

DATA SHEET

74LVT623

3.3 V octal transceiver with dual enable
(3-State)

Product specification
Supersedes data of 1996 Feb 15
IC24 Data Handbook

1999 Jul 09

3.3 V octal transceiver with dual enable (3-State)

74LVT623

FEATURES

- Separate controls for data flow in each direction
- Output capability: +64 mA/-32 mA
- TTL input and output switching levels
- Input and output interface capability to systems at 5 V supply
- Bus-hold data inputs eliminate the need for external pull-up resistors to hold unused inputs
- Live insertion/extraction permitted
- No bus current loading when output is tied to 5 V bus
- Power-up 3-State
- Power-up reset
- 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 74LVT623 is a high-performance BiCMOS product designed for V_{CC} operation at 3.3 V.

The 74LVT623 device is an octal transceiver featuring non-inverting 3-State bus compatible outputs in both send and receive directions. The 74LVT623 is designed for asynchronous two-way communication between data buses. The control function implementation allows for 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 logic levels at the Enable inputs (\overline{OEBA} and OEAB). The Enable inputs can be used to disable the device so that the buses are effectively isolated.

Control of data flow from B to A is similar, but using the $\overline{EB\overline{A}}$, $\overline{LE\overline{BA}}$, and OEBA inputs.

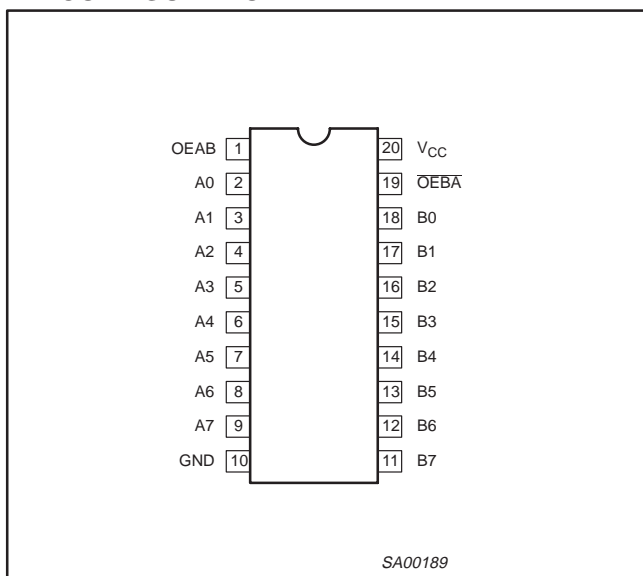
QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^{\circ}\text{C}; \text{GND} = 0\text{V}$	TYPICAL	UNIT
t_{PLH} t_{PHL}	Propagation delay An to Bn or Bn to An	$C_L = 50\text{pF};$ $V_{CC} = 3.3\text{V}$	2.3 2.5	ns
C_{IN}	Input capacitance	$V_I = 0\text{V or } 3.0\text{V}$	4	pF
$C_{I/O}$	I/O capacitance	Outputs disabled; $V_{I/O} = 0\text{V or } 3.0\text{V}$	7	pF
I_{CCZ}	Total supply current	Outputs disabled; $V_{CC} = 3.6\text{V}$	0.13	mA

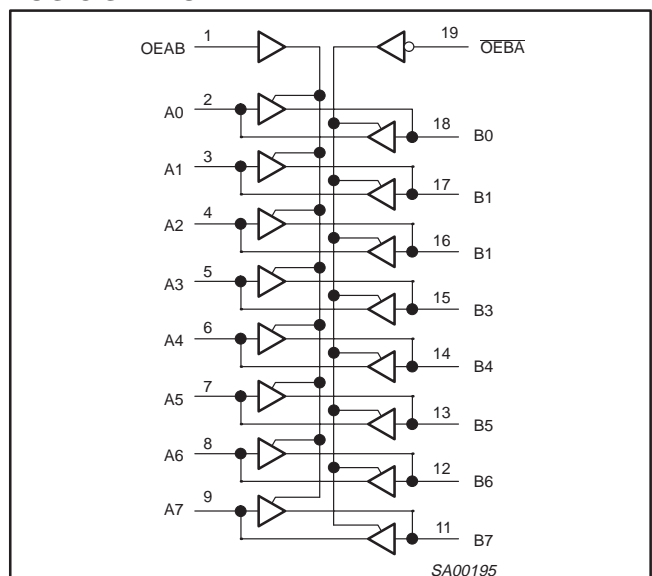
ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
24-Pin Plastic SOL	-40°C to +85°C	74LVT623 D	74LVT623 D	SOT137-1
24-Pin Plastic SSOP Type II	-40°C to +85°C	74LVT623 DB	74LVT623 DB	SOT340-1
24-Pin Plastic TSSOP Type I	-40°C to +85°C	74LVT623 PW	74LVT623PW DH	SOT355-1

PIN CONFIGURATION



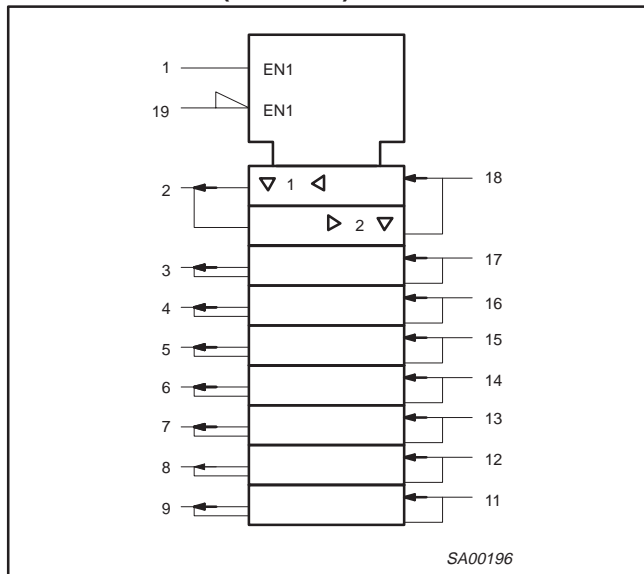
LOGIC SYMBOL



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LOGIC SYMBOL (IEEE/IEC)



PIN DESCRIPTION

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

FUNCTION TABLE

INPUTS		INPUTS/OUTPUTS	
\overline{OEBA}	OEAB	A _n	B _n
L	L	A _n = B _n	Inputs
H	H	Inputs	B _n = A _n
H	L	Z	Z
L	H	A _n = B _n	B _n = A _n

H = High voltage level
 L = Low voltage level
 Z = High impedance "off" state

ABSOLUTE MAXIMUM RATINGS^{1, 2}

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V _{CC}	DC supply voltage		-0.5 to +4.6	V
I _{IK}	DC input diode current	V _I < 0	-50	mA
V _I	DC input voltage ³		-0.5 to +7.0	V
I _{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 +7.0	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 negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

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RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		MIN	MAX	
V _{CC}	DC supply voltage	2.7	3.6	V
V _I	Input voltage	0	5.5	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		32	mA
	Low-level output current; current duty cycle ≤ 50%; f ≥ 1 kHz		64	
Δt/Δv	Input transition rise or fall rate; outputs enabled		10	ns/V
T _{amb}	Operating free-air temperature range	-40	+85	°C

DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Temp = -40°C to +85°C			
			MIN	TYP ¹	MAX	
V _{IK}	Input clamp voltage	V _{CC} = 2.7 V; I _{IK} = -18 mA		-0.9	-1.2	V
V _{OH}	High-level output voltage	V _{CC} = 2.7 to 3.6 V; I _{OH} = -100 μA	V _{CC} -0.2	V _{CC} -0.1		V
		V _{CC} = 2.7 V; I _{OH} = -8 mA	2.4	2.5		
		V _{CC} = 3.0 V; I _{OH} = -32 mA	2.0	2.2		
V _{OL}	Low-level output voltage	V _{CC} = 2.7 V; I _{OL} = 100 μA		0.1	0.2	V
		V _{CC} = 2.7 V; I _{OL} = 24 mA		0.3	0.5	
		V _{CC} = 3.0 V; I _{OL} = 16 mA		0.25	0.4	
		V _{CC} = 3.0 V; I _{OL} = 32 mA		0.3	0.5	
		V _{CC} = 3.0 V; I _{OL} = 64 mA		0.4	0.55	
V _{RST}	Power-up output low voltage ⁵	V _{CC} = 3.6 V; I _O = 1 mA; V _I = GND or V _{CC}		0.13	0.55	V
I _I	Input leakage current	V _{CC} = 3.6 V; V _I = V _{CC} or GND	Control pins	±0.1	±1	μA
		V _{CC} = 0 or 3.6 V; V _I = 5.5 V		1	10	
		V _{CC} = 3.6 V; V _I = 5.5 V	I/O Data pins ⁴	1	20	
		V _{CC} = 3.6 V; V _I = V _{CC}		0.1	1	
		V _{CC} = 3.6 V; V _I = 0		-1	-5	
I _{OFF}	Output off current	V _{CC} = 0 V; V _I or V _O = 0 to 4.5 V		1	±100	μA
I _{HOLD}	Bus Hold current A or B ports	V _{CC} = 3 V; V _I = 0.8 V	75	150		μA
		V _{CC} = 3 V; V _I = 2.0 V	-75	-150		
I _{EX}	Current into an output in the High state when V _O > V _{CC}	V _O = 5.5 V; V _{CC} = 3.0 V		60	125	μA
I _{PU/PD}	Power up/down 3-State output current ³	V _{CC} ≤ 1.2 V; V _O = 0.5 V to V _{CC} ; V _I = GND or V _{CC} ; OE/OE = Don't care		15	±100	μA
I _{CCH}	Quiescent supply current	V _{CC} = 3.6 V; Outputs High, V _I = GND or V _{CC} , I _O = 0		0.13	0.19	mA
I _{CCL}		V _{CC} = 3.6 V; Outputs Low, V _I = GND or V _{CC} , I _O = 0		3	12	
I _{CCZ}		V _{CC} = 3.6 V; Outputs Disabled; V _I = GND or V _{CC} , I _O = 0		0.13	0.19	
ΔI _{CC}	Additional supply current per input pin ²	V _{CC} = 3 V to 3.6 V; One input at V _{CC} -0.6 V, Other inputs at V _{CC} or GND		0.1	0.2	mA

NOTES:

- All typical values are at V_{CC} = 3.3 V and T_{amb} = 25°C.
- This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND
- This parameter is valid for any V_{CC} between 0V and 1.2V with a transition time of up to 10msec. From V_{CC} = 1.2 V to V_{CC} = 3.3 V ± 0.3 V a transition time of 100μsec is permitted. This parameter is valid for T_{amb} = 25°C only.
- Unused pins at V_{CC} or GND.
- For valid test results, data must not be loaded into the flip-flops (or latches) after applying the power.

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AC CHARACTERISTICS

GND = 0 V, $t_R = t_F = 2.5$ ns, $C_L = 50$ pF, $R_L = 500$ Ω ; $T_{amb} = -40^\circ\text{C}$ to $+85^\circ\text{C}$.

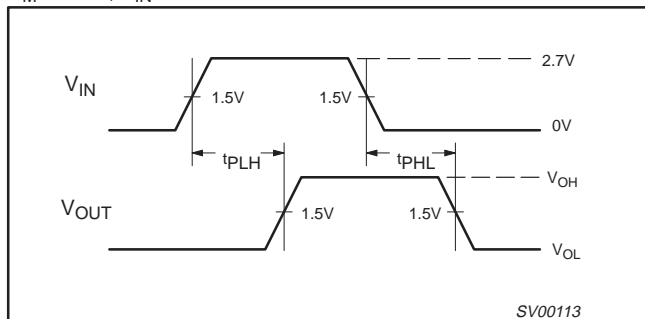
SYMBOL	PARAMETER	WAVEFORM	LIMITS				UNIT
			$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$			$V_{CC} = 2.7 \text{ V}$	
			MIN	TYP ¹	MAX	MAX	
t_{PLH} t_{PHL}	Propagation delay An to Bn, Bn to An	1	1.0 1.0	2.3 2.5	3.5 3.7	4.3 4.1	ns
t_{PZH} t_{PZL}	Output enable time OEBA to An	2 3	1.0 1.1	3.7 3.7	5.9 5.9	7.6 6.8	ns
t_{PHZ} t_{PLZ}	Output disable time OEBA to An	2 3	1.8 1.8	3.6 3.2	5.0 4.5	5.5 4.6	ns
t_{PZH} t_{PZL}	Output enable time OEAB to Bn	2 3	1.0 1.4	4.2 4.3	6.3 6.2	7.8 6.9	ns
t_{PHZ} t_{PLZ}	Output disable time OEAB to Bn	2 3	2.3 2.0	3.9 3.6	6.1 5.3	6.9 5.8	ns

NOTE:

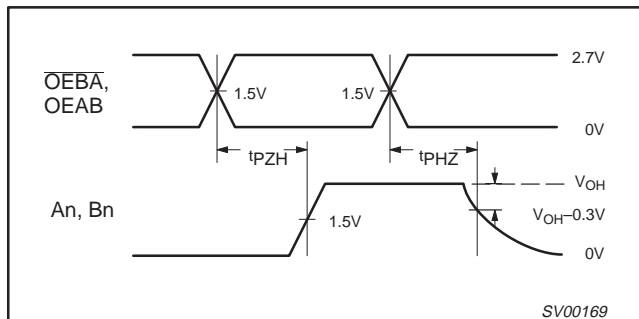
1. All typical values are at $V_{CC} = 3.3$ V and $T_{amb} = 25^\circ\text{C}$.

AC WAVEFORMS

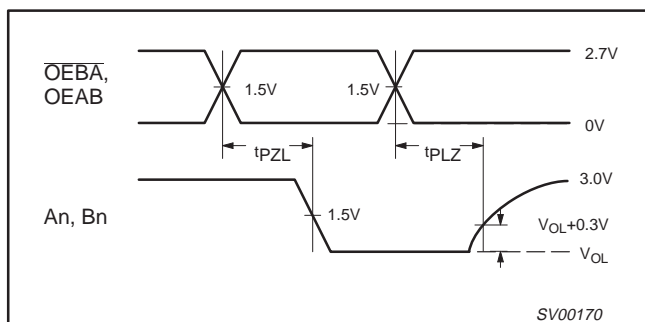
$V_M = 1.5$ V, $V_{IN} = \text{GND}$ to 2.7 V



Waveform 1. Propagation Delay for Non-Inverting Output



Waveform 2. 3-State Output Enable Time to High Level and Output Disable Time from High Level



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

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TEST CIRCUIT AND WAVEFORM

Test Circuit for 3-State Outputs

$V_M = 1.5\text{ V}$
Input Pulse Definition

SWITCH POSITION

TEST	SWITCH
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	6V
t_{PHZ}/t_{PZH}	GND

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
74LVT	2.7 V	$\leq 10\text{ MHz}$	500 ns	$\leq 2.5\text{ ns}$	$\leq 2.5\text{ ns}$

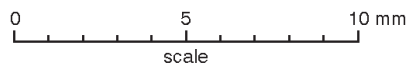
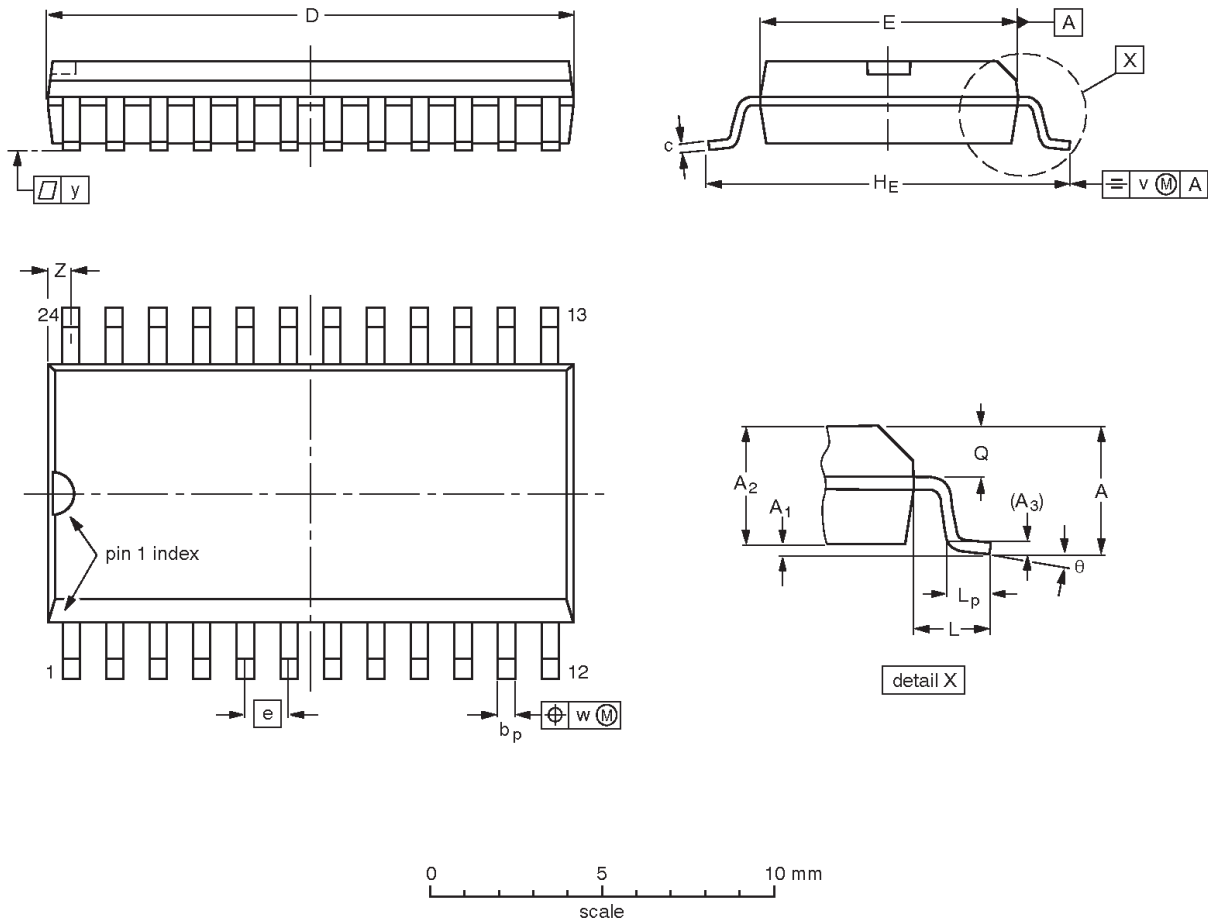
SV00092

3.3 V octal transceiver with dual enable (3-State)

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SO24: plastic small outline package; 24 leads; body width 7.5 mm

SOT137-1



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	15.6 15.2	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	0.61 0.60	0.30 0.29	0.050	0.419 0.394	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.

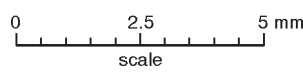
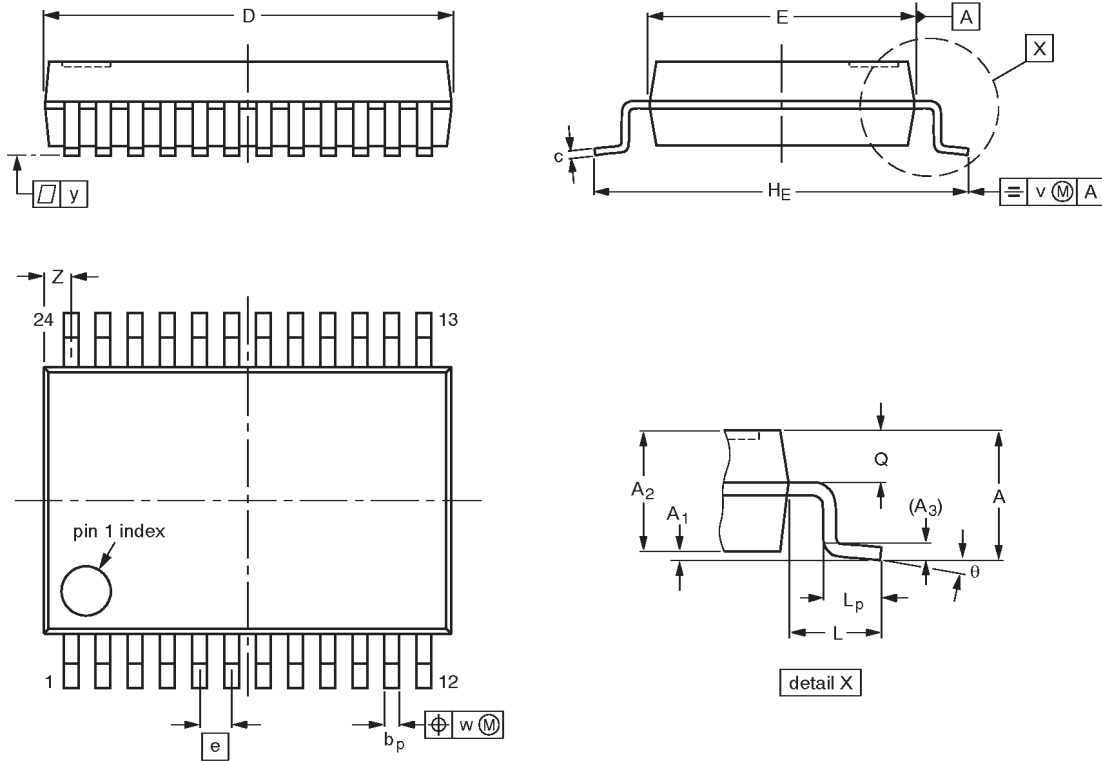
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT137-1	075E05	MS-013AD				95-01-24 97-05-22

3.3 V octal transceiver with dual enable (3-State)

74LVT623

SSOP24: plastic shrink small outline package; 24 leads; body width 5.3 mm

SOT340-1



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	8.4 8.0	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	0.8 0.4	8° 0°

Note

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

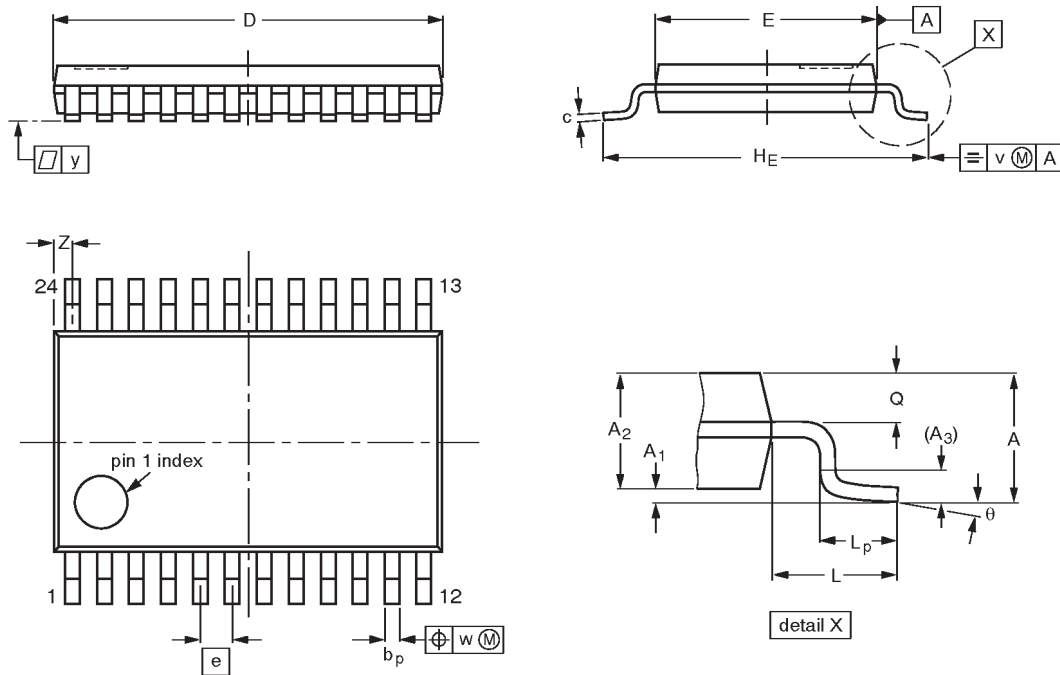
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT340-1		MO-150AG				93-09-08 95-02-04

3.3 V octal transceiver with dual enable (3-State)

74LVT623

TSSOP24: plastic thin shrink small outline package; 24 leads; body width 4.4 mm

SOT355-1



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 ⁽¹⁾	θ
mm	1.10	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	7.9 7.7	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			
SOT355-1		MO-153AD				93-06-16 95-02-04

3.3 V octal transceiver with dual enable (3-State)

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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.
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[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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