

# MMBTA42L, SMMBTA42L, MMBTA43L

## High Voltage Transistors

### NPN Silicon

#### Features

- AEC-Q101 Qualified and PPAP Capable
- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

| Characteristic                                              | Symbol    | Value      | Unit |
|-------------------------------------------------------------|-----------|------------|------|
| Collector – Emitter Voltage<br>MMBTA42, SMMBTA42<br>MMBTA43 | $V_{CEO}$ | 300<br>200 | Vdc  |
| Collector – Base Voltage<br>MMBTA42, SMMBTA42<br>MMBTA43    | $V_{CBO}$ | 300<br>200 | Vdc  |
| Emitter – Base Voltage<br>MMBTA42, SMMBTA42<br>MMBTA43      | $V_{EBO}$ | 6.0<br>6.0 | 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         | $^\circ\text{C/W}$         |
| 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 | $^\circ\text{C}$           |

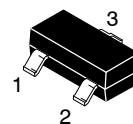
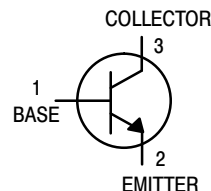
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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.



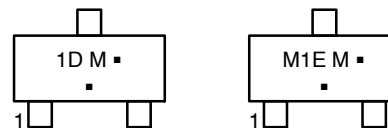
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SOT-23 (TO-236)  
CASE 318  
STYLE 6

#### MARKING DIAGRAMS



1D = MMBTA42LT, SMMBTA42L  
M1E = MMBTA43LT  
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 5 of this data sheet.

# MMBTA42L, SMMBTA42L, MMBTA43L

## 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>( $I_C = 1.0\text{ mA}$ , $I_E = 0$ )                                                                                                   | $V_{(BR)CEO}$                                                | 300<br>200                           | –<br>–           | Vdc           |
| Collector – Base Breakdown Voltage<br>( $I_C = 100\text{ }\mu\text{A}$ , $I_E = 0$ )                                                                                                      | $V_{(BR)CBO}$                                                | 300<br>200                           | –<br>–           | Vdc           |
| Emitter – Base Breakdown Voltage<br>( $I_E = 100\text{ }\mu\text{A}$ , $I_C = 0$ )                                                                                                        | $V_{(BR)EBO}$                                                | 6.0                                  | –                | Vdc           |
| Collector Cutoff Current<br>( $V_{CB} = 200\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 160\text{ Vdc}$ , $I_E = 0$ )                                                                        | $I_{CBO}$                                                    | –<br>–                               | 0.1<br>0.1       | $\mu\text{A}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 6.0\text{ Vdc}$ , $I_C = 0$ )<br>( $V_{EB} = 4.0\text{ Vdc}$ , $I_C = 0$ )                                                                          | $I_{EBO}$                                                    | –<br>–                               | 0.1<br>0.1       | $\mu\text{A}$ |
| <b>ON CHARACTERISTICS (Note 3)</b>                                                                                                                                                        |                                                              |                                      |                  |               |
| DC Current Gain<br>( $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ )<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ )<br><br>( $I_C = 30\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ ) | Both Types<br>Both Types<br><br>MMBTA42, SMMBTA42<br>MMBTA43 | $h_{FE}$<br>25<br>40<br><br>40<br>40 | –<br>–<br>–<br>– | –             |
| Collector – Emitter Saturation Voltage<br>( $I_C = 20\text{ mA}$ , $I_B = 2.0\text{ mA}$ )                                                                                                | MMBTA42, SMMBTA42<br>MMBTA43                                 | $V_{CE(sat)}$<br>–<br>–              | 0.5<br>0.5       | Vdc           |
| Base – Emitter Saturation Voltage<br>( $I_C = 20\text{ mA}$ , $I_B = 2.0\text{ mA}$ )                                                                                                     |                                                              | $V_{BE(sat)}$<br>–                   | 0.9              | Vdc           |
| <b>SMALL-SIGNAL CHARACTERISTICS</b>                                                                                                                                                       |                                                              |                                      |                  |               |
| Current – Gain – Bandwidth Product<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 100\text{ MHz}$ )                                                                          | $f_T$                                                        | 50                                   | –                | MHz           |
| Collector – Base Capacitance<br>( $V_{CB} = 20\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )                                                                                           | $C_{cb}$                                                     | –<br>–                               | 3.0<br>4.0       | pF            |

3. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

TYPICAL CHARACTERISTICS

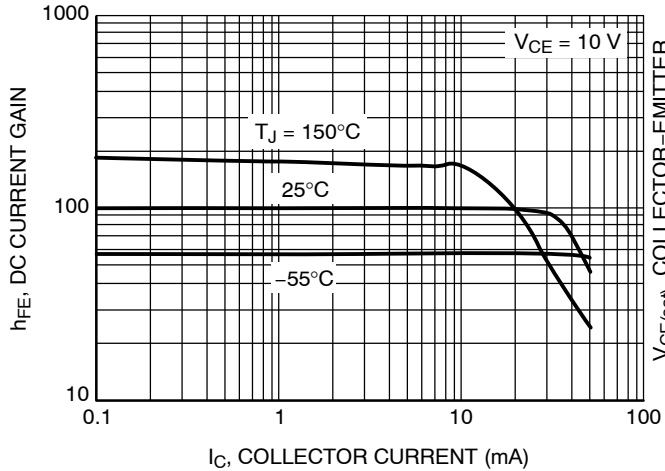


Figure 1. DC Current Gain

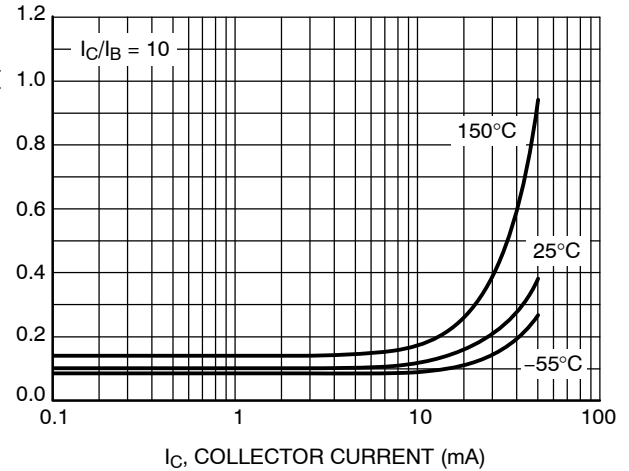


Figure 2. Collector-Emitter Saturation Voltage vs. Collector Current

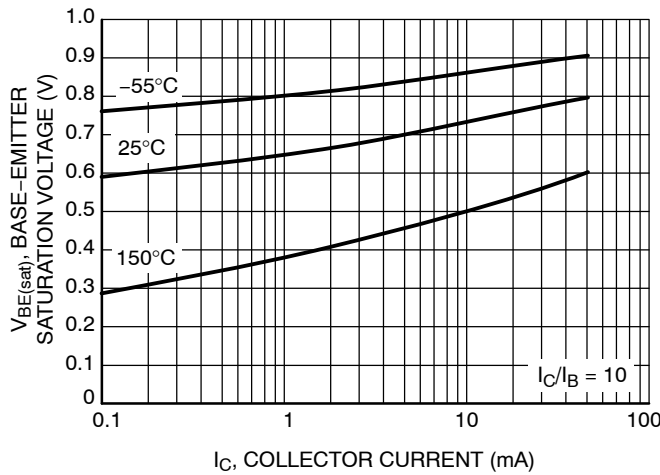


Figure 3. Base-Emitter Saturation Voltage vs. Collector Current

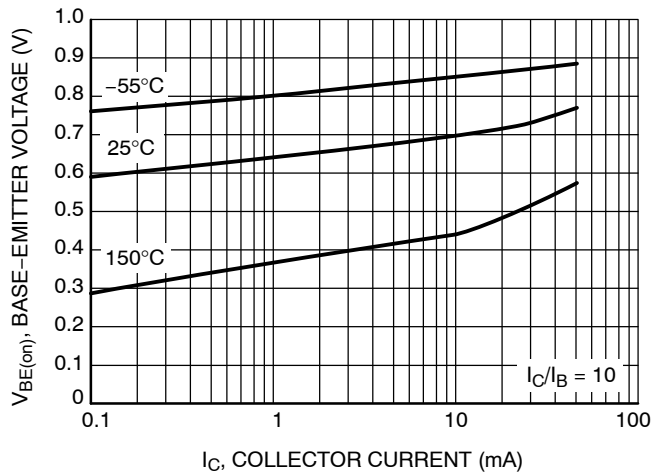


Figure 4. Base-Emitter On Voltage vs. Collector Current

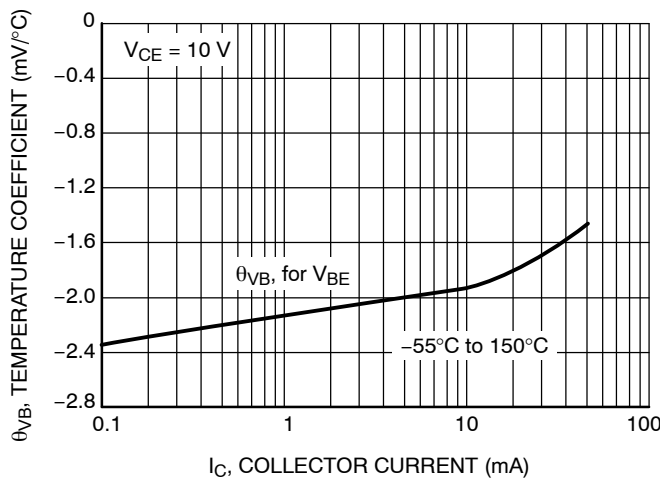


Figure 5. Base-Emitter Temperature Coefficient

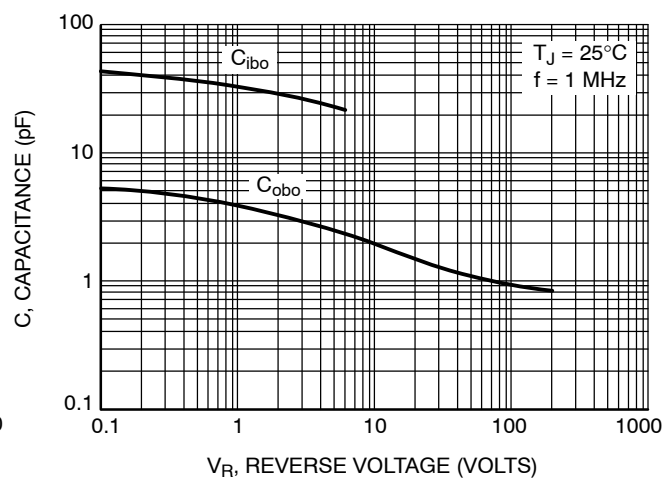


Figure 6. Capacitance

# MMBTA42L, SMMBTA42L, MMBTA43L

## TYPICAL CHARACTERISTICS

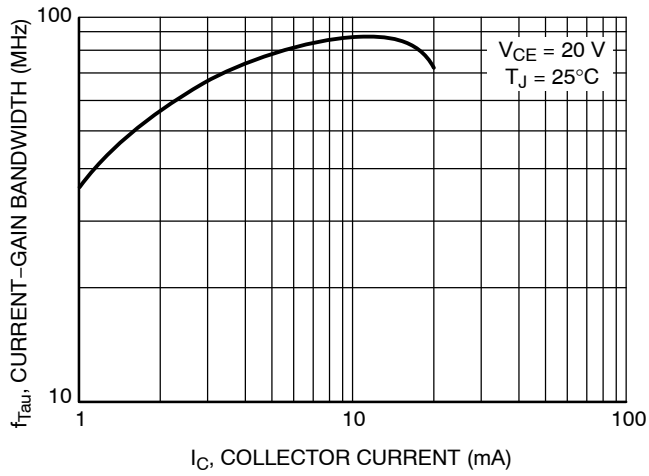


Figure 7. Current-Gain — Bandwidth Product

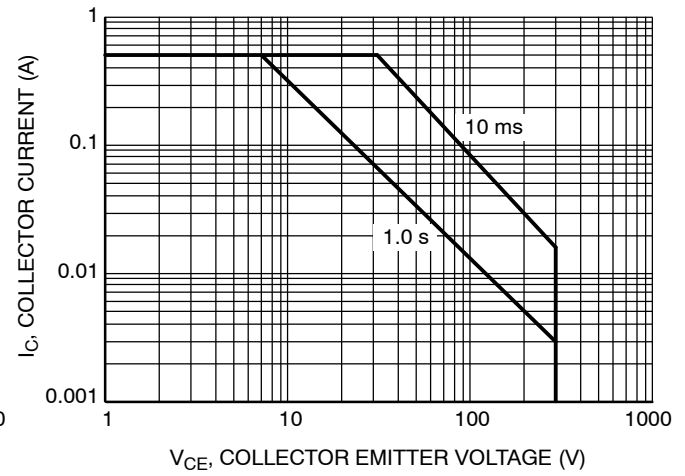


Figure 8. Safe Operating Area

## MMBTA42L, SMMBTA42L, MMBTA43L

### ORDERING INFORMATION

| Device Order Number | Package Type        | Shipping <sup>†</sup> |
|---------------------|---------------------|-----------------------|
| MMBTA42LT1G         | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| SMMBTA42LT1G        | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| MMBTA42LT3G         | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| SMMBTA42LT3G        | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| MMBTA43LT1G         | SOT-23<br>(Pb-Free) | 3,000 / 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.

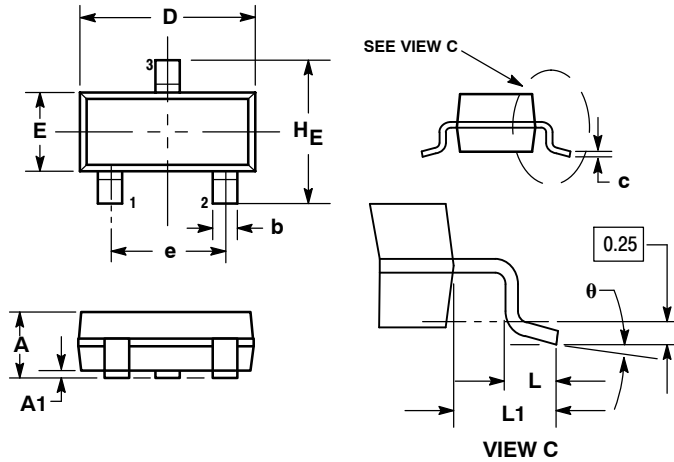
# MMBTA42L, SMMBTA42L, MMBTA43L

## PACKAGE DIMENSIONS

### SOT-23 (TO-236)

CASE 318-08

ISSUE AP



#### NOTES:

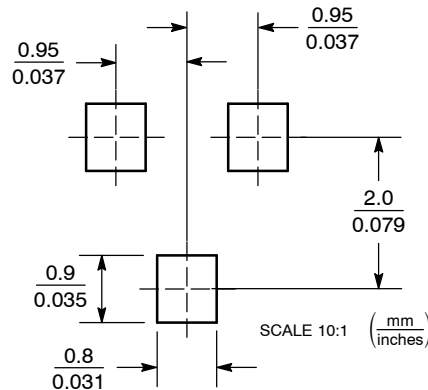
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| 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 |
| 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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MMBTA42LT1/D

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