

## High Voltage Transistor

### FEATURE

- Pb-Free package is available.

### DEVICE MARKING AND ORDERING INFORMATION

| Device                    | Package | Shipping       |
|---------------------------|---------|----------------|
| LMBT5401LT1               | SOT-23  | 3000/Tape&Reel |
| LMBT5401LT1G<br>(Pb-Free) | SOT-23  | 3000/Tape&Reel |

### MAXIMUM RATINGS

| Rating                         | Symbol    | Value | Unit |
|--------------------------------|-----------|-------|------|
| Collector-Emitter Voltage      | $V_{CEO}$ | - 150 | Vdc  |
| Collector-Base Voltage         | $V_{CBO}$ | - 160 | Vdc  |
| Emitter-Base Voltage           | $V_{EBO}$ | - 5.0 | Vdc  |
| Collector Current — Continuous | $I_C$     | - 500 | mAdc |

### THERMAL CHARACTERISTICS

| Characteristic                                                                                                     | Symbol          | Max        | Unit                         |
|--------------------------------------------------------------------------------------------------------------------|-----------------|------------|------------------------------|
| Total Device Dissipation FR- 5 Board (1)<br>$T_A=25^{\circ}\text{C}$<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<br>Alumina Substrate, (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                                                                                   | $T_J, T_{stg}$  | -55to+150  | $^{\circ}\text{C}$           |

### DEVICE MARKING

|                |
|----------------|
| LMBT5401LT1=2L |
|----------------|

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                                                                                           |               |        |              |                         |
|-------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|--------------|-------------------------|
| Collector-Emitter Breakdown Voltage<br>( $I_C = -1.0\text{ mAdc}, I_E = 0$ )                                                              | $V_{(BR)CEO}$ | - 150  | —            | Vdc                     |
| Collector-Base Breakdown Voltage<br>( $I_C = -100\text{ }\mu\text{Adc}, I_E = 0$ )                                                        | $V_{(BR)CBO}$ | - 160  | —            | Vdc                     |
| Emitter-Base Breakdown Voltage<br>( $I_E = -10\text{ }\mu\text{Adc}, I_C = 0$ )                                                           | $V_{(BR)EBO}$ | -5.0   | —            | Vdc                     |
| Collector Cutoff Current<br>( $V_{CB} = -120\text{ Vdc}, I_E = 0$ )<br>( $V_{CB} = -120\text{ Vdc}, I_E = 0, T_A = 100^{\circ}\text{C}$ ) | $I_{CES}$     | —<br>— | - 50<br>- 50 | nAdc<br>$\mu\text{Adc}$ |

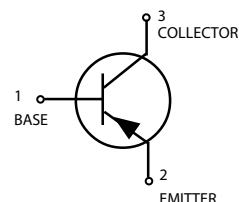
1. FR-5 = 1.0 x 0.75 x 0.062 in.

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

**LMBT5401LT1**



**SOT- 23**



**LMBT5401LT1**
**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted) (Continued)

| Characteristic                                        | Symbol        | Min | Max   | Unit |
|-------------------------------------------------------|---------------|-----|-------|------|
| <b>ON CHARACTERISTICS (2)</b>                         |               |     |       |      |
| DC Current Gain                                       | $h_{FE}$      |     |       | —    |
| ( $I_C = -1.0\text{mA}$ , $V_{CE} = -5.0\text{Vdc}$ ) |               | 50  | —     |      |
| ( $I_C = -10\text{mA}$ , $V_{CE} = -5.0\text{Vdc}$ )  |               | 60  | 240   |      |
| ( $I_C = -50\text{mA}$ , $V_{CE} = -5.0\text{Vdc}$ )  |               | 50  | —     |      |
| Collector–Emitter Saturation Voltage                  | $V_{CE(sat)}$ |     |       | Vdc  |
| ( $I_C = -10\text{mA}$ , $I_B = -1.0\text{mA}$ )      |               | —   | – 0.2 |      |
| ( $I_C = -50\text{mA}$ , $I_B = -5.0\text{mA}$ )      |               | —   | – 0.5 |      |
| Base–Emitter Saturation Voltage                       | $V_{BE(sat)}$ |     |       | Vdc  |
| ( $I_C = -10\text{mA}$ , $I_B = -1.0\text{mA}$ )      |               | —   | – 1.0 |      |
| ( $I_C = -50\text{mA}$ , $I_B = -5.0\text{mA}$ )      |               | —   | – 1.0 |      |

**SMALL–SIGNAL CHARACTERISTICS**

|                                                                                                  |           |     |     |     |
|--------------------------------------------------------------------------------------------------|-----------|-----|-----|-----|
| Current–Gain — Bandwidth Product                                                                 | $f_T$     |     |     | MHz |
| ( $I_C = -10\text{mA}$ , $V_{CE} = -10\text{Vdc}$ , $f = 100\text{MHz}$ )                        |           | 100 | 300 |     |
| Output Capacitance                                                                               | $C_{obo}$ |     |     | pF  |
| ( $V_{CB} = -10\text{Vdc}$ , $I_E = 0$ , $f = 1.0\text{MHz}$ )                                   |           | —   | 6.0 |     |
| Small–Signal Current Gain                                                                        | $h_{fe}$  |     |     | —   |
| ( $I_C = -1.0\text{mA}$ , $V_{CE} = -10\text{Vdc}$ , $f = 1.0\text{kHz}$ )                       |           | 40  | 200 |     |
| Noise Figure                                                                                     | NF        |     |     | dB  |
| ( $I_C = -200\mu\text{A}$ , $V_{CE} = -5.0\text{Vdc}$ , $R_s = 10\Omega$ , $f = 1.0\text{kHz}$ ) |           | —   | 8.0 |     |

## LMBT5401LT1

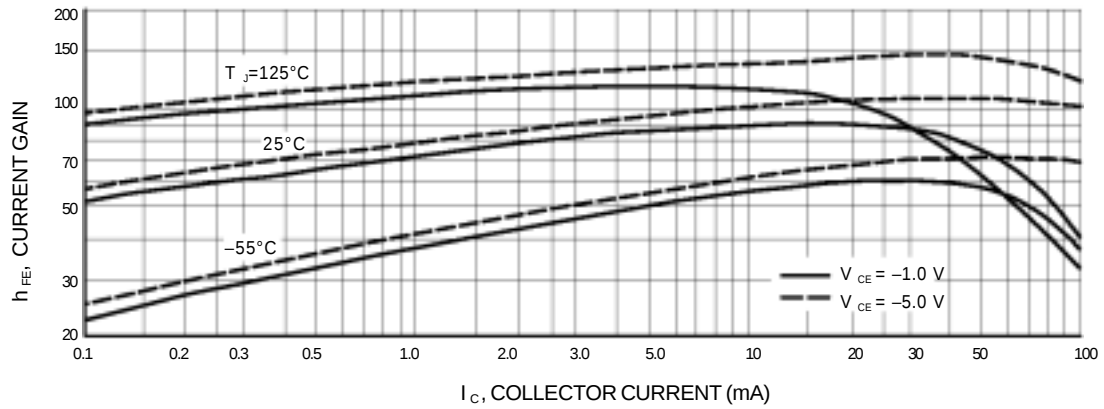


Figure 1. DC Current Gain

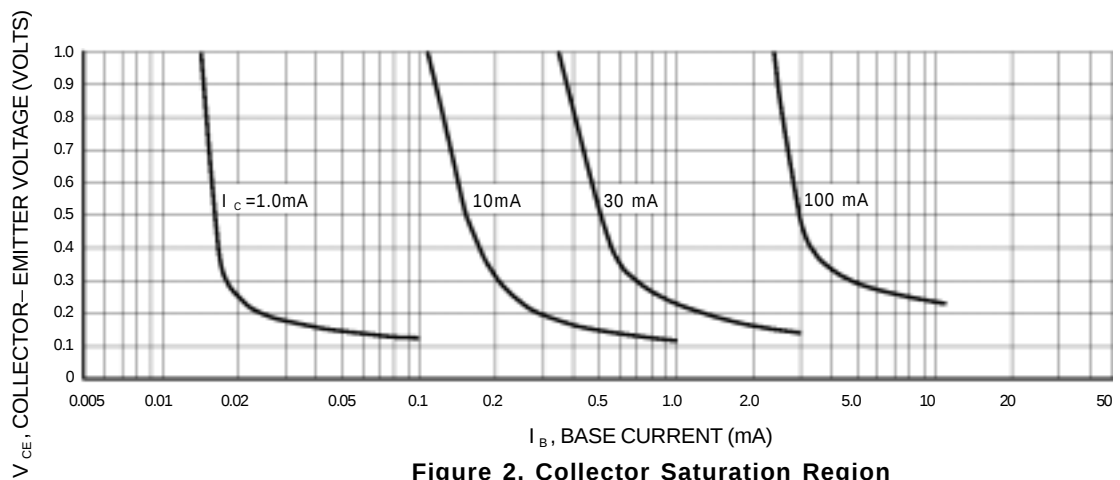


Figure 2. Collector Saturation Region

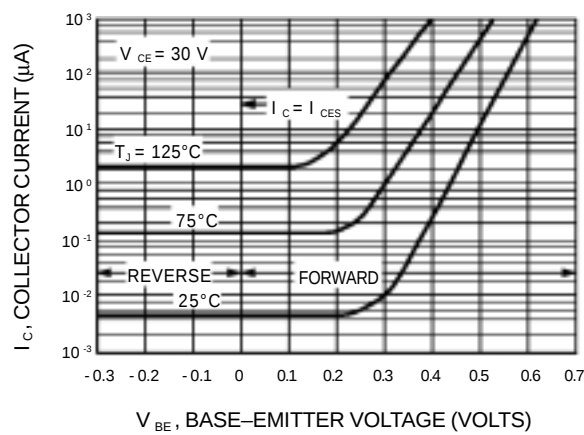


Figure 3. Collector Cut-Off Region

## LMBT5401LT1

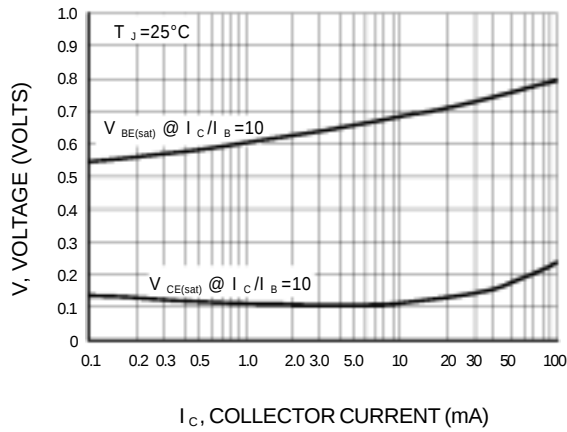


Figure 4. "On" Voltages

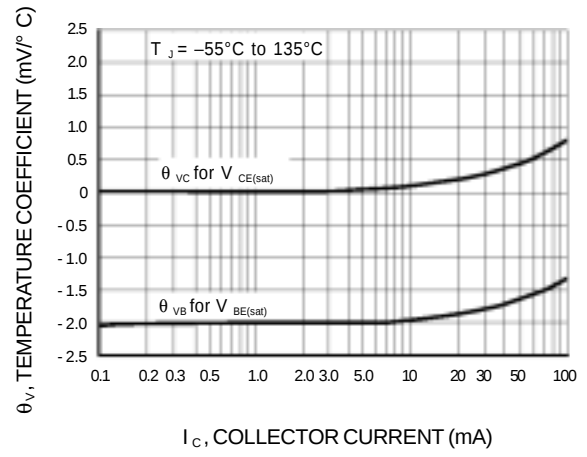


Figure 5. Temperature Coefficients

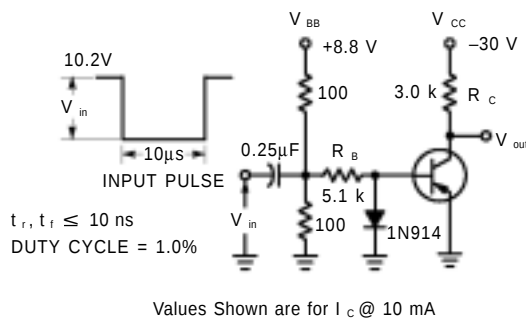


Figure 6. Switching Time Test Circuit

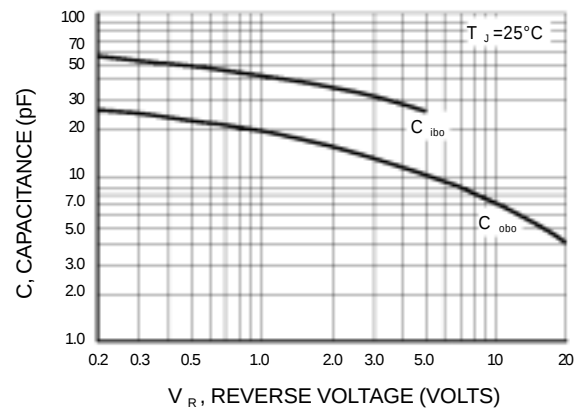


Figure 7. Capacitances

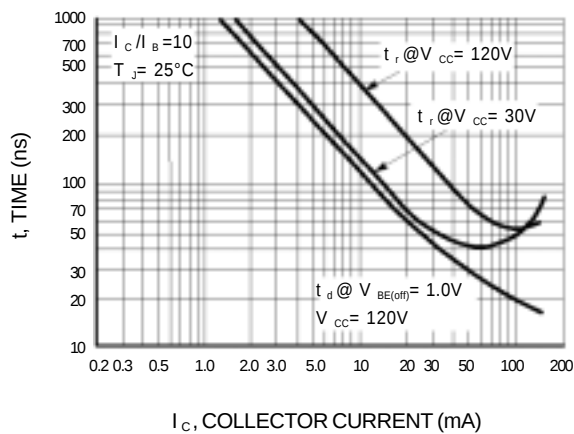


Figure 8. Turn-On Time

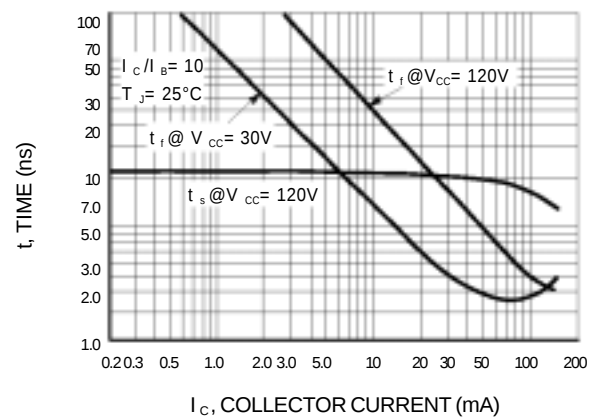
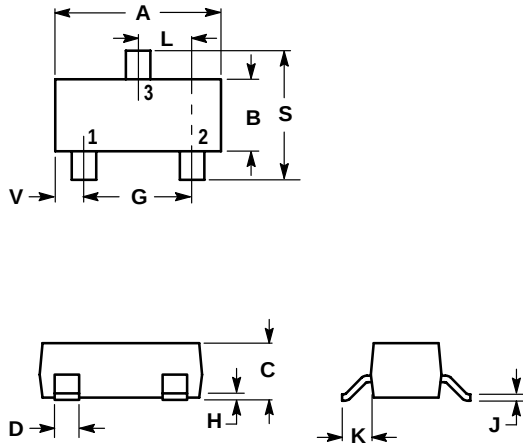


Figure 9. Turn-Off Time

**LMBT5401LT1**

**SOT-23**



**NOTES:**

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

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

- PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

