

# MMBT6520L, NSVMMBT6520L

## High Voltage Transistor

### PNP Silicon



ON Semiconductor®

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#### 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

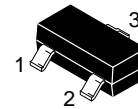
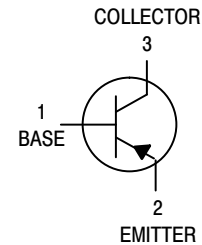
Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	–350	Vdc
Collector–Base Voltage	$V_{CBO}$	–350	Vdc
Emitter–Base Voltage	$V_{EBO}$	–5.0	Vdc
Base Current	$I_B$	–250	mA
Collector Current – Continuous	$I_C$	–500	mAdc

#### 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 1.8	mW mW/ $^\circ\text{C}$
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 2.4	mW mW/ $^\circ\text{C}$
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	$^\circ\text{C}$

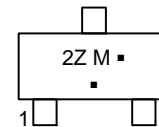
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR–5 = 1.0 x 0.75 x 0.062 in.
2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.



SOT–23 (TO–236)  
CASE 318  
STYLE 6

#### MARKING DIAGRAM



2Z = 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†
MMBT6520LT1G	SOT–23 (Pb–Free)	3000 / Tape & Reel
MMBT6520LT3G	SOT–23 (Pb–Free)	10,000 / Tape & Reel
NSVMMBT6520LT1G	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.

# MMBT6520L, NSVMMBT6520L

## 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	–	Vdc
Collector–Base Breakdown Voltage (I <sub>C</sub> = –100 μA)	V <sub>(BR)CBO</sub>	–350	–	Vdc
Emitter–Base Breakdown Voltage (I <sub>E</sub> = –10 μA)	V <sub>(BR)EBO</sub>	–5.0	–	Vdc
Collector Cutoff Current (V <sub>CB</sub> = –250 V)	I <sub>CBO</sub>	–	–50	nA
Emitter Cutoff Current (V <sub>EB</sub> = –4.0 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 (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	Vdc
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	Vdc
Base–Emitter On Voltage (I <sub>C</sub> = –100 mA, V <sub>CE</sub> = –10 V)	V <sub>BE(on)</sub>	–	–2.0	Vdc
<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>	–	100	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.

# MMBT6520L, NSVMMBT6520L

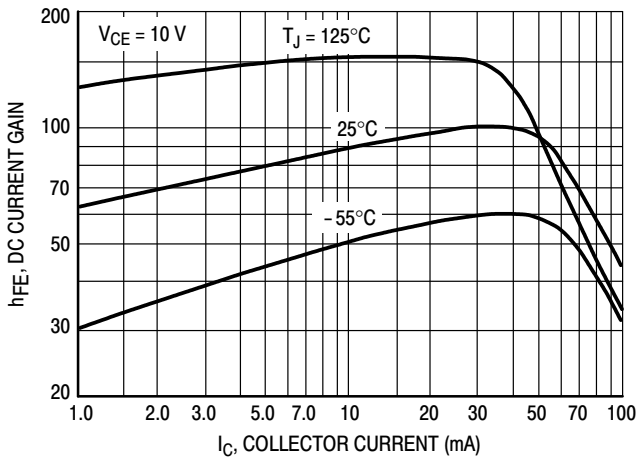


Figure 1. DC Current Gain

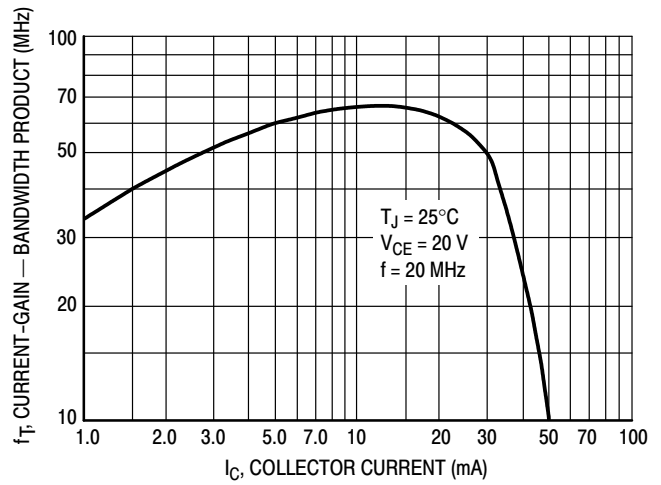


Figure 2. Current-Gain — Bandwidth Product

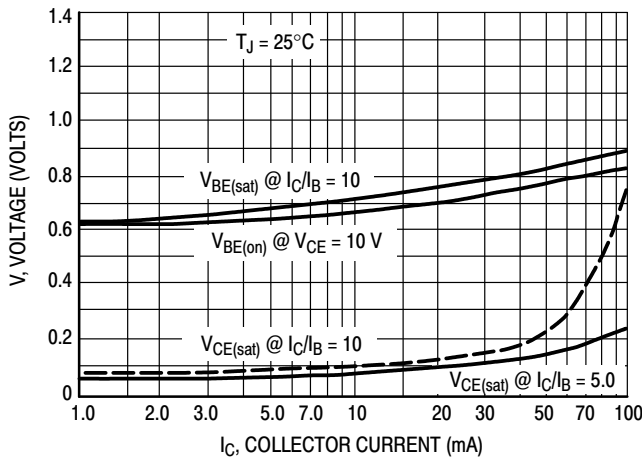


Figure 3. "On" Voltages

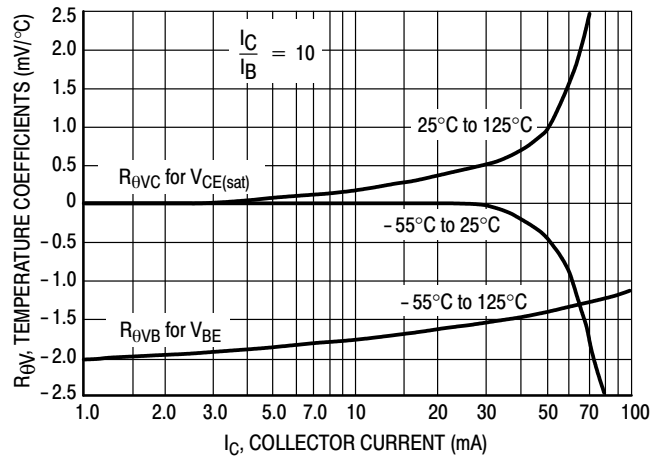


Figure 4. Temperature Coefficients

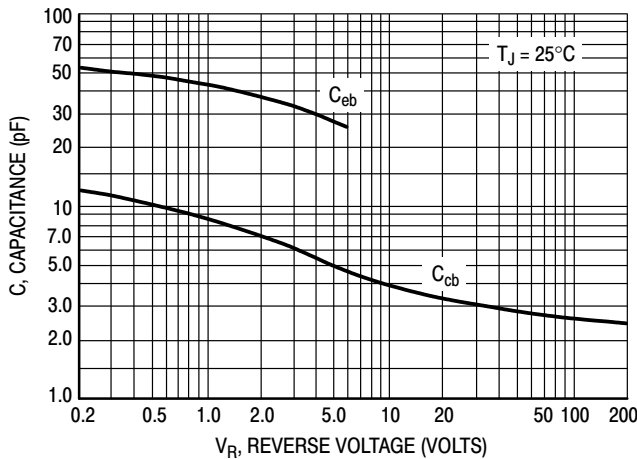


Figure 5. Capacitance

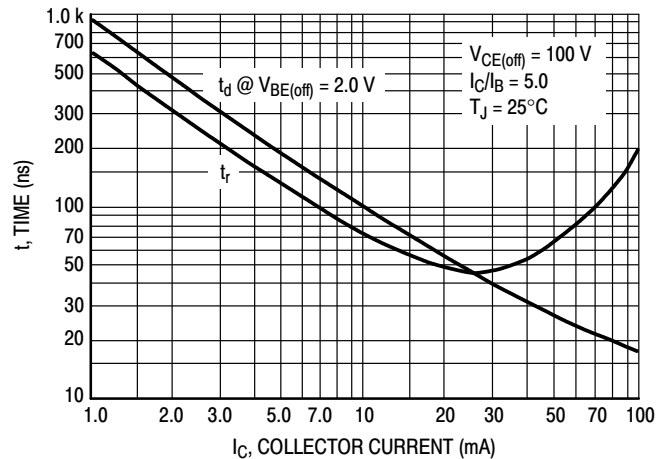


Figure 6. Turn-On Time

# MMBT6520L, NSVMMBT6520L

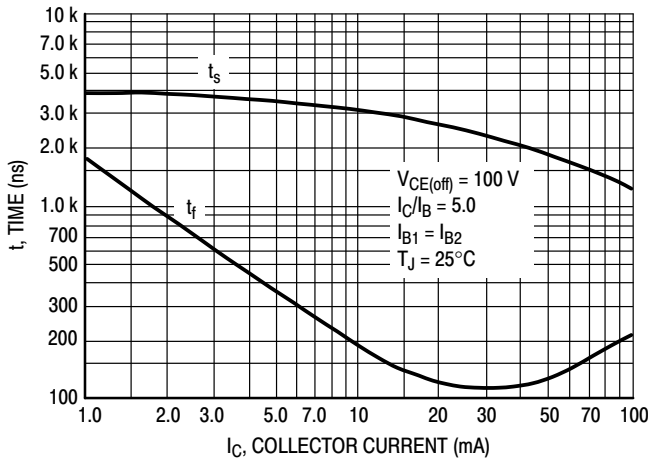


Figure 7. Turn-Off Time

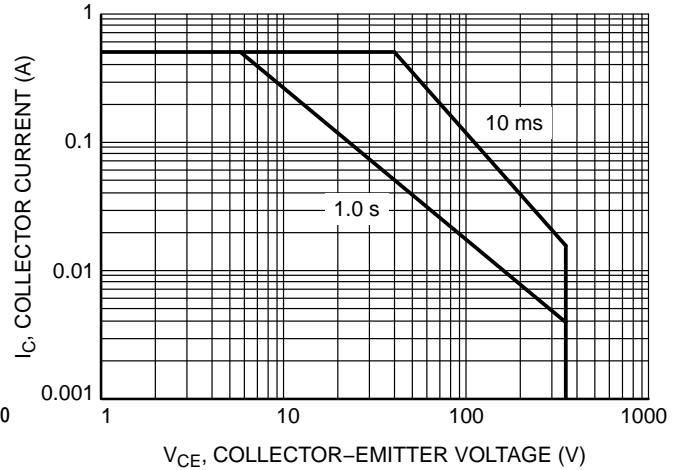


Figure 8. Safe Operating Area

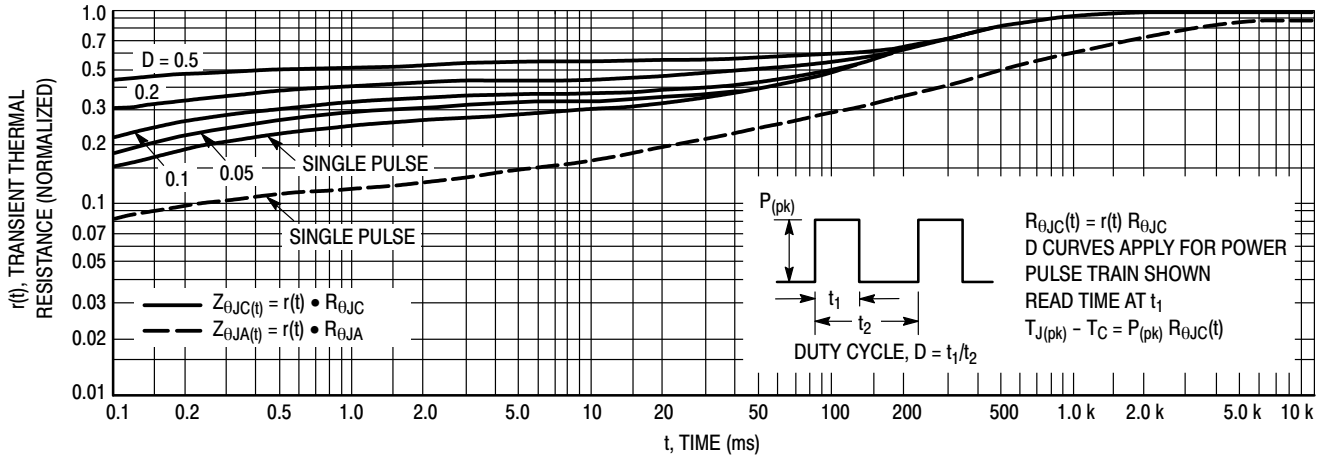


Figure 9. Thermal Response

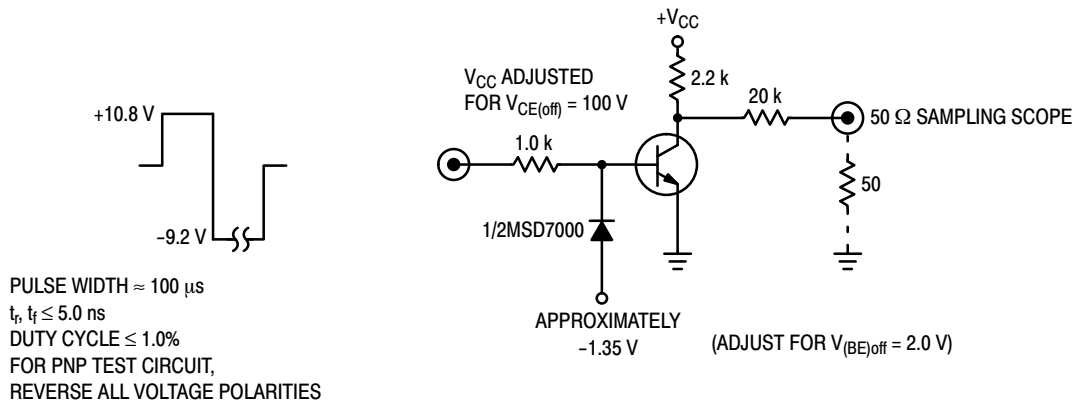
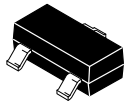


Figure 10. Switching Time Test Circuit

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



**SOT-23 (TO-236)**  
CASE 318-08  
ISSUE AS

DATE 30 JAN 2018

SCALE 4:1

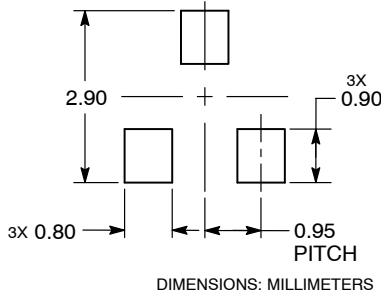


**NOTES:**

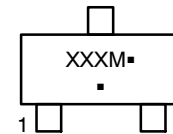
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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
HE	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

**RECOMMENDED SOLDERING FOOTPRINT**



**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.

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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