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# Is Now



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# **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:  $t_{PD} = 3.8 \text{ ns}$  (Typ) at  $V_{CC} = 5.0 \text{ V}$
- Low Power Dissipation:  $I_{CC} = 4.0 \mu A$  (Max) at  $T_A = 25^{\circ}C$
- 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:  $V_{OLP} = 0.8 \text{ V (Max)}$
- 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**

0E1 [	1 ●	14		$V_{CC}$		
A1 [	2	13	þ	OE4		
Y1 [	3	12	þ	A4		
0E2 [	4	11	þ	<b>Y</b> 4		
A2 [	5	10	þ	OE3		
Y2 [	6	9	þ	А3		
GND [	7	8	þ	Y3		
(Top View)						

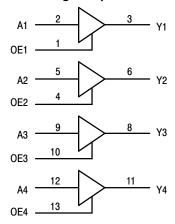
#### **ORDERING INFORMATION**

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				
Inp	outs	Output		
Α	OE	Υ		
Н	Н	Н		
L	Н	L		
Х	L	Z		

Figure 1. Logic Diagram

#### MAXIMUM RATINGS (Note 1)

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage	-0.5 to +7.0	V
V <sub>in</sub>	DC Input Voltage	−0.5 to +7.0	V
V <sub>out</sub>	DC Output Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	Input Diode Current	-20	mA
lok	Output Diode Current	±20	mA
I <sub>out</sub>	DC Output Current, per Pin	±25	mA
I <sub>CC</sub>	DC Supply Current, V <sub>CC</sub> and GND Pins	±50	mA
P <sub>D</sub>	Power Dissipation in Still Air (Note 2) SOIC Packages TSSOP Package	500 450	mW
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C

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.

#### **RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter		Max	Unit
V <sub>CC</sub>	DC Supply Voltage	2.0	5.5	V
V <sub>in</sub>	DC Input Voltage	0	5.5	V
V <sub>out</sub>	DC Output Voltage	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature, All Package Types		+125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time $ V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}                                  $	0 0	100 20	ns/V

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

#### DC ELECTRICAL CHARACTERISTICS

			Vcc	1	_A = 25°(		$T_A \le$	85°C	<b>T</b> <sub>A</sub> ≤ 1	125°C	
Symbol	Parameter	Test Conditions	(V)	Min	Тур	Max	Min	Max	Min	Max	Unit
V <sub>IH</sub>	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 <sub>IL</sub>	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 <sub>OH</sub>	Minimum High-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -50  \mu\text{A}$	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 <sub>OL</sub>	Maximum Low-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	$V_{IN} = V_{IH}$ or $V_{IL}$ $I_{OL} = 50 \mu A$	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 <sub>OZ</sub>	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	μА
I <sub>IN</sub>	Maximum Input Leakage Current	V <sub>IN</sub> = 5.5 V or GND	0 to 5.5			±0.1		±1.0		±1.0	μА
I <sub>CC</sub>	Maximum Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5			4.0		40		40	μА

#### AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0 \text{ ns}$ )

				7	T <sub>A</sub> = 25°C		<b>T</b> <sub>A</sub> = ≤ 85°C		<b>T</b> <sub>A</sub> = ≤ 125°C		
Symbol	Parameter	Test Condi	tions	Min	Тур	Max	Min	Max	Min	Max	Unit
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay,	$V_{CC} = 3.3 \pm 0.3 \text{ V}$	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		5.6 8.1	8.0 11.5	1.0 1.0	9.5 13.0	1.0 1.0	12.0 15.0	ns
	A to Y	$V_{CC} = 5.0 \pm 0.5 \text{ V}$	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		3.8 5.3	5.5 7.5	1.0 1.0	6.5 8.5	1.0 1.0	8.5 10.5	
t <sub>PZL</sub> , t <sub>PZH</sub>	Maximum Output Enable Time,	$V_{CC} = 3.3 \pm 0.3 \text{ V}$ $R_L = 1.0 \text{ k}\Omega$	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		5.4 7.9	8.0 11.5	1.0 1.0	9.5 13.0	1.0 1.0	11.5 15.0	ns
	OE to Y	$V_{CC} = 5.0 \pm 0.5 \text{ V}$ $R_L = 1.0 \text{ k}\Omega$	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		3.6 5.1	5.1 7.1	1.0 1.0	6.0 8.0	1.0 1.0	7.5 9.5	
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Maximum Output Disable Time,	$V_{CC}$ = 3.3 $\pm$ 0.3 $V$ $R_L$ = 1.0 $k\Omega$	C <sub>L</sub> = 50 pF		9.5	13.2	1.0	15.0	1.0	18.0	ns
	OE to Y	$V_{CC} = 5.0 \pm 0.5 \text{ V}$ $R_L = 1.0 \text{ k}\Omega$	C <sub>L</sub> = 50 pF		6.1	8.8	1.0	10.0	1.0	12.0	
t <sub>OSLH</sub> , t <sub>OSHL</sub>	Output-to-Output Skew	V <sub>CC</sub> = 3.3 ± 0.3 V (Note 3)	C <sub>L</sub> = 50 pF			1.5		1.5		1.5	ns
		V <sub>CC</sub> = 5.0 ± 0.5 V (Note 3)	C <sub>L</sub> = 50 pF			1.0		1.0		1.0	
C <sub>in</sub>	Maximum Input Capacitance				4.0	10		10		10	pF
C <sub>out</sub>	Maximum Three-State Output Capacitance (Output in High Impedance State)				6.0						pF

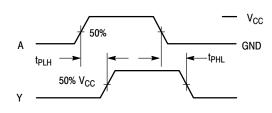
		Typical @ 25°C, V <sub>CC</sub> = 5.0V	
C <sub>PD</sub>	Power Dissipation Capacitance (Note 4)	15	pF

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

		T <sub>A</sub> = 25°C		
Symbol	Characteristic	Тур	Max	Unit
V <sub>OLP</sub>	Quiet Output Maximum Dynamic V <sub>OL</sub>	0.3	0.8	V
V <sub>OLV</sub>	Quiet Output Minimum Dynamic V <sub>OL</sub>	- 0.3	- 0.8	V
$V_{IHD}$	Minimum High Level Dynamic Input Voltage		3.5	V
V <sub>ILD</sub>	Maximum Low Level Dynamic Input Voltage		1.5	V

Parameter guaranteed by design. t<sub>OSLH</sub> = |t<sub>PLHm</sub> - t<sub>PLHn</sub>|, t<sub>OSHL</sub> = |t<sub>PHLm</sub> - t<sub>PHLn</sub>|.
 C<sub>PD</sub> 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<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>/4 (per buffer). C<sub>PD</sub> is used to determine the no–load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

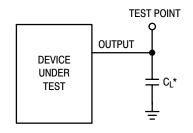
#### **SWITCHING WAVEFORMS**



 $V_{CC}$ 0E 50% GND  $t_{PLZ}$  $t_{PZL}$ HIGH IMPEDANCE 50% V<sub>CC</sub> Υ  $V_{OL} + 0.3V$ t<sub>PZH</sub> t<sub>PHZ</sub> V<sub>OH</sub> - 0.3V 50% V<sub>CC</sub> HIGH **IMPEDANCE** 

Figure 2.

Figure 3.



\*Includes all probe and jig capacitance

DEVICE UNDER TEST  $C_L^*$ TEST POINT

OUTPUT  $1 \text{ k}\Omega$ OUTPUT  $1 \text{ k}\Omega$ CONNECT TO  $V_{CC}$  WHEN TESTING  $t_{PLZ}$  AND  $t_{PZL}$ . CONNECT TO GND WHEN TESTING  $t_{PHZ}$  AND  $t_{PZH}$ .

\*Includes all probe and jig capacitance

Figure 4. Test Circuit

Figure 5. Test Circuit

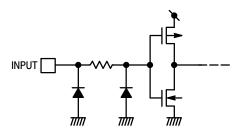
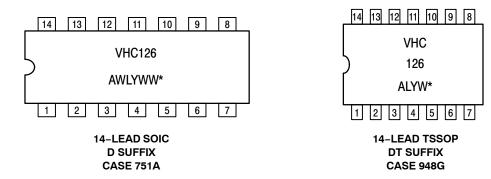


Figure 6. Input Equivalent Circuit

#### **MARKING DIAGRAMS**

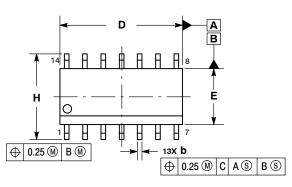


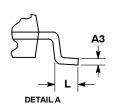
\*See Applications Note #AND8004/D for date code and traceability information.

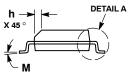


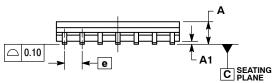
SOIC-14 NB CASE 751A-03 ISSUE L

**DATE 03 FEB 2016** 









# MILLIMETERS DIM MIN MAX MIN MAX A 1.35 1.75 0.054 0.068

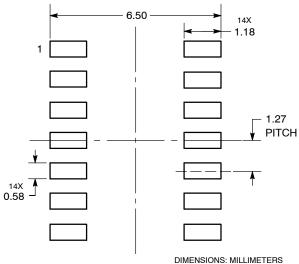
A1	0.10	0.25	0.004	0.010	
АЗ	0.19	0.25	0.008	0.010	
b	0.35	0.49	0.014	0.019	
D	8.55	8.75	0.337	0.344	
Е	3.80	4.00	0.150	0.157	
е	1.27	BSC	0.050 BSC		
Н	5.80	6.20	0.228	0.244	
h	0.25	0.50	0.010	0.019	
L	0.40	1.25	0.016	0.049	
М	0 °	7°	0 °	7°	

5. MAXIMUM MOLD PROTRUSION 0.15 PER

NOTES:
1. DIMENSIONING AND TOLERANCING PER

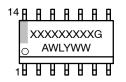
ASME Y14.5M, 1994.
CONTROLLING DIMENSION: MILLIMETERS. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.

#### **SOLDERING FOOTPRINT\***



\*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 Α = Assembly Location

WL = Wafer Lot Υ = Year = Work Week WW 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**

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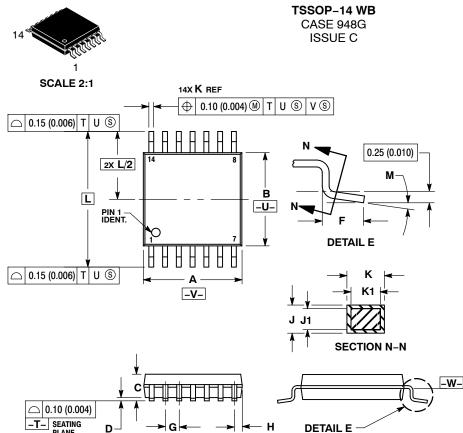
#### SOIC-14 CASE 751A-03 ISSUE L

#### 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

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**DATE 17 FEB 2016** 

- NOTES.

  1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

  2. CONTROLLING DIMENSION: MILLIMETER.

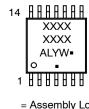
  3. DIMENSION A DOES NOT INCLUDE MOLD
- FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
  DIMENSION B DOES NOT INCLUDE
- INTERLEAD FLASH OR PROTRUSION.
  INTERLEAD FLASH OR PROTRUSION SHALL
- INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) 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 DEFERENCE ONLY
- REFERENCE ONLY.
  DIMENSION A AND B ARE TO BE
- DETERMINED AT DATUM PLANE -W-.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
Α	4.90	5.10	0.193	0.200
В	4.30	4.50	0.169	0.177
С		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	
Н	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	
М	o°	8 °	0 °	8 °

#### **GENERIC MARKING DIAGRAM\***



= Assembly Location

= Wafer Lot ٧ = 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.

1	
14X 0.36	DIMENSIONS: MILLIMETERS

**SOLDERING FOOTPRINT** 

7.06

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