DATA SHEET

74ABT16541
74ABTH16541
16-bit buffer/line driver (3-State)

Product specification
Supersedes data of 1995 Sep 18
IC23 Data Handbook

1998 Feb 25

Philips
Semiconductors

16-bit buffer/line driver (3-State)

74ABT16541
74ABTH16541

FEATURES

- Power-up 3-State
- Multiple V_{CC} and GND pins minimize switching noise
- Provides ideal interface and increases fan-out of MOS Microprocessors
- 3-State buffers sink 64mA and source 32mA
- 74ABTH16541 incorporates bus-hold data inputs which eliminate the need for external pull-up resistors to hold unused inputs
- 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
- Two 8-bit bus interfaces
- Bus-hold data inputs eliminate the need for external pull-up resistors to hold unused inputs

DESCRIPTION

The 74ABT16541 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT16541 has two octal buffers that are ideal for driving bus lines. The outputs are all capable of sinking 64mA and sourcing 32mA.

Two options are available, 74ABT16541 which does not have the bus-hold feature and 74ABTH16541 which incorporates the bus-hold feature.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T_{amb} = 25°C; GND = 0V	TYPICAL	UNIT
t_{PLH} t_{PHL}	Propagation delay nAx to nYx	C_L = 50pF; V_{CC} = 5V	2.0 1.5	ns
C_{IN}	Input capacitance	V_I = 0V or V_{CC}	4	pF
C_{OUT}	Output capacitance	V_O = 0V or V_{CC}; 3-State	6	pF
I_{CCZ}	Quiescent supply current	Outputs disabled; V_{CC} =5.5V	500	µA
I_{CCL}		Outputs LOW; V_{CC} = 5.5V	8	mA

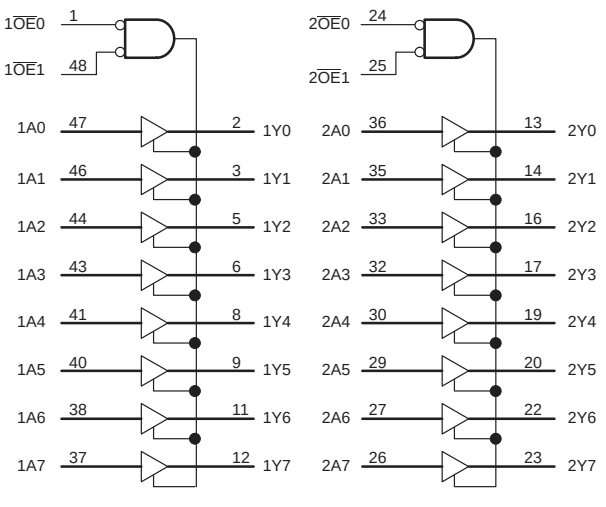
ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
48-Pin Plastic SSOP Type III	–40°C to +85°C	74ABT16541 DL	BT16541 DL	SOT370-1
48-Pin Plastic TSSOP Type II	–40°C to +85°C	74ABT16541 DGG	BT16541 DGG	SOT362-1
48-Pin Plastic SSOP Type III	–40°C to +85°C	74ABTH16541 DL	BH16541 DL	SOT370-1
48-Pin Plastic TSSOP Type II	–40°C to +85°C	74ABTH16541 DGG	BH16541 DGG	SOT362-1

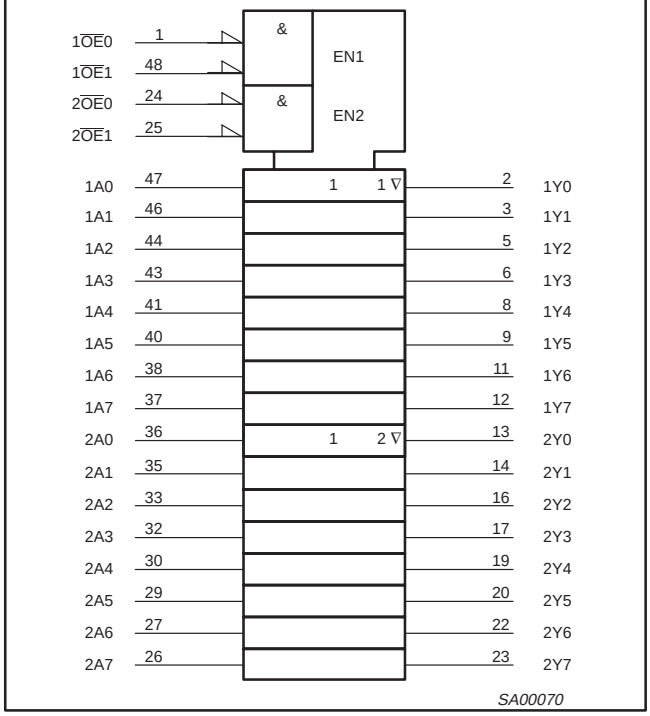
PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
47, 46, 44, 43, 41, 40, 38, 37, 36, 35, 33, 32, 30, 29, 27, 26	1A0 - 1A7 2A0 - 2A7	Data inputs
2, 3, 5, 6, 8, 9, 11, 12, 13, 14, 16, 17 19, 20, 22, 23	1Y0 - 1Y7, 2Y0 - 2Y7	Data outputs
1, 48 24, 25	$1\overline{OE}0$, $1\overline{OE}1$, $2\overline{OE}0$, $2\overline{OE}1$	Output enables
4, 10, 15, 21 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V_{CC}	Positive supply voltage

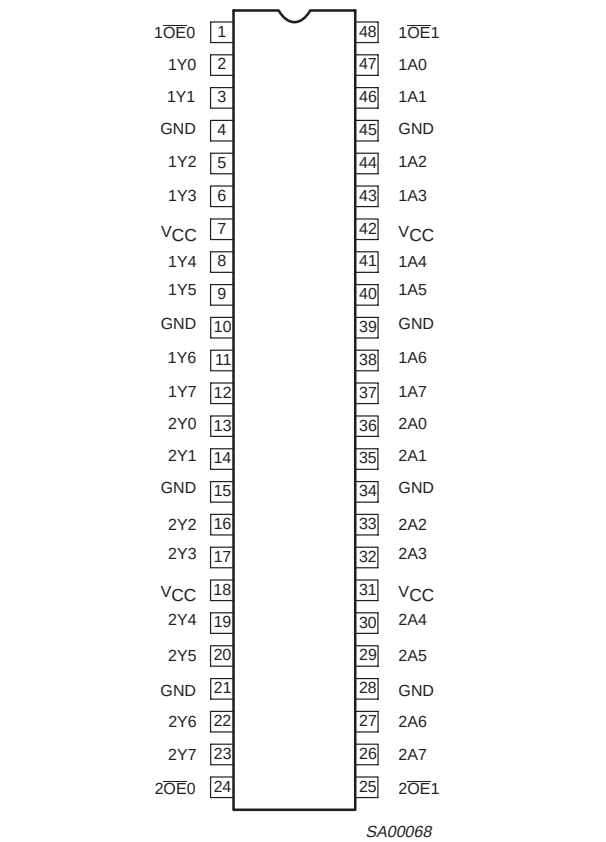
LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



PIN CONFIGURATION



FUNCTION TABLE

INPUTS			OUTPUTS
$n\overline{OE}0$	$n\overline{OE}1$	nIx	nYx
L	L	L	L
L	L	H	H
X	H	X	Z
H	X	X	Z

H = HIGH voltage level
L = LOW voltage level
X = D0n't care
Z = High impedance "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:
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

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	2.9		2.5		V
		V_{CC} = 5.0V; I_{OH} = –3mA; V_I = V_{IL} or V_{IH}		3.0	3.4		3.0		V
		V_{CC} = 4.5V; I_{OH} = –32mA; V_I = V_{IL} or V_{IH}		2.0	2.4		2.0		V
V_{OL}	Low-level output voltage	V_{CC} = 4.5V; I_{OL} = 64mA; V_I = V_{IL} or V_{IH}			0.42	0.55		0.55	V
I_I	Input leakage current	V_{CC} = 5.5V; V_I = GND or 5.5V			±0.01	±1.0		±1.0	µA
I_I	Input leakage current 74ABTH16541	V_{CC} = 5.5V; V_I = V_{CC} or GND	Control pins		±0.01	±1		±1	µA
		V_{CC} = 5.5V; V_I = V_{CC}	Data pins		0.01	1		1	µA
		V_{CC} = 5.5V; V_I = 0	Data pins		–2	–3		–5	µA
I_{HOLD}	Bus Hold current A inputs[3] 74ABTH16541	V_{CC} = 4.5V; V_I = 0.8V		50			50		µA
		V_{CC} = 4.5V; V_I = 2.0V		–75			–75		µA
		V_{CC} = 5.5V; V_I = 0 to 5.5V		±500					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}/I_{PD}	Power-up/down 3-State output current	V_{CC} = 2.0V; V_O = 0.5V; V_I = GND or V_{CC}; V_{OE} = V_{CC}			±5.0	±50		±50	µA
I_{OZH}	3-State output High current	V_{CC} = 5.5V; V_O = 2.7V; V_I = V_{IL} or V_{IH}			1.0	10		10	µA
I_{OZL}	3-State output Low current	V_{CC} = 5.5V; V_O = 0.5V; V_I = V_{IL} or V_{IH}			–1.0	–10		–10	µA
I_{CEX}	Output high leakage current	V_{CC} = 5.5V; V_O = 5.5V; V_I = GND or V_{CC}			1.0	50		50	µA
I_O	Output current[1]	V_{CC} = 5.5V; V_O = 2.5V		–50	–70	–180	–50	–180	mA
I_{CCH}	Quiescent supply current	V_{CC} = 5.5V; Outputs High, V_I = GND or V_{CC}			0.5	1.0		1.0	mA
I_{CCL}		V_{CC} = 5.5V; Outputs Low, V_I = GND or V_{CC}			8	19		19	mA
I_{CCZ}		V_{CC} = 5.5V; Outputs 3-State; V_I = GND or V_{CC}			0.5	1.0		1.0	mA
ΔI_{CC}	Additional supply current per input pin[2] 74ABT16541	Outputs enabled, one input at 3.4V, other inputs at V_{CC} or GND; V_{CC} = 5.5V			100	250		250	µA
ΔI_{CC}	Additional supply current per input pin[2] 74ABTH16541	Outputs enabled, one input at 3.4V, other inputs at V_{CC} or GND; V_{CC} = 5.5V			0.2	1.0		1.0	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. This is the bus hold overdrive current required to force the input to the opposite logic state.

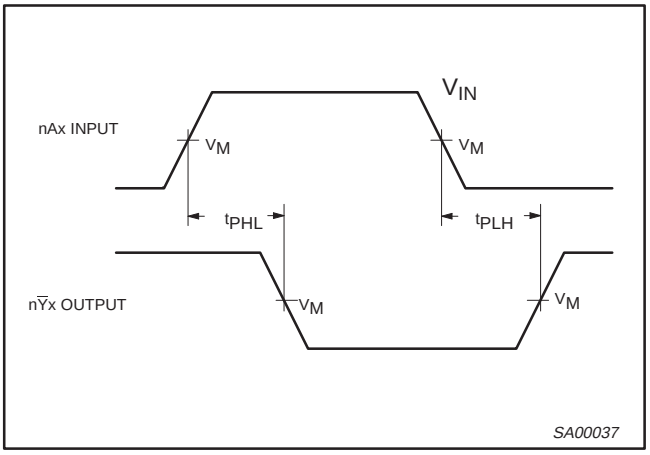
AC CHARACTERISTICS

GND = 0V; t_R = t_F = 2.5ns; C_L = 50pF, R_L = 500Ω

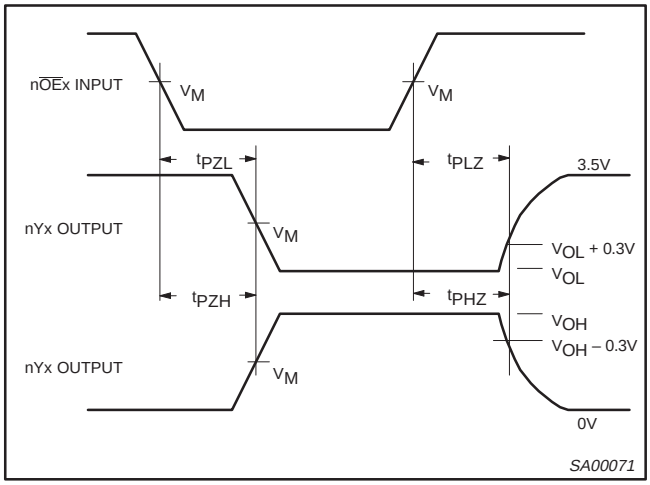
SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT
			T_{amb} = +25°C V_{CC} = +5.0V			T_{amb} = –40°C to +85°C V_{CC} = +5.0V ±0.5V		
			Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay nIx to nYx	1	1.0 1.0	2.0 1.5	3.0 3.6	1.0 1.0	3.4 4.2	ns
t_{PZH} t_{PZL}	Output enable time to High and Low level	2	1.3 1.6	2.9 3.1	4.3 4.7	1.3 1.6	5.2 6.0	ns
t_{PHZ} t_{PLZ}	Output disable time from High and Low level	2	1.3 1.0	3.5 2.8	4.4 3.6	1.3 1.0	5.1 3.9	ns

AC WAVEFORMS

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

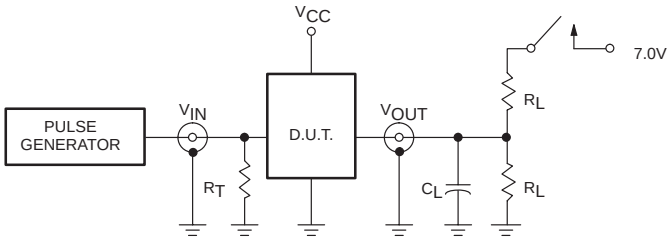


Waveform 1. Input (An) to Output (Yn) Propagation Delays

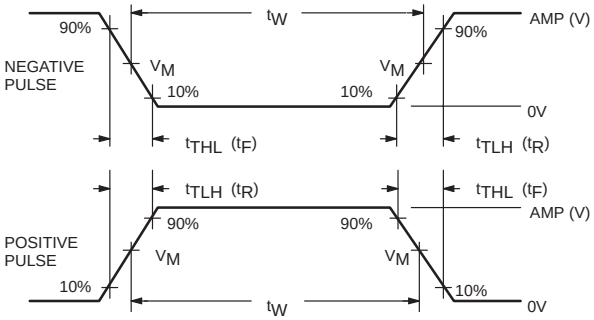


Waveform 2. 3-State Output Enable and Disable Times

TEST CIRCUIT AND WAVEFORMS



Test Circuit for 3-State Outputs



V_M = 1.5V

Input Pulse Definition

SWITCH POSITION

TEST	SWITCH
t_{PLZ}	closed
t_{PZL}	closed
All other	open

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.

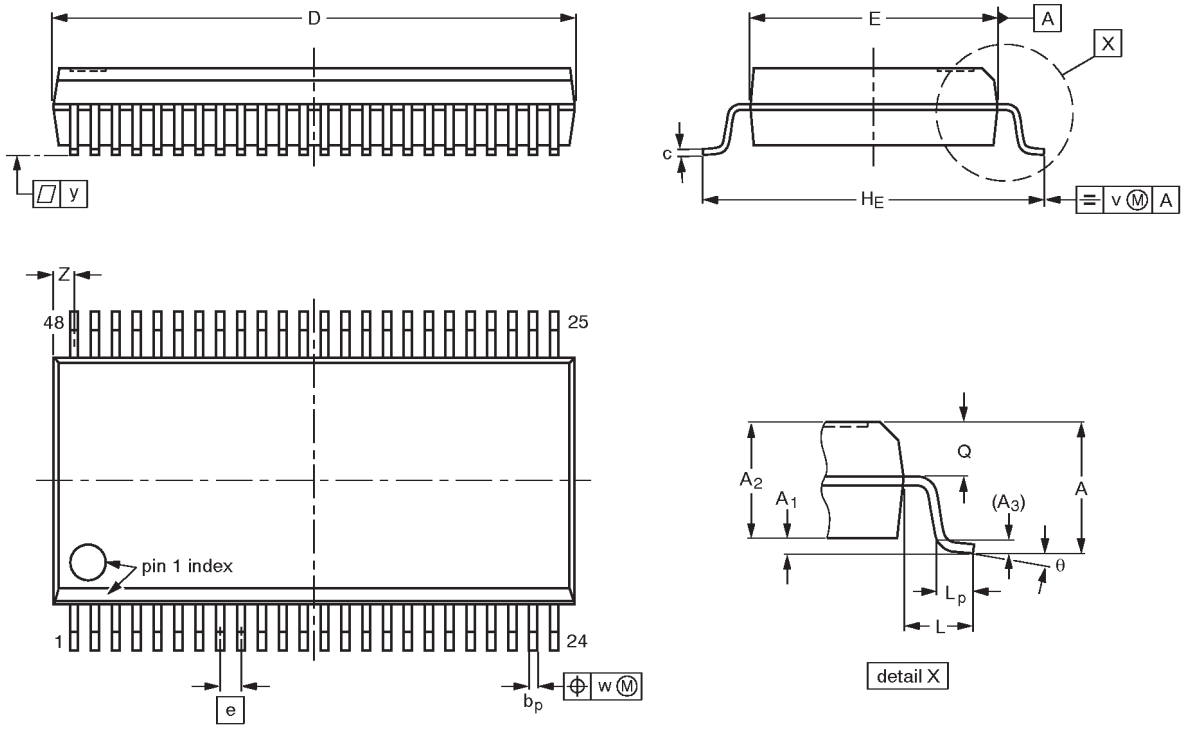
C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

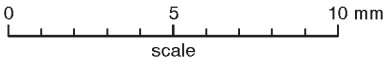
R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

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

SA00012

SSOP48: plastic shrink small outline package; 48 leads; body width 7.5 mm **SOT370-1**





DIMENSIONS (mm are the original dimensions)

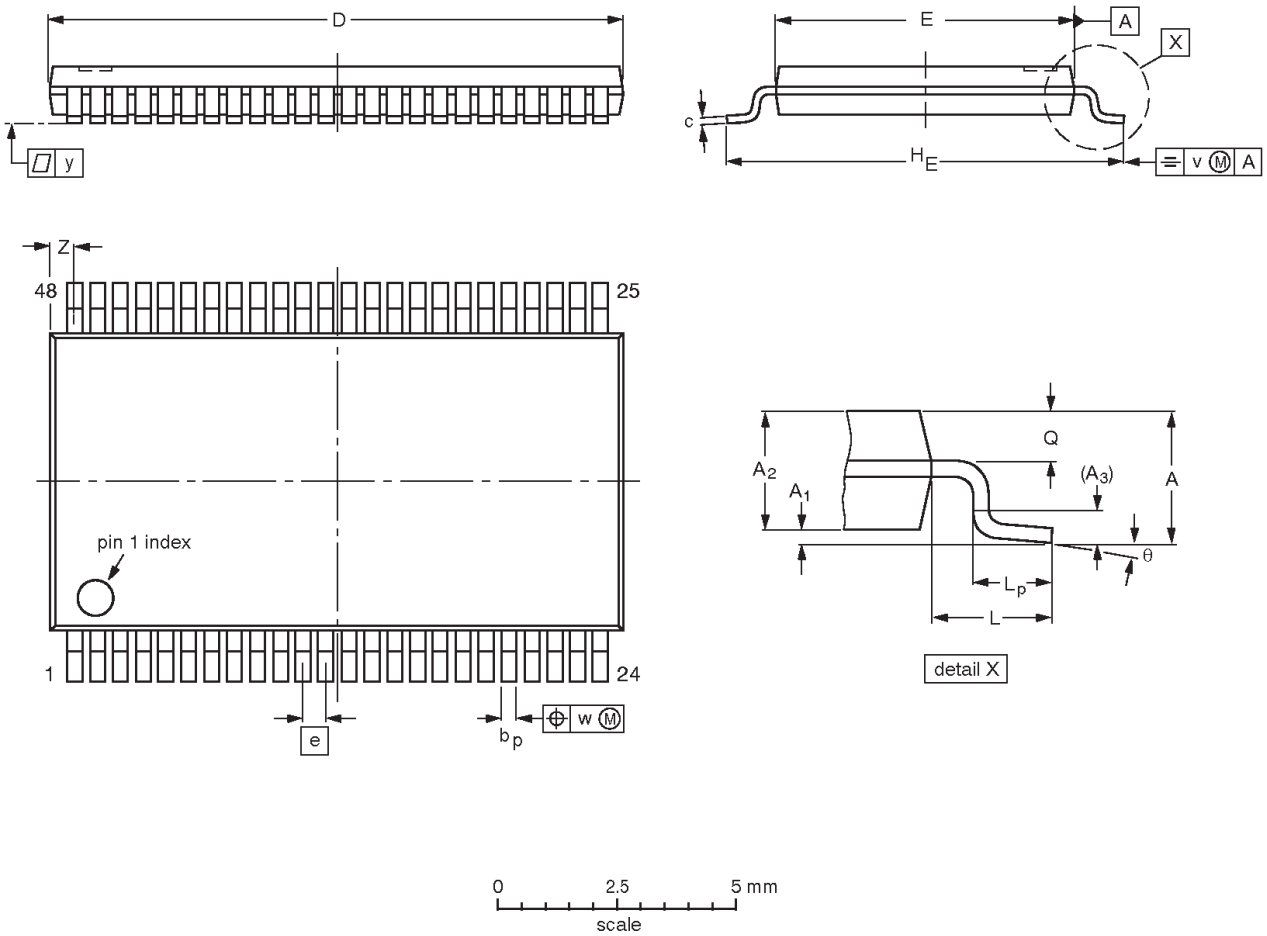
UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2.8	0.4 0.2	2.35 2.20	0.25	0.3 0.2	0.22 0.13	16.00 15.75	7.6 7.4	0.635	10.4 10.1	1.4	1.0 0.6	1.2 1.0	0.25	0.18	0.1	0.85 0.40	8° 0°

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			
SOT370-1		MO-118AA				~~93-11-02~~ 95-02-04

TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1mm **SOT362-1**



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	0.15 0.05	1.05 0.85	0.25	0.28 0.17	0.2 0.1	12.6 12.4	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	0.8 0.4	8^o 0^o

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				
SOT362-1		MO-153ED					~~93-02-03~~ 95-02-10

NOTES

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.

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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