DATA SHEET

74LVC623A

Octal transceiver with dual enable (3-State)

Product specification   1998 Jul 29

Philips
Semiconductors

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Octal transceiver with dual enable (3-State)   74LVC623A

FEATURES

- Wide supply voltage range of 1.2V to 3.6V
- In accordance with JEDEC standard no. 8-1A
- Flow-through pin-out architecture
- CMOS low power consumption
- Inputs accept voltages up to 5.5V
- Direct interface with TTL levels
- Output drive capability 50Ω transmission lines @ 85°C

DESCRIPTION

The 74LVC623A is a high performance, low-power, low-voltage Si-gate CMOS device, superior to most advanced CMOS compatible TTL families.

The 74LVC623A is an octal transceiver featuring non-inverting 3-State bus compatible outputs in both send and receive directions. This octal bus transceiver is designed for asynchronous two-way communication between data buses.

The control function implementation allows maximum flexibility in timing. This device allows data transmission from the A bus to the B bus or from the B bus to the A bus, depending upon the levels at the enable inputs (OEAB, $\overline{OEBA}$). The enable inputs can be used to disable the device so that the buses are effectively isolated. The dual enable function configuration gives this transceiver the capability to store data by simultaneous enabling of OEAB and $\overline{OEBA}$. Each output reinforces its input in this transceiver configuration. Thus, when both control inputs are enabled and all other data sources to the two sets of the bus lines are at high impedance OFF-state, both sets of bus lines will remain at their last states. The 8-bit codes appearing on the two sets of buses will be identical.

The '623A' is identical to the '620A' but has true (non-inverting) outputs.

QUICK REFERENCE DATA

GND = 0V; T_{amb} = 25°C; t_r = t_f ≤ 2.5 ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	Propagation delay An to Bn; Bn to An	C_L = 50pF V_{CC} = 3.3V	3.3	ns
C_I	Input capacitance		5.0	pF
$C_{I/O}$	Input/output capacitance		10	pF
C_{PD}	Power dissipation capacitance per latch	Notes 1, 2	32	pF

NOTES:
1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW)
   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:
   f_i = input frequency in MHz; C_L = output load capacity in pF;
   f_o = output frequency in MHz; V_{CC} = supply voltage in V;
   $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.
2. The condition is V_I = GND to V_{CC}.

ORDERING AND PACKAGE INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	PKG. DWG. #
20-Pin Plastic SO	−40°C to +85°C	74LVC623A D	74LVC623A D	SOT163-1
20-Pin Plastic SSOP Type II	−40°C to +85°C	74LVC623A DB	74LVC623A DB	SOT339-1
20-Pin Plastic TSSOP Type I	−40°C to +85°C	74LVC623A PW	7LVC623APW DH	SOT360-1

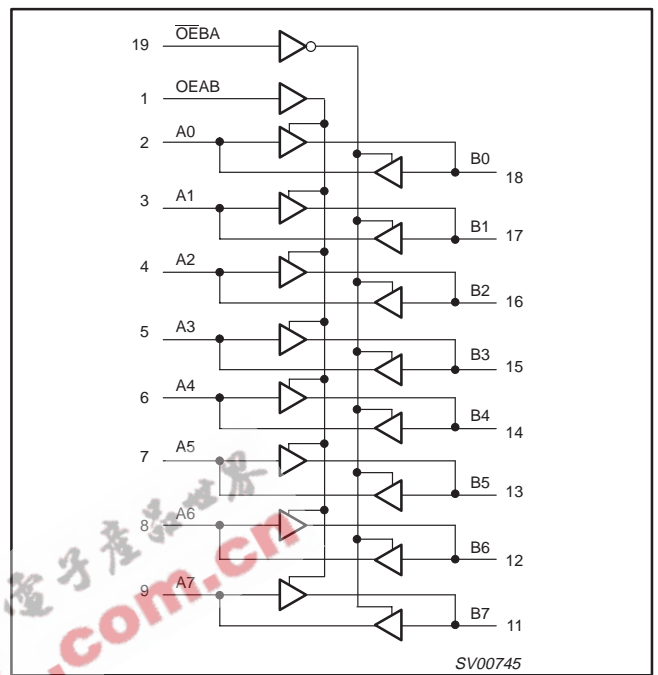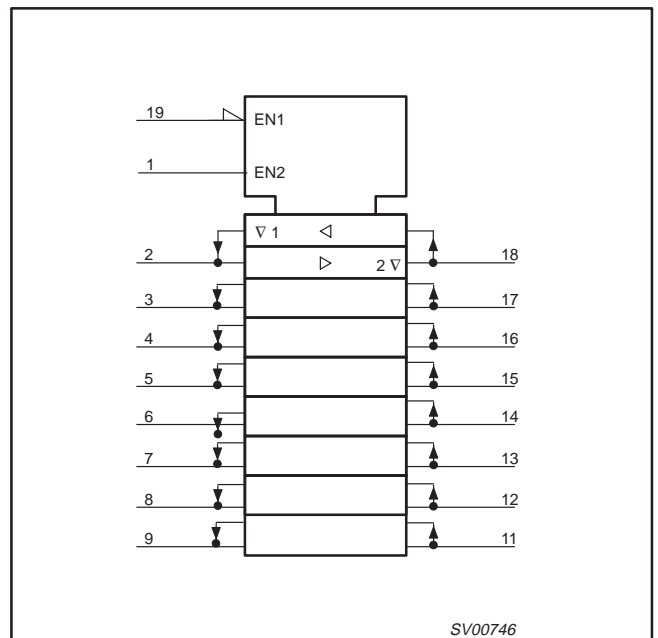## Octal transceiver with dual enable (3-State)

74LVC623A

PIN CONFIGURATION

SV00744

LOGIC SYMBOL

SV00745
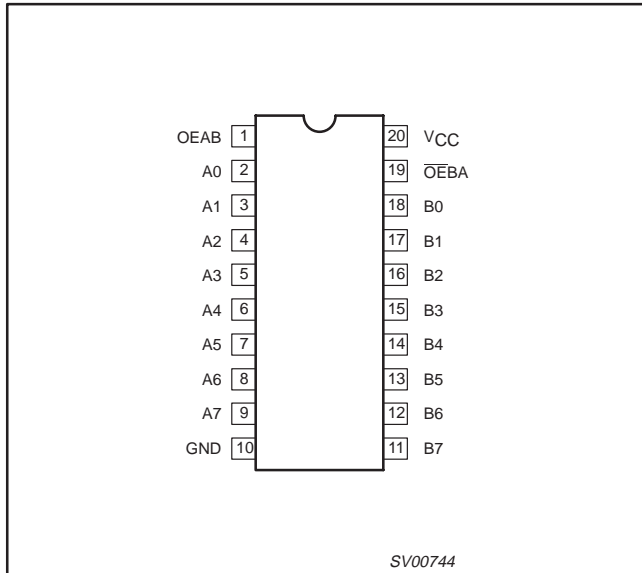
PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1	OEAB	Direction control
2, 3, 4, 5, 6, 7, 8, 9	A0 – A7	Data inputs/outputs
10	GND	Ground (0V)
18, 17, 16, 15, 14, 13, 12, 11	B0 – B7	Data inputs/outputs
19	$\overline{OEBA}$	Output enable input (active LOW)
20	V_{CC}	Positive supply voltage

LOGIC SYMBOL (IEEE/IEC)

SV00746

Octal transceiver with dual enable (3-State)

74LVC623A

FUNCTION TABLE

INPUTS		INPUTS/OUTPUT	
OEAB	$\overline{OEBA}$	An	Bn
L	L	A=B	Inputs
H	H	Inputs	B=A
L	H	Z	Z
H	L	A=B Inputs	Inputs B=A

H = High voltage level
L = Low voltage level
Z = High impedance

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	LIMITS		UNIT
			MIN	MAX	
V_{CC}	DC supply voltage (for max. speed performance)		2.7	3.6	V
V_{CC}	DC supply voltage (for low-voltage applications)		1.2	3.6	V
V_I	DC input voltage range		0	5.5	V
V_O	DC output voltage range; output HIGH or LOW state		0	V_{CC}	V
	DC output voltage range; output 3-State		0	5.5	
T_{amb}	Operating free-air temperature range		−40	+85	°C
t_r, t_f	Input rise and fall times	V_{CC} = 1.2 to 2.7V V_{CC} = 2.7 to 3.6V	0 0	20 10	ns/V

ABSOLUTE MAXIMUM RATINGS[1]

In accordance with the Absolute Maximum Rating System (IEC 134)
Voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		−0.5 to +6.5	V
I_{IK}	DC input diode current	$V_I < 0$	−50	mA
V_I	DC input voltage	Note 2	−0.5 to +6.5	V
I_{OK}	DC output diode current	$V_O > V_{CC}$ or $V_O < 0$	±50	mA
V_O	DC output voltage; output HIGH or LOW state	Note 2	−0.5 to V_{CC} +0.5	V
	DC output voltage; output 3-State	Note 2	−0.5 to 6.5	
I_O	DC output source or sink current	V_O = 0 to V_{CC}	±50	mA
I_{GND}, I_{CC}	DC V_{CC} or GND current		±100	mA
T_{stg}	Storage temperature range		−65 to +150	°C
P_{TOT}	Power dissipation per package – plastic mini-pack (SO) – plastic shrink mini-pack (SSOP and TSSOP)	above +70°C derate linearly with 8 mW/K above +60°C derate linearly with 5.5 mW/K	500 500	mW

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

Octal transceiver with dual enable (3-State)

DC ELECTRICAL CHARACTERISTICS

Over recommended operating conditions voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Temp = -40°C to +85°C			
			MIN	TYP[1]	MAX	
V_{IH}	HIGH level Input voltage	V_{CC} = 1.2V	V_{CC}			V
		V_{CC} = 2.7 to 3.6V	2.0			
V_{IL}	LOW level Input voltage	V_{CC} = 1.2V			GND	V
		V_{CC} = 2.7 to 3.6V			0.8	
V_{OH}	HIGH level output voltage	V_{CC} = 2.7V; $V_I = V_{IH}$ or V_{IL}; I_O = −12mA	$V_{CC} - 0.5$			V
		V_{CC} = 3.0V; $V_I = V_{IH}$ or V_{IL}; I_O = −100µA	$V_{CC} - 0.2$	V_{CC}		
		V_{CC} = 3.0V; $V_I = V_{IH}$ or V_{IL}; I_O = −18mA	$V_{CC} - 0.6$			
		V_{CC} = 3.0V; $V_I = V_{IH}$ or V_{IL}; I_O = −24mA	$V_{CC} - 0.8$			
V_{OL}	LOW level output voltage	V_{CC} = 2.7V; $V_I = V_{IH}$ or V_{IL}; I_O = 12mA			0.40	V
		V_{CC} = 3.0V; $V_I = V_{IH}$ or V_{IL}; I_O = 100µA		GND	0.20	
		V_{CC} = 3.0V; $V_I = V_{IH}$ or V_{IL}; I_O = 24mA			0.55	
I_I	Input leakage current	V_{CC} = 3.6V; V_I = 5.5V or GND		±0.1	±5	µA
I_{OZ}	3-State output OFF-state current	V_{CC} = 3.6V; $V_I = V_{IH}$ or V_{IL}; V_O = 5.5V or GND		0.1	±5	µA
I_{off}	Power off leakage supply	V_{CC} = 0.0V; V_I or V_O = 5.5V		0.1	±10	µA
I_{CC}	Quiescent supply current	V_{CC} = 3.6V; $V_I = V_{CC}$ or GND; I_O = 0		0.1	10	µA
ΔI_{CC}	Additional quiescent supply current per input pin	V_{CC} = 2.7V to 3.6V; $V_I = V_{CC}$ −0.6V; I_O = 0		5	500	µA

NOTES:
1. All typical values are at V_{CC} = 3.3V and T_{amb} = 25°C.

AC CHARACTERISTICS

GND = 0 V; $t_r = t_f \leq 2.5$ ns; C_L = 50 pF

SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT
			V_{CC} = 3.3V ±0.3V			V_{CC} = 2.7V		
			MIN	TYP[1]	MAX	MIN	MAX	
t_{PHL}/t_{PLH}	Propagation delay An to Bn, Bn to An	Figures 1, 4	1.5	2.3	6	1.5	7	ns
t_{PZH}/t_{PZL}	3-State output enable time OEAB to Bn	Figures 3, 4	1.5	4.6	7.6	1.5	8.6	ns
t_{PHZ}/t_{PLZ}	3-State output disable time OEAB to Bn	Figures 3, 4	1.5	4.0	6.5	1.5	7.5	ns
t_{PZH}/t_{PZL}	3-State output enable time $\overline{OE}$BA to An	Figures 2, 4	1.5	4.4	7.9	1.5	8.9	ns
t_{PHZ}/t_{PLZ}	3-State output disable time $\overline{OE}$BA to An	Figures 2, 4	1.5	3.7	6.5	1.5	7.5	ns

NOTE:
1. These typical values are at V_{CC} = 3.3V and T_{amb} = 25°C.

Octal transceiver with dual enable (3-State)

74LVC623A

AC WAVEFORMS

$V_M = 1.5V$ at $V_{CC} \geq 2.7V$

$V_M = 0.5V * V_{CC}$ at $V_{CC} < 2.7V$

V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.

$V_X = V_{OL}$ at $0.3V \geq 2.7V$

$V_X = V_{OL} + 0.1V_{CC}$ at $V_{CC} < 2.7V$

$V_Y = V_{OH} - 0.3V$ at $V_{CC} \geq 2.7V$
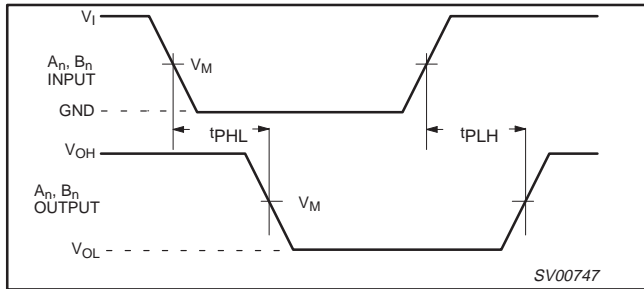
$V_Y = V_{OH} - 0.1V_{CC}$ at $V_{CC} < 2.7V$

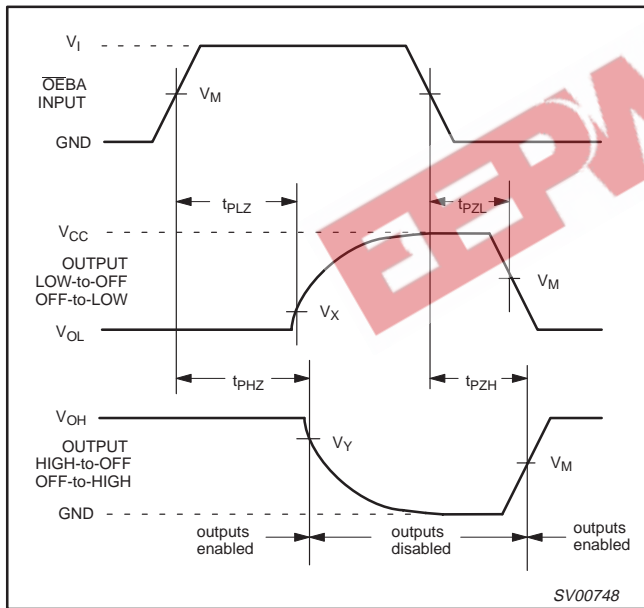**Figure 1. Input (An, Bn) to output (Bn, An) propagation delays.**

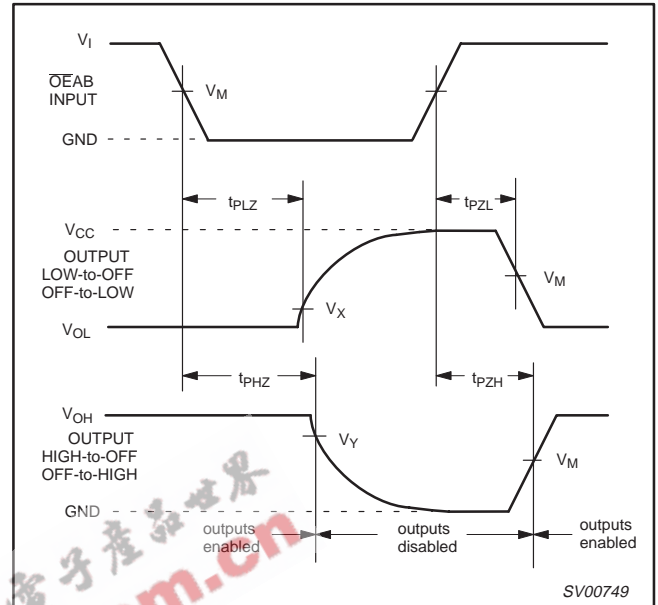**Figure 2. 3-State enable and disable times for $\overline{OE}$BA input**

Figure 3. 3-State enable and disable times for OEAB input

TEST CIRCUIT

V_{CC}	V_I
< 2.7V	V_{CC}
2.7V – 3.6V	2.7V

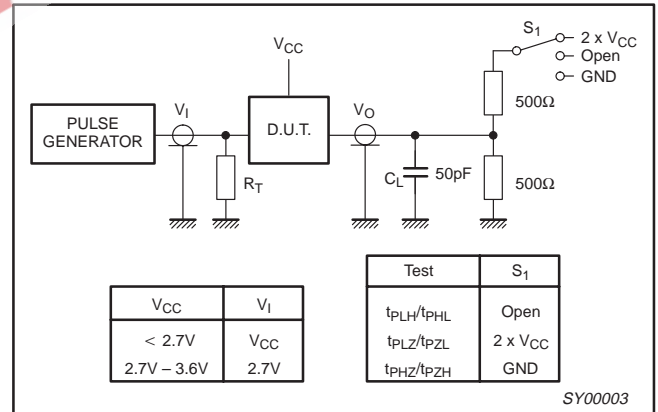| Test	S_1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	2 x V_{CC}
t_{PHZ}/t_{PZH}	GND

Figure 4. Load circuitry for switching times

Octal transceiver with dual enable (3-State)

74LVC623A

SO20:   plastic small outline package; 20 leads; body width 7.5 mm   **SOT163-1**

DIMENSIONS (inch dimensions are derived from the original mm 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	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.050	0.42 0.39	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

Note

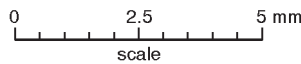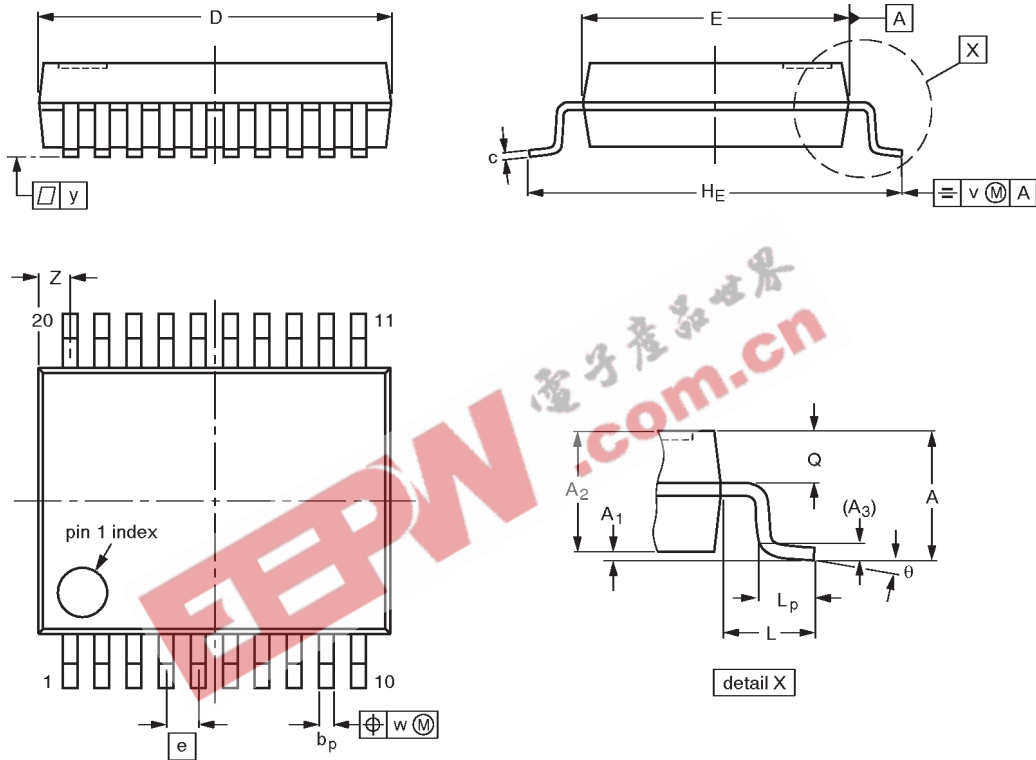1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT163-1	075E04	MS-013AC				~~92-11-17~~ 95-01-24

Octal transceiver with dual enable (3-State)

74LVC623A

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

SOT339-1

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	2.0	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	7.4 7.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	0.9 0.5	8° 0°

Note

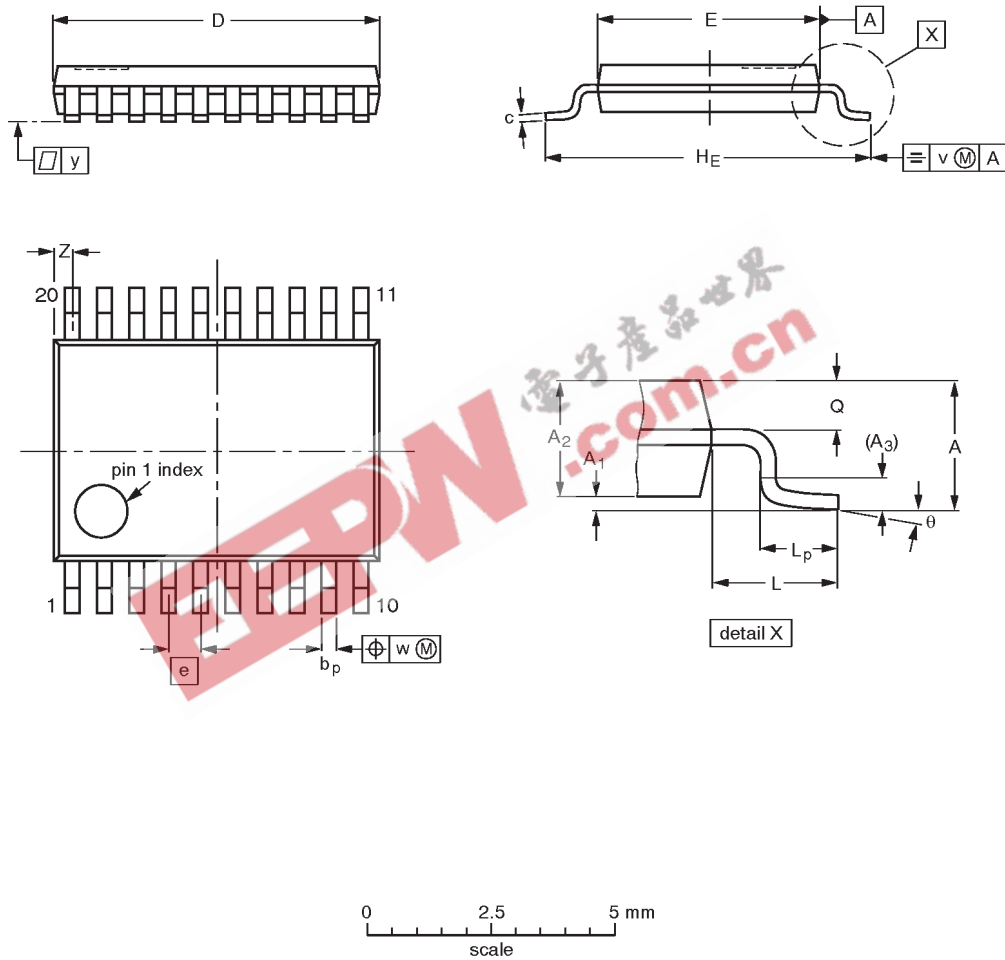1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT339-1		MO-150AE				~~93-09-08~~ 95-02-04

Octal transceiver with dual enable (3-State)

74LVC623A

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm **SOT360-1**

DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A₁	A₂	A₃	bₚ	c	D [1]	E [2]	e	Hₑ	L	Lₚ	Q	v	w	y	Z [1]	θ
mm	1.10	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	6.6 6.4	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.5 0.2	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	EIAJ			
SOT360-1		MO-153AC				~~93-06-16~~ 95-02-04

Octal transceiver with dual enable (3-State)   74LVC623A

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 chages 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.

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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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