

# DATA SHEET

**74ABT162827A**

**74ABTH162827A**

20-bit buffer/line driver, non-inverting,  
with 30 $\Omega$  termination resistors (3-State)

Product specification  
Supersedes data of 1997 Feb 26  
IC23 Data Handbook

1998 Feb 27

## 20-bit buffer/line driver, non-inverting, with 30Ω termination resistors (3-State)

## 74ABT162827A 74ABTH162827A

### FEATURES

- Multiple  $V_{CC}$  and GND pins minimize switching noise
- Live insertion/extraction permitted
- 3-State output buffers
- Power-up 3-State
- 74ABTH162827A incorporates bus-hold data inputs which eliminate the need for external pull-up resistors to hold unused inputs
- Output capability: +64mA/-32mA
- 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

### DESCRIPTION

The 74ABT162827A high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT162827A 20-bit buffers provide high performance bus interface buffering for wide data/address paths or buses carrying parity. They have NOR Output Enables ( $\overline{nOE1}$ ,  $\overline{nOE2}$ ) for maximum control flexibility.

The 74ABT162827A is designed with 30Ω series resistance in both the pull-up and pull-down output structures. This design reduces line noise in applications such as memory address drivers, clock drivers and bus receivers/transmitters.

Two options are available, 74ABT162827A which does not have the bus-hold feature and 74ABTH162827A which incorporates the bus-hold feature.

### 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 $nA_x$ to $nY_x$	$C_L = 50\text{pF}; V_{CC} = 5\text{V}$	1.8 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	$\mu\text{A}$
$I_{CCL}$		Outputs Low; $V_{CC} = 5.5\text{V}$	9	mA

### ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
56-Pin Plastic SSOP Type III	-40°C to +85°C	74ABT162827A DL	BT162827A DL	SOT371-1
56-Pin Plastic TSSOP Type II	-40°C to +85°C	74ABT162827A DGG	BT162827A DGG	SOT364-1
56-Pin Plastic SSOP Type III	-40°C to +85°C	74ABTH162827A DL	BH162827A DL	SOT371-1
56-Pin Plastic TSSOP Type II	-40°C to +85°C	74ABTH162827A DGG	BH162827A DGG	SOT364-1

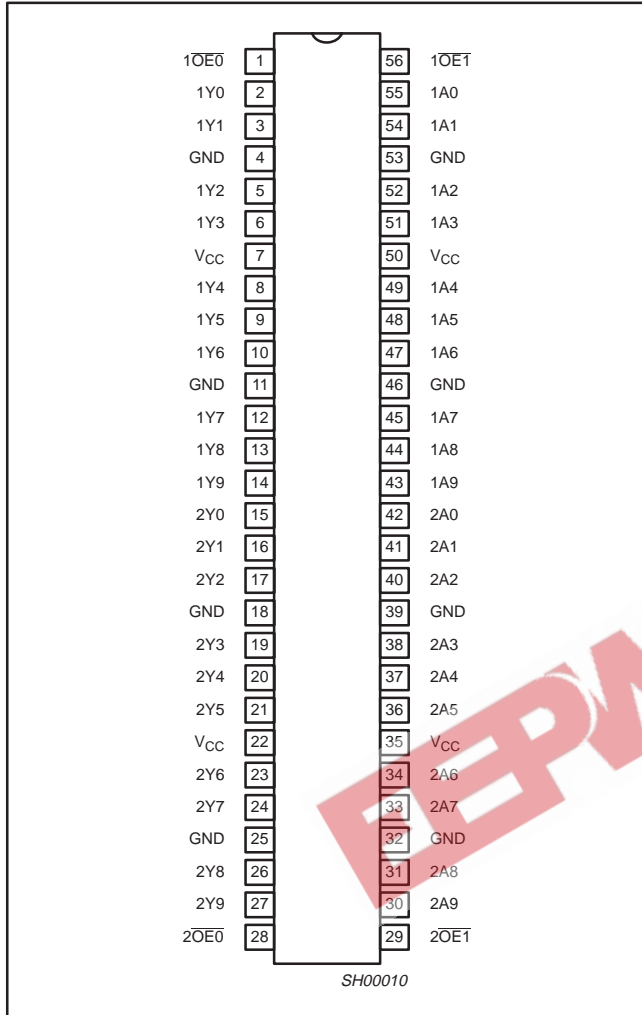
### PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
55, 54, 52, 51, 49, 48, 47, 45, 44, 43, 42, 41, 40, 38, 37, 36, 34, 33, 31, 30	1A0 - 1A9 2A0 - 2A9	Data inputs
2, 3, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 20, 21, 23, 24, 26, 27	1Y0 - 1Y9 2Y0 - 2Y9	Data outputs
1, 56, 28, 29	$1\overline{OE}0$ , $1\overline{OE}1$ $2\overline{OE}0$ , $2\overline{OE}1$	Output enable inputs (active-Low)
4, 11, 18, 25, 32, 39, 46, 53	GND	Ground (0V)
7, 22, 35, 50	$V_{CC}$	Positive supply voltage

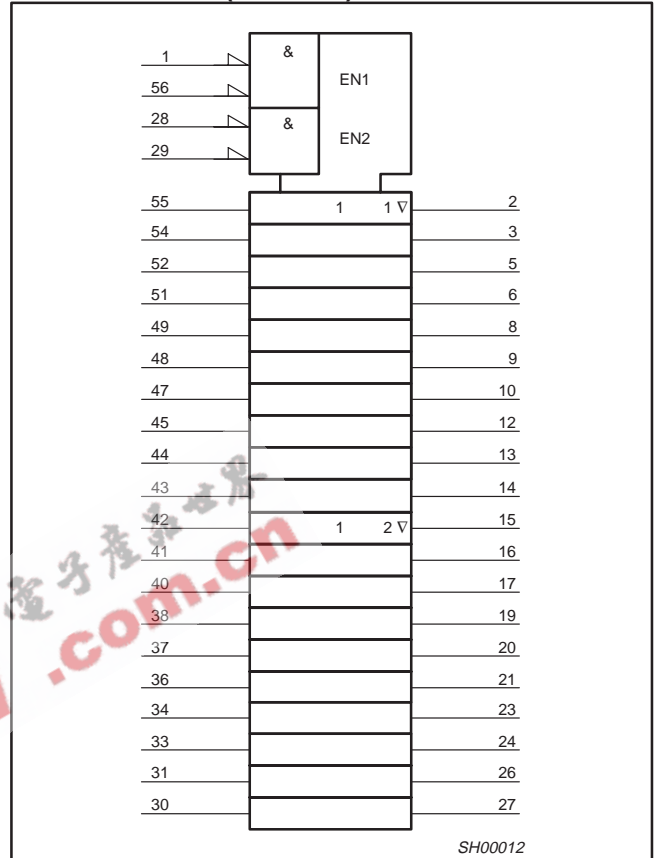
20-bit buffer/line driver, non-inverting,  
with 30Ω termination resistors (3-State)

74ABT162827A  
74ABTH162827A

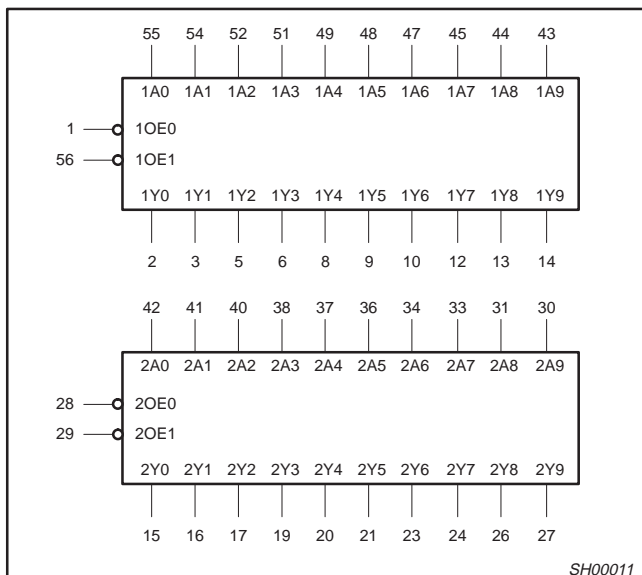
PIN CONFIGURATION



LOGIC SYMBOL (IEEE/IEC)



LOGIC SYMBOL



FUNCTION TABLE

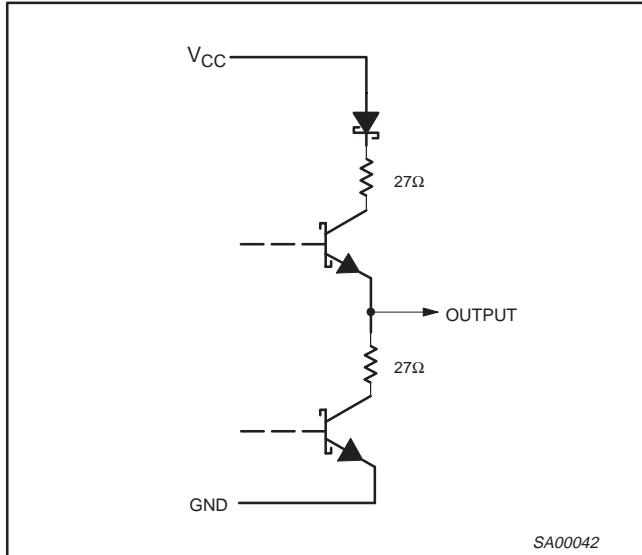
INPUTS		OUTPUTS	OPERATING MODE
nOE <sub>x</sub>	nA <sub>x</sub>	nY <sub>x</sub>	
L	L	L	Transparent
L	H	H	Transparent
H	X	Z	High impedance

X = Don't care  
Z = High impedance "off" state  
H = High voltage level  
L = Low voltage level

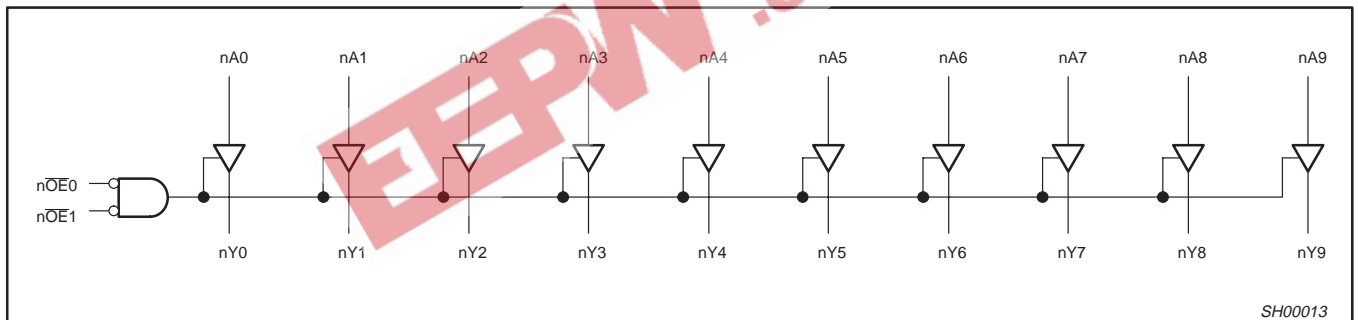
20-bit buffer/line driver, non-inverting,  
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**SCHEMATIC OF Y OUTPUTS**



**LOGIC DIAGRAM**



**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	$V_I < 0$	-18	mA
$V_I$	DC input voltage <sup>3</sup>		-1.2 to +7.0	V
$I_{OK}$	DC output diode current	$V_O < 0$	-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	mA
$T_{stg}$	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.

## 20-bit buffer/line driver, non-inverting, with 30Ω termination resistors (3-State)

## 74ABT162827A 74ABTH162827A

### 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		12	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

### DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			$T_{amb} = +25^\circ\text{C}$			$T_{amb} = -40^\circ\text{C}$ to $+85^\circ\text{C}$		
			MIN	TYP	MAX	MIN	MAX	
$V_{IK}$	Input clamp voltage	$V_{CC} = 4.5\text{V}; I_{IK} = -18\text{mA}$	-0.9	-1.2		-1.2	V	
$V_{OH}$	High-level output voltage	$V_{CC} = 4.5\text{V}; I_{OH} = -3\text{mA}; V_I = V_{IL}$ or $V_{IH}$	2.5	3.1		2.5	V	
		$V_{CC} = 5.0\text{V}; I_{OH} = -3\text{mA}; V_I = V_{IL}$ or $V_{IH}$	3.0	3.6		3.0	V	
		$V_{CC} = 4.5\text{V}; I_{OH} = -32\text{mA}; V_I = V_{IL}$ or $V_{IH}$	2.0	2.7		2.0	V	
$V_{OL}$	Low-level output voltage	$V_{CC} = 4.5\text{V}; I_{OH} = 8\text{mA}; V_I = V_{IL}$ or $V_{IN}$			0.65	0.65	V	
		$V_{CC} = 4.5\text{V}; I_{OL} = 12\text{mA}; V_I = V_{IL}$			0.80	0.80	V	
$I_I$	Input leakage current	$V_{CC} = 5.5\text{V}; V_I = \text{GND}$ or $5.5\text{V}$	$\pm 0.01$	$\pm 1.0$		$\pm 1.0$	$\mu\text{A}$	
$I_I$	Input leakage current 74ABTH162827A	$V_{CC} = 5.5\text{V}; V_I = 5.5\text{V}$	0.01	1		1	$\mu\text{A}$	
		$V_{CC} = 5.5\text{V}; V_I = V_{CC}$ or GND	$\pm 0.01$	$\pm 1$		$\pm 1$	$\mu\text{A}$	
		$V_{CC} = 5.5\text{V}; V_I = V_{CC}$	0.01	1		1	$\mu\text{A}$	
		$V_{CC} = 5.5\text{V}; V_I = 0$	-1	-3		-5	$\mu\text{A}$	
$I_{HOLD}$	Bus Hold current A inputs <sup>5</sup> 74ABTH162827A	$V_{CC} = 4.5\text{V}; V_I = 0.8\text{V}$	35			35	$\mu\text{A}$	
		$V_{CC} = 4.5\text{V}; V_I = 2.0\text{V}$	-75			-75		
		$V_{CC} = 5.5\text{V}; V_I = 0$ to $5.5\text{V}$	$\pm 800$					
$I_{OFF}$	Power-off leakage current	$V_{CC} = 0.0\text{V}; V_O = 4.5\text{V}; V_I = 0\text{V}$ or $5.5\text{V}$	$\pm 5.0$	$\pm 100$		$\pm 100$	$\mu\text{A}$	
$I_{PU}/I_{PD}$	Power-up/down 3-State output current <sup>3</sup>	$V_{CC} = 2.1\text{V}; V_O = 0.5\text{V}; V_I = \text{GND}$ or $V_{CC}$ ; $V_{OE} = \text{Don't care}$	$\pm 5.0$	$\pm 50$		$\pm 50$	$\mu\text{A}$	
$I_{OZH}$	3-State output High current	$V_{CC} = 5.5\text{V}; V_O = 2.7\text{V}; V_I = V_{IL}$ or $V_{IH}$	1.0	10		10	$\mu\text{A}$	
$I_{OZL}$	3-State output Low current	$V_{CC} = 5.5\text{V}; V_O = 0.5\text{V}; V_I = V_{IL}$ or $V_{IH}$	-1.0	-10		-10	$\mu\text{A}$	
$I_{CEX}$	Output High leakage current	$V_{CC} = 5.5\text{V}; V_O = 5.5\text{V}; V_I = \text{GND}$ or $V_{CC}$	1.0	50		50	$\mu\text{A}$	
$I_O$	Output current <sup>1</sup>	$V_{CC} = 5.5\text{V}; V_O = 2.5\text{V}$	-50	-70	-180	-50	-180	mA
$I_{CCH}$	Quiescent supply current	$V_{CC} = 5.5\text{V}; \text{Outputs High}, V_I = \text{GND}$ or $V_{CC}$	0.5	1		1	mA	
$I_{CCL}$		$V_{CC} = 5.5\text{V}; \text{Outputs Low}, V_I = \text{GND}$ or $V_{CC}$	9	19		19	mA	
$I_{CCZ}$		$V_{CC} = 5.5\text{V}; \text{Outputs 3-State}; V_I = \text{GND}$ or $V_{CC}$	0.5	1		1	mA	
$\Delta I_{CC}$	Additional supply current per input pin <sup>2</sup>	$V_{CC} = 5.5\text{V}; \text{one input at } 3.4\text{V}, \text{ other inputs at } V_{CC}$ 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.
- This parameter is valid for any  $V_{CC}$  between 0V and 2.1V with a transition time of up to 100μsec is permitted. From  $V_{CC} = 2.1\text{V}$  to  $V_{CC} = 5\text{V} \pm 10\%$  a transition time of up to 10msec. From  $V_{CC} = 2.1\text{V}$  to  $V_{CC} = 5\text{V} \pm 10\%$  a transition time of up to 100μsec is permitted.
- Unused pins at  $V_{CC}$  or GND.
- This is the bus hold overdrive current required to force the input to the opposite logic state.

20-bit buffer/line driver, non-inverting,  
with 30Ω termination resistors (3-State)

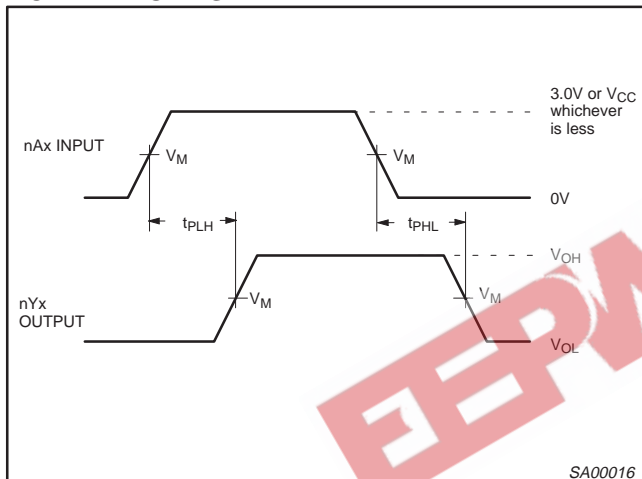
74ABT162827A  
74ABTH162827A

AC CHARACTERISTICS

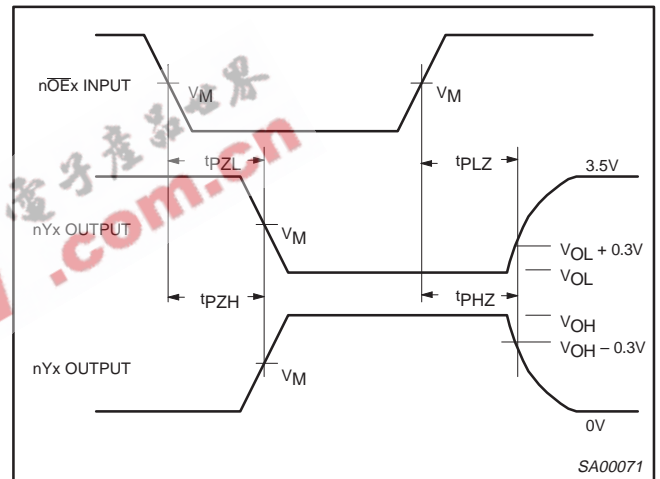
GND = 0V,  $t_R = t_F = 2.5\text{ns}$ ,  $C_L = 50\text{pF}$ ,  $R_L = 500\Omega$

SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT
			$T_{\text{amb}} = +25^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V}$			$T_{\text{amb}} = -40$ to $+85^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V} \pm 0.5\text{V}$		
			MIN	TYP	MAX	MIN	MAX	
$t_{\text{PLH}}$ $t_{\text{PHL}}$	Propagation delay nAx to nYx	1	1.0 1.0	1.8 1.4	2.6 2.6	1.0 1.0	2.9 2.9	ns
$t_{\text{PZH}}$ $t_{\text{PZL}}$	Output enable time to High and Low level	2	1.5 2.0	3.0 3.6	4.2 4.9	1.5 2.0	5.2 6.0	ns
$t_{\text{PHZ}}$ $t_{\text{PLZ}}$	Output disable time from High and Low level	2	2.0 1.5	3.4 2.8	4.8 4.0	2.0 1.5	5.4 4.3	ns

AC WAVEFORMS



Waveform 1. Input (nAx) to Output (nYx) Propagation Delays

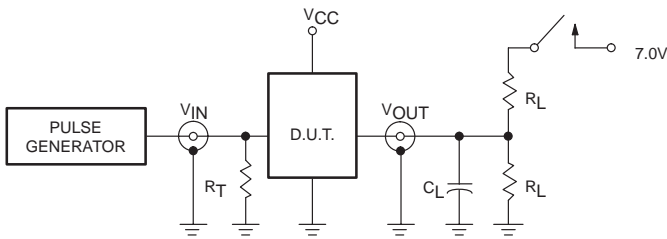


Waveform 2. 3-State Output Enable and Disable Times

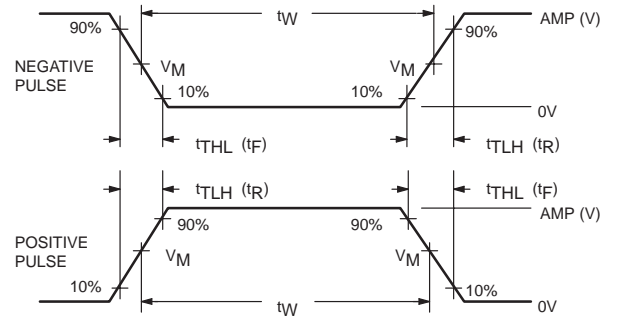
20-bit buffer/line driver, non-inverting,  
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74ABT162827A  
74ABTH162827A

TEST CIRCUIT AND WAVEFORM



Test Circuit for 3-State Outputs



VM = 1.5V  
Input Pulse Definition

SWITCH POSITION

TEST	SWITCH
t <sub>PLZ</sub>	closed
t <sub>pZL</sub>	closed
All other	open

DEFINITIONS

- R<sub>L</sub> = Load resistor; see AC CHARACTERISTICS for value.
- C<sub>L</sub> = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.
- R<sub>T</sub> = Termination resistance should be equal to Z<sub>OUT</sub> of pulse generators.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	t <sub>W</sub>	t <sub>R</sub>	t <sub>F</sub>
74ABT/H16	3.0V	1MHz	500ns	2.5ns	2.5ns

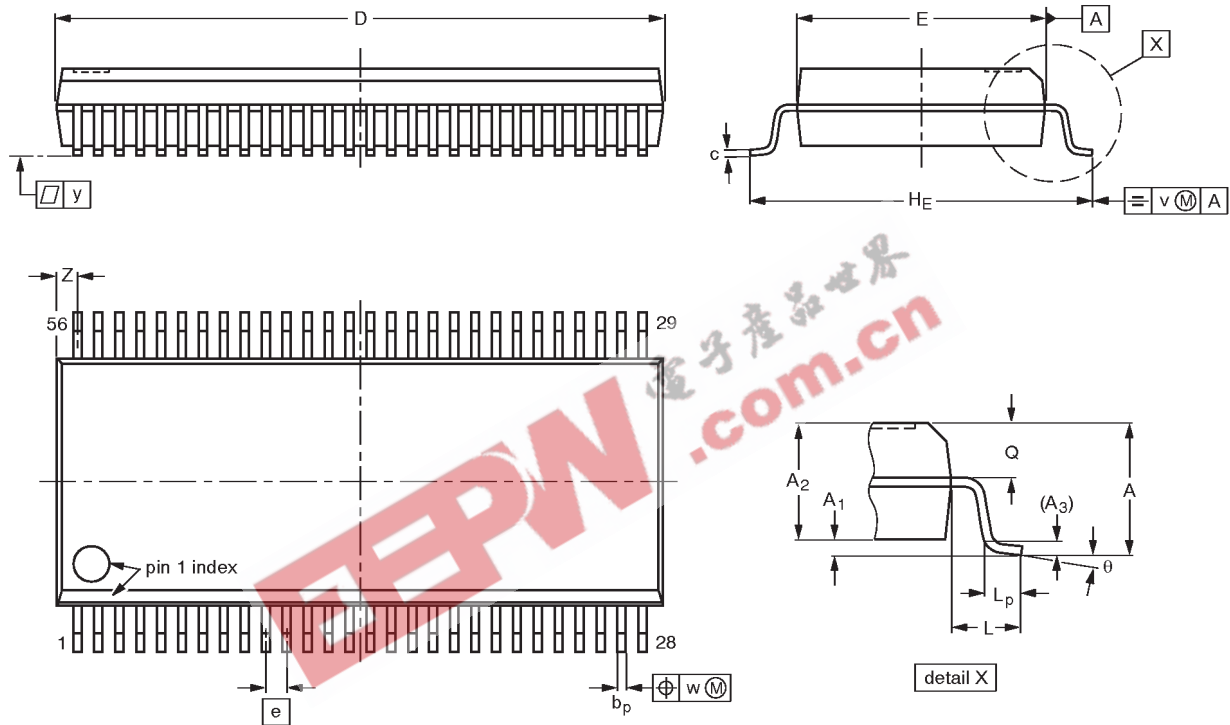
SA00018

20-bit buffer/line driver, non-inverting (3-State)

74ABT16827A  
74ABTH16827A

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	EIAJ			
SOT371-1		MO-118AB				93-11-02 95-02-04

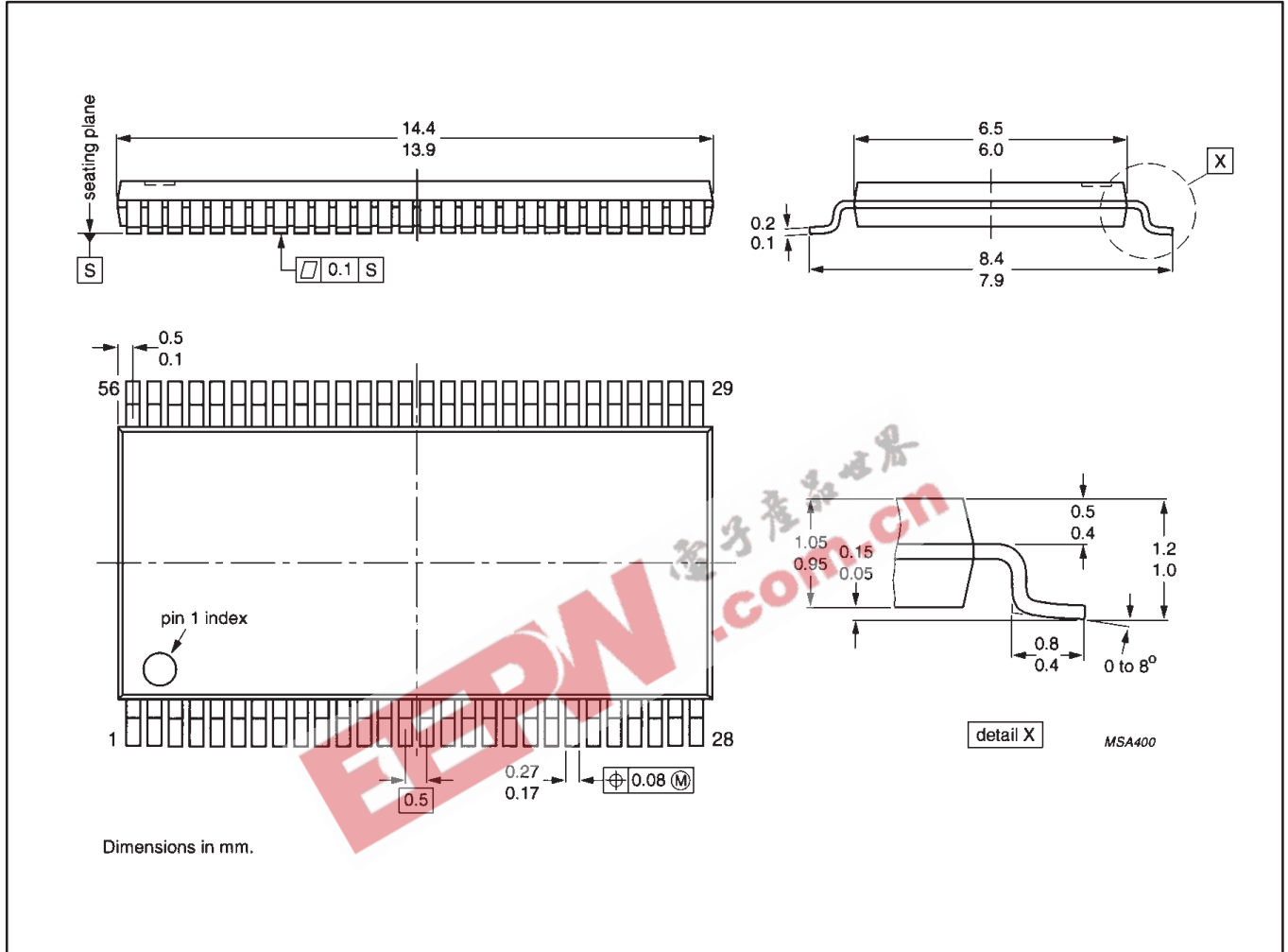


20-bit buffer/line driver, non-inverting (3-State)

74ABT16827A  
74ABTH16827A

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

SOT364-1



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20-bit buffer/line driver, non-inverting (3-State)

74ABT16827A  
74ABTH16827A

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NOTES



20-bit buffer/line driver, non-inverting, with 30Ω  
termination resistors (3-State)

74ABT162827A  
74ABTH162827A

### Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

[1] Please consult the most recently issued datasheet before initiating or completing a design.

### 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 134). 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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