

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)

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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

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^\circ\text{C}$; $\text{GND} = 0\text{ V}$	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-State	6	pF
I_{CCZ}	Quiescent supply current	Outputs disabled; $V_{CC} = 5.5\text{ V}$	500	μA
I_{CCL}		Outputs low; $V_{CC} = 5.5\text{ V}$	9	mA

ORDERING INFORMATION

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

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	$1\bar{OE}, 2\bar{OE}$	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	$1\bar{CE}, 2\bar{CE}$	Clock enable input (active-LOW)
1, 28	$1\bar{MR}, 2\bar{MR}$	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

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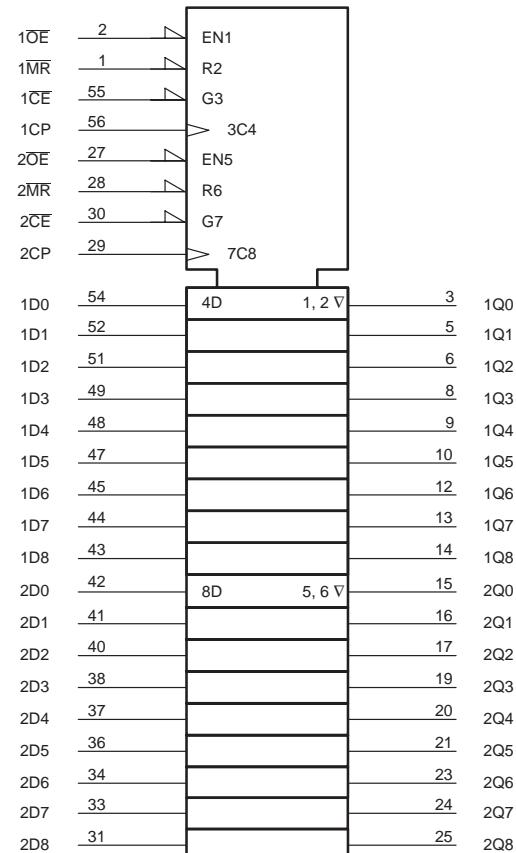
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PIN CONFIGURATION

1 \overline{MR}	1	56	1CP
1 \overline{OE}	2	55	1 \overline{CE}
1Q0	3	54	1D0
GND	4	53	GND
1Q1	5	52	1D1
1Q2	6	51	1D2
V _{CC}	7	50	V _{CC}
1Q3	8	49	1D3
1Q4	9	48	1D4
1Q5	10	47	1D5
GND	11	46	GND
1Q6	12	45	1D6
1Q7	13	44	1D7
1Q8	14	43	1D8
2Q0	15	42	2D0
2Q1	16	41	2D1
2Q2	17	40	2D2
GND	18	39	GND
2Q3	19	38	2D3
2Q4	20	37	2D4
2Q5	21	36	2D5
V _{CC}	22	35	V _{CC}
2Q6	23	34	2D6
2Q7	24	33	2D7
GND	25	32	GND
2Q8	26	31	2D8
2 \overline{OE}	27	30	2 \overline{CE}
2 \overline{MR}	28	29	2CP

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LOGIC SYMBOL (IEEE/IEC)

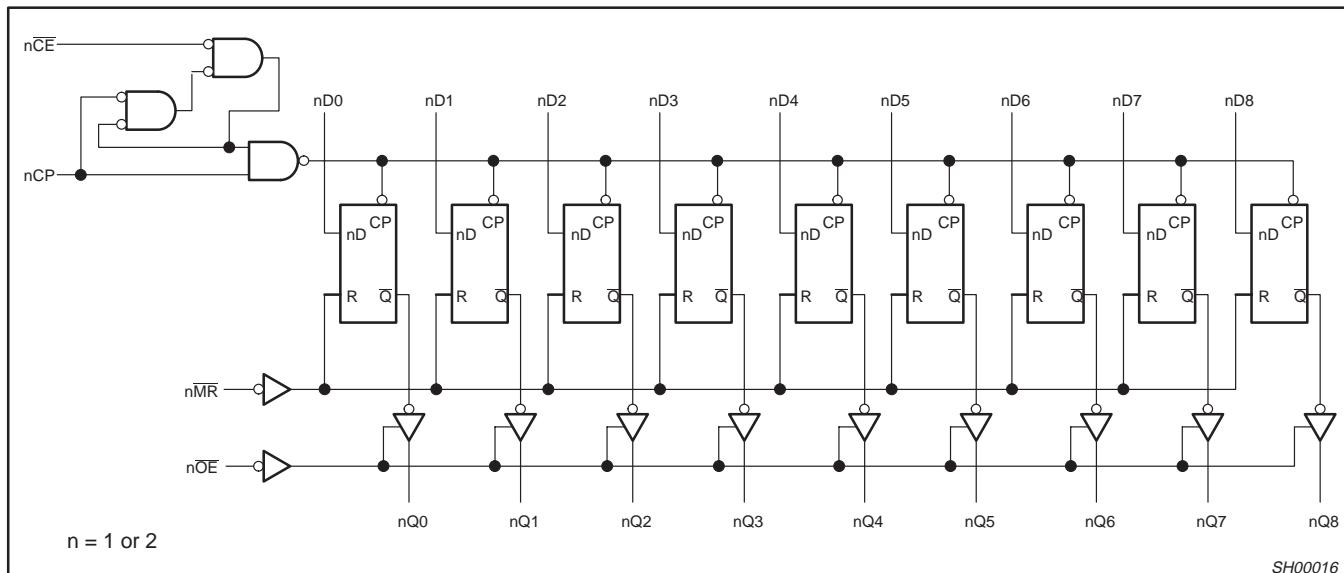


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LOGIC DIAGRAM



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

H = High voltage level
L = Low voltage level

L = Low voltage level
I = Low voltage level

NC= No change

NC = No change
X = Don't care

X = Don't care
Z = High impedance

\uparrow = LOW-to-HIGH clock transit

↑ = Not a LOW-to-HIGH clock transition

– Not a LOW to HIGH clock transition

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ABSOLUTE MAXIMUM RATINGS^{1, 2}

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 ³		−1.2 to +7.0	V
I_{OK}	DC output diode current	$V_O < 0$ V	−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
		output in HIGH state	−64	
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	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

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DC ELECTRICAL CHARACTERISTICS

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

NOTES:

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.
3. For valid test results, data must not be loaded into the flip-flops (or latches) after applying the power.
4. This parameter is valid for any V_{CC} between 0V and 2.1V with a transition time of up to 10msec. From V_{CC} = 2.1V to V_{CC} = 5V ± 10% a transition time of up to 100µsec is permitted.

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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	
			$T_{amb} = +25^\circ C$ $V_{CC} = +5.0 V$		$T_{amb} = -40^\circ C$ to $+85^\circ C$ $V_{CC} = +5.0 V \pm 0.5 V$				
			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
			$T_{amb} = +25^\circ C$ $V_{CC} = +5.0 V$		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

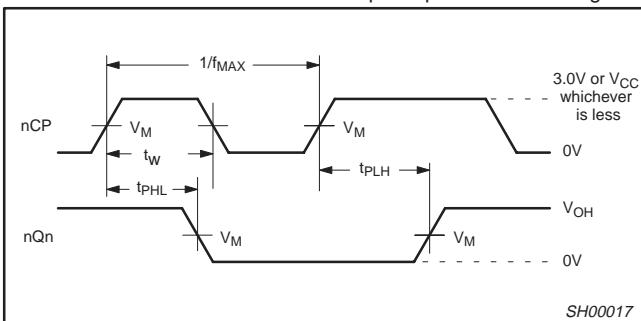
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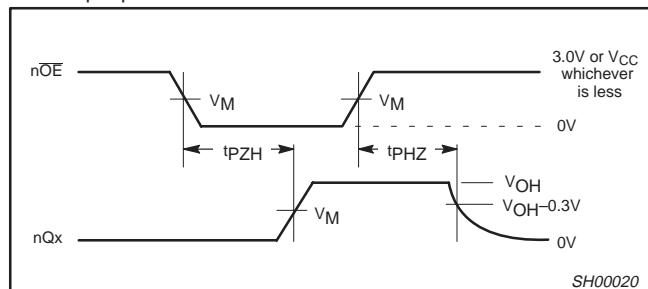
AC WAVEFORMS

For all waveforms, $V_M = 1.5$ V.

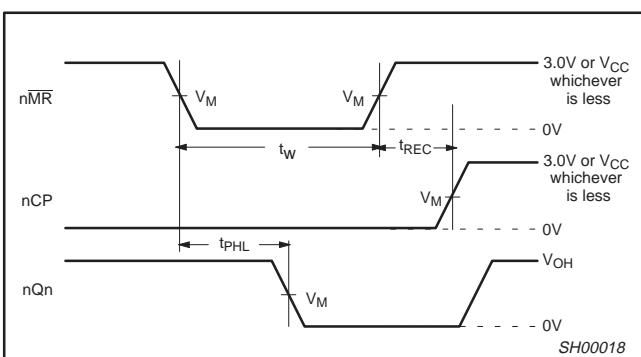
The shaded areas indicate when the input is permitted to change for predictable output performance.



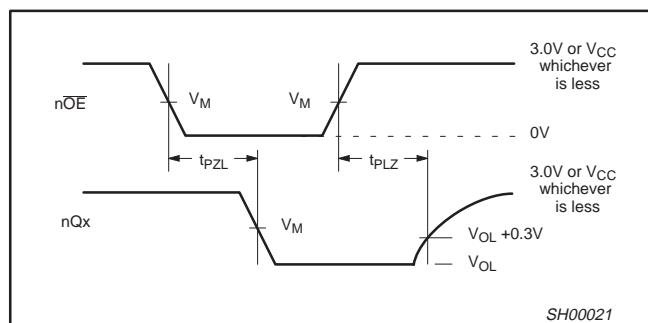
Waveform 1. Propagation Delay, Clock Input to Output,
Clock Pulse Width, and Maximum Clock Frequency



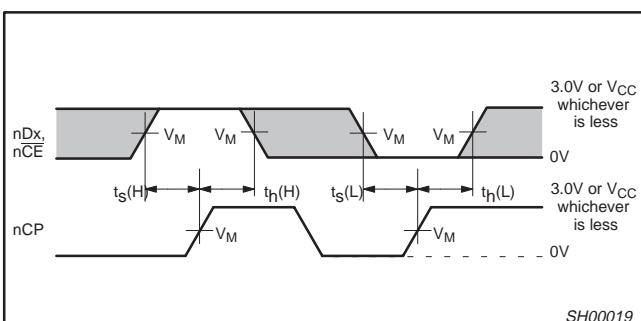
Waveform 4. 3-State Output Enable Time to HIGH Level
and Output Disable Time from HIGH Level



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

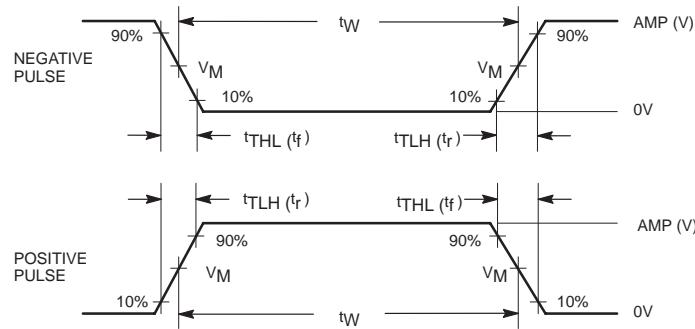
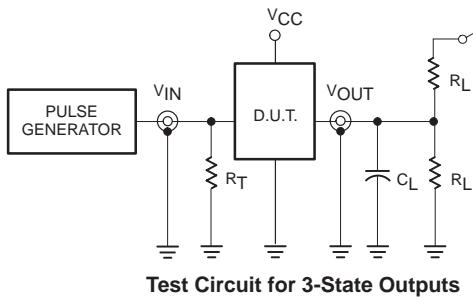


Waveform 3. Data Set-up and Hold Times

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TEST CIRCUIT AND WAVEFORM



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.

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

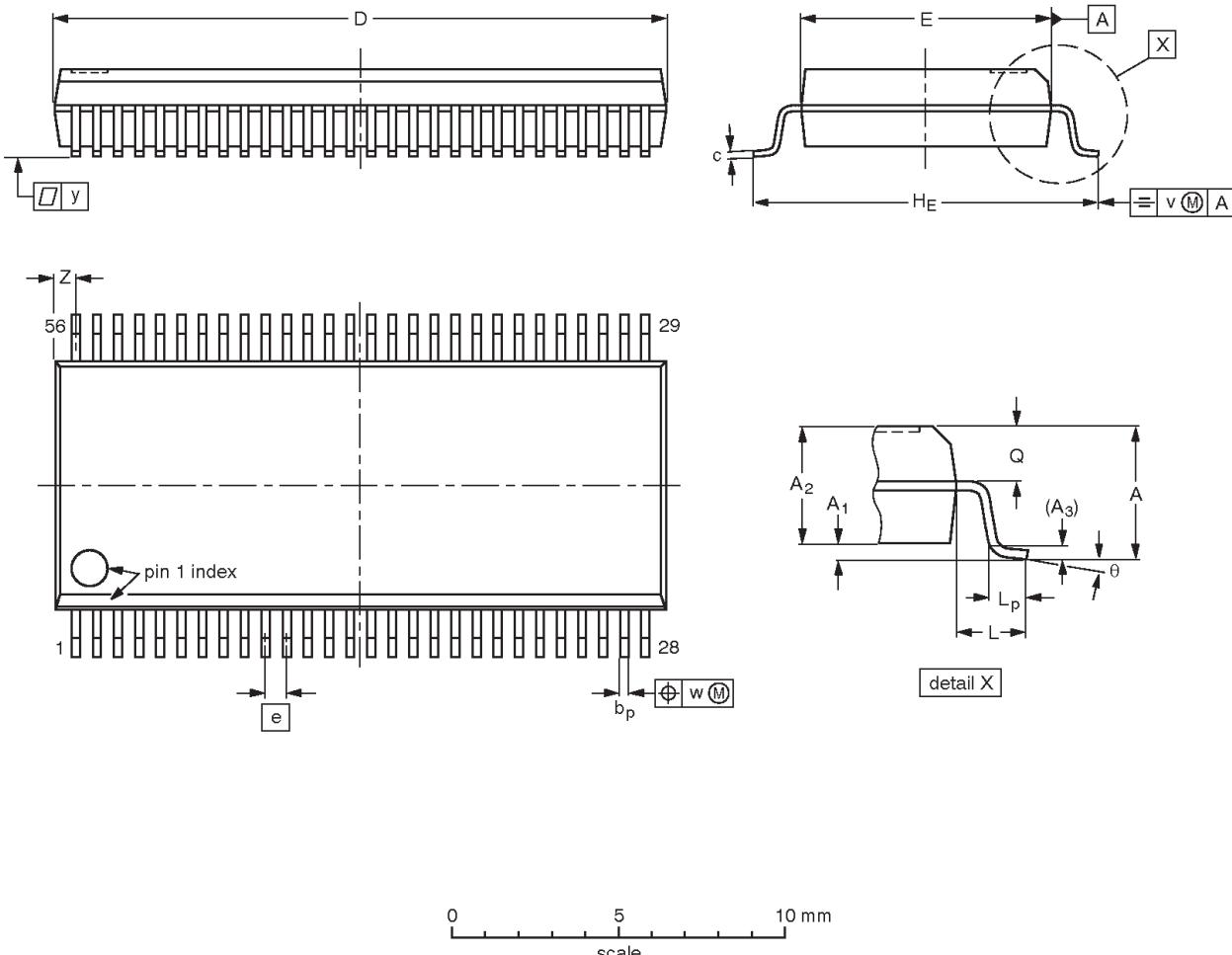
SH00022

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

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

Note

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

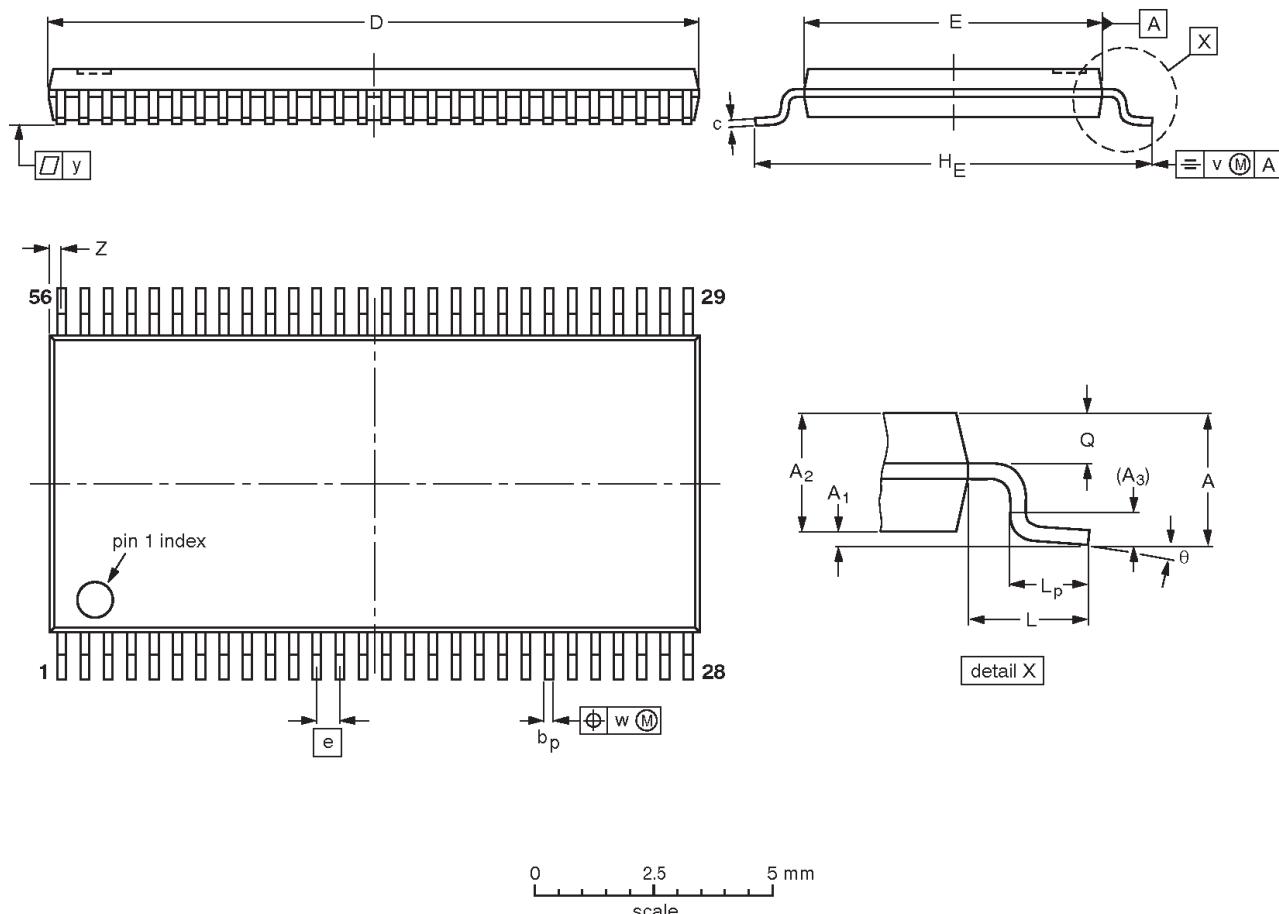
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT371-1		MO-118				-99-12-27 03-02-18

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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 ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽²⁾	e	H _E	L	L _p	Q	v	w	y	z	θ
mm	1.2 0.05	0.15 0.85	1.05	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

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REVISION HISTORY

Rev	Date	Description
_3	20040202	Product data (9397 750 12833); 853-1791 ECN 01-A15432 of 27 January 2004. Replaces data sheet 74ABT_H16823A_2 of 1998 February 27 (9397 750 03502). Modifications: • Delete all references to 74ABTH16823A (product discontinued).
_2	19980227	Product specification (9397 750 03502); ECN 853-1791 19025 of 27 February 1998. Supersedes data of 1995 Sep 28.

Data sheet status

Level	Data sheet status ^[1]	Product status ^[2] [3]	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.
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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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