MMBT2369LT1, MMBT2369ALT1

MMBT2369ALT1 is a Preferred Device

Switching Transistors

NPN Silicon

ON Semiconductor®

http://onsemi.com

Features

- Pb−Free Packages are Available

MAXIMUM RATINGS

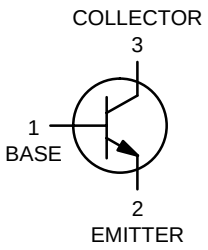
Rating	Symbol	Value	Unit
Collector−Emitter Voltage	V_{CEO}	15	Vdc
Collector−Emitter Voltage	V_{CES}	40	Vdc
Collector−Base Voltage	V_{CBO}	40	Vdc
Emitter−Base Voltage	V_{EBO}	4.5	Vdc
Collector Current − Continuous	I_C	200	mAdc

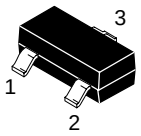
THERMAL CHARACTERISTICS

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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

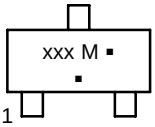
1. FR−5 = 1.0 × 0.75 × 0.062 in.
2. Alumina = 0.4 × 0.3 × 0.024 in. 99.5% alumina.





SOT−23
CASE 318
STYLE 6

MARKING DIAGRAMS



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
MMBT2369LT1	SOT−23	3000/Tape & Reel
MMBT2369LT1G	SOT−23 (Pb−Free)	3000/Tape & Reel
MMBT2369ALT1	SOT−23	3000/Tape & Reel
MMBT2369ALT1G	SOT−23 (Pb−Free)	3000/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.

Preferred devices are recommended choices for future use and best overall value.

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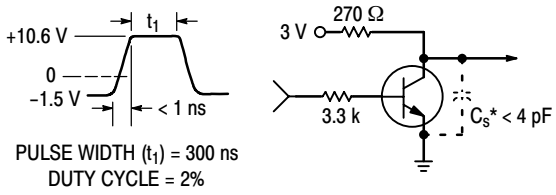
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

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 (V_{CE} = 20 Vdc, V_{BE} = 0)	MMBT2369A	I_{CES}	−	−	0.4	μAdc
ON CHARACTERISTICS						
DC Current Gain (Note 3) (I_C = 10 mAdc, V_{CE} = 1.0 Vdc) (I_C = 10 mAdc, V_{CE} = 1.0 Vdc) (I_C = 10 mAdc, V_{CE} = 0.35 Vdc) (I_C = 10 mAdc, V_{CE} = 0.35 Vdc, T_A = −55°C) (I_C = 30 mAdc, V_{CE} = 0.4 Vdc) (I_C = 100 mAdc, V_{CE} = 2.0 Vdc) (I_C = 100 mAdc, V_{CE} = 1.0 Vdc)	 MMBT2369 MMBT2369A MMBT2369A MMBT2369A MMBT2369A MMBT2369 MMBT2369A	h_{FE}	 40 − 40 20 30 20 20	 − − − − − − −	 120 120 − − − − −	−
Collector−Emitter Saturation Voltage (Note 3) (I_C = 10 mAdc, I_B = 1.0 mAdc) (I_C = 10 mAdc, I_B = 1.0 mAdc) (I_C = 10 mAdc, I_B = 1.0 mAdc, T_A = +125°C) (I_C = 30 mAdc, I_B = 3.0 mAdc) (I_C = 100 mAdc, I_B = 10 mAdc)	 MMBT2369 MMBT2369A MMBT2369A MMBT2369A MMBT2369A	$V_{CE(sat)}$	 − − − − −	 − − − − −	 0.25 0.20 0.30 0.25 0.50	Vdc
Base−Emitter Saturation Voltage (Note 3) (I_C = 10 mAdc, I_B = 1.0 mAdc) (I_C = 10 mAdc, I_B = 1.0 mAdc, T_A = −55°C) (I_C = 30 mAdc, I_B = 3.0 mAdc) (I_C = 100 mAdc, I_B = 10 mAdc)	 MMBT2369A MMBT2369A MMBT2369A MMBT2369A	$V_{BE(sat)}$	 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

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

SWITCHING TIME EQUIVALENT TEST CIRCUITS FOR 2N2369, 2N3227



*Total shunt capacitance of test jig and connectors.

Figure 1. t_{on} Circuit − 10 mA

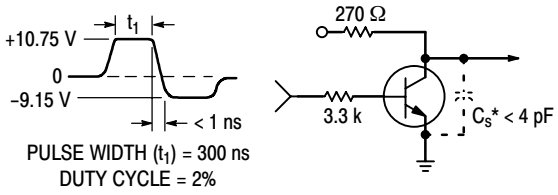
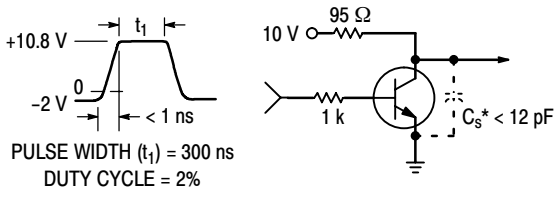


Figure 3. t_{off} Circuit − 10 mA



*Total shunt capacitance of test jig and connectors.

Figure 2. t_{on} Circuit − 100 mA

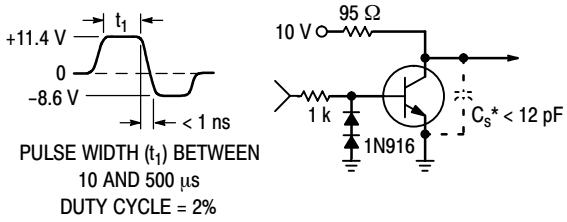


Figure 4. t_{off} Circuit − 100 mA

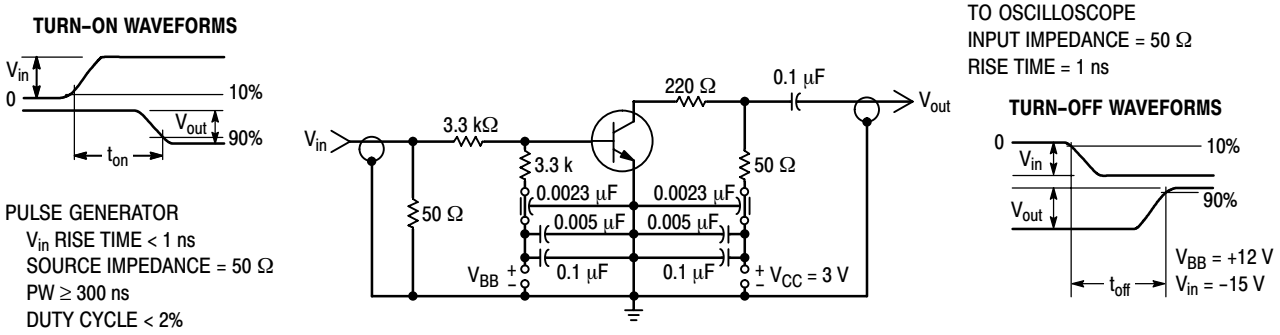


Figure 5. Turn−On and Turn−Off Time Test Circuit

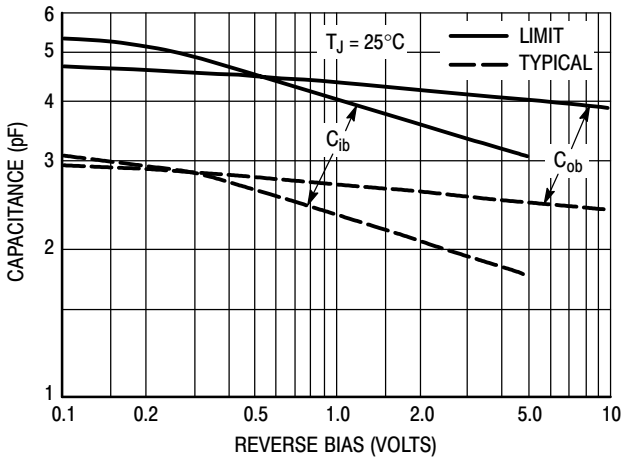


Figure 6. Junction Capacitance Variations

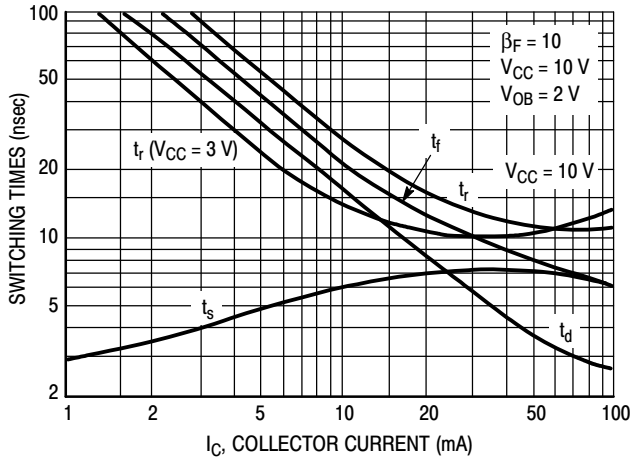


Figure 7. Typical Switching Times

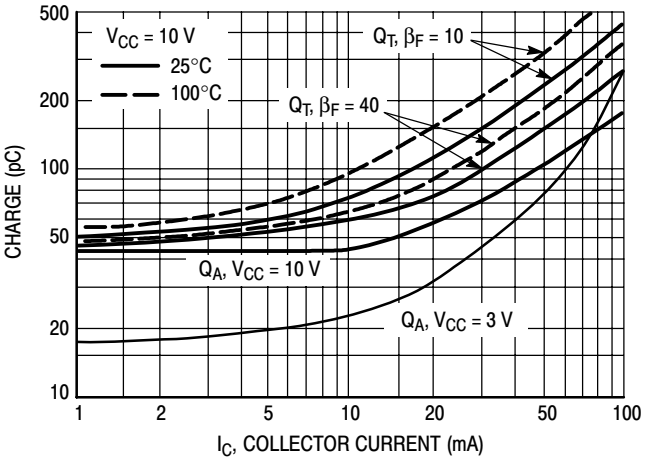


Figure 8. Maximum Charge Data

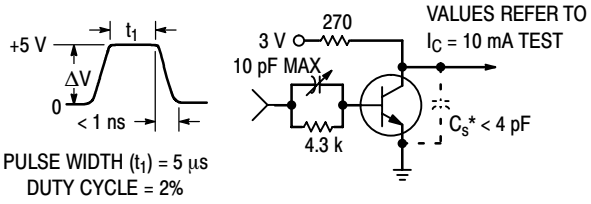


Figure 9. Q_T Test Circuit

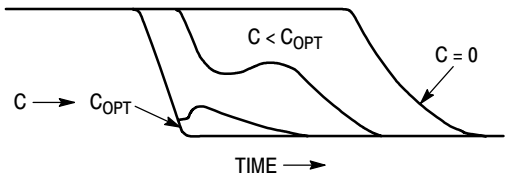


Figure 10. Turn−Off Waveform

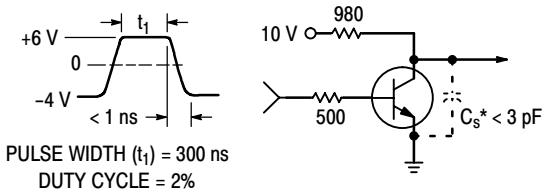


Figure 11. Storage Time Equivalent Test Circuit

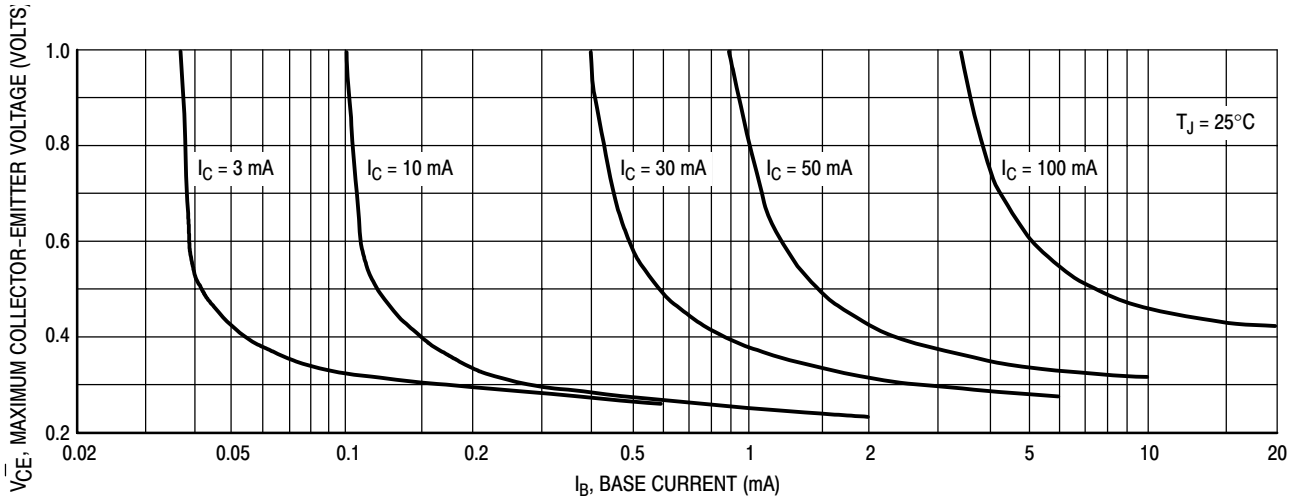


Figure 12. Maximum Collector Saturation Voltage Characteristics

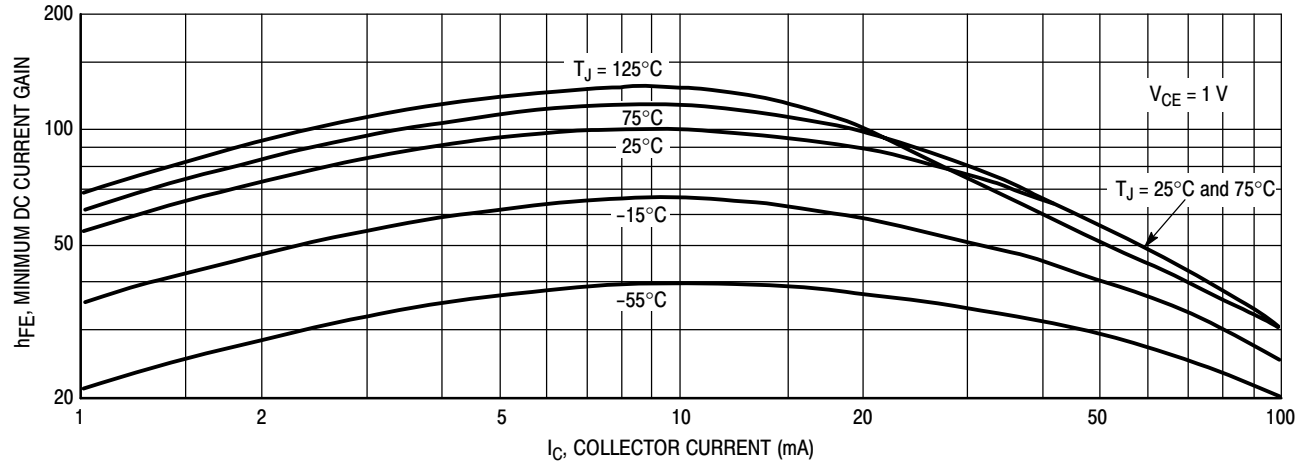


Figure 13. Minimum Current Gain Characteristics

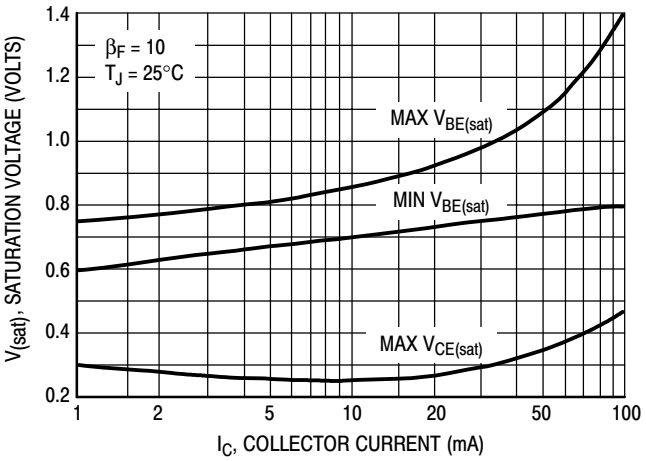


Figure 14. Saturation Voltage Limits

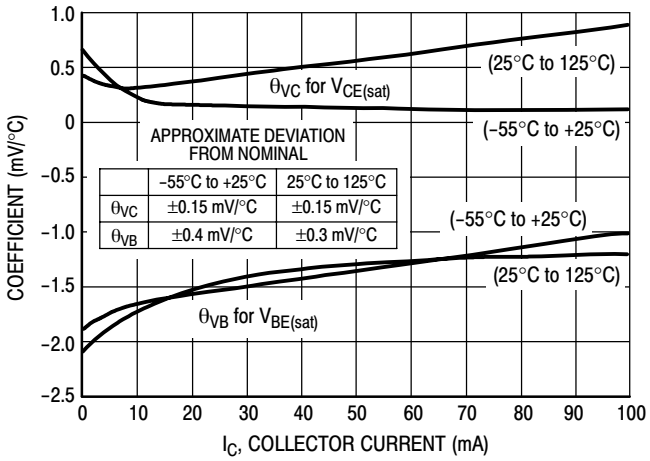
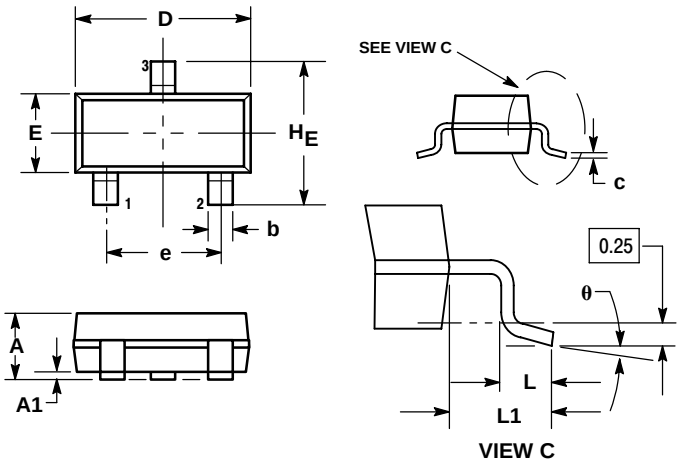


Figure 15. Typical Temperature Coefficients

PACKAGE DIMENSIONS

SOT−23 (TO−236)
CASE 318−08
ISSUE AN

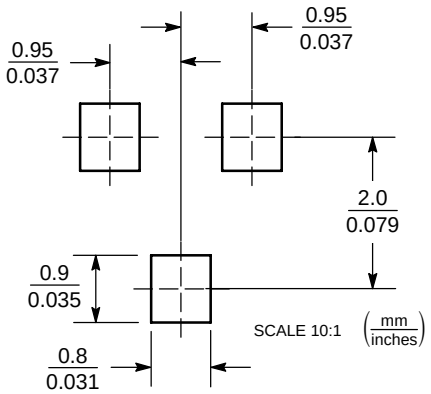


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318−01 THRU −07 AND −09 OBSOLETE, NEW STANDARD 318−08.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
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	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
H_E	2.10	2.40	2.64	0.083	0.094	0.104

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

SOLDERING FOOTPRINT*



*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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