INTEGRATED CIRCUITS

DATA SHEET

74ABT574AOctal D-type flip-flop (3-State)

Product specification

1995 May 22

IC23 Data Handbook





Octal D-type flip-flop (3-State)

74ABT574A

FEATURES

- 74ABT574A is flow-through pinout version of 74ABT374
- Inputs and outputs on opposite side of package allow easy interface to microprocessors
- 3-State outputs for bus interfacing
- Power-up 3-State
- Power-up reset
- Common output enable
- Latch-up protection exceeds 500mA per Jedec Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model
- Live insertion/extraction permitted.

DESCRIPTION

The 74ABT574A high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT574A is an 8-bit, edge triggered register coupled to eight 3-State output buffers. The two sections of the device are controlled independently by the clock (CP) and Output Enable ($\overline{\text{OE}}$) control gates. The state of each D input (one set-up time before the Low-to-High clock transition) is transferred to the corresponding flip-flop's Q output.

When $\overline{\text{OE}}$ is Low, the stored data appears at the outputs. When $\overline{\text{OE}}$ is High, the outputs are in the High-impedance "off" state, which means they will neither drive nor load the bus.

The 3-State output buffers are designed to drive heavily loaded 3-State buses, MOS memories, or MOS microprocessors. The active-Low Output Enable (\overline{OE}) controls all eight 3-State buffers independent of the clock operation.

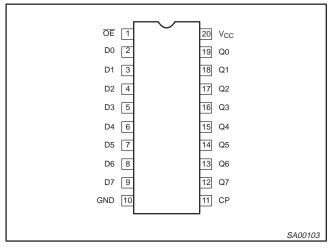
QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T _{amb} = 25°C; GND = 0V	TYPICAL	UNIT
t _{PLH} t _{PHL}	Propagation delay CP to Qn	$C_L = 50pF; V_{CC} = 5V$	3.0 3.4	ns
C _{IN}	Input capacitance	V _I = 0V or V _{CC}	3	pF
C _{OUT}	Output capacitance	Outputs disabled; V _O = 0V or V _{CC}	6	pF
I _{CCZ}	Total supply current	Outputs disabled; V _{CC} =5.5V	100	μΑ

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER				
20-Pin Plastic DIP	-40°C to +85°C	74ABT574A N	74ABT574A N	SOT146-1				
20-Pin plastic SO	–40°C to +85°C	74ABT574A D	74ABT574A D	SOT163-1				
20-Pin Plastic SSOP Type II	-40°C to +85°C	74ABT574A DB	74ABT574A DB	SOT339-1				
20-Pin Plastic TSSOP Type I	−40°C to +85°C	74ABT574A PW	7ABT574APW DH	SOT360-1				

PIN CONFIGURATION



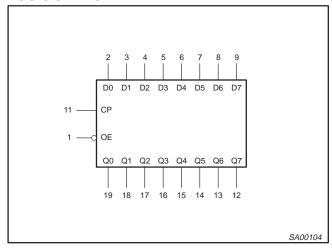
PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
1	ŌĒ	Output enable input (active-Low)
2, 3, 4, 5, 6, 7, 8, 9	D0-D7	Data inputs
19, 18, 17, 16, 15, 14, 13, 12	Q0-Q7	Data outputs
11	CP	Clock pulse input (active rising edge)
10	GND	Ground (0V)
20	V _{CC}	Positive supply voltage

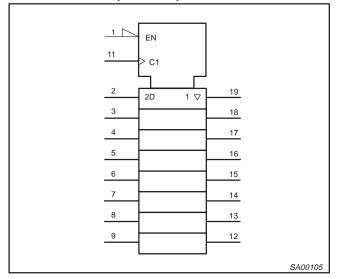
Octal D-type flip-flop (3-State)

74ABT574A

LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



FUNCTION TABLE

	NPUT	S	INTERNAL OUTPUTS		OPERATING	
OE	СР	Dn	REGISTER	Q0 – Q7	MODE	
L L	↑	l h	L H	L H	Load and read register	
L	1	Х	NC	NC	Hold	
H H		X Dn	NC Dn	Z Z	Disable outputs	

H = High voltage level
h = High voltage level one set-up time prior to the Low–to–High clock transition

Low voltage level

Low voltage level one set-up time prior to the Low-to-High clock transition

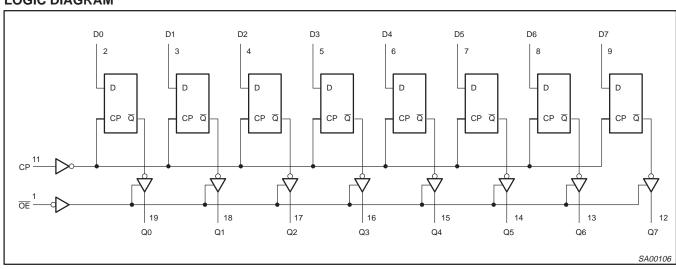
No change Don't care

X = Z = ↑ = + = + =

High impedance "off" state Low-to-High clock transition

= not a Low-to-High clock transition

LOGIC DIAGRAM



Octal D-type flip-flop (3-State)

74ABT574A

ABSOLUTE MAXIMUM RATINGS1, 2

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V _{CC}	DC supply voltage		-0.5 to +7.0	V
I _{IK}	DC input diode current	V ₁ < 0	-18	mA
VI	DC input voltage ³		-1.2 to +7.0	V
l _{OK}	DC output diode current	V _O < 0	-50	mA
V _{OUT}	DC output voltage ³	output in Off or High state	-0.5 to +5.5	V
I _{OUT}	DC output current	output in Low state	128	mA
T _{stg}	Storage temperature range		-65 to 150	°C

NOTES:

- 1. Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- 2. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
- 3. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIM	UNIT	
STWIBOL	PARAMETER	Min	Max	UNII
V _{CC}	DC supply voltage	4.5	5.5	V
VI	Input voltage	0	V _{CC}	V
V _{IH}	High-level input voltage	2.0		V
V _{IL}	Low-level input voltage		0.8	V
I _{OH}	High-level output current		-32	mA
I _{OL}	Low-level output current		64	mA
Δt/Δv	Input transition rise or fall rate	0	5	ns/V
T _{amb}	Operating free-air temperature range	-40	+85	°C

Octal D-type flip-flop (3-State)

74ABT574A

DC ELECTRICAL CHARACTERISTICS

SYMBOL PARAMETER		TEST CONDITIONS	T _{amb} = +25°C			T _{amb} =	–40°C 85°C	UNIT
			Min	Тур	Max	Min	Max	
V _{IK}	Input clamp voltage	V _{CC} = 4.5V; I _{IK} = -18mA		-0.9	-1.2		-1.2	V
		V_{CC} = 4.5V; I_{OH} = -3mA; V_{I} = V_{IL} or V_{IH}	2.5	2.9		2.5		V
V _{OH}	High-level output voltage	$V_{CC} = 5.0V$; $I_{OH} = -3mA$; $V_I = V_{IL}$ or V_{IH}	3.0	3.4		3.0		V
		V_{CC} = 4.5V; I_{OH} = -32mA; V_I = V_{IL} or V_{IH}	2.0	2.4		2.0		V
V _{OL}	Low-level output voltage	V_{CC} = 4.5V; I_{OL} = 64mA; V_I = V_{IL} or V_{IH}		0.42	0.55		0.55	V
V _{RST}	Power-up output low voltage ³	V_{CC} = 5.5V; I_{O} = 1mA; V_{I} = GND or V_{CC}		0.13	0.55		0.55	V
I _I	Input leakage current	V _{CC} = 5.5V; V _I = GND or 5.5V		±0.01	±1.0		±1.0	μΑ
I _{OFF}	Power-off leakage current	$V_{CC} = 0.0V$; V_O or $V_I \le 4.5V$		±5.0	±100		±100	μА
I _{PU} /I _{PD}	Power-up/down 3-State output current ⁴	V_{CC} = 2.0V; V_{O} = 0.5V; V_{I} = GND or V_{CC} ; V_{OE} = Don't care		±5.0	±50		±50	μА
I _{OZH}	3-State output High current	$V_{CC} = 5.5V; V_O = 2.7V; V_I = V_{IL} \text{ or } V_{IH}$		5.0	50		50	μΑ
I _{OZL}	3-State output Low current	$V_{CC} = 5.5V; V_O = 0.5V; V_I = V_{IL} \text{ or } V_{IH}$		-5.0	-50		-50	μА
I _{CEX}	Output High leakage current	V_{CC} = 5.5V; V_{O} = 5.5V; V_{I} = GND or V_{CC}		5.0	50		50	μА
I _O	Output current ¹	V _{CC} = 5.5V; V _O = 2.5V	-40		-180	-40	-180	mA
I _{CCH}		V_{CC} = 5.5V; Outputs High, V_I = GND or V_{CC}		100	250		250	μΑ
I _{CCL}	Quiescent supply current	V_{CC} = 5.5V; Outputs Low, V_{I} = GND or V_{CC}		24	30		30	mA
I _{CCZ}		V_{CC} = 5.5V; Outputs 3-State; V_{I} = GND or V_{CC}		100	250		250	μΑ
Δl _{CC}	Additional supply current per input pin ²	V_{CC} = 5.5V; one input at 3.4V, other inputs at V_{CC} or GND		0.5	1.5		1.5	mA

- 1. Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
- 2. This is the increase in supply current for each input at 3.4V.
- For valid test results, data must not be loaded into the flip-flops (or latches) after applying the power.
 This parameter is valid for any V_{CC} between 0V and 2.1V, with a transition time of up to 10 msec. From V_{CC} = 2.1V to V_{CC} = 5V ± 10% a transition time of up to 100 μsec is permitted.

AC CHARACTERISTICS

GND = 0V, t_R = t_F = 2.5ns, C_L = 50pF, R_L = 500 Ω

			LIMITS					
SYMBOL	PARAMETER	WAVEFORM	T _{amb} = +25°C V _{CC} = +5.0V			T_{amb} = -40 to +85°C V_{CC} = +5.0V ±0.5V		UNIT
			Min	Тур	Min	Min	Max	
f _{MAX}	Maximum clock frequency	1	150	400		150		ns
t _{PLH} t _{PHL}	Propagation delay CP to Qn	1	1.5 2.0	3.0 3.4	4.4 4.7	1.5 2.0	5.0 5.1	ns
t _{PZH} t _{PZL}	Output enable time to High and Low level	3 4	1.0 2.5	2.9 3.8	4.1 5.2	1.0 2.5	5.0 5.7	ns
t _{PHZ}	Output disable time from High and Low level	3 4	1.8 1.4	3.1 2.6	4.3 3.8	1.8 1.4	5.0 4.0	ns

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74ABT574A

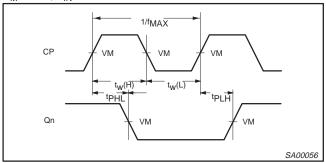
AC SETUP REQUIREMENTS

GND = 0V, t_R = t_F = 2.5ns, C_L = 50pF, R_L = 500 Ω

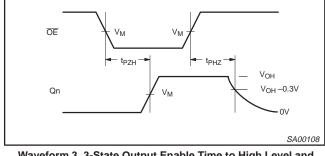
				L	IMITS	
SYMBOL	PARAMETER	WAVEFORM	WAVEFORM $T_{amb} = +25^{\circ}C$ $V_{CC} = +5.0V$		$T_{amb} = -40 \text{ to } +85^{\circ}\text{C}$ $V_{CC} = +5.0\text{V} \pm 0.5\text{V}$	UNIT
			Min	Тур	Min	
t _s (H) t _s (L)	Setup time, High or Low Dn to CP	2	1.0 1.0	0.6 0.2	1.0 1.0	ns
t _h (H) t _h (L)	Hold time, High or Low Dn to CP	2	1.0 1.0	-0.7 -0.4	1.0 1.0	ns
t _w (H) t _w (L)	CP pulse width High or Low	1	2.0 2.0	0.7 0.8	2.0 2.0	ns

AC WAVEFORMS

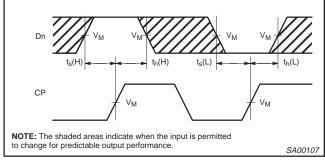
 $V_M = 1.5V$, $V_{IN} = GND$ to 3.0V



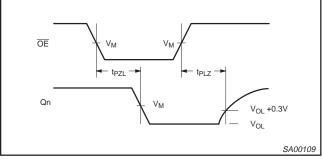
Waveform 1. Propagation Delay, Clock Input to Output, Clock Pulse Width, and Maximum Clock Frequency



Waveform 3. 3-State Output Enable Time to High Level and Output Disable Time from High Level



Waveform 2. Data Setup and Hold Times



Waveform 4. 3-State Output Enable Time to Low Level and Output Disable Time from Low Level

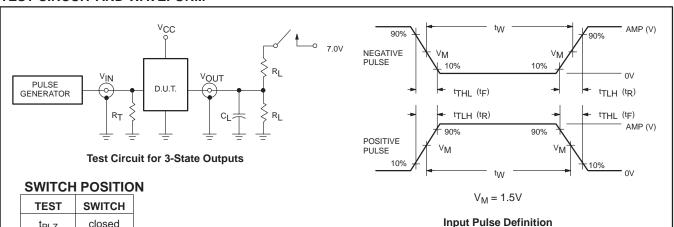
1995 May 22 6

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74ABT574A

TEST CIRCUIT AND WAVEFORM

closed closed



open **DEFINITIONS**

 t_{PLZ}

 t_{PZL} All other

R_L = Load resistor; see AC CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

 R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

FAMILY	INPUT PULSE REQUIREMENTS						
FAMILY	Amplitude	Rep. Rate	t _W	t _R	t _F		
74ABT	3.0V	1MHz	500ns	2.5ns	2.5ns		

SA00012

Octal D-type flip-flop (3-State)

74ABT574A

DIP20: plastic dual in-line package; 20 leads (300 mil)

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT146-1

SOT163-1

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74ABT574A

SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1

Octal D-type flip-flop (3-State)

74ABT574A

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1

1995 May 22 10

Octal D-type flip-flop (3-State)

74ABT574A

	DEFINITIONS				
Data Sheet Identification Product Status Definition		Definition			
Objective Specification	Formative or in Design	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.			
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