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MC74VHC126

Quad Bus Buffer
with 3−State Control Inputs

The MC74VHC126 is a high speed CMOS quad bus buffer fabricated with silicon gate CMOS technology. It achieves noninverting high speed operation similar to equivalent Bipolar Schottky TTL while maintaining CMOS low power dissipation.

The MC74VHC126 requires the 3−state control input (OE) to be set Low to place the output into high impedance.

The internal circuit is composed of three stages, including a buffer output which provides high noise immunity and stable output. The inputs tolerate voltages up to 7.0 V, allowing the interface of 5.0 V systems to 3.0 V systems.

- High Speed: t_{PD} = 3.8 ns (Typ) at V_{CC} = 5.0 V
- Low Power Dissipation: I_{CC} = 4.0 μA (Max) at T_A = 25°C
- High Noise Immunity: $V_{NIH} = V_{NIL}$ = 28% V_{CC}
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Designed for 2.0 V to 5.5 V Operating Range
- Low Noise: V_{OLP} = 0.8 V (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300 mA
- ESD Performance: HBM > 2000 V; Machine Model > 200 V
- Chip Complexity: 72 FETs or 18 Equivalent Gates
- These Devices are Pb−Free and are RoHS Compliant

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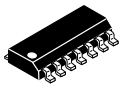
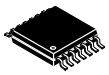
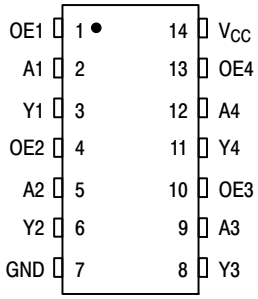


14−LEAD SOIC
D SUFFIX
CASE 751A



14−LEAD TSSOP
DT SUFFIX
CASE 948G

PIN CONNECTIONS



(Top View)

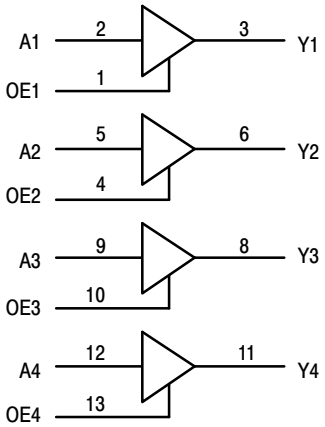
ORDERING INFORMATION

Device	Package	Shipping
MC74VHC126DR2G	SOIC	2500 Units/Reel
MC74VHC126DTR2G	TSSOP	2500 Units/Reel

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 7 of this data sheet.

Active−High Output Enables



FUNCTION TABLE

VHC126		
Inputs		Output
A	OE	Y
H	H	H
L	H	L
X	L	Z

Figure 1. Logic Diagram

MAXIMUM RATINGS (Note 1)

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		–0.5 to +7.0	V
V_{in}	DC Input Voltage		–0.5 to +7.0	V
V_{out}	DC Output Voltage		–0.5 to V_{CC} + 0.5	V
I_{IK}	Input Diode Current		–20	mA
I_{OK}	Output Diode Current		±20	mA
I_{out}	DC Output Current, per Pin		±25	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins		±50	mA
P_D	Power Dissipation in Still Air (Note 2)	SOIC Packages TSSOP Package	500 450	mW
T_{stg}	Storage Temperature		–65 to +150	°C

1. Maximum Ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute maximum–rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.
2. Derating – SOIC Packages: – 7.0 mW/°C from 65° to 125°C
   TSSOP Package: – 6.1 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage		2.0	5.5	V
V_{in}	DC Input Voltage		0	5.5	V
V_{out}	DC Output Voltage		0	V_{CC}	V
T_A	Operating Temperature, All Package Types		–55	+125	°C
t_r, t_f	Input Rise and Fall Time	V_{CC} = 3.3 V ±0.3 V V_{CC} = 5.0 V ±0.5 V	0 0	100 20	ns/V

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V_{CC} (V)	T_A = 25°C Min	T_A = 25°C Typ	T_A = 25°C Max	$T_A \le 85°C$ Min	$T_A \le 85°C$ Max	$T_A \le 125°C$ Min	$T_A \le 125°C$ Max	Unit
V_{IH}	Minimum High−Level Input Voltage		2.0 3.0 4.5 5.5	1.5 2.1 3.15 3.85			1.5 2.1 3.15 3.85		1.5 2.1 3.15 3.85		V
V_{IL}	Maximum Low−Level Input Voltage		2.0 3.0 4.5 5.5			0.5 0.9 1.35 1.65		0.5 0.9 1.35 1.65		0.5 0.9 1.35 1.65	V
V_{OH}	Minimum High−Level Output Voltage $V_{IN} = V_{IH}$ or V_{IL}	$V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = -50$ μA	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5		1.9 2.9 4.4		1.9 2.9 4.4		V
		$V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = -4.0$ mA $I_{OH} = -8.0$ mA	 3.0 4.5	 2.58 3.94			 2.48 3.80		 2.34 3.66		V
V_{OL}	Maximum Low−Level Output Voltage $V_{IN} = V_{IH}$ or V_{IL}	$V_{IN} = V_{IH}$ or V_{IL} $I_{OL} = 50$ μA	2.0 3.0 4.5		0.0 0.0 0.0	0.1 0.1 0.1		0.1 0.1 0.1		0.1 0.1 0.1	V
		$V_{IN} = V_{IH}$ or V_{IL} $I_{OL} = 4.0$ mA $I_{OL} = 8.0$ mA	 3.0 4.5			 0.36 0.36		 0.44 0.44		 0.52 0.52	V
I_{OZ}	Maximum 3−State Leakage Current	$V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = V_{CC}$ or GND	5.5			±0.25		±2.5		±2.5	μA
I_{IN}	Maximum Input Leakage Current	$V_{IN} = 5.5$ V or GND	0 to 5.5			±0.1		±1.0		±1.0	μA
I_{CC}	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND	5.5			4.0		40		40	μA

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns)

Symbol	Parameter	Test Conditions	$T_A = 25°C$ Min	$T_A = 25°C$ Typ	$T_A = 25°C$ Max	$T_A \leq 85°C$ Min	$T_A \leq 85°C$ Max	$T_A \leq 125°C$ Min	$T_A \leq 125°C$ Max	Unit
t_{PLH}, t_{PHL}	Maximum Propagation Delay, A to Y	$V_{CC} = 3.3 \pm 0.3$ V, $C_L = 15$ pF		5.6	8.0	1.0	9.5	1.0	12.0	ns
		$V_{CC} = 3.3 \pm 0.3$ V, $C_L = 50$ pF		8.1	11.5	1.0	13.0	1.0	15.0	
		$V_{CC} = 5.0 \pm 0.5$ V, $C_L = 15$ pF		3.8	5.5	1.0	6.5	1.0	8.5	
		$V_{CC} = 5.0 \pm 0.5$ V, $C_L = 50$ pF		5.3	7.5	1.0	8.5	1.0	10.5	
t_{PZL}, t_{PZH}	Maximum Output Enable TIme, OE to Y	$V_{CC} = 3.3 \pm 0.3$ V, $R_L = 1.0$ kΩ, $C_L = 15$ pF		5.4	8.0	1.0	9.5	1.0	11.5	ns
		$V_{CC} = 3.3 \pm 0.3$ V, $R_L = 1.0$ kΩ, $C_L = 50$ pF		7.9	11.5	1.0	13.0	1.0	15.0	
		$V_{CC} = 5.0 \pm 0.5$ V, $R_L = 1.0$ kΩ, $C_L = 15$ pF		3.6	5.1	1.0	6.0	1.0	7.5	
		$V_{CC} = 5.0 \pm 0.5$ V, $R_L = 1.0$ kΩ, $C_L = 50$ pF		5.1	7.1	1.0	8.0	1.0	9.5	
t_{PLZ}, t_{PHZ}	Maximum Output Disable Time, OE to Y	$V_{CC} = 3.3 \pm 0.3$ V, $R_L = 1.0$ kΩ, $C_L = 50$ pF		9.5	13.2	1.0	15.0	1.0	18.0	ns
		$V_{CC} = 5.0 \pm 0.5$ V, $R_L = 1.0$ kΩ, $C_L = 50$ pF		6.1	8.8	1.0	10.0	1.0	12.0	
t_{OSLH}, t_{OSHL}	Output−to−Output Skew	$V_{CC} = 3.3 \pm 0.3$ V, $C_L = 50$ pF (Note 3)			1.5		1.5		1.5	ns
		$V_{CC} = 5.0 \pm 0.5$ V, $C_L = 50$ pF (Note 3)			1.0		1.0		1.0	
C_{in}	Maximum Input Capacitance			4.0	10		10		10	pF
C_{out}	Maximum Three−State Output Capacitance (Output in High Impedance State)			6.0						pF

		Typical @ 25°C, $V_{CC} = 5.0$V	
C_{PD}	Power Dissipation Capacitance (Note 4)	15	pF

3. Parameter guaranteed by design. $t_{OSLH} = |t_{PLHm} - t_{PLHn}|$, $t_{OSHL} = |t_{PHLm} - t_{PHLn}|$.
4. 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: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}/4$ (per buffer). C_{PD} is used to determine the no−load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

NOISE CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns, $C_L = 50$ pF, $V_{CC} = 5.0$ V)

Symbol	Characteristic	$T_A = 25°C$ Typ	$T_A = 25°C$ Max	Unit
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	0.3	0.8	V
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	− 0.3	− 0.8	V
V_{IHD}	Minimum High Level Dynamic Input Voltage		3.5	V
V_{ILD}	Maximum Low Level Dynamic Input Voltage		1.5	V

SWITCHING WAVEFORMS

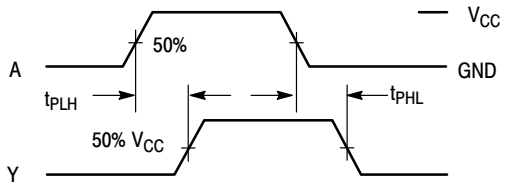


Figure 2.

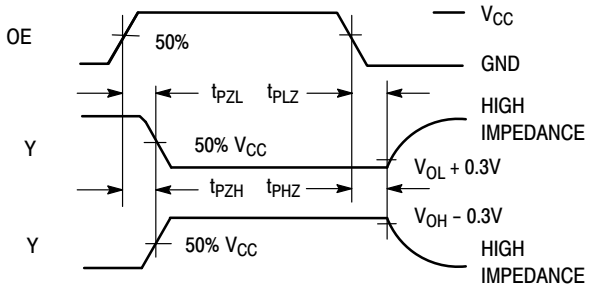
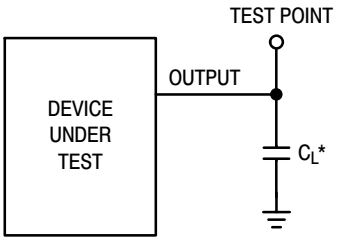
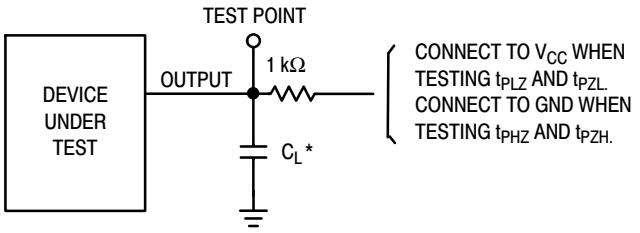


Figure 3.



*Includes all probe and jig capacitance

Figure 4. Test Circuit



*Includes all probe and jig capacitance

Figure 5. Test Circuit

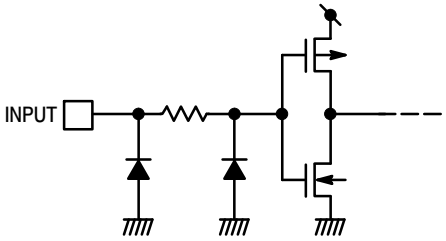
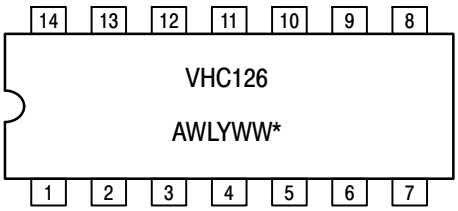
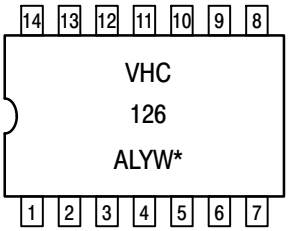


Figure 6. Input Equivalent Circuit

MARKING DIAGRAMS



14−LEAD SOIC
D SUFFIX
CASE 751A



14−LEAD TSSOP
DT SUFFIX
CASE 948G

*See Applications Note #AND8004/D for date code and traceability information.

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

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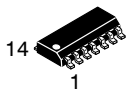

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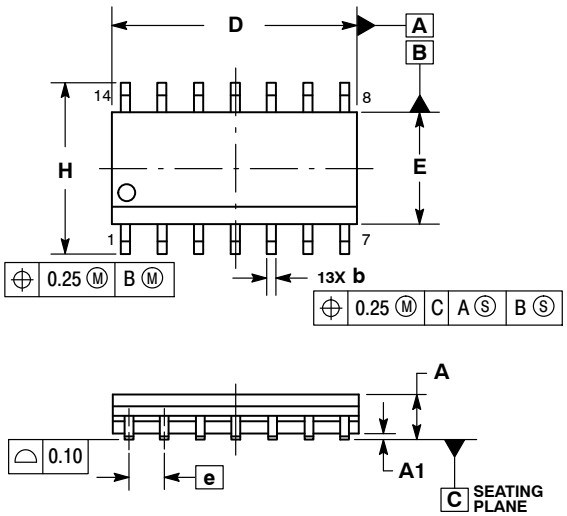
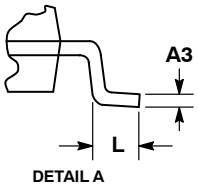
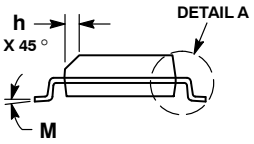
SOIC−14 NB
CASE 751A−03
ISSUE L

DATE 03 FEB 2016



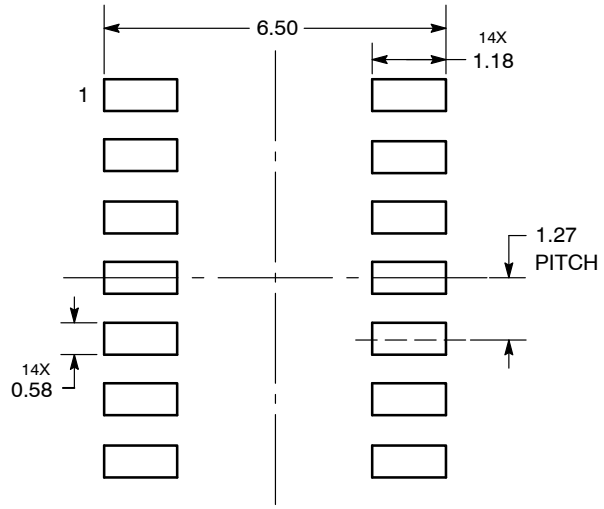




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM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

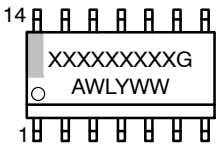
SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor 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.

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

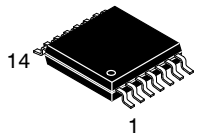
STYLE 8:
PIN 1. COMMON CATHODE
2. ANODE/CATHODE
3. ANODE/CATHODE
4. NO CONNECTION
5. ANODE/CATHODE
6. ANODE/CATHODE
7. COMMON ANODE
8. COMMON ANODE
9. ANODE/CATHODE
10. ANODE/CATHODE
11. NO CONNECTION
12. ANODE/CATHODE
13. ANODE/CATHODE
14. COMMON CATHODE

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

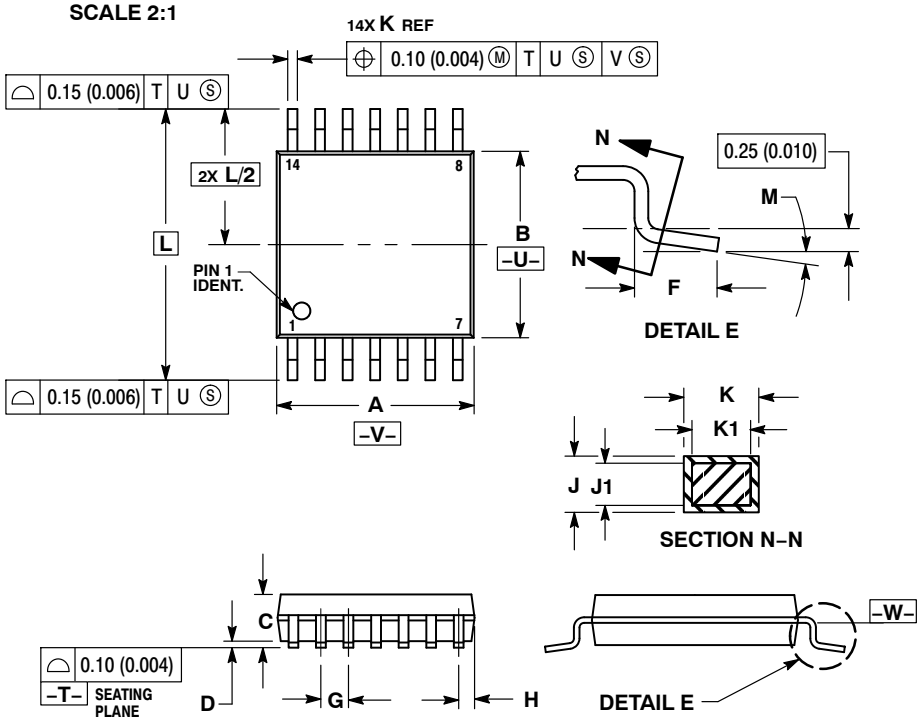
ON Semiconductor®

TSSOP−14 WB
CASE 948G
ISSUE C

DATE 17 FEB 2016



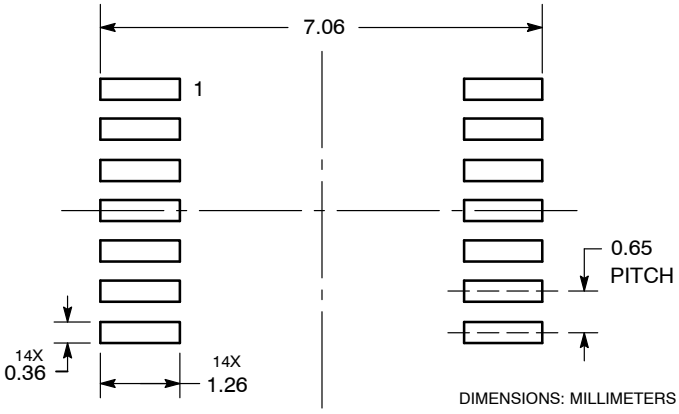
SCALE 2:1



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−.

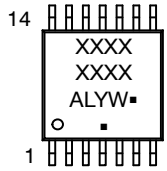
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	−−−	1.20	−−−	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010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

SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

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.

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