

# MMBT589LT1

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

### Features

- Pb-Free Packages are Available

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	-30	Vdc
Collector-Base Voltage	$V_{CB0}$	-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	$T_J, T_{stg}$	-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.

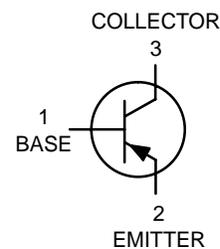
- FR-4 @ Minimum Pad
- FR-4 @ 1.0 X 1.0 inch Pad



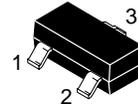
ON Semiconductor®

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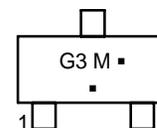
## 30 VOLTS, 2.0 AMPS PNP TRANSISTORS



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†
MMBT589LT1	SOT-23	3,000 / Tape & Reel
MMBT589LT1G	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.

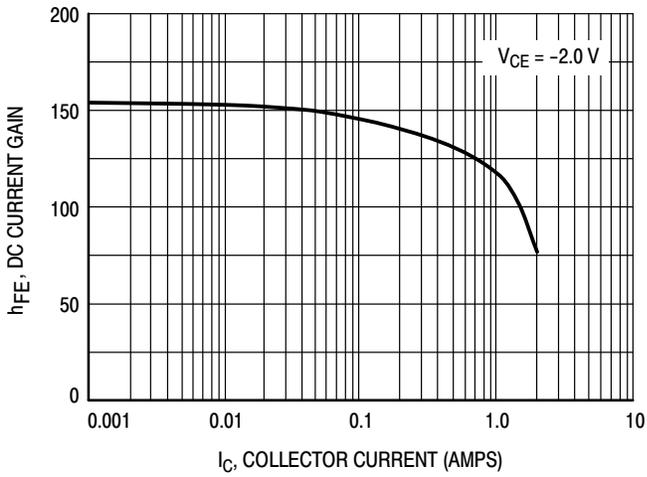
# MMBT589LT1

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

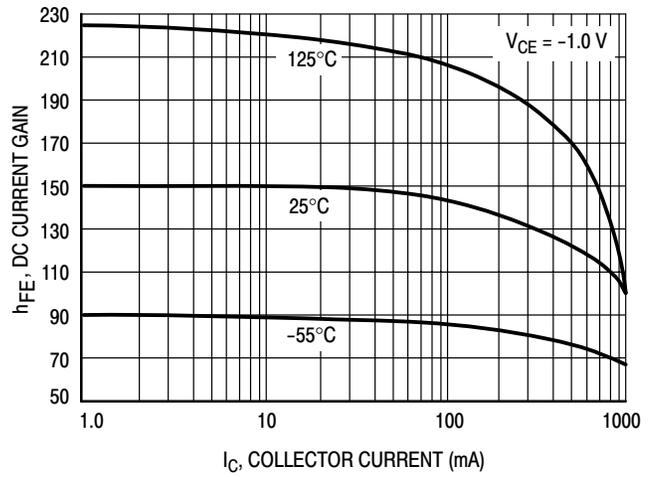
Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Breakdown Voltage ( $I_C = -10\text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	-30	-	Vdc
Collector–Base Breakdown Voltage ( $I_C = -0.1\text{ mA}$ , $I_E = 0$ )	$V_{(BR)CBO}$	-50	-	Vdc
Emitter–Base Breakdown Voltage ( $I_E = -0.1\text{ mA}$ , $I_C = 0$ )	$V_{(BR)EBO}$	-5.0	-	Vdc
Collector Cutoff Current ( $V_{CB} = -30\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	-	-0.1	$\mu\text{A}$
Collector–Emitter Cutoff Current ( $V_{CES} = -30\text{ Vdc}$ )	$I_{CES}$	-	-0.1	$\mu\text{A}$
Emitter Cutoff Current ( $V_{EB} = -4.0\text{ Vdc}$ )	$I_{EBO}$	-	-0.1	$\mu\text{A}$
<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

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

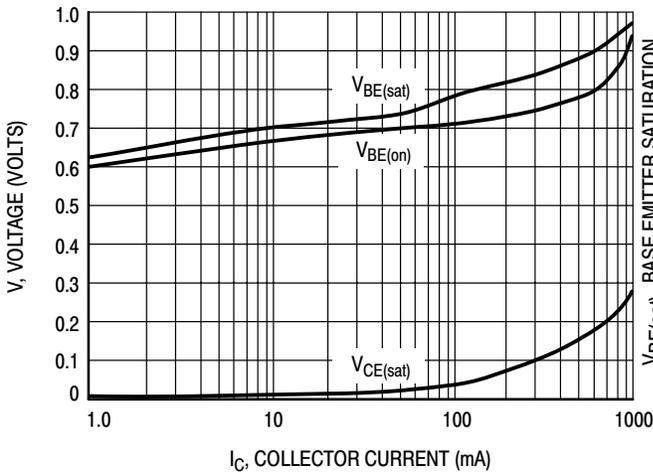
# MMBT589LT1



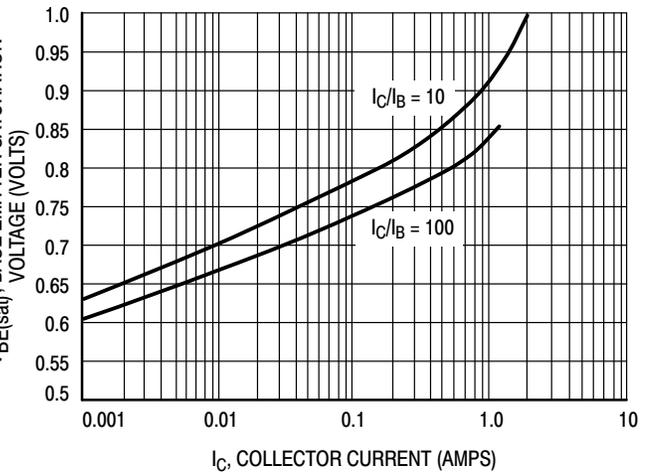
**Figure 1. DC Current Gain versus Collector Current**



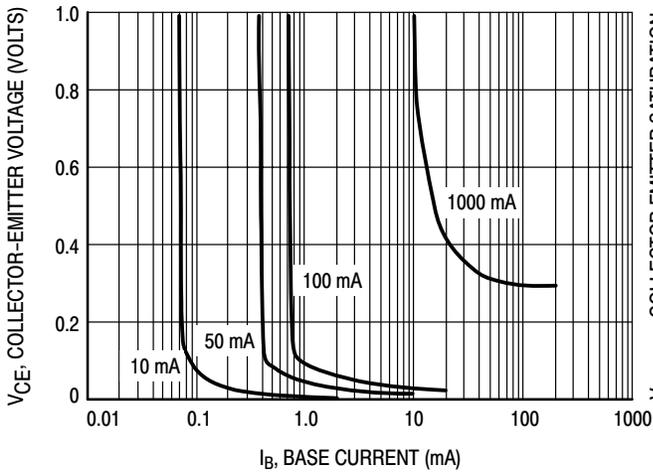
**Figure 2. DC Current Gain versus Collector Current**



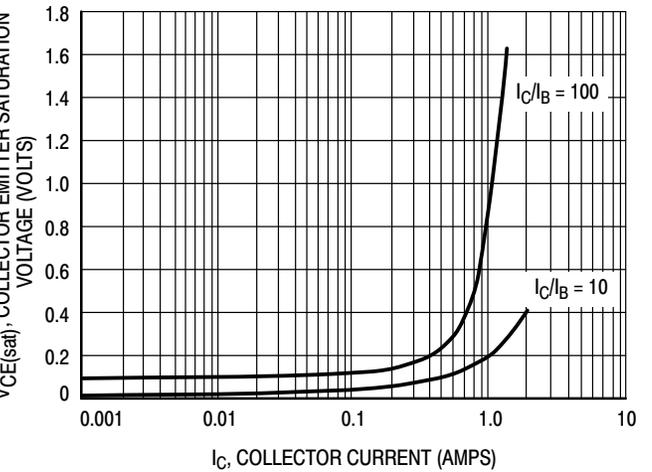
**Figure 3. "On" Voltages**



**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**

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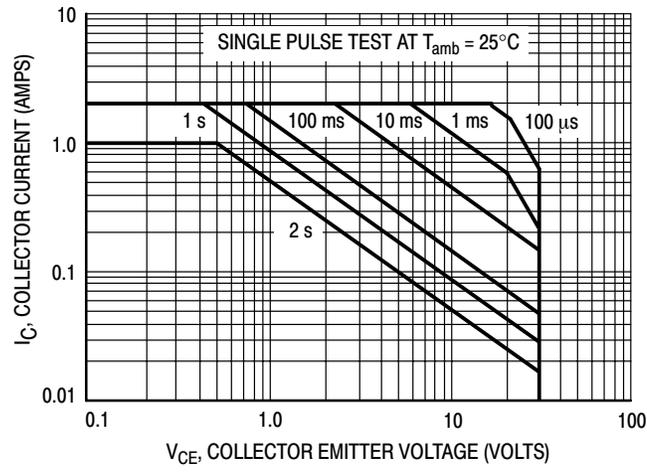


Figure 7. Safe Operating Area

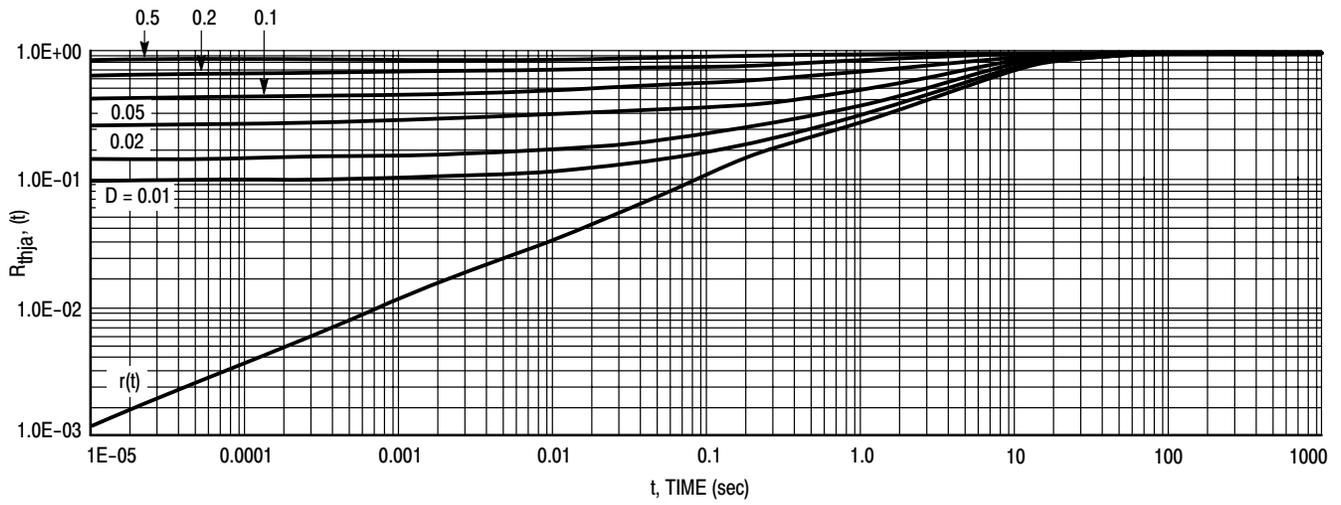
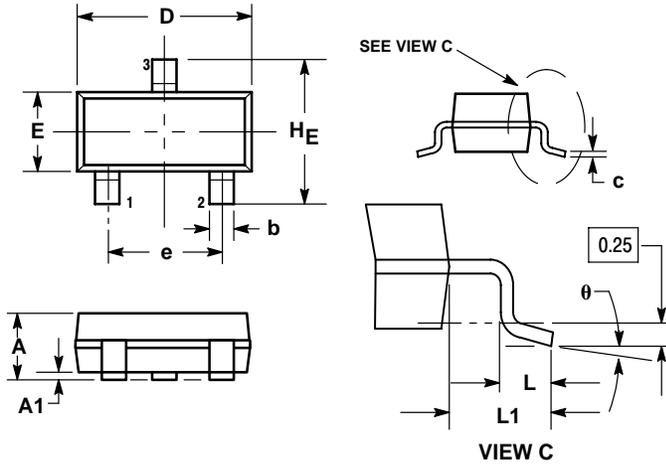


Figure 8. Normalized Thermal Response

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## PACKAGE DIMENSIONS

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



NOTES:

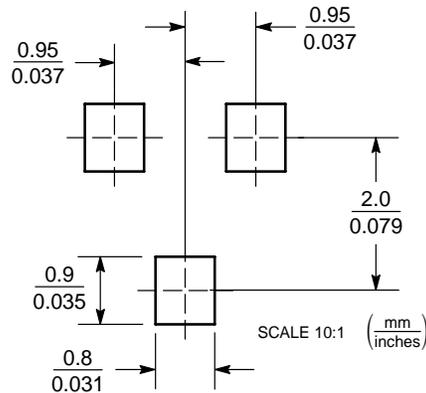
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

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

STYLE 6:

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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