FAIRCHILD SEMICONDUCTOR™

October 2001
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NC7WB126
TinyLogic™ Low Voltage UHS Dual SPST Wide Bandwidth Normally Open Analog Switch

General Description

The NC7WB126 is an ultra high-speed (UHS) dual single-pole/single-throw (SPST) analog switch or 2-bit bus switch. The device is fabricated with advanced sub-micron CMOS technology to achieve high speed enable and disable times and low On Resistance over a broad V_{CC} range. The device is specified to operate over the 2V to 5.5V V_{CC} operating range. The device is organized as a dual switch with independent CMOS compatible switch enable (OE) controls. When OE is HIGH, the switch is ON and Port A is connected to Port B. When OE is LOW, the switch is OPEN and a high-impedance state exists between the two ports. The enable inputs tolerate voltages up to 5.5V independent of the V_{CC} operating range.

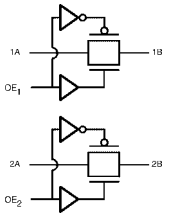
Features

- Useful in both analog and digital applications
- Space saving US8 surface mount package
- Typical 7.2 Ω On Resistance @ 5V V_{CC}
- Broad V_{CC} operating range: 2V to 5.5V
- Rail-to-rail signal handling
- Power down high impedance control inputs
- Control inputs are overvoltage tolerant
- Control inputs are CMOS compatible
- >326 MHz –3dB bandwidth
- Improved package replacement for the P15A126

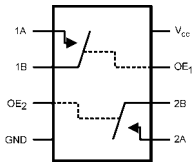
Ordering Code:

Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7WB126K8X	MAB08A	WB26	8-Lead US8, 0.7mm x 3.1mm x 2.0mm	3K Units on Tape and Reel

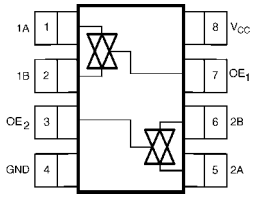
Logic Symbol



Analog Symbol

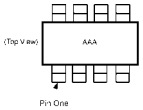


Connection Diagrams



(Top View)

Pin One Orientation Diagram



AAA represents Product Code Top Mark - see ordering code

Note: Orientation of Top Mark determines Pin One location. Read the top product code mark left to right, Pin One is the lower left pin (see diagram).

Pin Descriptions

Pin Names	Description
A	Switch Port A
B	Switch Port B
OE	Control Input

Function Table

Switch Enable Input (OE)	Function
L	Disconnect
H	B Connected to A

H = HIGH Logic Level L = LOW Logic Level

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Absolute Maximum Ratings (Note 1)

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Switch Voltage (V_S)	−0.5V to V_{CC} + 0.5V
DC Input Voltage (V_{IN}) (Note 2)	−0.5V to +7.0V
DC Input Diode Current	
@ (I_{IK}) V_{IN} < 0V	−50 mA
DC Switch Output Current (I_{OUT})	±128 mA
DC V_{CC} or Ground Current (I_{CC}/I_{GND})	±100 mA
Storage Temperature Range (T_{STG})	−65°C to +150°C
Junction Lead Temperature	
under Bias (T_J)	+150°C
Junction Lead Temperature (T_L)	
(Soldering, 10 Seconds)	+260°C
Power Dissipation (P_D) @ +85°C	
SC70-6	250 mW

Recommended Operating Conditions (Note 3)

Supply Voltage (V_{CC})	2V to 5.5V
Control Input Voltage (V_{IN})	0V to 5.5V
Switch Input Voltage (V_{IN})	0V to V_{CC}
Switch Output Voltage (V_{OUT})	0V to V_{CC}
Operating Temperature (T_A)	−40°C to +85°C
Input Rise and Fall Time (t_r, t_f)	
Control Input V_{CC} = 1.65V–2.7V	0 ns/V to 20 ns/V
Control Input V_{CC} = 3.0V–3.6V	0 ns/V to 10 ns/V
Control Input V_{CC} = 4.5V–5.5V	0 ns/V to 5 ns/V
Thermal Resistance (θ_{JA})	250°C/W

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 2: The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

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

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	T_A = +25°C			T_A = −40°C to +85°C		Units	Conditions
			Min	Typ	Max	Min	Max		
	Analog Signal Range	V_{CC}	0		V_{CC}	0	V_{CC}	V	
V_{IH}	HIGH Level Input Voltage	2 - 5.5	0.7 V_{CC}			0.7 V_{CC}		V	
V_{IL}	LOW Level Input Voltage	2 - 5.5			0.3 V_{CC}		0.3 V_{CC}	V	
I_{IN}	Input Leakage Current	0 - 5.5	−200		200			nA	0 ≤ V_{IN} ≤ 5.5V
I_{OFF}	Switch OFF Leakage Current	2 - 5.5	−200		200			nA	0 ≤ A, B ≤ V_{CC}
R_{ON}	Switch On Resistance	4.5		7.2	10		12	Ω	V_I = 2.5V, I_O = −30 mA
	(Note 4)	3.0		14	18		22		V_I = 1.5V, I_O = 24 mA
I_{CC}	Quiescent Supply Current	5.5			1		10	µA	V_{IN} = V_{CC} or GND
	All Channels ON or OFF								I_{OUT} = 0
ΔR_{ON}	On Resistance Match	4.5		0.2				Ω	I_O = −30 mA, V_I = 3.15
	Between Channels	3.0		0.2					I_O = −24 mA, V_I = 2.1
	(Note 4)(Note 7)								
R_{flat}	On Resistance Flatness	4.5		2.72			6		I_O = −30 mA, 0 ≤ V_I ≤ V_{CC}
	(Note 4)(Note 5)(Note 6)	3.0		8			17.5		I_O = −24 mA, 0 ≤ V_I ≤ V_{CC}

Note 4: Measured by the voltage drop between A and B pins at the indicated current through the switch. On Resistance is determined by the lower of the voltages on the two (A or B) pins.

Note 5: Guaranteed by design.

Note 6: Flatness is defined as the difference between the minimum and maximum value of On Resistance over the specified range of conditions.

Note 7: $\Delta R_{ON} = R_{ON}$ max − R_{ON} min measured at identical V_{CC}, temperature and voltage levels.

AC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	$T_A = -40°C$ to $+85°C$			Units	Conditions	Figure Number
			Min	Typ	Max			
t_{PZL}, t_{PZH}	Output Enable Time	4.5 - 5.5			75	ns	V_I = 0V for t_{PZH} V_I = 2 x V_{CC} for t_{PZL} C_L = 50 pF, $R_U = R_D$ = 500Ω	Figures 2, 1
	Turn on Time	3.0 - 3.6			25			
t_{PLZ}, t_{PHZ}	Output Disable Time	4.5 - 5.5			7	ns	V_I = 0V for t_{PHZ} V_I = 2 x V_{CC} for t_{PLZ} C_L = 50 pF, $R_U = R_D$ = 500Ω	Figures 2, 1
	Turn Off Time	3.0 - 3.6			12			
Q	Charge Injection (Note 8)	2 - 5.5			10	pC	C_L = 1.0 nF, V_{GEN} = 0V, R_{GEN} = 0 Ω, f = 1 MHz	Figure 3
OIRR	Off Isolation (Note 9)	2 - 5.5		-43		dB	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz	Figure 4
Xtalk	Crosstalk	2 - 5.5		–43		dB	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz	Figure 5
BW	–3dB Bandwidth	2 - 5.5		>326		MHz	R_L = 50 Ω	Figure 8
THD	Total Harmonic Distortion (Note 8)	5		0.02		%	R_L = 600Ω 0.5 V_{P-P} f = 600 Hz to 20 KHz	

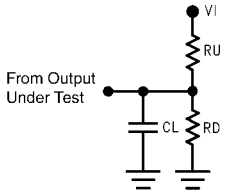
Note 8: Guaranteed by design.

Note 9: Off Isolation = 20 $\log_{10}$ [V_A/V_{Bn}]

Capacitance

Symbol	Parameter	Typ	Max	Units	Conditions	Figures
C_{IN}	Control Pin Input Capacitance	2.5		pF	V_{CC} = 0V	
$C_{I/O}$ (OFF)	Switch Port Off Capacitance	5.5		pF	V_{CC} = 5.0V	Figure 6
$C_{I/O}$ (ON)	Switch Port Capacitance when Switch is Enabled	13		pF	V_{CC} = 5.0V	Figure 7

AC Loading and Waveforms



Input driven by 50Ω source terminated in 50Ω
C_L includes load and stray capacitance.
Input PRR = 1.0 MHz; t_w = 500 ns

FIGURE 1. AC Test Circuit

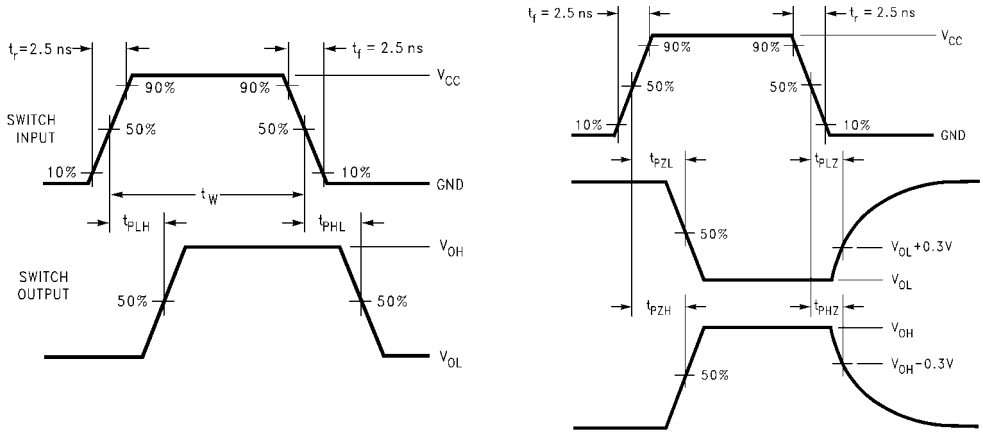


FIGURE 2. AC Waveforms

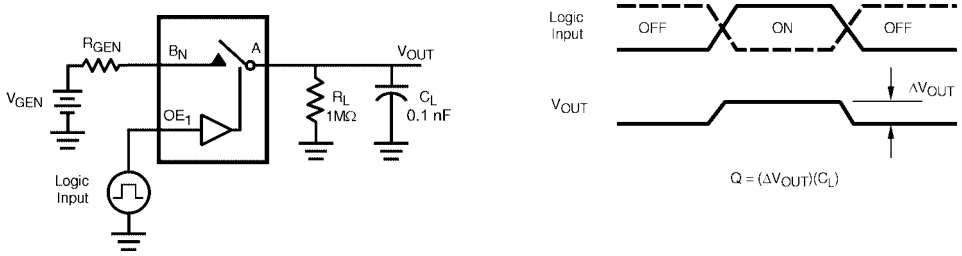


FIGURE 3. Charge Injection Test

AC Loading and Waveforms (Continued)

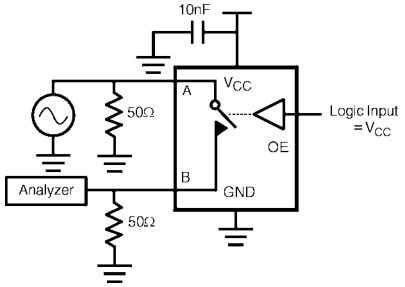


FIGURE 4. Off Isolation

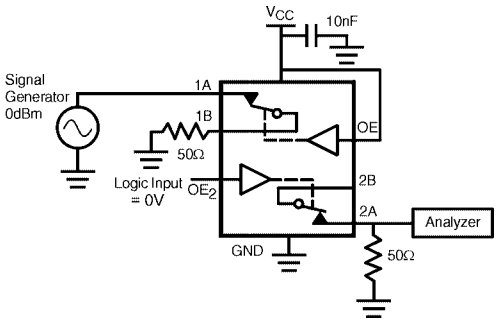


FIGURE 5. Crosstalk

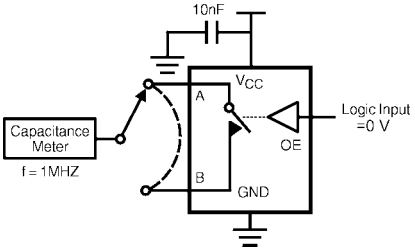


FIGURE 6. Channel Off Capacitance

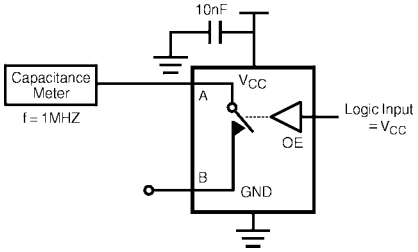


FIGURE 7. Channel On Capacitance

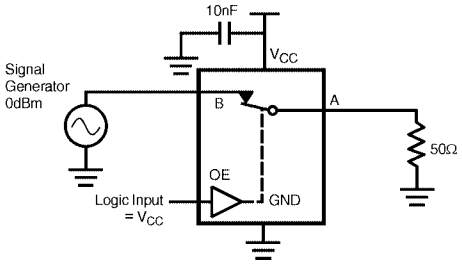


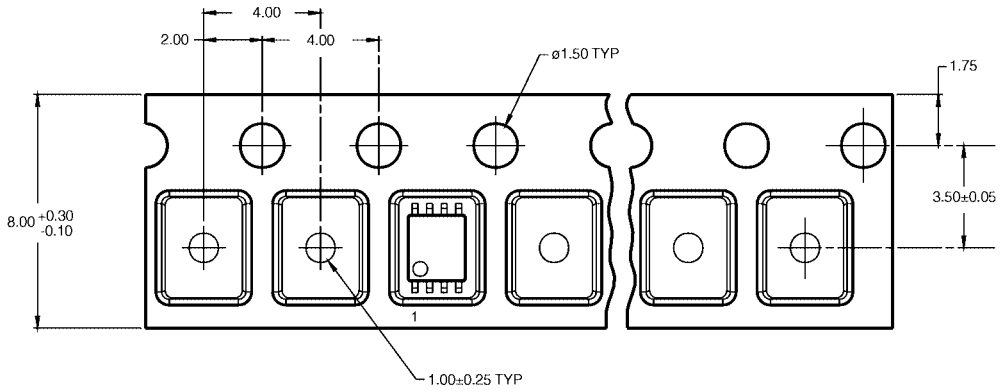
FIGURE 8. Bandwidth

Tape and Reel Specification

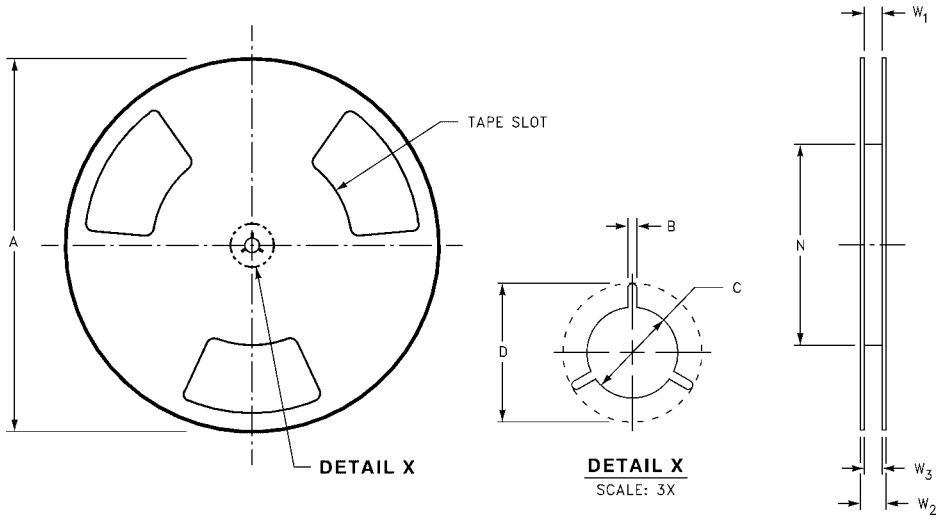
TAPE FORMAT

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
K8X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	250	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

TAPE DIMENSIONS inches (millimeters)

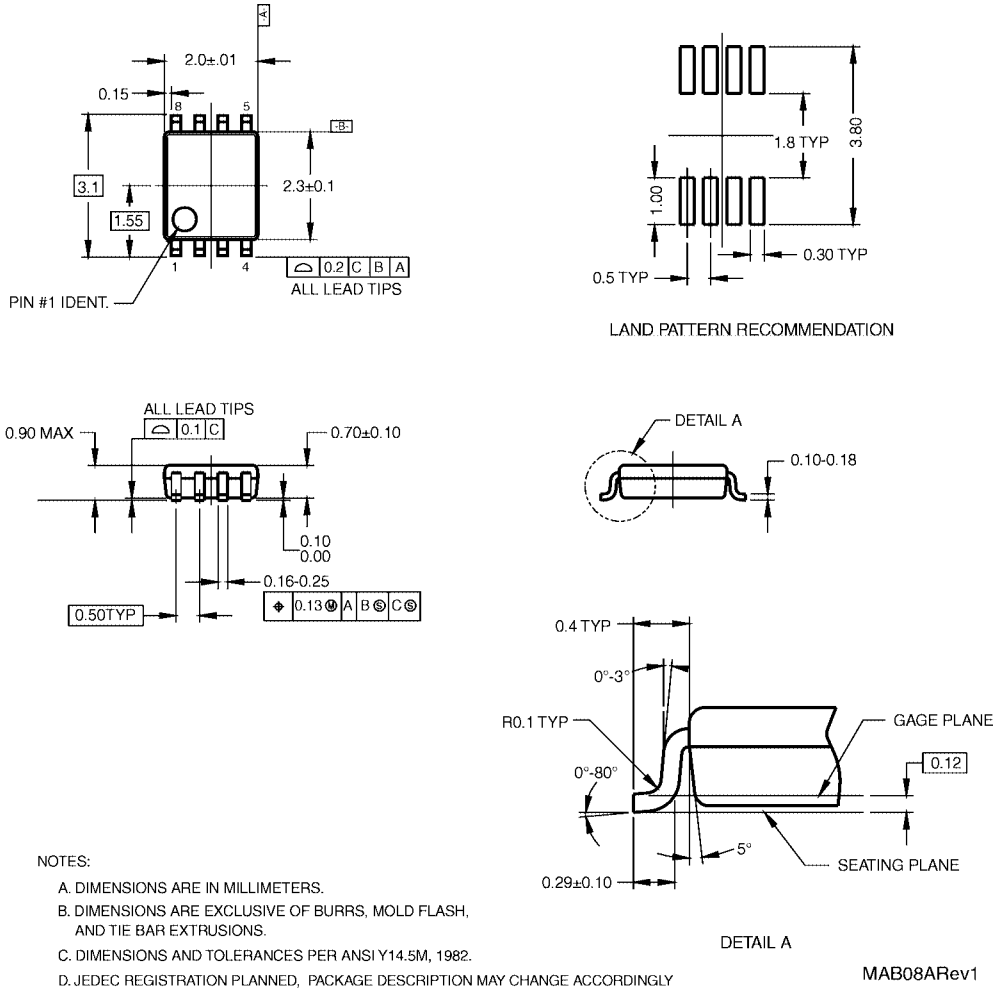


REEL DIMENSIONS inches (millimeters)



Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 + 0.059/–0.000 (8.40 + 1.50/–0.00)	0.567 (14.40)	W1 + 0.078/–0.039 (W1 + 2.00/–1.00)

Physical Dimensions inches (millimeters) unless otherwise noted



NOTES:

A. DIMENSIONS ARE IN MILLIMETERS.

B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

C. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

D. JEDEC REGISTRATION PLANNED, PACKAGE DESCRIPTION MAY CHANGE ACCORDINGLY

8-Lead US8, 0.7mm x 3.1 mm x 2.0 mm
Package Number MA08A

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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