

# MMBT6520L, NSVMMBT6520L

## High Voltage Transistor

### PNP Silicon



ON Semiconductor®

<http://onsemi.com>

#### 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

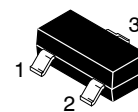
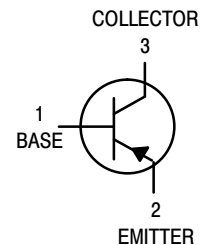
Rating	Symbol	Value	Unit
Collector - Emitter Voltage	$V_{CEO}$	-350	Vdc
Collector - Base Voltage	$V_{CBO}$	-350	Vdc
Emitter - Base Voltage	$V_{EBO}$	-5.0	Vdc
Base Current	$I_B$	-250	mA
Collector Current - Continuous	$I_C$	-500	mAdc

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

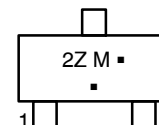
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. FR-5 = 1.0 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 ( $T_A = 25^\circ\text{C}$ 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	-	Vdc
Collector-Base Breakdown Voltage ( $I_C = -100\ \mu\text{A}$ )	$V_{(BR)CBO}$	-350	-	Vdc
Emitter-Base Breakdown Voltage ( $I_E = -10\ \mu\text{A}$ )	$V_{(BR)EBO}$	-5.0	-	Vdc
Collector Cutoff Current ( $V_{CB} = -250\text{ V}$ )	$I_{CBO}$	-	-50	nA
Emitter Cutoff Current ( $V_{EB} = -4.0\text{ V}$ )	$I_{EBO}$	-	-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 ( $I_C = -10\text{ mA}$ , $I_B = -1.0\text{ mA}$ ) ( $I_C = -20\text{ mA}$ , $I_B = -2.0\text{ mA}$ ) ( $I_C = -30\text{ mA}$ , $I_B = -3.0\text{ mA}$ ) ( $I_C = -50\text{ mA}$ , $I_B = -5.0\text{ mA}$ )	$V_{CE(sat)}$	- - - -	-0.30 -0.35 -0.50 -1.0	Vdc
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	Vdc
Base-Emitter On Voltage ( $I_C = -100\text{ mA}$ , $V_{CE} = -10\text{ V}$ )	$V_{BE(on)}$	-	-2.0	Vdc
<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 ( $V_{EB} = -0.5\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{eb}$	-	100	pF

# MMBT6520L, NSVMMBT6520L

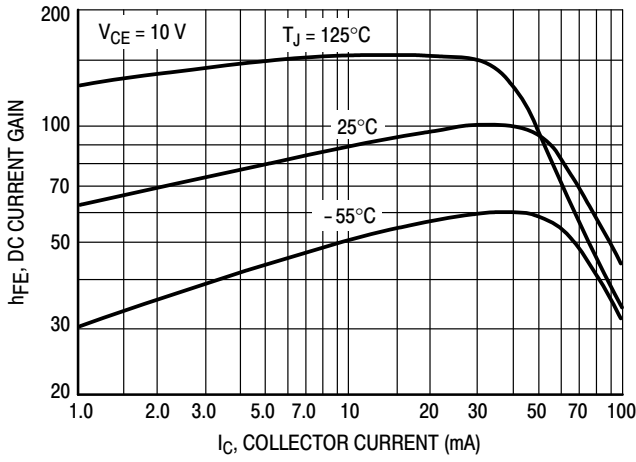


Figure 1. DC Current Gain

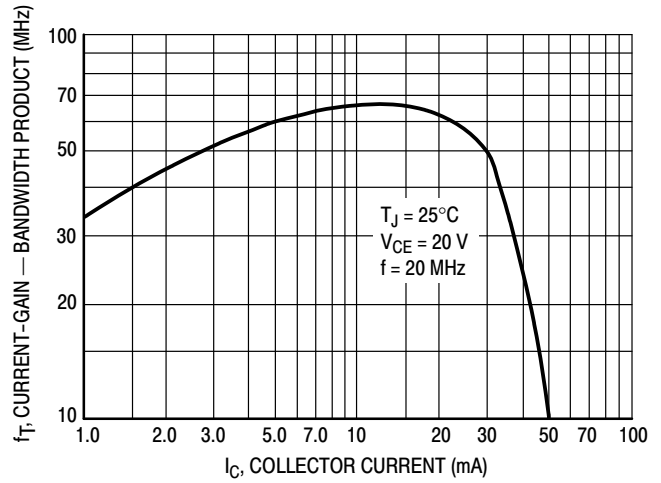


Figure 2. Current-Gain — Bandwidth Product

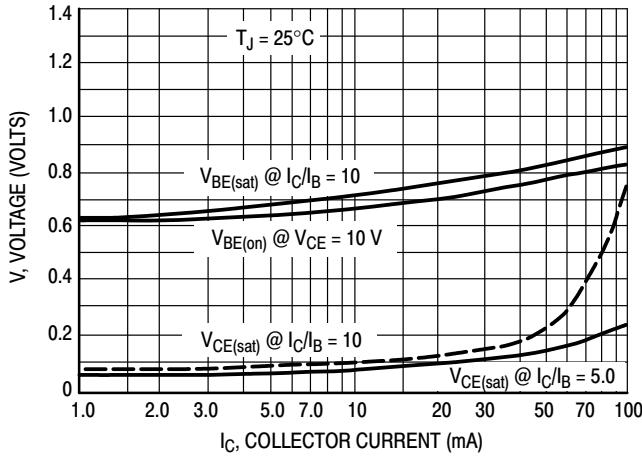


Figure 3. "On" Voltages

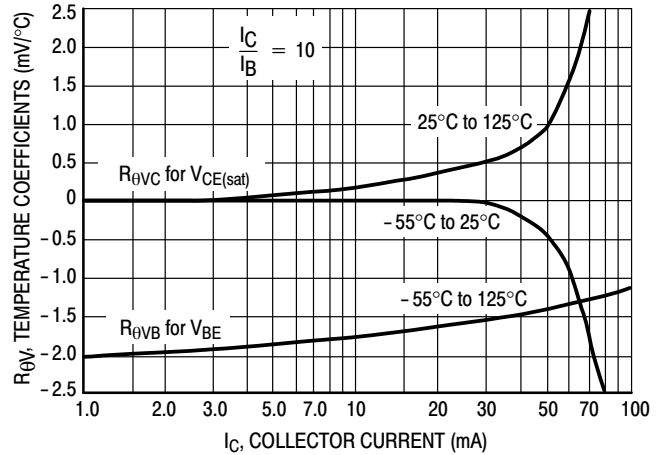


Figure 4. Temperature Coefficients

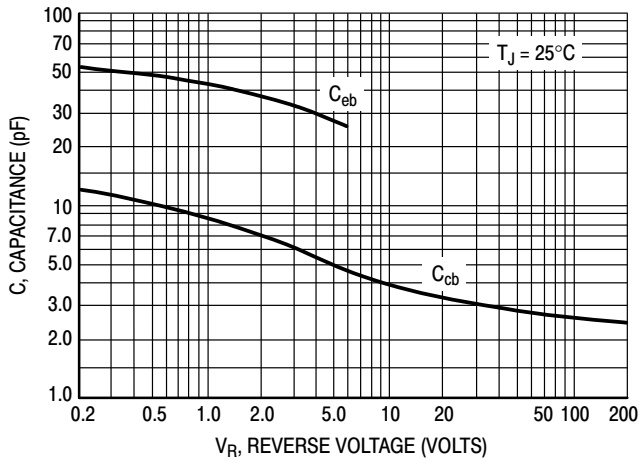


Figure 5. Capacitance

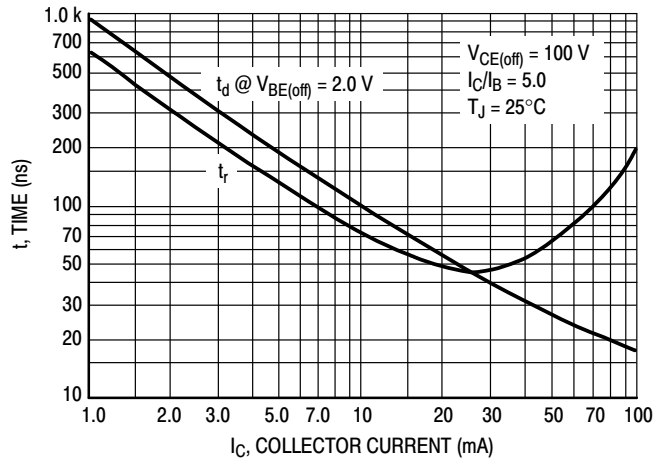


Figure 6. Turn-On Time

# MMBT6520L, NSVMMBT6520L

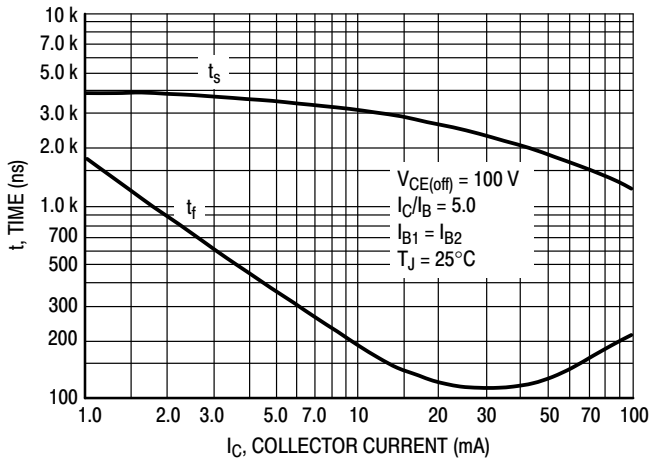


Figure 7. Turn-Off Time

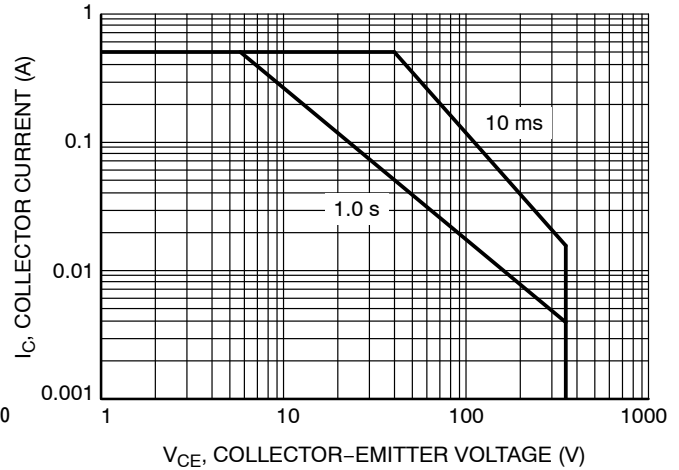


Figure 8. Safe Operating Area

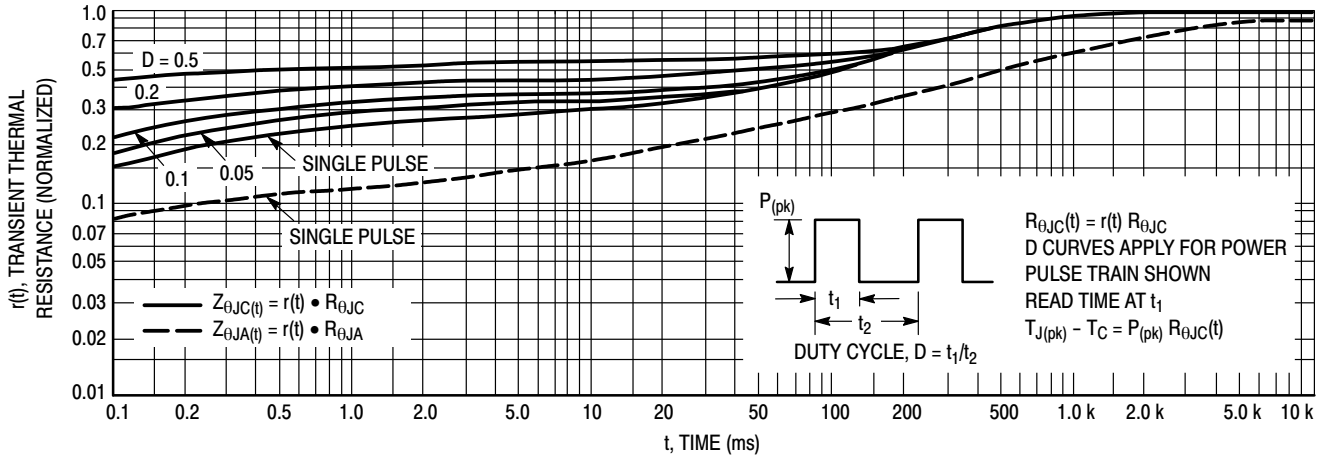


Figure 9. Thermal Response

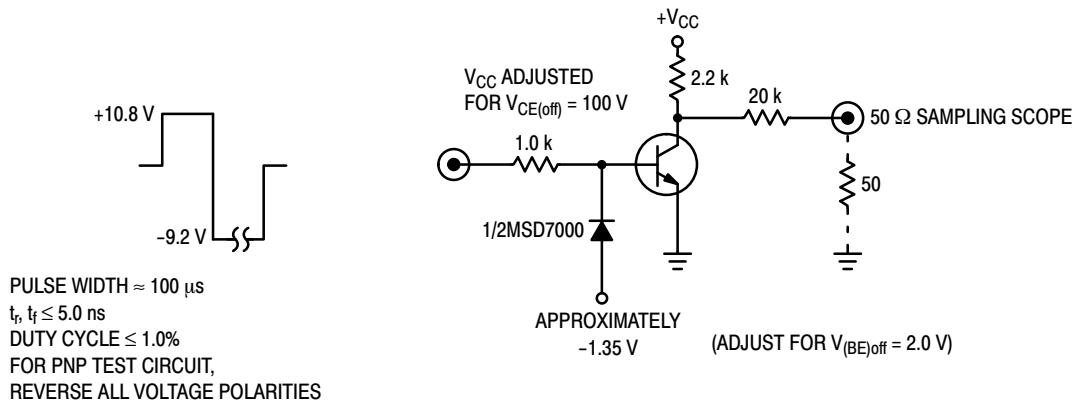
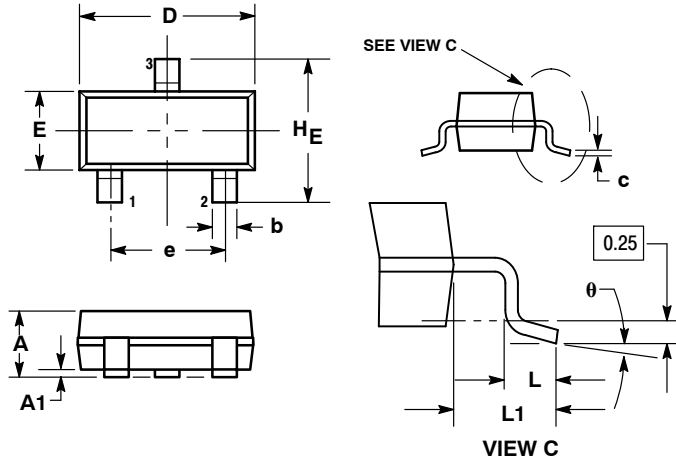


Figure 10. Switching Time Test Circuit

# MMBT6520L, NSVMMBT6520L

## PACKAGE DIMENSIONS

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



NOTES:

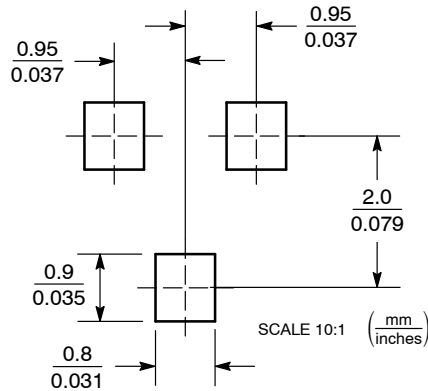
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
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	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
HE	2.10	2.40	2.64	0.083	0.094	0.104
θ	0°	---	10°	0°	---	10°

STYLE 6:

1. BASE
2. EMITTER
3. COLLECTOR

### 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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