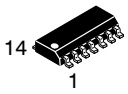
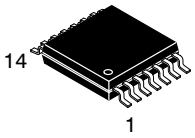
Quad 2-Input AND Gate

74VHC08



SOIC−14
D SUFFIX
CASE 751A



TSSOP−14
DT SUFFIX
CASE 948G

General Description

The VHC08 is an advanced high speed CMOS 2 Input AND Gate fabricated with silicon gate CMOS technology. It achieves the high−speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

The internal circuit is composed of 4 stages including buffer output, which provide high noise immunity and stable output. An input protection circuit insures that 0 V to 5.5 V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5 V to 3 V systems and two supply systems such as battery backup. This circuit prevents device destruction due to mismatched supply and input voltages.

Features

- High Speed: t_{PD} = 4.3 ns (Typ.) at T_A = 25°C
- High Noise Immunity: $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Power Down Protection is Provided on All Inputs
- Low Power Dissipation: I_{CC} = 2 μA (Max.) @ T_A = 25°C
- Low Noise: V_{OLP} = 0.8 V (Max.)
- Pin and Function Compatible with 74HC08
- Pb−Free, Halogen Free/BFR Free and RoHS Compliant

Logic Symbol

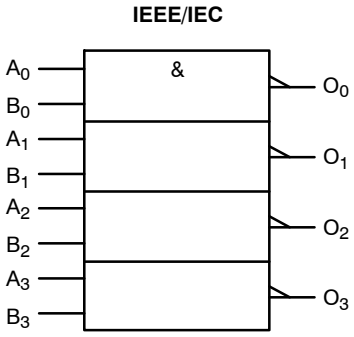
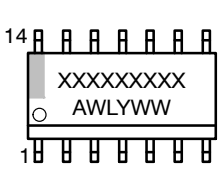


Figure 1. Logic Symbol

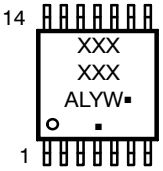
TRUTH TABLE

A	B	O
L	L	L
L	H	L
H	L	L
H	H	H

MARKING DIAGRAMS



(SOIC−14)

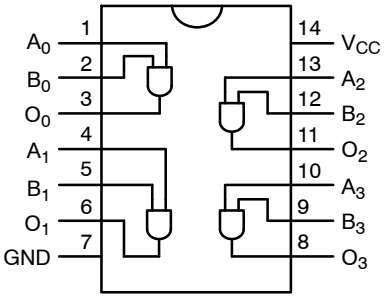


(TSSOP−14)

XXXXX = Specific Device Code
A = Assembly Location
WL, L = Wafer Lot
Y = Year
WW, W = Work Week
G or ▪ = Pb−Free Package

(Note: Microdot may be in either location)

CONNECTION DIAGRAM



PIN DESCRIPTION

Pin Names	Description
A_n, B_n	Inputs
O_n	Outputs

ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage	−0.5 to +6.5	V
V_{IN}	DC Input Voltage	−0.5 to +6.5	V
V_{OUT}	DC Output Voltage	−0.5 to V_{CC} + 0.5	V
I_{IN}	DC Input Current, per Pin	±20	mA
I_{OUT}	DC Output Current, per Pin	±25	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	±50	mA
I_{IK}	Input Clamp Current	−20	mA
I_{OK}	Output Clamp Current	±20	mA
T_{STG}	Storage Temperature Range	−65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 seconds	260	°C
T_J	Junction Temperature Under Bias	+150	°C
θ_{JA}	Thermal Resistance (Note 1) SOIC−14 TSSOP−14	 116 150	°C/W
P_D	Power Dissipation in Still Air at 25°C SOIC−14 TSSOP−14	 1077 833	mW
V_{ESD}	ESD Withstand Voltage (Note 2) Human Body Model Charged Device Model	 > 2000 N/A	V

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. Measured with minimum pad spacing on an FR4 board, using 76mm−by−114mm, 2−ounce copper trace no air flow per JESD51−7.
2. HBM tested to EIA / JESD22−A114−A. CDM tested to JESD22−C101−A. JEDEC recommends that ESD qualification to EIA/JESD22−A115A (Machine Model) be discontinued.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage	2.0	5.5	V
V_{IN}	DC Input Voltage (Note 3)	0	5.5	V
V_{OUT}	DC Output Voltage (Note 3)	0	V_{CC}	V
T_A	Operating Temperature	−40	+85	°C
t_r, t_f	Input Rise or Fall Rate V_{CC} = 3.0 V to 3.6 V V_{CC} = 4.5 V to 5.5 V	 0 0	 100 20	ns/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

3. Unused inputs must be held HIGH or LOW. They may not float.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	Conditions		T_A = 25°C			T_A = −40°C to +85°C		Unit
					Min	Typ	Max	Min	Max	
V_{IH}	HIGH Level Input Voltage	2.0			1.50	–	–	1.50	–	V
		3.0–5.5			0.7 x V_{CC}	–	–	0.7 x V_{CC}	–	
V_{IL}	LOW Level Input Voltage	2.0			–	–	0.50	–	0.50	V
		3.0–5.5			–	–	0.3 x V_{CC}	–	0.3 x V_{CC}	
V_{OH}	HIGH Level Output Voltage	2.0	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −50 μA	1.9	2.0	–	1.9	–	V
		3.0			2.9	3.0	–	2.9	–	
		4.5			4.4	4.5	–	4.4	–	
		3.0		I_{OH} = −4 mA	2.58	–	–	2.48	–	
		4.5		I_{OH} = −8 mA	3.94	–	–	3.80	–	
V_{OL}	LOW Level Output Voltage	2.0	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50 μA	–	0.0	0.1	–	0.1	V
		3.0			–	0.0	0.1	–	0.1	
		4.5			–	0.0	0.1	–	0.1	
		3.0		I_{OL} = 4 mA	–	–	0.36	–	0.44	
		4.5		I_{OL} = 8 mA	–	–	0.36	–	0.44	
I_{IN}	Input Leakage Current	0–5.5	V_{IN} = 5.5 V or GND		–	–	±0.1	–	±1.0	μA
I_{CC}	Quiescent Supply Current	5.5	V_{IN} = V_{CC} or GND		–	–	2.0	–	20.0	μA

NOISE CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	Conditions	T_A = 25°C		Unit
				Typ	Limits	
V_{OLP}	Quiet Output Maximum Dynamic V_{OL} (Note 4)	5.0	C_L = 50 pF	0.3	0.8	V
V_{OLV}	Quiet Output Minimum Dynamic V_{OL} (Note 4)	5.0	C_L = 50 pF	−0.3	−0.8	V
V_{IHD}	Minimum HIGH Level Dynamic Input Voltage (Note 4)	5.0	C_L = 50 pF	–	3.5	V
V_{ILD}	Maximum LOW Level Dynamic Input Voltage (Note 4)	5.0	C_L = 50 pF	–	1.5	V

4. Parameter guaranteed by design.

AC ELECTRICAL CHARACTERISTICS

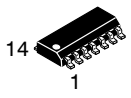
Symbol	Parameter	V_{CC} (V)	Conditions	T_A = 25°C			T_A = −40°C to +85°C		Unit
				Min	Typ	Max	Min	Max	
t_{PHL}, t_{PLH}	Propagation Delay	3.3 ±0.3	C_L = 15 pF	–	6.2	8.8	1.0	10.5	ns
			C_L = 50 pF	–	8.7	12.3	1.0	14.0	
		5.0 ±0.5	C_L = 15 pF	–	4.3	5.9	1.0	7.0	ns
			C_L = 50 pF	–	5.8	7.9	1.0	9.0	
C_{IN}	Input Capacitance		V_{CC} = Open	–	4	10	–	10	pF
C_{PD}	Power Dissipation Capacitance		(Note 5)	–	18	–	–	–	pF

5. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:
I_{CC} (opr.) = C_{PD} × V_{CC} × f_{IN} + I_{CC} / 4 (per gate).

ORDERING INFORMATION

Device Order Number	Top Marking	Package Type	Shipping†
74VHC08M	VHC08G	SOIC−14 (Pb−Free, Halide Free)	55 / Tube
74VHC08MX	VHC08G	SOIC−14 (Pb−Free, Halide Free)	2,500 / Tape & Reel
74VHC08MTCX	VHC 08	TSSOP−14 (Pb−Free, Halide Free)	2,500 / Tape & Reel

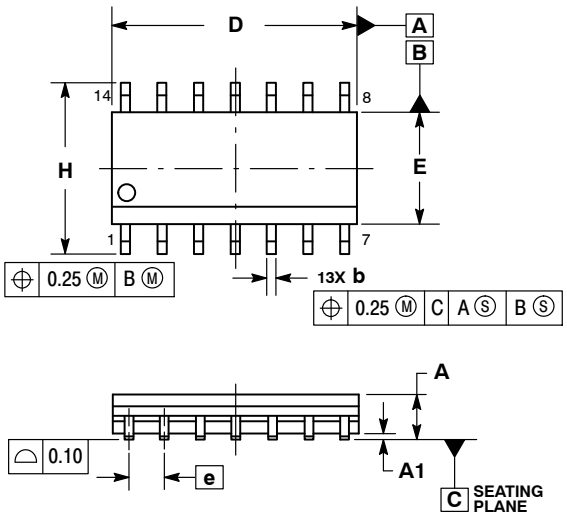
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

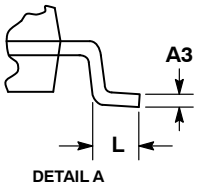


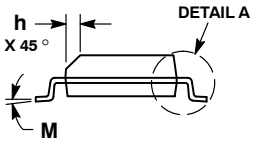
SCALE 1:1

SOIC−14 NB
CASE 751A−03
ISSUE L

DATE 03 FEB 2016



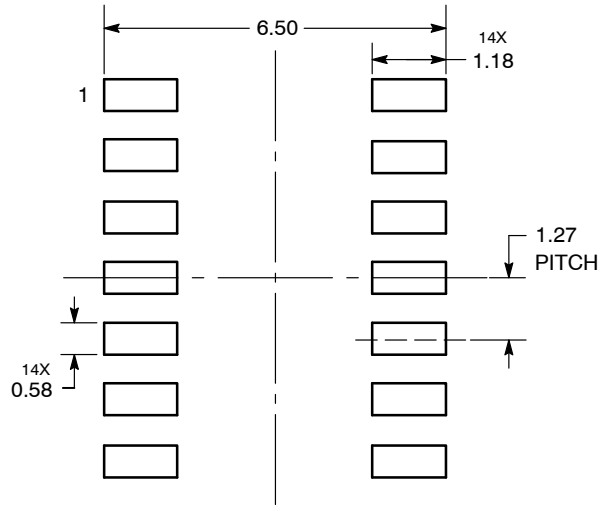




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0 °	7 °	0 °	7 °

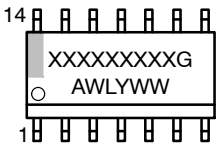
SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
G = 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. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

DOCUMENT NUMBER:	**98ASB42565B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.	
DESCRIPTION:	**SOIC−14 NB**		**PAGE 1 OF 2**

SOIC−14
CASE 751A−03
ISSUE L

DATE 03 FEB 2016

STYLE 1:
PIN 1. COMMON CATHODE
2. ANODE/CATHODE
3. ANODE/CATHODE
4. NO CONNECTION
5. ANODE/CATHODE
6. NO CONNECTION
7. ANODE/CATHODE
8. ANODE/CATHODE
9. ANODE/CATHODE
10. NO CONNECTION
11. ANODE/CATHODE
12. ANODE/CATHODE
13. NO CONNECTION
14. COMMON ANODE

STYLE 2:
CANCELLED

STYLE 3:
PIN 1. NO CONNECTION
2. ANODE
3. ANODE
4. NO CONNECTION
5. ANODE
6. NO CONNECTION
7. ANODE
8. ANODE
9. ANODE
10. NO CONNECTION
11. ANODE
12. ANODE
13. NO CONNECTION
14. COMMON CATHODE

STYLE 4:
PIN 1. NO CONNECTION
2. CATHODE
3. CATHODE
4. NO CONNECTION
5. CATHODE
6. NO CONNECTION
7. CATHODE
8. CATHODE
9. CATHODE
10. NO CONNECTION
11. CATHODE
12. CATHODE
13. NO CONNECTION
14. COMMON ANODE

STYLE 5:
PIN 1. COMMON CATHODE
2. ANODE/CATHODE
3. ANODE/CATHODE
4. ANODE/CATHODE
5. ANODE/CATHODE
6. NO CONNECTION
7. COMMON ANODE
8. COMMON CATHODE
9. ANODE/CATHODE
10. ANODE/CATHODE
11. ANODE/CATHODE
12. ANODE/CATHODE
13. NO CONNECTION
14. COMMON ANODE

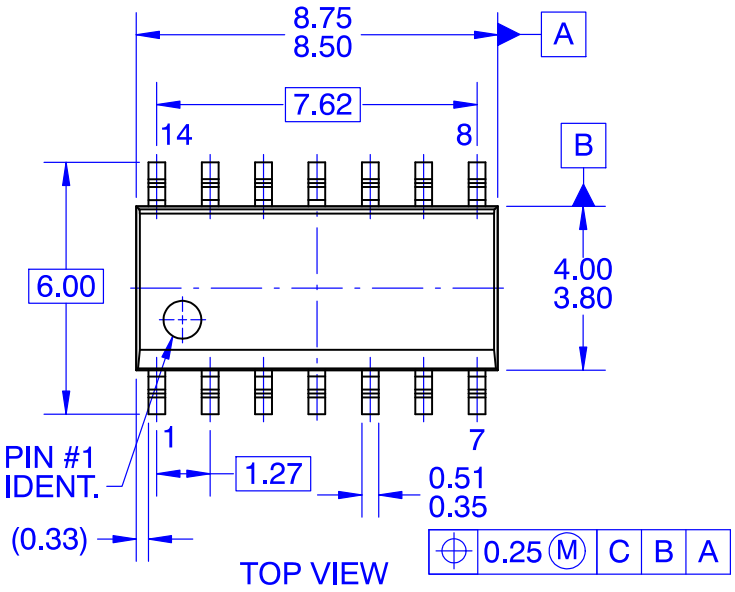
STYLE 6:
PIN 1. CATHODE
2. CATHODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE
7. CATHODE
8. ANODE
9. ANODE
10. ANODE
11. ANODE
12. ANODE
13. ANODE
14. ANODE

STYLE 7:
PIN 1. ANODE/CATHODE
2. COMMON ANODE
3. COMMON CATHODE
4. ANODE/CATHODE
5. ANODE/CATHODE
6. ANODE/CATHODE
7. ANODE/CATHODE
8. ANODE/CATHODE
9. ANODE/CATHODE
10. ANODE/CATHODE
11. COMMON CATHODE
12. COMMON ANODE
13. ANODE/CATHODE
14. ANODE/CATHODE

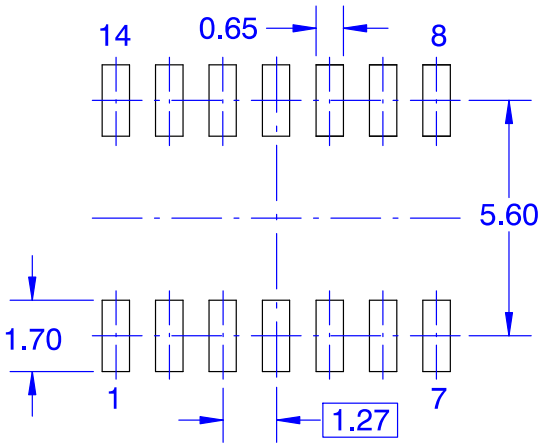
STYLE 8:
PIN 1. COMMON CATHODE
2. ANODE/CATHODE
3. ANODE/CATHODE
4. NO CONNECTION
5. ANODE/CATHODE
6. ANODE/CATHODE
7. COMMON ANODE
8. COMMON ANODE
9. ANODE/CATHODE
10. ANODE/CATHODE
11. NO CONNECTION
12. ANODE/CATHODE
13. ANODE/CATHODE
14. COMMON CATHODE

SOIC14
CASE 751EF
ISSUE O

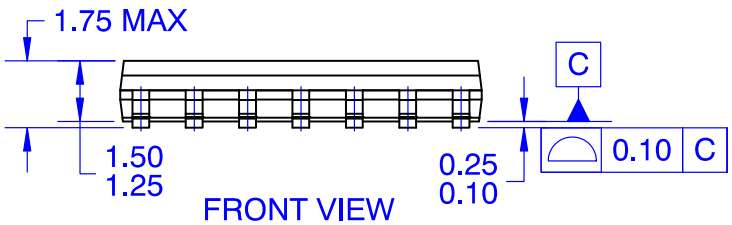
DATE 30 SEP 2016



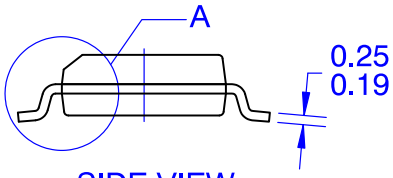
TOP VIEW



LAND PATTERN RECOMMENDATION

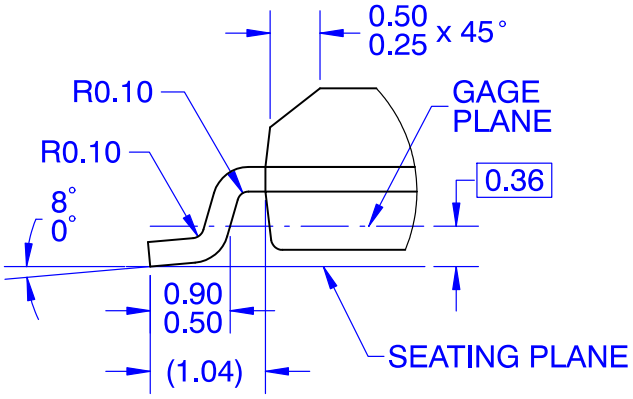


FRONT VIEW



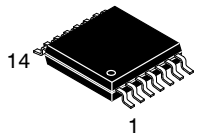
SIDE VIEW

NOTES:
A. CONFORMS TO JEDEC MS−012, VARIATION AB, ISSUE C
B. ALL DIMENSIONS ARE IN MILLIMETERS
C. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS
D. LAND PATTERN STANDARD: SOIC127P600X145−14M
E. CONFORMS TO ASME Y14.5M, 2009



DETAIL A
SCALE 16 : 1

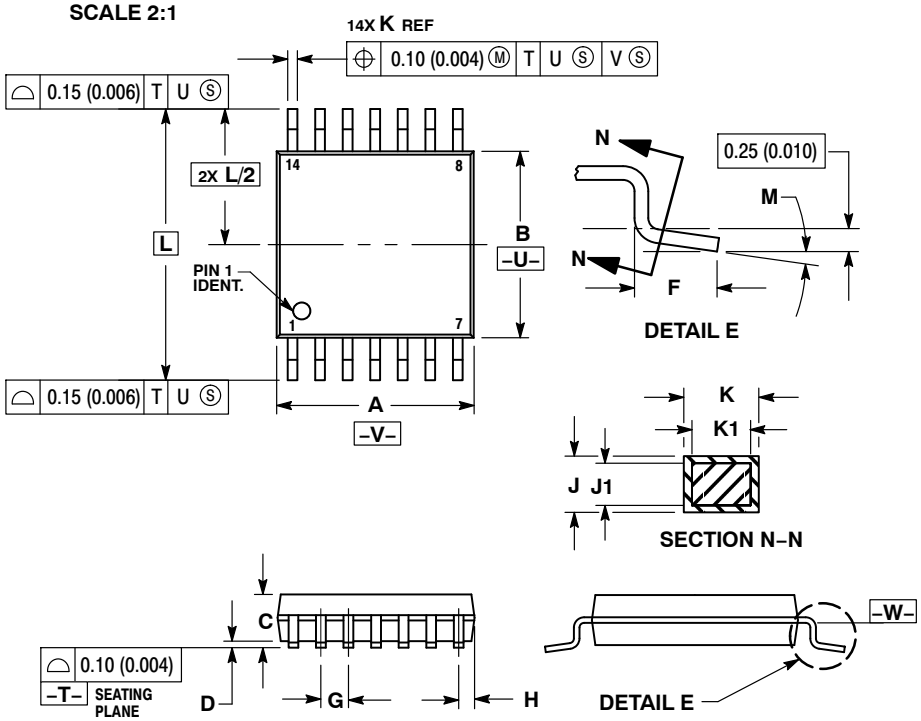
DOCUMENT NUMBER:	**98AON13739G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**SOIC14**	**PAGE 1 OF 1**



SCALE 2:1

TSSOP−14 WB
CASE 948G
ISSUE C

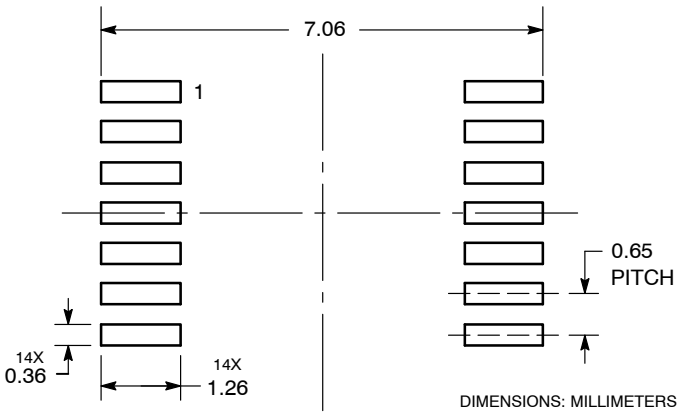
DATE 17 FEB 2016



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE −W−.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	−−−	1.20	−−−	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0 °	8 °	0 °	8 °

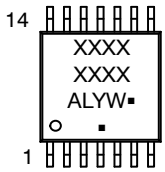
RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



A	= Assembly Location
L	= Wafer Lot
Y	= Year
W	= Work Week
▪	= 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:	**98ASH70246A**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**TSSOP−14 WB**	**PAGE 1 OF 1**

ADDITIONAL INFORMATION

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