

## General Purpose Transistors NPN Silicon

### ●FEATURES

- 1) We declare that the material of product compliant with RoHS requirements and Halogen Free.
- 2) S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

### ●DEVICE MARKING AND ORDERING INFORMATION

| Device        | Marking | Shipping        |
|---------------|---------|-----------------|
| LMBT2222ALT1G | 1P      | 3000/Tape&Reel  |
| LMBT2222ALT3G | 1P      | 10000/Tape&Reel |

### ●MAXIMUM RATINGS(Ta = 25°C)

| Parameter                      | Symbol           | Limits | Unit |
|--------------------------------|------------------|--------|------|
| Collector–Emitter Voltage      | V <sub>CEO</sub> | 40     | Vdc  |
| Collector–Base Voltage         | V <sub>CB0</sub> | 75     | Vdc  |
| Emitter–Base Voltage           | V <sub>EB0</sub> | 6.0    | Vdc  |
| Collector Current — Continuous | I <sub>c</sub>   | 600    | mAdc |

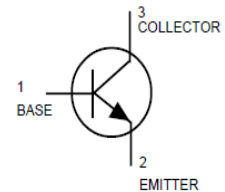
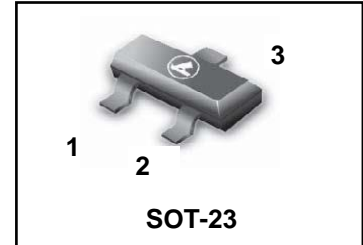
### ●THERMAL CHARACTERISTICS

|  |                                   |            |             |
|--|-----------------------------------|------------|-------------|
| Total Device Dissipation,<br>FR-5 Board (Note 1) @ T <sub>A</sub> = 25°C<br>Derate above 25°C        | P <sub>D</sub>                    | 225<br>1.8 | mW<br>mW/°C |
| Thermal Resistance,<br>Junction–to–Ambient(Note 1)   | R <sub>θJA</sub>                  | 556        | °C/W        |
| Total Device Dissipation,<br>Alumina Substrate (Note 2) @ T <sub>A</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>                    | 300<br>2.4 | mW<br>mW/°C |
| Thermal Resistance,<br>Junction–to–Ambient   | R <sub>θJA</sub>                  | 417        | °C/W        |
| Junction and Storage temperature   | T <sub>J</sub> , T <sub>stg</sub> | -55 ~ +150 | °C          |

1. FR-5 = 1.0×0.75×0.062 in.

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

## LMBT2222ALT1G S-LMBT2222ALT1G



**LMBT2222ALT1G,S-LMBT2222ALT1G**

● ELECTRICAL CHARACTERISTICS (Ta= 25°C)

OFF CHARACTERISTICS

| Characteristic   | Symbol               | Min. | Typ. | Max.       | Unit |
|--|----------------------|------|------|------------|------|
| Collector–Emitter Breakdown Voltage<br>(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0)  | V <sub>BR(CEO)</sub> | 40   | –    | –          | V    |
| Collector–Base Breakdown Voltage<br>(I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0)   | V <sub>BR(CBO)</sub> | 75   | –    | –          | V    |
| Emitter–Base Breakdown Voltage<br>(I <sub>E</sub> = 10 μA, I <sub>C</sub> = 0)   | V <sub>BR(EBO)</sub> | 6    | –    | –          | V    |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 60 Vdc, V <sub>EB(off)</sub> = 3.0Vdc)  | I <sub>CEX</sub>     | –    | –    | 10         | nA   |
| Collector Cutoff Current<br>(V <sub>CB</sub> = 60 Vdc, I <sub>E</sub> = 0)<br>(V <sub>CB</sub> = 60 Vdc, I <sub>E</sub> = 0, T <sub>A</sub> = 125°C) | I <sub>CBO</sub>     | –    | –    | 0.01<br>10 | μA   |
| Emitter Cutoff Current<br>(V <sub>EB</sub> = 3.0 Vdc, I <sub>C</sub> = 0)  | I <sub>EBO</sub>     | –    | –    | 100        | nA   |
| Base Cutoff Current<br>(V <sub>CE</sub> = 60 Vdc, V <sub>EB(off)</sub> = 3.0 Vdc)  | I <sub>BL</sub>      | –    | –    | 20         | nA   |

ON CHARACTERISTICS (Note 1.)

|   |                      |   |                                 |                                   |   |
|---|----------------------|---|---------------------------------|-----------------------------------|---|
| DC Current Gain<br>(I <sub>C</sub> = 0.1 mA, V <sub>CE</sub> = 10 Vdc)<br>(I <sub>C</sub> = 1.0 mA, V <sub>CE</sub> = 10 Vdc)<br>(I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 10 Vdc)<br>(I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 10 Vdc, T <sub>A</sub> = –55°C )<br>(I <sub>C</sub> = 150 mA, V <sub>CE</sub> = 10 Vdc) (3)<br>(I <sub>C</sub> = 150 mA, V <sub>CE</sub> = 1.0 Vdc) (3)<br>(I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 10 Vdc)(3) | h <sub>FE</sub>      | 35<br>50<br>75<br>35<br>100<br>50<br>40 | –<br>–<br>–<br>–<br>–<br>–<br>– | –<br>–<br>–<br>–<br>300<br>–<br>– |   |
| Collector–Emitter Saturation Voltage(3)<br>(I <sub>C</sub> = 150 mA, I <sub>B</sub> = 15 mA)<br>(I <sub>C</sub> = 500mA, I <sub>B</sub> = 50 mA)  | V <sub>CE(sat)</sub> | –<br>–                                  | –<br>–                          | 0.3<br>1                          | V |
| Base–Emitter Saturation Voltage<br>(I <sub>C</sub> = 150 mA, I <sub>B</sub> = 15 mA)<br>(I <sub>C</sub> = 500mA, I <sub>B</sub> = 50 mA)  | V <sub>BE(sat)</sub> | 0.6<br>–                                | –<br>–                          | 1.2<br>2                          | V |

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

**LMBT2222ALT1G,S-LMBT2222ALT1G**

● ELECTRICAL CHARACTERISTICS (Ta= 25°C)  
SMALL-SIGNAL CHARACTERISTICS

| Characteristic  | Symbol                          | Min. | Typ. | Max. | Unit               |
|---|---------------------------------|------|------|------|--------------------|
| Current-Gain — Bandwidth Product(4)<br>(I <sub>C</sub> = 20mA, V <sub>CE</sub> = 20V, f = 100MHz)   | f <sub>T</sub>                  | 300  | —    | —    | MHz                |
| Output Capacitance<br>(V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0, f = 1.0 MHz)                     | C <sub>obo</sub>                | —    | —    | 8    | pF                 |
| Input Capacitance<br>(V <sub>EB</sub> = 0.5 V, I <sub>C</sub> = 0, f = 1.0 MHz)                     | C <sub>ibo</sub>                | —    | —    | 25   | pF                 |
| Input Impedance<br>(V <sub>CE</sub> = 10 V, I <sub>C</sub> = 10 mA, f = 1.0 kHz)                    | h <sub>ie</sub>                 | 0.25 | —    | 1.25 | kΩ                 |
| Voltage Feedback Ratio<br>(V <sub>CE</sub> = 10 V, I <sub>C</sub> = 10 mA, f = 1.0 kHz)             | h <sub>re</sub>                 | —    | —    | 4    | X 10 <sup>-4</sup> |
| Small-Signal Current Gain<br>(V <sub>CE</sub> = 10 V, I <sub>C</sub> = 10 mA, f = 1.0 kHz)          | h <sub>fe</sub>                 | 75   | —    | 375  |                    |
| Output Admittance<br>(V <sub>CE</sub> = 10 V, I <sub>C</sub> = 10 mA, f = 1.0 kHz)                  | h <sub>oe</sub>                 | 25   | —    | 200  | μhos               |
| Collector Base Time Constant<br>(V <sub>CB</sub> = 20 V, I <sub>E</sub> = 20 mA, f = 31.8 MHz)      | r <sub>b</sub> , C <sub>c</sub> | —    | —    | 150  | ps                 |
| Noise Figure<br>(V <sub>CE</sub> = 10V, I <sub>C</sub> = 100μA, R <sub>S</sub> = 1.0kΩ, f = 1.0kHz) | N <sub>F</sub>                  | —    | —    | 4    | dB                 |

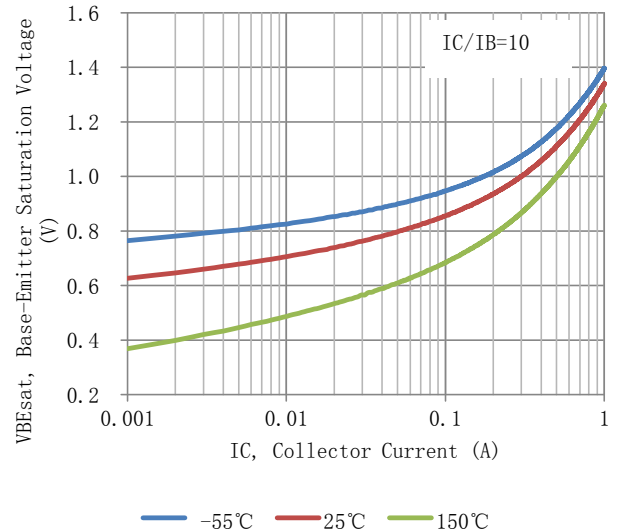
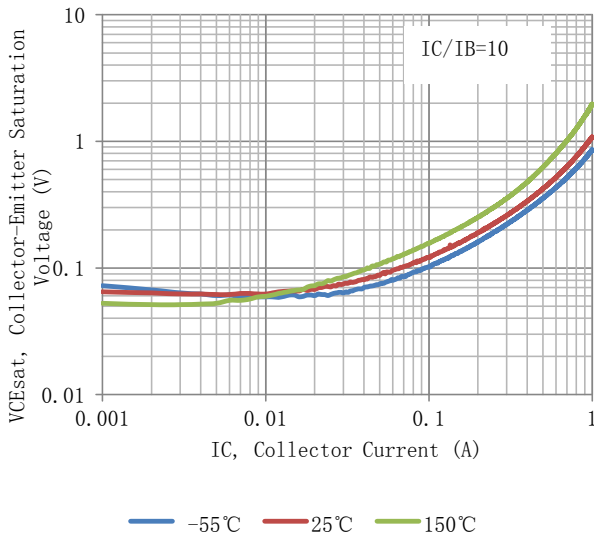
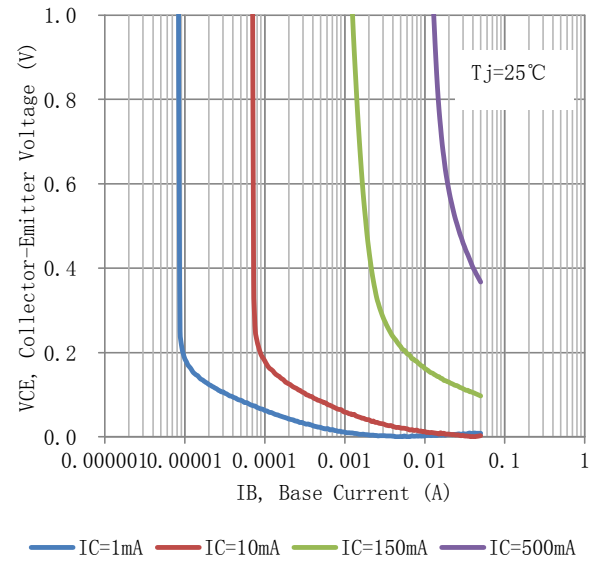
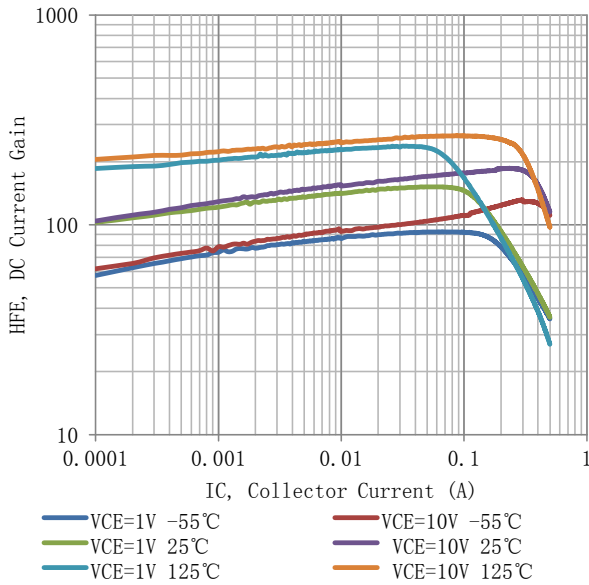
SWITCHING CHARACTERISTICS

|              |   |                |   |   |     |    |
|--------------|---|----------------|---|---|-----|----|
| Delay Time   | (V <sub>CC</sub> = 30 V, V <sub>EB(off)</sub> = -0.5 V, I <sub>C</sub> = 150 mA, I <sub>B1</sub> = 15 mA) | t <sub>d</sub> | — | — | 10  | ns |
| Rise Time    |   | t <sub>r</sub> | — | — | 25  |    |
| Storage Time | (V <sub>CC</sub> = 30 V, I <sub>C</sub> = 150 mA, I <sub>B1</sub> = I <sub>B2</sub> = 15 mA)              | t <sub>s</sub> | — | — | 225 |    |
| Fall Time    |   | t <sub>f</sub> | — | — | 60  |    |

4.f<sub>T</sub> is defined as the frequency at which h<sub>fe</sub> extrapolates to unity.

# LMBT2222ALT1G,S-LMBT2222ALT1G

## ELRCTRICAL CHARACTERISTICS CURVES



## LMBT2222ALT1G,S-LMBT2222ALT1G

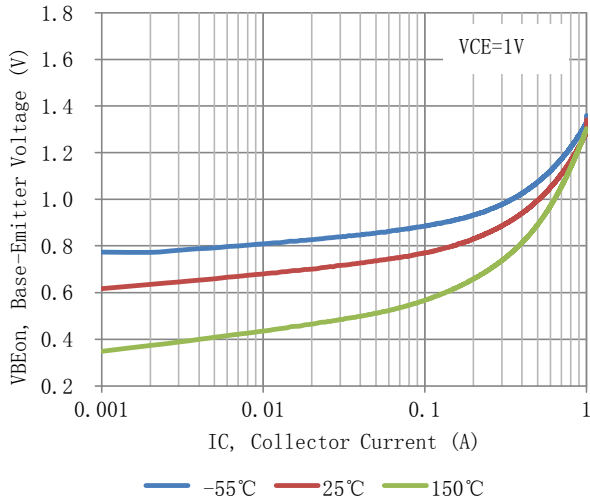


Figure 5. Base Emitter Voltage vs. Collector Current

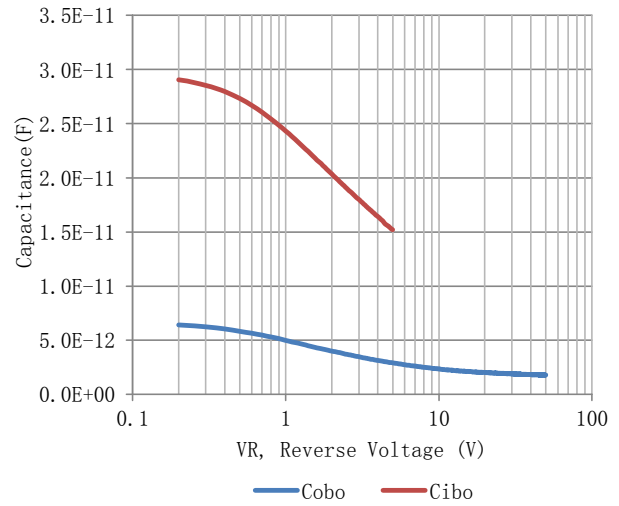


Figure 6. Capacitance

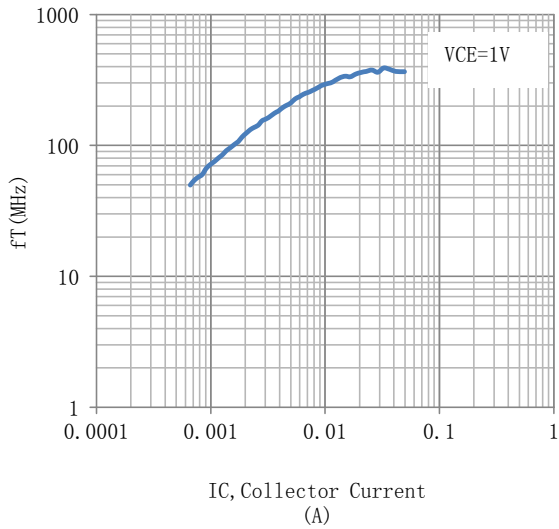


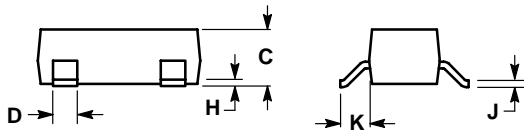
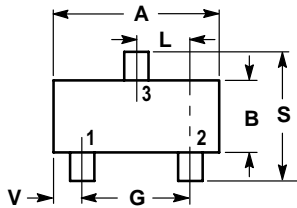
Figure 7. Current-Gain Bandwidth Product

# LMBT2222ALT1G,S-LMBT2222ALT1G

## SOT-23

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M,1982
2. CONTROLLING DIMENSION: INCH.



| DIM | INCHES |        | MILLIMETERS |       |
|-----|--------|--------|-------------|-------|
|     | MIN    | MAX    | MIN         | MAX   |
| A   | 0.1102 | 0.1197 | 2.80        | 3.04  |
| B   | 0.0472 | 0.0551 | 1.20        | 1.40  |
| C   | 0.0350 | 0.0440 | 0.89        | 1.11  |
| D   | 0.0150 | 0.0200 | 0.37        | 0.50  |
| G   | 0.0701 | 0.0807 | 1.78        | 2.04  |
| H   | 0.0005 | 0.0040 | 0.013       | 0.100 |
| J   | 0.0034 | 0.0070 | 0.085       | 0.177 |
| K   | 0.0140 | 0.0285 | 0.35        | 0.69  |
| L   | 0.0350 | 0.0401 | 0.89        | 1.02  |
| S   | 0.0830 | 0.1039 | 2.10        | 2.64  |
| V   | 0.0177 | 0.0236 | 0.45        | 0.60  |

