

# 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

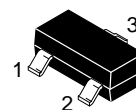
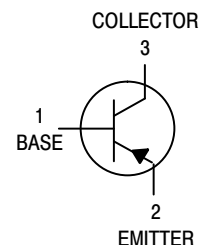
Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	–350	Vdc
Collector–Base Voltage	$V_{CBO}$	–350	Vdc
Emitter–Base Voltage	$V_{EBO}$	–5.0	Vdc
Base Current	$I_B$	–250	mA
Collector Current – Continuous	$I_C$	–500	mAdc

### 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	$^\circ\text{C}$

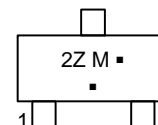
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

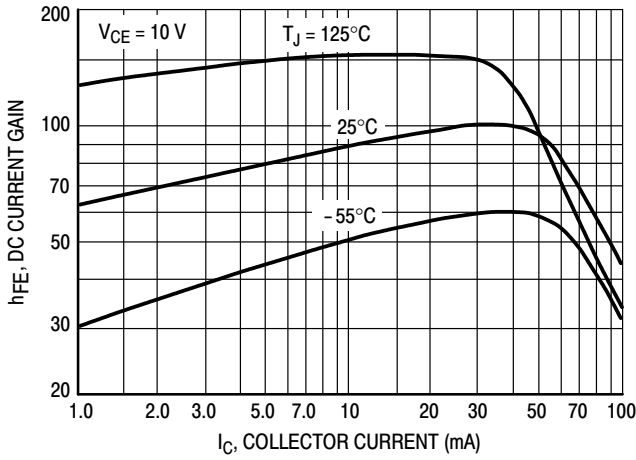


Figure 1. DC Current Gain

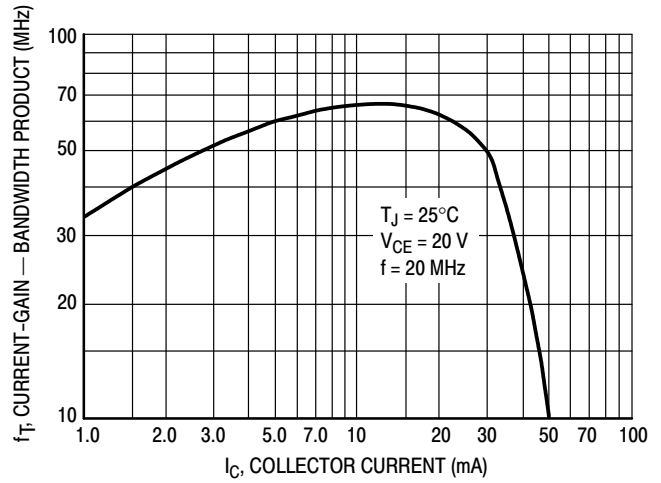


Figure 2. Current-Gain — Bandwidth Product

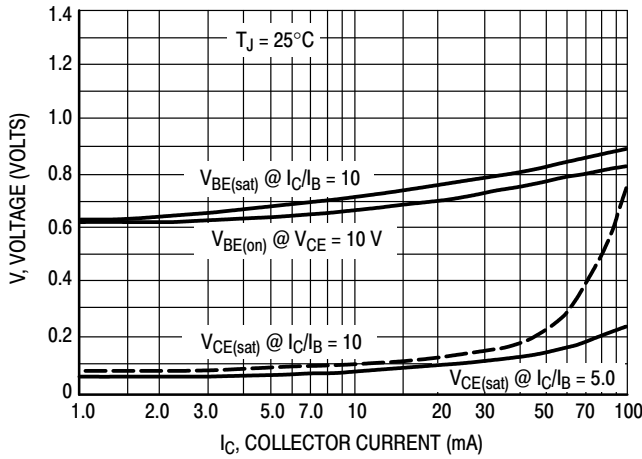


Figure 3. "On" Voltages

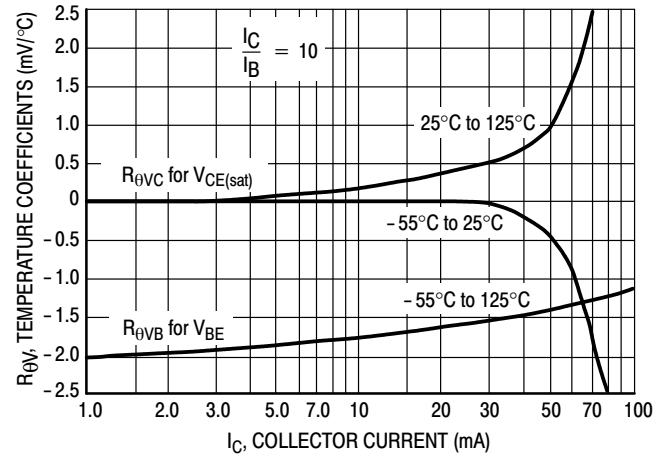


Figure 4. Temperature Coefficients

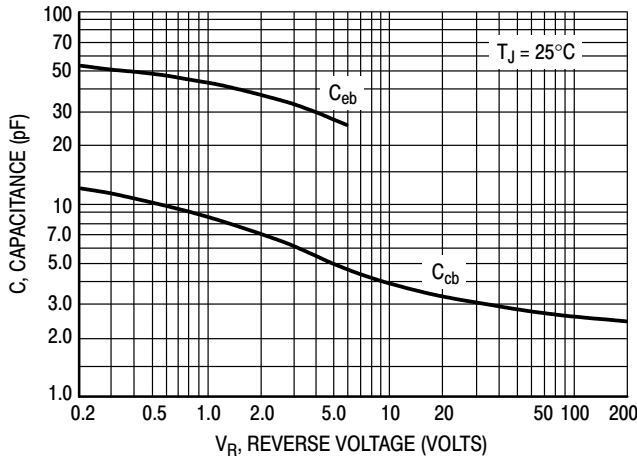


Figure 5. Capacitance

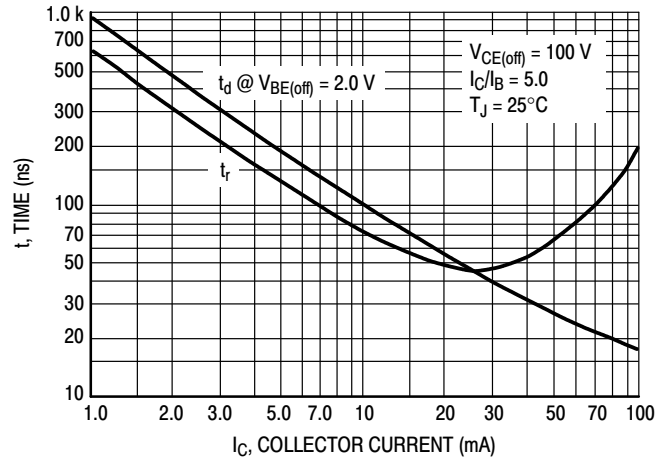


Figure 6. Turn-On Time

# MMBT6520L, NSVMMBT6520L

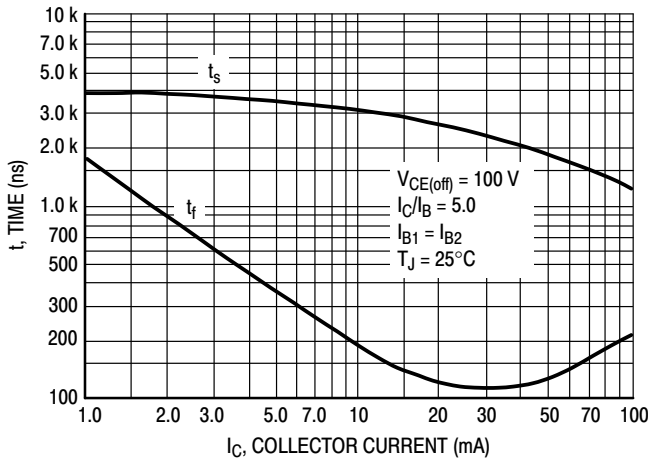


Figure 7. Turn-Off Time

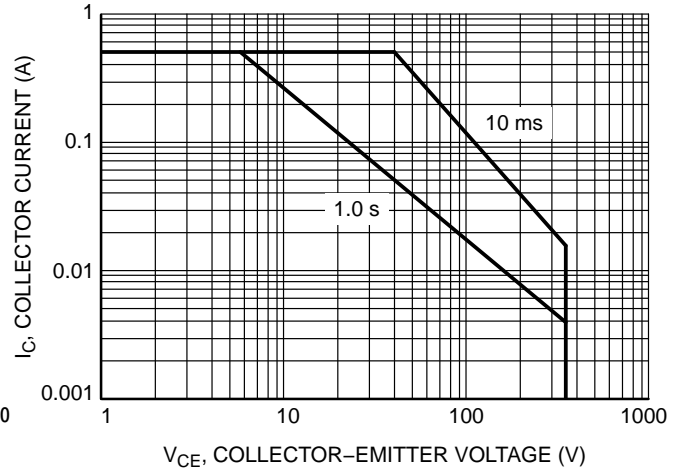


Figure 8. Safe Operating Area

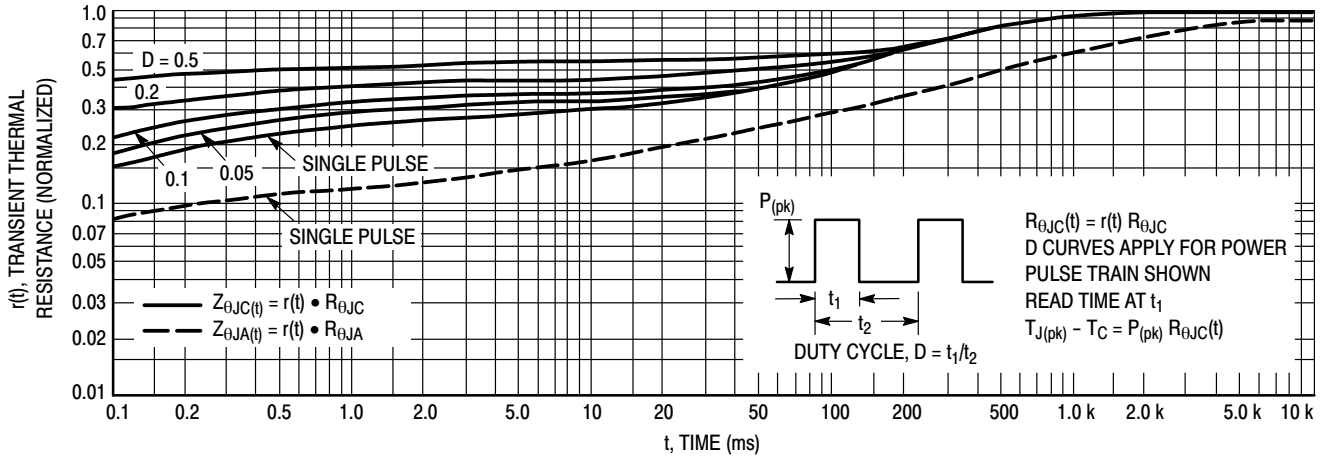


Figure 9. Thermal Response

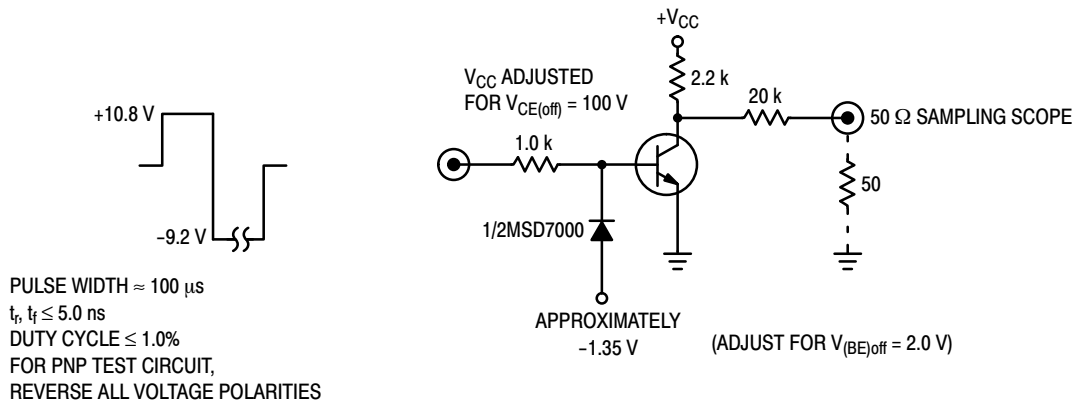
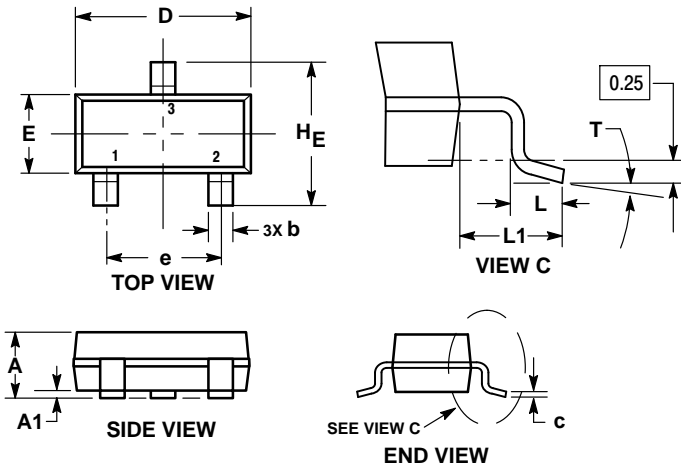


Figure 10. Switching Time Test Circuit

# MMBT6520L, NSVMMBT6520L

## PACKAGE DIMENSIONS

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



NOTES:

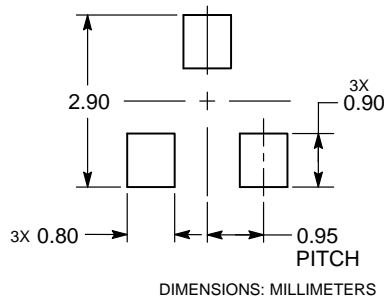
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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°

STYLE 6:

1. BASE
2. EMITTER
3. COLLECTOR

### RECOMMENDED 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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