

# 74ABT162245A; 74ABTH162245A

16-bit bus transceiver with 30  $\Omega$  series termination resistors;  
3-state

Rev. 5 — 2 July 2021

Product data sheet

## 1. General description

The 74ABT162245A; 74ABTH162245A is a 16-bit transceiver with 30  $\Omega$  termination resistors and 3-state outputs. The device can be used as two 8-bit transceivers or one 16-bit transceiver. The device features two output enables (1 $\overline{OE}$  and 2 $\overline{OE}$ ) each controlling eight outputs, and two send/receive (1DIR and 2DIR) inputs for direction control. A HIGH on n $\overline{OE}$  causes the outputs to assume a high-impedance OFF-state. This device is fully specified for partial power down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

Two options are available, 74ABT162245A which does not have the bus hold feature and the 74ABTH162245A which incorporates the bus hold feature.

## 2. Features and benefits

- 16-bit bidirectional bus interface
- Multiple V<sub>CC</sub> and GND pins minimize switching noise
- 3-state buffers
- Output capability: +12 mA/–32 mA
- 74ABTH162245A incorporates bus-hold data inputs which eliminate the need for external pull-up resistors to hold unused inputs
- Integrated 30  $\Omega$  termination resistors
- Supply voltage range from 4.5 to 5.5 V
- BiCMOS high speed and output drive
- Direct interface with TTL levels
- Power-up 3-state
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 500 mA per JESD 78 Class II Level B
- ESD protection:
  - HBM JESD-A114E exceeds 2000 V
  - CDM JESD22-C101C exceeds 1000 V
- Specified from -40 °C to +85 °C

## 3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74ABT162245ADGG	-40 °C to +85 °C	TSSOP48	plastic thin shrink small outline package; 48 leads; body width 6.1 mm	SOT362-1
74ABTH162245ADGG				

### 4. Functional diagram

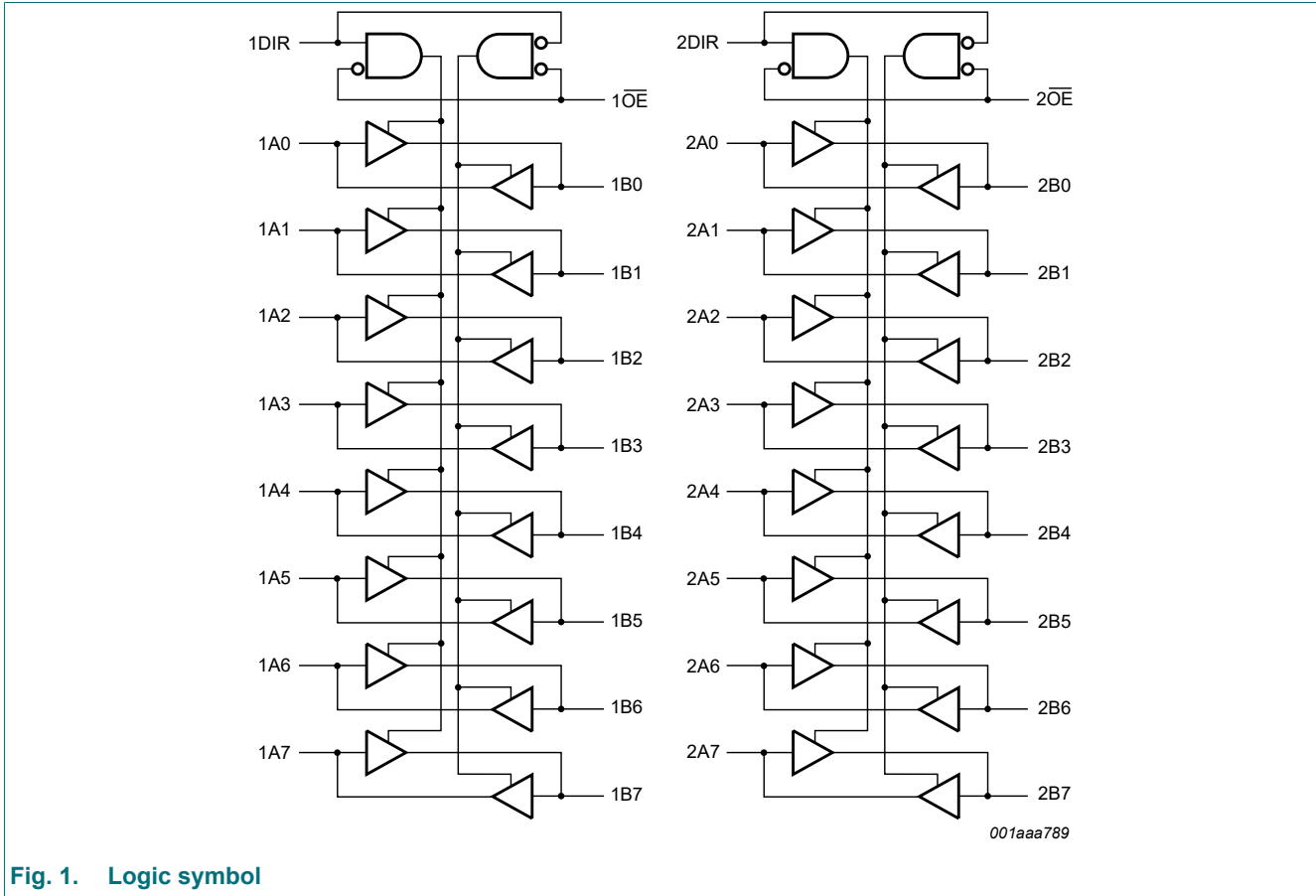


Fig. 1. Logic symbol

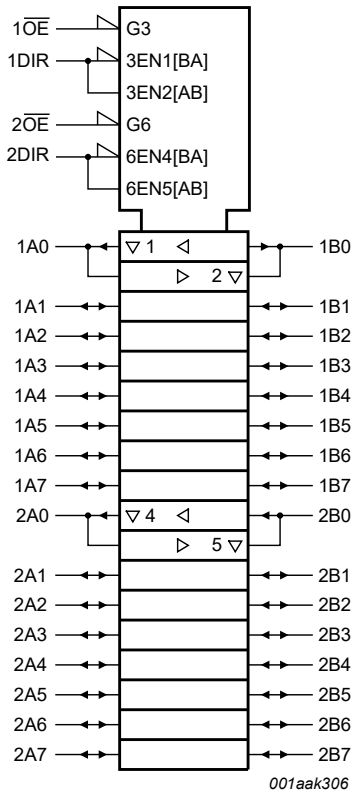


Fig. 2. IEC logic symbol

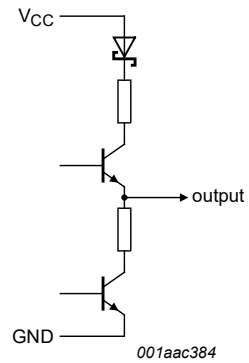


Fig. 3. Schematic of each output

## 5. Pinning information

### 5.1. Pinning

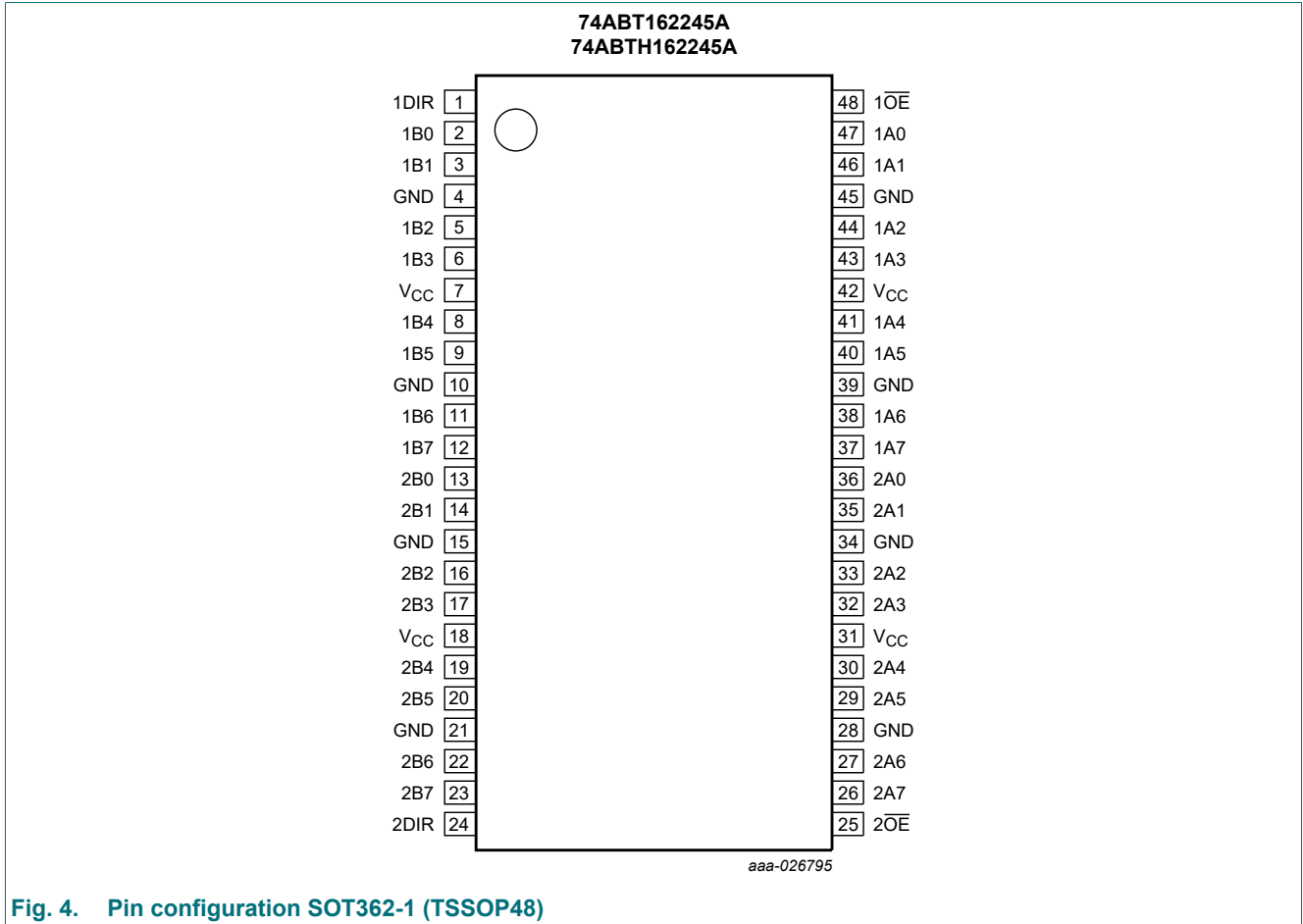


Fig. 4. Pin configuration SOT362-1 (TSSOP48)

### 5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
1DIR, 2DIR	1, 24	direction control input
1A0, 1A1, 1A2, 1A3, 1A4, 1A5, 1A6, 1A7	47, 46, 44, 43, 41, 40, 38, 37	data input/output
2A0, 2A1, 2A2, 2A3, 2A4, 2A5, 2A6, 2A7	36, 35, 33, 32, 30, 29, 27, 26	data input/output
GND	4, 10, 15, 21, 28, 34, 39, 45	ground (0 V)
1B0, 1B1, 1B2, 1B3, 1B4, 1B5, 1B6, 1B7	2, 3, 5, 6, 8, 9, 11, 12	data input/output
2B0, 2B1, 2B2, 2B3, 2B4, 2B5, 2B6, 2B7	13, 14, 16, 17, 19, 20, 22, 23	data input/output
1OE, 2OE	48, 25	output enable input
V <sub>CC</sub>	7, 18, 31, 42	supply voltage

## 6. Functional description

**Table 3. Function table**

*H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.*

Control		Input/output	
nOE	nDIR	nAn	nBn
L	L	output nAn = nBn	input
L	H	input	output nBn = nAn
H	X	Z	Z

## 7. Limiting values

**Table 4. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		-0.5	+7.0	V
$V_I$	input voltage		[1] -1.2	+7.0	V
$V_O$	output voltage	output in OFF-state or HIGH-state	[1] -0.5	+5.5	V
$I_{IK}$	input clamping current	$V_I < 0$ V	-18	-	mA
$I_{OK}$	output clamping current	$V_O < 0$ V	-50	-	mA
$I_O$	output current	output in LOW-state	-	128	mA
		output in HIGH-state	-64	-	mA
$T_j$	junction temperature		[2] -	150	$^{\circ}$ C
$T_{stg}$	storage temperature		-65	+150	$^{\circ}$ C

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[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.

## 8. Recommended operating conditions

**Table 5. Operating conditions**

*Voltages are referenced to GND (ground = 0 V).*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage		4.5	-	5.5	V
$V_I$	input voltage		0	-	$V_{CC}$	V
$I_{OH}$	HIGH-level output current		-32	-	-	mA
$I_{OL}$	LOW-level output current		-	-	12	mA
$\Delta t/\Delta V$	input transition rise and fall rate		0	-	10	ns/V
$T_{amb}$	ambient temperature	in free air	-40	-	+85	$^{\circ}$ C

## 9. Static characteristics

**Table 6. Static characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		Unit
			Min	Typ	Max	Min	Max	
$V_{IK}$	input clamping voltage	$V_{CC} = 4.5 \text{ V}$ ; $I_{IK} = -18 \text{ mA}$	-1.2	-0.9	-	-1.2	-	V
$V_{IH}$	HIGH-level input voltage		2.0	-	-	2.0	-	V
$V_{IL}$	LOW-level input voltage		-	-	0.8	-	0.8	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	2.9	-	2.5	-	V
		$V_{CC} = 5.0 \text{ V}$ ; $I_{OH} = -3 \text{ mA}$ ; $V_I = V_{IL}$ or $V_{IH}$	3.0	3.4	-	3.0	-	V
		$V_{CC} = 4.5 \text{ V}$ ; $I_{OH} = -32 \text{ mA}$ ; $V_I = V_{IL}$ or $V_{IH}$	2.0	2.4	-	2.0	-	V
$V_{OL}$	LOW-level output voltage	$V_{CC} = 4.5 \text{ V}$ ; $I_{OL} = 8 \text{ mA}$ ; $V_I = V_{IL}$ or $V_{IH}$	-	0.46	0.65	-	0.65	V
		$V_{CC} = 4.5 \text{ V}$ ; $I_{OL} = 12 \text{ mA}$ ; $V_I = V_{IL}$ or $V_{IH}$	-	0.5	0.8	-	0.8	V
$I_I$	input leakage current	$\overline{nOE}$ , nDIR; $V_{CC} = 5.5 \text{ V}$ ; $V_I = \text{GND}$ or $5.5 \text{ V}$	-	$\pm 0.01$	$\pm 1$	-	$\pm 1$	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_{CC} = 0 \text{ V}$ ; $V_I$ or $V_O \leq 4.5 \text{ V}$	-	$\pm 5.0$	$\pm 100$	-	$\pm 100$	$\mu\text{A}$
$I_{BHL}$	bus hold LOW current	$V_{CC} = 4.5 \text{ V}$ ; $V_I = 0.8 \text{ V}$ [1]	50	-	-	50	-	$\mu\text{A}$
$I_{BHH}$	bus hold HIGH current	$V_{CC} = 5.5 \text{ V}$ ; $V_I = 2.0 \text{ V}$ [1]	-75	-	-	-75	-	$\mu\text{A}$
$I_{BHLO}$	bus hold LOW overdrive current	$V_{CC} = 5.5 \text{ V}$ ; $V_I = 0 \text{ V}$ to $5.5 \text{ V}$ [1] [2]	500	-	-	-	-	$\mu\text{A}$
$I_{BHHO}$	bus hold HIGH overdrive current	$V_{CC} = 5.5 \text{ V}$ ; $V_I = 0 \text{ V}$ to $5.5 \text{ V}$ [1] [2]	-500	-	-	-	-	$\mu\text{A}$
$I_{O(pu/pd)}$	power-up/power-down output current	$V_{CC} = 2.0 \text{ V}$ ; $V_O = 0.5 \text{ V}$ ; $V_I = \text{GND}$ or $V_{CC}$ ; nOE = don't care [3]	-	$\pm 5.0$	$\pm 50$	-	$\pm 50$	$\mu\text{A}$
$I_{OZ}$	OFF-state output current	$V_{CC} = 5.5 \text{ V}$ ; $V_I = V_{IL}$ or $V_{IH}$ ; $V_O = 5.5 \text{ V}$	-	0.5	10	-	10	$\mu\text{A}$
		$V_{CC} = 5.5 \text{ V}$ ; $V_I = V_{IL}$ or $V_{IH}$ ; $V_O = 0.0 \text{ V}$	-	-0.5	-10	-	-10	$\mu\text{A}$
		$V_{CC} = 5.5 \text{ V}$ ; $V_I = V_{IL}$ or $V_{IH}$ ; $V_O = 2.5 \text{ V}$	-	0.5	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 $V_{CC}$	-	5.0	50	-	50	$\mu\text{A}$
$I_O$	output current	$V_{CC} = 5.5 \text{ V}$ ; $V_O = 2.5 \text{ V}$ [4]	-50	-92	-180	-50	-180	mA
$I_{CC}$	supply current	$V_{CC} = 5.5 \text{ V}$ ; $V_I = \text{GND}$ or $V_{CC}$						
		outputs HIGH	-	0.3	0.7	-	0.7	mA
		outputs LOW	-	10	19	-	19	mA
		outputs 3-state	-	0.3	0.7	-	0.7	mA

## 16-bit bus transceiver with 30 Ω series termination resistors; 3-state

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		Unit
			Min	Typ	Max	Min	Max	
$\Delta I_{CC}$	additional supply current	per input pin; $V_{CC} = 5.5$ V; one input at 3.4 V, other inputs at $V_{CC}$ or GND [5]						
		outputs enabled	-	400	700	-	700	μA
		74ABT162245A; outputs 3-state	-	1.0	50	-	50	μA
		74ABTH162245A; outputs 3-state	-	100	250	-	250	μA
		n $\overline{OE}$ , nDIR	-	400	700	-	700	μA
$C_I$	input capacitance	$V_I = 0$ V or $V_{CC}$	-	3	-	-	-	pF
$C_{I/O}$	input/output capacitance	$V_O = 0$ V or $V_{CC}$ ; outputs 3-state	-	7	-	-	-	pF

[1] Valid for data inputs of bus hold parts only (74ABTH162245A)

[2] This is the bus hold overdrive current required to force the input to the opposite logic state.

[3] This parameter is valid for any  $V_{CC}$  between 0 V and 2.1 V with a transition time of up to 10 ms. From  $V_{CC} = 2.1$  V to  $V_{CC} = 4.5$  V to 5.5 V a transition time of 100 μs is permitted.

[4] Not more than one output should be tested at a time and the duration of the test should not exceed one second

[5] This is the increase in supply current for each input at 3.4 V.

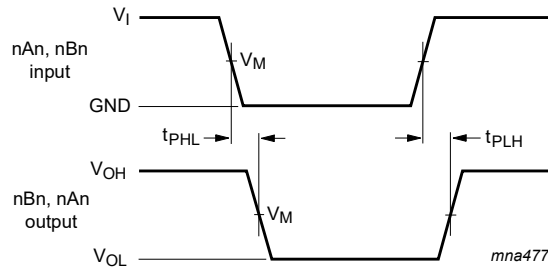
## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 7.

Symbol	Parameter	Conditions	$T_{amb} = 25$ °C; $V_{CC} = 5.0$ V			$T_{amb} = -40$ °C to 85 °C; $V_{CC} = 5.0$ V $\pm$ 0.5 V		Unit
			Min	Typ	Max	Min	Max	
$t_{PLH}$	LOW to HIGH propagation delay	nAn to nBn or nBn to nAn; see Fig. 5	1.0	2.0	3.3	1.0	3.5	ns
$t_{PHL}$	HIGH to LOW propagation delay	nAn to nBn or nBn to nAn; see Fig. 5	1.5	3.0	4.5	1.5	4.9	ns
$t_{PZH}$	OFF-state to HIGH propagation delay	n $\overline{OE}$ to nAn or nBn; see Fig. 6	1.5	3.1	4.3	1.5	5.0	ns
$t_{PZL}$	OFF-state to LOW propagation delay	n $\overline{OE}$ to nAn or nBn; see Fig. 6	2.0	5.0	6.1	2.0	7.0	ns
$t_{PHZ}$	HIGH to OFF-state propagation delay	n $\overline{OE}$ to nAn or nBn; see Fig. 6	1.7	3.5	4.8	1.7	5.4	ns
$t_{PLZ}$	LOW to OFF-state propagation delay	n $\overline{OE}$ to nAn or nBn; see Fig. 6	1.5	3.2	4.5	1.5	4.9	ns

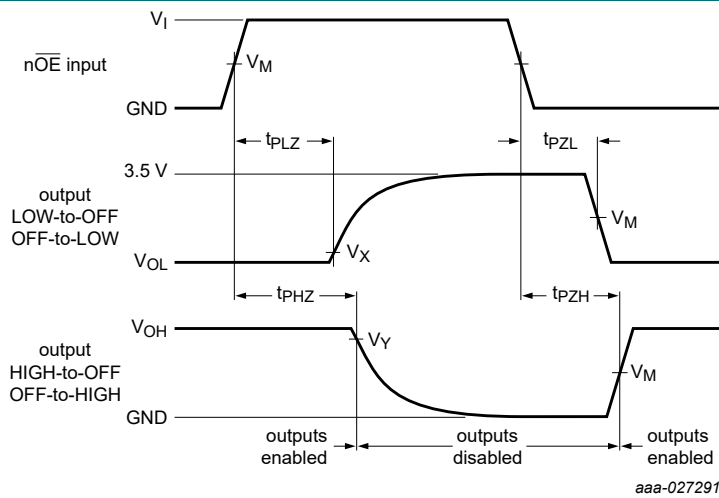
10.1. Waveforms and test circuit



Measurement points are given in [Table 8](#).

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

Fig. 5. Input (An or Bn) to output (Bn or An) propagation delays



Measurement points are given in [Table 8](#).

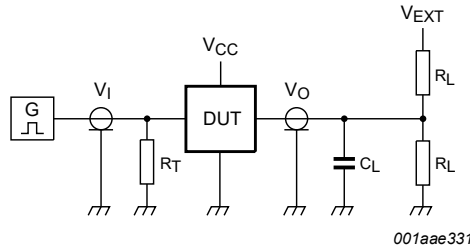
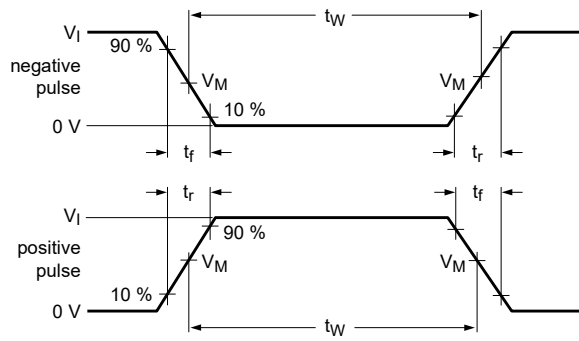
$V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

Fig. 6. 3-state output enable and disable times

Table 8. Measurement points

Input		Output		
$V_I$	$V_M$	$V_M$	$V_X$	$V_Y$
3.0 V	1.5 V	1.5 V	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$





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Test data is given in [Table 9](#).

Definitions test circuit:

$R_L$  = Load resistance.

$C_L$  = Load capacitance including jig and probe capacitance.

$R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator.

$V_{EXT}$  = Test voltage for switching times.

**Fig. 7. Test circuit for measuring switching times**

**Table 9. Test data**

Input				Load		$V_{EXT}$		
$V_I$	$f_i$	$t_W$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHZ}, t_{PZH}$	$t_{PLZ}, t_{PZL}$	$t_{PLH}, t_{PHL}$
3.0 V	$\leq 1$ MHz	500 ns	$\leq 2.5$ ns	50 pF	500 Ω	open	7 V	open

### 11. Package outline

TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1 mm

SOT362-1

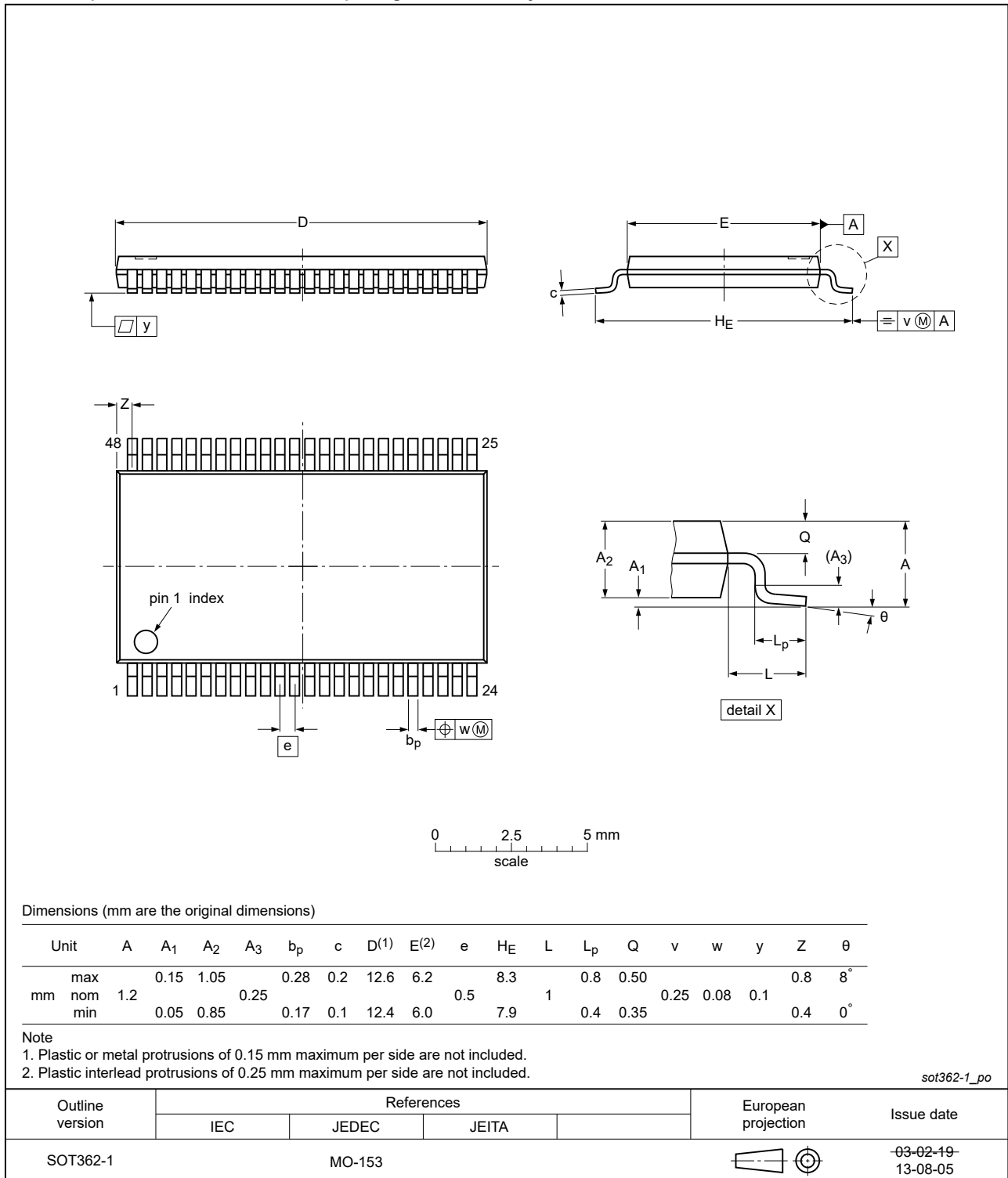


Fig. 8. Package outline SOT362-1 (TSSOP48)

## 12. Abbreviations

Table 10. Abbreviations

Acronym	Description
BiCMOS	Bipolar Complementary Metal Oxide Semiconductor
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model

## 13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74ABT_ABTH162245A v.5	20210702	Product data sheet	-	74ABT_H162245A v.4
Modifications:	<ul style="list-style-type: none"> <li>Type number 74ABT162245ADL (SOT370-1 / SSOP48) removed.</li> <li><a href="#">Section 1</a> and <a href="#">Section 2</a> updated.</li> </ul>			
74ABT_H162245A v.4	20190220	Product data sheet	-	74ABT_H162245A v.3
Modifications:	<ul style="list-style-type: none"> <li>Type number 74ABTH162245ADL (SOT370-1) removed.</li> </ul>			
74ABT_H162245A v.3	20170831	Product data sheet	-	74ABT_H162245A v.2
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
74ABT_H162245A v.2	19980225	Product specification	-	74ABT_H162245A v.1
74ABT_H162245A v.1	19961120	Product specification	-	-

## 14. Legal information

### Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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