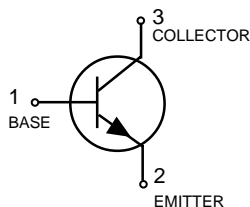
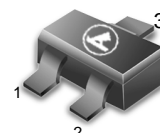


# Switching Transistors



**LMBT2369LT1**  
**LMBT2369ALT1**



**SC-70/SOT-323**

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	15	Vdc
Collector-Emitter Voltage	$V_{CES}$	40	Vdc
Collector-Base Voltage	$V_{CBO}$	40	Vdc
Emitter-Base Voltage	$V_{EBO}$	4.5	Vdc
Collector Current — Continuous	$I_C$	200	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 $25^\circ\text{C}$		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 $25^\circ\text{C}$		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	$^\circ\text{C}$

## DEVICE MARKING

LMBT2369LT1 = M1J, LMBT2369ALT1 = 1JA

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

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

## OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage(3) ( $I_C = 10 \text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	15	—	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 10 \text{ }\mu\text{Adc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	40	—	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = 10 \text{ }\mu\text{Adc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	40	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 10 \text{ }\mu\text{Adc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.5	—	—	Vdc
Collector Cutoff Current( $V_{CB} = 20\text{Vdc}$ , $I_E = 0$ ) ( $V_{CB} = 20\text{Vdc}$ , $I_E = 0$ , $T_A = 150^\circ\text{C}$ )	$I_{CBO}$	—	—	0.4 30	$\mu\text{Adc}$
Collector Cutoff Current ( $V_{CE} = 20\text{Vdc}$ , $V_{BE} = 0$ )	$I_{CES}$	—	—	0.4	$\mu\text{Adc}$

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

## LMBT2369LT1 LMBT2369ALT1

### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>ON CHARACTERISTICS</b>					
DC Current Gain(3) (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 1.0 Vdc)	h <sub>FE</sub>	40	—	120	—
(I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 1.0 Vdc)		—	—	120	
(I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 0.35 Vdc)		40	—	—	
(I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 0.35 Vdc, T <sub>A</sub> = -55°C)		20	—	—	
(I <sub>C</sub> = 30 mAdc, V <sub>CE</sub> = 0.4Vdc)		30	—	—	
(I <sub>C</sub> = 100mAdc, V <sub>CE</sub> = 2.0 Vdc)		20	—	—	
(I <sub>C</sub> = 100mAdc, V <sub>CE</sub> = 1.0 Vdc)		20	—	—	
Collector-Emitter Saturation Voltage(3) (I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 1.0 mAdc)	V <sub>CE(sat)</sub>	—	—	0.25	Vdc
(I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 1.0 mAdc)		—	—	0.20	
(I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 1.0 mAdc, T <sub>A</sub> = + 125°C)		—	—	0.30	
(I <sub>C</sub> = 30mAdc, I <sub>B</sub> = 3.0 mAdc)		—	—	0.25	
(I <sub>C</sub> = 100mAdc, I <sub>B</sub> = 10 mAdc)		—	—	0.50	
Base-Emitter Saturation Voltage (I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 1.0 mAdc)	V <sub>BE(sat)</sub>	0.7	—	0.85	Vdc
(I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 1.0 mAdc, T <sub>A</sub> = - 55°C)		—	—	1.02	
(I <sub>C</sub> = 30 mAdc, I <sub>B</sub> = 3.0 mAdc)		—	—	1.15	
(I <sub>C</sub> = 100 mAdc, I <sub>B</sub> = 10 mAdc)		—	—	1.60	

### SMALL-SIGNAL CHARACTERISTICS

Output Capacitance (V <sub>CB</sub> = 5.0 Vdc, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>obo</sub>	—	—	4.0	pF
Small-Signal Current Gain (V <sub>CE</sub> = 10 Vdc, I <sub>C</sub> = 10 mAdc, f = 100 MHz)	h <sub>fe</sub>	5.0	—	—	—

### SWITCHING CHARACTERISTICS

Storage Time (I <sub>B1</sub> = I <sub>B2</sub> = I <sub>C</sub> = 10 mAdc)	t <sub>s</sub>	—	5.0	13	ns
Turn-On Time (V <sub>CC</sub> = 3.0 Vdc, I <sub>C</sub> = 10 mAdc, I <sub>B1</sub> = 3.0 mAdc)	t <sub>on</sub>	—	8.0	12	ns
Turn-Off Time (V <sub>CC</sub> = 3.0 Vdc, I <sub>C</sub> = 10 mAdc, I <sub>B1</sub> = 3.0 mAdc, I <sub>B2</sub> = 1.5 mAdc)	t <sub>off</sub>	—	10	18	ns

3. Pulse Test: Pulse Width ≤ 300 ms, Duty Cycle ≤ 2.0%.

## LMBT2369LT1 LMBT2369ALT1

### SWITCHING TIME EQUIVALENT TEST CIRCUITS FOR 2N2369, 2N3227

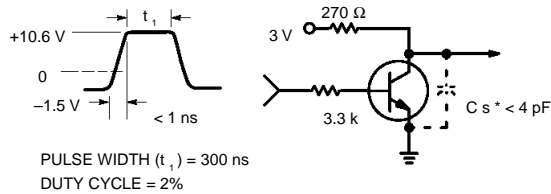


Figure 1.  $t_{on}$  Circuit — 10 mA

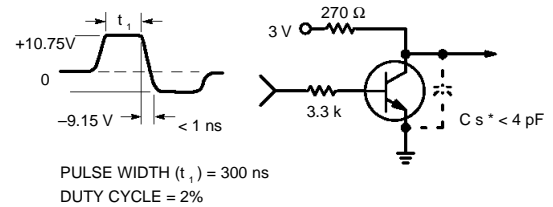


Figure 3.  $t_{off}$  Circuit — 10 mA

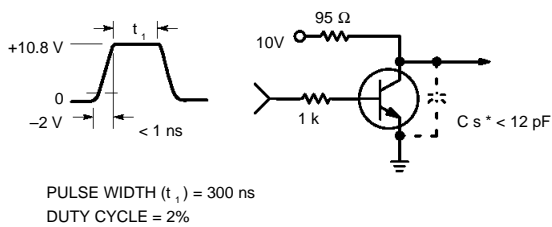


Figure 2.  $t_{on}$  Circuit — 100 mA

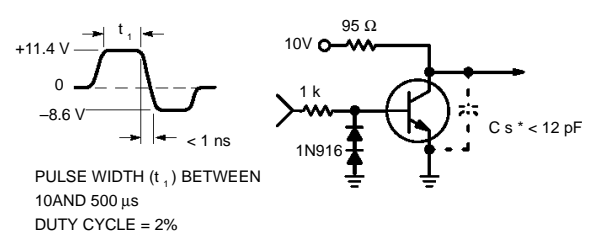


Figure 4.  $t_{off}$  Circuit — 100 mA

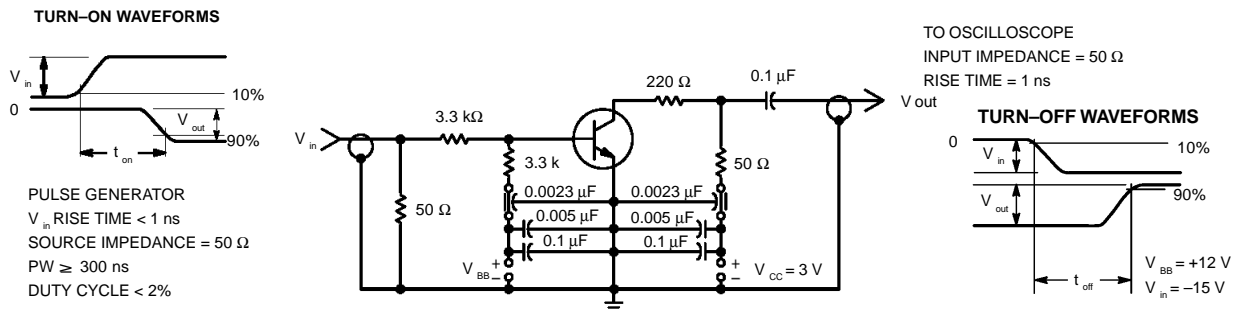


Figure 5. Turn-On and Turn-Off Time Test Circuit

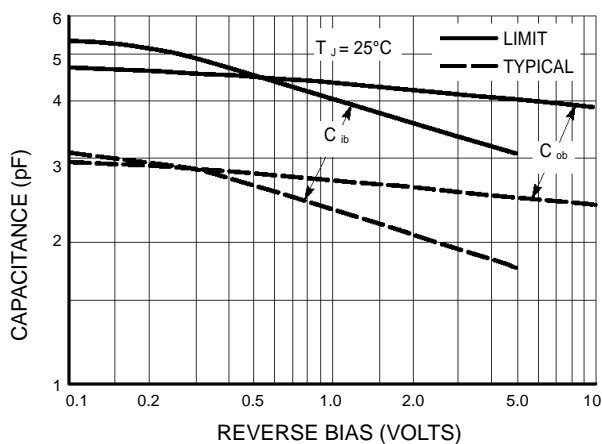


Figure 6. Junction Capacitance Variations

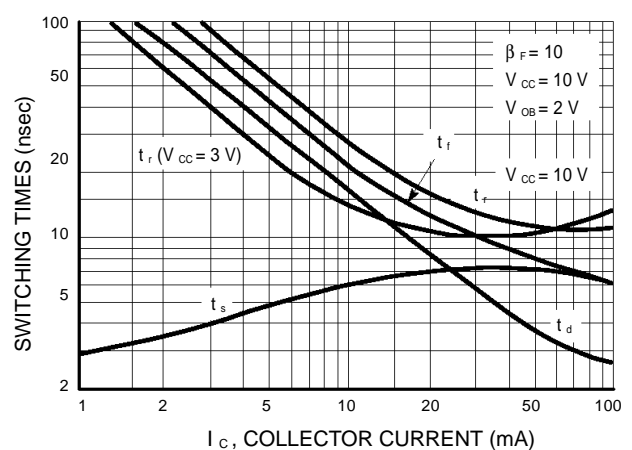
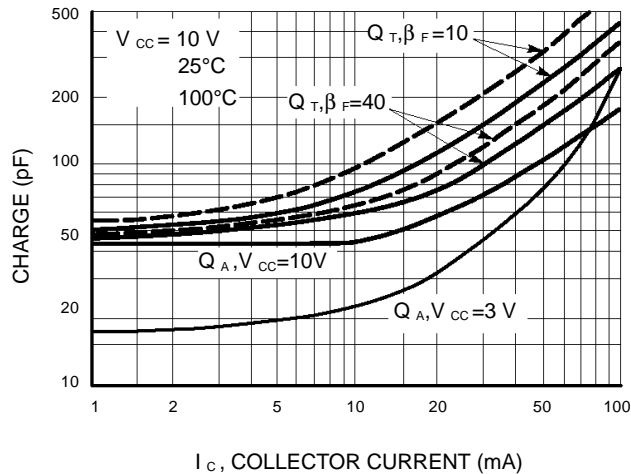
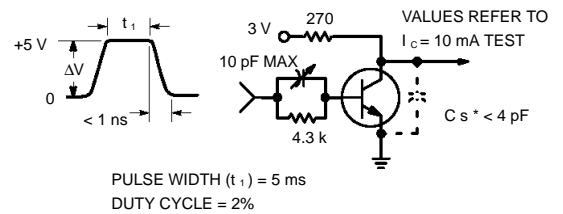


Figure 7. Typical Switching Times

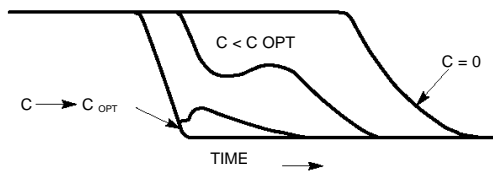
**LMBT2369LT1 LMBT2369ALT1**



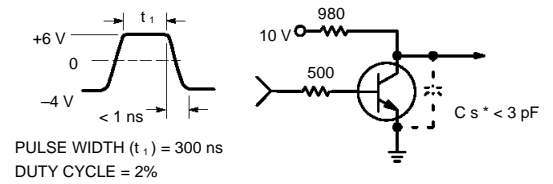
**Figure 8. Maximum Charge Data**



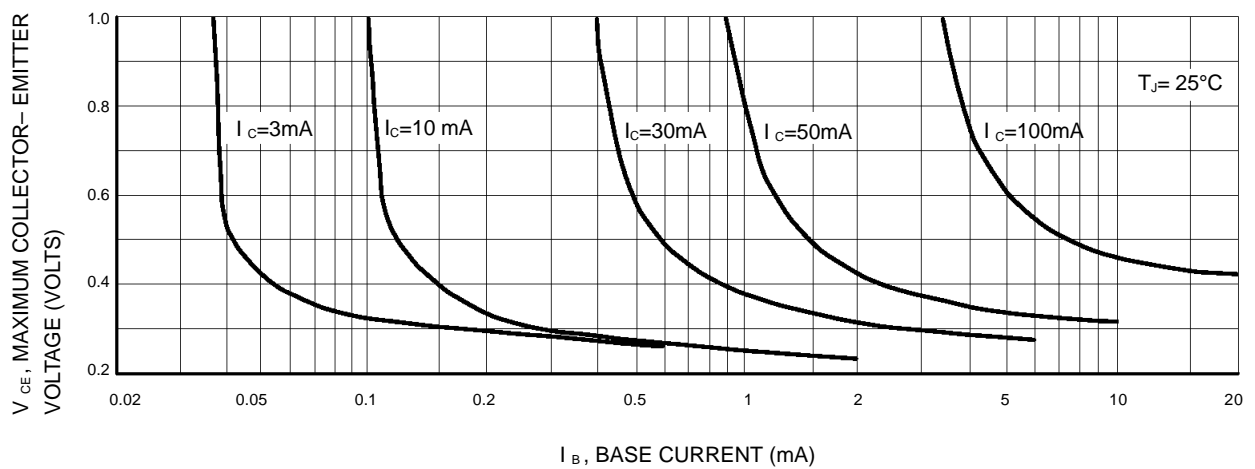
**Figure 9. Q T Test Circuit**



**Figure 10. Turn-Off Waveform**



**Figure 11. Storage Time Equivalent Test Circuit**



**Figure 12. Maximum Collector Saturation Voltage Characteristics**

LMBT2369LT1 LMBT2369ALT1

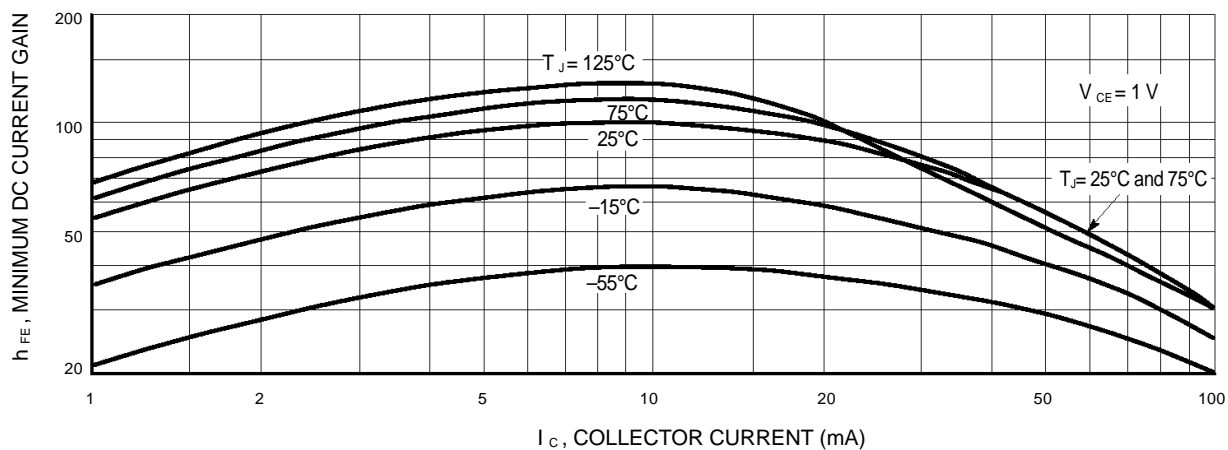


Figure 13. Minimum Current Gain Characteristics

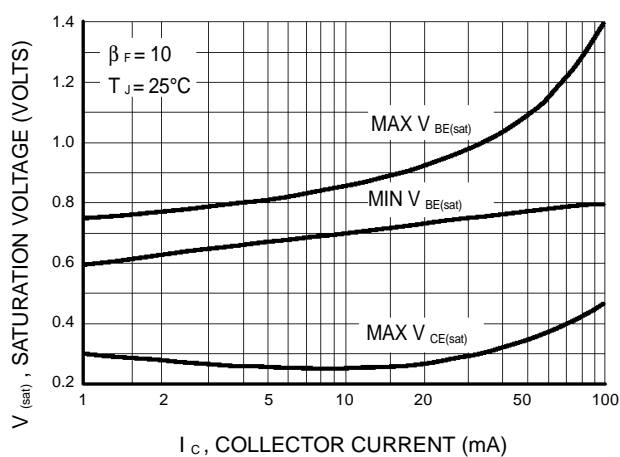


Figure 14. Saturation Voltage Limits

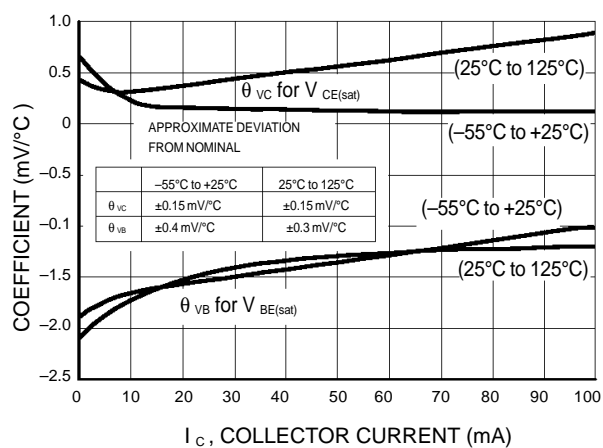


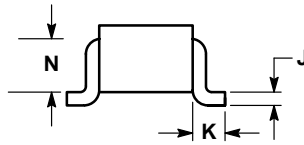
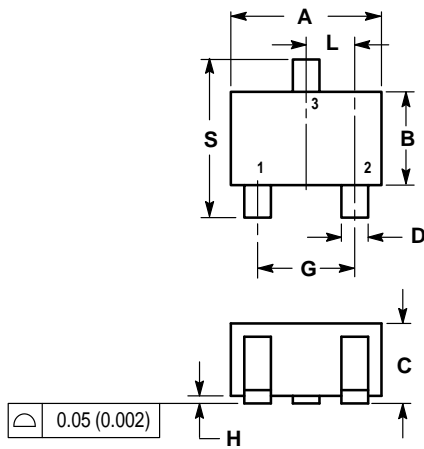
Figure 15. Typical Temperature Coefficients

**LMBT2369LT1 LMBT2369ALT1**

**SC-70 / SOT-323**

NOTES:

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



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.032	0.040	0.80	1.00
D	0.012	0.016	0.30	0.40
G	0.047	0.055	1.20	1.40
H	0.000	0.004	0.00	0.10
J	0.004	0.010	0.10	0.25
K	0.017 REF		0.425 REF	
L	0.026 BSC		0.650 BSC	
N	0.028 REF		0.700 REF	
S	0.079	0.095	2.00	2.40

- PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

