

# MMBTA42L, SMMBTA42L, MMBTA43L

## 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

| 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        | mA dc |

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

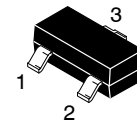
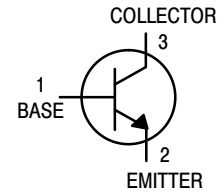
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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



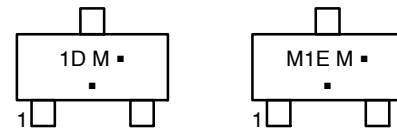
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SOT-23 (TO-236)  
CASE 318  
STYLE 6

#### 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 4 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>( $I_C = 1.0\text{ mA}$ , $I_B = 0$ )   | MMBTA42, SMMBTA42<br>MMBTA43                             | $V_{(BR)CEO}$ | 300<br>200           | –<br>–           | Vdc           |
| Collector – Base Breakdown Voltage<br>( $I_C = 100\ \mu\text{A}$ , $I_E = 0$ )  | MMBTA42, SMMBTA42<br>MMBTA43                             | $V_{(BR)CBO}$ | 300<br>200           | –<br>–           | Vdc           |
| Emitter – Base Breakdown Voltage<br>( $I_E = 100\ \mu\text{A}$ , $I_C = 0$ )  |  | $V_{(BR)EBO}$ | 6.0                  | –                | Vdc           |
| Collector Cutoff Current<br>( $V_{CB} = 200\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 160\text{ Vdc}$ , $I_E = 0$ )  | MMBTA42, SMMBTA42<br>MMBTA43                             | $I_{CBO}$     | –<br>–               | 0.1<br>0.1       | $\mu\text{A}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 6.0\text{ Vdc}$ , $I_C = 0$ )<br>( $V_{EB} = 4.0\text{ Vdc}$ , $I_C = 0$ )  | MMBTA42, SMMBTA42<br>MMBTA43                             | $I_{EBO}$     | –<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>MMBTA42, SMMBTA42<br>MMBTA43 | $h_{FE}$      | 25<br>40<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>–               | 0.5<br>0.5       | Vdc           |
| Base – Emitter Saturation Voltage<br>( $I_C = 20\text{ mA}$ , $I_B = 2.0\text{ mA}$ )   |  | $V_{BE(sat)}$ | –                    | 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>( $V_{CB} = 20\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )   | MMBTA42, SMMBTA42<br>MMBTA43                             | $C_{cb}$      | –<br>–               | 3.0<br>4.0       | pF            |

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

# MMBTA42L, SMMBTA42L, MMBTA43L

## TYPICAL CHARACTERISTICS

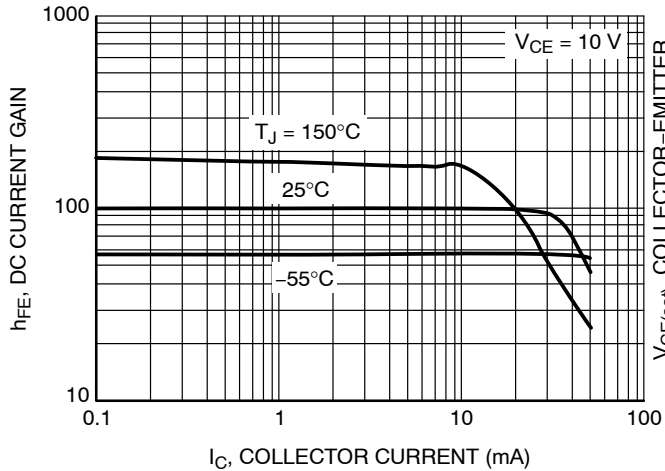


Figure 1. DC Current Gain

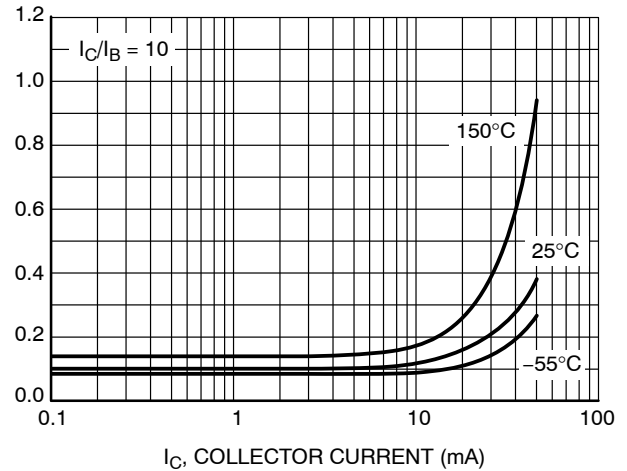


Figure 2. Collector-Emitter Saturation Voltage vs. Collector Current

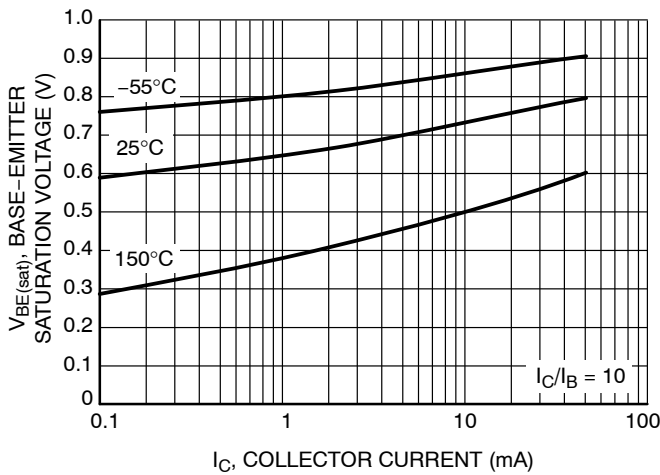


Figure 3. Base-Emitter Saturation Voltage vs. Collector Current

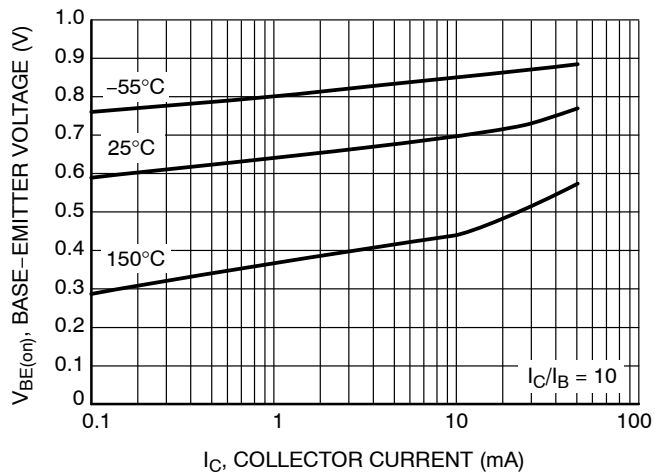


Figure 4. Base-Emitter On Voltage vs. Collector Current

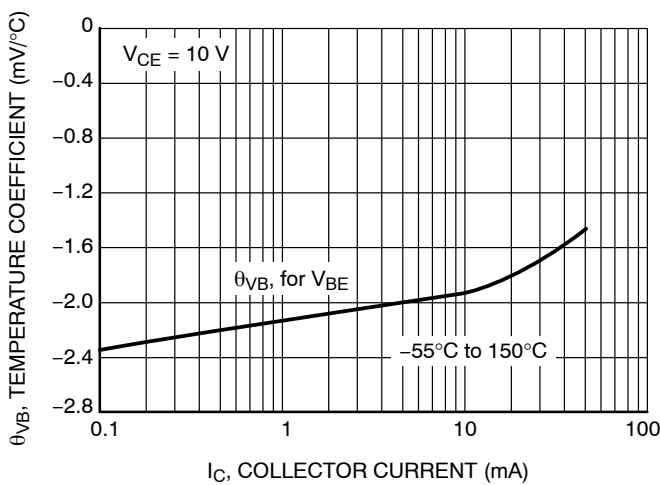


Figure 5. Base-Emitter Temperature Coefficient

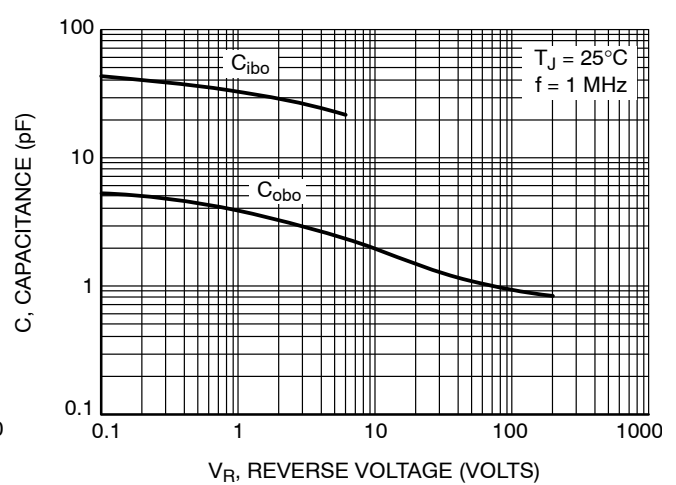


Figure 6. Capacitance

# MMBTA42L, SMMBTA42L, MMBTA43L

## TYPICAL CHARACTERISTICS

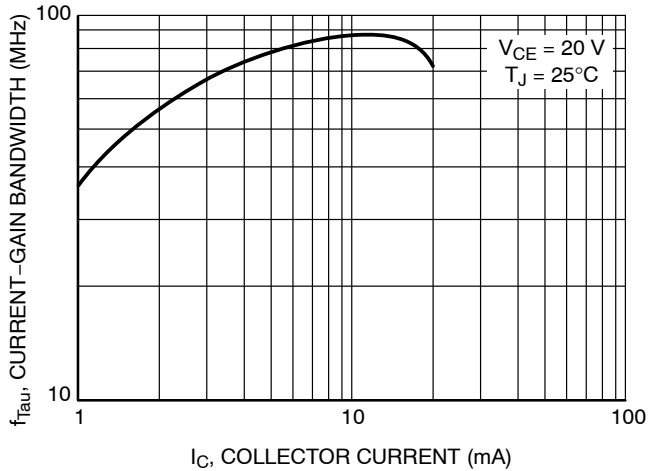


Figure 7. Current-Gain — Bandwidth Product

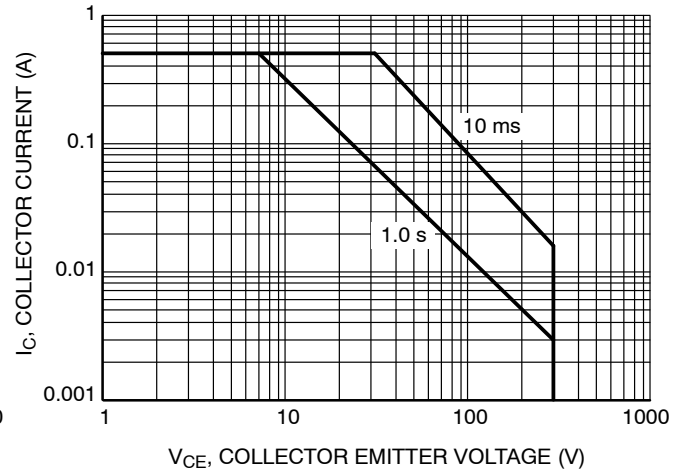


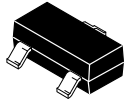
Figure 8. Safe Operating Area

## 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.

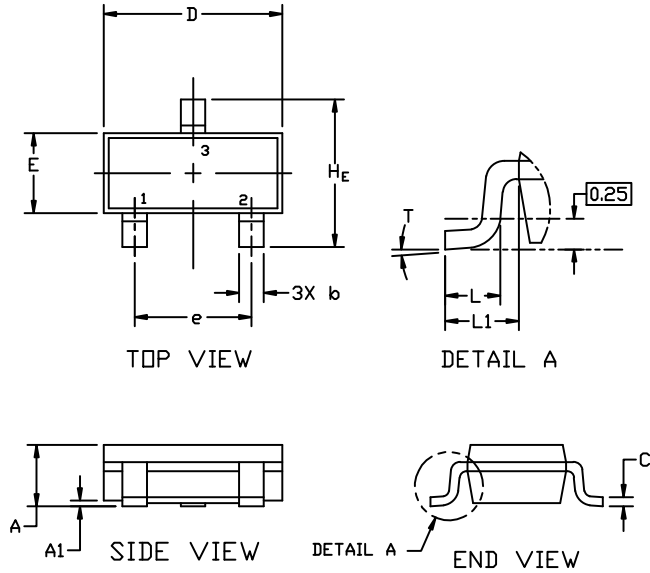
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



**SOT-23 (TO-236)**  
CASE 318  
ISSUE AT

DATE 01 MAR 2023

SCALE 4:1

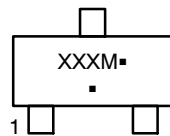


**NOTES:**

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.

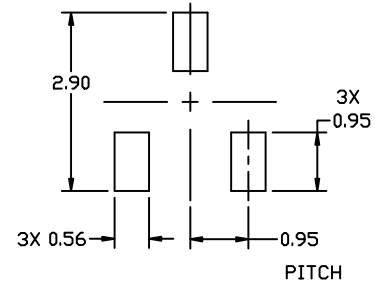
| DIM            | MILLIMETERS |      |      | INCHES |       |       |
|----------------|-------------|------|------|--------|-------|-------|
|                | MIN.        | NOM. | MAX. | MIN.   | NOM.  | MAX.  |
| A              | 0.89        | 1.00 | 1.11 | 0.035  | 0.039 | 0.044 |
| A1             | 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 |
| H <sub>E</sub> | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |
| T              | 0°          | ---  | 10°  | 0°     | ---   | 10°   |

**GENERIC MARKING DIAGRAM\***



- XXX = Specific Device Code
- M = Date Code
- = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



**RECOMMENDED MOUNTING 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.

**STYLES ON PAGE 2**

|                         |                        |  |
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**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**



**SOT-23 (TO-236)**  
**CASE 318**  
**ISSUE AT**

DATE 01 MAR 2023

- |   |   |   |   |   |   |
|---|---|---|---|---|---|
| STYLE 1 THRU 5:<br>CANCELLED                            | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE  |   |   |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE      | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE     | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE      | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE | STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE          |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN       | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT   | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE           | STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION |
| STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE     |   |   |   |   |

|                         |                        |   |
|-------------------------|------------------------|---|
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