

# MMBT589LT1G, NSVMMBT589LT1G

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

### Features

- AEC-Q101 Qualified and PPAP Capable
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- 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,<br>(Note 1) $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$        | $P_D$                 | 310<br>2.5  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance<br>Junction-to-Ambient (Note 1)                                                                  | $R_{\theta JA}$       | 403         | $^\circ\text{C/W}$         |
| Total Device Dissipation Alumina<br>Substrate, (Note 2) $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$                 | 710<br>5.7  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance<br>Junction-to-Ambient (Note 2)                                                                  | $R_{\theta JA}$       | 176         | $^\circ\text{C/W}$         |
| Total Device Dissipation (Ref. Figure 8)<br>(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 Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

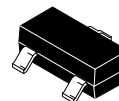
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



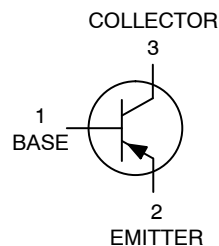
ON Semiconductor®

<http://onsemi.com>

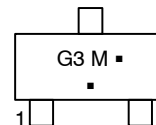
30 VOLTS, 2.0 AMPS  
PNP TRANSISTORS



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<br>(Pb-Free) | 3,000 /<br>Tape & Reel |
| NSVMMBT589LT1G | SOT-23<br>(Pb-Free) | 3,000 /<br>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.

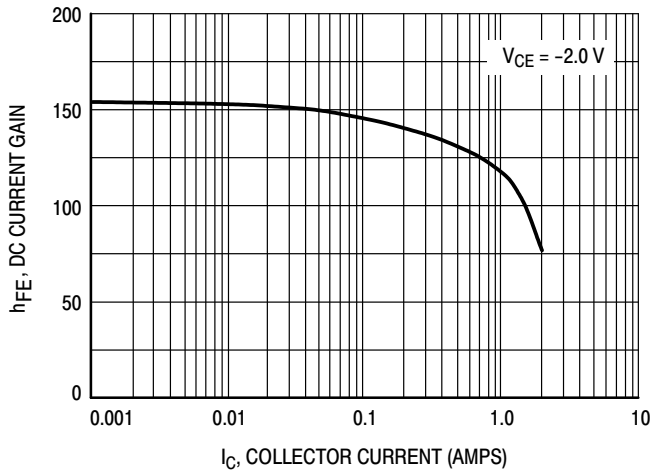
# MMBT589LT1G, NSVMMBT589LT1G

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

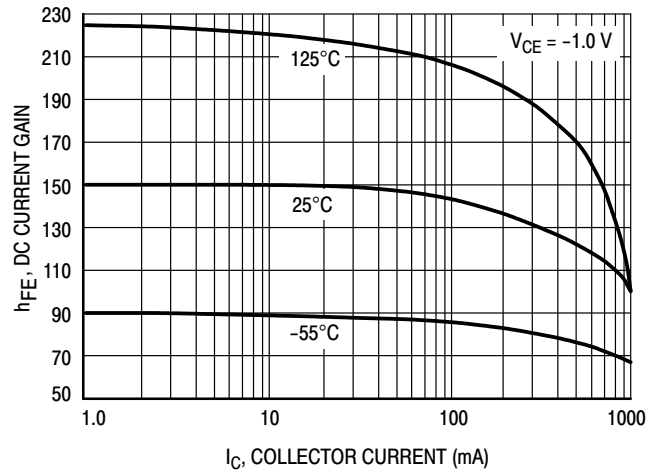
| Characteristic                                                                                                                                                                                                                                                       | Symbol        | Min                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

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

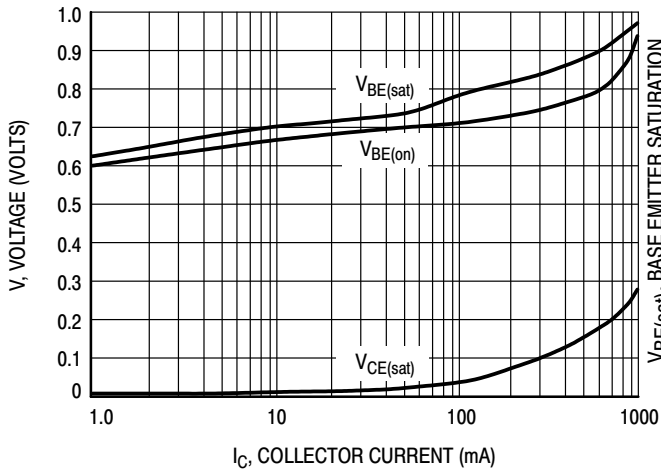
# MMBT589LT1G, NSVMMBT589LT1G



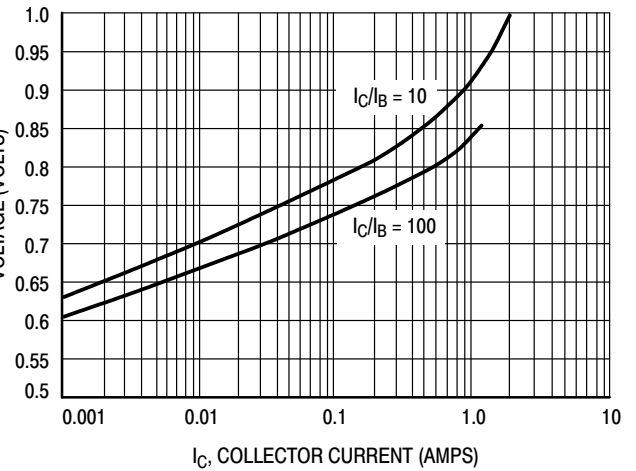
**Figure 1. DC Current Gain versus Collector Current**



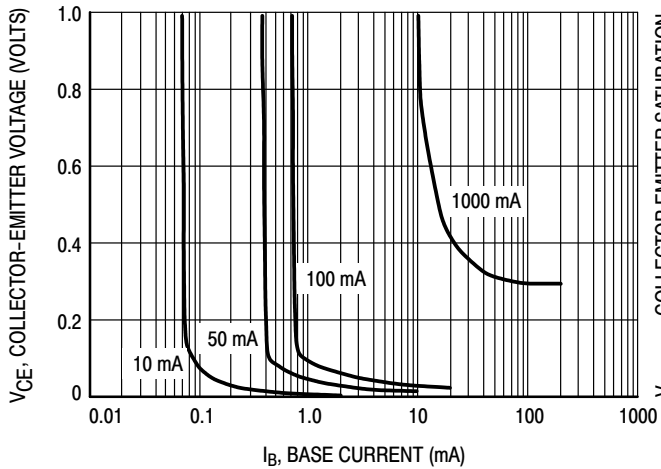
**Figure 2. DC Current Gain versus Collector Current**



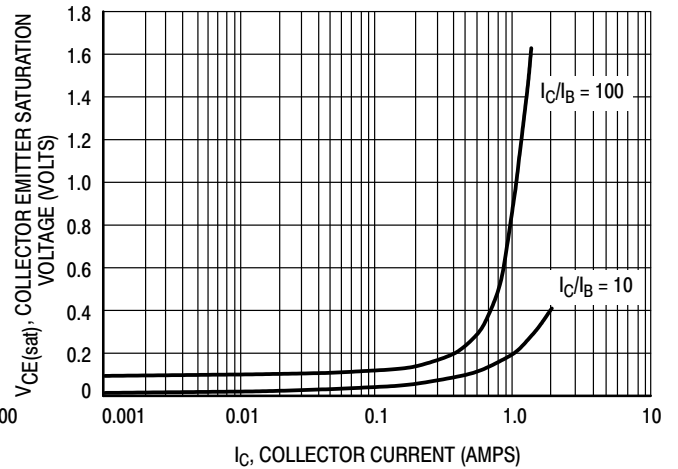
**Figure 3. "On" Voltages**



**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

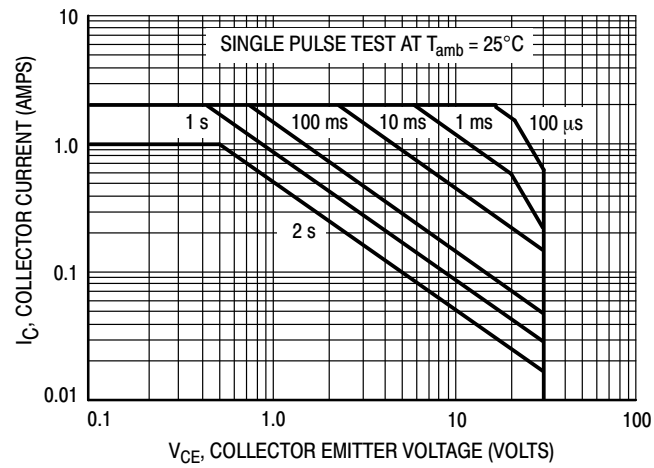


Figure 7. Safe Operating Area

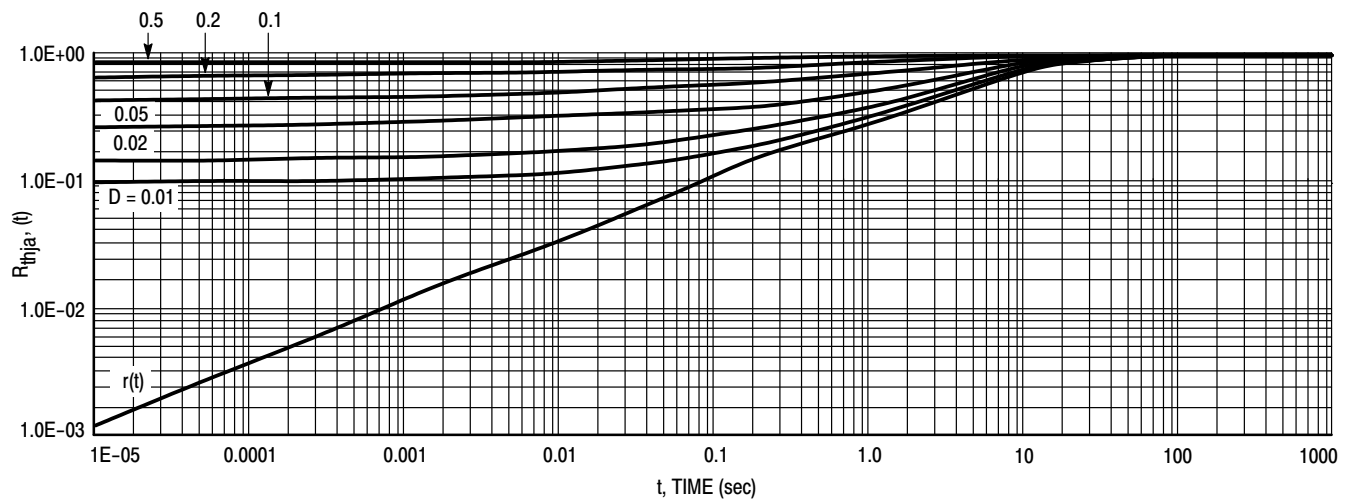
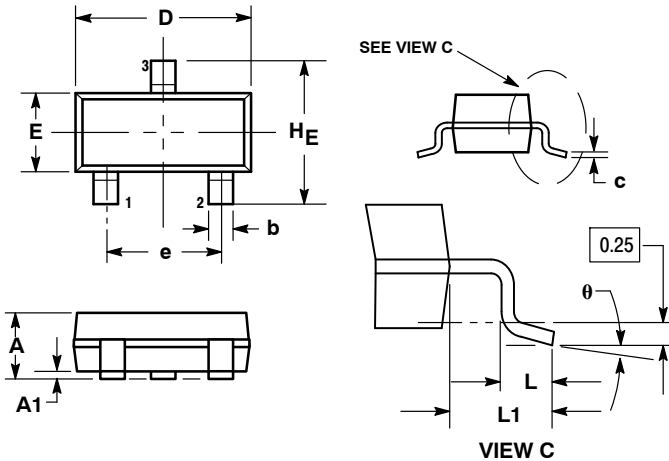


Figure 8. Normalized Thermal Response

# MMBT589LT1G, NSVMMBT589LT1G

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AP



### NOTES:

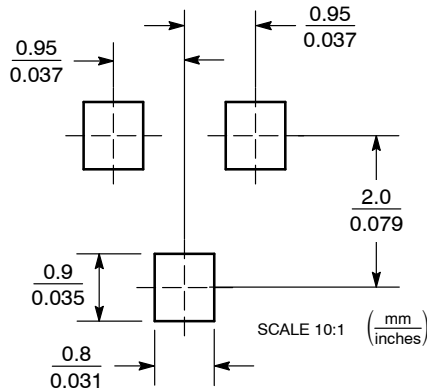
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 0.89        | 1.00 | 1.11 | 0.035  | 0.040 | 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 |
| HE  | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |
| θ   | 0°          | ---  | 10°  | 0°     | ---   | 10°   |

### STYLE 6:

- PIN 1. BASE
- EMITTER
- COLLECTOR

## SOLDERING FOOTPRINT



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MMBT589LT1/D



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**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.