

# 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.

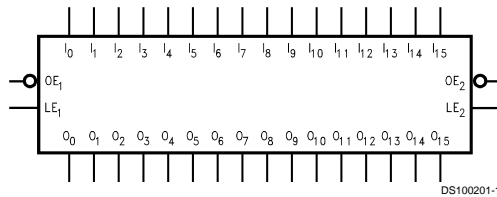
### Features

- 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:

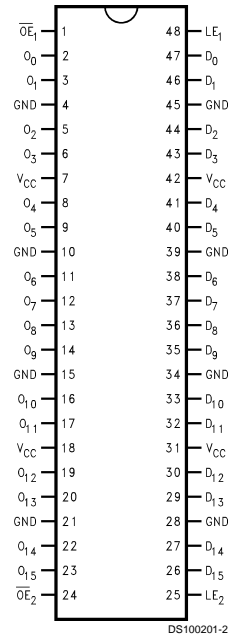
Military	Package Number	Package Description
54ABT16373W-QML	WA48A	48-Lead Cerpack

### Logic Symbol



### Connection Diagram

Pin Assignment for Cerpack



### 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

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**54ABT16373 16-Bit Transparent Latch with TRI-STATE Outputs**

## 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.

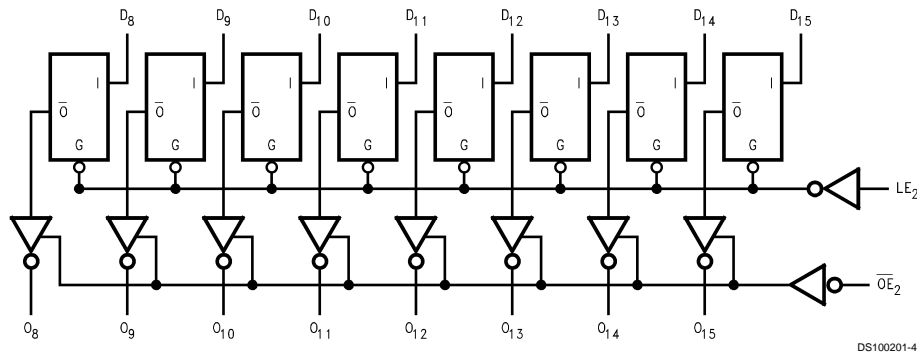
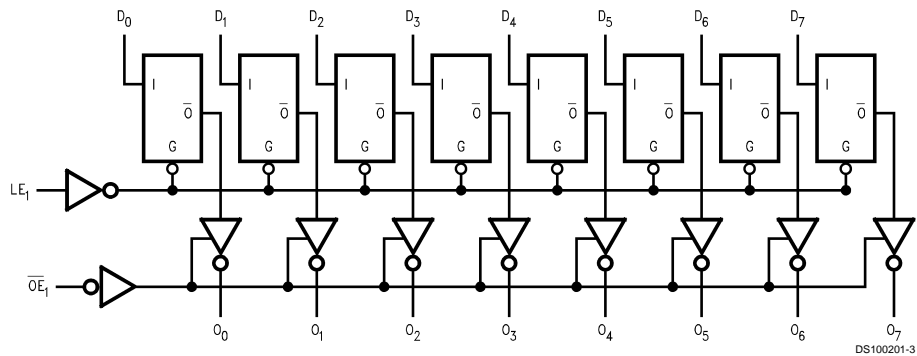
## Truth Tables

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

**Note 3:** For 8 bits toggling, I<sub>CCD</sub> < 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

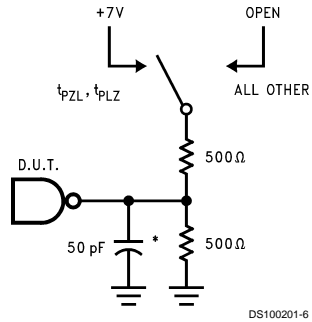
Symbol	Parameter	54ABT		Units
		$T_A = -55^\circ\text{C to }+125^\circ\text{C}$ $V_{CC} = 4.5\text{V to }5.5\text{V}$ $C_L = 50\text{ pF}$		
		Min	Max	
$t_s(H)$	Setup Time, HIGH	2.4		ns
$t_s(L)$	or LOW $D_n$ to LE	2.4		
$t_h(H)$	Hold Time, HIGH	2.2		ns
$t_h(L)$	or LOW $D_n$ to LE	2.2		
$t_w(H)$	Pulse 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	$V_{CC} = 5.0\text{V}$

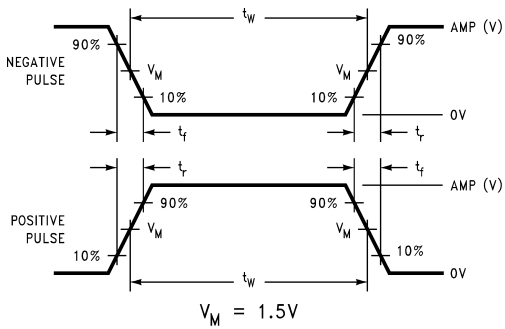
**Note 5:**  $C_{OUT}$  is measured at frequency  $f = 1\text{ MHz}$ , per MIL-STD-883B, Method 3012.

# AC Loading



\*Includes jig and probe capacitance

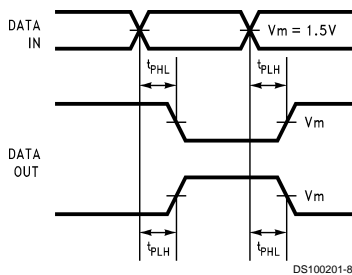
**FIGURE 1. Standard AC Test Load**



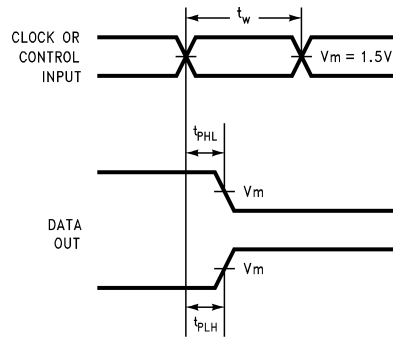
**FIGURE 2. Test Input Signal Levels**

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

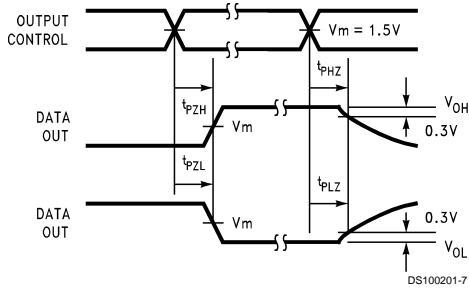
**FIGURE 3. Test Input Signal Requirements**



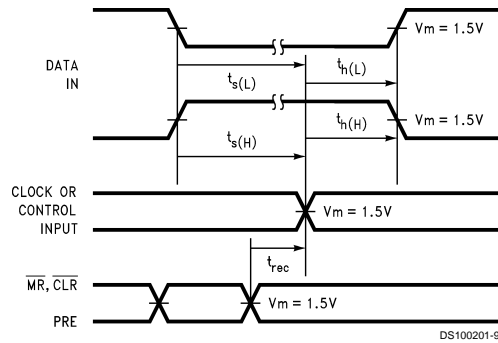
**FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions**



**FIGURE 5. Propagation Delay, Pulse Width Waveforms**

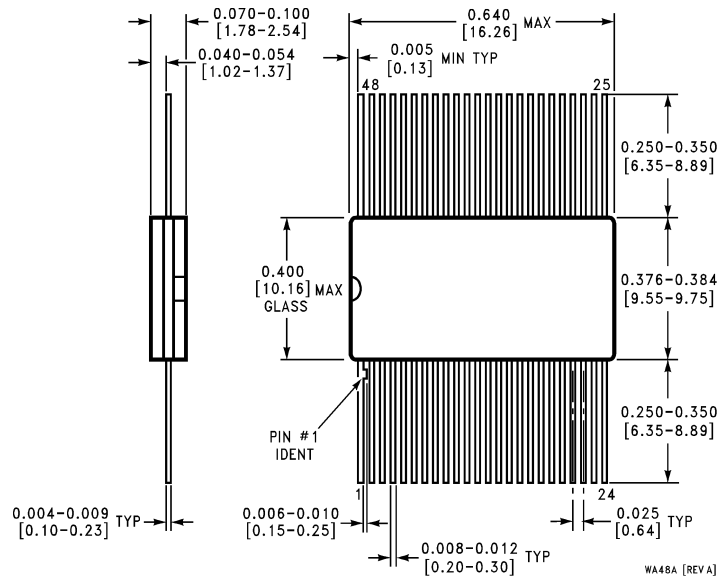


**FIGURE 6. TRI-STATE Output HIGH and LOW Enable and Disable Times**



**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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