

# MMBT6517L, NSVMMBT6517L

## High Voltage Transistor

### NPN Silicon

#### 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

Rating	Symbol	Value	Unit
Collector – Emitter Voltage	$V_{CEO}$	350	V
Collector – Base Voltage	$V_{CBO}$	350	V
Emitter – Base Voltage	$V_{EBO}$	5.0	V
Base Current	$I_B$	25	mA
Collector Current – Continuous	$I_C$	100	mA

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225	mW
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	556	$^\circ\text{C/W}$
Total Device Dissipation Alumina Substrate, (Note 2) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300	mW
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	417	$^\circ\text{C/W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

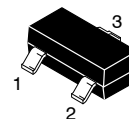
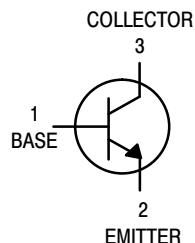
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. FR-5 =  $1.0 \times 0.75 \times 0.062$  in.
2. Alumina =  $0.4 \times 0.3 \times 0.024$  in. 99.5% alumina.



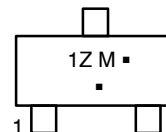
ON Semiconductor®

<http://onsemi.com>



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

#### MARKING DIAGRAM



1Z = 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†
MMBT6517LT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
MMBT6517LT3G	SOT-23 (Pb-Free)	10,000 / Tape & Reel
NSVMMBT6517LT1G	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.

# MMBT6517L, NSVMMBT6517L

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector – Emitter Breakdown Voltage ( $I_C = 1.0\text{ mA}$ )	$V_{(BR)CEO}$	350	–	V
Collector – Base Breakdown Voltage ( $I_C = 100\ \mu\text{A}$ )	$V_{(BR)CBO}$	350	–	V
Emitter – Base Breakdown Voltage ( $I_E = 10\ \mu\text{A}$ )	$V_{(BR)EBO}$	6.0	–	V
Collector Cutoff Current ( $V_{CB} = 250\text{ V}$ )	$I_{CBO}$	–	50	nA
Emitter Cutoff Current ( $V_{EB} = 5.0\text{ V}$ )	$I_{EBO}$	–	50	nA
<b>ON CHARACTERISTICS</b>				
DC Current Gain ( $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ V}$ ) ( $I_C = 10\text{ mA}$ , $V_{CE} = 10\text{ V}$ ) ( $I_C = 30\text{ mA}$ , $V_{CE} = 10\text{ V}$ ) ( $I_C = 50\text{ mA}$ , $V_{CE} = 10\text{ V}$ ) ( $I_C = 100\text{ mA}$ , $V_{CE} = 10\text{ V}$ )	$h_{FE}$	20 30 30 20 15	– – 200 200 –	–
Collector – Emitter Saturation Voltage (Note 3) ( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ ) ( $I_C = 20\text{ mA}$ , $I_B = 2.0\text{ mA}$ ) ( $I_C = 30\text{ mA}$ , $I_B = 3.0\text{ mA}$ ) ( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )	$V_{CE(sat)}$	– – – –	0.30 0.35 0.50 1.0	V
Base – Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ ) ( $I_C = 20\text{ mA}$ , $I_B = 2.0\text{ mA}$ ) ( $I_C = 30\text{ mA}$ , $I_B = 3.0\text{ mA}$ )	$V_{BE(sat)}$	– – –	0.75 0.85 0.90	V
Base – Emitter On Voltage ( $I_C = 100\text{ mA}$ , $V_{CE} = 10\text{ V}$ )	$V_{BE(on)}$	–	2.0	V
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current Gain – Bandwidth Product ( $I_C = 10\text{ mA}$ , $V_{CE} = 20\text{ V}$ , $f = 20\text{ MHz}$ )	$f_T$	40	200	MHz
Collector–Base Capacitance ( $V_{CB} = 20\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{cb}$	–	6.0	pF
Emitter–Base Capacitance ( $V_{EB} = 0.5\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{eb}$	–	80	pF

3. Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle = 2.0%.

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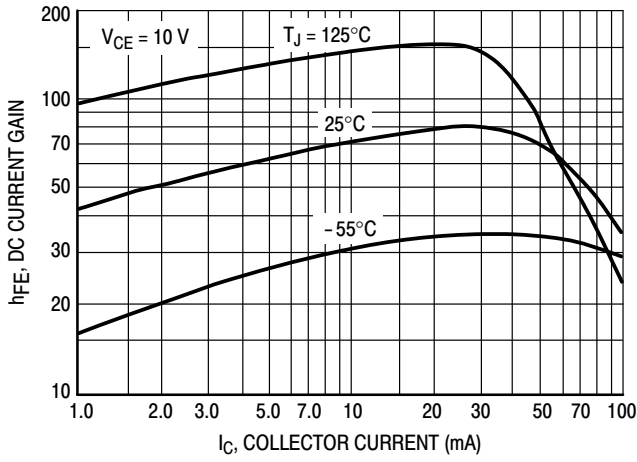


Figure 1. DC Current Gain

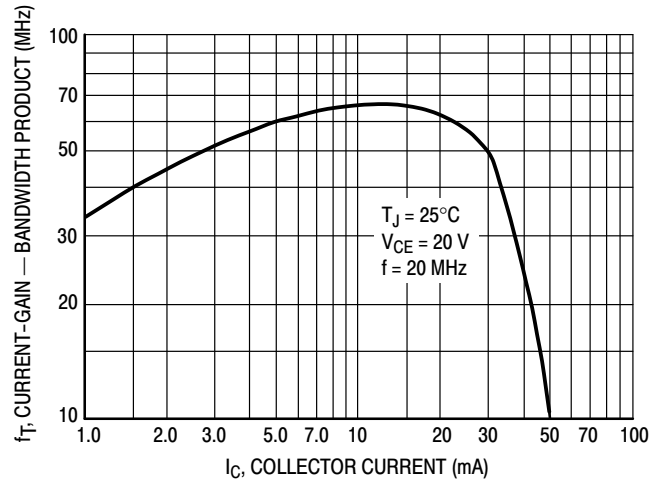


Figure 2. Current-Gain — Bandwidth Product

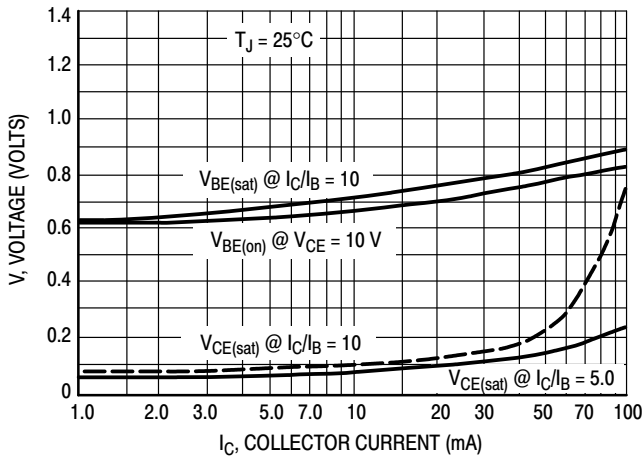


Figure 3. "On" Voltages

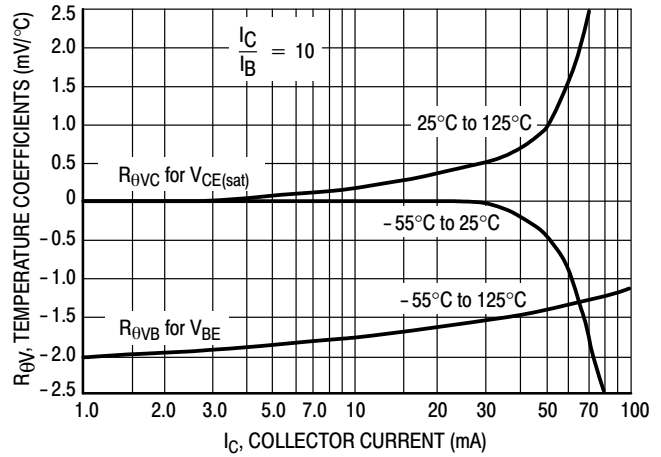


Figure 4. Temperature Coefficients

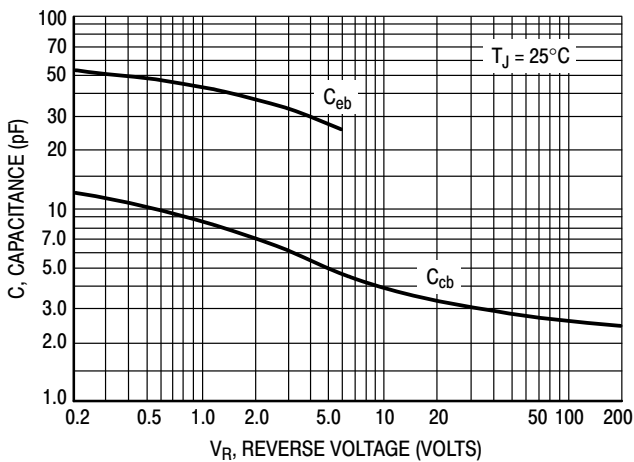


Figure 5. Capacitance

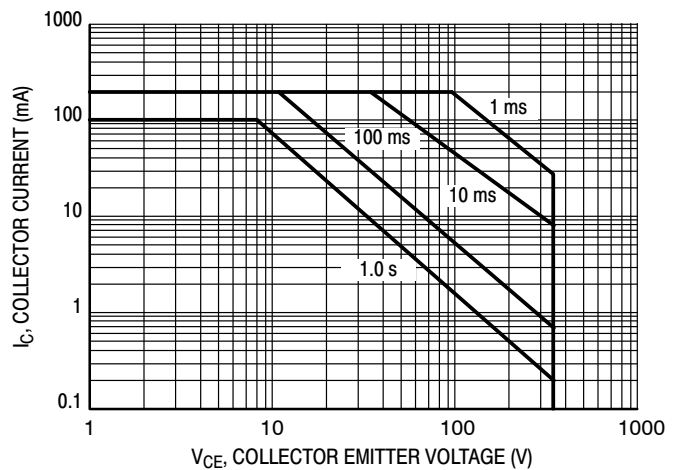


Figure 6. Safe Operating Area

# MMBT6517L, NSVMMBT6517L

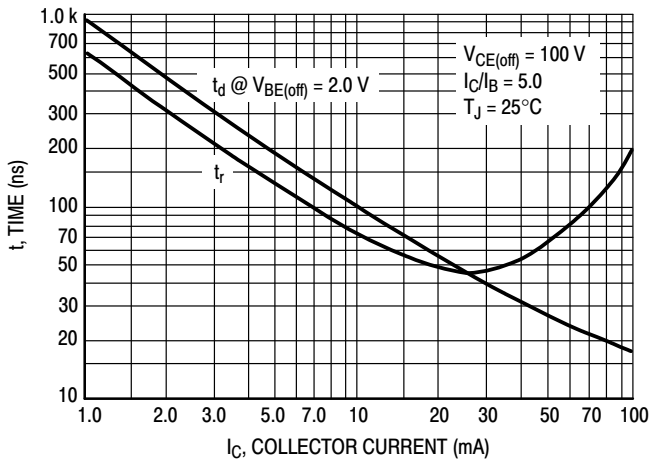


Figure 7. Turn-On Time

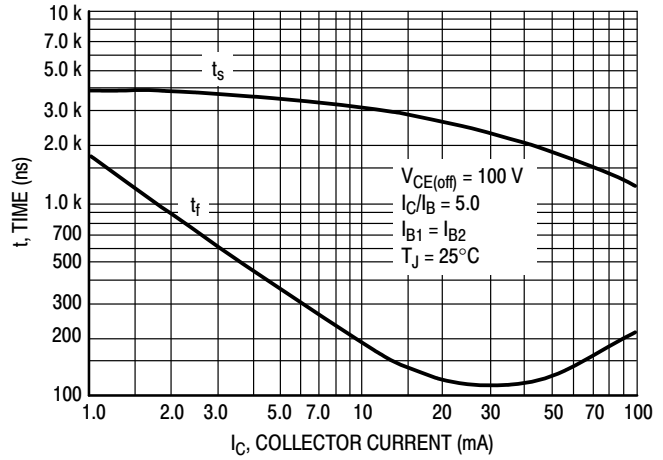


Figure 8. Turn-Off Time

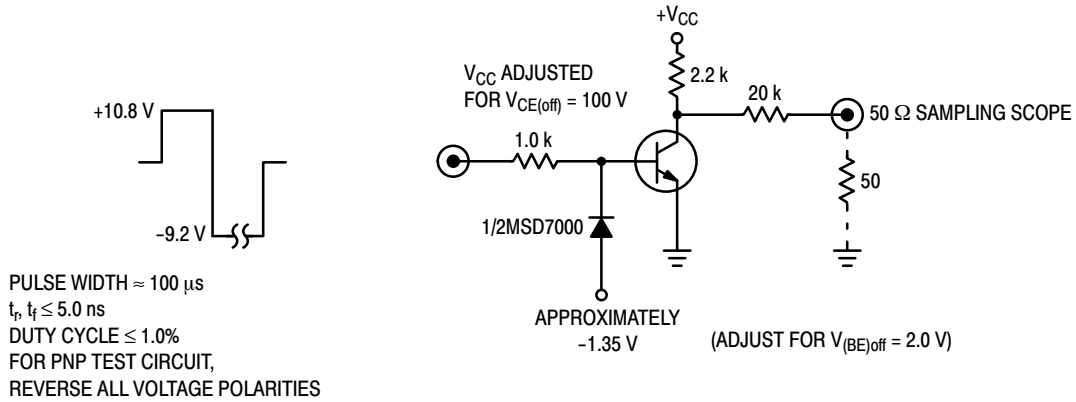


Figure 9. Switching Time Test Circuit

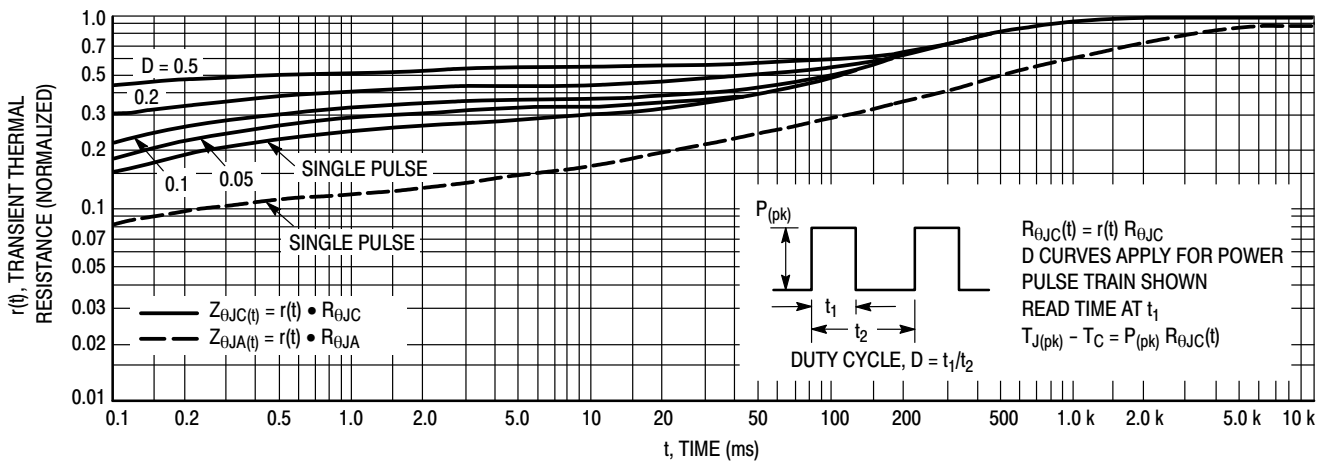


Figure 10. Thermal Response

# 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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**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**



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

DATE 01 MAR 2023

- |   |   |   |   |   |   |
|---|---|---|---|---|---|
| STYLE 1 THRU 5:<br>CANCELLED                            | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE  |   |   |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE      | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE     | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE      | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE | STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE          |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN       | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT   | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE           | STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION |
| STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE     |   |   |   |   |

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