



# THE DATASHEET OF SMMBT2369ALT1G



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

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.

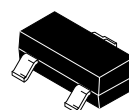
1. FR-5 =  $1.0 \times 0.75 \times 0.062$  in.
2. Alumina =  $0.4 \times 0.3 \times 0.024$  in. 99.5% alumina.

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



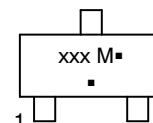
ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)



SOT-23  
CASE 318  
STYLE 6

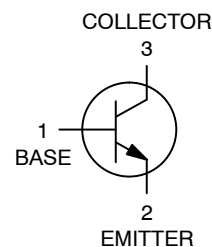
#### MARKING DIAGRAM



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.

# MMBT2369L, MMBT2369AL

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector – Emitter Breakdown Voltage (Note 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 MMBT2369A ( $V_{CE} = 20\text{ Vdc}$ , $V_{BE} = 0$ )	$I_{CES}$	–	–	0.4	$\mu\text{Adc}$

## ON CHARACTERISTICS

DC Current Gain (Note 3) MMBT2369 ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ ) MMBT2369A ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ ) MMBT2369A ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 0.35\text{ Vdc}$ ) MMBT2369A ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 0.35\text{ Vdc}$ , $T_A = -55^\circ\text{C}$ ) MMBT2369A ( $I_C = 30\text{ mAdc}$ , $V_{CE} = 0.4\text{ Vdc}$ ) MMBT2369 ( $I_C = 100\text{ mAdc}$ , $V_{CE} = 2.0\text{ Vdc}$ ) MMBT2369A ( $I_C = 100\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )	$h_{FE}$	40 – 40 20 30 20 20	– – – – – – –	120 120 – – – – –	–
Collector – Emitter Saturation Voltage (Note 3) MMBT2369 ( $I_C = 10\text{ mAdc}$ , $I_B = 1.0\text{ mAdc}$ ) MMBT2369A ( $I_C = 10\text{ mAdc}$ , $I_B = 1.0\text{ mAdc}$ ) MMBT2369A ( $I_C = 10\text{ mAdc}$ , $I_B = 1.0\text{ mAdc}$ , $T_A = +125^\circ\text{C}$ ) MMBT2369A ( $I_C = 30\text{ mAdc}$ , $I_B = 3.0\text{ mAdc}$ ) MMBT2369A ( $I_C = 100\text{ mAdc}$ , $I_B = 10\text{ mAdc}$ )	$V_{CE(sat)}$	– – – – –	– – – – –	0.25 0.20 0.30 0.25 0.50	Vdc
Base – Emitter Saturation Voltage (Note 3) MMBT2369/A ( $I_C = 10\text{ mAdc}$ , $I_B = 1.0\text{ mAdc}$ ) MMBT2369A ( $I_C = 10\text{ mAdc}$ , $I_B = 1.0\text{ mAdc}$ , $T_A = -55^\circ\text{C}$ ) MMBT2369A ( $I_C = 30\text{ mAdc}$ , $I_B = 3.0\text{ mAdc}$ ) MMBT2369A ( $I_C = 100\text{ mAdc}$ , $I_B = 10\text{ mAdc}$ )	$V_{BE(sat)}$	0.7 – – –	– – – –	0.85 1.02 1.15 1.60	Vdc

## SMALL-SIGNAL CHARACTERISTICS

Output Capacitance ( $V_{CB} = 5.0\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	–	–	4.0	pF
Small Signal Current Gain ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$h_{fe}$	5.0	–	–	–

## SWITCHING CHARACTERISTICS

Storage Time ( $I_{B1} = I_{B2} = I_C = 10\text{ mAdc}$ )	$t_s$	–	5.0	13	ns
Turn-On Time ( $V_{CC} = 3.0\text{ Vdc}$ , $I_C = 10\text{ mAdc}$ , $I_{B1} = 3.0\text{ mAdc}$ )	$t_{on}$	–	8.0	12	ns
Turn-Off Time ( $V_{CC} = 3.0\text{ Vdc}$ , $I_C = 10\text{ mAdc}$ , $I_{B1} = 3.0\text{ mAdc}$ , $I_{B2} = 1.5\text{ mAdc}$ )	$t_{off}$	–	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  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

# MMBT2369L, MMBT2369AL

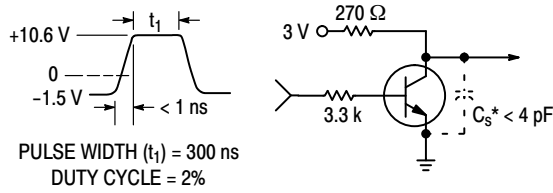


Figure 1.  $t_{on}$  Circuit – 10 mA

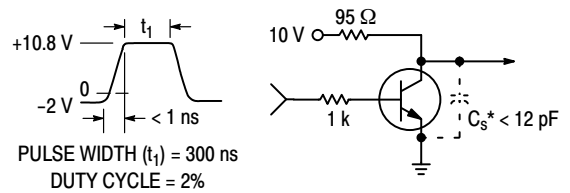


Figure 2.  $t_{on}$  Circuit – 100 mA

\*Total shunt capacitance of test jig and connectors.

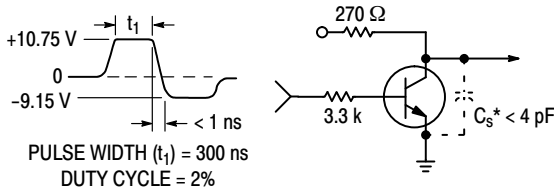


Figure 3.  $t_{off}$  Circuit – 10 mA

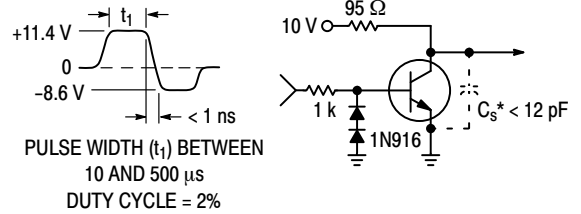
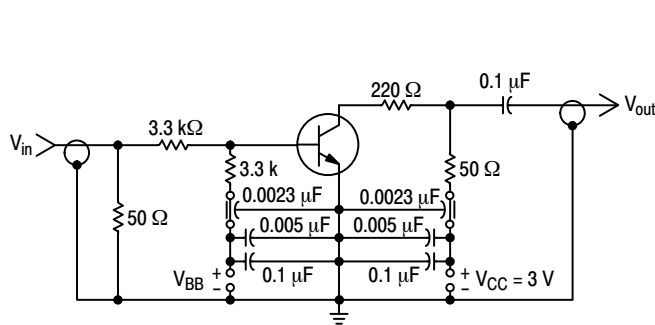
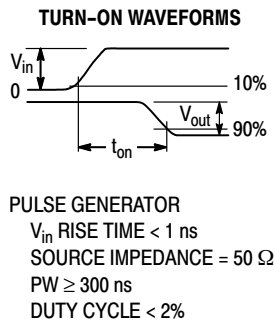


Figure 4.  $t_{off}$  Circuit – 100 mA

\*Total shunt capacitance of test jig and connectors.



TO OSCILLOSCOPE  
 INPUT IMPEDANCE = 50 Ω  
 RISE TIME = 1 ns

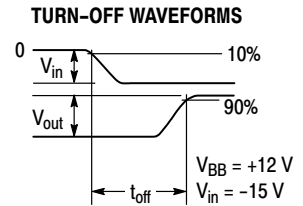


Figure 5. Turn-On and Turn-Off Time Test Circuit

# MMBT2369L, MMBT2369AL

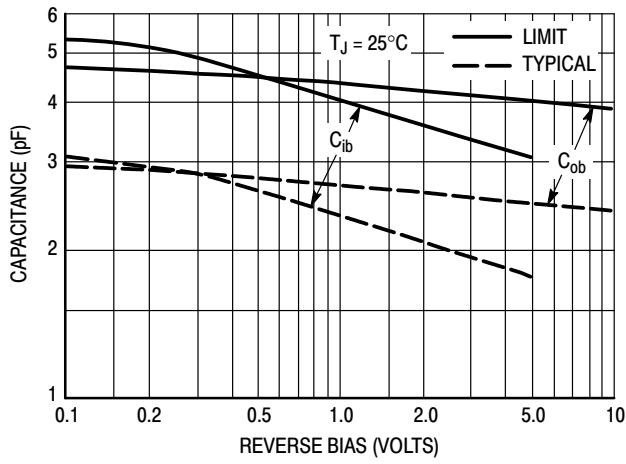


Figure 6. Junction Capacitance Variations

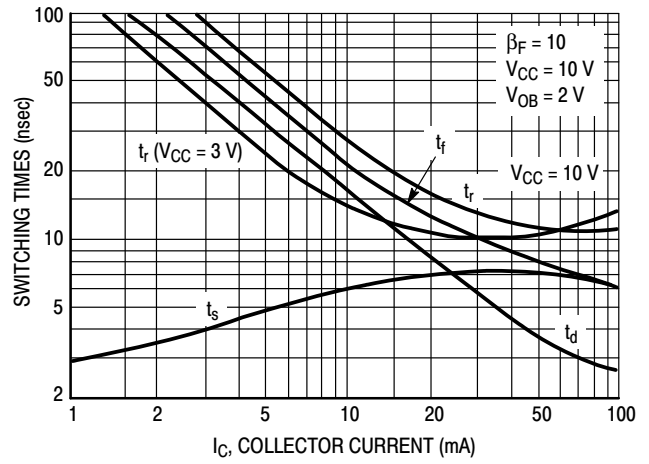


Figure 7. Typical Switching Times

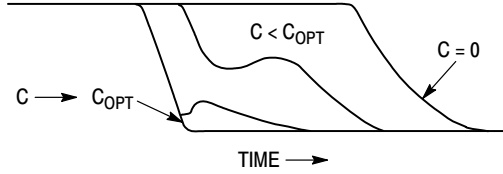


Figure 8. Turn-Off Waveform

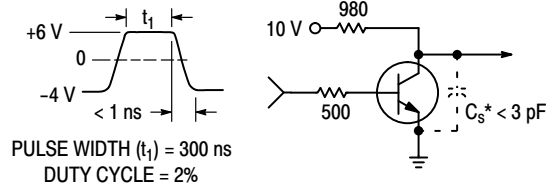


Figure 9. Storage Time Equivalent Test Circuit

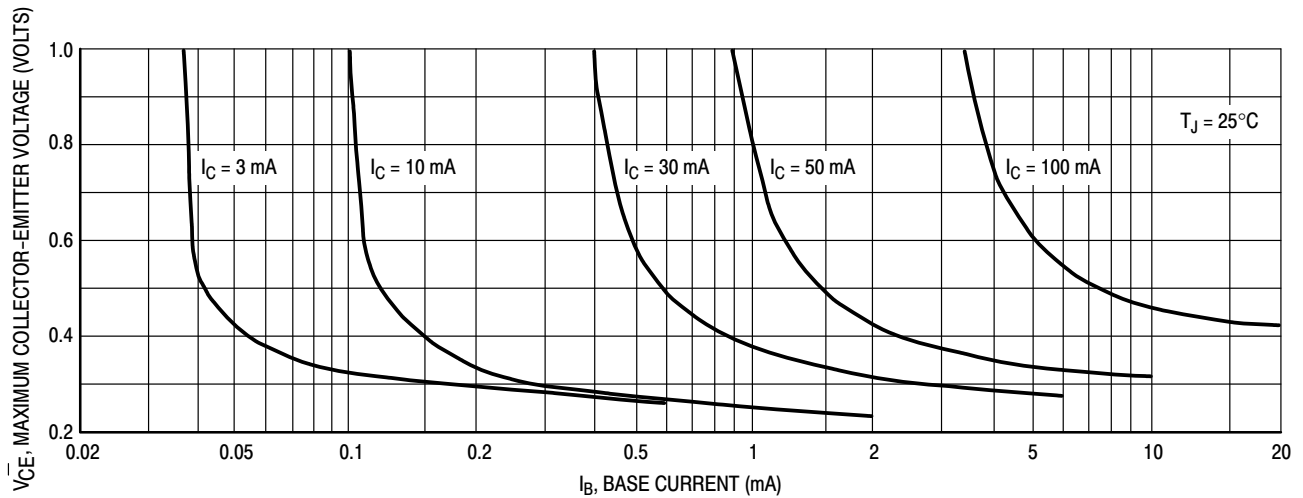


Figure 10. Maximum Collector Saturation Voltage Characteristics

# MMBT2369L, MMBT2369AL

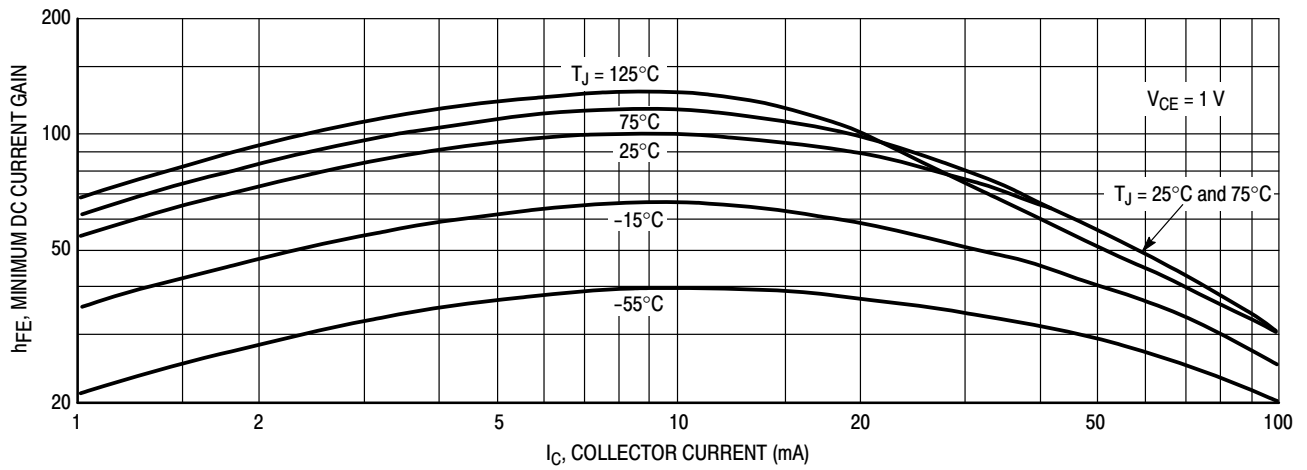


Figure 11. Minimum Current Gain Characteristics

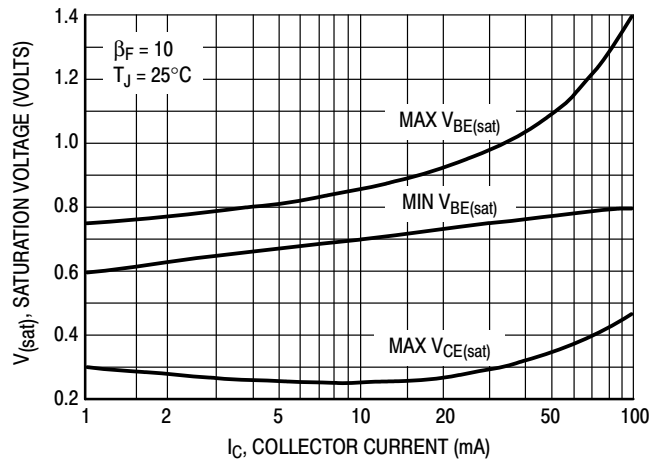


Figure 12. Saturation Voltage Limits

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## ADDITIONAL INFORMATION

### TECHNICAL PUBLICATIONS:

Technical Library: [www.onsemi.com/design/resources/technical-documentation](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at [www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View SMMBT2369ALT1G on WIN SOURCE](#)

 [ON Semiconductor](#) Information

## Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management