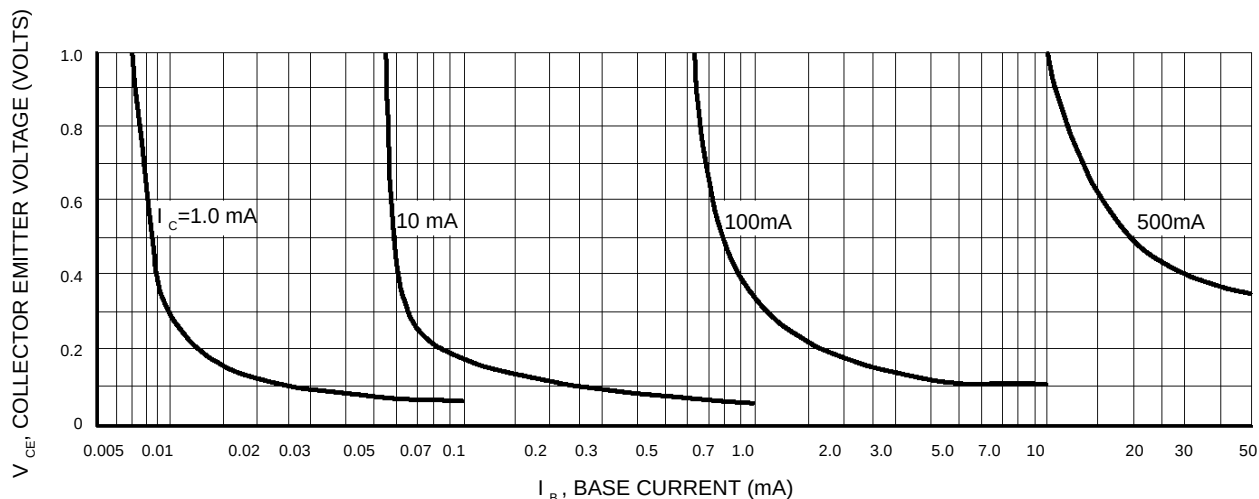


Figure 15. Collector Saturation Region

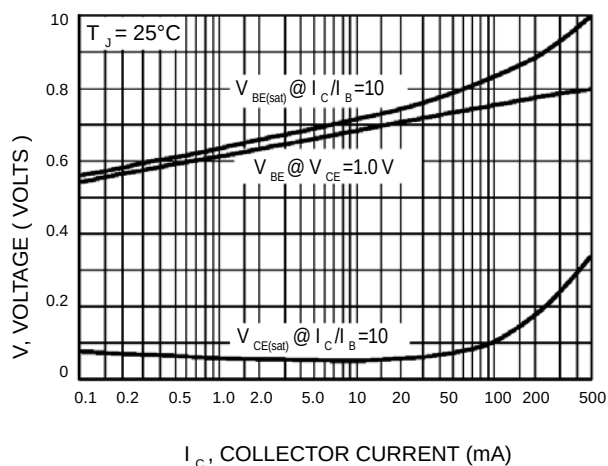


Figure 16. "On" Voltages

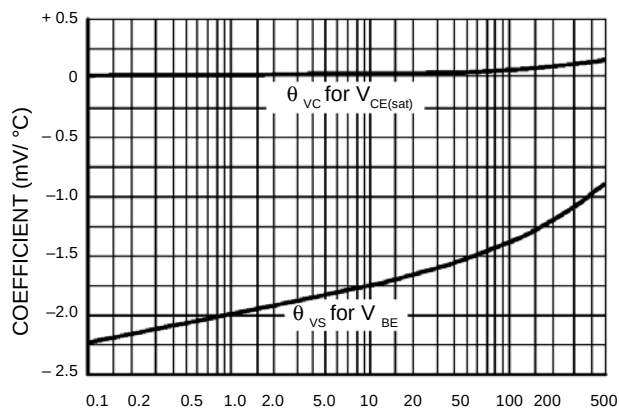
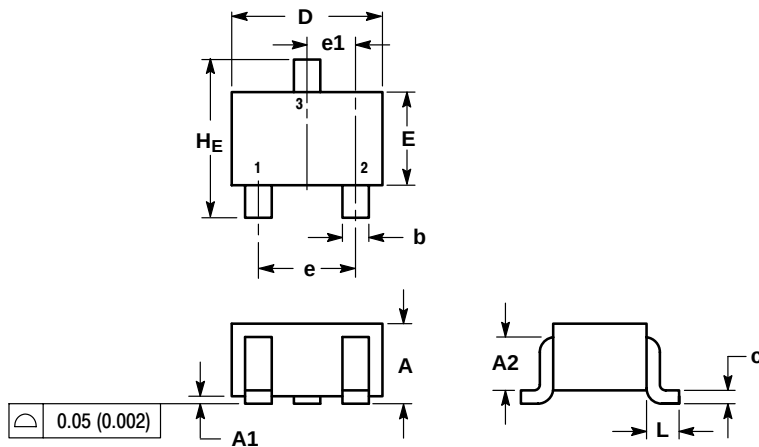


Figure 17. Temperature Coefficients

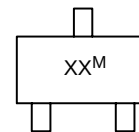
SC-70 (SOT-323)



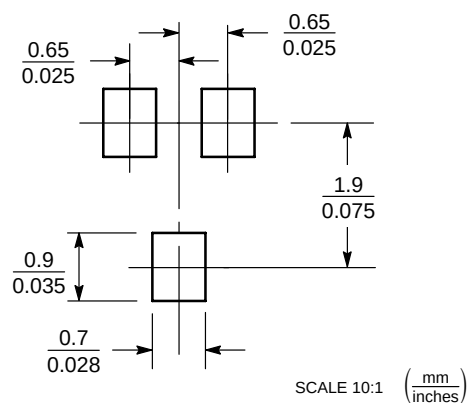
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.7 REF			0.028 REF		
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.10	2.20	0.071	0.083	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1	0.65 BSC			0.026 BSC		
L	0.425 REF			0.017 REF		
HE	2.00	2.10	2.40	0.079	0.083	0.095

GENERIC MARKING DIAGRAM



SOLDERING FOOTPRINT*



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