

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

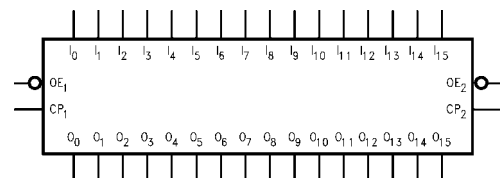
- Separate control logic for each byte
- 16-bit version of the ABT374
- Edge-triggered D-type inputs
- Buffered Positive edge-triggered clock
- High impedance glitch free bus loading during entire power up and power down cycle
- Non-destructive hot insertion capability
- Guaranteed latch-up protection

Ordering Code:

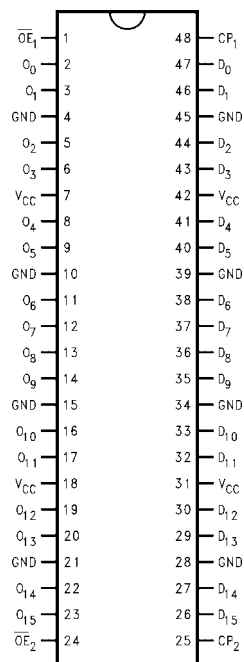
Order Number	Package Number	Package Description
74ABT16374CSSC	MS48A	48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
74ABT16374CMTD	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

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

74ABT16374 16-Bit D-Type Flip-Flop with 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 $\overline{OE}_n$ input does not affect the state of the flip-flops.

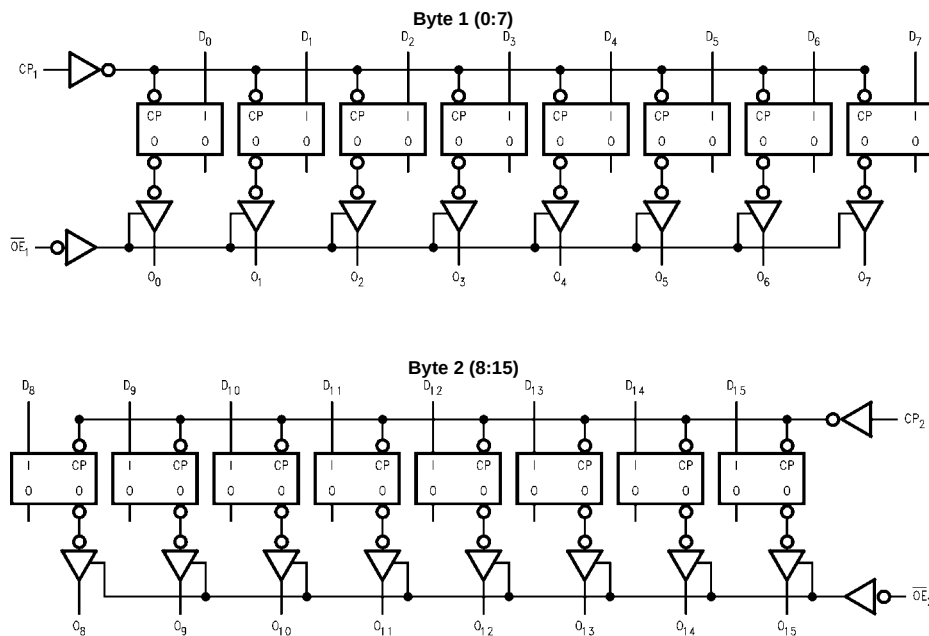
Truth Tables

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)

Storage Temperature	–65°C to +150°C
Ambient Temperature under Bias	–55°C to +125°C
Junction Temperature under Bias	–55°C to +150°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: 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	–40°C to +85°C
Supply Voltage	+4.5V to +5.5V
Minimum Input Edge Rate ($\Delta V/\Delta t$)	
Data Input	50 mV/ns
Enable Input	20 mV/ns
Clock Input	100mV/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	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	μA	Max	V _{IN} = 2.7V (Note 3)
				1	μA	Max	V _{IN} = V _{CC}
I _{BVI}	Input HIGH Current Breakdown Test			7	μA	Max	V _{IN} = 7.0V
I _{IL}	Input LOW Current			–1	μA	Max	V _{IN} = 0.5V (Note 3)
				–1	μA	Max	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			10	μA	0–5.5V	V _{OUT} = 2.7V; OE = 2.0V
I _{OZL}	Output Leakage Current			–10	μA	0–5.5V	V _{OUT} = 0.5V; 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 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	OE = V _{CC} ; All Others at V _{CC} or GND
I _{CCT}	Additional I _{CC} /Input	Outputs Enabled Outputs 3-STATE Outputs 3-STATE		2.5	mA		V _I = V _{CC} – 2.1V
				2.5	mA	Max	Enable Input V _I = V _{CC} – 2.1V
				2.5	mA	Max	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 OE = GND, (Note 4) One Bit Toggling, 50% Duty Cycle

Note 3: Guaranteed, but not tested.

Note 4: For 8-bit toggling, I_{CCD} < 0.8 mA/MHz.

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	ns
t _{PZH}	Output Enable Time	1.2		5.6	1.2	5.6	ns
t _{PZL}		1.6		5.3	1.6	5.3	ns
t _{PHZ}	Output Disable Time	2.2		7.1	2.2	7.1	ns
t _{PLZ}		2.2		6.6	2.2	6.6	ns

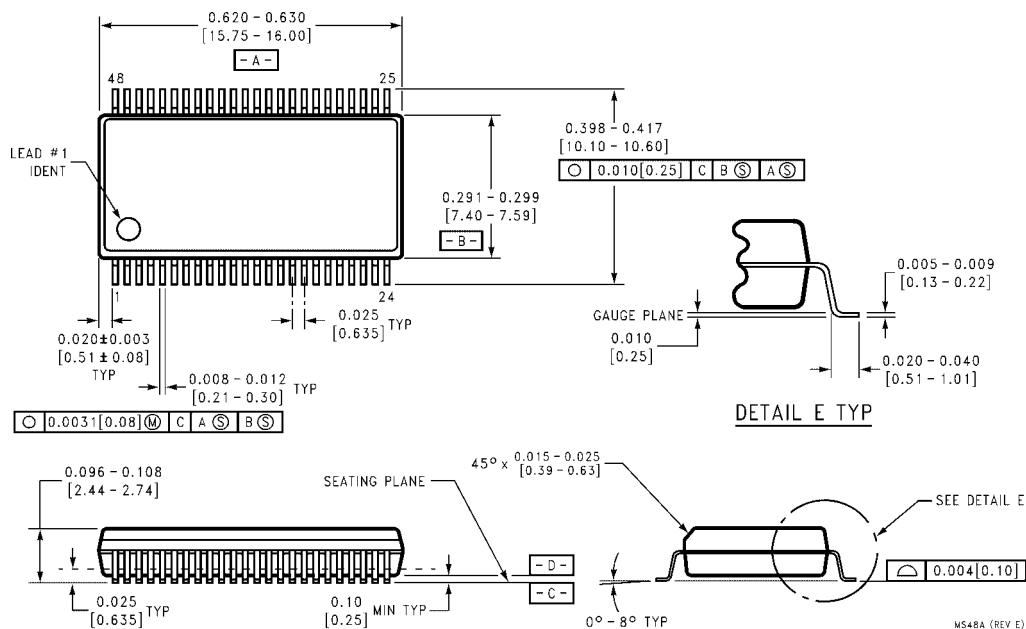
AC Operating Requirements

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		ns
t _H (H)	Hold Time, HIGH	1.3		1.3		ns
t _H (L)	or LOW D _n to CP	1.3		1.3		ns
t _W (H)	Pulse Width, CP	3.0		3.0		ns
t _W (L)	HIGH or LOW	3.0		3.0		ns

Capacitance

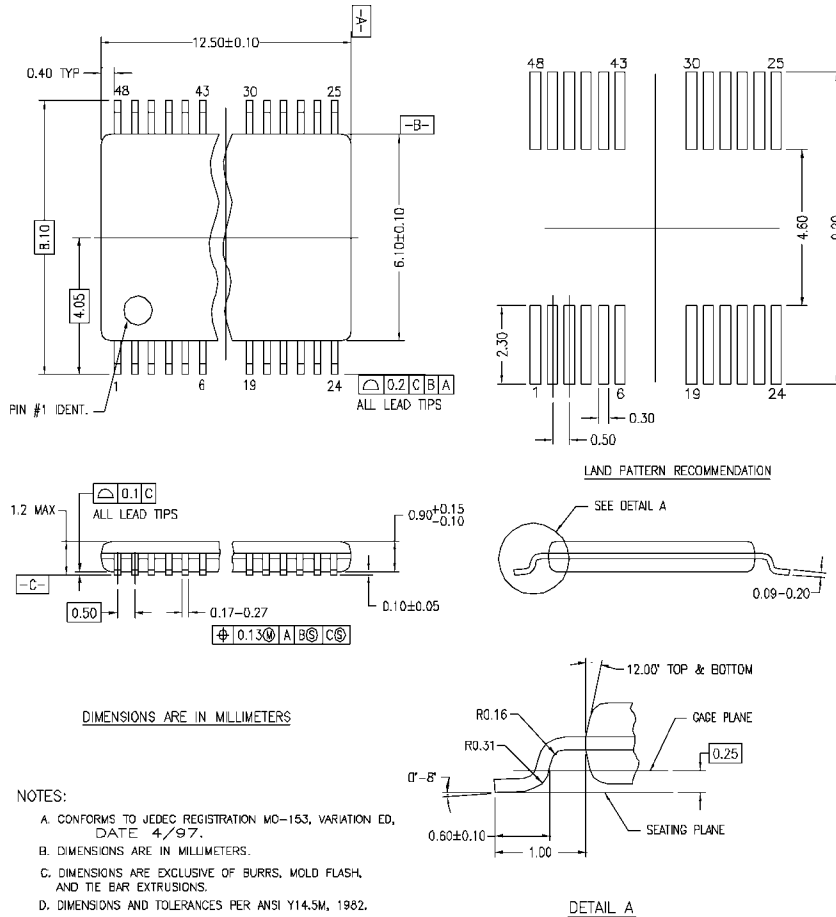
Symbol	Parameter	Typ	Units	Conditions (T _A = 25°C)
C _{IN}	Input Capacitance	5.0	pF	V _{CC} = 0V
C _{OUT} (Note 5)	Output Capacitance	11.0	pF	V _{CC} = 5.0V

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)



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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