

MMBT5401M3

High Voltage Transistor

PNP Silicon

The MMBT5401M3 device is a spin-off of our popular SOT-23 three-leaded device. It is designed for general purpose amplifier applications and is housed in the SOT-723 surface mount package. This device is ideal for low-power surface mount applications where board space is at a premium.

Features

- NSV 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

| 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 | -60 | mA _{dc} |

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.

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|--|-----------------|-------------|---------------------------|
| Total Device Dissipation FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate Above 25°C | P_D | 130 | mW |
| Thermal Resistance, Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 470 | $^\circ\text{C}/\text{W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

1. FR-5 @ 100 mm², 1.0 oz. copper traces, still air.

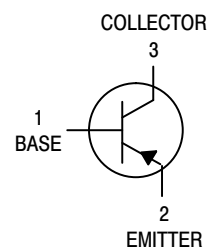


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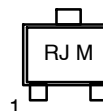
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SOT-723
CASE 631AA



MARKING DIAGRAM



RJ = Specific Device Code
M = Date Code

ORDERING INFORMATION

| Device | Package | Shipping† |
|------------------|----------------------|--------------------|
| MMBT5401M3T5G | SOT-723 (Pb-Free) | 8000 / Tape & Reel |
| NSVMMBT5401M3T5G | SOT-723 (Pb-Free) | 8000 / 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.

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

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

OFF CHARACTERISTICS

| | | | | | |
|---|---------------|------|-------|------|----|
| Collector–Emitter Breakdown Voltage ($I_C = -1.0\text{ mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | -150 | – | – | V |
| Collector–Base Breakdown Voltage ($I_C = -100\text{ }\mu\text{A}$, $I_E = 0$) | $V_{(BR)CBO}$ | -160 | – | – | V |
| Emitter–Base Breakdown Voltage ($I_E = -10\text{ }\mu\text{A}$, $I_C = 0$) | $V_{(BR)EBO}$ | -5.0 | – | – | V |
| Collector–Base Cutoff Current ($V_{CB} = -120\text{ V}$, $I_E = 0$) | I_{CBO} | – | -1.6 | -100 | nA |
| Emitter Cutoff Current ($V_{BE} = -5\text{ V}$) | I_{EBO} | – | -0.20 | -100 | nA |

ON CHARACTERISTICS

| | | | | | |
|--|---------------|----------------|----------------|----------------|---|
| DC Current Gain ($I_C = -1.0\text{ mA}$, $V_{CE} = -5.0\text{ V}$) ($I_C = -10\text{ mA}$, $V_{CE} = -5.0\text{ V}$) ($I_C = -50\text{ mA}$, $V_{CE} = -5.0\text{ V}$) | h_{FE} | 50 60 20 | 80 90 40 | – 240 – | – |
| Collector–Emitter Saturation Voltage ($I_C = -10\text{ mA}$, $I_B = -1.0\text{ mA}$) ($I_C = -50\text{ mA}$, $I_B = -5.0\text{ mA}$) | $V_{CE(sat)}$ | – – | -0.09 -0.15 | -0.25 -0.60 | V |
| Base–Emitter Saturation Voltage ($I_C = -10\text{ mA}$, $I_B = -1.0\text{ mA}$) ($I_C = -50\text{ mA}$, $I_B = -5.0\text{ mA}$) | $V_{BE(sat)}$ | – – | -0.76 -0.92 | -1.0 -1.0 | V |

SMALL–SIGNAL CHARACTERISTICS

| | | | | | |
|--|-----------|-----|------|-----|-----|
| Current–Gain — Bandwidth Product ($I_C = -10\text{ mA}$, $V_{CE} = -5.0\text{ V}$, $f = 100\text{ MHz}$) | f_T | 100 | 180 | 300 | MHz |
| Input Capacitance ($V_{EB} = -3\text{ V}$, $I_C = 0$, $f = 1.0\text{ MHz}$) | C_{ibo} | – | 12.5 | 15 | pF |
| Output Capacitance ($V_{CB} = -10\text{ V}$, $I_E = 0$, $f = 1.0\text{ MHz}$) | C_{obo} | – | 1.5 | 6.0 | pF |
| Small Signal Current Gain ($I_C = -1.0\text{ mA}$, $V_{CE} = -10\text{ V}$, $f = 1.0\text{ kHz}$) | h_{fe} | 40 | – | 200 | – |
| Noise Figure ($I_C = -200\text{ }\mu\text{A}$, $V_{CE} = -5.0\text{ V}$, $R_S = 10\text{ }\Omega$, $f = 1.0\text{ kHz}$) | NF | – | – | 8.0 | 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.

TYPICAL CHARACTERISTICS

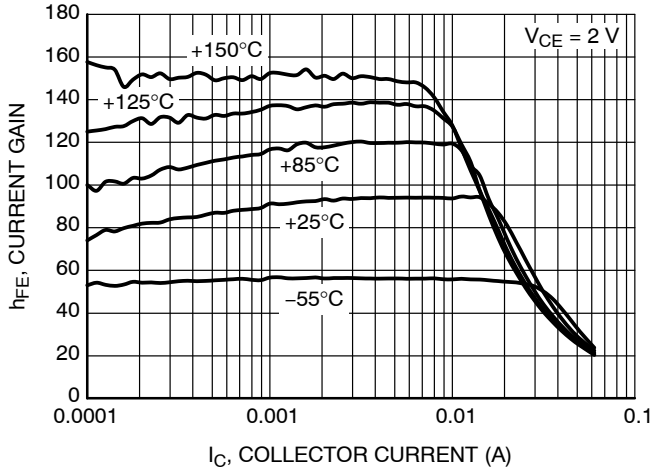


Figure 1. DC Current Gain

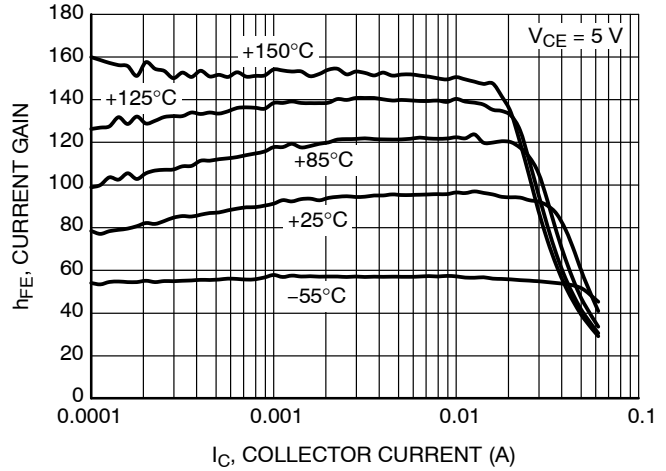


Figure 2. DC Current Gain

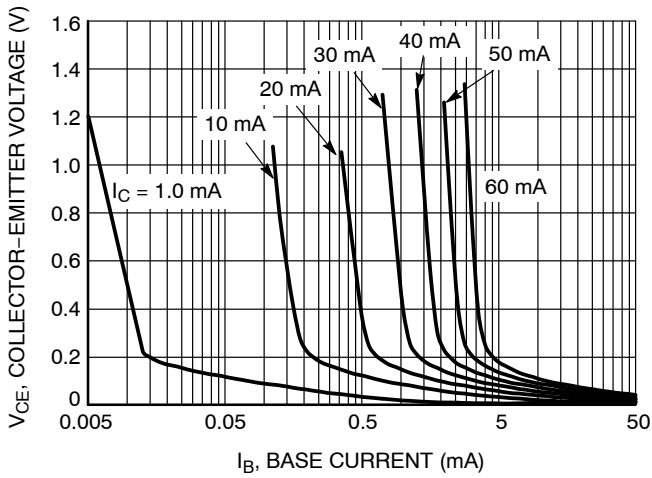


Figure 3. Collector Saturation Region

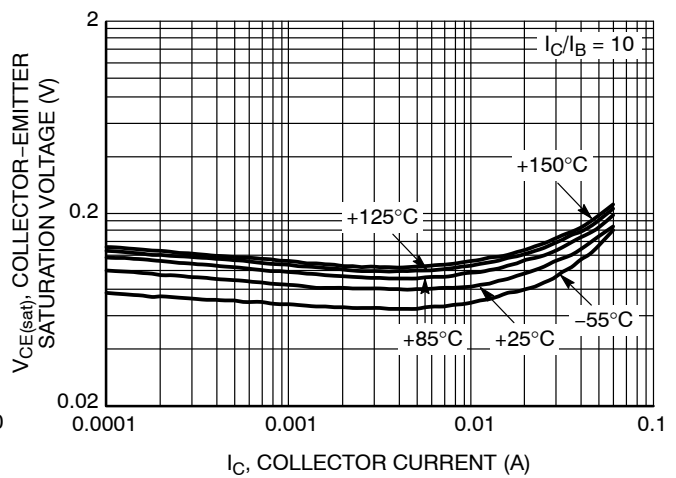


Figure 4. Collector-Emitter Saturation Region

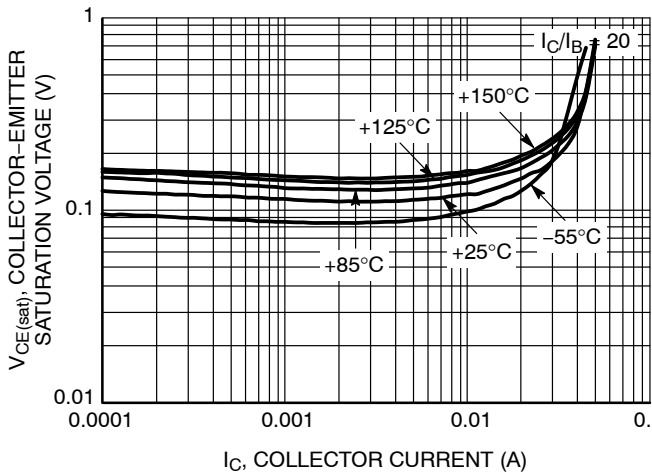


Figure 5. Collector-Emitter Saturation Region

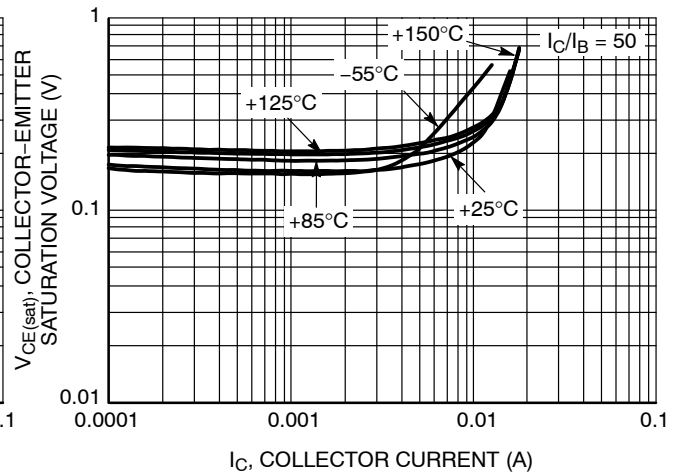


Figure 6. Collector-Emitter Saturation Region

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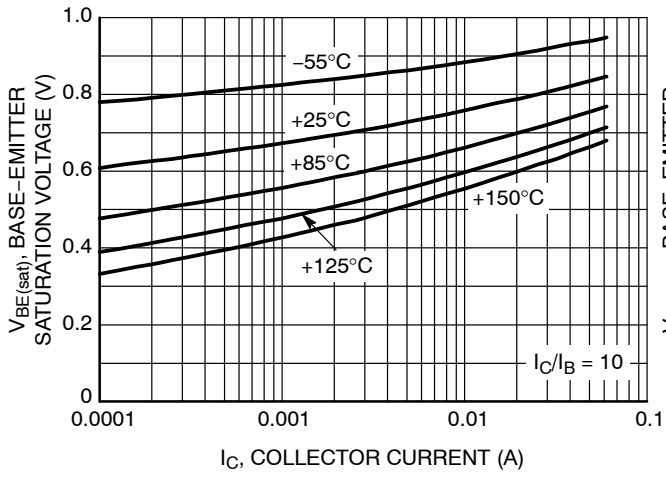


Figure 7. Base-Emitter Saturation Voltage

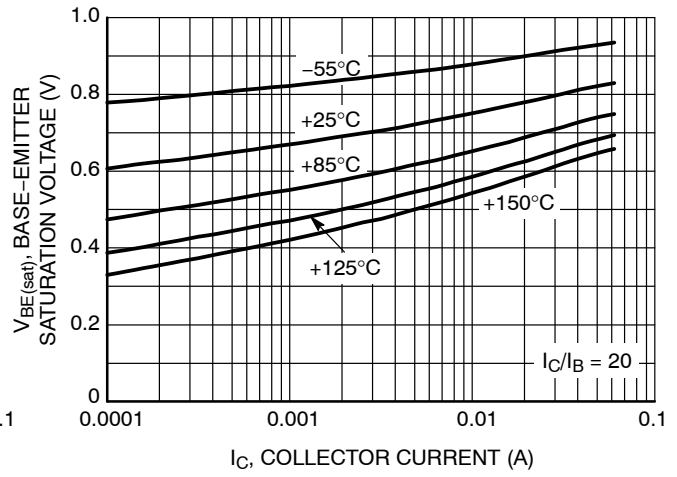


Figure 8. Base-Emitter Saturation Voltage

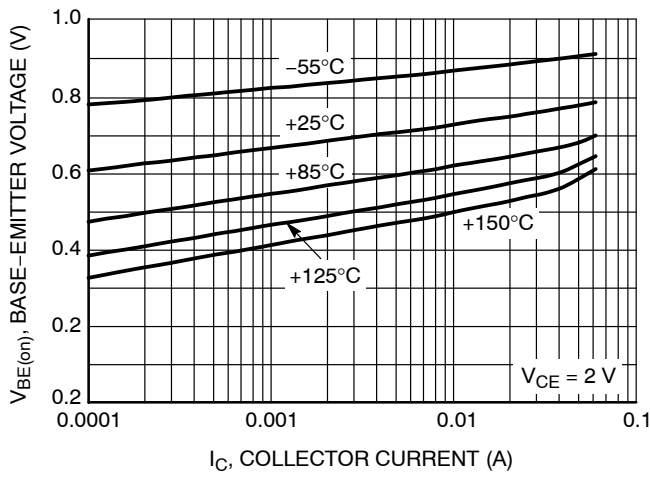


Figure 9. Base-Emitter "ON" Voltage

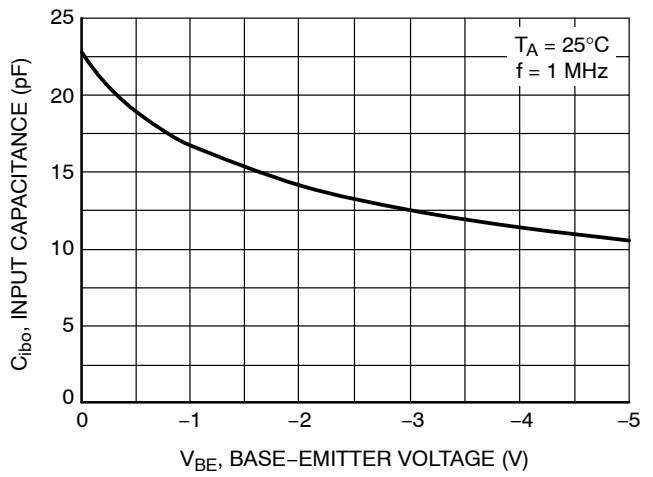


Figure 10. Input Capacitance

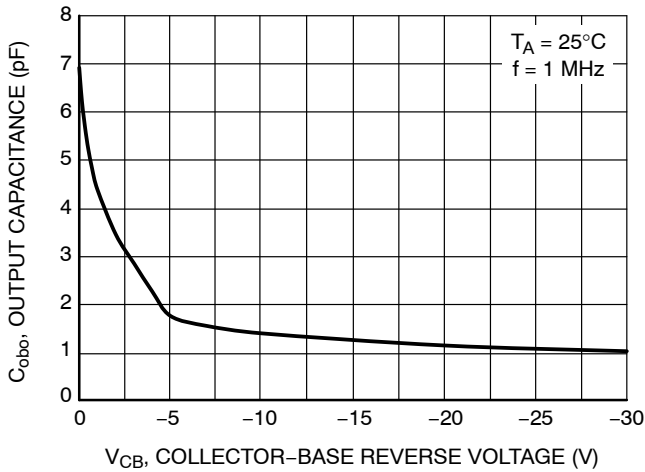


Figure 11. Output Capacitance

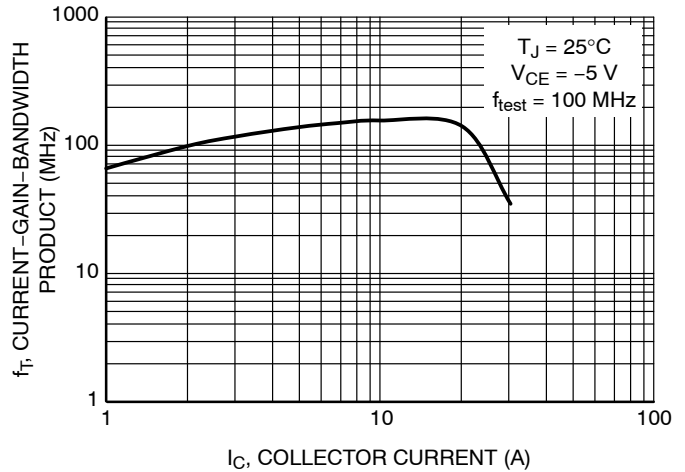


Figure 12. Current Gain Bandwidth Product

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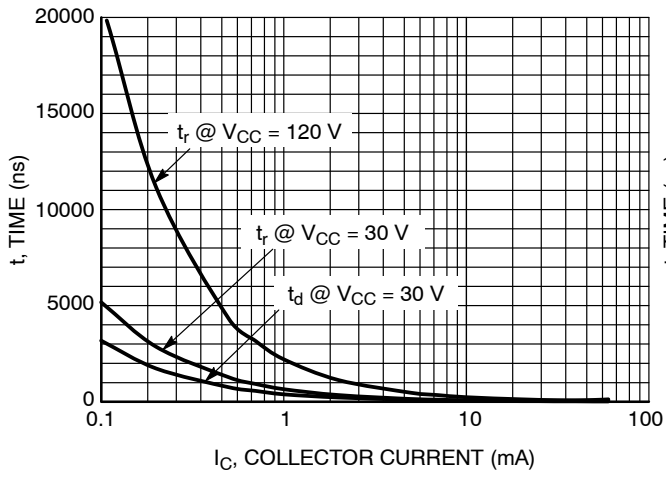


Figure 13. Turn-On Time

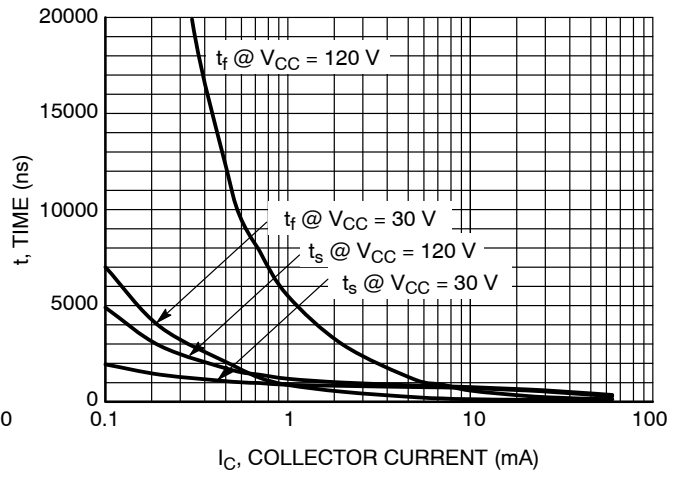
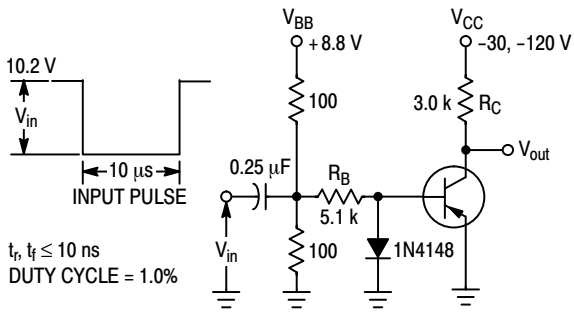


Figure 14. Turn-Off Time



$t_r, t_f \leq 10 \text{ ns}$
DUTY CYCLE = 1.0%

Values Shown are for $I_C @ 10 \text{ mA}$

Figure 15. Switching Time Test Circuit

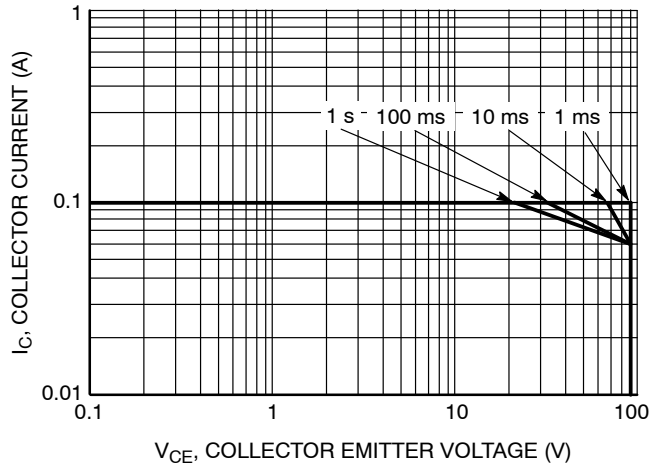


Figure 16. Safe Operating Area

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

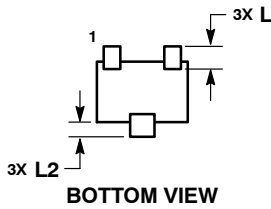
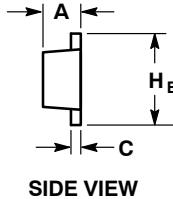
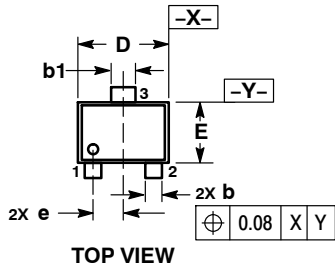
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SCALE 4:1

SOT-723
CASE 631AA-01
ISSUE D

DATE 10 AUG 2009

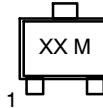


NOTES:

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 BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

| MILLIMETERS | | | |
|-------------|----------|------|------|
| DIM | MIN | NOM | MAX |
| A | 0.45 | 0.50 | 0.55 |
| b | 0.15 | 0.21 | 0.27 |
| b1 | 0.25 | 0.31 | 0.37 |
| C | 0.07 | 0.12 | 0.17 |
| D | 1.15 | 1.20 | 1.25 |
| E | 0.75 | 0.80 | 0.85 |
| e | 0.40 BSC | | |
| H E | 1.15 | 1.20 | 1.25 |
| L | 0.29 REF | | |
| L2 | 0.15 | 0.20 | 0.25 |

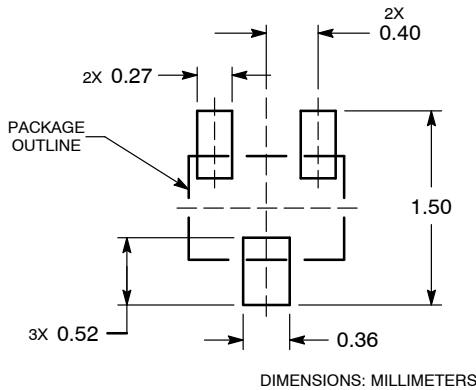
GENERIC MARKING DIAGRAM*



XX = Specific Device Code
M = Date Code

- | | | | | |
|---|--|--|--|--|
| STYLE 1: PIN 1. BASE 2. EMITTER 3. COLLECTOR | STYLE 2: PIN 1. ANODE 2. N/C 3. CATHODE | STYLE 3: PIN 1. ANODE 2. ANODE 3. CATHODE | STYLE 4: PIN 1. CATHODE 2. CATHODE 3. ANODE | STYLE 5: PIN 1. GATE 2. SOURCE 3. DRAIN |
|---|--|--|--|--|

RECOMMENDED SOLDERING FOOTPRINT*



*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G", may or not be present.

*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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|-------------------------|--------------------|--|
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