

# 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  $\mu$ A to 100 mA. Sourced from Process 66.

### ABSOLUTE MAXIMUM RATINGS (Note 1)

( $T_A = 25^\circ\text{C}$ , 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	$^\circ\text{C}$

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.

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.

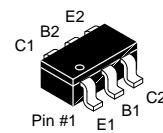
### THERMAL CHARACTERISTICS (Note 2)

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

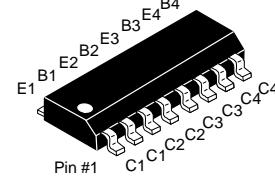
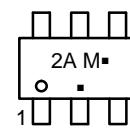
Symbol	Parameter	Max		Unit
		FMB3906	MMPQ3906	
$P_D$	Total Device Dissipation	700	1,000	mW
	Derate Above 25 $^\circ\text{C}$	5.6	8.0	mW/ $^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	180	–	$^\circ\text{C/W}$
	Thermal Resistance, Junction to Ambient, Effective 4 Die	–	125	$^\circ\text{C/W}$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

2. PCB size: FR-4 76 x 114 x 0.67 mm<sup>3</sup> (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.

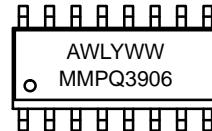
### MARKING DIAGRAM



TSOT23 6-Lead  
CASE 419BL

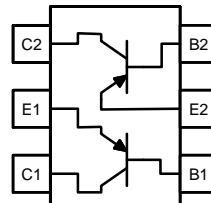


SOIC-16, 150 mils  
CASE 751BG

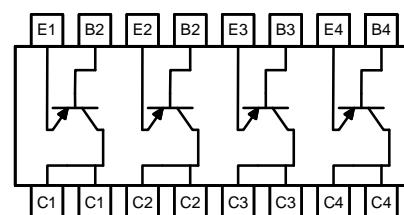


2A, MMPQ3906 = Specific Device Code  
M = Date Code  
– = Pb-Free Package  
A = Assembly Site  
WL = Wafer Lot Number  
Y = Year of Production  
WW = Work Week Number  
(Note: Microdot may be in either location)

### INTERNAL CONNECTIONS



FMB3906



MMPQ3906

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
FMB3906	TSOT23 (Pb-Free, Halide Free)	3000 / Tape & Reel
MMPQ3906	SOIC-16 (Pb-Free, Halide Free)	2500 / Tape & Reel

<sup>†</sup>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](#).

# FMB3906, MMPQ3906

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>OFF CHARACTERISTICS</b>							
$V_{(\text{BR})\text{CEO}}$	Collector-Emitter Breakdown Voltage (Note 3)	$I_C = -1.0 \text{ mA}, I_B = 0$	-40	-	-	V	
$V_{(\text{BR})\text{CBO}}$	Collector-Base Breakdown Voltage	$I_C = -10 \mu\text{A}, I_E = 0$	-40	-	-	V	
$V_{(\text{BR})\text{EBO}}$	Emitter-Base Breakdown Voltage	$I_E = -10 \mu\text{A}, I_C = 0$	-5.0	-	-	V	
$I_{BL}$	Base Cut-Off Current	$V_{CE} = -30 \text{ V}, V_{BE} = 3.0 \text{ V}$	-	-	-50	nA	
$I_{\text{CEX}}$	Collector Cut-Off Current	$V_{CE} = -30 \text{ V}, V_{BE} = 3.0 \text{ V}$	-	-	-50	nA	
<b>ON CHARACTERISTICS</b>							
$h_{FE}$	DC Current Gain (Note 3)	FMB3906	$I_C = -0.1 \text{ mA}, V_{CE} = -1.0 \text{ V}$	60	-	-	
		MMPQ3906		40	-	-	
		FMB3906	$I_C = -1.0 \text{ mA}, V_{CE} = -1.0 \text{ V}$	80	-	-	
		MMPQ3906		60	-	-	
		FMB3906	$I_C = 10 \text{ mA}, V_{CE} = -1.0 \text{ V}$	100	-	300	
		MMPQ3906		75	-	-	
		All Devices	$I_C = -50 \text{ mA}, V_{CE} = -1.0 \text{ V}$	60	-	-	
		All Devices	$I_C = -100 \text{ mA}, V_{CE} = -1.0 \text{ V}$	30	-	-	
$V_{CE(\text{sat})}$	Collector-Emitter Saturation Voltage	$I_C = -10 \text{ mA}, I_B = -1.0 \text{ mA}$	-	-	-0.25	V	
		$I_C = -50 \text{ mA}, I_B = -5.0 \text{ mA}$	-	-	-0.40		
$V_{BE(\text{sat})}$	Base-Emitter Saturation Voltage	$I_C = -10 \text{ mA}, I_B = -1.0 \text{ mA}$	-0.65	-	-0.85	V	
		$I_C = -50 \text{ mA}, I_B = -5.0 \text{ mA}$	-	-	-0.95		

## SMALL-SIGNAL CHARACTERISTICS (MMPQ3906 ONLY)

$f_T$	Current Gain-Bandwidth Product	$I_C = -10 \text{ mA}, V_{CE} = -20 \text{ V}, f = 100 \text{ MHz}$	-	200	-	MHz
$C_{ob}$	Output Capacitance	$V_{CB} = -5.0 \text{ V}, I_E = 0, f = 140 \text{ kHz}$	-	4.5	-	pF
$C_{ib}$	Input Capacitance	$V_{EB} = -0.5 \text{ V}, I_C = 0, f = 140 \text{ kHz}$	-	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  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2.0\%$ .

# FMB3906, MMPQ3906

## TYPICAL PERFORMANCE CHARACTERISTICS

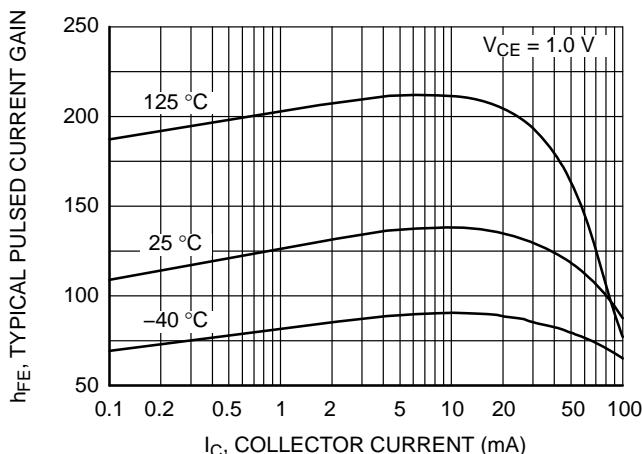


Figure 1. Typical Pulsed Current Gain vs. Collector Current

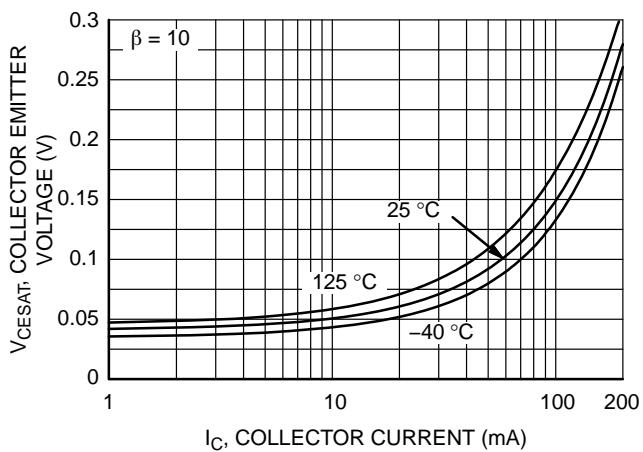


Figure 2. Collector-Emitter Saturation Voltage vs. Collector Current

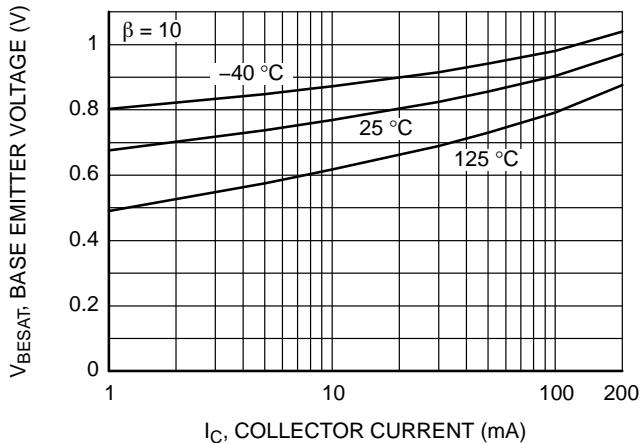


Figure 3. Base-Emitter Saturation Voltage vs. Collector Current

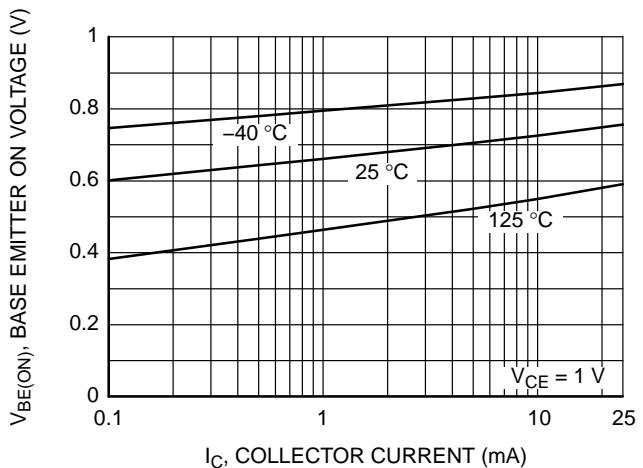


Figure 4. Base-Emitter On Voltage vs. Collector Current

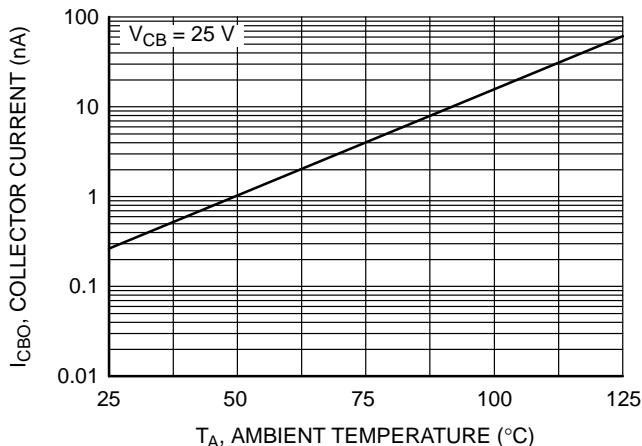


Figure 5. Collector Cut-Off Current vs. Ambient Temperature

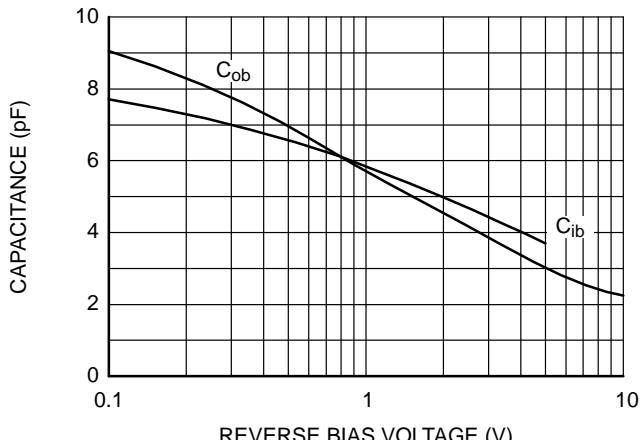


Figure 6. Common-Base Open Circuit Input and Output Capacitance vs. Reverse Bias Voltage

# FMB3906, MMPQ3906

## TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

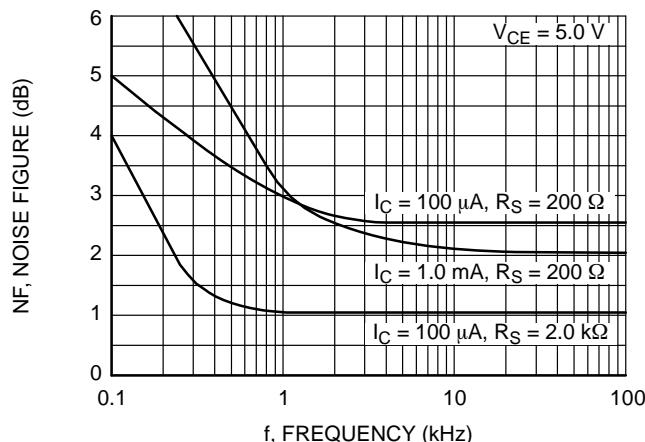


Figure 7. Noise Figure vs. Frequency

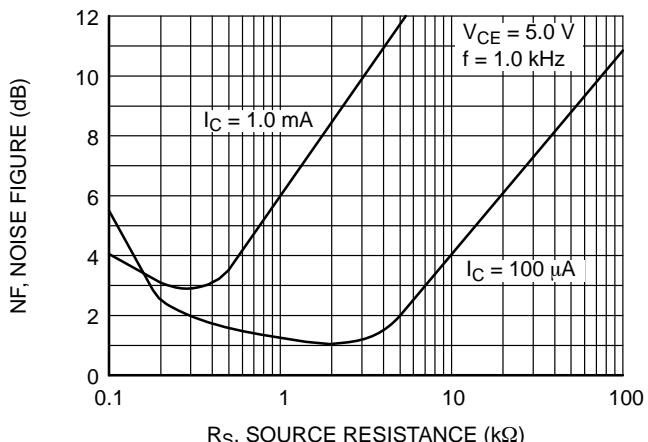


Figure 8. Noise Figure vs. Source Resistance

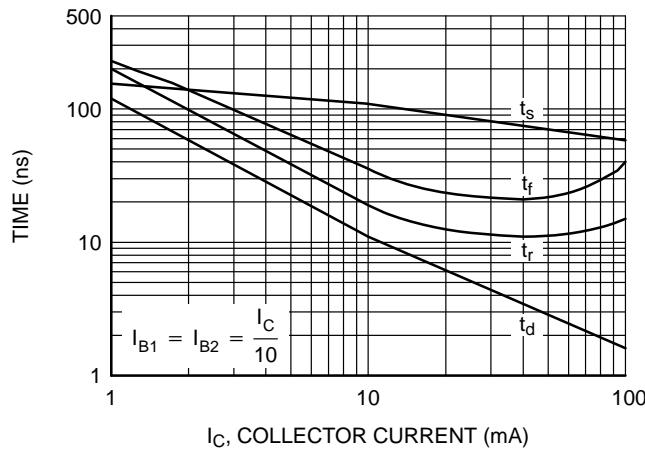


Figure 9. Switching Times vs. Collector Current

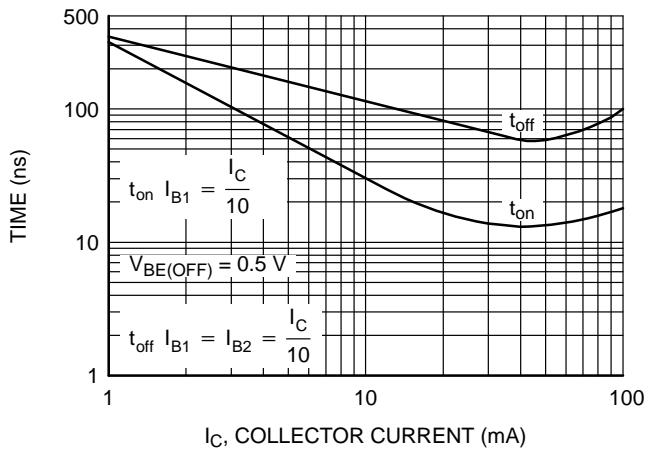


Figure 10. Turn-On and Turn-Off Times vs. Collector Current

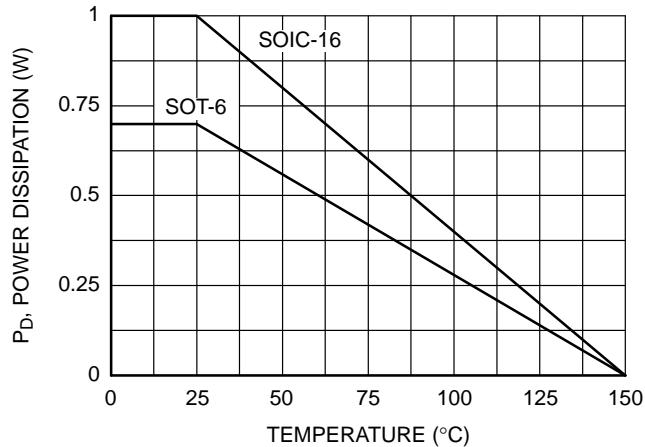


Figure 11. Power Dissipation vs. Ambient Temperature

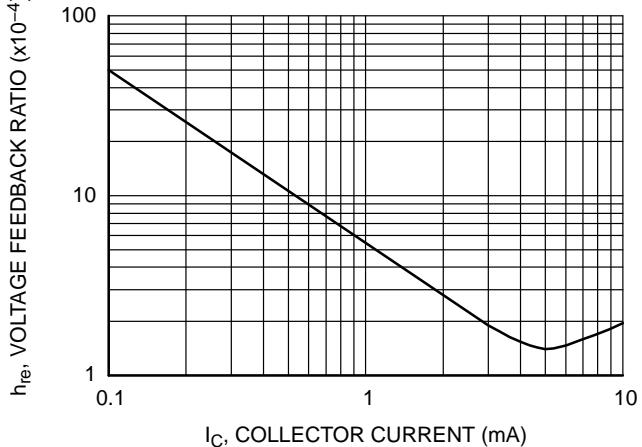


Figure 12. Voltage Feedback Ratio

# FMB3906, MMPQ3906

## TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

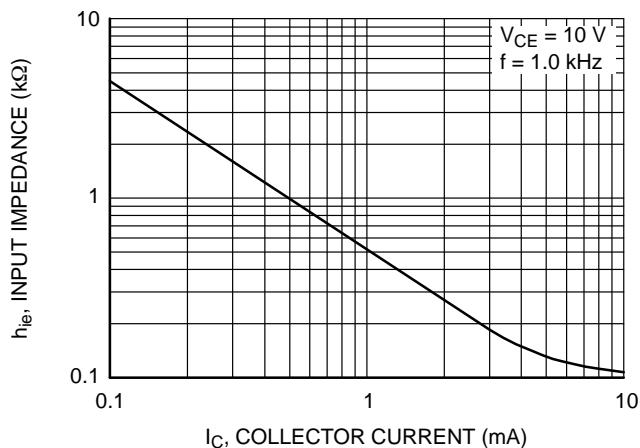


Figure 13. Input Impedance

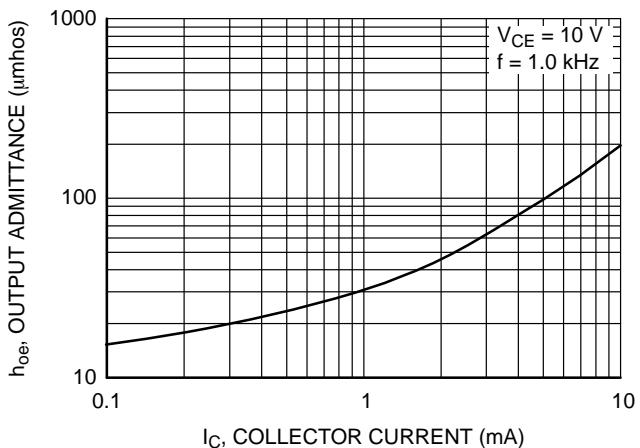


Figure 14. Output Admittance

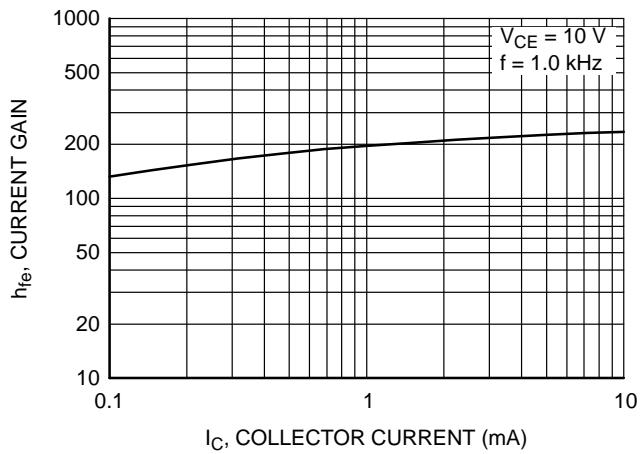
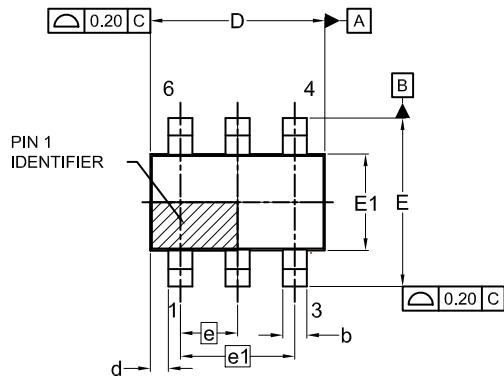


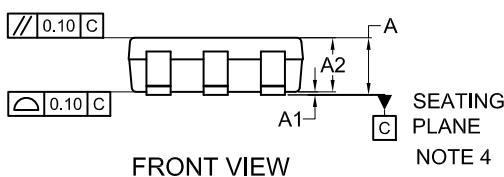
Figure 15. Current Gain



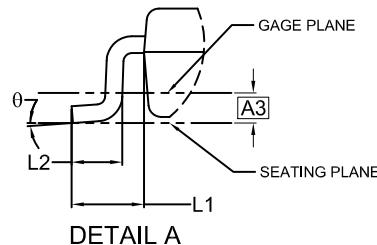
SCALE 2:1



TOP VIEW



FRONT VIEW



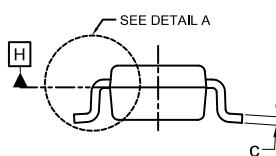
DETAIL A

TSOT23 6-Lead  
CASE 419BL  
ISSUE A

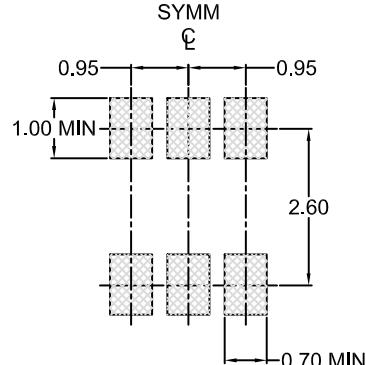
DATE 31 AUG 2020

## 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.

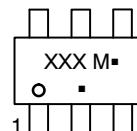


SIDE VIEW

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, SOLDERRRM.D.

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)

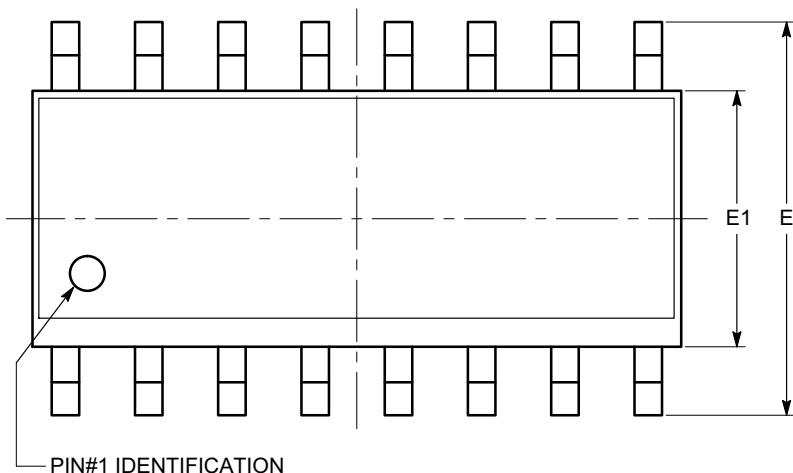
\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

DOCUMENT NUMBER:	98AON83292G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	TSOT23 6-Lead	PAGE 1 OF 1

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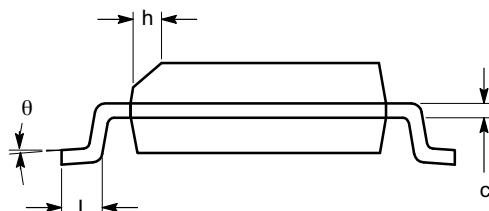
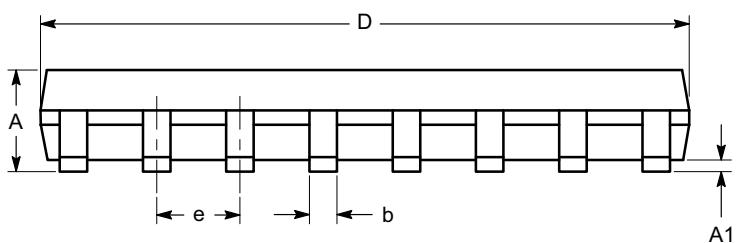
SOIC-16, 150 mils  
CASE 751BG  
ISSUE O

DATE 19 DEC 2008



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
$\theta$	$0^\circ$		$8^\circ$

TOP VIEW



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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