

# MMBT589LT1G, NSVMMBT589LT1G

## High Current Surface Mount PNP Silicon Switching Transistor for Load Management in Portable Applications

### Features

- NSV 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 ( $T_A = 25^\circ\text{C}$ )

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	-30	Vdc
Collector-Base Voltage	$V_{CBO}$	-50	Vdc
Emitter-Base Voltage	$V_{EBO}$	-5.0	Vdc
Collector Current - Continuous	$I_C$	-1.0	Adc
Collector Current - Peak	$I_{CM}$	-2.0	A

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board, (Note 1) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	310 2.5	mW mW/ $^\circ\text{C}$
Thermal Resistance Junction-to-Ambient (Note 1)	$R_{\theta JA}$	403	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate, (Note 2) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	710 5.7	mW mW/ $^\circ\text{C}$
Thermal Resistance Junction-to-Ambient (Note 2)	$R_{\theta JA}$	176	$^\circ\text{C}/\text{W}$
Total Device Dissipation (Ref. Figure 8) (Single Pulse < 10 sec.)	$P_{D\text{single}}$	575	mW
Junction and Storage Temperature	$T_J, T_{\text{stg}}$	-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.

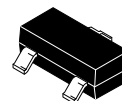
1. FR-4 @ Minimum Pad
2. FR-4 @ 1.0 X 1.0 inch Pad



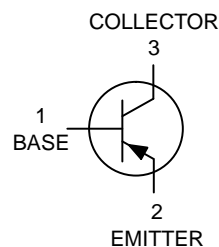
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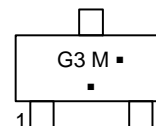
30 VOLTS, 2.0 AMPS  
PNP TRANSISTORS



SOT-23 (TO-236)  
CASE 318  
STYLE 6



### MARKING DIAGRAM



G3 = Device Code  
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†
MMBT589LT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
NSVMMBT589LT1G	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.

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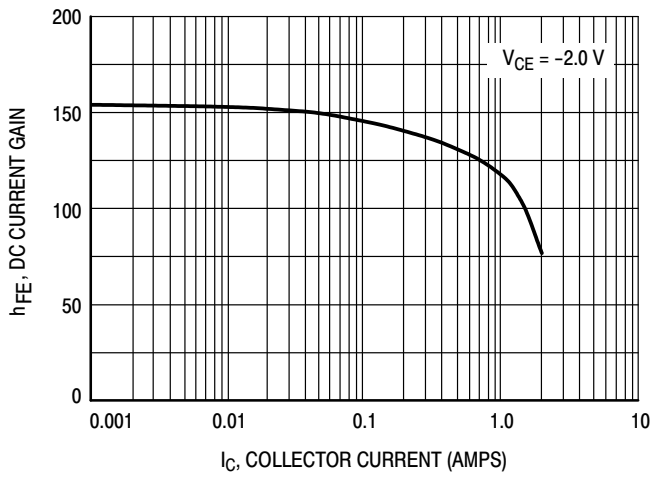
## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Breakdown Voltage ( $I_C = -10\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	–30	–	Vdc
Collector–Base Breakdown Voltage ( $I_C = -0.1\text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	–50	–	Vdc
Emitter–Base Breakdown Voltage ( $I_E = -0.1\text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	–5.0	–	Vdc
Collector Cutoff Current ( $V_{CB} = -30\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	–	–0.1	$\mu\text{Adc}$
Collector–Emitter Cutoff Current ( $V_{CES} = -30\text{ Vdc}$ )	$I_{CES}$	–	–0.1	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB} = -4.0\text{ Vdc}$ )	$I_{EBO}$	–	–0.1	$\mu\text{Adc}$
<b>ON CHARACTERISTICS</b>				
DC Current Gain (Note 3) (Figure 1) ( $I_C = -1.0\text{ mA}$ , $V_{CE} = -2.0\text{ V}$ ) ( $I_C = -500\text{ mA}$ , $V_{CE} = -2.0\text{ V}$ ) ( $I_C = -1.0\text{ A}$ , $V_{CE} = -2.0\text{ V}$ ) ( $I_C = 2.0\text{ A}$ , $V_{CE} = -2.0\text{ V}$ )	$h_{FE}$	100 100 80 40	– 300 – –	–
Collector–Emitter Saturation Voltage (Note 3) (Figure 3) ( $I_C = -0.5\text{ A}$ , $I_B = -0.05\text{ A}$ ) ( $I_C = -1.0\text{ A}$ , $I_B = 0.1\text{ A}$ ) ( $I_C = -2.0\text{ A}$ , $I_B = -0.2\text{ A}$ )	$V_{CE(sat)}$	– – –	–0.25 –0.30 –0.65	V
Base–Emitter Saturation Voltage (Note 3) (Figure 2) ( $I_C = -1.0\text{ A}$ , $I_B = -0.1\text{ A}$ )	$V_{BE(sat)}$	–	–1.2	V
Base–Emitter Turn–on Voltage (Note 3) ( $I_C = -1.0\text{ A}$ , $V_{CE} = -2.0\text{ V}$ )	$V_{BE(on)}$	–	–1.1	V
Cutoff Frequency ( $I_C = -100\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ , $f = 100\text{ MHz}$ )	$f_T$	100	–	MHz
Output Capacitance ( $f = 1.0\text{ MHz}$ )	$C_{obo}$	–	15	pF

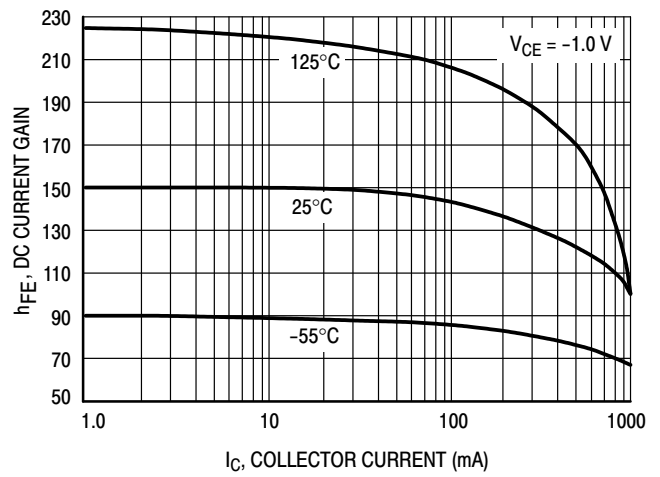
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle  $\leq 2\%$

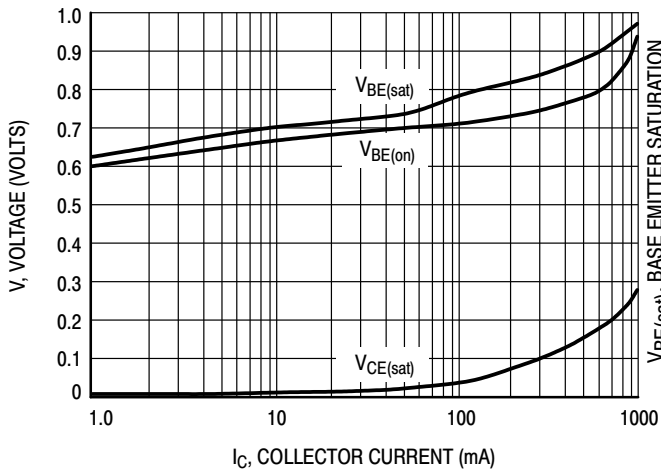
# MMBT589LT1G, NSVMMBT589LT1G



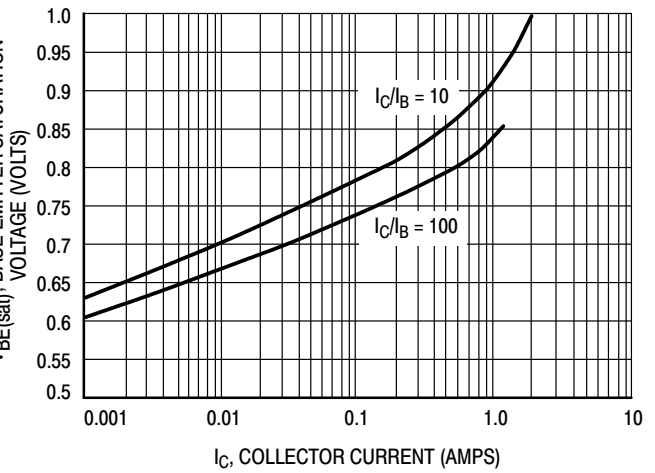
**Figure 1. DC Current Gain versus Collector Current**



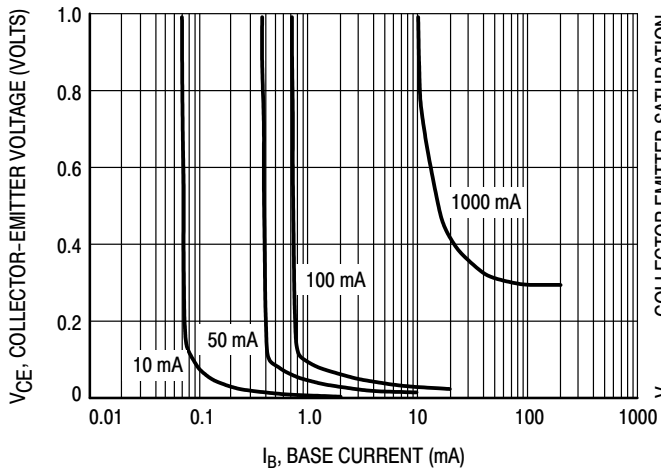
**Figure 2. DC Current Gain versus Collector Current**



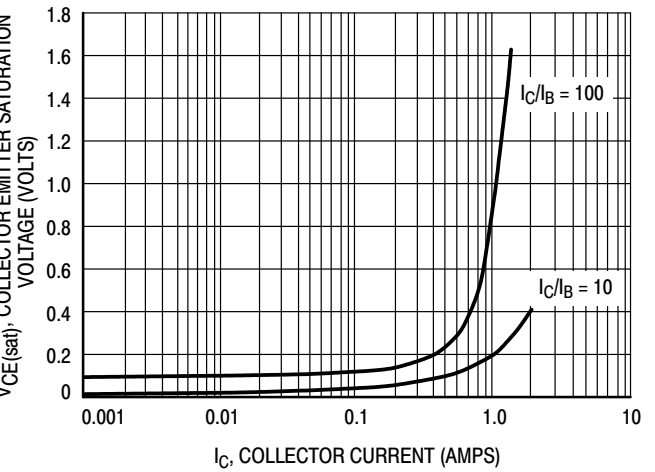
**Figure 3. "On" Voltages**



**Figure 4. Base Emitter Saturation Voltage versus Collector Current**



**Figure 5. Collector Emitter Saturation Voltage versus Collector Current**



**Figure 6. Collector Emitter Saturation Voltage versus Collector Current**

# MMBT589LT1G, NSVMMBT589LT1G

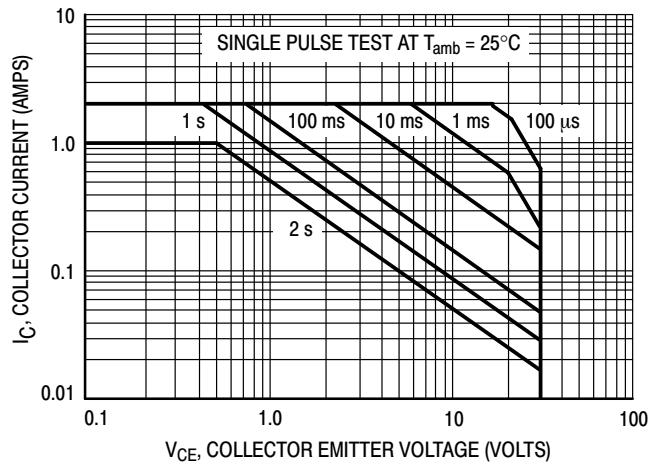


Figure 7. Safe Operating Area

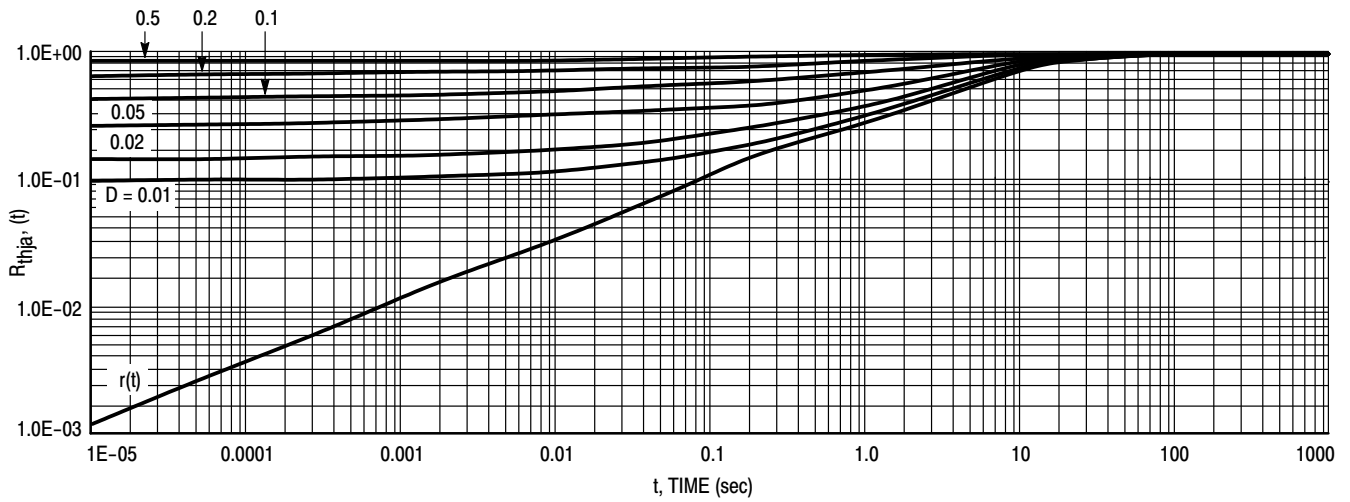


Figure 8. Normalized Thermal Response

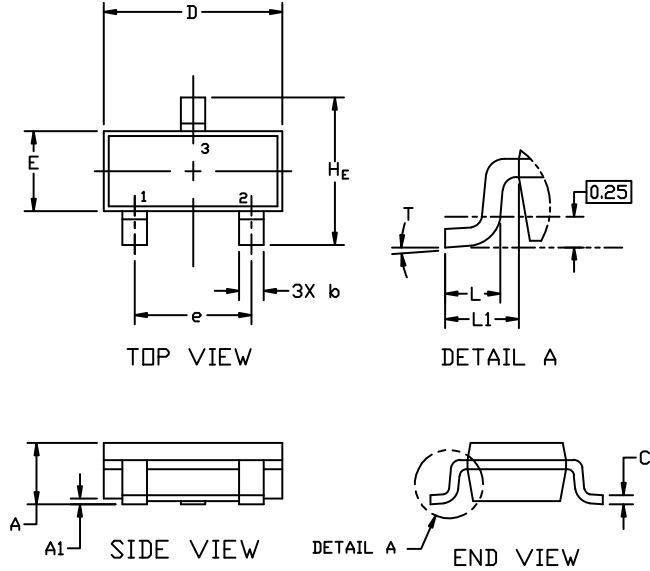
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



**SOT-23 (TO-236)**  
CASE 318  
ISSUE AT

DATE 01 MAR 2023

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.

DIM	MILLIMETERS			INCHES		
	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 <sub>E</sub>	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

**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. Some products may not follow the Generic Marking.



**RECOMMENDED MOUNTING 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.

**STYLES ON PAGE 2**

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<b>DESCRIPTION:</b>	<b>SOT-23 (TO-236)</b>	<b>PAGE 1 OF 2</b>

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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS



### SOT-23 (TO-236) CASE 318 ISSUE AT

DATE 01 MAR 2023

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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