

# DATA SHEET

## **74ABT16823A**

18-bit bus interface D-type flip-flop  
with reset and enable (3-State)

Product data

2004 Feb 02

Replaces data sheet 74ABT16823A/ABTH16823A of 1998 Feb 27

# 18-bit bus-interface D-type flip-flop with reset and enable (3-State)

74ABT16823A

## FEATURES

- Two sets of high speed parallel registers with positive edge-triggered D-type flip-flops
- Ideal where high speed, light loading, or increased fan-in are required with MOS microprocessors
- Live insertion/extraction permitted
- Power-up 3-State
- Power-up Reset
- Output capability: +64 mA/–32 mA
- Latch-up protection exceeds 500 mA per Jedec Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model

## DESCRIPTION

The 74ABT16823A 18-bit bus interface register is designed to eliminate the extra packages required to buffer existing registers and provide extra data width for wider data/address paths of buses carrying parity.

The 74ABT16823A has two 9-bit wide buffered registers with Clock Enable ( $\overline{nCE}$ ) and Master Reset ( $\overline{nMR}$ ) which are ideal for parity bus interfacing in high microprogrammed systems.

The registers are fully edge-triggered. 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.

## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25\text{ }^{\circ}\text{C}; \text{GND} = 0\text{ V}$	TYPICAL	UNIT
$t_{PLH}$ $t_{PHL}$	Propagation delay nCP to nQx	$C_L = 50\text{ pF}; V_{CC} = 5\text{ V}$	2.3 1.9	ns
$C_{IN}$	Input capacitance	$V_I = 0\text{ V or } V_{CC}$	4	pF
$C_{OUT}$	Output capacitance	$V_O = 0\text{ V or } V_{CC}; 3\text{-State}$	6	pF
$I_{CCZ}$	Quiescent supply current	Outputs disabled; $V_{CC} = 5.5\text{ V}$	500	$\mu\text{A}$
$I_{CCL}$		Outputs low; $V_{CC} = 5.5\text{ V}$	9	mA

## ORDERING INFORMATION

$T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}$

Type number	Package		
	Name	Description	Version
74ABT16823ADL	SSOP56	plastic shrink small outline package; 56 leads; body width 7.5 mm	SOT371-1
74ABT16823ADGG	TSSOP56	plastic thin shrink small outline package; 56 leads; body width 6.1 mm	SOT364-1

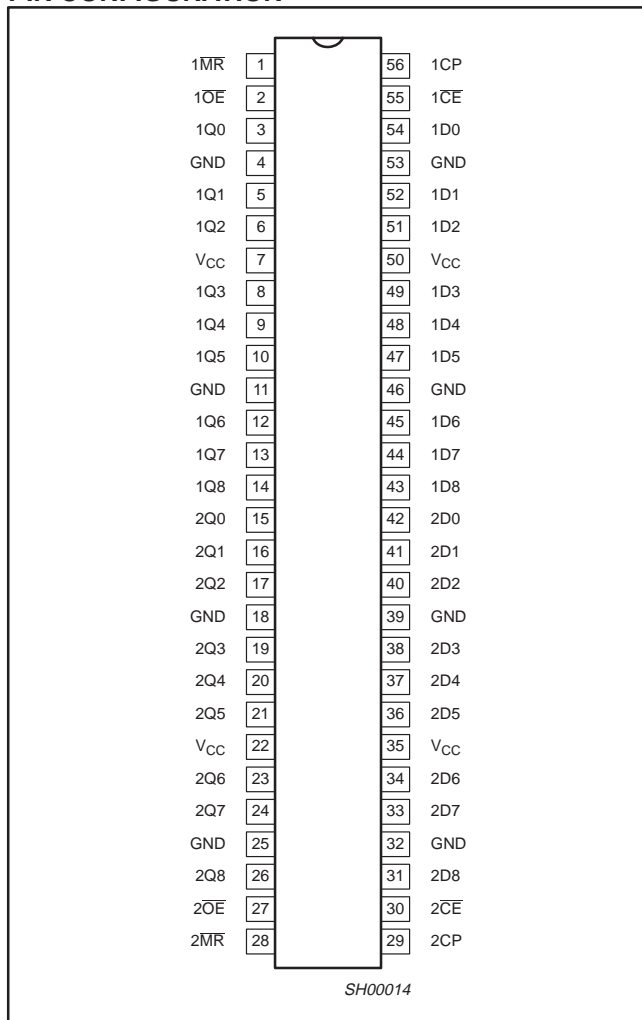
## PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
2, 27	1OE, 2OE	Output enable input (active-LOW)
54, 52, 51, 49, 48, 47, 45, 44, 43 42, 41, 40, 38, 37, 36, 34, 33, 31	1D0-1D8 2D0-2D8	Data inputs
3, 5, 6, 8, 9, 10, 12, 13, 14 15, 16, 17, 19, 20, 21, 23, 24, 26	1Q0-1Q8 2Q0-2Q8	Data outputs
56, 29	1CP, 2CP	Clock pulse input (active rising edge)
55, 30	1CE, 2CE	Clock enable input (active-LOW)
1, 28	1MR, 2MR	Master reset input (active-LOW)
4, 11, 18, 25, 32, 39, 46, 53	GND	Ground (0 V)
7, 22, 35, 50	$V_{CC}$	Positive supply voltage

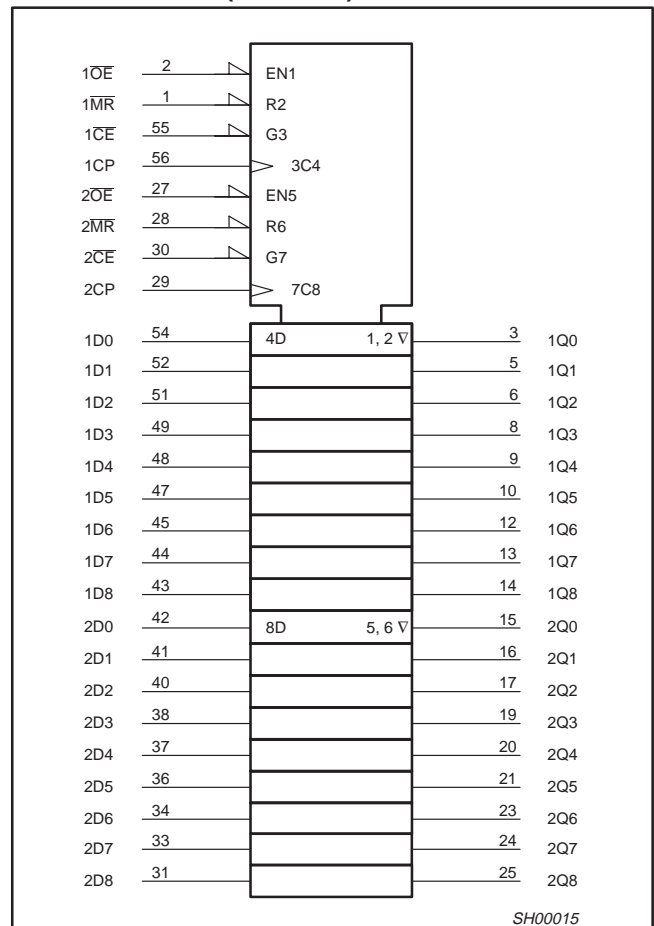
# 18-bit bus-interface D-type flip-flop with reset and enable (3-State)

## 74ABT16823A

### PIN CONFIGURATION



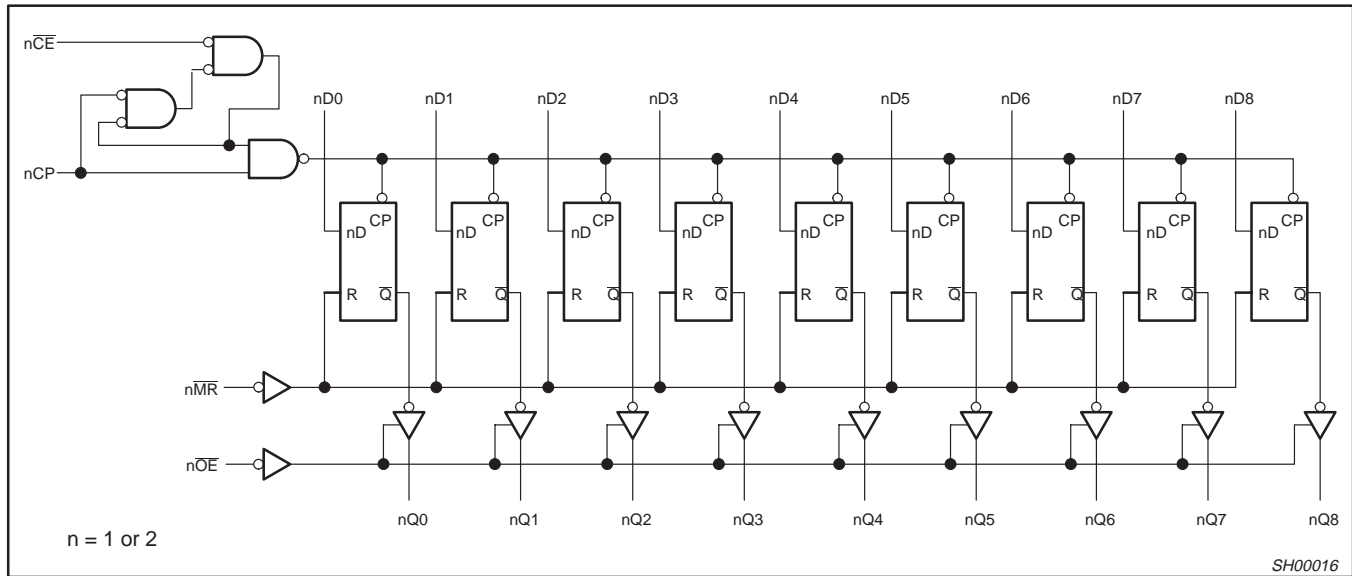
### LOGIC SYMBOL (IEEE/IEC)



# 18-bit bus-interface D-type flip-flop with reset and enable (3-State)

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## LOGIC DIAGRAM



## FUNCTION TABLE

INPUTS					OUTPUTS	OPERATING MODE
nOE	nMR	nCE	nCP	nDx	nQ0 – nQ8	
L	L	X	X	X	L	Clear
L	H	L	↑	h	H	Load and read data
L	H	L	↑	l	L	
L	H	H	‡	X	NC	Hold
H	X	X	X	X	Z	High impedance

H = High voltage level  
 h = High voltage level one set-up time prior to the LOW-to-HIGH clock transition  
 L = Low voltage level  
 l = Low voltage level one set-up time prior to the LOW-to-HIGH clock transition  
 NC = No change  
 X = Don't care  
 Z = High impedance "off" state  
 ↑ = LOW-to-HIGH clock transition  
 ‡ = Not a LOW-to-HIGH clock transition

# 18-bit bus-interface D-type flip-flop with reset and enable (3-State)

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## ABSOLUTE MAXIMUM RATINGS<sup>1, 2</sup>

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
$V_{CC}$	DC supply voltage		-0.5 to +7.0	V
$I_{IK}$	DC input diode current	$V_I < 0$ V	-18	mA
$V_I$	DC input voltage <sup>3</sup>		-1.2 to +7.0	V
$I_{OK}$	DC output diode current	$V_O < 0$ V	-50	mA
$V_{OUT}$	DC output voltage <sup>3</sup>	output in Off or HIGH state	-0.5 to +5.5	V
$I_{OUT}$	DC output current	output in LOW state	128	mA
		output in HIGH state	-64	
$T_{stg}$	Storage temperature range		-65 to 150	°C

### NOTES:

- 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.
- 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.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		MIN	MAX	
$V_{CC}$	DC supply voltage	4.5	5.5	V
$V_I$	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
$\Delta t/\Delta v$	Input transition rise or fall rate	0	10	ns/V
$T_{amb}$	Operating free-air temperature range	-40	+85	°C

# 18-bit bus-interface D-type flip-flop with reset and enable (3-State)

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## DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			T <sub>amb</sub> = +25 °C			T <sub>amb</sub> = -40 °C to +85 °C		
			MIN	TYP	MAX	MIN	MAX	
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = 4.5 V; I <sub>IK</sub> = -18 mA	-	-0.9	-1.2	-	-1.2	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>CC</sub> = 4.5 V; I <sub>OH</sub> = -3 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	2.5	2.9	-	2.5	-	V
		V <sub>CC</sub> = 5.0 V; I <sub>OH</sub> = -3 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	3.0	3.4	-	3.0	-	V
		V <sub>CC</sub> = 4.5 V; I <sub>OH</sub> = -32 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	2.0	2.4	-	2.0	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>CC</sub> = 4.5 V; I <sub>OL</sub> = 64 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	-	0.42	0.55	-	0.55	V
V <sub>RST</sub>	Power-up output LOW voltage <sup>3</sup>	V <sub>CC</sub> = 5.5 V; I <sub>OL</sub> = 1 mA; V <sub>I</sub> = GND or V <sub>CC</sub>	-	0.13	0.55	-	0.55	V
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>CC</sub> or GND	-	±0.01	±1	-	±1	µA
I <sub>OFF</sub>	Power-off leakage current	V <sub>CC</sub> = 0.0 V; V <sub>O</sub> or V <sub>I</sub> ≤ 4.5 V	-	±5.0	±100	-	±100	µA
I <sub>PU/PD</sub>	Power-up/down 3-State output current <sup>4</sup>	V <sub>CC</sub> = 2.1 V; V <sub>O</sub> = 0.5 V; V <sub>I</sub> = GND or V <sub>CC</sub> ; V <sub>OE</sub> = Don't care	-	±5.0	±50	-	±50	µA
I <sub>OZH</sub>	3-State output HIGH current	V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 2.7 V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	-	1.0	10	-	10	µA
I <sub>OZL</sub>	3-State output LOW current	V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 0.5 V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	-	-1.0	-10	-	-10	µA
I <sub>CEX</sub>	Output HIGH leakage current	V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 5.5 V; V <sub>I</sub> = GND or V <sub>CC</sub>	-	50	50	-	50	µA
I <sub>O</sub>	Output current <sup>1</sup>	V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 2.5 V	-50	-80	-180	-50	-180	mA
I <sub>CCH</sub>	Quiescent supply current	V <sub>CC</sub> = 5.5 V; Outputs HIGH; V <sub>I</sub> = GND or V <sub>CC</sub>	-	0.5	1	-	1	mA
I <sub>CCL</sub>		V <sub>CC</sub> = 5.5V; Outputs LOW; V <sub>I</sub> = GND or V <sub>CC</sub>	-	9.0	19	-	19	mA
I <sub>CCZ</sub>		V <sub>CC</sub> = 5.5V; Outputs 3-State; V <sub>I</sub> = GND or V <sub>CC</sub>	-	0.5	1	-	1	mA
ΔI <sub>CC</sub>	Additional supply current per input pin <sup>2</sup>	V <sub>CC</sub> = 5.5V; one input at 3.4 V, other inputs at V <sub>CC</sub> or GND	-	0.2	1	-	1	mA

### NOTES:

- Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
- 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<sub>CC</sub> between 0V and 2.1V with a transition time of up to 10msec. From V<sub>CC</sub> = 2.1V to V<sub>CC</sub> = 5V ± 10% a transition time of up to 100µsec is permitted.

# 18-bit bus-interface D-type flip-flop with reset and enable (3-State)

74ABT16823A

## AC CHARACTERISTICS

GND = 0 V,  $t_R = t_F = 2.5$  ns,  $C_L = 50$  pF,  $R_L = 500$   $\Omega$ 

SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT
			$T_{amb} = +25$ °C $V_{CC} = +5.0$ V			$T_{amb} = -40$ °C to $+85$ °C $V_{CC} = +5.0$ V $\pm$ 0.5 V		
			MIN	TYP	MAX	MIN	MAX	
$f_{MAX}$	Maximum clock frequency	1	140	190	–	140		MHz
$t_{PLH}$ $t_{PHL}$	Propagation delay nCP to nQx	1	1.4 1.2	2.3 1.9	3.2 2.6	1.4 1.2	3.7 2.9	ns
$t_{PHL}$	Propagation delay nMR to nQx	2	2.0	3.3	4.3	2.0	5.0	ns
$t_{PZH}$ $t_{PZL}$	Output enable time to HIGH and LOW level	4 5	1.3 1.2	2.4 2.1	3.2 2.9	1.3 1.2	3.9 3.4	ns
$t_{PHZ}$ $t_{PLZ}$	Output disable time from HIGH and LOW level	4 5	1.7 1.6	2.9 2.3	4.0 3.2	1.7 1.6	4.7 3.4	ns

## AC SET-UP REQUIREMENTS

GND = 0 V,  $t_R = t_F = 2.5$  ns,  $C_L = 50$  pF,  $R_L = 500$   $\Omega$ 

SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			$T_{amb} = +25$ °C $V_{CC} = +5.0$ V		$T_{amb} = -40$ °C to $+85$ °C $V_{CC} = +5.0$ V $\pm$ 0.5V	
			MIN	TYP	MIN	
$t_s(H)$ $t_s(L)$	Set-up time, HIGH or LOW nDx to nCP	3	2.0 1.5	1.3 0.9	2.0 1.5	ns
$t_h(H)$ $t_h(L)$	Hold time, HIGH or LOW nDx to nCP	3	1.5 1.5	-0.9 -1.2	1.5 1.5	ns
$t_w(H)$ $t_w(L)$	nCP pulse width HIGH or LOW	1	3.3 3.3	1.7 1.7	3.3 3.3	ns
$t_s(H)$ $t_s(L)$	Set-up time, HIGH or LOW nCE to nCP	3	1.5 2.0	0.9 0.9	1.5 2.0	ns
$t_h(H)$ $t_h(L)$	Hold time, HIGH or LOW nCE to nCP	3	1.5 1.5	-0.8 -0.9	1.5 1.5	ns
$t_w(L)$	nMR pulse width, LOW	2	3.0	1.7	3.0	ns
$t_{rec}$	Recovery time nMR to nCP	2	2.5	1.0	2.5	ns

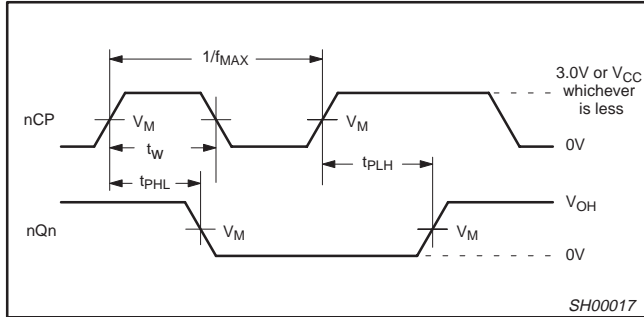
# 18-bit bus-interface D-type flip-flop with reset and enable (3-State)

74ABT16823A

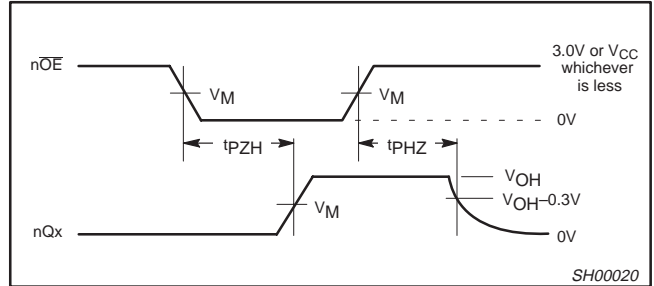
## AC WAVEFORMS

For all waveforms,  $V_M = 1.5\text{ V}$ .

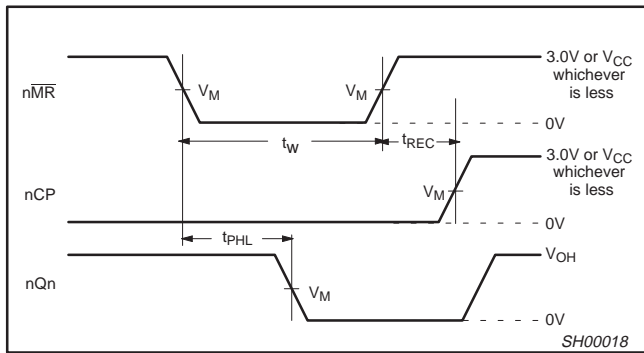
The shaded areas indicate when the input is permitted to change for predictable output performance.



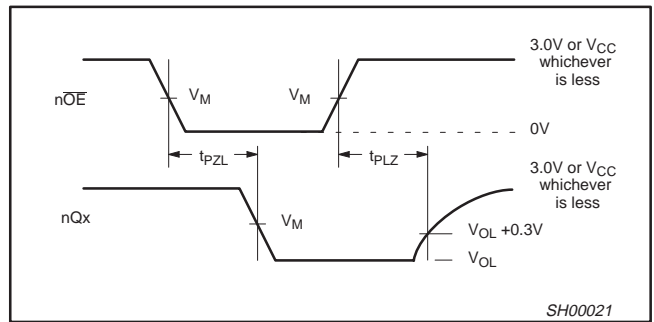
**Waveform 1. Propagation Delay, Clock Input to Output, Clock Pulse Width, and Maximum Clock Frequency**



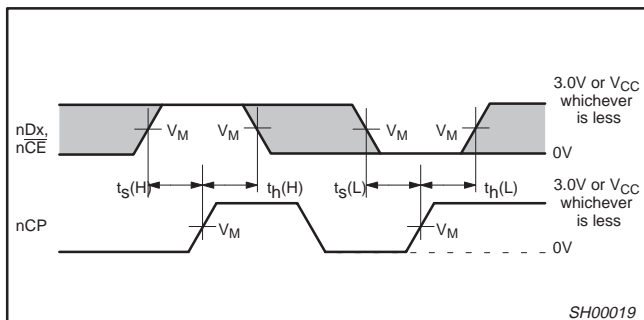
**Waveform 4. 3-State Output Enable Time to HIGH Level and Output Disable Time from HIGH Level**



**Waveform 2. Master Reset Pulse Width, Master Reset to Output Delay and Master Reset to Clock Recovery Time**



**Waveform 5. 3-State Output Enable Time to LOW Level and Output Disable Time from LOW Level**



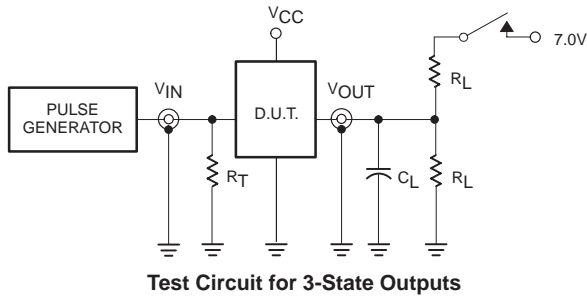
**Waveform 3. Data Set-up and Hold Times**



# 18-bit bus-interface D-type flip-flop with reset and enable (3-State)

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## TEST CIRCUIT AND WAVEFORM



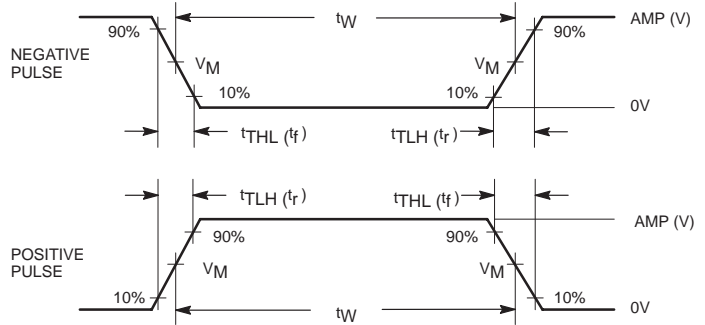
Test Circuit for 3-State Outputs

### SWITCH POSITION

TEST	SWITCH
$t_{PLZ}$	closed
$t_{PZL}$	closed
All other	open

### DEFINITIONS:

$R_L$  = 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.



$V_M = 1.5V$   
Input Pulse Definition

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	$t_w$	$t_R$	$t_F$
74ABT16	3.0V	1MHz	500ns	2.5ns	2.5ns

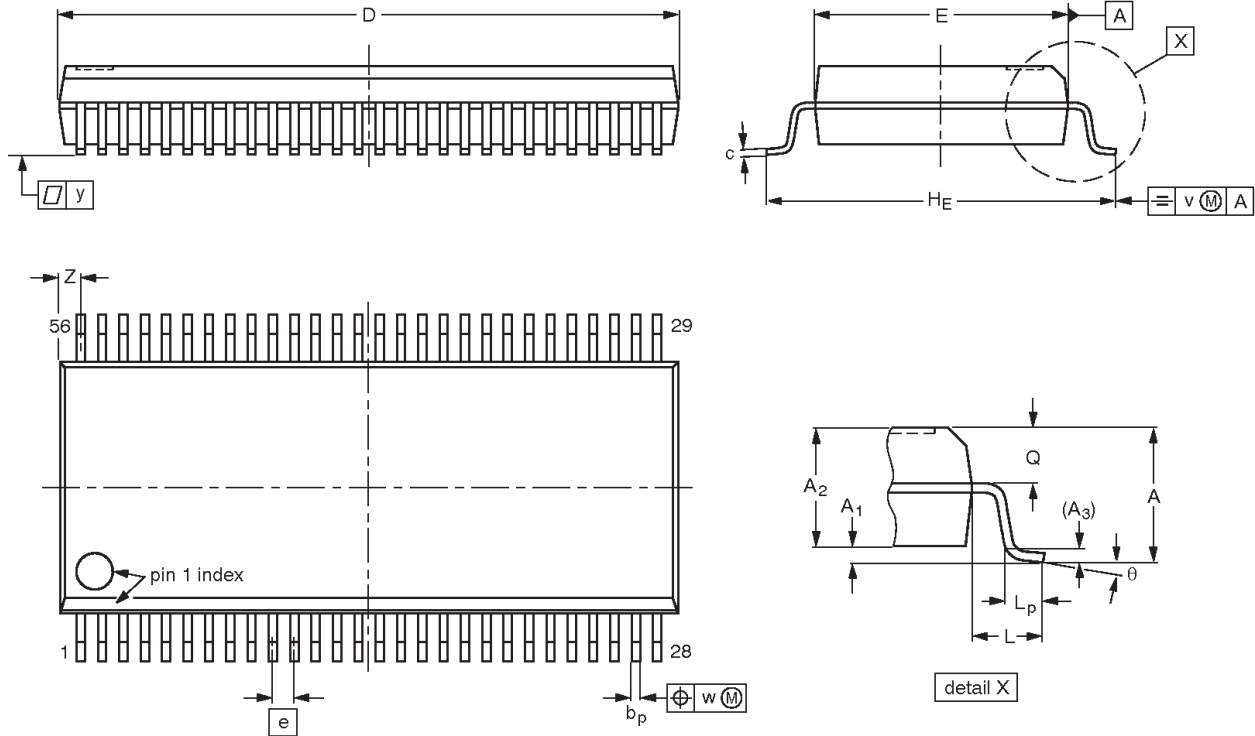
SH00022

# 18-bit bus-interface D-type flip-flop with reset and enable (3-State)

## 74ABT16823A

**SSOP56:** plastic shrink small outline package; 56 leads; body width 7.5 mm

**SOT371-1**



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	2.8	0.4 0.2	2.35 2.20	0.25	0.3 0.2	0.22 0.13	18.55 18.30	7.6 7.4	0.635	10.4 10.1	1.4	1.0 0.6	1.2 1.0	0.25	0.18	0.1	0.85 0.40	8° 0°

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

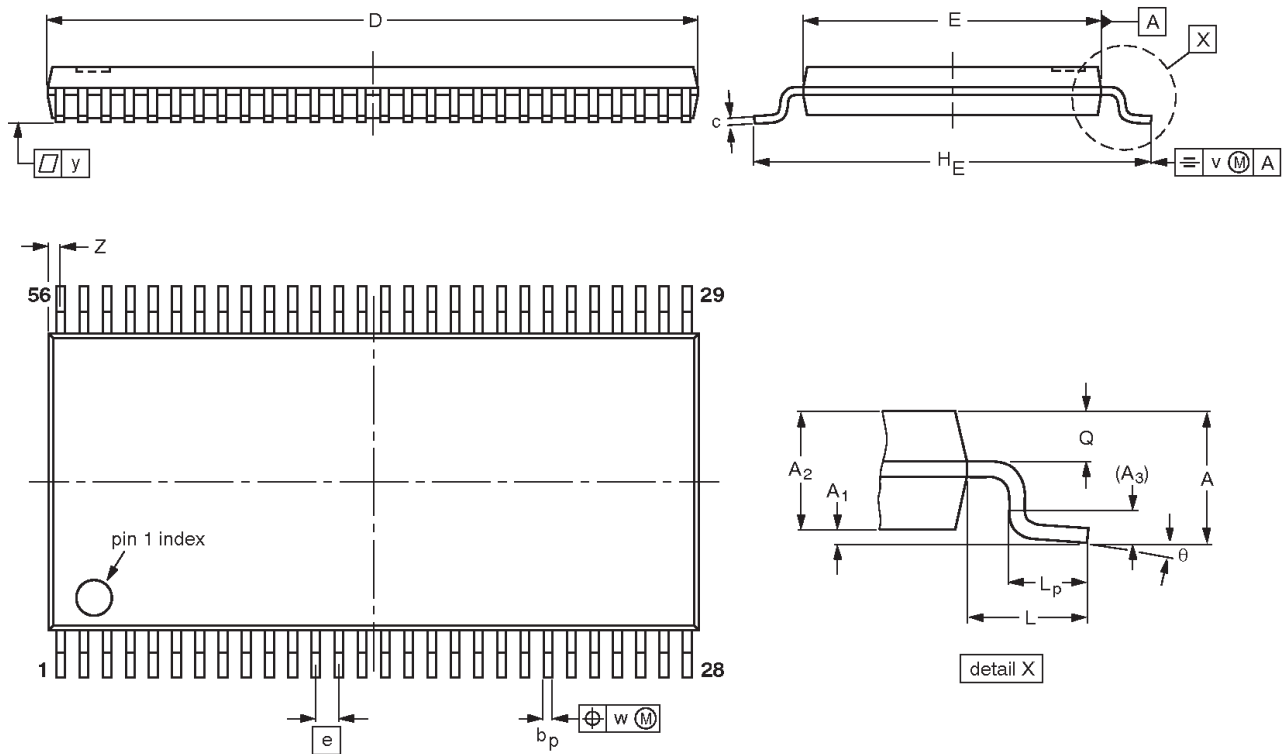
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT371-1		MO-118				99-12-27 03-02-18

# 18-bit bus-interface D-type flip-flop with reset and enable (3-State)

## 74ABT16823A

**TSSOP56:** plastic thin shrink small outline package; 56 leads; body width 6.1 mm

**SOT364-1**



**DIMENSIONS (mm are the original dimensions).**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z	θ
mm	1.2	0.15 0.05	1.05 0.85	0.25	0.28 0.17	0.2 0.1	14.1 13.9	6.2 6.0	0.5	8.3 7.9	1	0.8 0.4	0.50 0.35	0.25	0.08	0.1	0.5 0.1	8° 0°

**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT364-1		MO-153				-99-12-27 03-02-19

# 18-bit bus-interface D-type flip-flop with reset and enable (3-State)

74ABT16823A

## REVISION HISTORY

Rev	Date	Description
_3	20040202	<b>Product data (9397 750 12833); 853-1791 ECN 01-A15432 of 27 January 2004.</b> <b>Replaces data sheet 74ABT_H16823A_2 of 1998 February 27 (9397 750 03502).</b> Modifications: <ul style="list-style-type: none"> <li>• Delete all references to 74ABTH16823A (product discontinued).</li> </ul>
_2	19980227	<b>Product specification (9397 750 03502); ECN 853-1791 19025 of 27 February 1998.</b> <b>Supersedes data of 1995 Sep 28.</b>

## Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2] [3]</sup>	Definitions
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

## Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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Date of release: 02-04

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