

General Purpose Transistor

- 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.

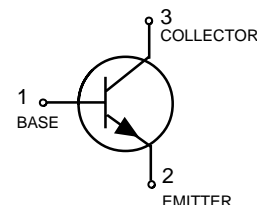
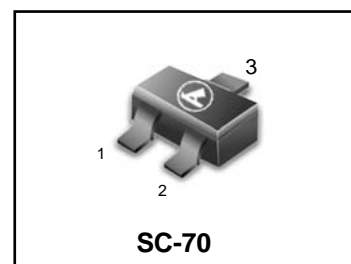
LMBT4401WT1G
S-LMBT4401WT1G

ORDERING INFORMATION

Device	Marking	Shipping
LMBT4401WT1G S-LMBT4401WT1G	2X	3000/Tape & Reel
LMBT4401WT3G S-LMBT4401WT3G	2X	10000/Tape & Reel

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CE0}	40	Vdc
Collector–Base Voltage	V_{CBO}	60	Vdc
Emitter–Base Voltage	V_{EBO}	6.0	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	$^\circ\text{C}$

DEVICE MARKING

LMBT4401WT1G = 2X

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 ($I_C = 0.1 \text{ mAdc}, I_E = 0$)	$V_{(BR)CBO}$	60	—	Vdc
Emitter–Base Breakdown Voltage ($I_E = 0.1 \text{ mAdc}, I_C = 0$)	$V_{(BR)EBO}$	6.0	—	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

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

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

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS (3)				
DC Current Gain ($I_C = 0.1 \text{ mAdc}, V_{CE} = 1.0 \text{ Vdc}$) ($I_C = 1.0 \text{ mAdc}, V_{CE} = 1.0 \text{ Vdc}$) ($I_C = 10 \text{ mAdc}, V_{CE} = 1.0 \text{ Vdc}$) ($I_C = 150 \text{ mAdc}, V_{CE} = 1.0 \text{ Vdc}$) ($I_C = 500 \text{ mAdc}, V_{CE} = 2.0 \text{ Vdc}$)	h_{FE}	20 40 80 100 40	— — — 300 —	—
Collector–Emitter Saturation Voltage ($I_C = 150 \text{ mAdc}, I_B = 15 \text{ mAdc}$) ($I_C = 500 \text{ mAdc}, I_B = 50 \text{ mAdc}$)	$V_{CE(sat)}$	— —	0.4 0.75	Vdc
Base–Emitter Saturation Voltage ($I_C = 150 \text{ mAdc}, I_B = 15 \text{ mAdc}$) ($I_C = 500 \text{ mAdc}, I_B = 50 \text{ mAdc}$)	$V_{BE(sat)}$	0.75 —	0.95 1.2	Vdc

SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product ($I_C = 20 \text{ mAdc}, V_{CE} = 10\text{Vdc}, f = 100 \text{ MHz}$)	f_T	250	—	MHz
Collector–Base Capacitance ($V_{CB} = 5.0 \text{ Vdc}, I_E = 0, f = 1.0 \text{ MHz}$)	C_{cb}	—	6.5	pF
Emitter–Base Capacitance ($V_{EB} = 0.5 \text{ Vdc}, I_C = 0, f = 1.0 \text{ MHz}$)	C_{eb}	—	30	pF
Input Impedance ($V_{CE} = 10 \text{ Vdc}, I_C = 1.0 \text{ mAdc}, f = 1.0 \text{ kHz}$)	h_{ie}	1.0	15	k Ω
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}	40	500	—
Output Admittance ($V_{CE} = 10 \text{ Vdc}, I_C = 1.0 \text{ mAdc}, f = 1.0 \text{ kHz}$)	h_{oe}	1.0	30	μmhos

SWITCHING CHARACTERISTICS

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

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

SWITCHING TIME EQUIVALENT TEST CIRCUITS

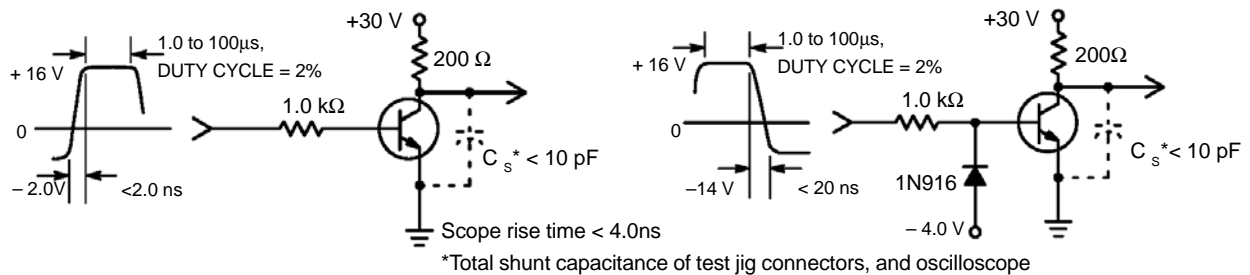
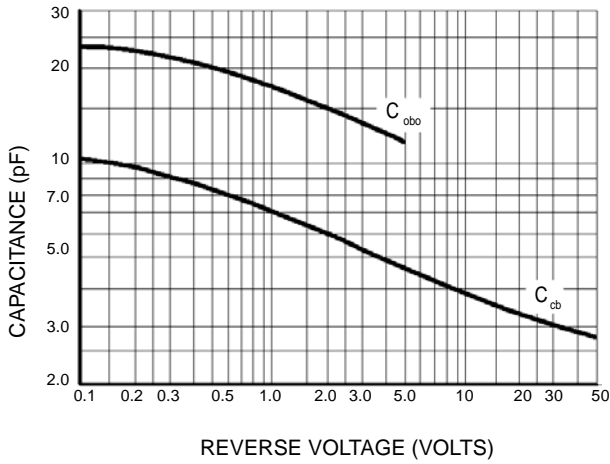


Figure 1. Turn–On Time

Figure 2. Turn–Off Time

TRANSIENT CHARACTERISTICS



REVERSE VOLTAGE (VOLTS)
Figure 3. Capacitance

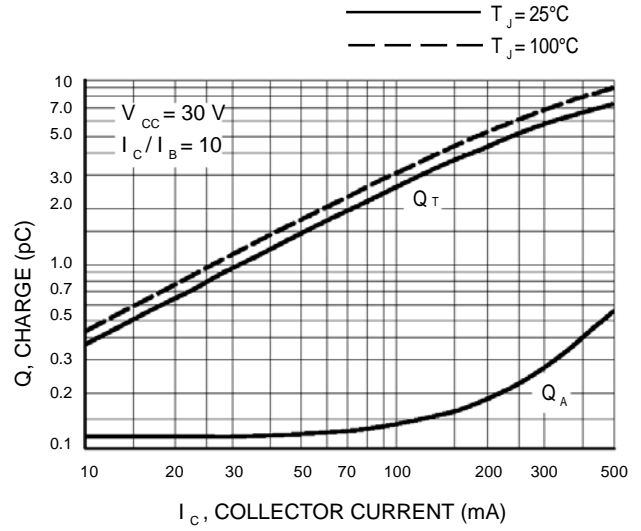


Figure 4. Charge Data

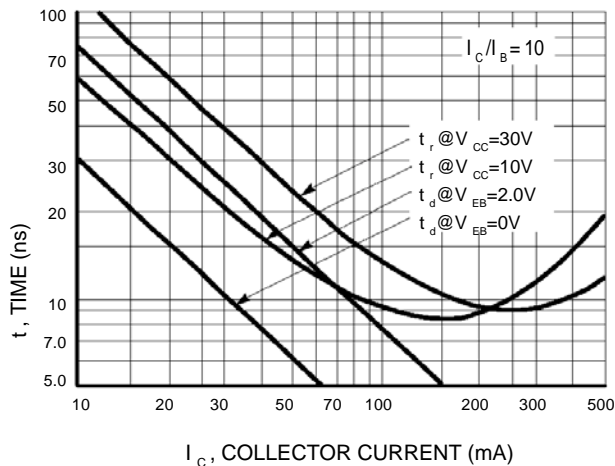


Figure 5. Turn-On Time

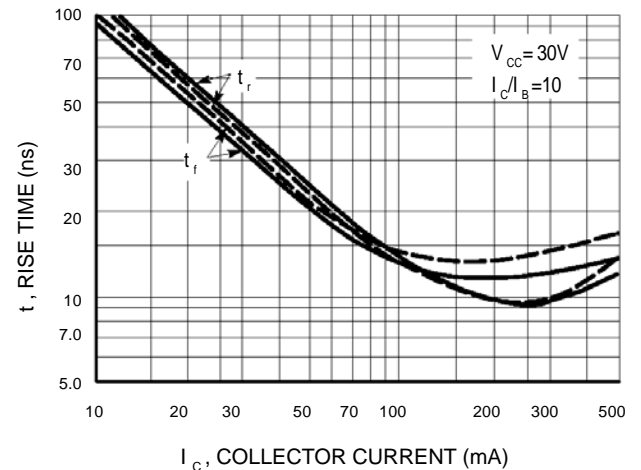


Figure 6. Rise and Fall Time

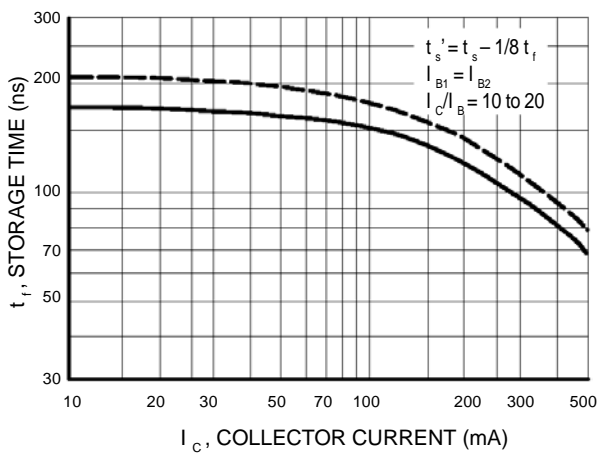


Figure 7. Storage Time

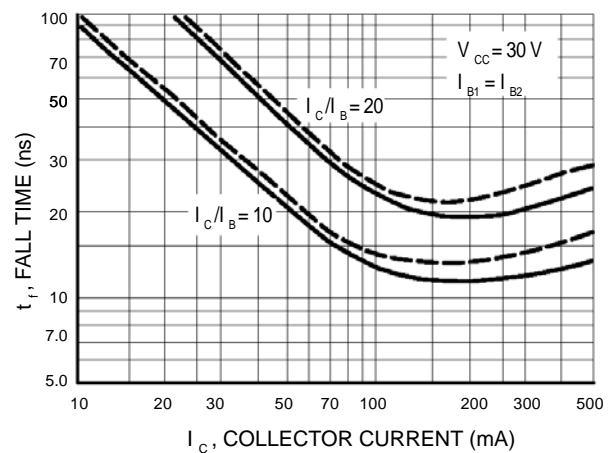


Figure 8. Fall Time

LMBT4401WT1G;S-LMBT4401WT1G

SMALL-SIGNAL CHARACTERISTICS

NOISE FIGURE

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

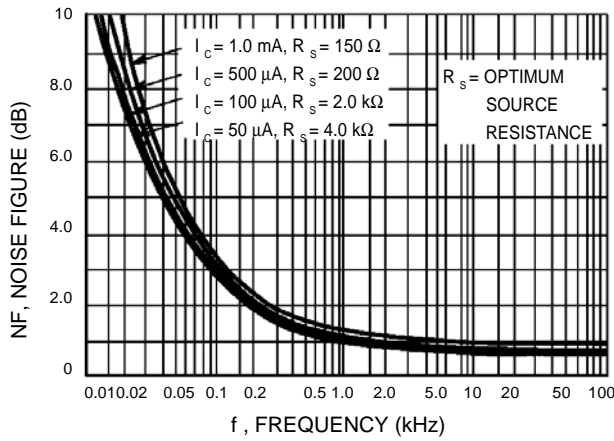


Figure 9. Frequency Effects

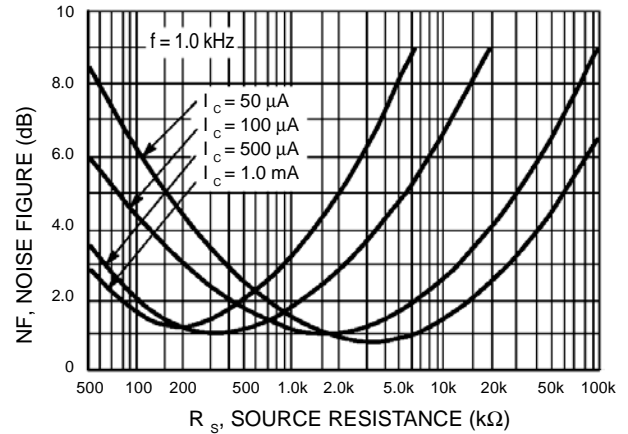


Figure 10. Source Resistance Effects

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 LMBT4401WT1G lines, and the same units were used to develop the correspondingly numbered curves on each graph.

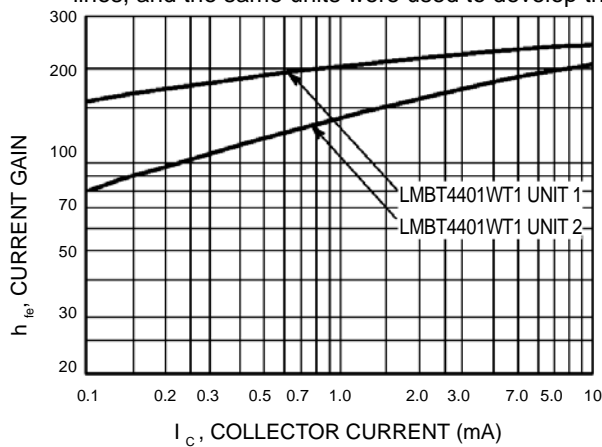


Figure 11. Current Gain

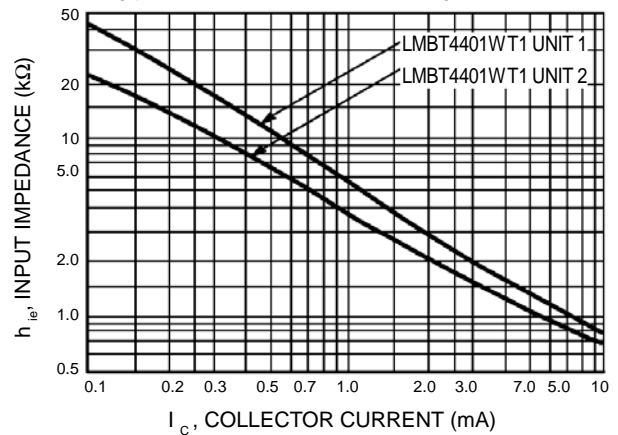


Figure 12. Input Impedance

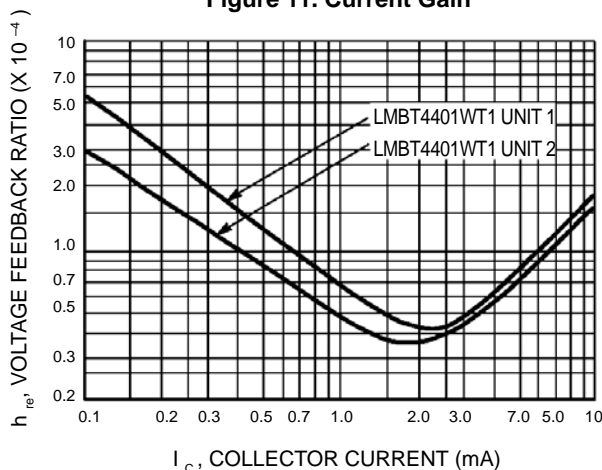


Figure 13. Voltage Feedback Ratio

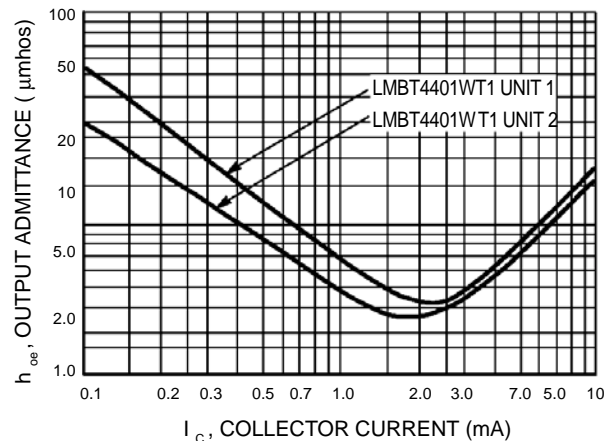


Figure 14. Output Admittance

LMBT4401WT1G;S-LMBT4401WT1G

STATIC CHARACTERISTICS

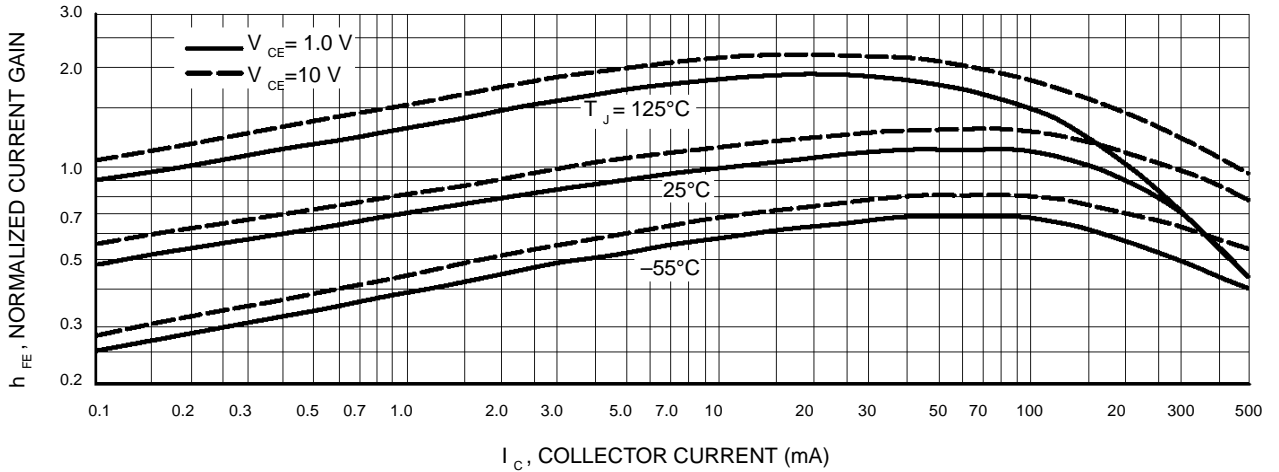


Figure 15. DC Current Gain

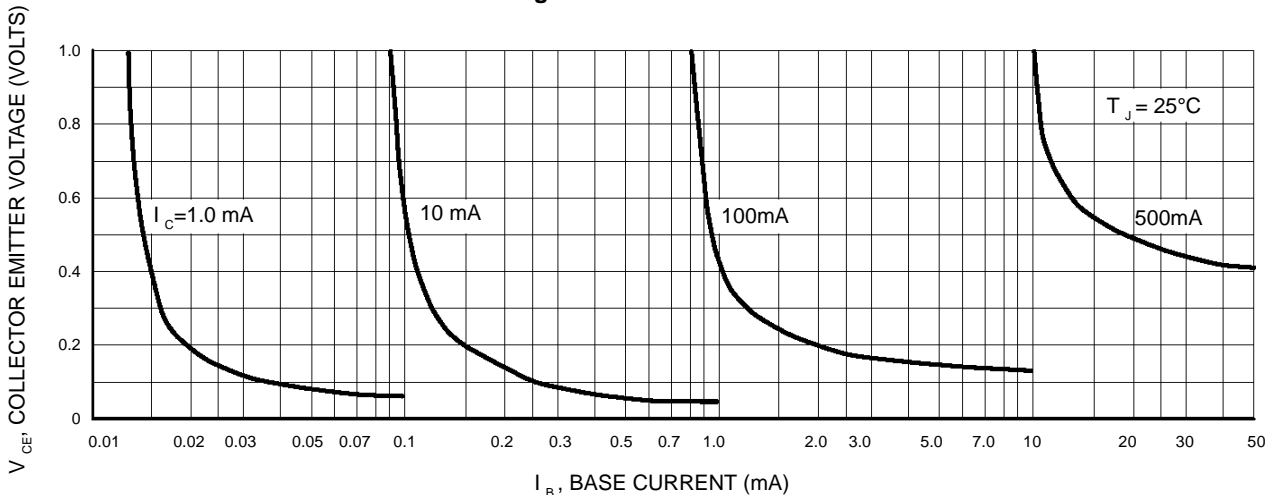


Figure 16. Collector Saturation Region

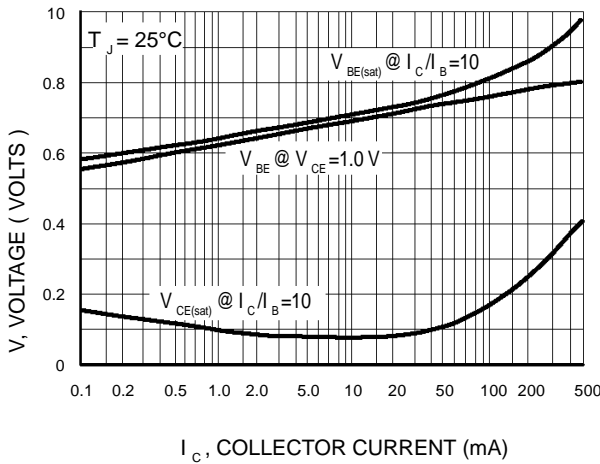


Figure 17. "On" Voltages

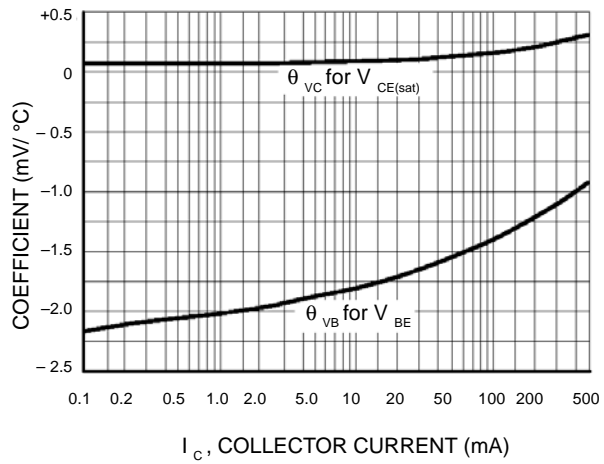
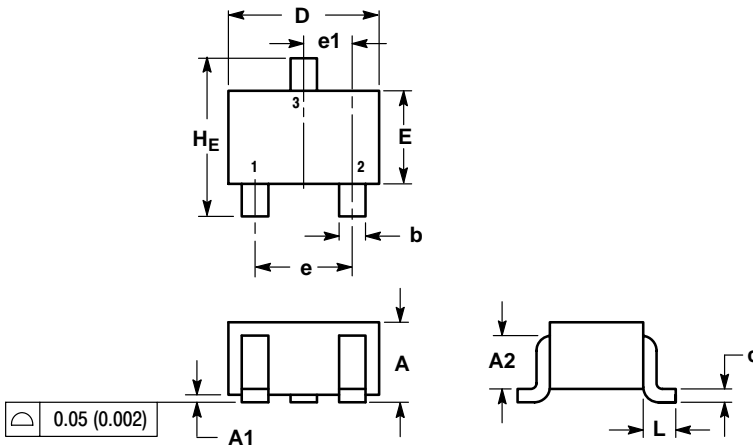
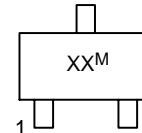


Figure 18. Temperature Coefficients

LMBT4401WT1G ;S-LMBT4401WT1G
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.

