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MMBT2369L, MMBT2369AL

Switching Transistors

NPN Silicon

Features

- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant*

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 (Note 1) T_A = 25°C Derate above 25°C	P_D	225 1.8	mW mW/°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate, (Note 2) T_A = 25°C Derate above 25°C	P_D	300 2.4	mW mW/°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	T_J, T_{stg}	−55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR−5 = 1.0 × 0.75 × 0.062 in.
2. Alumina = 0.4 × 0.3 × 0.024 in. 99.5% alumina.

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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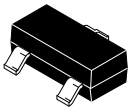
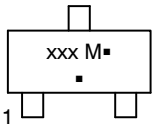
MARKING DIAGRAM



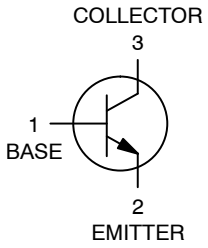
SOT−23
CASE 318
STYLE 6



xxx = M1J or 1JA
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon manufacturing location.



ORDERING INFORMATION

Device	Package	Shipping†
MMBT2369LT1G	SOT−23 (Pb−Free)	3,000 / Tape & Reel
MMBT2369LT3G	SOT−23 (Pb−Free)	10,000 / Tape & Reel
SMMBT2369LT1G	SOT−23 (Pb−Free)	3,000 / Tape & Reel
MMBT2369ALT1G	SOT−23 (Pb−Free)	3,000 / Tape & Reel
SMMBT2369ALT1G	SOT−23 (Pb−Free)	3,000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector – Emitter Breakdown Voltage (Note 3) (I_C = 10 mAdc, I_B = 0)	$V_{(BR)CEO}$	15	–	–	Vdc
Collector – Emitter Breakdown Voltage (I_C = 10 μAdc, V_{BE} = 0)	$V_{(BR)CES}$	40	–	–	Vdc
Collector – Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	$V_{(BR)CBO}$	40	–	–	Vdc
Emitter – Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	$V_{(BR)EBO}$	4.5	–	–	Vdc
Collector Cutoff Current (V_{CB} = 20 Vdc, I_E = 0) (V_{CB} = 20 Vdc, I_E = 0, T_A = 150°C)	I_{CBO}	– –	– –	0.4 30	μAdc
Collector Cutoff Current MMBT2369A (V_{CE} = 20 Vdc, V_{BE} = 0)	I_{CES}	–	–	0.4	μAdc
ON CHARACTERISTICS					
DC Current Gain (Note 3) MMBT2369 (I_C = 10 mAdc, V_{CE} = 1.0 Vdc) MMBT2369A (I_C = 10 mAdc, V_{CE} = 1.0 Vdc) MMBT2369A (I_C = 10 mAdc, V_{CE} = 0.35 Vdc) MMBT2369A (I_C = 10 mAdc, V_{CE} = 0.35 Vdc, T_A = −55°C) MMBT2369A (I_C = 30 mAdc, V_{CE} = 0.4 Vdc) MMBT2369 (I_C = 100 mAdc, V_{CE} = 2.0 Vdc) MMBT2369A (I_C = 100 mAdc, V_{CE} = 1.0 Vdc)	h_{FE}	 40 – 40 20 30 20 20	 – – – – – – –	 120 120 – – – – –	–
Collector – Emitter Saturation Voltage (Note 3) MMBT2369 (I_C = 10 mAdc, I_B = 1.0 mAdc) MMBT2369A (I_C = 10 mAdc, I_B = 1.0 mAdc) MMBT2369A (I_C = 10 mAdc, I_B = 1.0 mAdc, T_A = +125°C) MMBT2369A (I_C = 30 mAdc, I_B = 3.0 mAdc) MMBT2369A (I_C = 100 mAdc, I_B = 10 mAdc)	$V_{CE(sat)}$	 – – – – –	 – – – – –	 0.25 0.20 0.30 0.25 0.50	Vdc
Base – Emitter Saturation Voltage (Note 3) MMBT2369/A (I_C = 10 mAdc, I_B = 1.0 mAdc) MMBT2369A (I_C = 10 mAdc, I_B = 1.0 mAdc, T_A = −55°C) MMBT2369A (I_C = 30 mAdc, I_B = 3.0 mAdc) MMBT2369A (I_C = 100 mAdc, I_B = 10 mAdc)	$V_{BE(sat)}$	 0.7 – – –	 – – – –	 0.85 1.02 1.15 1.60	Vdc
SMALL– SIGNAL CHARACTERISTICS					
Output Capacitance (V_{CB} = 5.0 Vdc, I_E = 0, f = 1.0 MHz)	C_{obo}	–	–	4.0	pF
Small Signal Current Gain (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)	h_{fe}	5.0	–	–	–
SWITCHING CHARACTERISTICS					
Storage Time (I_{B1} = I_{B2} = I_C = 10 mAdc)	t_s	–	5.0	13	ns
Turn–On Time (V_{CC} = 3.0 Vdc, I_C = 10 mAdc, I_{B1} = 3.0 mAdc)	t_{on}	–	8.0	12	ns
Turn–Off Time (V_{CC} = 3.0 Vdc, I_C = 10 mAdc, I_{B1} = 3.0 mAdc, I_{B2} = 1.5 mAdc)	t_{off}	–	10	18	ns

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

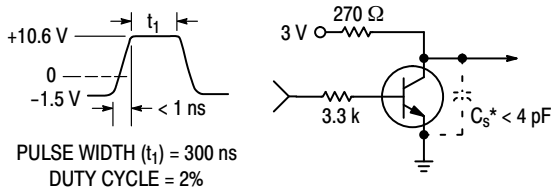


Figure 1. t_{on} Circuit – 10 mA

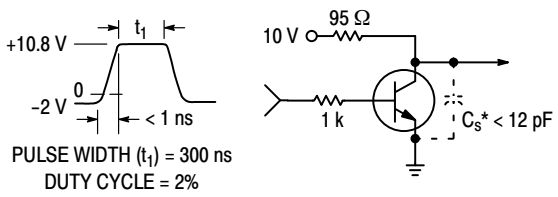


Figure 2. t_{on} Circuit – 100 mA

*Total shunt capacitance of test jig and connectors.

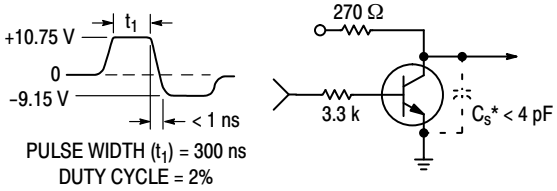
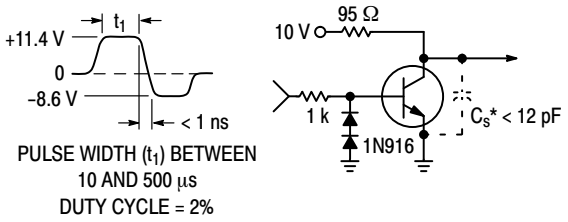


Figure 3. t_{off} Circuit – 10 mA



*Total shunt capacitance of test jig and connectors.

Figure 4. t_{off} Circuit – 100 mA

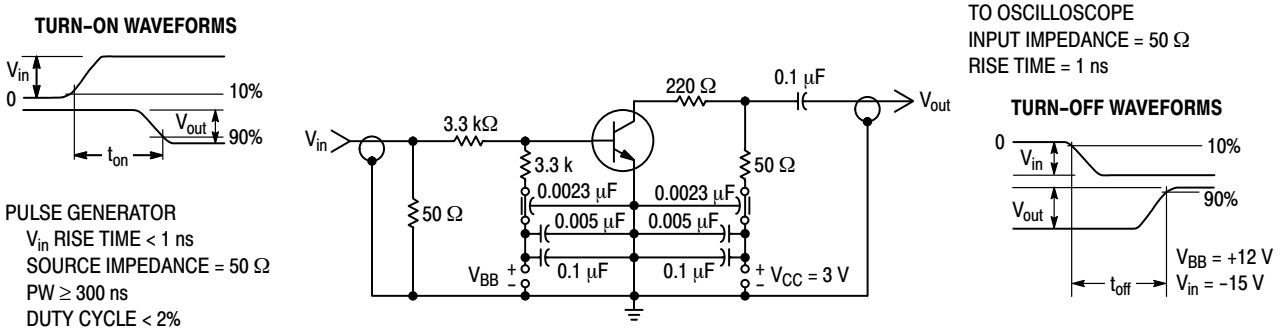


Figure 5. Turn–On and Turn–Off Time Test Circuit

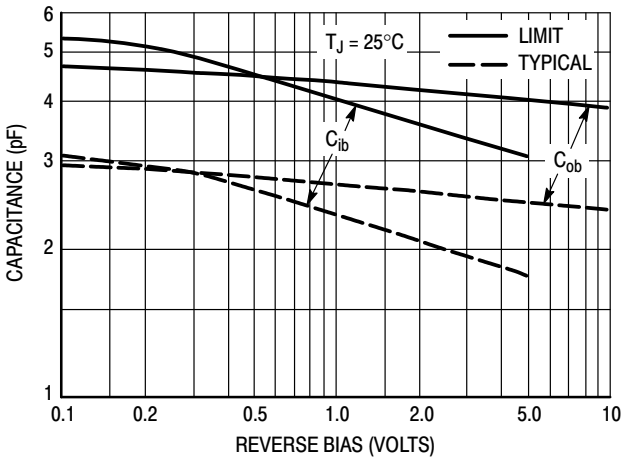


Figure 6. Junction Capacitance Variations

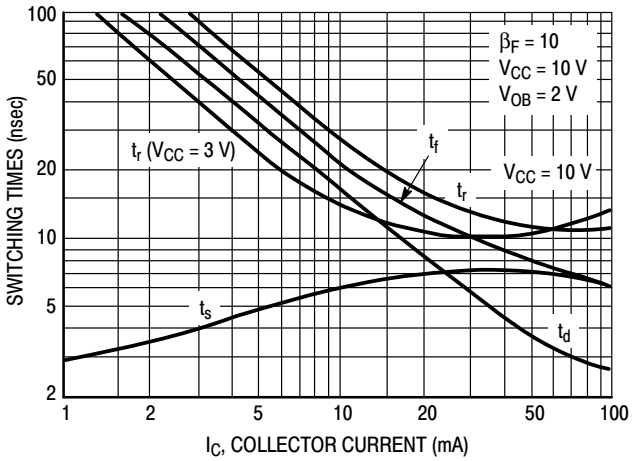


Figure 7. Typical Switching Times

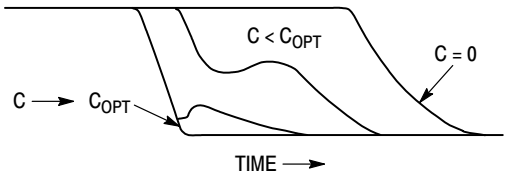


Figure 8. Turn−Off Waveform

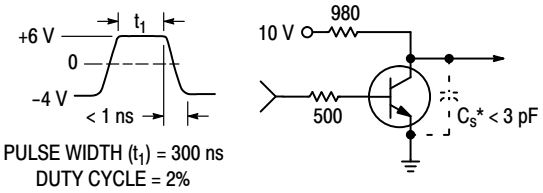


Figure 9. Storage Time Equivalent Test Circuit

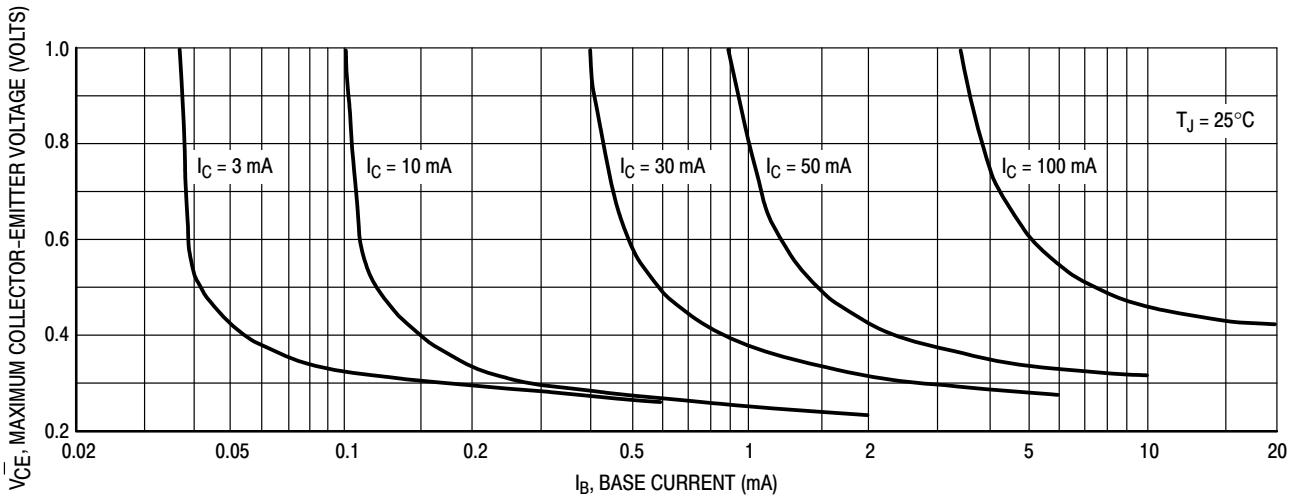


Figure 10. Maximum Collector Saturation Voltage Characteristics

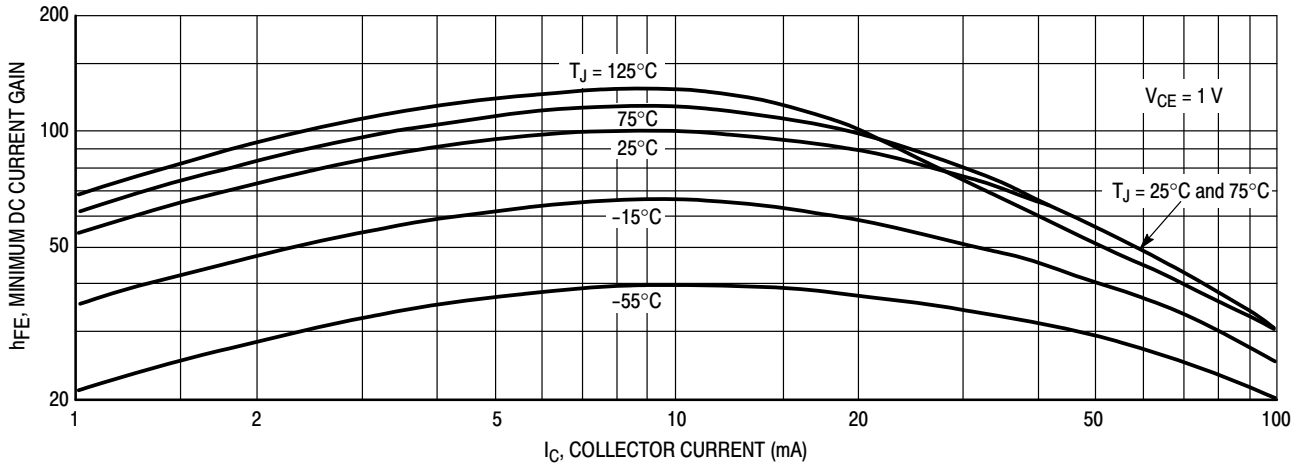


Figure 11. Minimum Current Gain Characteristics

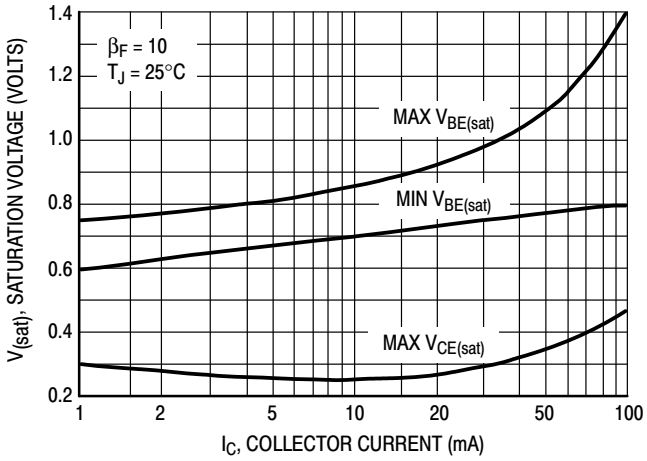
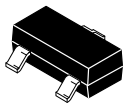


Figure 12. Saturation Voltage Limits

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

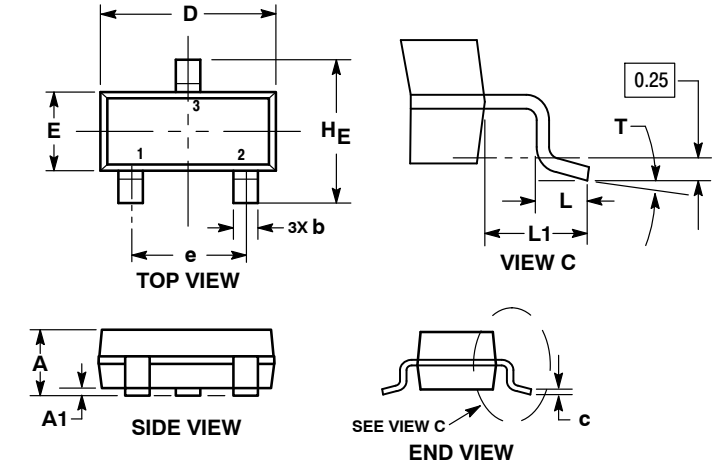
ON Semiconductor®



SOT−23 (TO−236)
CASE 318−08
ISSUE AS

DATE 30 JAN 2018

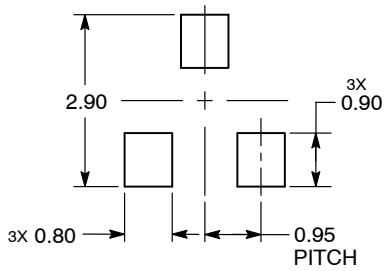
SCALE 4:1



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

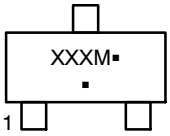
	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H_E	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	−−−	10°	0°	−−−	10°

RECOMMENDED SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

GENERIC MARKING DIAGRAM*



XXX = 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.

STYLE 1 THRU 5:
CANCELLED

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE

STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 10:
PIN 1. DRAIN
2. SOURCE
3. GATE

STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE−ANODE

STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE

STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE

STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE

STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE

STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE

STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE

STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE−ANODE

STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT

STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE

STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION

STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE

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