

## 74ABT16373 16-Bit Transparent D-Type Latch with 3-STATE Outputs

### General Description

The ABT16373 contains sixteen non-inverting latches with 3-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 ( $\overline{OE}$ ) is LOW. When  $\overline{OE}$  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

### Ordering Code:

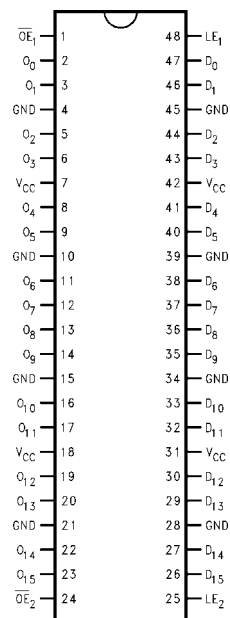
Order Number	Package Number	Package Description
74ABT16373CSSC	MS48A	48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
74ABT16373CMTD	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

Devices also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.

### Logic Symbol



### Connection Diagram



### Pin Descriptions

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

## Functional Description

The ABT16373 contains sixteen D-type latches with 3-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 3-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

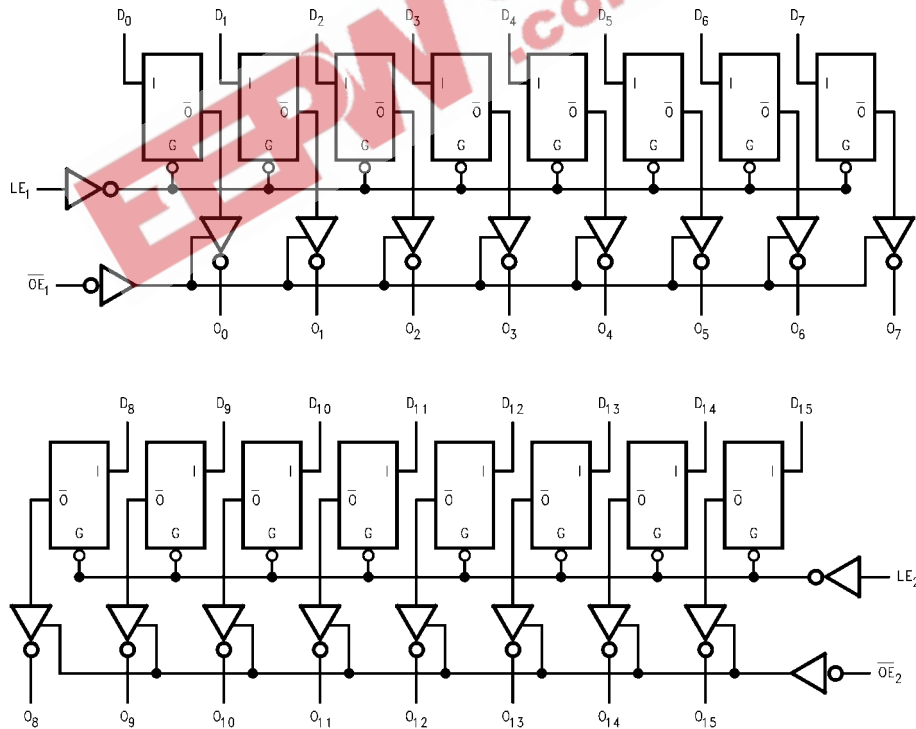
L = LOW Voltage Level

X = Immaterial

Z = High Impedance

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

## Logic Diagrams



Absolute Maximum Ratings (Note 1)		Recommended Operating Conditions	
Storage Temperature	-65°C to +150°C	Free Air Ambient Temperature	-40°C to +85°C
Ambient Temperature under Bias	-55°C to +125°C	Supply Voltage	+4.5V to +5.5V
Junction Temperature under Bias	-55°C to +150°C	Minimum Input Edge Rate ( $\Delta V/\Delta t$ )	
$V_{CC}$ Pin Potential to Ground Pin	-0.5V to +7.0V	Data Input	50 mV/ns
Input Voltage (Note 2)	-0.5V to +7.0V	Enable Input	20 mV/ns
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		
Voltage Applied to Any Output 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 (Across Comm Operating Range)	-350 mA		
Other Pins	-500 mA		
Over Voltage Latchup (I/O)	10V		

**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	Min	Typ	Max	Units	$V_{CC}$	Conditions
$V_{IH}$	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	2.5 2.0				Min	$I_{OH} = -3$ mA $I_{OH} = -32$ mA
$V_{OL}$	Output LOW Voltage			0.55	V	Min	$I_{OL} = 64$ mA
$I_{IH}$	Input HIGH Current			1 1	$\mu$ A	Max	$V_{IN} = 2.7V$ (Note 3) $V_{IN} = V_{CC}$
$I_{BVI}$	Input HIGH Current Breakdown Test			7	$\mu$ A	Max	$V_{IN} = 7.0V$
$I_{IL}$	Input LOW Current			-1 -1	$\mu$ A	Max	$V_{IN} = 0.5V$ (Note 3) $V_{IN} = 0.0V$
$V_{ID}$	Input Leakage Test	4.75			V	0.0	$I_{ID} = 1.9$ $\mu$ A All Other Pins Grounded
$I_{OZH}$	Output Leakage Current			10	$\mu$ A	0 - 5.5V	$V_{OUT} = 2.7V$ ; $\overline{OE} = 2.0V$
$I_{OZL}$	Output Leakage Current			-10	$\mu$ A	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	$\mu$ A	Max	$V_{OUT} = V_{CC}$
$I_{ZZ}$	Bus Drainage Test			100	$\mu$ A	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			62	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
$I_{CCT}$	Additional $I_{CC}$ /Input			2.5 2.5 2.5	mA	Max	$V_1 = V_{CC} - 2.1V$ Enable Input $V_1 = V_{CC} - 2.1V$ Data Input $V_1 = V_{CC} - 2.1V$ All Others at $V_{CC}$ or GND
$I_{CCD}$	Dynamic $I_{CC}$ (Note 3)			0.15	mA/ MHz	Max	Outputs Open, $LE = V_{CC}$ $\overline{OE} = GND$ , (Note 4) One Bit Toggling, 50% Duty Cycle

**Note 3:** Guaranteed, but not tested.

**Note 4:** For 8 bits toggling,  $I_{CCD} < 0.8$  mA/MHz.

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AC Electrical Characteristics							
(SOIC and SSOP Packages)							
Symbol	Parameter	T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> = -40°C to +85°C V <sub>CC</sub> = 4.5V to 5.5V C <sub>L</sub> = 50 pF		Units
		Min	Typ	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay	1.4		5.6	1.4	5.6	ns
t <sub>PHL</sub>	D <sub>n</sub> to O <sub>n</sub>	1.4		5.6	1.4	5.6	
t <sub>PLH</sub>	Propagation Delay	1.7		6.0	1.7	6.0	ns
t <sub>PHL</sub>	LE to O <sub>n</sub>	1.7		5.5	1.7	5.5	
t <sub>PZH</sub>	Output Enable Time	1.1		6.1	1.1	6.1	ns
t <sub>PZL</sub>		1.5		5.6	1.5	5.6	
t <sub>PHZ</sub>	Output Disable Time	2.4		7.1	2.4	7.1	ns
t <sub>PLZ</sub>		1.6		6.5	1.6	6.5	

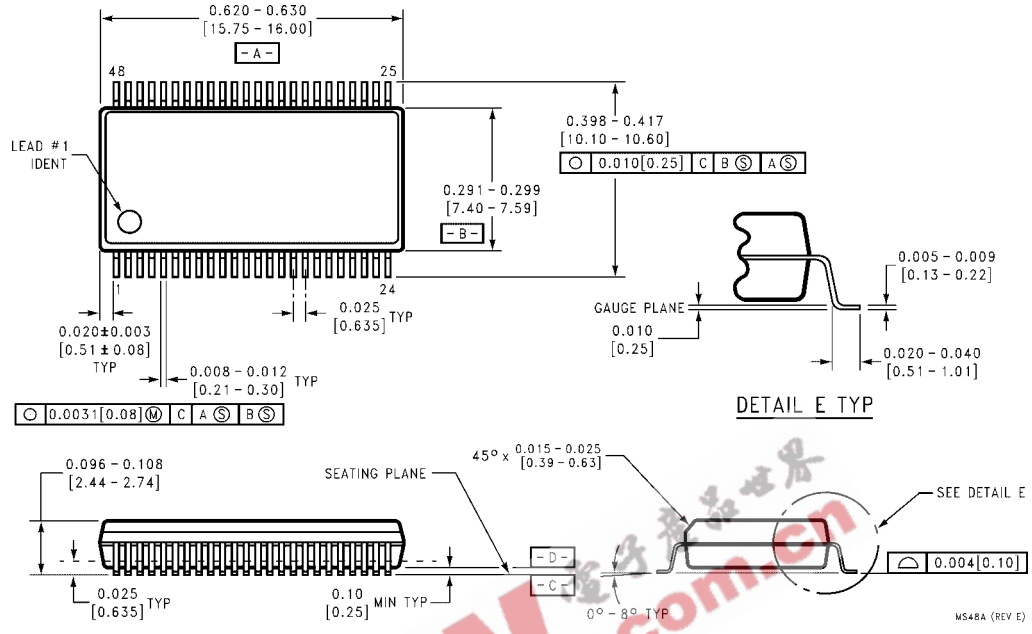
AC Operating Requirements							
(SOIC and SSOP Packages)							
Symbol	Parameter	T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> = -40°C to +85°C V <sub>CC</sub> = 4.5V to 5.5V C <sub>L</sub> = 50 pF		Units
		Min	Typ	Max	Min	Max	
t <sub>TOGGLE</sub>	Maximum Toggle Frequency		100				MHz
t <sub>S</sub> (H)	Setup Time, HIGH	1.5			1.5		ns
t <sub>S</sub> (L)	or LOW D <sub>n</sub> to LE	1.5			1.5		
t <sub>H</sub> (H)	Hold Time, HIGH	1.0			1.0		ns
t <sub>H</sub> (L)	or LOW D <sub>n</sub> to LE	1.0			1.0		
t <sub>W</sub> (H)	Pulse Width, LE HIGH	3.0			3.0		ns

Capacitance				
Symbol	Parameter	Typ	Units	Conditions (T <sub>A</sub> = 25°C)
C <sub>IN</sub>	Input Capacitance	5	pF	V <sub>CC</sub> = 0V
C <sub>OUT</sub> (Note 5)	Output Capacitance	11	pF	V <sub>CC</sub> = 5.0V

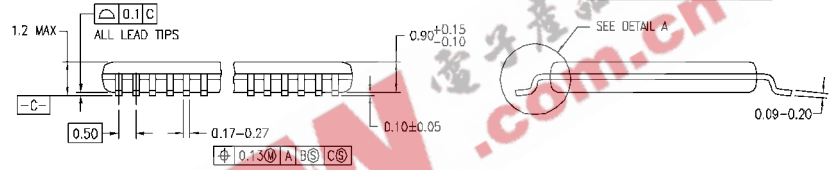
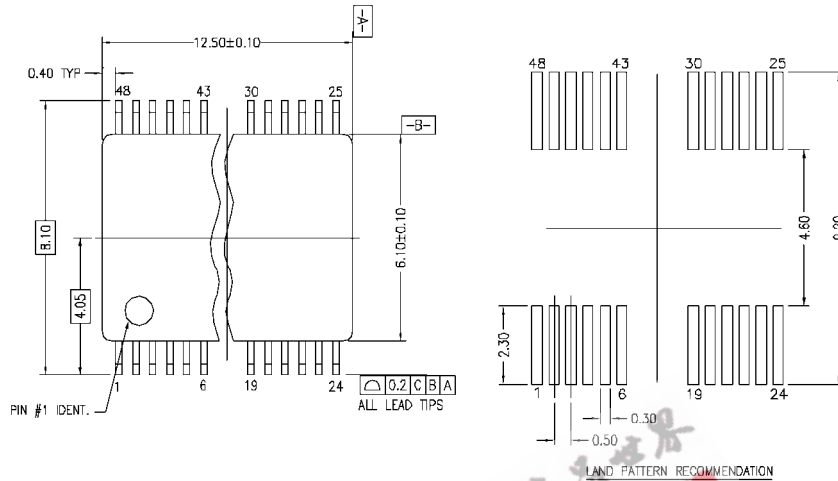
**Note 5:** C<sub>OUT</sub> is measured at frequency f = 1 MHz, per MIL-STD-883, Method 3012.

**Physical Dimensions** inches (millimeters) unless otherwise noted



48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide  
Package Number MS48A

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



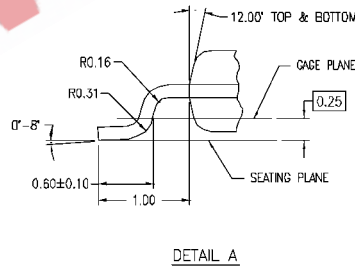
DIMENSIONS ARE IN MILLIMETERS

**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION ED, DATE 4/97.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTD48REV C

**48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide Package Number MTD48**



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