# PNP Multi-Chip General-Purpose Amplifier

# FMB3906, MMPQ3906

## Description

This device is designed for general-purpose amplifier and switching applications at collector currents of 10 μA to 100 mA. Sourced from Process 66.

## ABSOLUTE MAXIMUM RATINGS (Note 1)

($T_A$ = 25 °C, unless otherwise noted)

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CEO}$ | Collector-Emitter Voltage | −40 | V |
| $V_{CBO}$ | Collector-Base Voltage | −40 | V |
| $V_{EBO}$ | Emitter-Base Voltage | −5 | V |
| $I_C$ | Collector Current − Continuous | −200 | mA |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | −55 to +150 | °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. These ratings are based on a maximum junction temperature of 150°C. These are steady-state limits. **onsemi** should be consulted on applications involving pulsed or low-duty cycle operations.

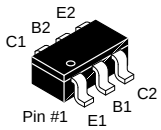
## THERMAL CHARACTERISTICS (Note 2)

($T_A$ = 25 °C, unless otherwise noted)

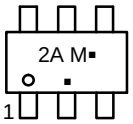
| Symbol | Parameter | Max | | Unit |
|---|---|---|---|---|
| | | FMB3906 | MMPQ3906 | |
| $P_D$ | Total Device Dissipation | 700 | 1,000 | mW |
| | Derate Above 25 °C | 5.6 | 8.0 | mW/°C |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 180 | − | °C/W |
| | Thermal Resistance, Junction to Ambient, Effective 4 Die | − | 125 | °C/W |
| | Thermal Resistance, Junction to Ambient, Each Die | − | 240 | °C/W |

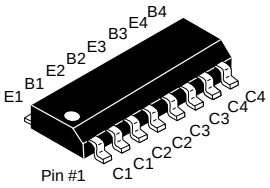
2. PCB size: FR-4 76 x 114 x 0.6T mm$^3$ (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.

## MARKING DIAGRAM

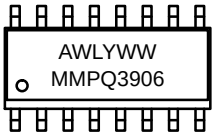



TSOT23 6-Lead
CASE 419BL



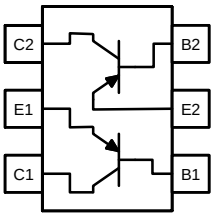

SOIC-16, 150 mils
CASE 751BG



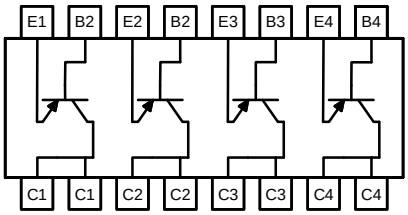

| | |
|---|---|
| 2A, MMPQ3906 | = Specific Device Code |
| M | = Date Code |
| ▪ | = Pb-Free Package |
| A | = Assembly Site |
| WL | = Wafer Lot Number |
| Y | = Year of Production |
| WW | = Work Week Number |

(Note: Microdot may be in either location)

## INTERNAL CONNECTIONS




FMB3906




MMPQ3906

## ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| FMB3906 | TSOT23 (Pb-Free, Halide Free) | 3000 / Tape & Reel |
| MMPQ3906 | SOIC-16 (Pb-Free, Halide Free) | 2500 / 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 °C unless otherwise noted)

| Symbol | Parameter | | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage (Note 3) | | $I_C$ = −1.0 mA, $I_B$ = 0 | −40 | – | – | V |
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage | | $I_C$ = −10 μA, $I_E$ = 0 | −40 | – | – | V |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage | | $I_E$ = −10 μA, $I_C$ = 0 | −5.0 | – | – | V |
| $I_{BL}$ | Base Cut-Off Current | | $V_{CE}$ = −30 V, $V_{BE}$ = 3.0 V | – | – | −50 | nA |
| $I_{CEX}$ | Collector Cut-Off Current | | $V_{CE}$ = −30 V, $V_{BE}$ = 3.0 V | – | – | −50 | nA |
| **ON CHARACTERISTICS** | | | | | | | |
| $h_{FE}$ | DC Current Gain (Note 3) | FMB3906 | $I_C$ = −0.1 mA, $V_{CE}$ = −1.0 V | 60 | – | – | |
| | | MMPQ3906 | | 40 | – | – | |
| | | FMB3906 | $I_C$ = −1.0 mA, $V_{CE}$ = −1.0 V | 80 | – | – | |
| | | MMPQ3906 | | 60 | – | – | |
| | | FMB3906 | $I_C$ = 10 mA, $V_{CE}$ = −1.0 V | 100 | – | 300 | |
| | | MMPQ3906 | | 75 | – | – | |
| | | All Devices | $I_C$ = −50 mA, $V_{CE}$ = −1.0 V | 60 | – | – | |
| | | All Devices | $I_C$ = −100 mA, $V_{CE}$ = −1.0 V | 30 | – | – | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | | $I_C$ = −10 mA, $I_B$ = −1.0 mA | – | – | −0.25 | V |
| | | | $I_C$ = −50 mA, $I_B$ = −5.0 mA | – | – | −0.40 | |
| $V_{BE(sat)}$ | Base-Emitter Saturation Voltage | | $I_C$ = −10 mA, $I_B$ = −1.0 mA | −0.65 | – | −0.85 | V |
| | | | $I_C$ = −50 mA, $I_B$ = −5.0 mA | – | – | −0.95 | |
| **SMALL-SIGNAL CHARACTERISTICS (MMPQ3906 ONLY)** | | | | | | | |
| $f_T$ | Current Gain-Bandwidth Product | | $I_C$ = −10 mA, $V_{CE}$ = −20 V, f = 100 MHz | – | 200 | – | MHz |
| $C_{ob}$ | Output Capacitance | | $V_{CB}$ = −5.0 V, $I_E$ = 0, f = 140 kHz | – | 4.5 | – | pF |
| $C_{ib}$ | Input Capacitance | | $V_{EB}$ = −0.5 V, $I_C$ = 0, f = 140 kHz | – | 10 | – | 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 ≤ 300 μs, duty cycle ≤ 2.0%.

## TYPICAL PERFORMANCE CHARACTERISTICS

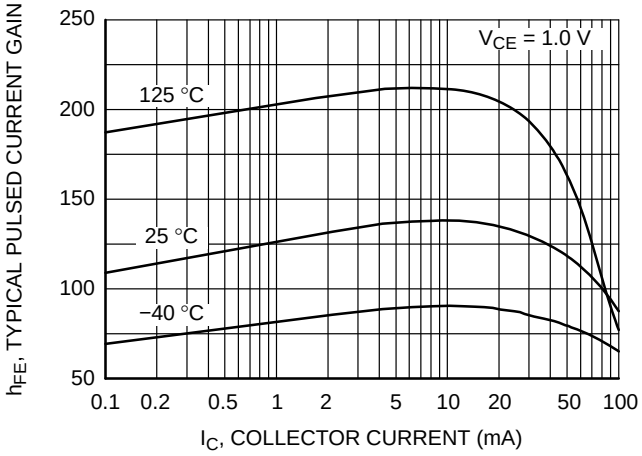



**Figure 1. Typical Pulsed Current Gain vs. Collector Current**

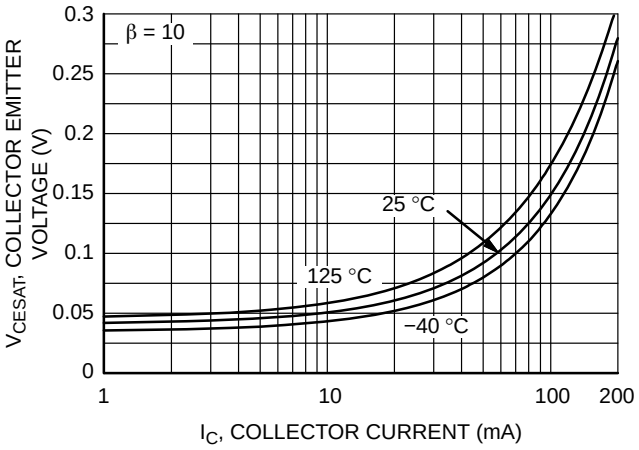



**Figure 2. Collector-Emitter Saturation Voltage vs. Collector Current**

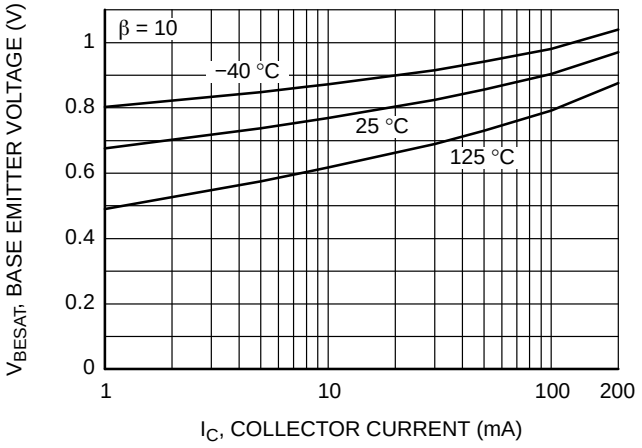



**Figure 3. Base-Emitter Saturation Voltage vs. Collector Current**

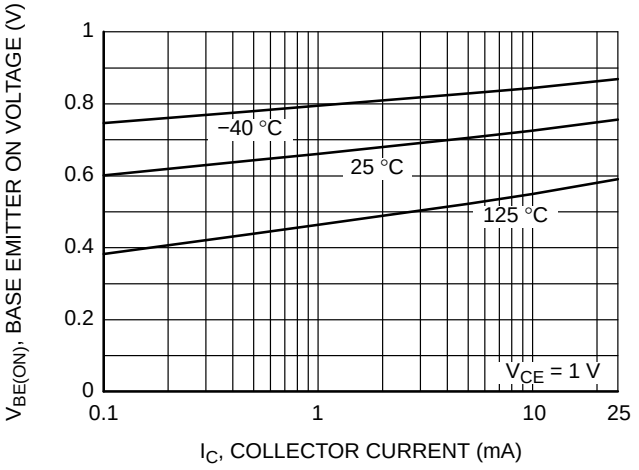



**Figure 4. Base-Emitter On Voltage vs. Collector Current**

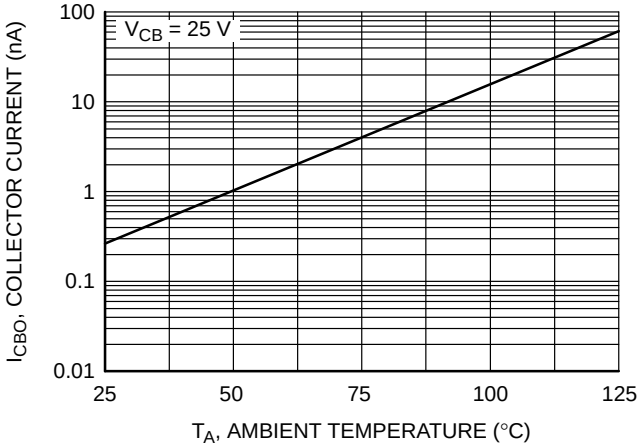



**Figure 5. Collector Cut-Off Current vs. Ambient Temperature**

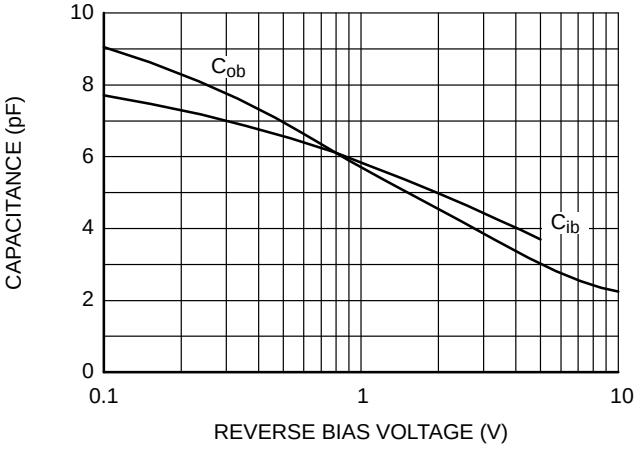



**Figure 6. Common-Base Open Circuit Input and Output Capacitance vs. Reverse Bias Voltage**

## TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

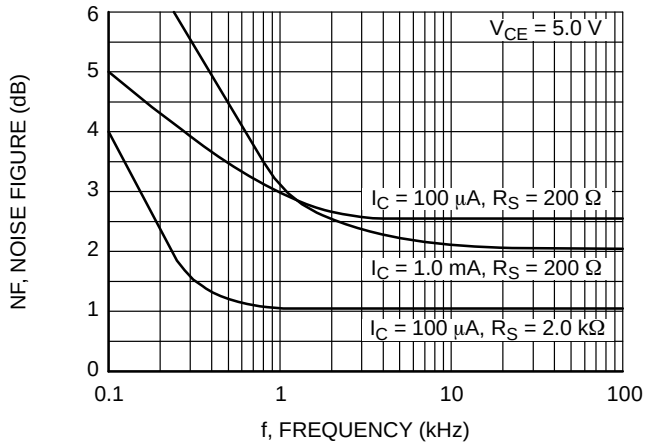



**Figure 7. Noise Figure vs. Frequency**

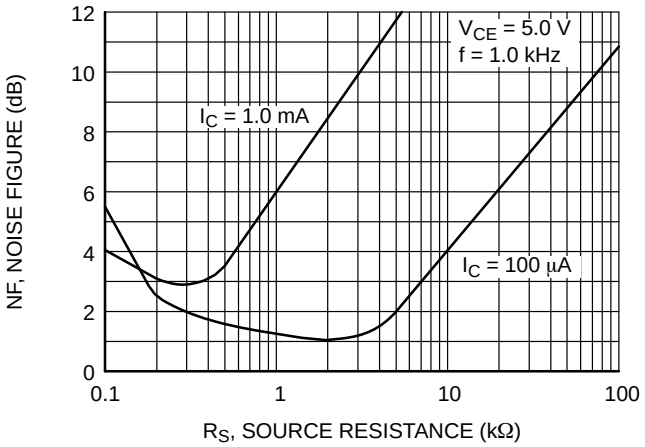



**Figure 8. Noise Figure vs. Source Resistance**

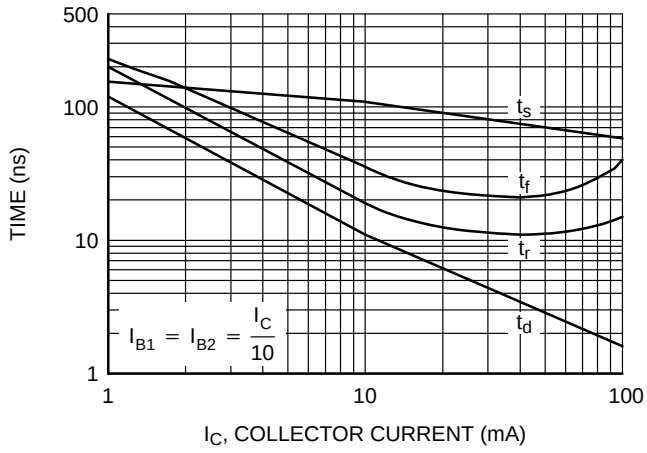



**Figure 9. Switching Times vs. Collector Current**

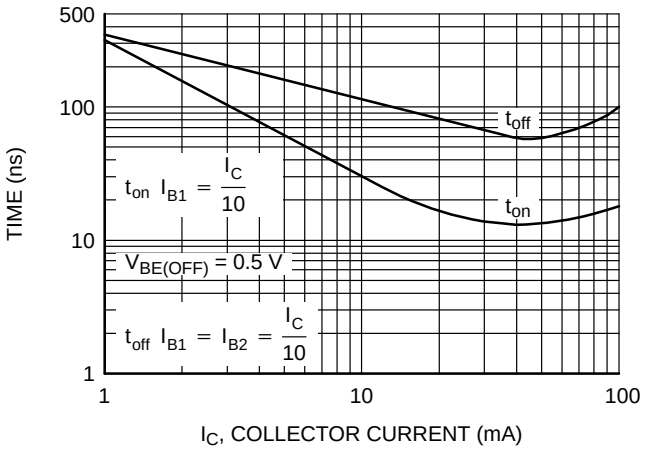



**Figure 10. Turn-On and Turn-Off Times vs. Collector Current**

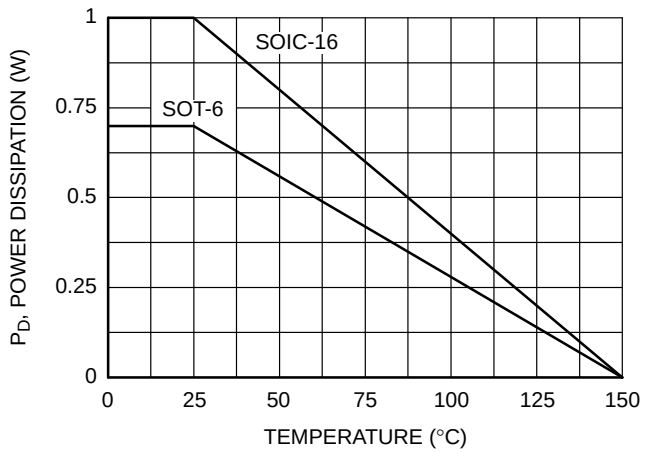



**Figure 11. Power Dissipation vs. Ambient Temperature**

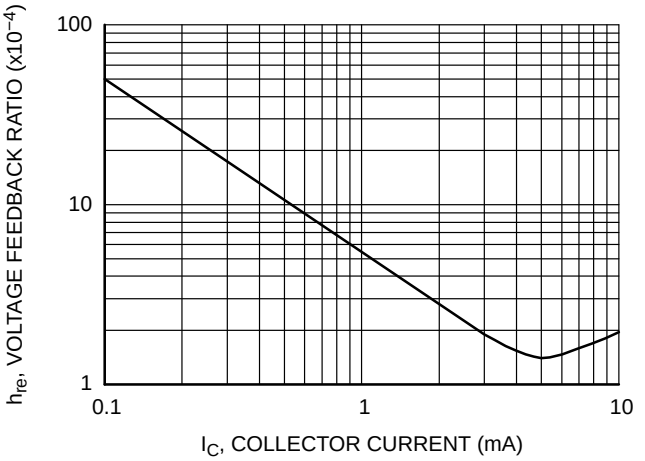



**Figure 12. Voltage Feedback Ratio**

## TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

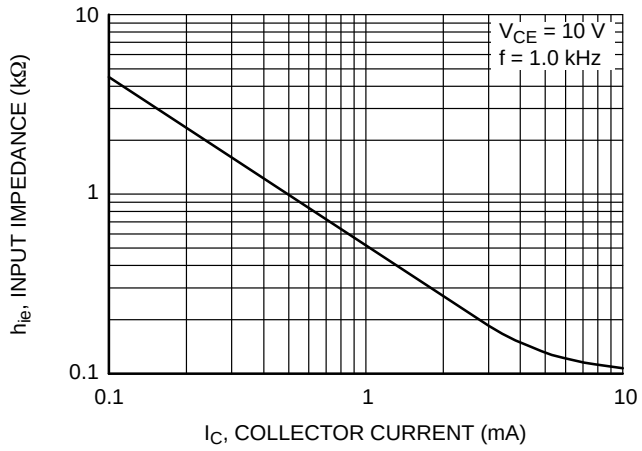



**Figure 13. Input Impedance**

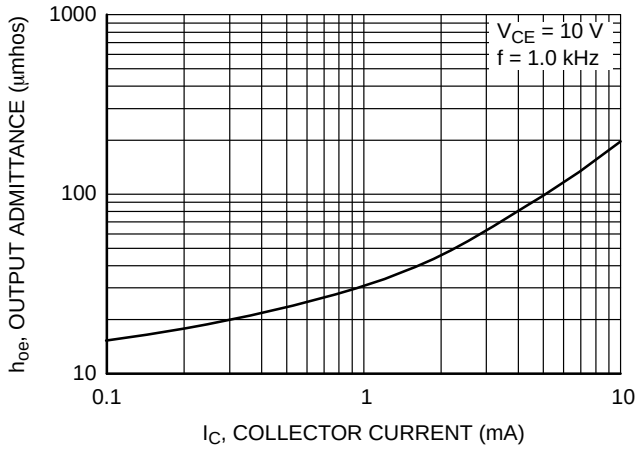



**Figure 14. Output Admittance**

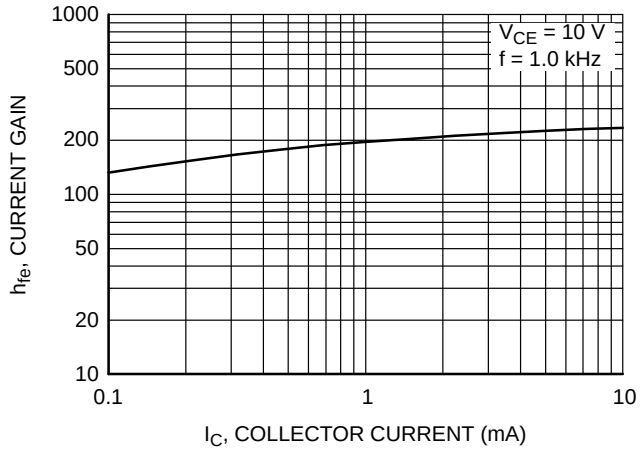


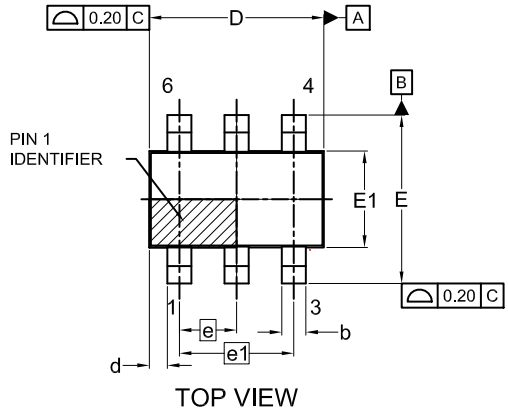

**Figure 15. Current Gain**



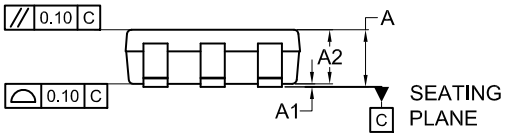
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**SCALE 2:1**

**TSOT23 6−Lead**
CASE 419BL
ISSUE A

DATE 31 AUG 2020

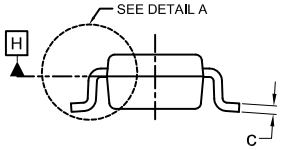



TOP VIEW

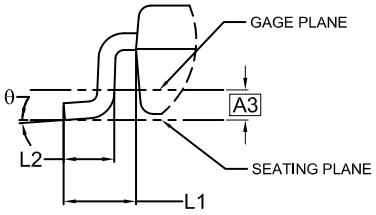



FRONT VIEW

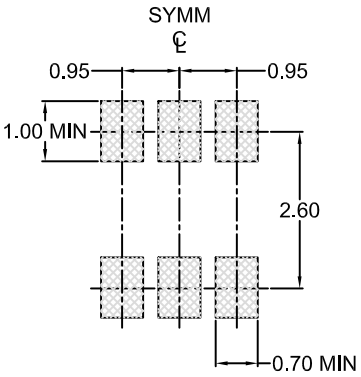
NOTE 4




SIDE VIEW




DETAIL A




LAND PATTERN
RECOMMENDATION

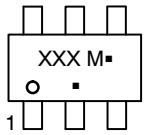
*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.25MM PER END. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
4. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.00 | 0.05 | 0.10 |
| A2 | 0.70 | 0.85 | 1.00 |
| A3 | | 0.25 BSC | |
| b | 0.25 | 0.38 | 0.50 |
| c | 0.10 | 0.18 | 0.26 |
| D | 2.80 | 2.95 | 3.10 |
| d | | 0.30 REF | |
| E | 2.50 | 2.75 | 3.00 |
| E1 | 1.30 | 1.50 | 1.70 |
| e | | 0.95 BSC | |
| e1 | | 1.90 BSC | |
| L1 | | 0.60 REF | |
| L2 | 0.20 | 0.40 | 0.60 |
| θ | 0° | --- | 10° |

**GENERIC MARKING DIAGRAM***




XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

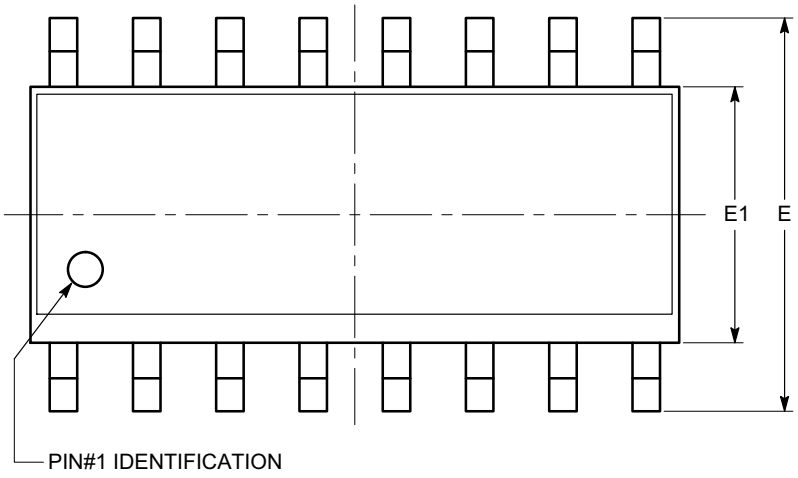
*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot " ▪", may or may not be present. Some products may not follow the Generic Marking.

| | | |
|---|---|---|
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| **DESCRIPTION:** | **TSOT23 6−Lead** | **PAGE 1 OF 1** |

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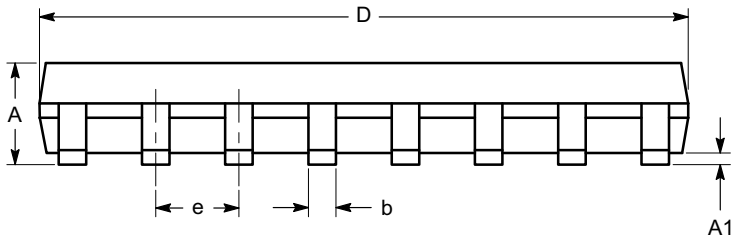
**SOIC−16, 150 mils**
CASE 751BG
ISSUE O

DATE 19 DEC 2008

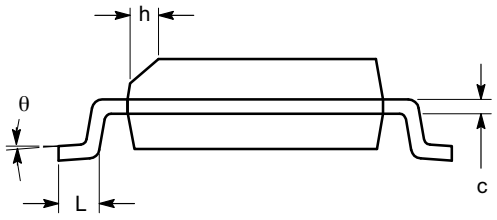



**TOP VIEW**

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 1.35 | | 1.75 |
| A1 | 0.10 | | 0.25 |
| b | 0.33 | | 0.51 |
| c | 0.19 | | 0.25 |
| D | 9.80 | 9.90 | 10.00 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.80 | 3.90 | 4.00 |
| e | 1.27 BSC | | |
| h | 0.25 | | 0.50 |
| L | 0.40 | | 1.27 |
| θ | 0º | | 8º |




**SIDE VIEW**




**END VIEW**

**Notes:**
(1) All dimensions are in millimeters. Angles in degrees.
(2) Complies with JEDEC MS-012.

| | | | |
|---|---|---|---|
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| **DESCRIPTION:** | **SOIC−16, 150 mils** | | **PAGE 1 OF 1** |

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