

# MMBT5550L, MMBT5551L

## High Voltage Transistors

### NPN Silicon

#### Features

- S 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<br>MMBT5550<br>MMBT5551          | $V_{CEO}$ | 140<br>160      | Vdc  |
| Collector – Base Voltage<br>MMBT5550<br>MMBT5551             | $V_{CBO}$ | 160<br>180      | Vdc  |
| Emitter – Base Voltage                                       | $V_{EBO}$ | 6.0             | Vdc  |
| Collector Current – Continuous                               | $I_C$     | 600             | mAdc |
| Electrostatic Discharge<br>Human Body Model<br>Machine Model | ESD       | > 8000<br>> 400 | V    |

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

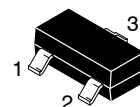
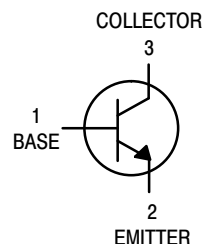
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-5 =  $1.0 \times 0.75 \times 0.062$  in.
2. Alumina =  $0.4 \times 0.3 \times 0.024$  in. 99.5% alumina.



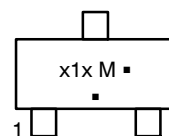
ON Semiconductor®

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SOT-23 (TO-236)  
CASE 318  
STYLE 6

#### MARKING DIAGRAM



x1x = Device Code  
M1F = MMBT5550LT  
G1 = MMBT5551LT

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†            |
|---------------|---------------------|----------------------|
| MMBT5550LT1G  | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel  |
| MMBT5550LT3G  | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel |
| MMBT5551LT1G  | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel  |
| SMMBT5551LT1G | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel  |
| MMBT5551LT3G  | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel |
| SMMBT5551LT3G | SOT-23<br>(Pb-Free) | 10,000 / 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.

# MMBT5550L, MMBT5551L

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

| Characteristic                                                                                                                                                                                                                                                                       |                                                                      | Symbol               | Min                              | Max                            | Unit     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------|----------------------------------|--------------------------------|----------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                                                                                                                           |                                                                      |                      |                                  |                                |          |
| Collector – Emitter Breakdown Voltage (Note 3)<br>(I <sub>C</sub> = 1.0 mA, I <sub>B</sub> = 0)                                                                                                                                                                                      | MMBT5550<br>MMBT5551                                                 | V <sub>(BR)CEO</sub> | 140<br>160                       | –<br>–                         | Vdc      |
| Collector – Base Breakdown Voltage<br>(I <sub>C</sub> = 100 μA, I <sub>E</sub> = 0)                                                                                                                                                                                                  | MMBT5550<br>MMBT5551                                                 | V <sub>(BR)CBO</sub> | 160<br>180                       | –<br>–                         | Vdc      |
| Emitter – Base Breakdown Voltage<br>(I <sub>E</sub> = 10 μA, I <sub>C</sub> = 0)                                                                                                                                                                                                     |                                                                      | V <sub>(BR)EBO</sub> | 6.0                              | –                              | Vdc      |
| Collector Cutoff Current<br>(V <sub>CB</sub> = 100 Vdc, I <sub>E</sub> = 0)<br>(V <sub>CB</sub> = 120 Vdc, I <sub>E</sub> = 0)<br>(V <sub>CB</sub> = 100 Vdc, I <sub>E</sub> = 0, T <sub>A</sub> = 100°C)<br>(V <sub>CB</sub> = 120 Vdc, I <sub>E</sub> = 0, T <sub>A</sub> = 100°C) | MMBT5550<br>MMBT5551<br>MMBT5550<br>MMBT5551                         | I <sub>CBO</sub>     | –<br>–<br>–<br>–                 | 100<br>50<br>100<br>50         | nA<br>μA |
| Emitter Cutoff Current<br>(V <sub>EB</sub> = 4.0 Vdc, I <sub>C</sub> = 0)                                                                                                                                                                                                            |                                                                      | I <sub>EBO</sub>     | –                                | 50                             | nA       |
| <b>ON CHARACTERISTICS</b>                                                                                                                                                                                                                                                            |                                                                      |                      |                                  |                                |          |
| DC Current Gain<br>(I <sub>C</sub> = 1.0 mA, V <sub>CE</sub> = 5.0 Vdc)<br>(I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 5.0 Vdc)<br>(I <sub>C</sub> = 50 mA, V <sub>CE</sub> = 5.0 Vdc)                                                                                                | MMBT5550<br>MMBT5551<br>MMBT5550<br>MMBT5551<br>MMBT5550<br>MMBT5551 | h <sub>FE</sub>      | 60<br>80<br>60<br>80<br>20<br>30 | –<br>–<br>250<br>250<br>–<br>– | –        |
| Collector – Emitter Saturation Voltage<br>(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1.0 mA)<br>(I <sub>C</sub> = 50 mA, I <sub>B</sub> = 5.0 mA)                                                                                                                                     | Both Types<br>MMBT5550<br>MMBT5551                                   | V <sub>CE(sat)</sub> | –<br>–<br>–                      | 0.15<br>0.25<br>0.20           | Vdc      |
| Base – Emitter Saturation Voltage<br>(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1.0 mA)<br>(I <sub>C</sub> = 50 mA, I <sub>B</sub> = 5.0 mA)                                                                                                                                          | Both Types<br>MMBT5550<br>MMBT5551                                   | V <sub>BE(sat)</sub> | –<br>–<br>–                      | 1.0<br>1.2<br>1.0              | Vdc      |
| Collector Emitter Cut-off<br>(V <sub>CB</sub> = 10 V)<br>(V <sub>CB</sub> = 75 V)                                                                                                                                                                                                    | Both Types                                                           | I <sub>CES</sub>     | –<br>–                           | 50<br>100                      | nA       |

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.

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

# MMBT5550L, MMBT5551L

## TYPICAL CHARACTERISTICS

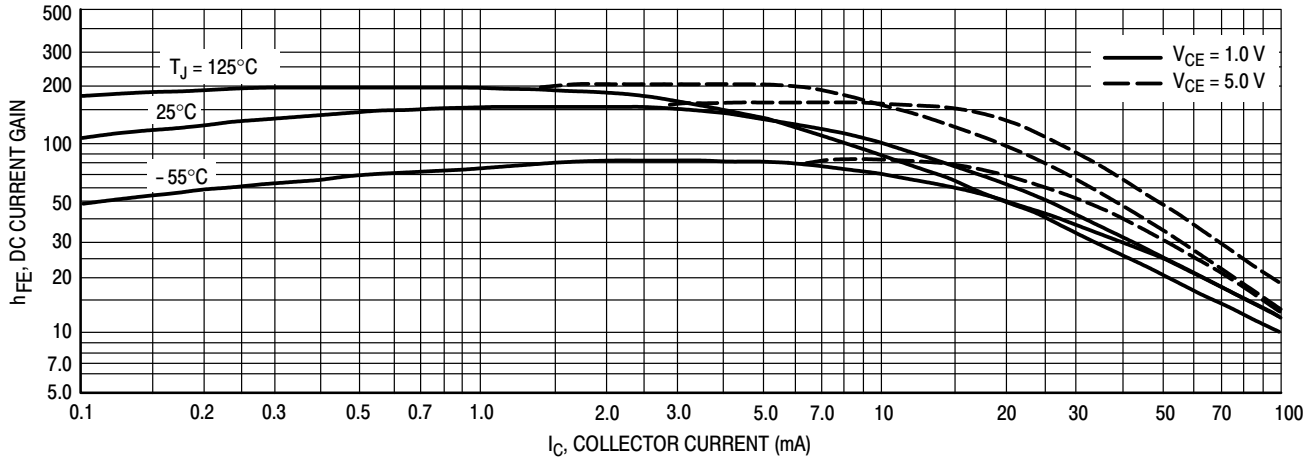


Figure 1. DC Current Gain

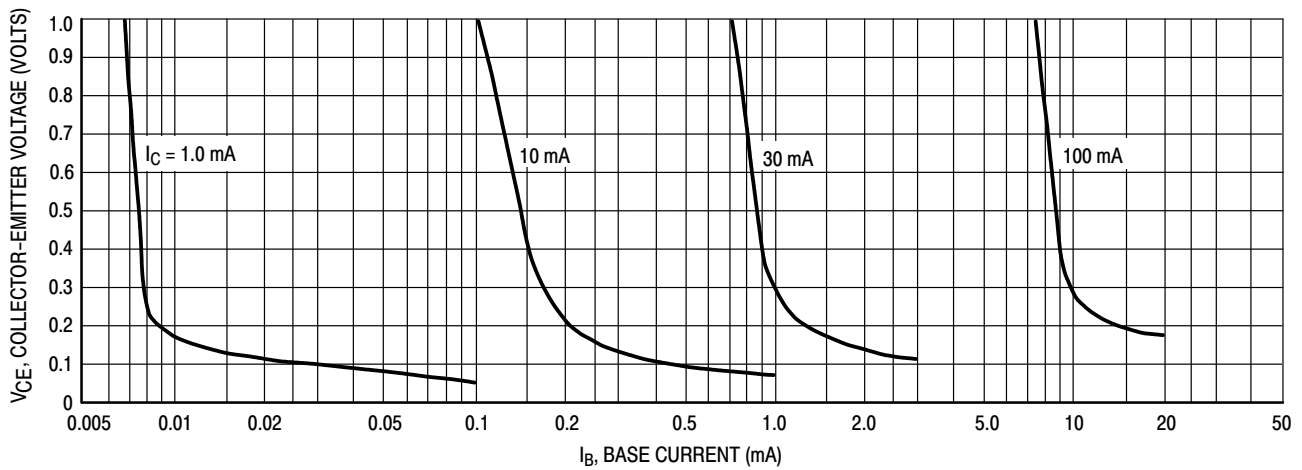


Figure 2. Collector Saturation Region

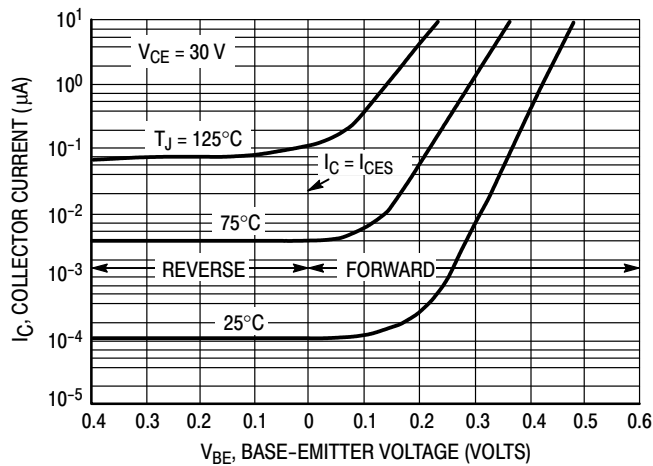


Figure 3. Collector Cut-Off Region

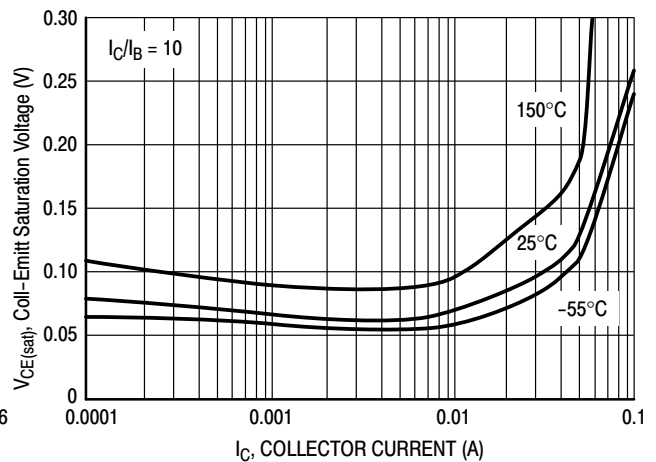


Figure 4.  $V_{CE(sat)}$

# MMBT5550L, MMBT5551L

## TYPICAL CHARACTERISTICS

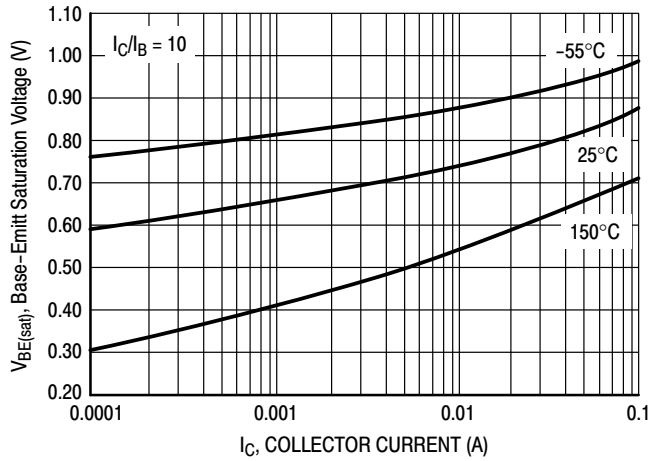


Figure 5.  $V_{BE(sat)}$

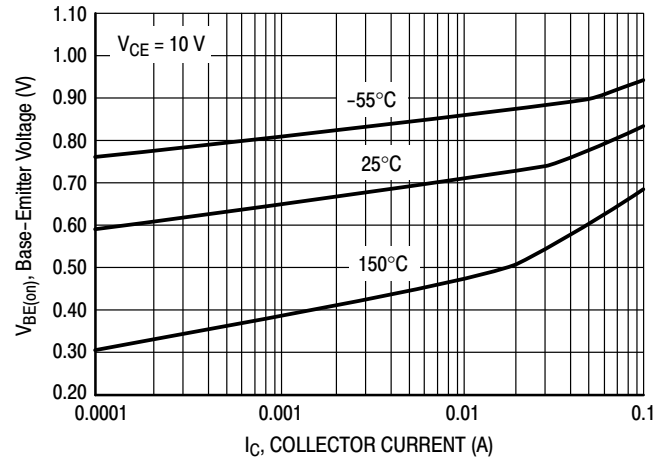


Figure 6.  $V_{BE(on)}$

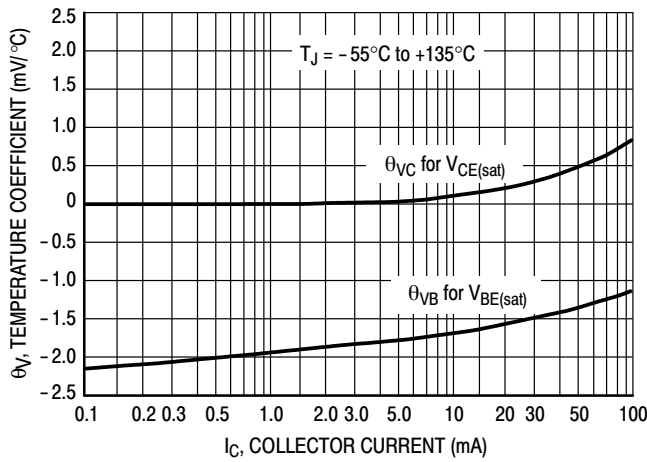


Figure 7. Temperature Coefficients

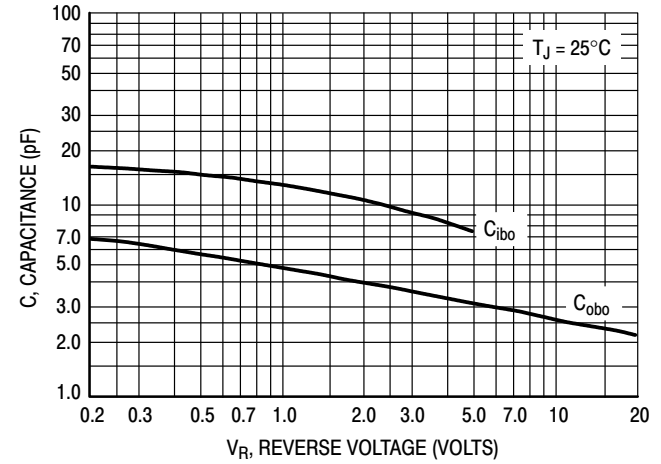
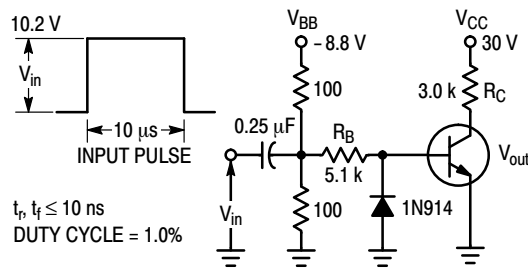


Figure 8. Capacitances



Values Shown are for  $I_C$  @ 10 mA

Figure 9. Switching Time Test Circuit

# MMBT5550L, MMBT5551L

## TYPICAL CHARACTERISTICS

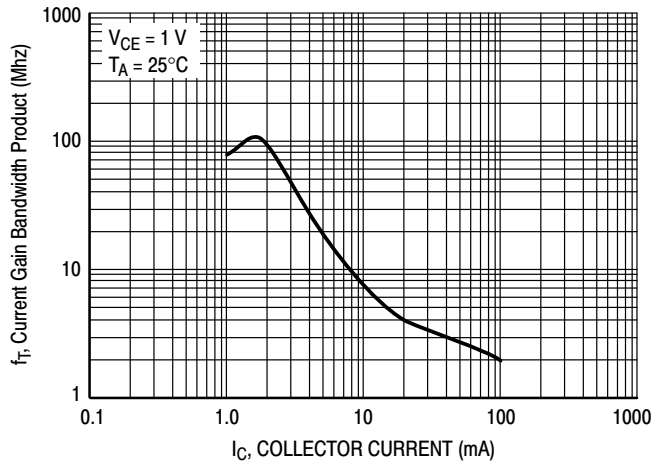


Figure 10. Current Gain Bandwidth Product

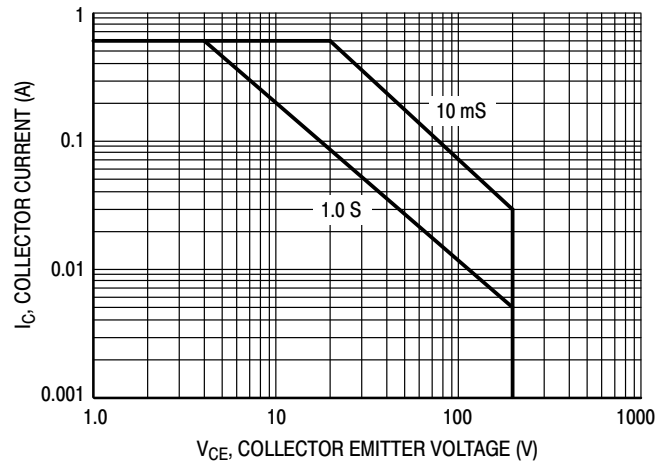


Figure 11. Safe Operating Area

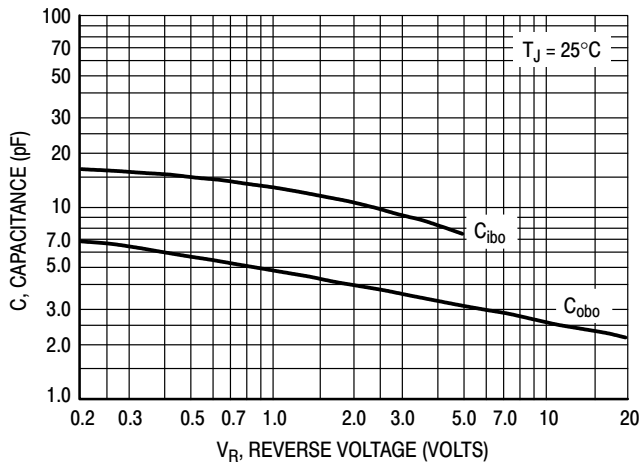


Figure 12. Capacitances

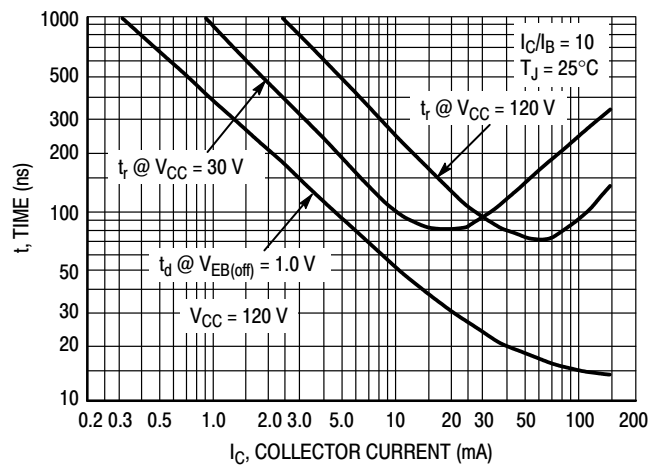
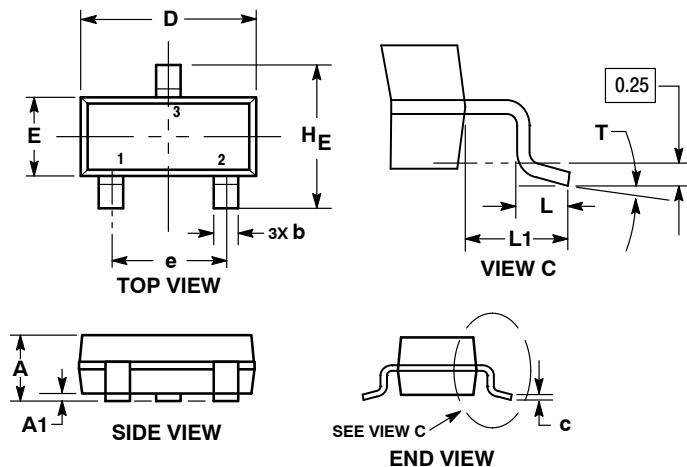


Figure 13. Turn-On Time

# MMBT5550L, MMBT5551L

## PACKAGE DIMENSIONS

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



### NOTES:

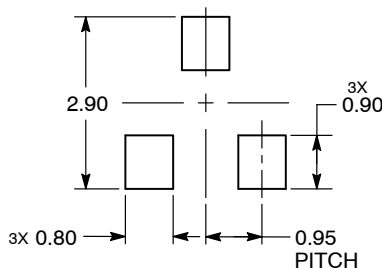
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| 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:

- PIN 1. BASE
- EMITTER
- COLLECTOR

## RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*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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