

# MMBTA55L Series, MMBTA56L Series, SMMBTA56L Series

## Driver Transistors

### PNP 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>MMBTA55<br>MMBTA56, SMMBTA56 | $V_{CEO}$ | -60<br>-80 | Vdc  |
| Collector-Base Voltage<br>MMBTA55<br>MMBTA56, SMMBTA56    | $V_{CBO}$ | -60<br>-80 | Vdc  |
| Emitter-Base Voltage                                      | $V_{EBO}$ | -4.0       | Vdc  |
| 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         | $^\circ\text{C}/\text{W}$  |
| 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         | $^\circ\text{C}/\text{W}$  |
| Junction and Storage Temperature                                                                                    | $T_J, T_{stg}$  | -55 to +150 | $^\circ\text{C}$           |

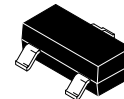
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

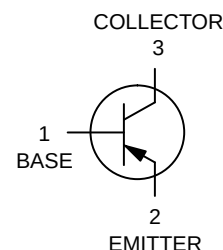


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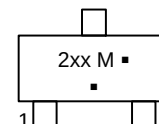
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SOT-23  
CASE 318  
STYLE 6



#### MARKING DIAGRAM



2xx = Device Code  
x = H for MMBTA55LT1G  
xx = GM for MMBTA56LT1G,  
SMMBTA56LT1G

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

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

# MMBTA55L Series, MMBTA56L Series, SMMBTA56L Series

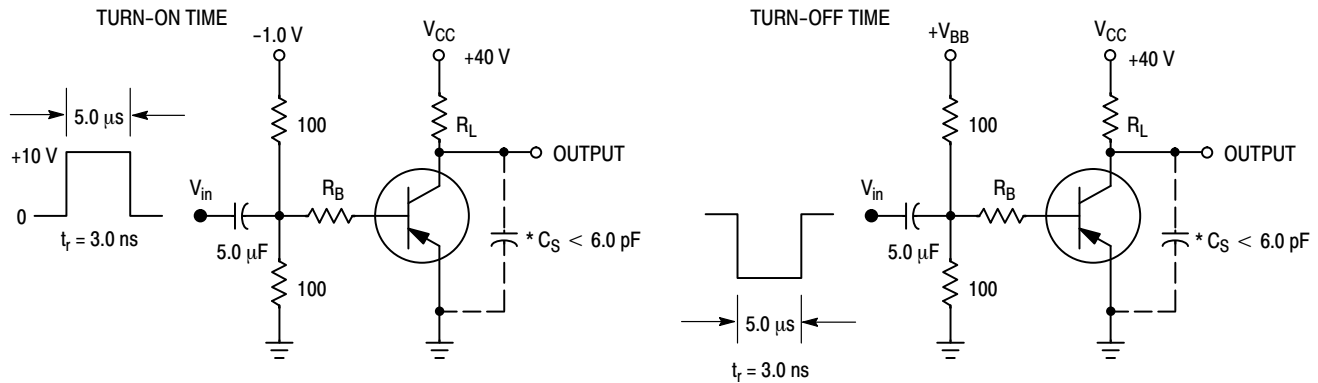
## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic                                                                                                                                     | Symbol        | Min        | Max          | Unit          |
|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|--------------|---------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                         |               |            |              |               |
| Collector – Emitter Breakdown Voltage (Note 3)<br>( $I_C = -1.0\text{ mA}$ , $I_B = 0$ )<br>MMBTA55<br>MMBTA56, SMMBTA56                           | $V_{(BR)CEO}$ | -60<br>-80 | -            | Vdc           |
| Emitter – Base Breakdown Voltage<br>( $I_E = -100\text{ }\mu\text{A}$ , $I_C = 0$ )                                                                | $V_{(BR)EBO}$ | -4.0       | -            | Vdc           |
| Collector Cutoff Current<br>( $V_{CE} = -60\text{ Vdc}$ , $I_B = 0$ )                                                                              | $I_{CES}$     | -          | -0.1         | $\mu\text{A}$ |
| Collector Cutoff Current<br>( $V_{CB} = -60\text{ Vdc}$ , $I_E = 0$ )<br>MMBTA55<br>( $V_{CB} = -80\text{ Vdc}$ , $I_E = 0$ )<br>MMBTA56, SMMBTA56 | $I_{CBO}$     | -          | -0.1<br>-0.1 | $\mu\text{A}$ |
| <b>ON CHARACTERISTICS</b>                                                                                                                          |               |            |              |               |
| DC Current Gain<br>( $I_C = -10\text{ mA}$ , $V_{CE} = -1.0\text{ Vdc}$ )<br>( $I_C = -100\text{ mA}$ , $V_{CE} = -1.0\text{ Vdc}$ )               | $h_{FE}$      | 100<br>100 | -<br>-       | -             |
| Collector – Emitter Saturation Voltage<br>( $I_C = -100\text{ mA}$ , $I_B = -10\text{ mA}$ )                                                       | $V_{CE(sat)}$ | -          | -0.25        | Vdc           |
| Base – Emitter On Voltage<br>( $I_C = -100\text{ mA}$ , $V_{CE} = -1.0\text{ Vdc}$ )                                                               | $V_{BE(on)}$  | -          | -1.2         | Vdc           |
| <b>SMALL – SIGNAL CHARACTERISTICS</b>                                                                                                              |               |            |              |               |
| Current – Gain – Bandwidth Product (Note 4)<br>( $I_C = -100\text{ mA}$ , $V_{CE} = -1.0\text{ Vdc}$ , $f = 100\text{ MHz}$ )                      | $f_T$         | 50         | -            | MHz           |

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  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

4.  $f_T$  is defined as the frequency at which  $|h_{fe}|$  extrapolates to unity.



\*Total Shunt Capacitance of Test Jig and Connectors For PNP Test Circuits, Reverse All Voltage Polarities

Figure 1. Switching Time Test Circuits

# MMBTA55L Series, MMBTA56L Series, SMMBTA56L Series

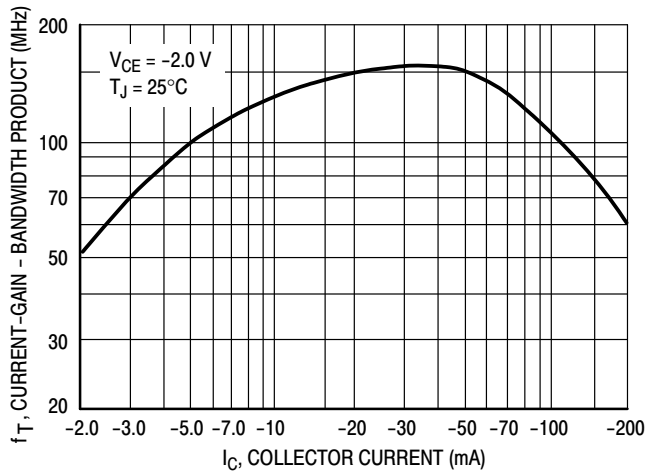


Figure 2. Current-Gain — Bandwidth Product

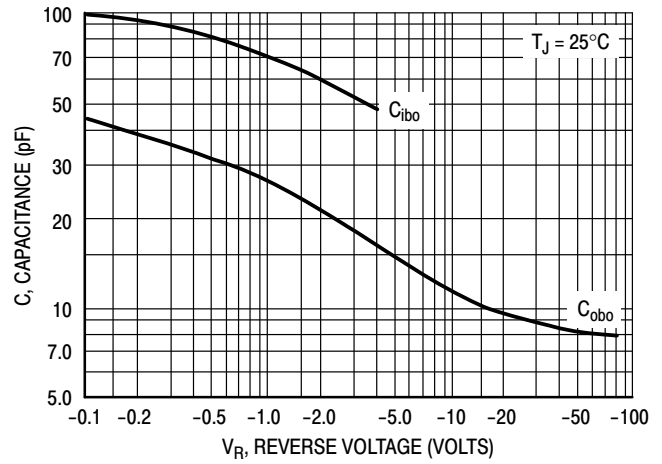


Figure 3. Capacitance

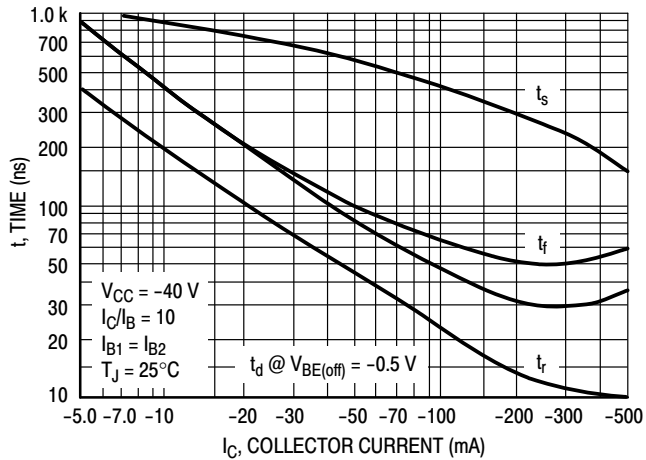


Figure 4. Switching Time

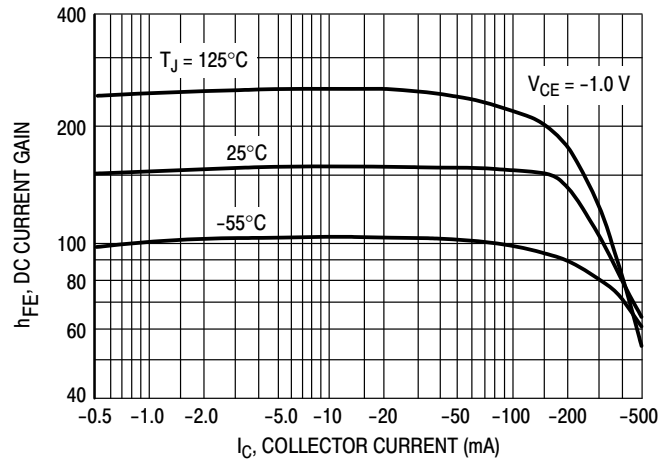


Figure 5. DC Current Gain

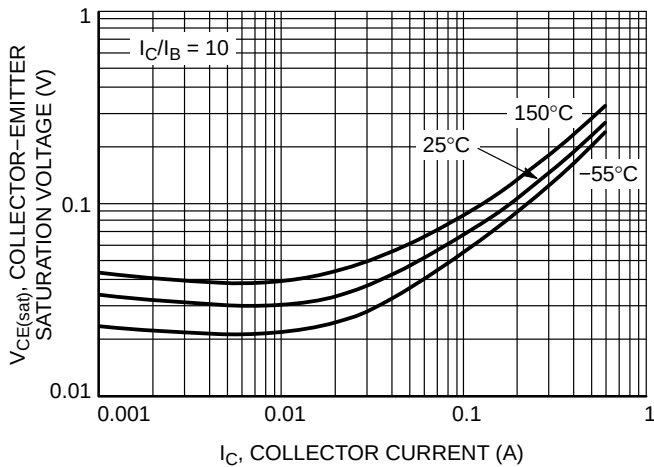


Figure 6. Collector Emitter Saturation Voltage vs. Collector Current

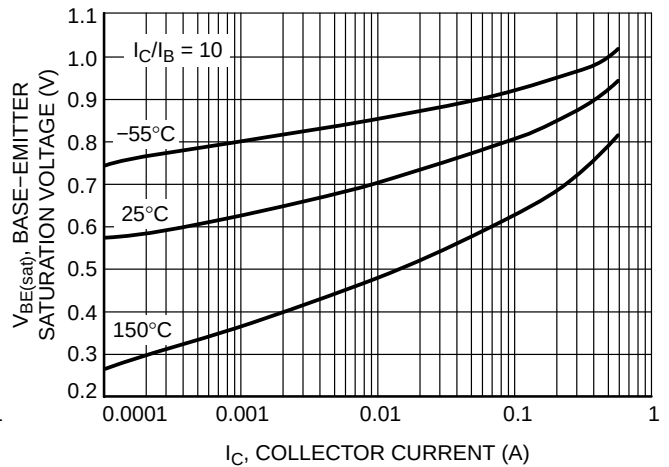
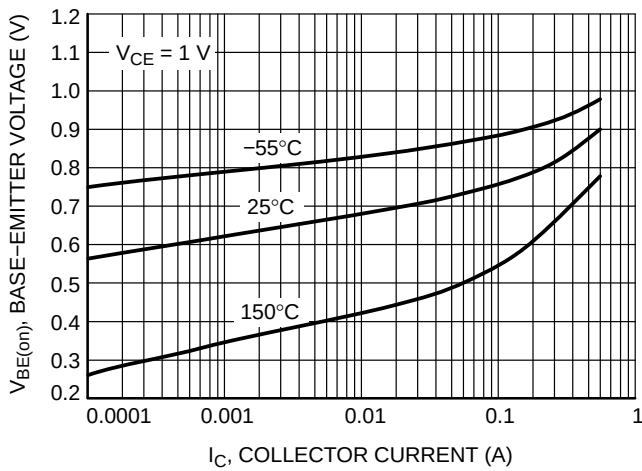
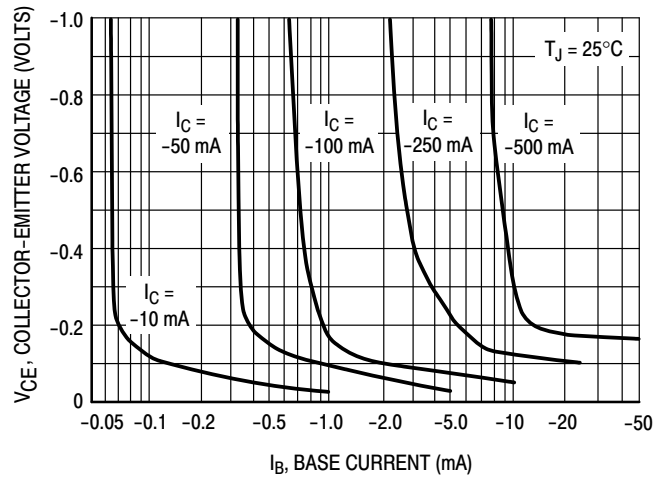


Figure 7. Base Emitter Saturation Voltage vs. Collector Current

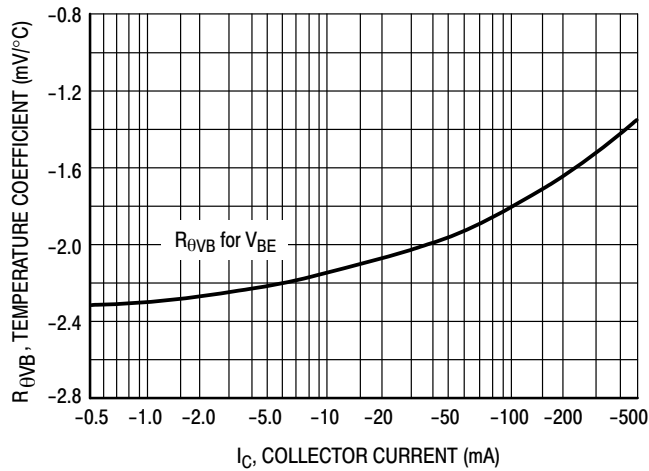
## MMBTA55L Series, MMBTA56L Series, SMMBTA56L Series



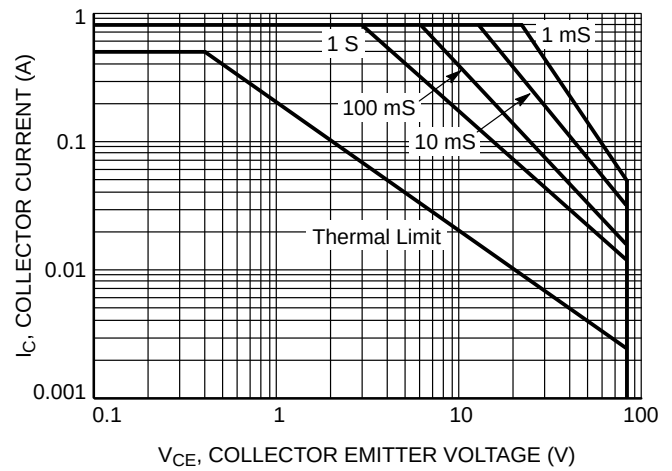
**Figure 8. Base-Emitter Voltage vs. Collector Current**



**Figure 9. Collector Saturation Region**



**Figure 10. Base-Emitter Temperature Coefficient**



**Figure 11. Safe Operating Area**

### ORDERING INFORMATION

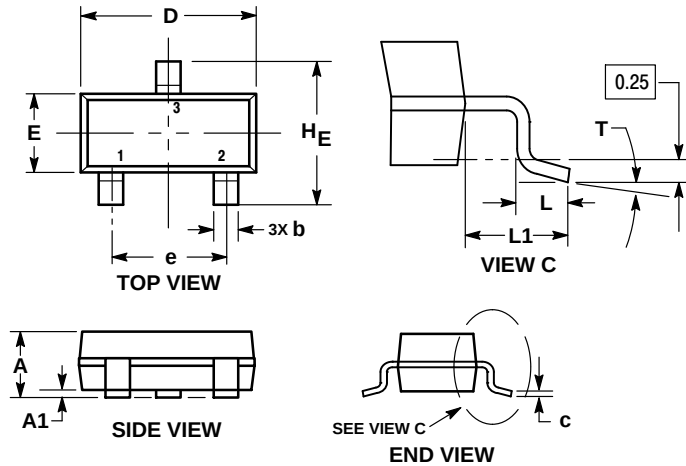
| Device Order Number | Package Type        | Shipping <sup>†</sup> |
|---------------------|---------------------|-----------------------|
| MMBTA55LT1G         | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| MMBTA55LT3G         | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| MMBTA56LT1G         | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| SMMBTA56LT1G        | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| MMBTA56LT3G         | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| SMMBTA56LT3G        | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |

<sup>†</sup>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.

# MMBTA55L Series, MMBTA56L Series, SMMBTA56L Series

## PACKAGE DIMENSIONS

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



### NOTES:

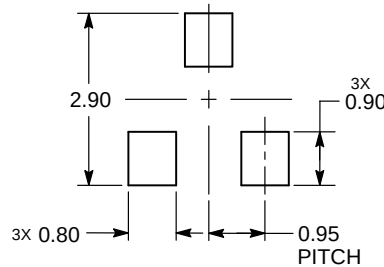
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| 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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