

# 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	$^\circ\text{C}/\text{W}$
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	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

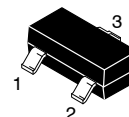
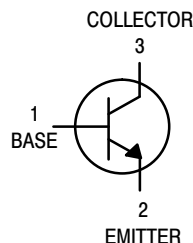
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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.



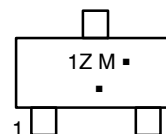
ON Semiconductor®

<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<sub>A</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector – Emitter Breakdown Voltage (I <sub>C</sub> = 1.0 mA)	V <sub>(BR)CEO</sub>	350	–	V
Collector – Base Breakdown Voltage (I <sub>C</sub> = 100 μA)	V <sub>(BR)CBO</sub>	350	–	V
Emitter – Base Breakdown Voltage (I <sub>E</sub> = 10 μA)	V <sub>(BR)EBO</sub>	6.0	–	V
Collector Cutoff Current (V <sub>CB</sub> = 250 V)	I <sub>CBO</sub>	–	50	nA
Emitter Cutoff Current (V <sub>EB</sub> = 5.0 V)	I <sub>EBO</sub>	–	50	nA
<b>ON CHARACTERISTICS</b>				
DC Current Gain (I <sub>C</sub> = 1.0 mA, V <sub>CE</sub> = 10 V) (I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 10 V) (I <sub>C</sub> = 30 mA, V <sub>CE</sub> = 10 V) (I <sub>C</sub> = 50 mA, V <sub>CE</sub> = 10 V) (I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 10 V)	h <sub>FE</sub>	20 30 30 20 15	– – 200 200 –	–
Collector – Emitter Saturation Voltage (Note 3) (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1.0 mA) (I <sub>C</sub> = 20 mA, I <sub>B</sub> = 2.0 mA) (I <sub>C</sub> = 30 mA, I <sub>B</sub> = 3.0 mA) (I <sub>C</sub> = 50 mA, I <sub>B</sub> = 5.0 mA)	V <sub>CE(sat)</sub>	– – – –	0.30 0.35 0.50 1.0	V
Base – Emitter Saturation Voltage (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1.0 mA) (I <sub>C</sub> = 20 mA, I <sub>B</sub> = 2.0 mA) (I <sub>C</sub> = 30 mA, I <sub>B</sub> = 3.0 mA)	V <sub>BE(sat)</sub>	– – –	0.75 0.85 0.90	V
Base – Emitter On Voltage (I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 10 V)	V <sub>BE(on)</sub>	–	2.0	V
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current Gain – Bandwidth Product (I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 20 V, f = 20 MHz)	f <sub>T</sub>	40	200	MHz
Collector–Base Capacitance (V <sub>CB</sub> = 20 V, f = 1.0 MHz)	C <sub>cb</sub>	–	6.0	pF
Emitter–Base Capacitance (V <sub>EB</sub> = 0.5 V, f = 1.0 MHz)	C <sub>eb</sub>	–	80	pF

3. Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2.0%.

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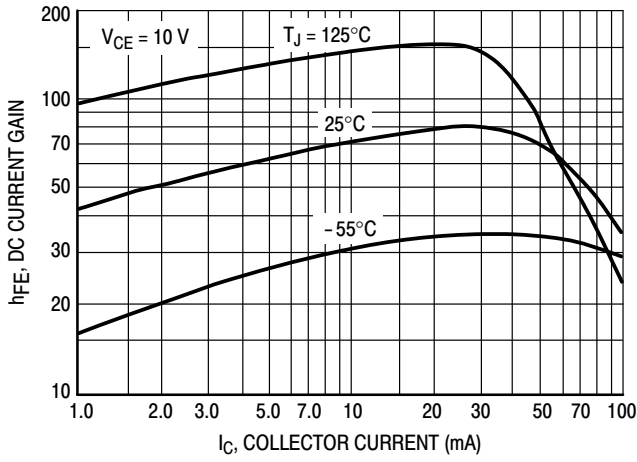


Figure 1. DC Current Gain

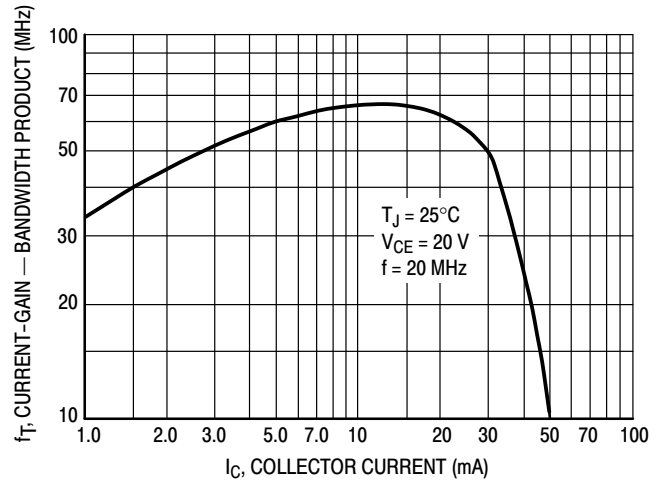


Figure 2. Current-Gain — Bandwidth Product

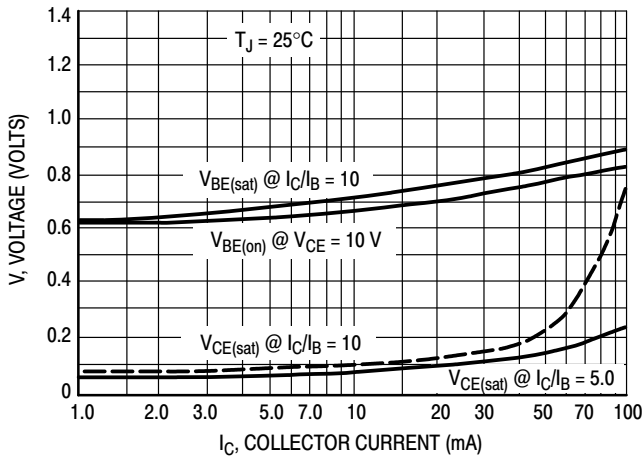


Figure 3. "On" Voltages

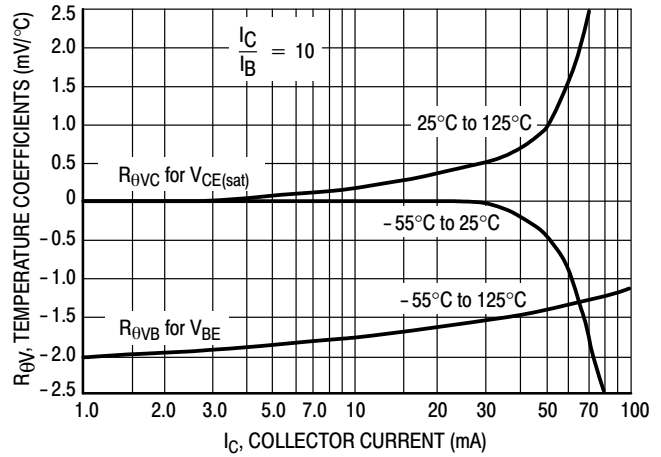


Figure 4. Temperature Coefficients

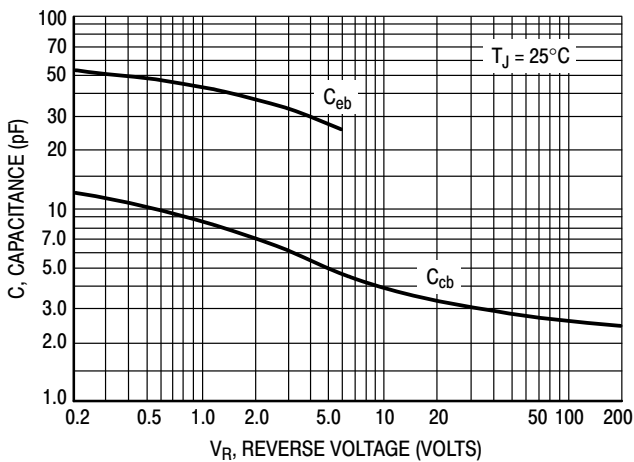


Figure 5. Capacitance

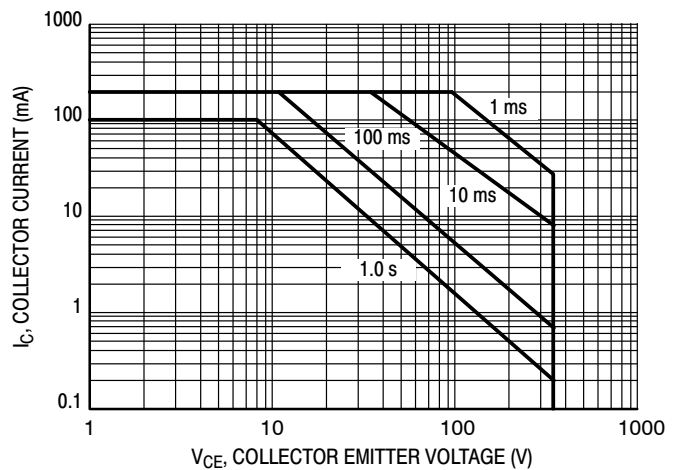


Figure 6. Safe Operating Area

# MMBT6517L, NSVMMBT6517L

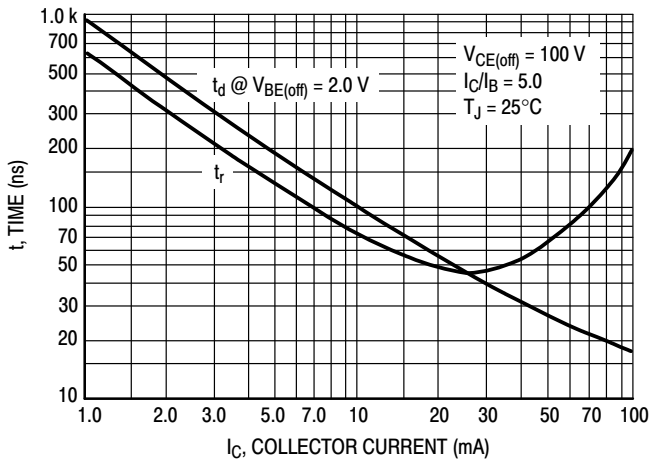


Figure 7. Turn-On Time

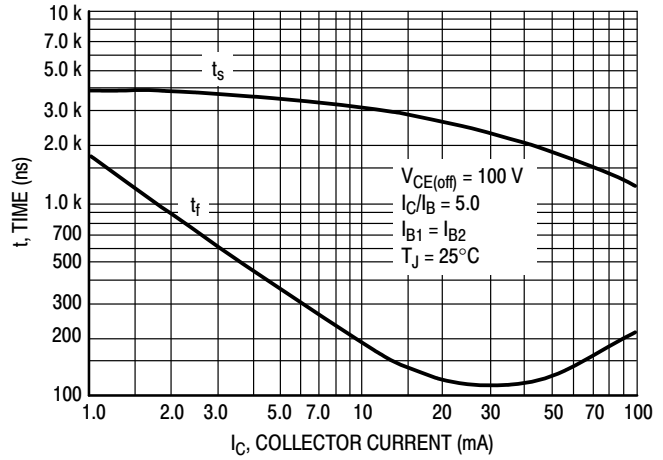


Figure 8. Turn-Off Time

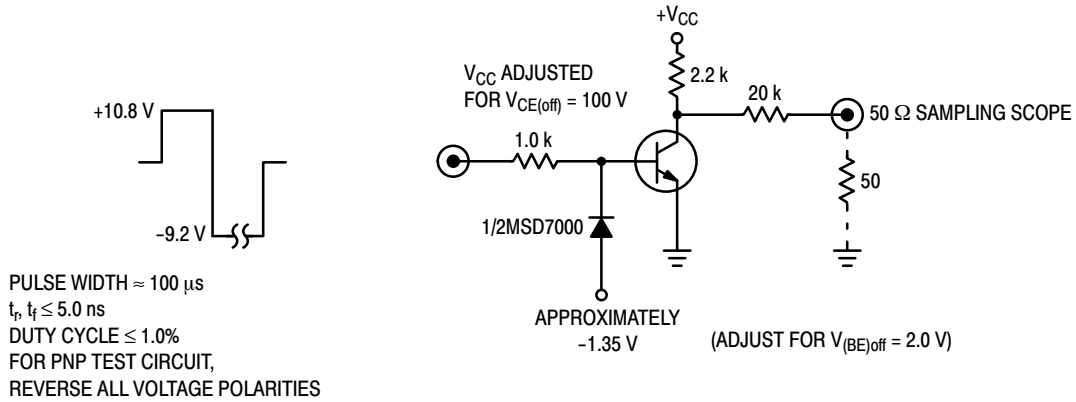


Figure 9. Switching Time Test Circuit

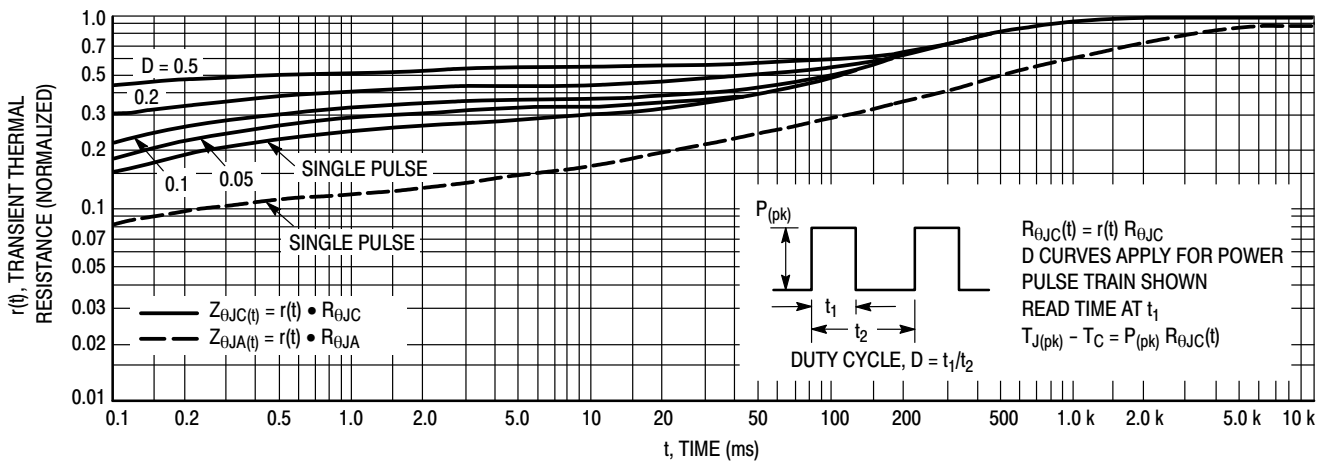


Figure 10. Thermal Response



SCALE 4:1

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

DATE 14 AUG 2024



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
HE	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.



\* 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**

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<b>DESCRIPTION:</b>	<b>SOT-23 (TO-236) 2.90x1.30x1.00 1.90P</b>	<b>PAGE 1 OF 2</b>

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**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

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