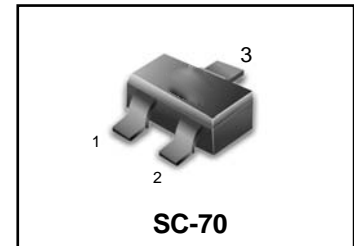


- We declare that the material of product compliance with RoHS requirements.
- S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

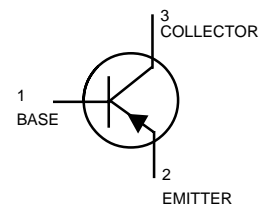
## ORDERING INFORMATION

Device	Marking	Shipping
MBT4403WT1G S-MBT4403WT1G	2T	3000/Tape & Reel
MBT4403WT3G S-MBT4403WT3G	2T	10000/Tape & Reel



## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CE0}$	- 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	$^\circ\text{C/W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

## DEVICE MARKING

MBT4403WT1G = 2T

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

Characteristic	Symbol	Min	Max	Unit
----------------	--------	-----	-----	------

## OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage (3) ( $I_C = -1.0\text{ mAdc}, I_B = 0$ )	$V_{(BR)CEO}$	- 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	$\mu\text{Adc}$
Collector Cutoff Current ( $V_{CE} = -35\text{ Vdc}, V_{EB} = -0.4\text{ Vdc}$ )	$I_{CEX}$	—	- 0.1	$\mu\text{Adc}$

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  $\leq 300\ \mu\text{s}$ ; Duty Cycle  $\leq 2.0\%$ .

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

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

**SMALL-SIGNAL CHARACTERISTICS**

Current–Gain — Bandwidth Product ( $I_C = -20 \text{ mA}$ , $V_{CE} = -10 \text{ Vdc}$ , $f = 100 \text{ MHz}$ )	$f_T$	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 ( $V_{CE} = -10 \text{ Vdc}$ , $I_C = -1.0 \text{ mA}$ , $f = 1.0 \text{ kHz}$ )	$h_{ie}$	1.5	15	$k\Omega$
Voltage Feedback Ratio ( $V_{CE} = -10 \text{ Vdc}$ , $I_C = -1.0 \text{ mA}$ , $f = 1.0 \text{ kHz}$ )	$h_{re}$	0.1	8.0	$\times 10^{-4}$
Small–Signal Current Gain ( $V_{CE} = -10 \text{ Vdc}$ , $I_C = -1.0 \text{ mA}$ , $f = 1.0 \text{ kHz}$ )	$h_{fe}$	60	500	—
Output Admittance ( $V_{CE} = -10 \text{ Vdc}$ , $I_C = -1.0 \text{ mA}$ , $f = 1.0 \text{ kHz}$ )	$h_{oe}$	1.0	100	$\mu\text{mhos}$

**SWITCHING CHARACTERISTICS**

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

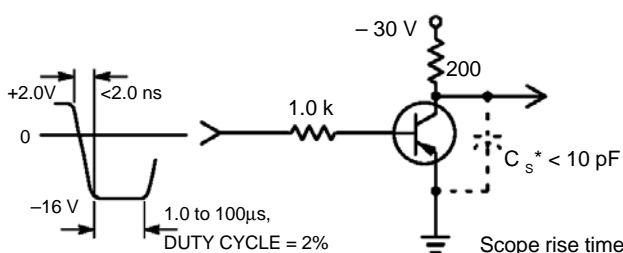


Figure 1. Turn–On Time

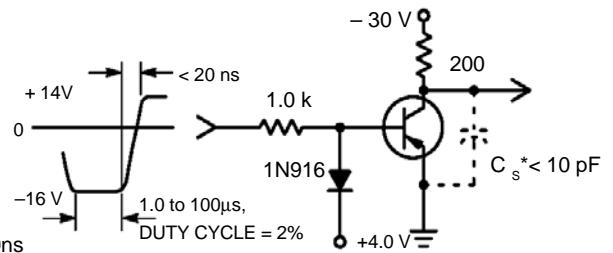
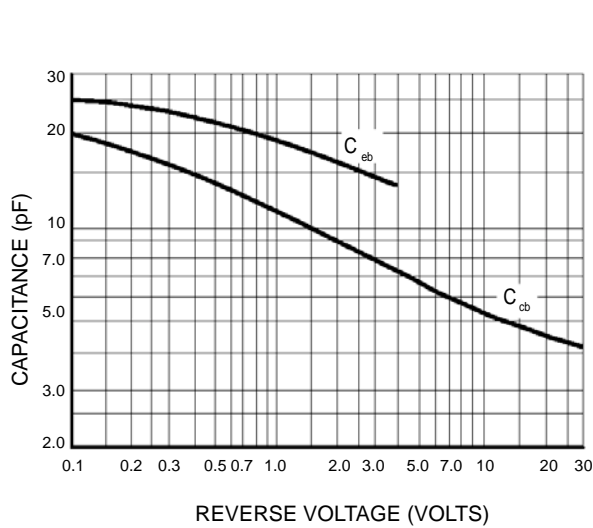


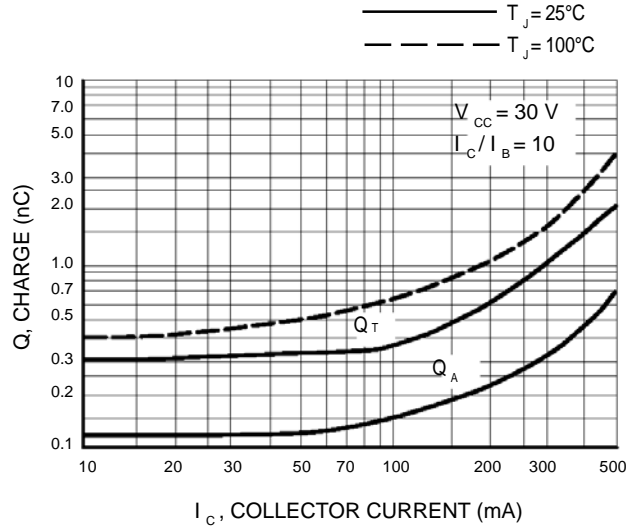
Figure 2. Turn–Off Time

\*Total shunt capacitance of test jig connectors, and oscilloscope

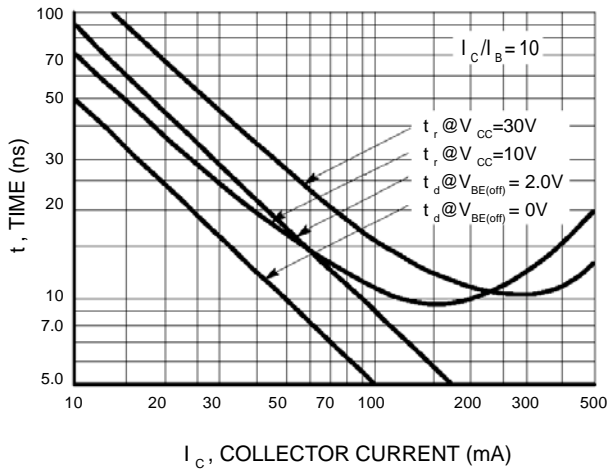
**TYPICAL TRANSIENT CHARACTERISTICS**



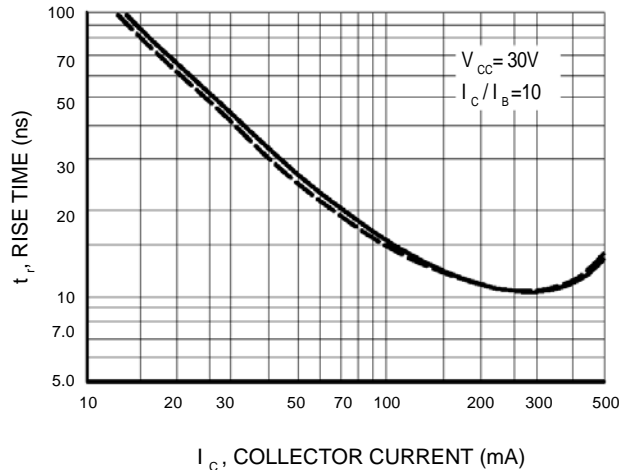
**Figure 3. Capacitance**



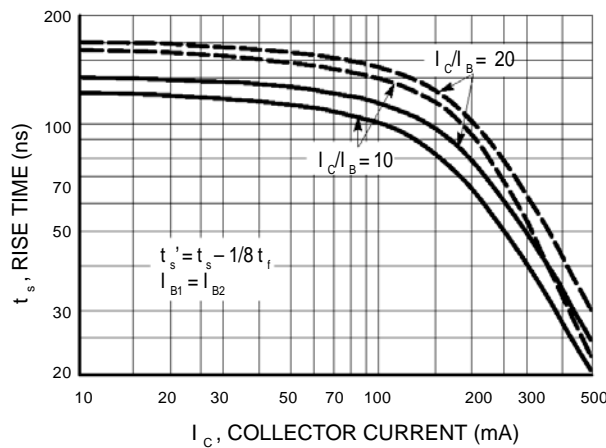
**Figure 4. Charge Data**



**Figure 5. Turn-On Time**



**Figure 6. Rise Time**

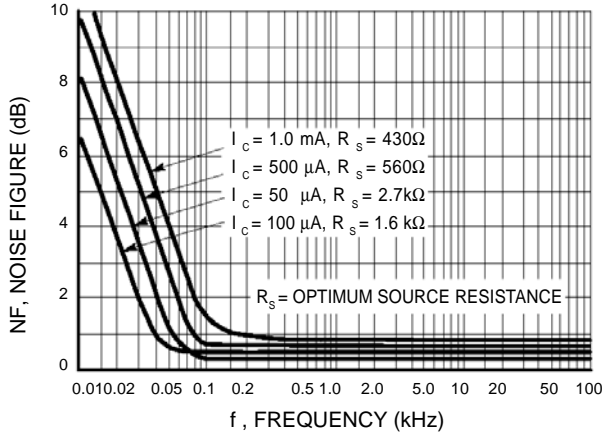


**Figure 7. Storage Time**

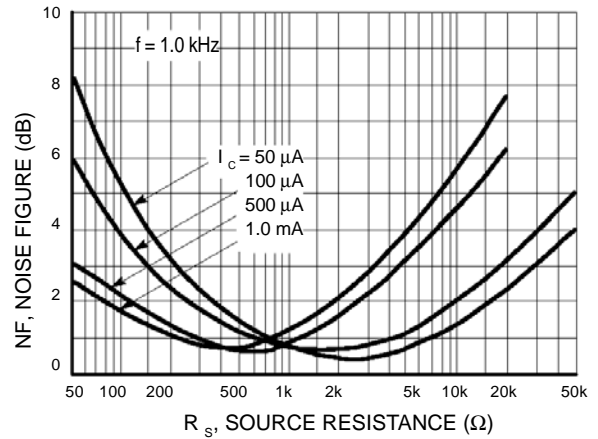
**SMALL-SIGNAL CHARACTERISTICS**

**NOISE FIGURE**

$V_{CE} = -10 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$   
Bandwidth = 1.0 Hz



**Figure 8. Frequency Effects**

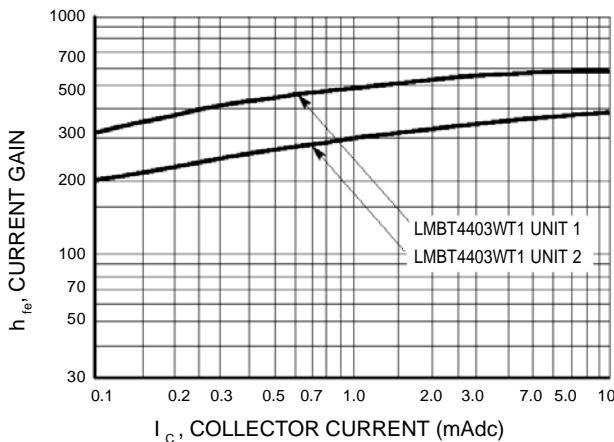


**Figure 9. Source Resistance Effects**

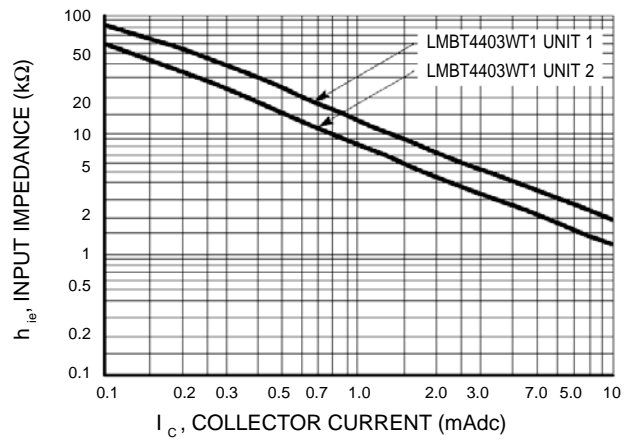
**h PARAMETERS**

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

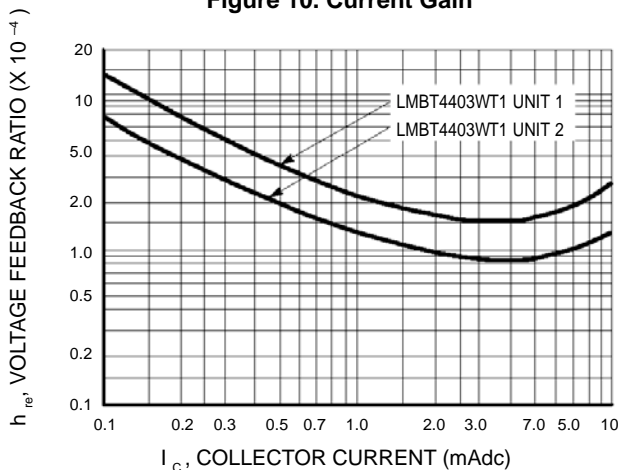
This group of graphs illustrates the relationship between  $h_{fe}$  and other "h" parameters for this series of transistors. To obtain these curves, a high-gain and a low-gain unit were selected from the LMBT4403WT1 lines, and the same units were used to develop the correspondingly numbered curves on each graph.



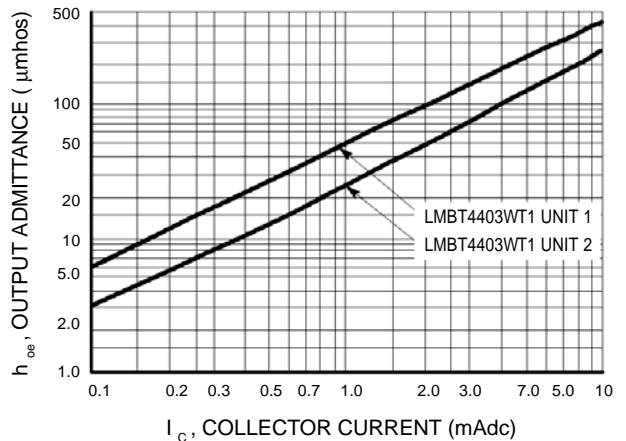
**Figure 10. Current Gain**



**Figure 11. Input Impedance**

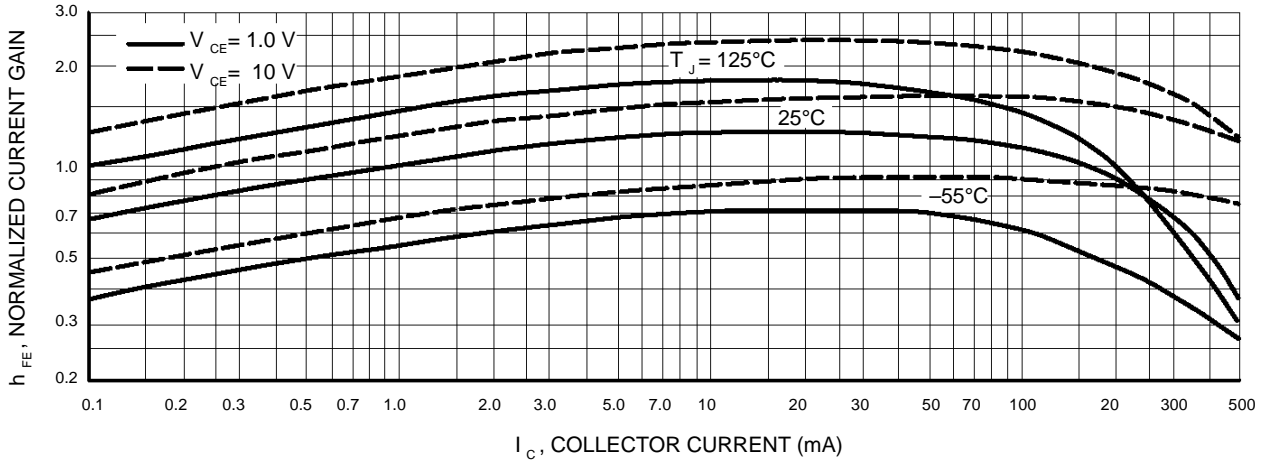


**Figure 12. Voltage Feedback Ratio**

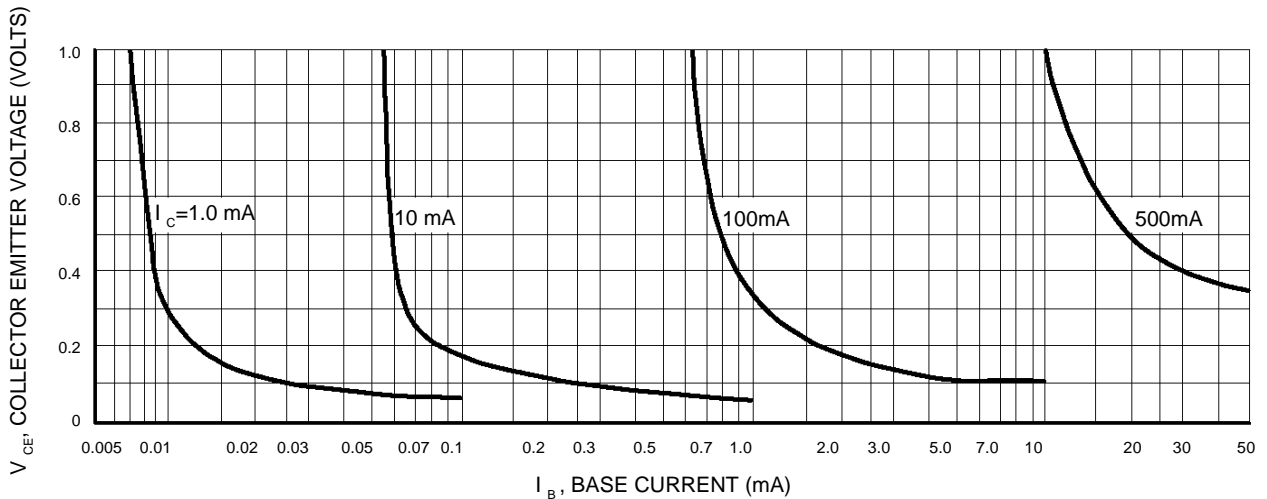


**Figure 13. Output Admittance**

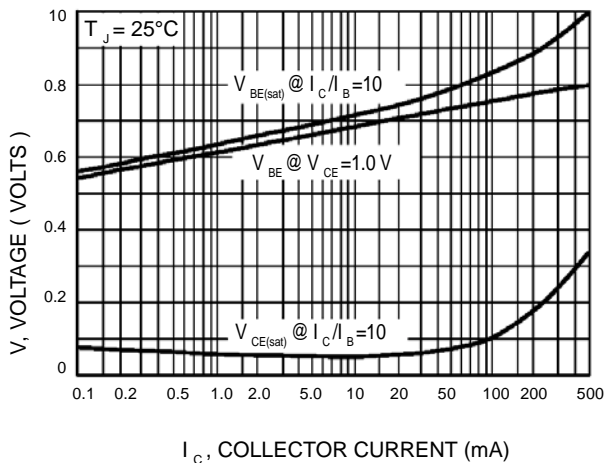
**STATIC CHARACTERISTICS**



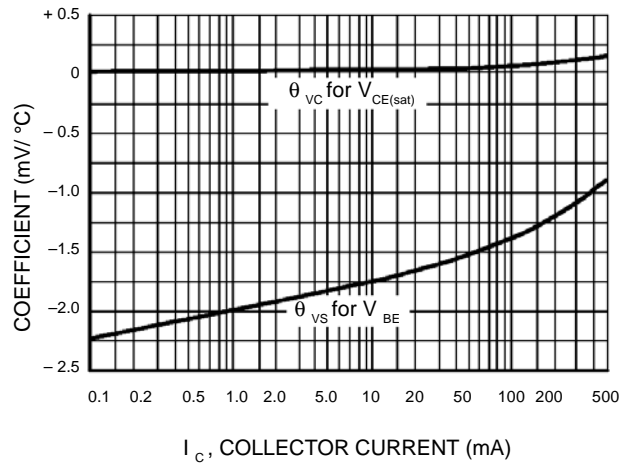
**Figure 14. DC Current Gain**



**Figure 15. Collector Saturation Region**



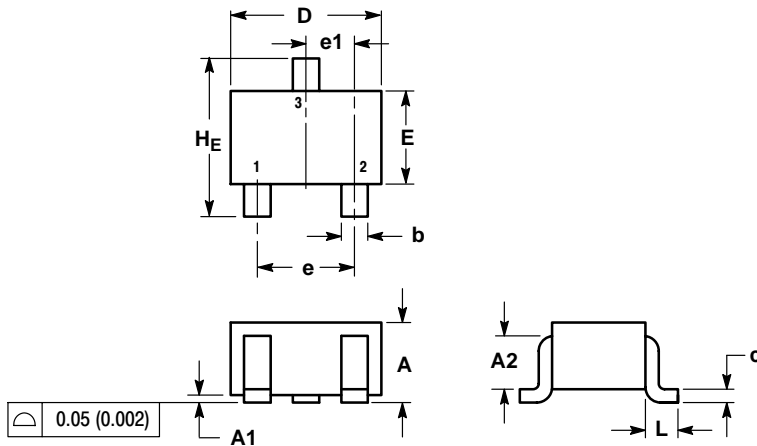
**Figure 16. "On" Voltages**



**Figure 17. Temperature Coefficients**

**MBT4403WT1G ; S-MBT4403WT1G**

SC-70 (SOT-323)

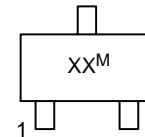


NOTES:

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

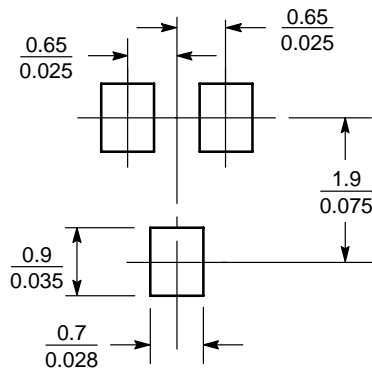
**GENERIC MARKING DIAGRAM**



- XX = Specific Device Code
- M = Date Code
- = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

**SOLDERING FOOTPRINT\***



SCALE 10:1 (mm/inches)