

54ABT16373

16-Bit Transparent Latch with TRI-STATE® Outputs

General Description

The ABT16373 contains sixteen non-inverting latches with TRI-STATE outputs and is intended for bus oriented applications. The device is byte controlled. The flip-flops appear transparent to the data when the Latch Enable (LE) is HIGH. When LE is low, the data that meets the setup time is latched. Data appears on the bus when the Output Enable (OE) is LOW. When OE is HIGH, the outputs are in high Z state.

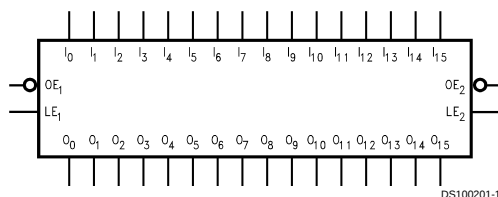
Features

- Separate control logic for each byte
- 16-bit version of the ABT373
- High impedance glitch free bus loading during entire power up and power down cycle
- Non-destructive hot insertion capability
- Guaranteed latch-up protection
- Standard Microcircuit Drawing (SMD) 5962-9320001

Ordering Code:

Military	Package Number	Package Description
54ABT16373W-QML	WA48A	48-Lead Cerpack

Logic Symbol

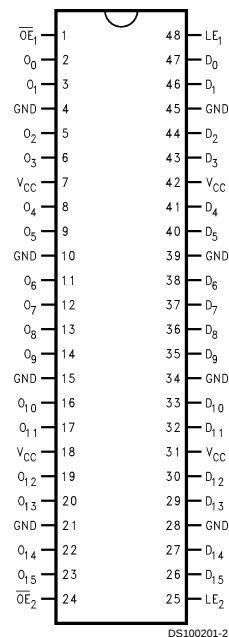


Pin Description

Pin Names	Description
$\overline{OE}_n$	Output Enable Input (Active Low)
LE_n	Latch Enable Input
D_0-D_{15}	Data Inputs
O_0-O_{15}	Outputs

Connection Diagram

Pin Assignment for Cerpack



Functional Description

The ABT16373 contains sixteen D-type latches with TRI-STATE standard outputs. The device is byte controlled with each byte functioning identically, but independent of the other. Control pins can be shorted together to obtain full 16-bit operation. The following description applies to each byte. When the Latch Enable (LE_n) input is HIGH, data on the D_n enters the latches. In this condition the latches are transparent, i.e., a latch output will change states each time its D input changes. When LE_n is LOW, the latches store information that was present on the D inputs a setup time preceding the HIGH-to-LOW transition of LE_n . The TRI-STATE standard outputs are controlled by the Output Enable ($\overline{OE}_n$) input. When $\overline{OE}_n$ is LOW, the standard outputs are in the 2-state mode. When $\overline{OE}_n$ is HIGH, the standard outputs are in the high impedance mode but this does not interfere with entering new data into the latches.

Truth Tables

Inputs			Outputs
LE_1	$\overline{OE}_1$	D_0-D_7	O_0-O_7
X	H	X	Z
H	L	L	L
H	L	H	H
L	L	X	(Previous)

Inputs			Outputs
LE_2	$\overline{OE}_2$	D_8-D_{15}	O_8-O_{15}
X	H	X	Z
H	L	L	L
H	L	H	H
L	L	X	(Previous)

H = High Voltage Level

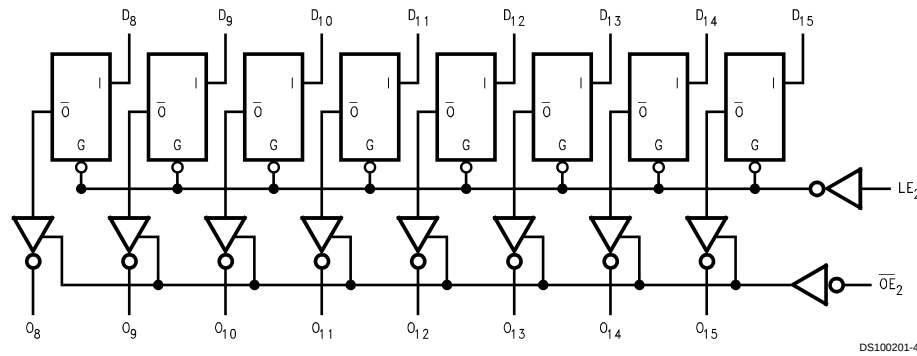
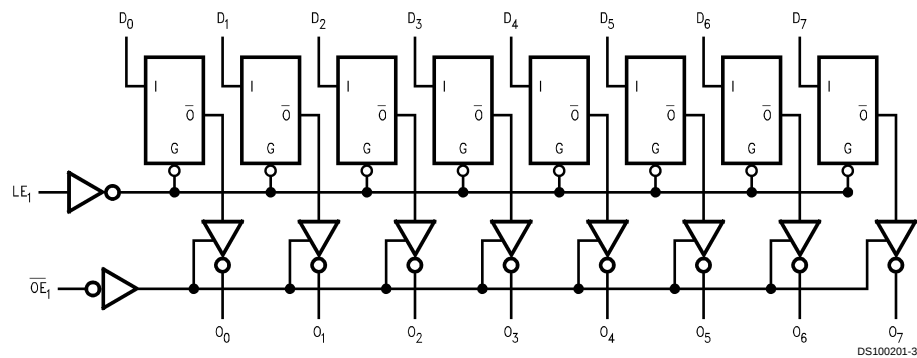
L = Low Voltage Level

X = Immaterial

Z = High Impedance

Previous = previous output prior to HIGH to LOW transition of LE

Logic Diagrams



Absolute Maximum Ratings (Note 1)

Storage Temperature	–65°C to +150°C
Ambient Temperature under Bias	–55°C to +125°C
Junction Temperature under Bias	
Ceramic	–55°C to +175°C
V _{CC} Pin Potential to	
Ground Pin	–0.5V to +7.0V
Input Voltage (Note 2)	–0.5V to +7.0V
Input Current (Note 2)	–30 mA to +5.0 mA
Voltage Applied to Any Output	
in the Disabled or	
Power-Off State	–0.5V to +5.5V
in the HIGH State	–0.5V to V _{CC}
Current Applied to Output	
in LOW State (Max)	twice the rated I _{OL} (mA)
DC Latchup Source Current: $\overline{OE}$ Pin	–350 mA

(Across Comm Operating Range) Other Pins –500 mA
Over Voltage Latchup (I/O) 10V

Recommended Operating Conditions

Free Air Ambient Temperature	
Military	–55°C to +125°C
Supply Voltage	
Military	+4.5V to +5.5V
Minimum Input Edge Rate	($\Delta V/\Delta t$)
Data Input	50 mV/ns
Enable Input	20 mV/ns

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

DC Electrical Characteristics

Symbol	Parameter	ABT16373			Units	V _{CC}	Conditions
		Min	Typ	Max			
V _{IH}	Input HIGH Voltage	2.0			V		Recognized HIGH Signal
V _{IL}	Input LOW Voltage		0.8		V		Recognized LOW Signal
V _{CD}	Input Clamp Diode Voltage		–1.2		V	Min	I _{IN} = –18 mA
V _{OH}	Output HIGH Voltage	54ABT	2.5				I _{OH} = –3 mA
		54ABT	2.0				I _{OH} = –24 mA
V _{OL}	Output LOW Voltage	54ABT		0.55	V	Min	I _{OL} = 48 mA
I _{IH}	Input HIGH Current		5		μA	Max	V _{IN} = 2.7V (Note 4)
			5				V _{IN} = V _{CC}
I _{BVI}	Input HIGH Current Breakdown Test		7		μA	Max	V _{IN} = 7.0V
I _{IL}	Input LOW Current		–5		μA	Max	V _{IN} = 0.5V (Note 4)
			–5				V _{IN} = 0.0V
V _{ID}	Input Leakage Test	4.75			V	0.0	I _{ID} = 1.9 μA All Other Pins Grounded
I _{OZH}	Output Leakage Current		50		μA	0 – 5.5V	V _{OUT} = 2.7V; $\overline{OE}$ = 2.0V
I _{OZL}	Output Leakage Current		–50		μA	0 – 5.5V	V _{OUT} = 0.5V; $\overline{OE}$ = 2.0V
I _{OS}	Output Short-Circuit Current	–100	–275		mA	Max	V _{OUT} = 0.0V
I _{CEX}	Output High Leakage Current		50		μA	Max	V _{OUT} = V _{CC}
I _{ZZ}	Bus Drainage Test		100		μA	0.0	V _{OUT} = 5.5V; All Others GND
I _{CCH}	Power Supply Current		2.0		mA	Max	All Outputs HIGH
I _{CCL}	Power Supply Current		85		mA	Max	All Outputs LOW
I _{CCZ}	Power Supply Current		2.0		mA	Max	$\overline{OE}$ = V _{CC} All Others at V _{CC} or GND
I _{CCCT}	Additional I _{CC} /Input	Outputs Enabled	2.5		mA		V _I = V _{CC} – 2.1V
		Outputs TRI-STATE	2.5		mA	Max	Enable Input V _I = V _{CC} – 2.1V
		Outputs TRI-STATE	2.5		mA		Data Input V _I = V _{CC} – 2.1V All Others at V _{CC} or GND
I _{CCD}	Dynamic I _{CC}	No Load		0.15	mA/ MHz	Max	Outputs Open, LE = V _{CC} $\overline{OE}$ = GND, (Note 3) One Bit Toggling, 50% Duty Cycle

Note 3: For 8 bits toggling, I_{CCD} < 0.8 mA/MHz.

Note 4: Guaranteed, but not tested.

AC Electrical Characteristics

Symbol	Parameter	54ABT		Units
		$T_A = -55^{\circ}\text{C to } +125^{\circ}\text{C}$ $V_{CC} = 4.5\text{V to } 5.5\text{V}$ $C_L = 50\text{ pF}$		
		Min	Max	
t_{PLH}	Propagation Delay	1.4	6.5	ns
t_{PHL}	D_n to O_n	1.4	6.5	
t_{PLH}	Propagation Delay	1.7	7.0	ns
t_{PHL}	LE to O_n	1.4	6.3	
t_{PZH}	Output Enable Time	1.1	6.8	ns
t_{PZL}		1.5	6.8	
t_{PHZ}	Output Disable Time	1.5	8.5	ns
t_{PLZ}		1.6	8.0	

AC Operating Requirements

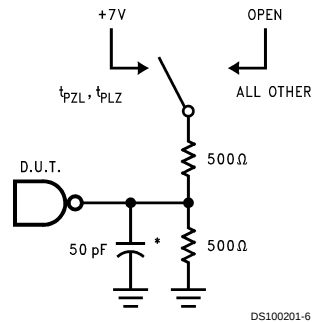
Symbol	Parameter	54ABT		Units
		$T_A = -55^{\circ}\text{C to } +125^{\circ}\text{C}$ $V_{CC} = 4.5\text{V to } 5.5\text{V}$ $C_L = 50\text{ pF}$		
		Min	Max	
$t_s(\text{H})$	Setup Time, HIGH	2.4		ns
$t_s(\text{L})$	or LOW D_n to LE	2.4		
$t_h(\text{H})$	Hold Time, HIGH	2.2		ns
$t_h(\text{L})$	or LOW D_n to LE	2.2		
$t_w(\text{H})$	Pulse Width, LE HIGH	3.3		ns

Capacitance

Symbol	Parameter	Typ	Units	Conditions ($T_A = 25^{\circ}\text{C}$)
C_{IN}	Input Capacitance	5	pF	$V_{CC} = 0\text{V}$
C_{OUT} (Note 5)	Output Capacitance	11	pF	$V_{CC} = 5.0\text{V}$

Note 5: C_{OUT} is measured at frequency $f = 1\text{ MHz}$, per MIL-STD-883B, Method 3012.

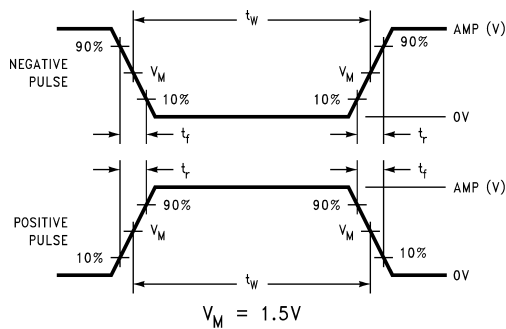
AC Loading



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*Includes jig and probe capacitance

FIGURE 1. Standard AC Test Load

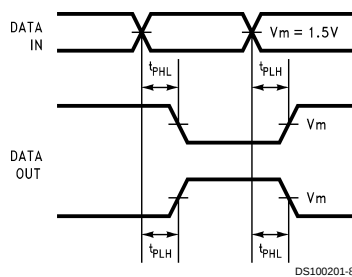


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FIGURE 2. Test Input Signal Levels

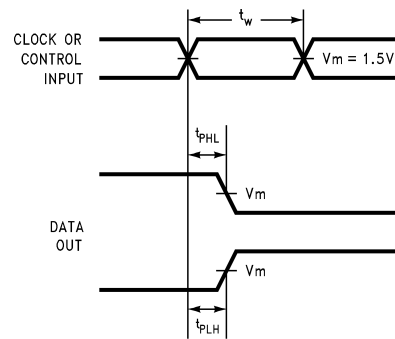
Amplitude	Rep. Rate	t_w	t_r	t_f
3.0V	1 MHz	500 ns	2.5 ns	2.5 ns

FIGURE 3. Test Input Signal Requirements



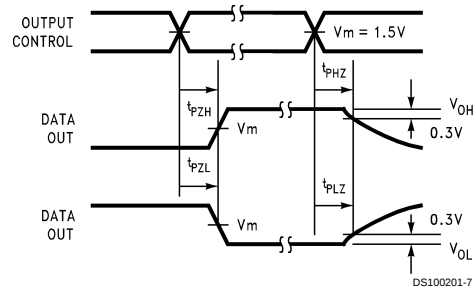
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FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions



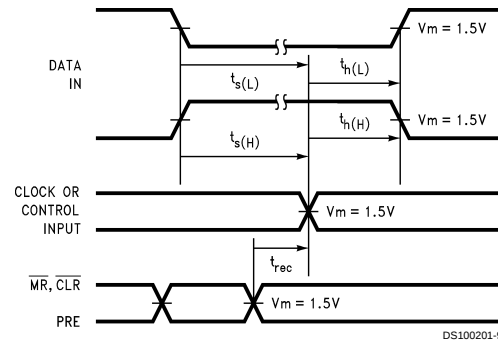
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FIGURE 5. Propagation Delay, Pulse Width Waveforms



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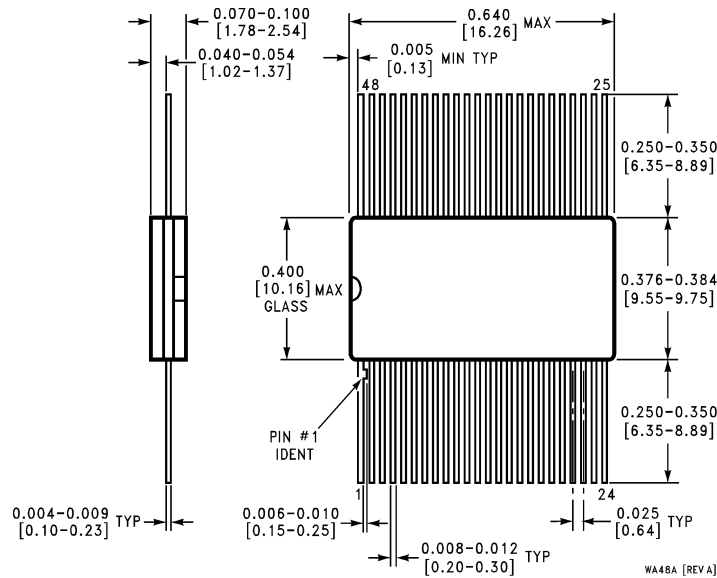
FIGURE 6. TRI-STATE Output HIGH and LOW Enable and Disable Times



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FIGURE 7. Setup Time, Hold Time and Recovery Time Waveforms

Physical Dimensions inches (millimeters) unless otherwise noted



48-Lead Cerpack
NS Package Number WA48A

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Fax: 1-800-737-7018
Email: support@nsc.com

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National Semiconductor Europe
Fax: +49 (0) 1 80-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 1 80-530 85 85
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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

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