

# MMBT6520L, NSVMMBT6520L

## High Voltage Transistor

### PNP 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  | 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,<br>(Note 1) $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$        | $P_D$           | 225<br>1.8  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient                                                                             | $R_{\theta JA}$ | 556         | $^\circ\text{C/W}$         |
| Total Device Dissipation Alumina<br>Substrate, (Note 2) $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 300<br>2.4  | mW<br>mW/ $^\circ\text{C}$ |
| 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.

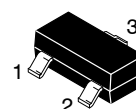
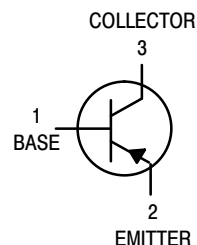
1. FR-5 = 1.0 x 0.75 x 0.062 in.

2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.



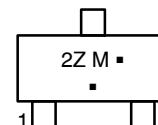
ON Semiconductor®

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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<br>(Pb-Free) | 3000 / Tape &<br>Reel   |
| MMBT6520LT3G    | SOT-23<br>(Pb-Free) | 10,000 / Tape &<br>Reel |
| NSVMMBT6520LT1G | SOT-23<br>(Pb-Free) | 3,000 / Tape &<br>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.

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

| Characteristic                                                                                                                                                                                                                                                                                       | Symbol        | Min                        | Max                             | Unit |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------|---------------------------------|------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                                                                                                                                           |               |                            |                                 |      |
| Collector-Emitter Breakdown Voltage<br>( $I_C = -1.0\text{ mA}$ )                                                                                                                                                                                                                                    | $V_{(BR)CEO}$ | -350                       | -                               | Vdc  |
| Collector-Base Breakdown Voltage<br>( $I_C = -100\text{ }\mu\text{A}$ )                                                                                                                                                                                                                              | $V_{(BR)CBO}$ | -350                       | -                               | Vdc  |
| Emitter-Base Breakdown Voltage<br>( $I_E = -10\text{ }\mu\text{A}$ )                                                                                                                                                                                                                                 | $V_{(BR)EBO}$ | -5.0                       | -                               | Vdc  |
| Collector Cutoff Current<br>( $V_{CB} = -250\text{ V}$ )                                                                                                                                                                                                                                             | $I_{CBO}$     | -                          | -50                             | nA   |
| Emitter Cutoff Current<br>( $V_{EB} = -4.0\text{ V}$ )                                                                                                                                                                                                                                               | $I_{EBO}$     | -                          | -50                             | nA   |
| <b>ON CHARACTERISTICS</b>                                                                                                                                                                                                                                                                            |               |                            |                                 |      |
| DC Current Gain<br>( $I_C = -1.0\text{ mA}$ , $V_{CE} = -10\text{ V}$ )<br>( $I_C = -10\text{ mA}$ , $V_{CE} = -10\text{ V}$ )<br>( $I_C = -30\text{ mA}$ , $V_{CE} = -10\text{ V}$ )<br>( $I_C = -50\text{ mA}$ , $V_{CE} = -10\text{ V}$ )<br>( $I_C = -100\text{ mA}$ , $V_{CE} = -10\text{ V}$ ) | $h_{FE}$      | 20<br>30<br>30<br>20<br>15 | -<br>-<br>200<br>200<br>-       | -    |
| Collector-Emitter Saturation Voltage<br>( $I_C = -10\text{ mA}$ , $I_B = -1.0\text{ mA}$ )<br>( $I_C = -20\text{ mA}$ , $I_B = -2.0\text{ mA}$ )<br>( $I_C = -30\text{ mA}$ , $I_B = -3.0\text{ mA}$ )<br>( $I_C = -50\text{ mA}$ , $I_B = -5.0\text{ mA}$ )                                         | $V_{CE(sat)}$ | -<br>-<br>-<br>-           | -0.30<br>-0.35<br>-0.50<br>-1.0 | Vdc  |
| Base-Emitter Saturation Voltage<br>( $I_C = -10\text{ mA}$ , $I_B = -1.0\text{ mA}$ )<br>( $I_C = -20\text{ mA}$ , $I_B = -2.0\text{ mA}$ )<br>( $I_C = -30\text{ mA}$ , $I_B = -3.0\text{ mA}$ )                                                                                                    | $V_{BE(sat)}$ | -<br>-<br>-                | -0.75<br>-0.85<br>-0.90         | Vdc  |
| Base-Emitter On Voltage<br>( $I_C = -100\text{ mA}$ , $V_{CE} = -10\text{ V}$ )                                                                                                                                                                                                                      | $V_{BE(on)}$  | -                          | -2.0                            | Vdc  |
| <b>SMALL-SIGNAL CHARACTERISTICS</b>                                                                                                                                                                                                                                                                  |               |                            |                                 |      |
| Current-Gain – Bandwidth Product<br>( $I_C = -10\text{ mA}$ , $V_{CE} = -20\text{ V}$ , $f = 20\text{ MHz}$ )                                                                                                                                                                                        | $f_T$         | 40                         | 200                             | MHz  |
| Collector-Base Capacitance<br>( $V_{CB} = -20\text{ V}$ , $f = 1.0\text{ MHz}$ )                                                                                                                                                                                                                     | $C_{cb}$      | -                          | 6.0                             | pF   |
| Emitter-Base Capacitance<br>( $V_{EB} = -0.5\text{ V}$ , $f = 1.0\text{ MHz}$ )                                                                                                                                                                                                                      | $C_{eb}$      | -                          | 100                             | pF   |

# MMBT6520L, NSVMMBT6520L

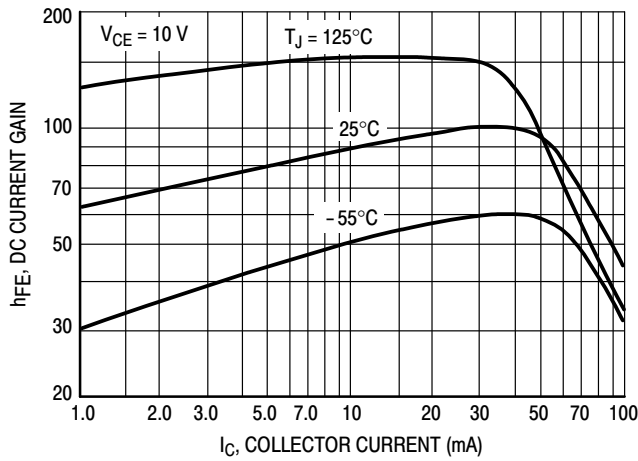


Figure 1. DC Current Gain

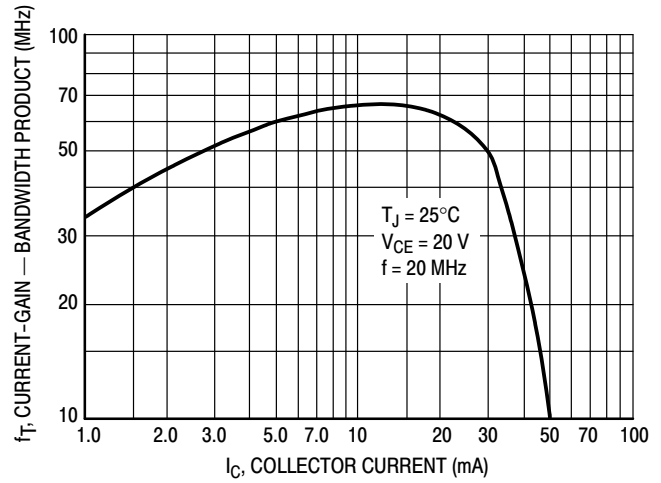


Figure 2. Current-Gain — Bandwidth Product

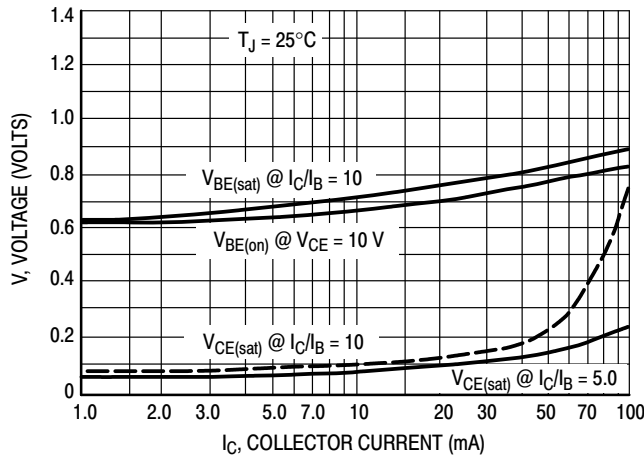


Figure 3. "On" Voltages

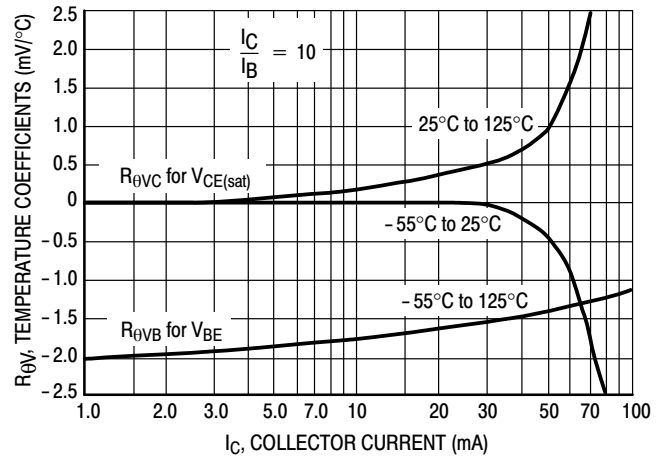


Figure 4. Temperature Coefficients

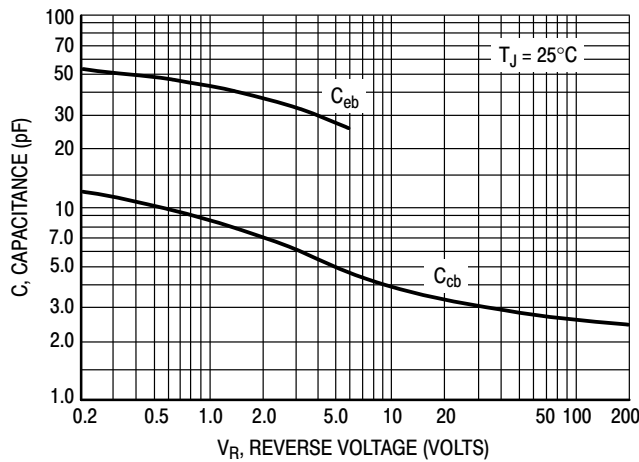


Figure 5. Capacitance

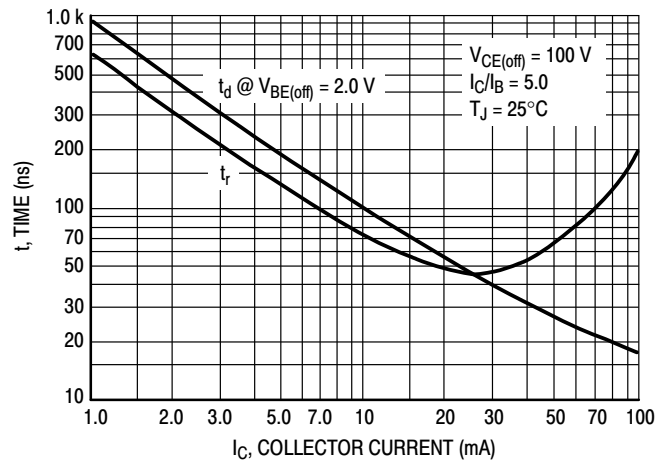


Figure 6. Turn-On Time

# MMBT6520L, NSVMMBT6520L

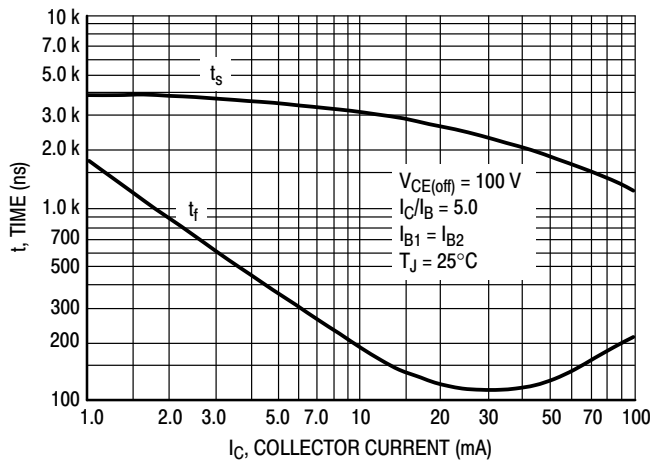


Figure 7. Turn-Off Time

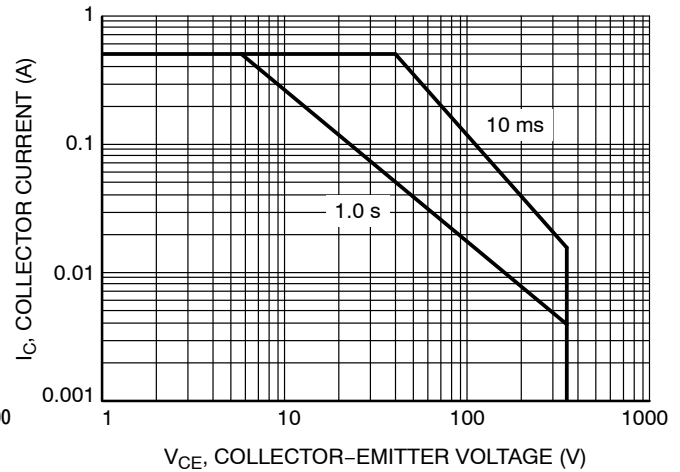


Figure 8. Safe Operating Area

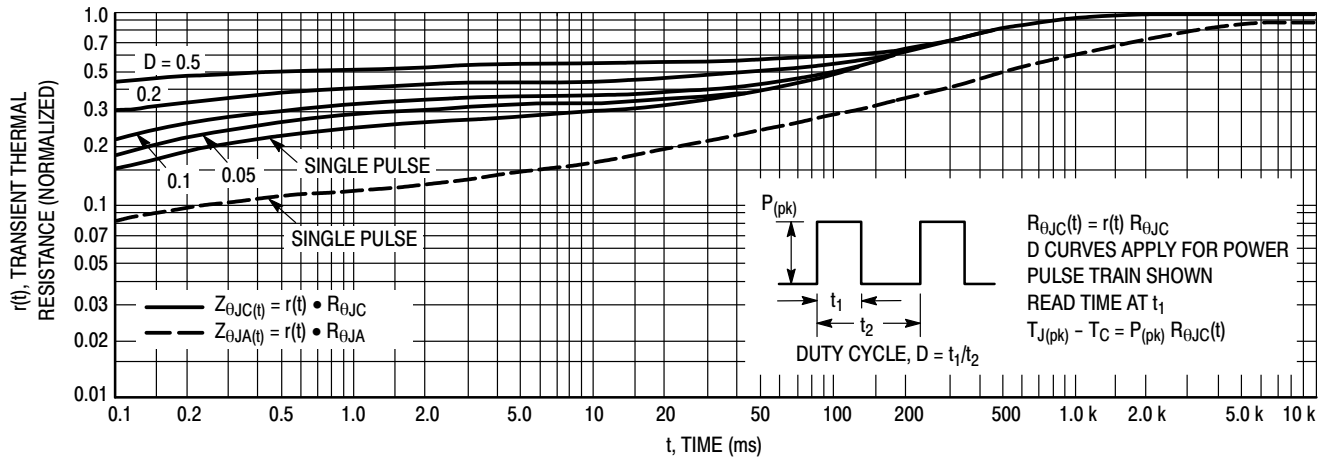


Figure 9. Thermal Response

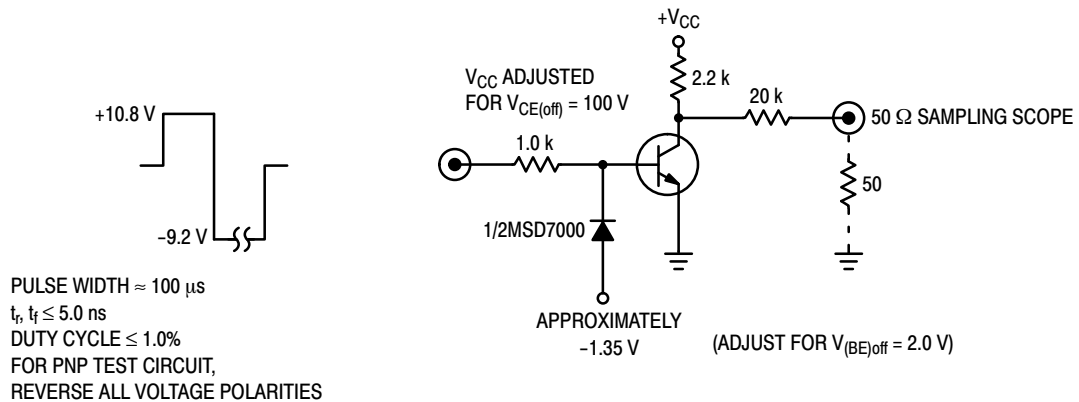


Figure 10. Switching Time Test Circuit

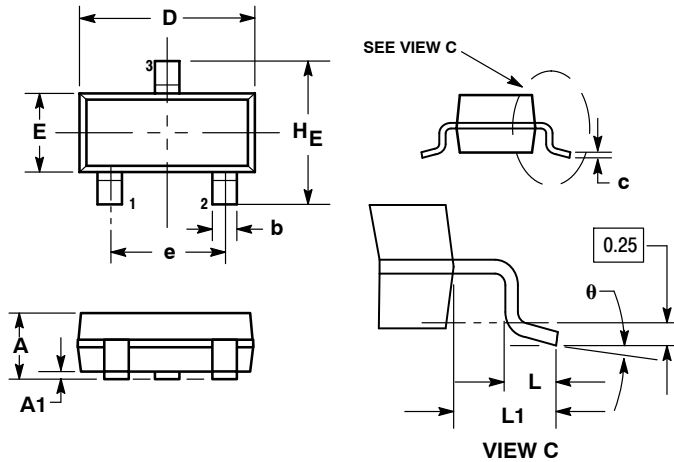
# MMBT6520L, NSVMMBT6520L

## PACKAGE DIMENSIONS

### SOT-23 (TO-236)

CASE 318-08

ISSUE AP



#### NOTES:

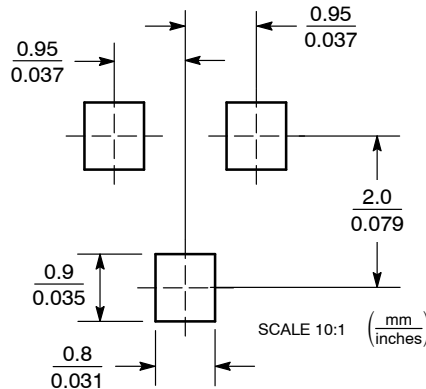
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| 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 |
| H_E   | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |
| theta | 0°          | —    | 10°  | 0°     | —     | 10°   |

#### STYLE 6:

- PIN 1. BASE
- EMITTER
- 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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MMBT6520LT1/D

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