

DATA SHEET

74ABT543A

Octal latched transceiver
with dual enable (3-State)

Product specification
Supersedes data of 1995 Apr 19
IC23 Data Handbook

1998 Sep 24

Octal latched transceiver with dual enable (3-State)

74ABT543A

FEATURES

- Combines 74ABT245 and 74ABT373 type functions in one device
- 8-bit octal transceiver with D-type latch
- Back-to-back registers for storage
- Separate controls for data flow in each direction
- Output capability: +64mA/-32mA
- Live insertion/extraction permitted
- Power-up 3-State
- Power-up reset
- 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 74ABT543A high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT543A Octal Registered Transceiver contains two sets of D-type latches for temporary storage of data flowing in either direction. Separate Latch Enable (\overline{LEAB} , \overline{LEBA}) and Output Enable (\overline{OEAB} , \overline{OEBA}) inputs are provided for each register to permit independent control of data transfer in either direction. The outputs are guaranteed to sink 64mA.

FUNCTIONAL DESCRIPTION

The 74ABT543A contains two sets of eight D-type latches, with separate control pins for each set. Using data flow from A to B as an example, when the A-to-B Enable (\overline{EAB}) input and the A-to-B Latch Enable (\overline{LEAB}) input are Low the A-to-B path is transparent. A subsequent Low-to-High transition of the \overline{LEAB} signal puts the A data into the latches where it is stored and the B outputs no longer change with the A inputs. With \overline{EAB} and \overline{OEAB} both Low, the 3-State B output buffers are active and display the data present at the outputs of the A latches.

Control of data flow from B to A is similar, but using the \overline{EBA} , \overline{LEBA} , and \overline{OEBA} inputs.

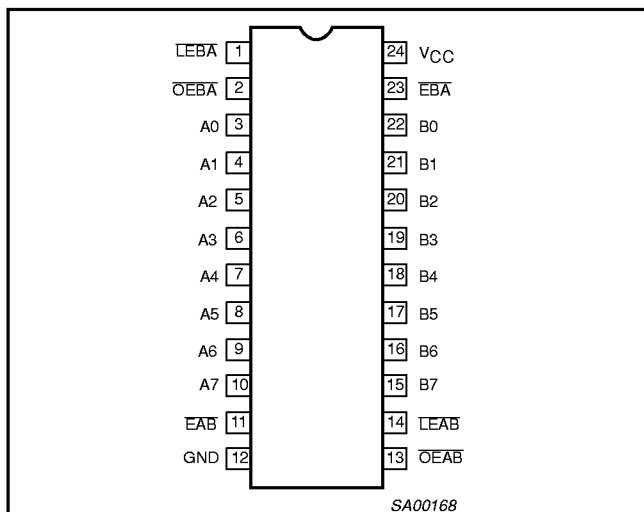
QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^{\circ}C$; $GND = 0V$	TYPICAL	UNIT
t_{PLH} t_{PHL}	Propagation delay An to Bn or Bn to An	$C_L = 50pF$; $V_{CC} = 5V$	2.9 3.6	ns
C_{IN}	Input capacitance	$V_I = 0V$ or V_{CC}	4	pF
$C_{I/O}$	I/O capacitance	Outputs disabled; $V_O = 0V$ or V_{CC}	7	pF
I_{CCZ}	Total supply current	Outputs disabled; $V_{CC} = 5.5V$	110	μA

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
24-Pin Plastic DIP	-40°C to +85°C	74ABT543A N	74ABT543A N	SOT222-1
24-Pin plastic SO	-40°C to +85°C	74ABT543A D	74ABT543A D	SOT137-1
24-Pin Plastic SSOP Type II	-40°C to +85°C	74ABT543A DB	74ABT543A DB	SOT340-1
24-Pin Plastic TSSOP Type I	-40°C to +85°C	74ABT543A PW	74ABT543A PW	SOT355-1

PIN CONFIGURATION



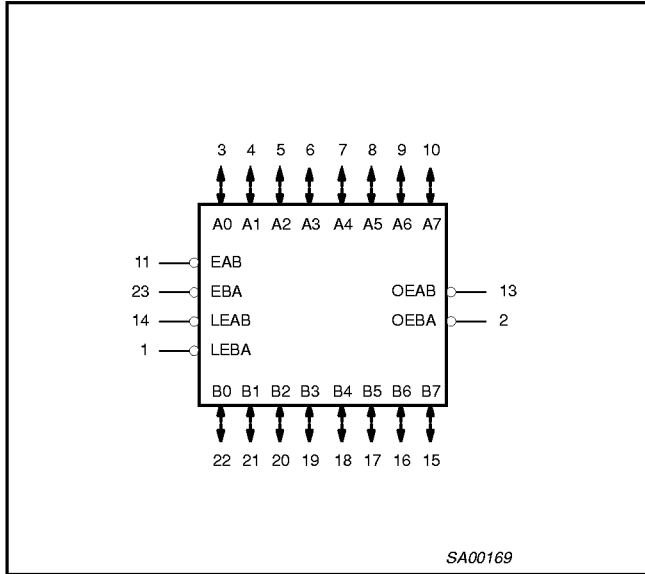
PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
14, 1	$\overline{LEAB} / \overline{LEBA}$	A to B / B to A Latch Enable input (active-Low)
11, 23	$\overline{EAB} / \overline{EBA}$	A to B / B to A Enable input (active-Low)
13, 2	$\overline{OEAB} / \overline{OEBA}$	A to B / B to A Output Enable input (active-Low)
3, 4, 5, 6, 7, 8, 9, 10	A0 – A7	Port A, 3-State outputs
22, 21, 20, 19, 18, 17, 16, 15	B0 – B7	Port B, 3-State outputs
12	GND	Ground (0V)
24	V_{CC}	Positive supply voltage

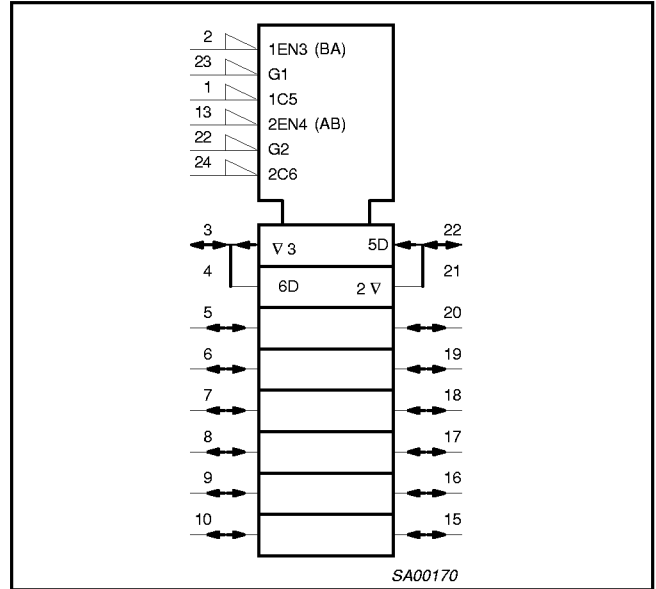
Octal latched transceiver with dual enable (3-State)

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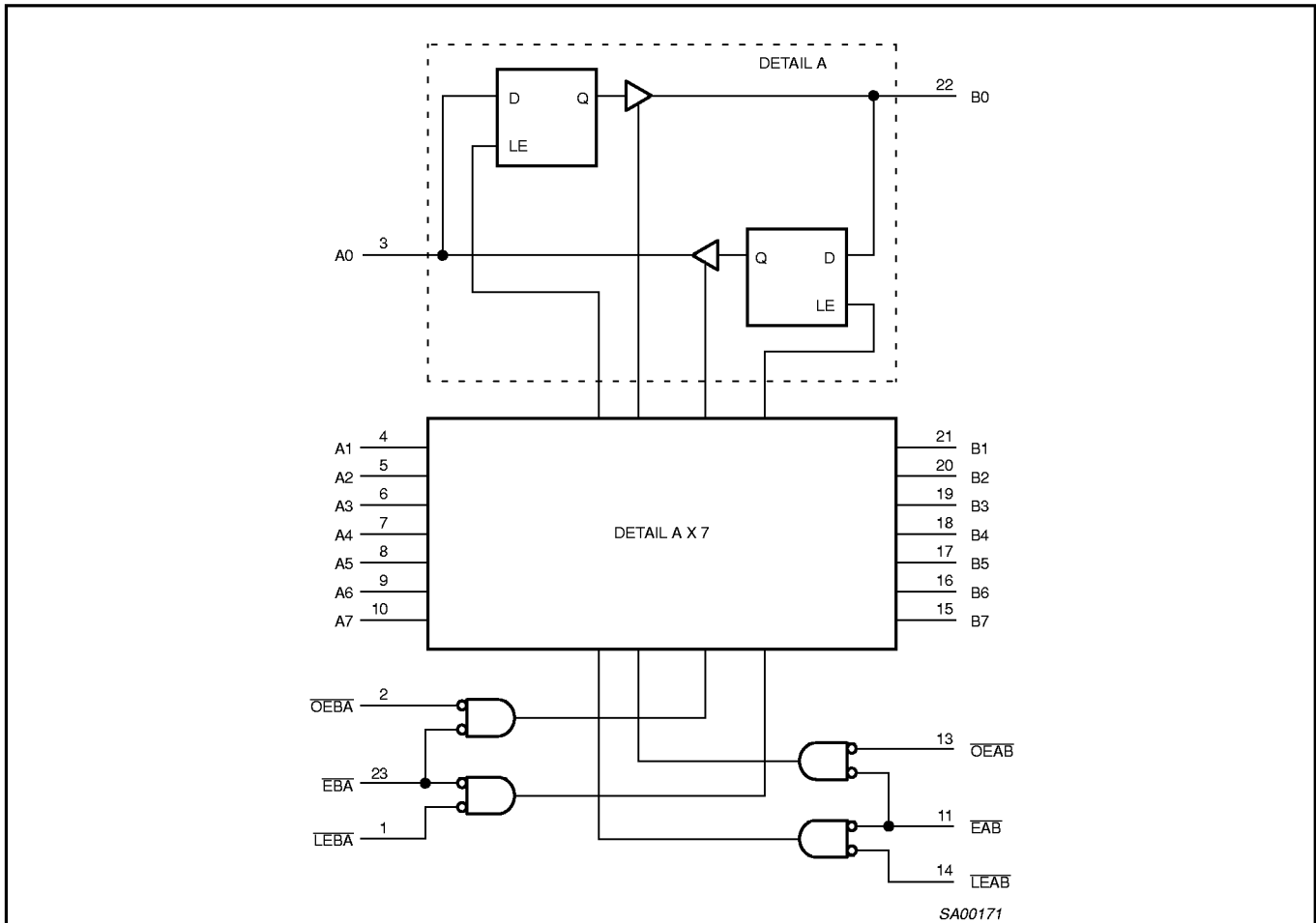
LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



LOGIC DIAGRAM



Octal latched transceiver with dual enable (3-State)

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FUNCTION TABLE

INPUTS				OUTPUTS	STATUS
\overline{OEXX}	\overline{EXX}	\overline{LEXX}	An or Bn	Bn or An	
H	X	X	X	Z	Disabled
X	H	X	X	Z	Disabled
L	↑	L	h	Z	Disabled + Latch
L	↑	L	l	Z	
L	L	↑	h	H	Latch + Display
L	L	↑	l	L	
L	L	L	H	H	Transparent
L	L	L	L	L	
L	L	H	X	NC	Hold

H = High voltage level

h = High voltage level one set-up time prior to the Low-to-High transition of \overline{LEXX} or \overline{EXX} (XX = AB or BA)

L = Low voltage level

l = Low voltage level one set-up time prior to the Low-to-High transition of \overline{LEXX} or \overline{EXX} (XX = AB or BA)

X = Don't care

↑ = Low-to-High transition of \overline{LEXX} or \overline{EXX} (XX = AB or BA)

NC = No change

Z = High impedance or "off" state

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	$V_I < 0$	-18	mA
V_I	DC input voltage ³		-1.2 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 +5.5	V
I_{OUT}	DC output current	output in Low state	128	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.

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} = 4.5V; I _{IK} = -18mA		-0.9	-1.2		-1.2	V
V _{OH}	High-level output voltage	V _{CC} = 4.5V; I _{OH} = -3mA; V _I = V _{IL} or V _{IH}	2.5	3.2		2.5		V
		V _{CC} = 5.0V; I _{OH} = -3mA; V _I = V _{IL} or V _{IH}	3.0	3.7		3.0		V
		V _{CC} = 4.5V; I _{OH} = -32mA; V _I = V _{IL} or V _{IH}	2.0	2.3		2.0		V
V _{OL}	Low-level output voltage	V _{CC} = 4.5V; I _{OL} = 64mA; V _I = V _{IL} or V _{IH}		0.3	0.55		0.55	V
V _{RST}	Power-up output low voltage ³	V _{CC} = 5.5V; I _O = 1mA; V _I = GND or V _{CC}		0.13	.55		.55	V
I _I	Input leakage current	Control pins		±0.01	±1.0		±1.0	µA
		Data pins		±5	±100		±100	µA
I _{OFF}	Power-off leakage current	V _{CC} = 0.0V; V _O or V _I ≤ 4.5V		±5.0	±100		±100	µA
I _{PU/PD}	Power-up/down 3-State output current ⁴	V _{CC} = 2.1V; V _O = 0.5V; V _I = GND or V _{CC} ; V _{OE} = Don't care		±5.0	±50		±50	µA
I _{IH} + I _{OZH}	3-State output High current	V _{CC} = 5.5V; V _O = 2.7V; V _I = V _{IL} or V _{IH}		5.0	50		50	µA
I _{IL} + I _{OZL}	3-State output Low current	V _{CC} = 5.5V; V _O = 0.5V; V _I = V _{IL} or V _{IH}		-5.0	-50		-50	µA
I _{CEX}	Output high leakage current	V _{CC} = 5.5V; V _O = 5.5V; V _I = GND or V _{CC}		5.0	50		50	µA
I _O	Output current ¹	V _{CC} = 5.5V; V _O = 2.5V	-40	-65	-180	-40	-180	mA
I _{CCH}	Quiescent supply current	V _{CC} = 5.5V; Outputs High, V _I = GND or V _{CC}		110	250		250	µA
I _{CCL}		V _{CC} = 5.5V; Outputs Low, V _I = GND or V _{CC}		20	30		30	mA
I _{CCZ}		V _{CC} = 5.5V; Outputs 3-State; V _I = GND or V _{CC}		110	250		250	µA
ΔI _{CC}	Additional supply current per input pin ²	V _{CC} = 5.5V; one input at 3.4V, other inputs at V _{CC} or GND; V _{CC} = 5.5V		0.3	1.5		1.5	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_{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 = 0V, $t_R = t_F = 2.5\text{ns}$, $C_L = 50\text{pF}$, $R_L = 500\Omega$

SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT
			$T_{\text{amb}} = +25^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V}$			$T_{\text{amb}} = -40 \text{ to } +85^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V} \pm 0.5\text{V}$		
			Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay An to Bn, Bn to An	2	1.0 1.9	2.9 3.6	4.5 5.2	1.0 1.9	5.2 5.7	ns
t_{PLH} t_{PHL}	Propagation delay LEBA to An, LEAB to Bn	1 2	1.0 2.1	3.4 4.3	5.1 6.0	1.0 2.1	6.2 6.7	ns
t_{pZH} t_{pZL}	Output enable time $\overline{\text{OEBA}}$ to An, $\overline{\text{OEAB}}$ to Bn	4 5	1.0 2.0	3.2 4.3	5.1 5.9	1.0 2.0	6.2 6.6	ns
t_{pHZ} t_{pLZ}	Output disable time $\overline{\text{OEBA}}$ to An, $\overline{\text{OEAB}}$ to Bn	4 5	2.0 1.0	4.0 3.0	5.7 4.6	2.0 1.0	6.2 5.0	ns
t_{pZH} t_{pZL}	Output enable time EBA to An, EAB to Bn	4 5	1.0 2.0	3.4 4.4	5.1 6.1	1.0 2.0	6.2 6.8	ns
t_{pHZ} t_{pLZ}	Output disable time EBA to An, EAB to Bn	4 5	2.0 1.0	3.6 3.0	5.4 4.6	2.0 1.0	5.9 5.0	ns

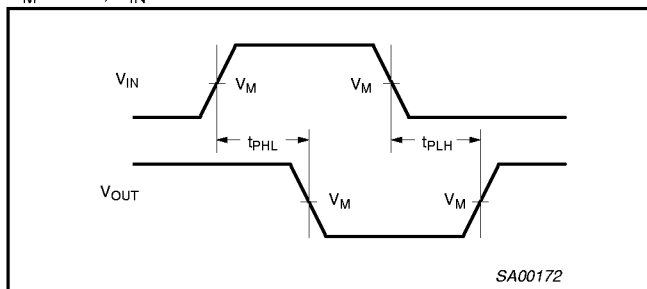
AC SETUP REQUIREMENTS

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

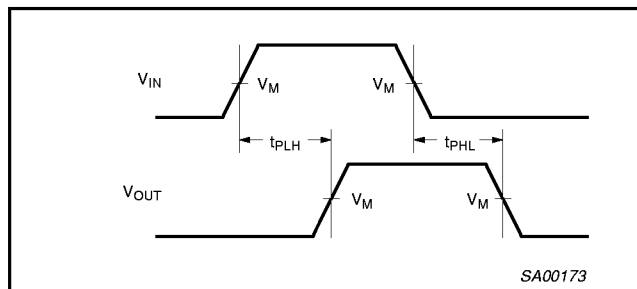
SYMBOL	PARAMETER	WAVEFORM	LIMITS				UNIT
			$T_{\text{amb}} = +25^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V}$		$T_{\text{amb}} = -40 \text{ to } +85^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V} \pm 0.5\text{V}$		
			Min	Typ	Min	Max	
$t_s(\text{H})$ $t_s(\text{L})$	Setup time An to $\overline{\text{LEAB}}$, Bn to $\overline{\text{LEBA}}$	3	2.5 3.0	1.0 1.4	2.5 3.0	ns	
$t_h(\text{H})$ $t_h(\text{L})$	Hold time An to $\overline{\text{LEAB}}$, Bn to $\overline{\text{LEBA}}$	3	0.5 0.5	-0.8 -0.6	0.5 0.5	ns	
$t_s(\text{H})$ $t_s(\text{L})$	Setup time An to $\overline{\text{EAB}}$, Bn to $\overline{\text{EBA}}$	3	3.5 3.0	1.3 1.4	3.5 3.0	ns	
$t_h(\text{H})$ $t_h(\text{L})$	Hold time An to $\overline{\text{EAB}}$, Bn to $\overline{\text{EBA}}$	3	0.5 0.5	-0.8 -0.6	0.5 0.5	ns	
$t_w(\text{L})$	Latch enable pulse width, Low	3	3.5	1.0	3.5	ns	

AC WAVEFORMS

$V_M = 1.5\text{V}$, $V_{\text{IN}} = \text{GND to } 3.0\text{V}$



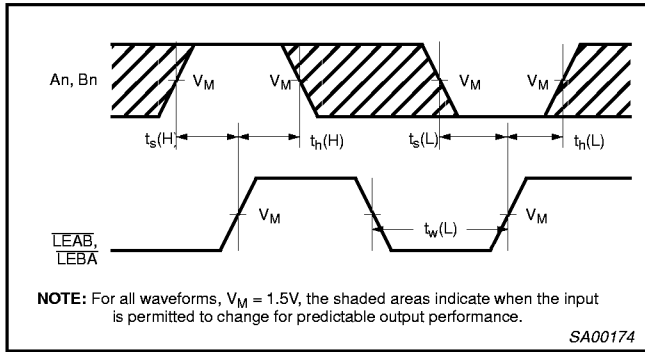
Waveform 1. Propagation Delay For Inverting Output



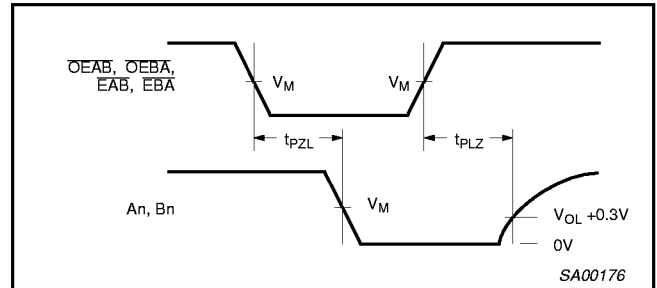
Waveform 2. Propagation Delay For Non-Inverting Output

Octal latched transceiver with dual enable (3-State)

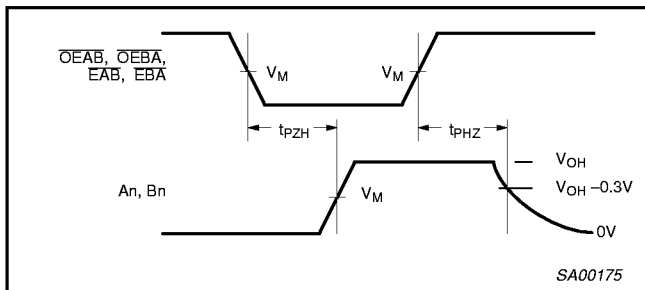
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Waveform 3. Data Setup and Hold Times And Latch Enable Pulse Width



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



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

TEST CIRCUIT AND WAVEFORM

TEST	S1
t_{pd}	open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	open

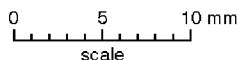
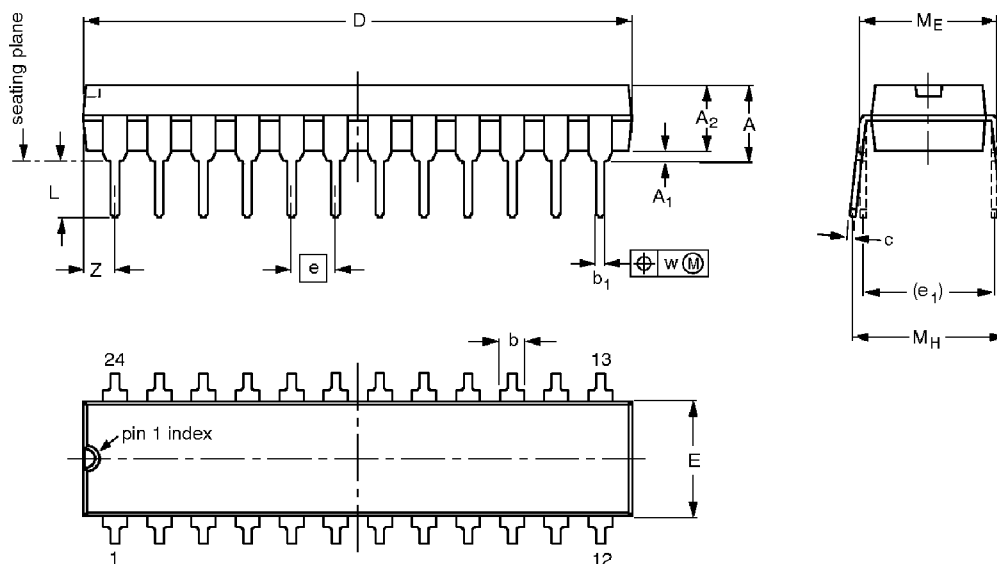
DEFINITIONS
 $C_L =$ Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

Octal latched transceiver with dual enable (3-State)

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DIP24: plastic dual in-line package; 24 leads (300 mil)

SOT222-1



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A max.	A ₁ min.	A ₂ max.	b	b ₁	c	D ⁽¹⁾	E ⁽¹⁾	e	e ₁	L	M _E	M _H	w	Z ⁽¹⁾ max.
mm	4.70	0.38	3.94	1.63 1.14	0.56 0.43	0.36 0.25	31.9 31.5	6.73 6.48	2.54	7.62	3.51 3.05	8.13 7.62	10.03 7.62	0.25	2.05
inches	0.185	0.015	0.155	0.064 0.045	0.022 0.017	0.014 0.010	1.256 1.240	0.265 0.255	0.100	0.300	0.138 0.120	0.32 0.30	0.395 0.300	0.01	0.081

Note

1. Plastic or metal protrusions of 0.01 inches maximum per side are not included.

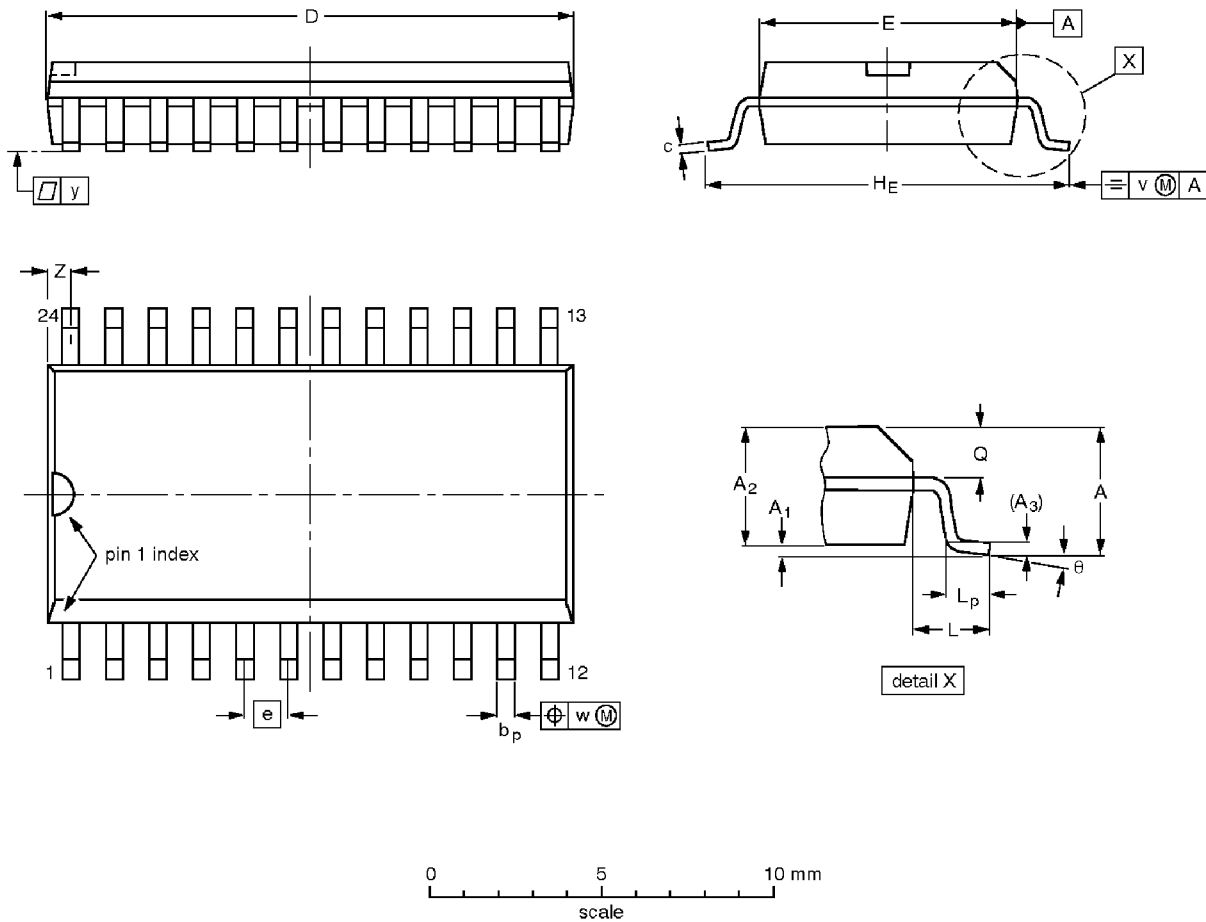
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT222-1		MS-001AF				95-03-11

Octal latched transceiver with dual enable (3-State)

74ABT543A

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.

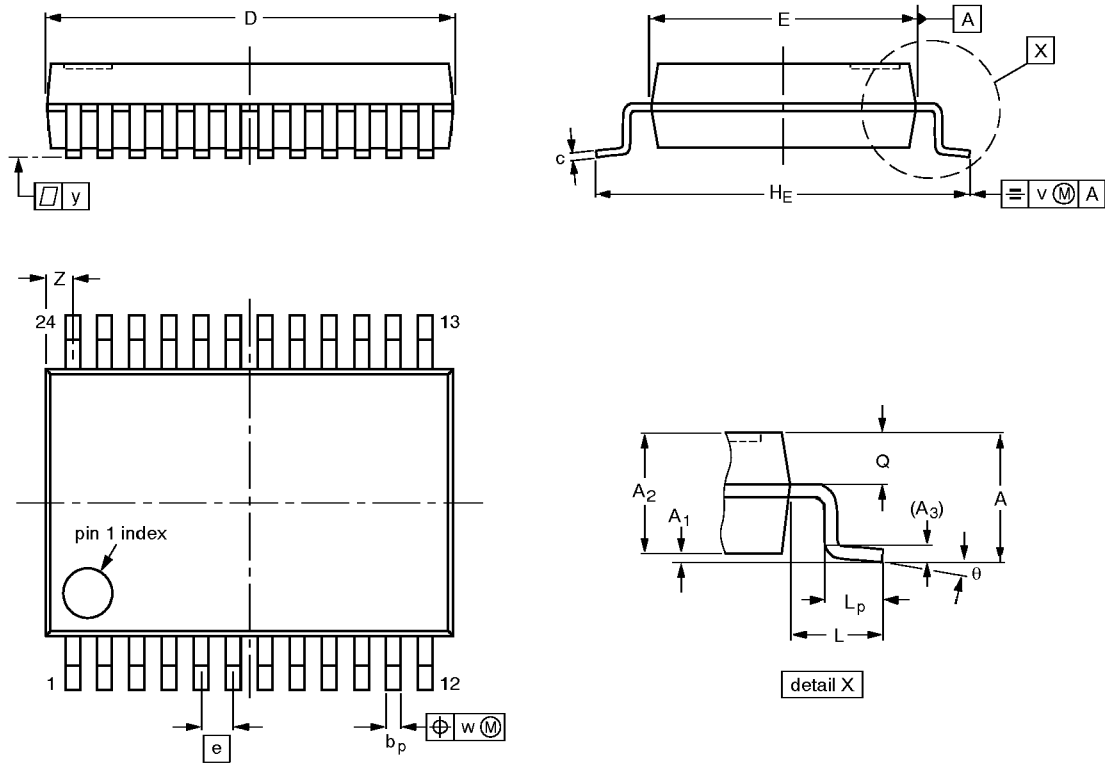
OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT137-1	075E05	MS-013AD			95-01-24 97-05-22

Octal latched transceiver with dual enable (3-State)

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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.

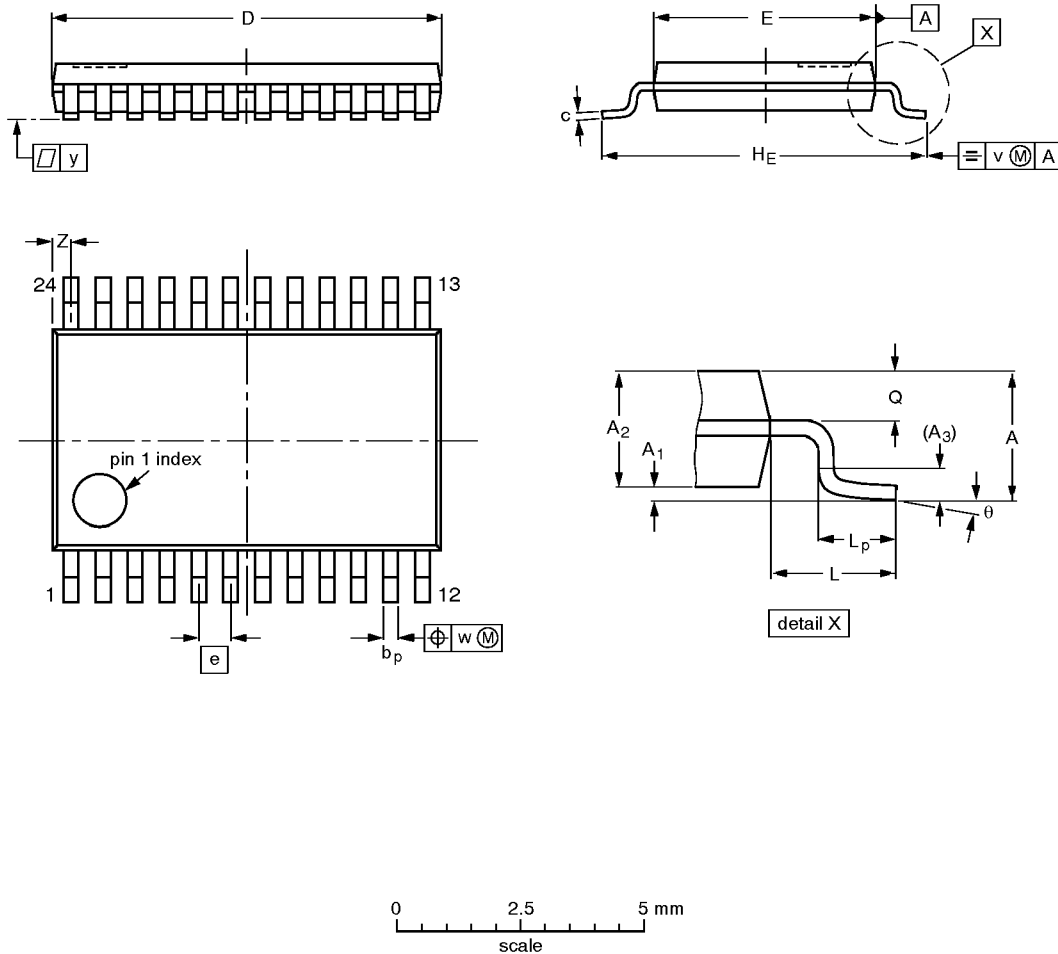
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT340-1		MO-150AG				93-09-08 95-02-04

Octal latched transceiver with dual enable (3-State)

74ABT543A

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

Octal latched 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.
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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