

74ABT16374 16-Bit D-Type Flip-Flop with 3-STATE Outputs

General Description

The ABT16374 contains sixteen non-inverting D-type flip-flops with 3-STATE outputs and is intended for bus oriented applications. The device is byte controlled. A buffered clock (CP) and Output Enable (\overline{OE}) are common to each byte and can be shorted together for full 16-bit operation.

Features

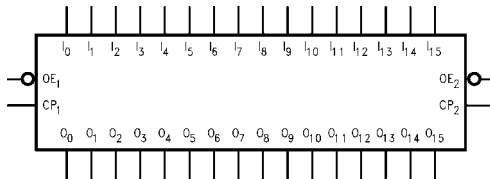
- Separate control logic for each byte
- 16-bit version of the ABT374
- Edge-triggered D-type inputs
- Buffered Positive edge-triggered clock
- High impedance glitch free bus loading during entire power up and power down cycle
- Non-destructive hot insertion capability
- Guaranteed latch-up protection

Ordering Code:

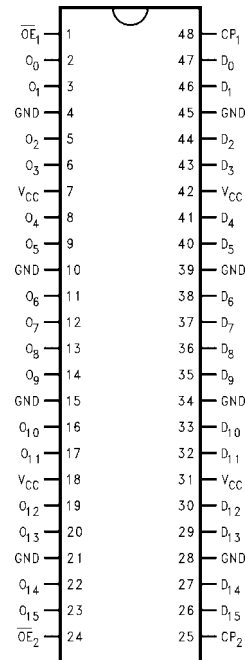
Order Number	Package Number	Package Description
74ABT16374CSSC	MS48A	48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
74ABT16374CMTD	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

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

Logic Symbol



Connection Diagram



Pin Descriptions

Pin Name	Description
\overline{OE}_n	3-STATE Output Enable Input (Active LOW)
CP_n	Clock Pulse Input (Active Rising Edge)
D_0 - D_{15}	Data Inputs
O_0 - O_{15}	3-STATE Outputs

Functional Description

The ABT16374 consists of sixteen edge-triggered flip-flops with individual D-type inputs and 3-STATE true outputs. The device is byte controlled with each byte functioning identically, but independent of the other. The control pins can be shorted together to obtain full 16-bit operation. Each byte has a buffered clock and buffered Output Enable common to all flip-flops within that byte. The description which follows applies to each byte. Each flip-flop will store the state of their individual D inputs that meet the setup and hold time requirements on the LOW-to-HIGH Clock (CP_n) transition. With the Output Enable (\overline{OE}_n) LOW, the contents of the flip-flops are available at the outputs. When \overline{OE}_n is HIGH, the outputs go to the high impedance state. Operation of the OE_n input does not affect the state of the flip-flops.

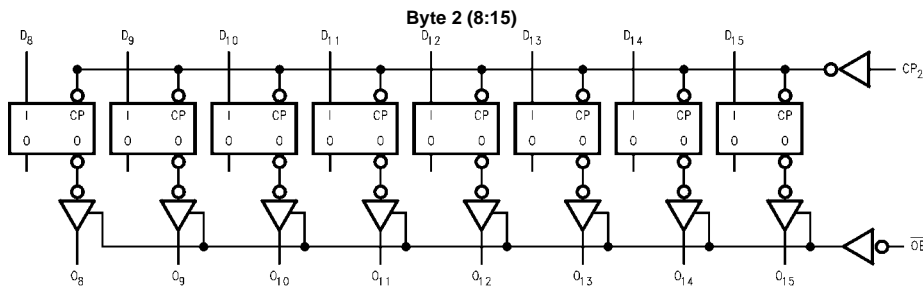
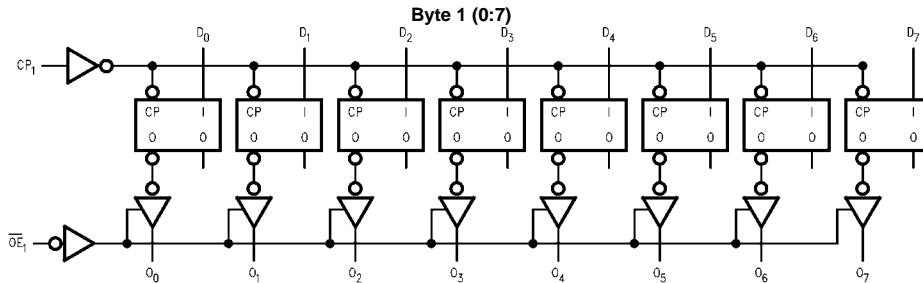
Truth Tables

Inputs			Outputs
CP_1	\overline{OE}_1	D_0-D_7	O_0-O_7
↗	L	H	H
↗	L	L	L
L	L	X	(Previous)
X	H	X	Z

Inputs			Outputs
CP_2	\overline{OE}_2	D_8-D_{15}	O_8-O_{15}
↗	L	H	H
↗	L	L	L
L	L	X	(Previous)
X	H	X	Z

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial
 Z = High Impedance

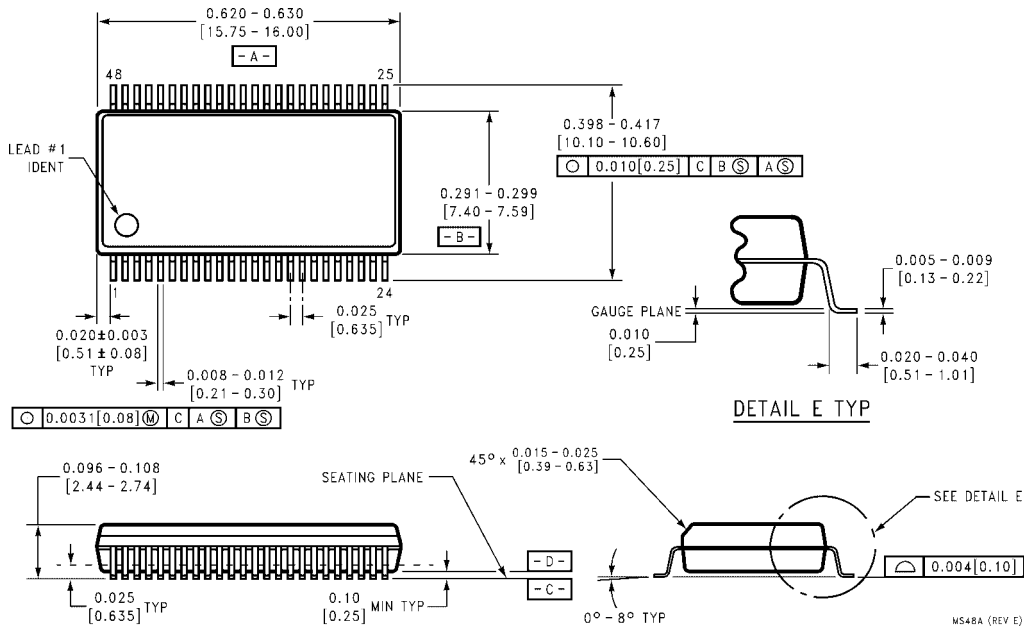
Logic Diagrams



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	Clock Input	100mV/ns				
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	-350 mA						
(Across Comm Operating Range)							
Other Pins	-500 mA						
Over Voltage Latchup (I/O)	10V						
<p>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.</p> <p>Note 2: Either voltage limit or current limit is sufficient to protect inputs.</p>							
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			V	Min	$I_{OH} = -3$ mA
		2.0			V	Min	$I_{OH} = -32$ mA
V_{OL}	Output LOW Voltage			0.55	V	Min	$I_{OL} = 64$ mA
I_{IH}	Input HIGH Current			1	μ A	Max	$V_{IN} = 2.7V$ (Note 3)
				1	μ A	Max	$V_{IN} = V_{CC}$
I_{BVI}	Input HIGH Current Breakdown Test			7	μ A	Max	$V_{IN} = 7.0V$
I_{IL}	Input LOW Current			-1	μ A	Max	$V_{IN} = 0.5V$ (Note 3)
				-1	μ A	Max	$V_{IN} = 0.0V$
V_{ID}	Input Leakage Test	4.75			V	0.0	$I_{ID} = 1.9$ μ A All Other Pins Grounded
I_{OZH}	Output Leakage Current			10	μ A	0-5.5V	$V_{OUT} = 2.7V$; $\overline{OE} = 2.0V$
I_{OZL}	Output Leakage Current			-10	μ 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	μ A	Max	$V_{OUT} = V_{CC}$
I_{ZZ}	Bus Drainage Test			100	μ A	0.0	$V_{OUT} = 5.5V$; All Others V_{CC} or 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	Outputs Enabled		2.5	mA		$V_I = V_{CC} - 2.1V$
		Outputs 3-STATE		2.5	mA	Max	Enable Input $V_I = V_{CC} - 2.1V$
		Outputs 3-STATE		2.5	mA		Data Input $V_I = V_{CC} - 2.1V$ All Others at V_{CC} or GND
I_{CCD}	Dynamic I_{CC} (Note 3)	No Load		0.30	mA/ MHz	Max	Outputs Open $\overline{OE} = GND$, (Note 4) One Bit Toggling, 50% Duty Cycle
<p>Note 3: Guaranteed, but not tested.</p> <p>Note 4: For 8-bit toggling, $I_{CCD} < 0.8$ mA/MHz.</p>							

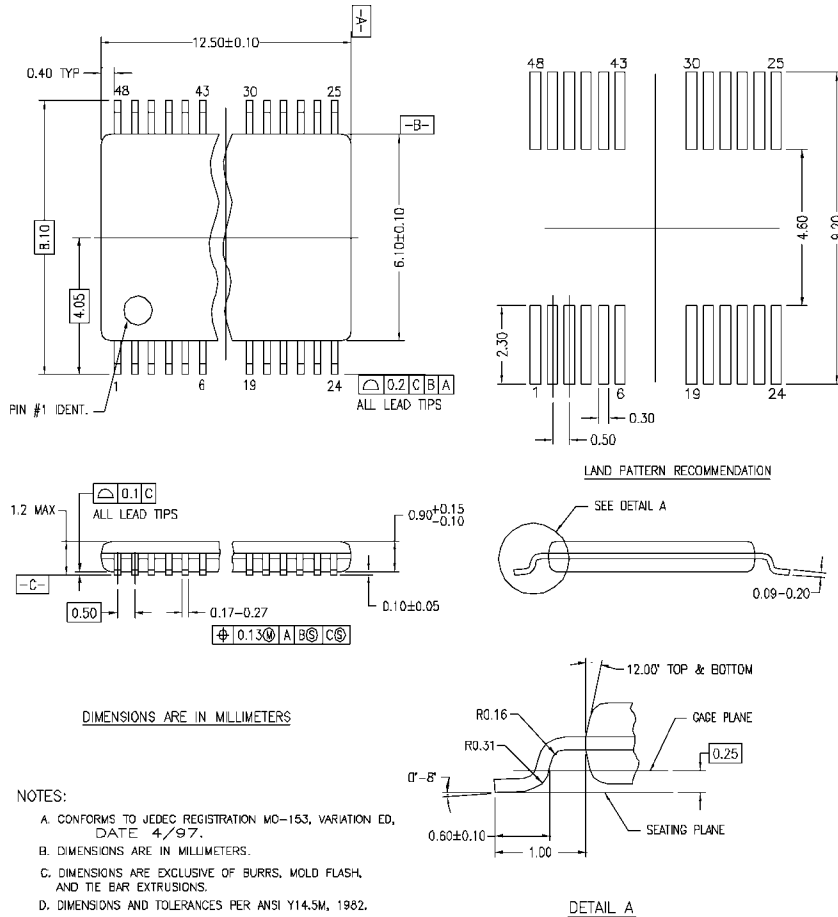
AC Electrical Characteristics							
(SSOP Package)							
Symbol	Parameter	T _A = +25°C V _{CC} = +5.0V C _L = 50 pF			T _A = -40°C to +85°C V _{CC} = 4.5V to 5.5V C _L = 50 pF		Units
		Min	Typ	Max	Min	Max	
f _{MAX}	Maximum Clock Frequency	150			150		MHz
t _{PLH}	Propagation Delay	1.8		6.2	1.8	6.2	ns
t _{PHL}	CP to O _n	1.8		5.9	1.8	5.9	
t _{PZH}	Output Enable Time	1.2		5.6	1.2	5.6	ns
t _{PZL}		1.6		5.3	1.6	5.3	
t _{PHZ}	Output Disable Time	2.2		7.1	2.2	7.1	ns
t _{PLZ}		2.2		6.6	2.2	6.6	
AC Operating Requirements							
Symbol	Parameter	T _A = +25°C V _{CC} = +5.0V C _L = 50 pF		T _A = -40°C to +85°C V _{CC} = 4.5V to 5.5V C _L = 50 pF		Units	
		Min	Max	Min	Max		
t _S (H)	Setup Time, HIGH	1.1		1.1		ns	
t _S (L)	or LOW D _n to CP	1.1		1.1			
t _H (H)	Hold Time, HIGH	1.3		1.3		ns	
t _H (L)	or LOW D _n to CP	1.3		1.3			
t _W (H)	Pulse Width, CP	3.0		3.0		ns	
t _W (L)	HIGH or LOW	3.0		3.0			
Capacitance							
Symbol	Parameter	Typ	Units	Conditions (T _A = 25°C)			
C _{IN}	Input Capacitance	5.0	pF	V _{CC} = 0V			
C _{OUT} (Note 5)	Output Capacitance	11.0	pF	V _{CC} = 5.0V			
Note 5: C _{OUT} 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)



MTD48REV C

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

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