

# MMBT4124LT1G

## General Purpose Transistor

### NPN Silicon

#### Features

- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

| Rating                         | Symbol    | Value | Unit             |
|--------------------------------|-----------|-------|------------------|
| Collector–Emitter Voltage      | $V_{CEO}$ | 25    | Vdc              |
| Collector–Base Voltage         | $V_{CBO}$ | 30    | Vdc              |
| Emitter–Base Voltage           | $V_{EBO}$ | 5.0   | Vdc              |
| Collector Current – Continuous | $I_C$     | 200   | mA <sub>dc</sub> |

#### THERMAL CHARACTERISTICS

| Characteristic                                                                                                       | Symbol          | Max         | Unit                      |
|----------------------------------------------------------------------------------------------------------------------|-----------------|-------------|---------------------------|
| Total Device Dissipation<br>FR–5 Board (Note 1) @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$        | $P_D$           | 225<br>1.8  | W<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  | W<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 | $^\circ\text{C}$          |

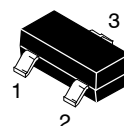
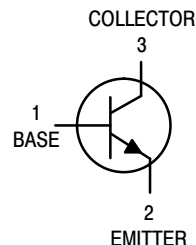
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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



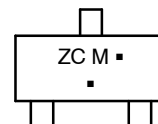
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SOT–23 (TO–236)  
CASE 318  
STYLE 6

#### MARKING DIAGRAM



ZC = Device Code  
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

| Device       | Package             | Shipping†          |
|--------------|---------------------|--------------------|
| MMBT4124LT1G | SOT–23<br>(Pb–Free) | 3000 / Tape & Reel |

†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.

# MMBT4124LT1G

## 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>( $I_C = 1.0\text{ mA}$ , $I_E = 0$ )                                                                                                    | $V_{(BR)CEO}$ | 25         | –        | Vdc  |
| Collector–Base Breakdown Voltage<br>( $I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ )                                                                                                        | $V_{(BR)CBO}$ | 30         | –        | Vdc  |
| Emitter–Base Breakdown Voltage<br>( $I_E = 10\text{ }\mu\text{A}$ , $I_C = 0$ )                                                                                                          | $V_{(BR)EBO}$ | 5.0        | –        | Vdc  |
| Collector Cutoff Current<br>( $V_{CB} = 20\text{ Vdc}$ , $I_E = 0$ )                                                                                                                     | $I_{CBO}$     | –          | 50       | nAdc |
| Emitter Cutoff Current<br>( $V_{EB} = 3.0\text{ Vdc}$ , $I_C = 0$ )                                                                                                                      | $I_{EBO}$     | –          | 50       | nAdc |
| <b>ON CHARACTERISTICS</b>                                                                                                                                                                |               |            |          |      |
| DC Current Gain (Note 3)<br>( $I_C = 2.0\text{ mA}$ , $V_{CE} = 1.0\text{ Vdc}$ )<br>( $I_C = 50\text{ mA}$ , $V_{CE} = 1.0\text{ Vdc}$ )                                                | $h_{FE}$      | 120<br>60  | 360<br>– | –    |
| Collector–Emitter Saturation Voltage (Note 3)<br>( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )                                                                                        | $V_{CE(sat)}$ | –          | 0.3      | Vdc  |
| Base–Emitter Saturation Voltage (Note 3)<br>( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )                                                                                             | $V_{BE(sat)}$ | –          | 0.95     | Vdc  |
| <b>SMALL–SIGNAL CHARACTERISTICS</b>                                                                                                                                                      |               |            |          |      |
| Current–Gain – Bandwidth Product<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 100\text{ MHz}$ )                                                                           | $f_T$         | 300        | –        | MHz  |
| Input Capacitance<br>( $V_{EB} = 0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )                                                                                                    | $C_{ibo}$     | –          | 8.0      | pF   |
| Collector–Base Capacitance<br>( $I_E = 0$ , $V_{CB} = 5.0\text{ V}$ , $f = 1.0\text{ MHz}$ )                                                                                             | $C_{cb}$      | –          | 4.0      | pF   |
| Small–Signal Current Gain<br>( $I_C = 2.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $R_S = 10\text{ k }\Omega$ , $f = 1.0\text{ kHz}$ )                                                    | $h_{fe}$      | 120        | 480      | –    |
| Current Gain – High Frequency<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 100\text{ MHz}$ )<br>( $I_C = 2.0\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ kHz}$ ) | $ h_{fe} $    | 3.0<br>120 | –<br>480 | –    |
| Noise Figure<br>( $I_C = 100\text{ }\mu\text{A}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 1.0\text{ k }\Omega$ , $f = 1.0\text{ kHz}$ )                                                      | NF            | –          | 5.0      | dB   |

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

# MMBT4124LT1G

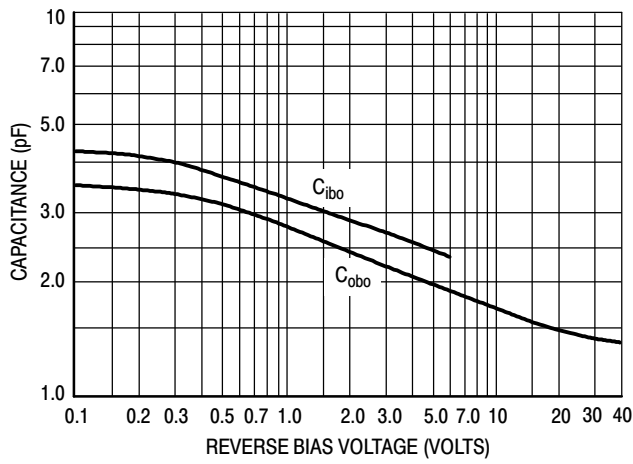


Figure 1. Capacitance

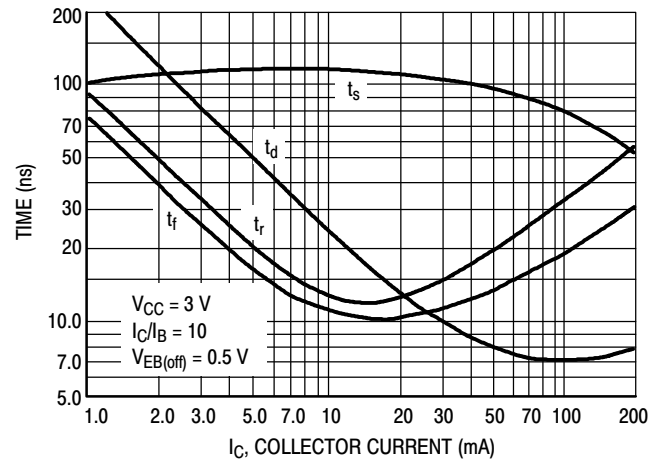


Figure 2. Switching Times

## AUDIO SMALL-SIGNAL CHARACTERISTICS

### NOISE FIGURE

( $V_{CE} = 5V_{dc}$ ,  $T_A = 25^\circ C$ )

Bandwidth = 1.0 Hz

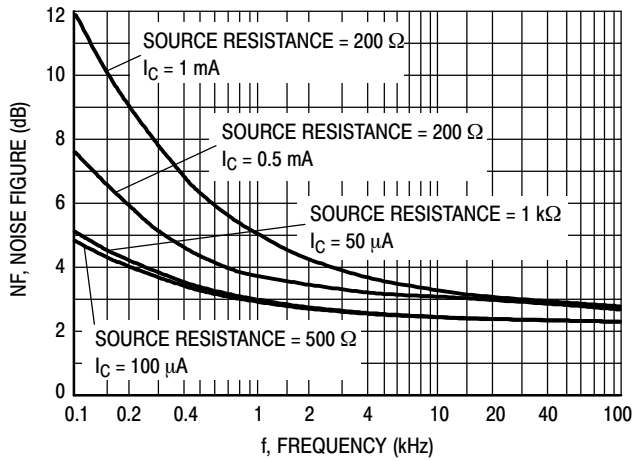


Figure 3. Frequency Variations

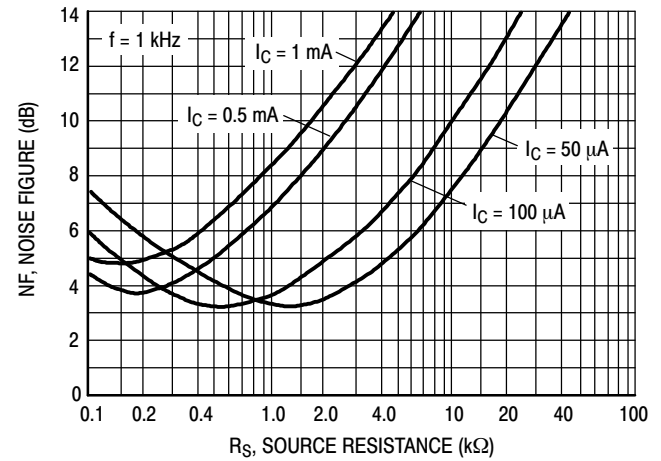


Figure 4. Source Resistance

# MMBT4124LT1G

## h PARAMETERS

( $V_{CE} = 10\text{ V}$ ,  $f = 1\text{ kHz}$ ,  $T_A = 25^\circ\text{C}$ )

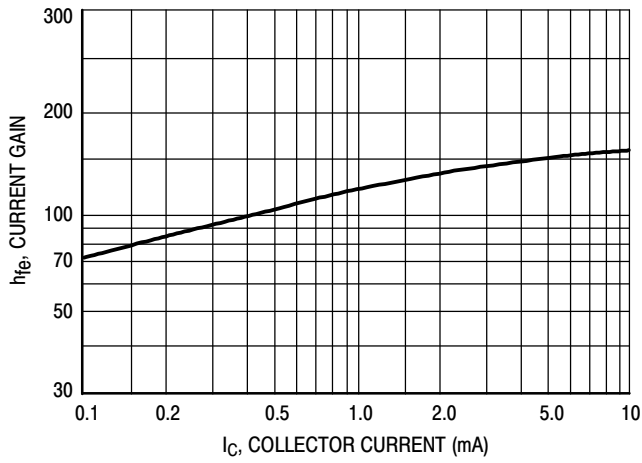


Figure 5. Current Gain

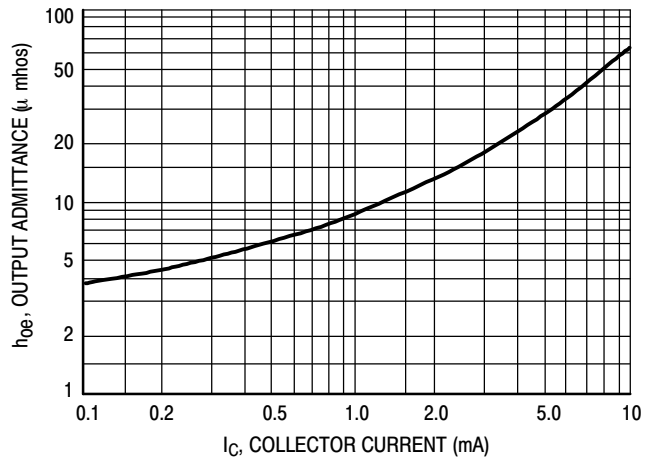


Figure 6. Output Admittance

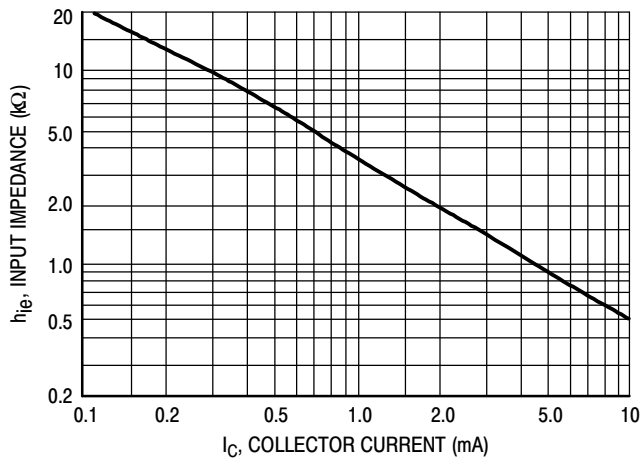


Figure 7. Input Impedance

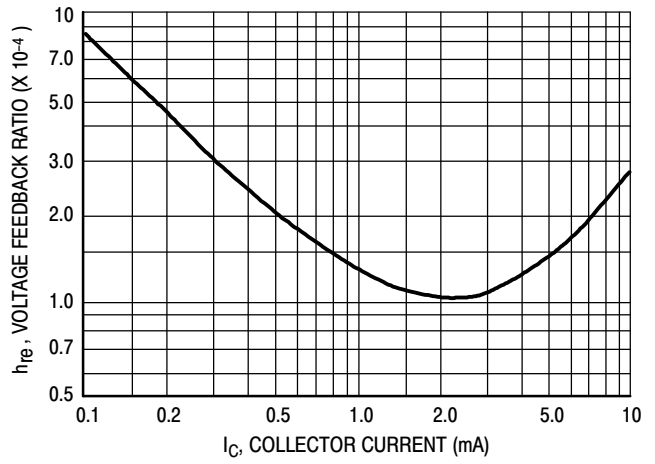


Figure 8. Voltage Feedback Ratio

# MMBT4124LT1G

## STATIC CHARACTERISTICS

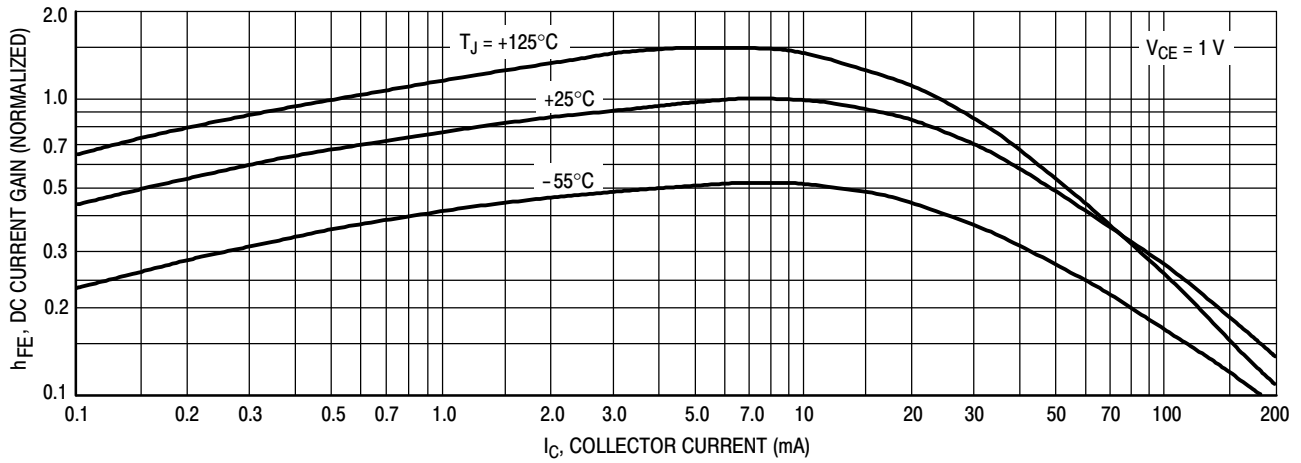


Figure 9. DC Current Gain

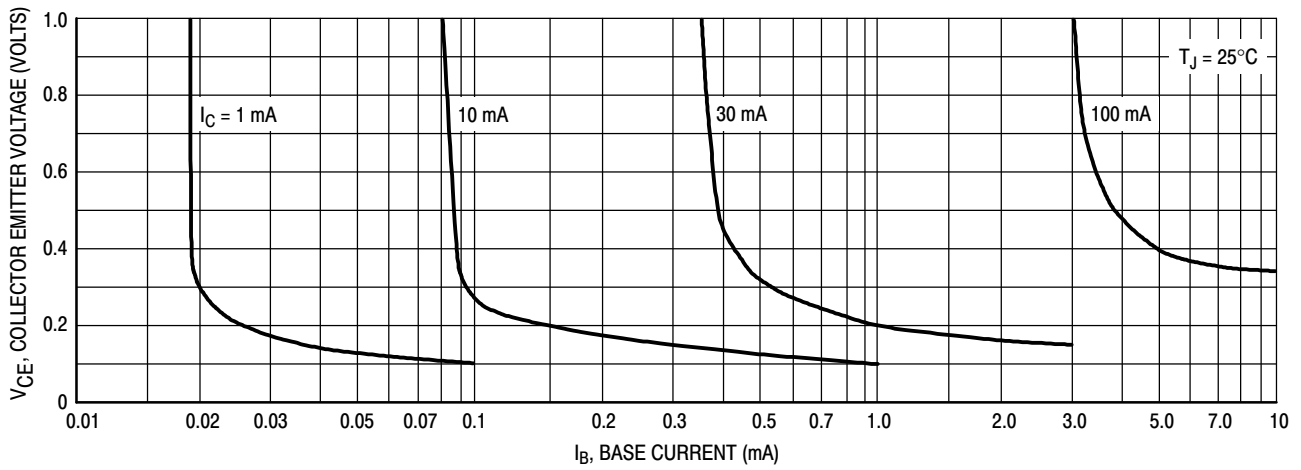


Figure 10. Collector Saturation Region

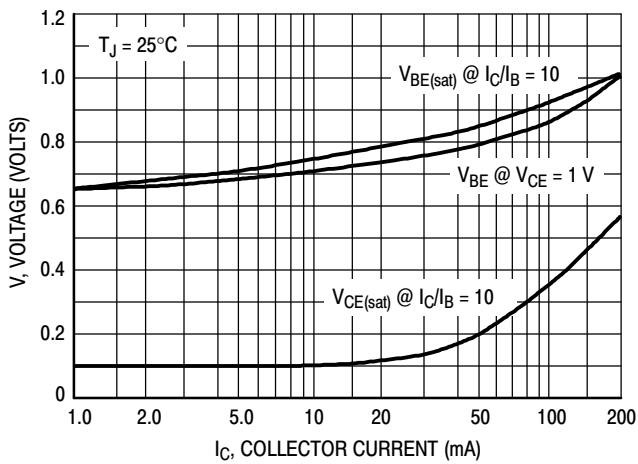


Figure 11. "On" Voltages

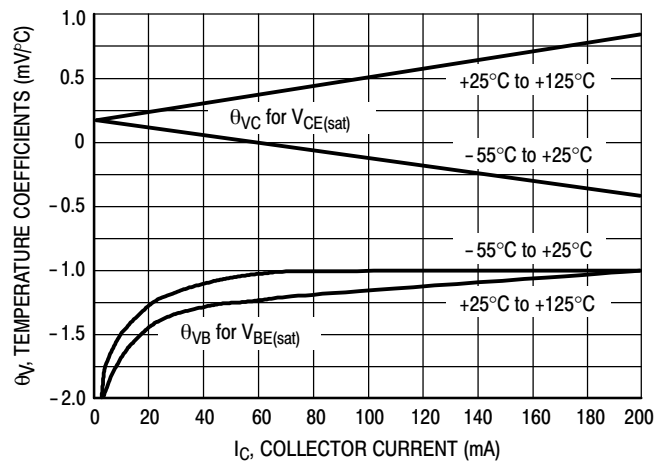
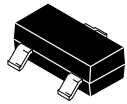


Figure 12. Temperature Coefficients

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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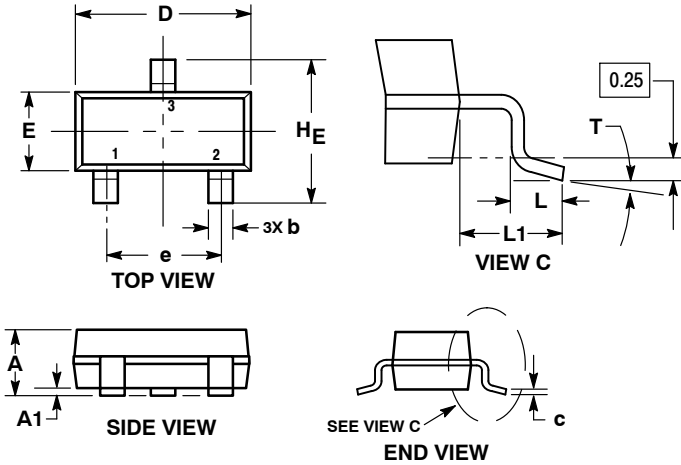
ON



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

DATE 30 JAN 2018

SCALE 4:1

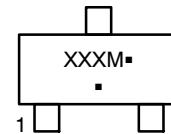


### NOTES:

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 |
| HE  | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |
| T   | 0°          | ---  | 10°  | 0°     | ---   | 10°   |

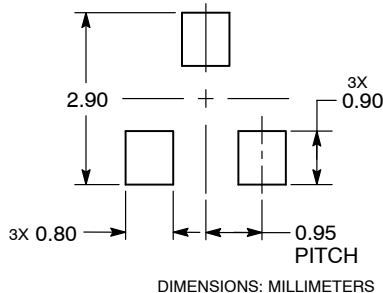
### GENERIC MARKING DIAGRAM\*



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.

### RECOMMENDED SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

STYLE 1 THRU 5:  
CANCELLED

STYLE 6:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 7:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

STYLE 8:  
PIN 1. ANODE  
2. NO CONNECTION  
3. CATHODE

STYLE 9:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 10:  
PIN 1. DRAIN  
2. SOURCE  
3. GATE

STYLE 11:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE-ANODE

STYLE 12:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 13:  
PIN 1. SOURCE  
2. DRAIN  
3. GATE

STYLE 14:  
PIN 1. CATHODE  
2. GATE  
3. ANODE

STYLE 15:  
PIN 1. GATE  
2. CATHODE  
3. ANODE

STYLE 16:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE

STYLE 17:  
PIN 1. NO CONNECTION  
2. ANODE  
3. CATHODE

STYLE 18:  
PIN 1. NO CONNECTION  
2. CATHODE  
3. ANODE

STYLE 19:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE-ANODE

STYLE 20:  
PIN 1. CATHODE  
2. ANODE  
3. GATE

STYLE 21:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

STYLE 22:  
PIN 1. RETURN  
2. OUTPUT  
3. INPUT

STYLE 23:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 24:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE

STYLE 25:  
PIN 1. ANODE  
2. CATHODE  
3. GATE

STYLE 26:  
PIN 1. CATHODE  
2. ANODE  
3. NO CONNECTION

STYLE 27:  
PIN 1. CATHODE  
2. CATHODE  
3. CATHODE

STYLE 28:  
PIN 1. ANODE  
2. ANODE  
3. ANODE

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