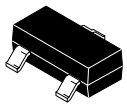
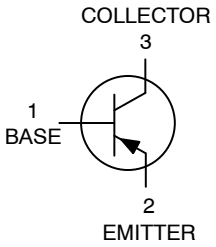
High Current Surface Mount PNP Silicon Switching Transistor for Load Management in Portable Applications

MMBT589LT1G, NSVMMBT589LT1G

30 VOLTS, 2.0 AMPS PNP TRANSISTORS



SOT−23 (TO−236)
CASE 318
STYLE 6



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°C)

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

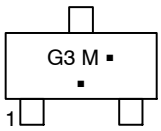
THERMAL CHARACTERISTICS

Symbol	Characteristic	Max	Unit
P_D	Total Device Dissipation FR−5 Board, (Note 1) T_A = 25°C Derate above 25°C	310 2.5	mW mW/°C
$R_{\theta JA}$	Thermal Resistance Junction−to−Ambient (Note 1)	403	°C/W
P_D	Total Device Dissipation Alumina Substrate, (Note 2) T_A = 25°C Derate above 25°C	710 5.7	mW mW/°C
$R_{\theta JA}$	Thermal Resistance Junction−to−Ambient (Note 2)	176	°C/W
$P_{Dsingle}$	Total Device Dissipation (Ref. Figure 8) (Single Pulse < 10 sec.)	575	mW
T_J, T_{stg}	Junction and Storage Temperature	−55 to +150	°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

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 Specification Brochure, BRD8011/D.

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

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

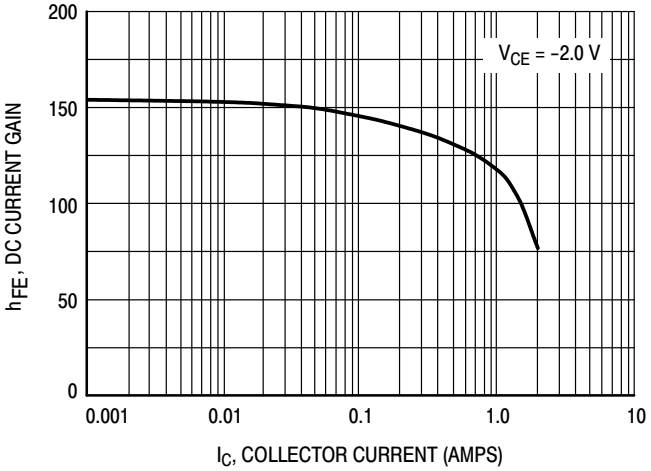


Figure 1. DC Current Gain versus Collector Current

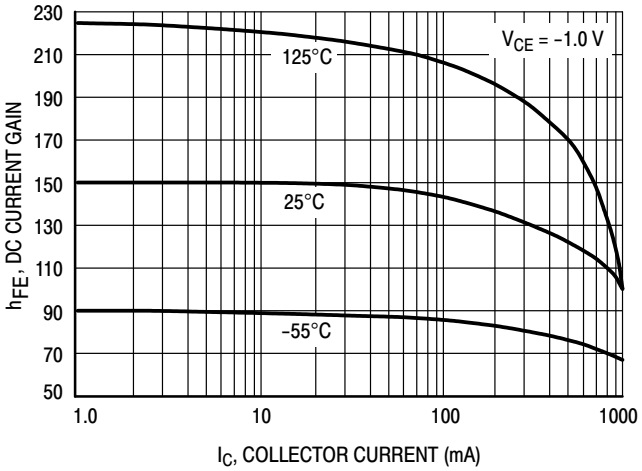


Figure 2. DC Current Gain versus Collector Current

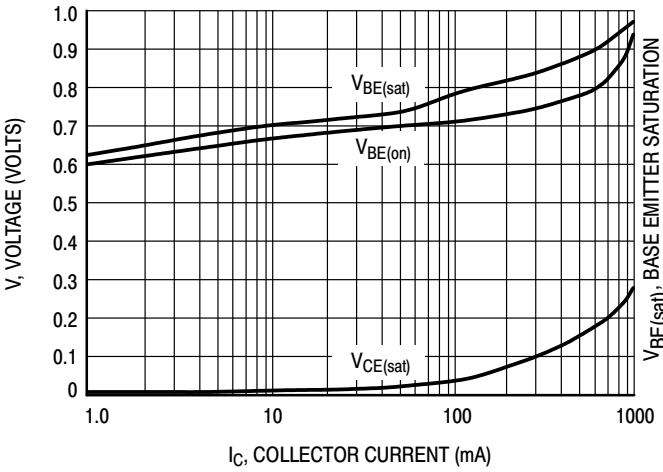


Figure 3. “On” Voltages

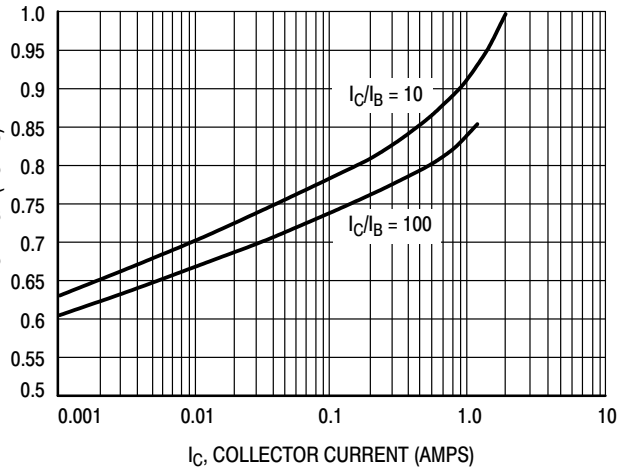


Figure 4. Base Emitter Saturation Voltage versus Collector Current

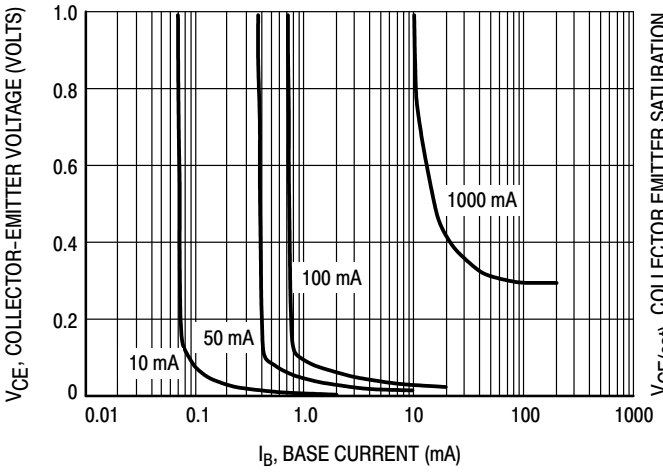


Figure 5. Collector Emitter Saturation Voltage versus Collector Current

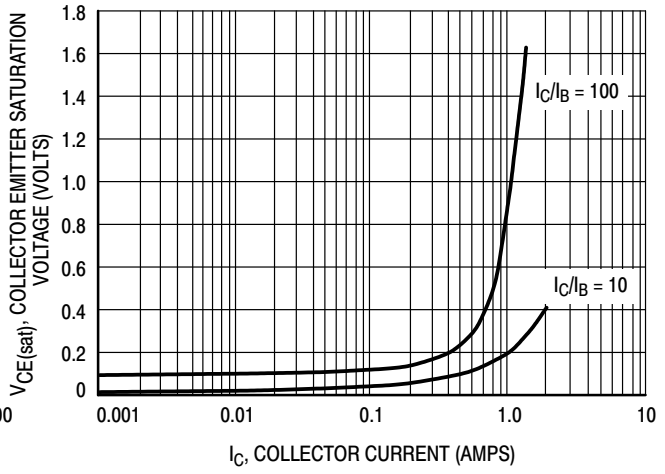


Figure 6. Collector Emitter Saturation Voltage versus Collector Current

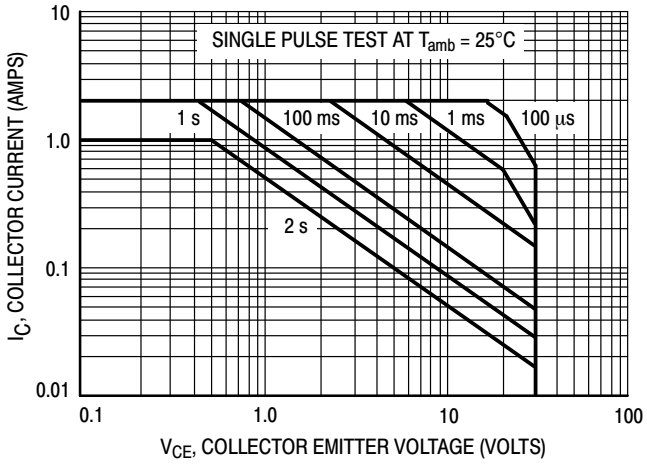


Figure 7. Safe Operating Area

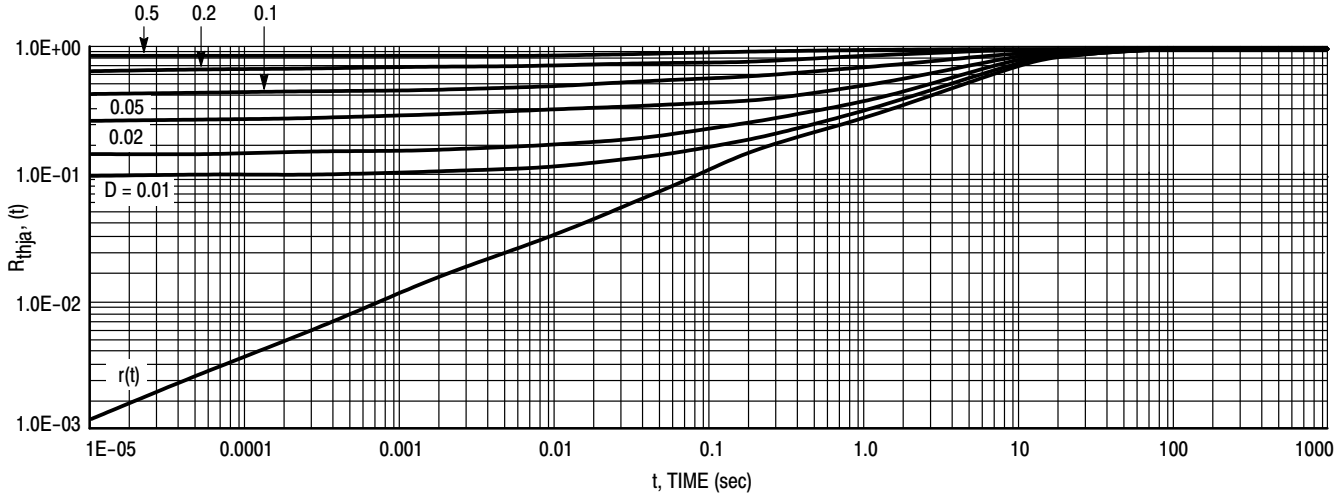
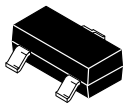


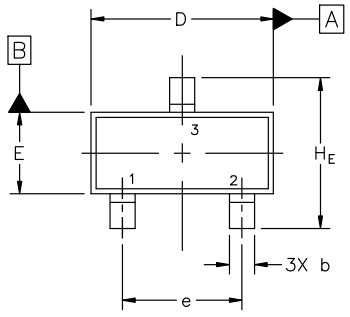
Figure 8. Normalized Thermal Response



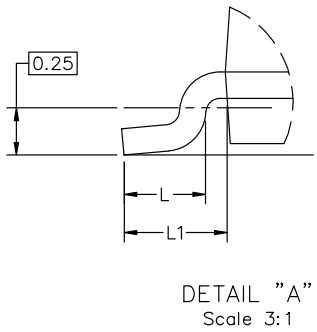
SCALE 4:1

SOT−23 (TO−236) 2.90x1.30x1.00 1.90P
CASE 318
ISSUE AU

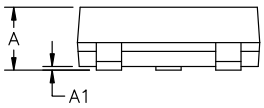
DATE 14 AUG 2024



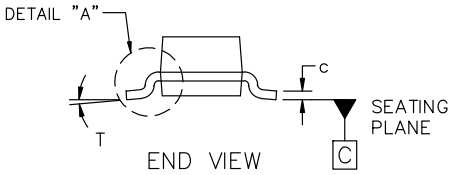
TOP VIEW



DETAIL "A"
Scale 3:1



SIDE VIEW

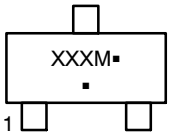


END VIEW

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
H_E	2.10	2.40	2.64
T	0°	−−−	10°

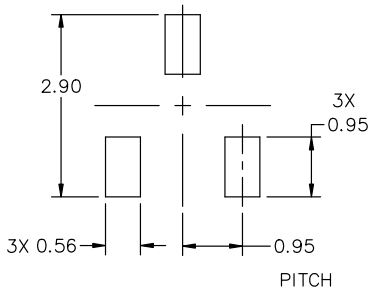
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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 onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

STYLES ON PAGE 2

SOT−23 (TO−236) 2.90x1.30x1.00 1.90P
CASE 318
ISSUE AU

DATE 14 AUG 2024

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

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
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