74ABT162245A; 74ABTH162245A

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

Rev. 7 — 24 June 2024 Product data sheet

1. General description

The 74ABT162245A; 74ABTH162245A is a 16-bit transceiver with 30 Ω 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_{OFF}. The I_{OFF} 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_{CC} 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 Ω 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_{OFF} circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 500 mA per JESD 78 Class II Level B
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 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 74ABTH162245ADGG	-40 °C to +85 °C	TSSOP48	plastic thin shrink small outline package; 48 leads; body width 6.1 mm	SOT362-1

4. Functional diagram

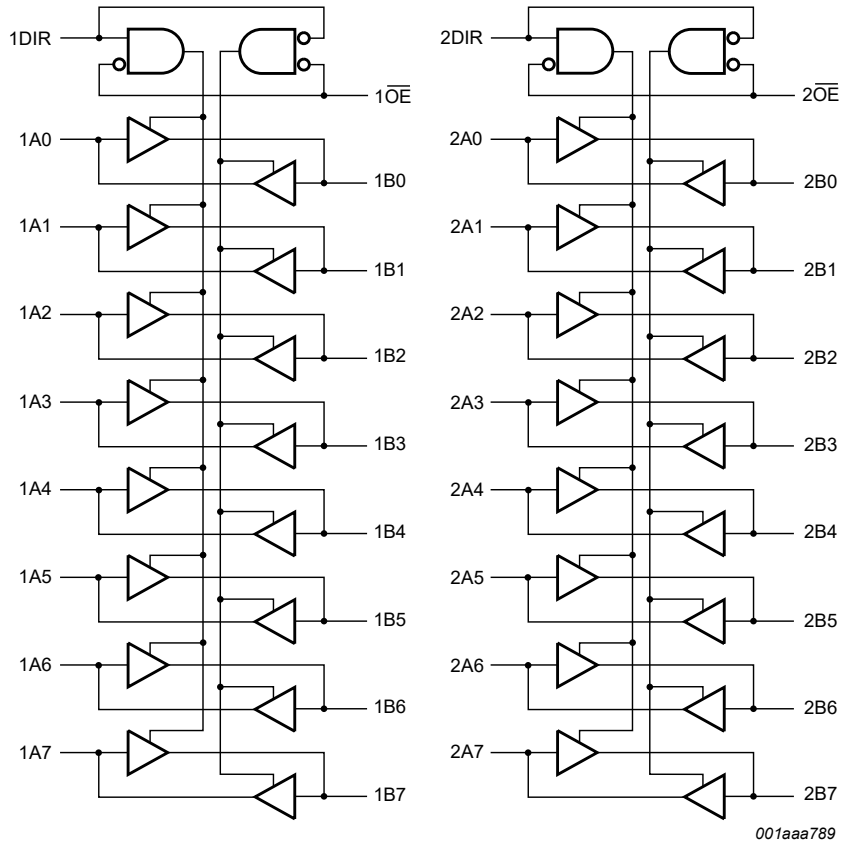


Fig. 1. Logic symbol

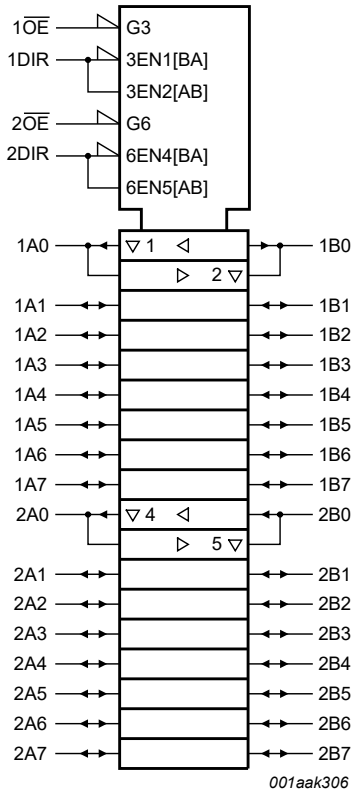


Fig. 2. IEC logic symbol

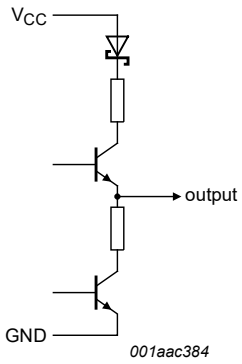
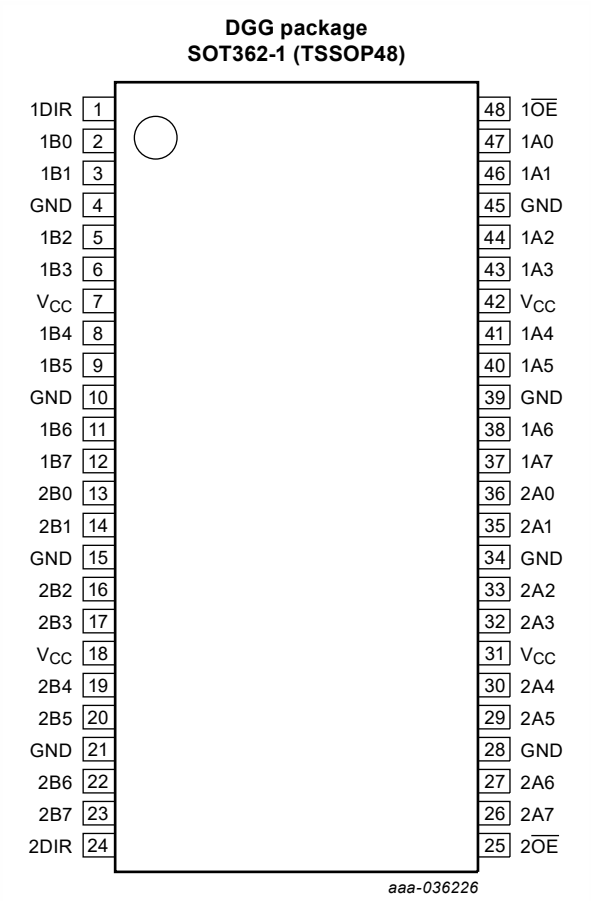


Fig. 3. Schematic of each output

5. Pinning information

5.1. Pinning



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
$1\overline{OE}$, $2\overline{OE}$	48, 25	output enable input
V_{CC}	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	
n$\overline{OE}$	**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	°C
T_{stg}	storage temperature		-65	+150	°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	°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 V; I_{IK} = -18 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 V; I_{OH} = -3 mA; V_I = V_{IL} or V_{IH}	2.5	2.9	-	2.5	-	V
		V_{CC} = 5.0 V; I_{OH} = -3 mA; V_I = V_{IL} or V_{IH}	3.0	3.4	-	3.0	-	V
		V_{CC} = 4.5 V; I_{OH} = -32 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 V; I_{OL} = 8 mA; V_I = V_{IL} or V_{IH}	-	0.46	0.65	-	0.65	V
		V_{CC} = 4.5 V; I_{OL} = 12 mA; V_I = V_{IL} or V_{IH}	-	0.5	0.8	-	0.8	V
I_I	input leakage current	$n\overline{OE}$, nDIR; V_{CC} = 5.5 V; V_I = GND or 5.5 V	-	±0.01	±1	-	±1	µA
I_{OFF}	power-off leakage current	V_{CC} = 0 V; V_I or V_O ≤ 4.5 V	-	±5.0	±100	-	±100	µA
I_{BHL}	bus hold LOW current	V_{CC} = 4.5 V; V_I = 0.8 V [1]	50	-	-	50	-	µA
I_{BHH}	bus hold HIGH current	V_{CC} = 5.5 V; V_I = 2.0 V [1]	-75	-	-	-75	-	µA
I_{BHLO}	bus hold LOW overdrive current	V_{CC} = 5.5 V; V_I = 0 V to 5.5 V [1] [2]	500	-	-	-	-	µA
I_{BHHO}	bus hold HIGH overdrive current	V_{CC} = 5.5 V; V_I = 0 V to 5.5 V [1] [2]	-500	-	-	-	-	µA
$I_{O(pu/pd)}$	power-up/power-down output current	V_{CC} = 2.0 V; V_O = 0.5 V; V_I = GND or V_{CC}; $n\overline{OE}$ = don't care [3]	-	±5.0	±50	-	±50	µA
I_{OZ}	OFF-state output current	V_{CC} = 5.5 V; V_I = V_{IL} or V_{IH}						
		V_O = 5.5 V	-	0.5	10	-	10	µA
		V_O = 0.0 V	-	-0.5	-10	-	-10	µA
I_{CEX}	output high leakage current	V_{CC} = 5.5 V; V_O = 5.5 V; V_I = GND or V_{CC}	-	5.0	50	-	50	µA
I_O	output current	V_{CC} = 5.5 V; V_O = 2.5 V [4]	-50	-92	-180	-50	-180	mA
I_{CC}	supply current	V_{CC} = 5.5 V; V_I = 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

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		Unit
			Min	Typ	Max	Min	Max	
ΔI_{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.

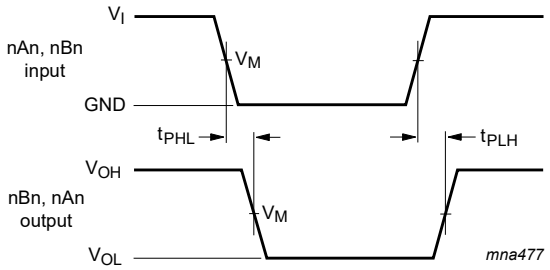
10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6.

Symbol	Parameter	Conditions	T_{amb} = 25 °C; V_{CC} = 5.0 V			T_{amb} = -40 °C to 85 °C; V_{CC} = 5.0 V ± 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. 4	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. 4	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. 5	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. 5	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. 5	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. 5	1.5	3.2	4.5	1.5	4.9	ns

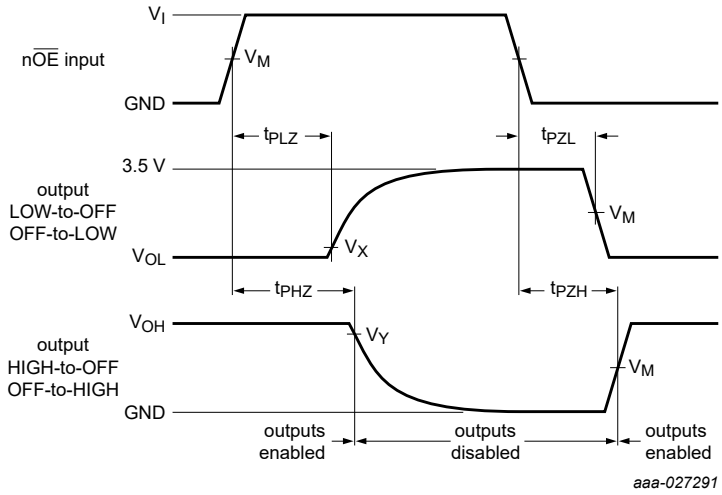
10.1. Waveforms and test circuit



Measurement points are given in Table 8.

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

Fig. 4. Input (An or Bn) to output (Bn or An) propagation delays



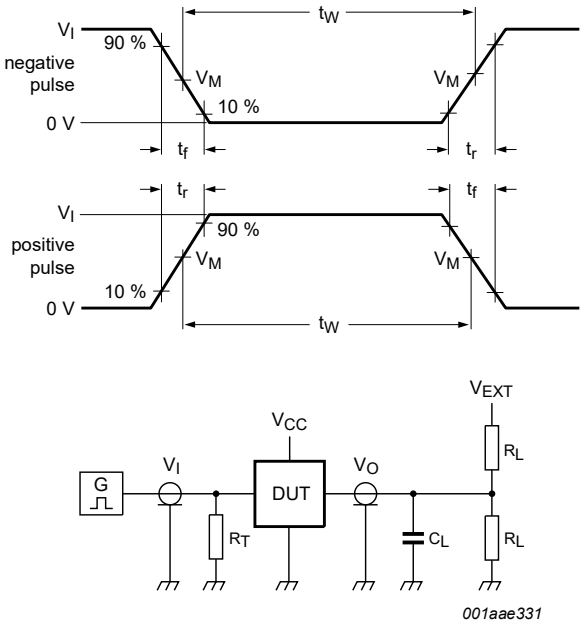
Measurement points are given in Table 8.

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

Fig. 5. 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



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.

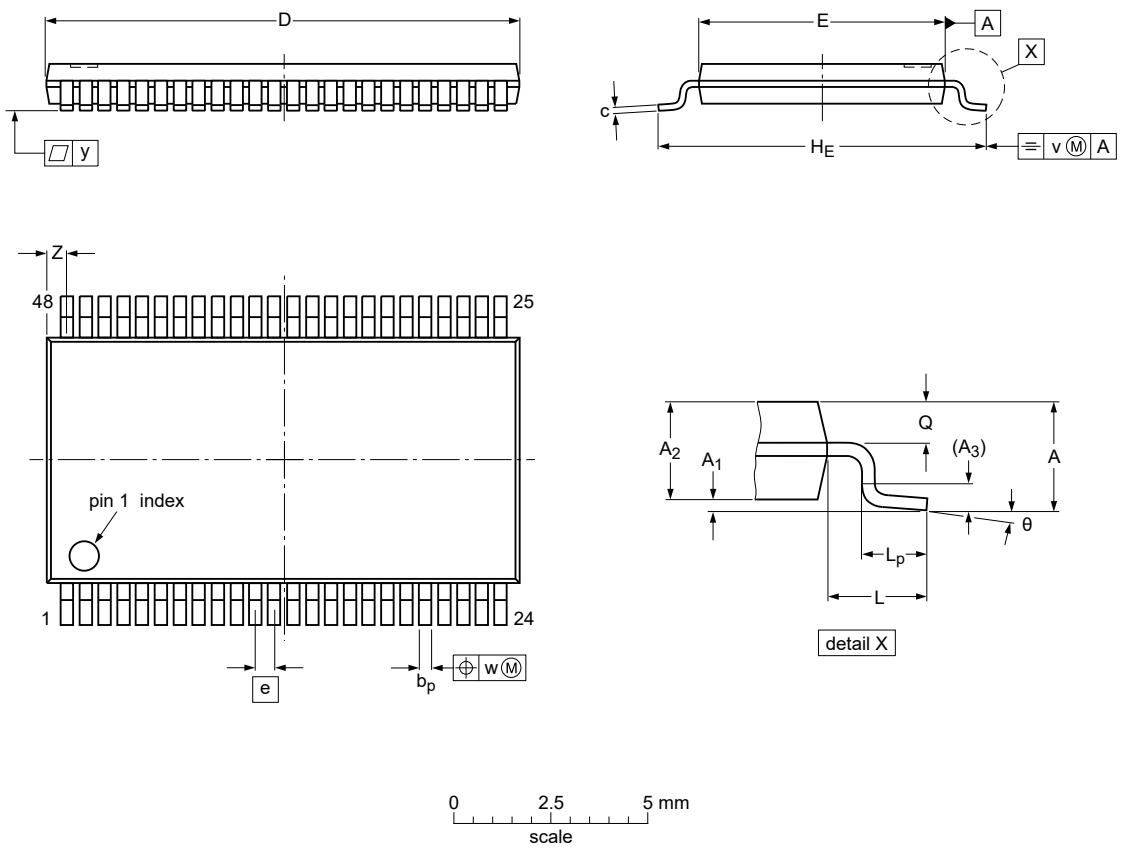
Fig. 6. Test circuit for measuring switching times

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	≤ 1 MHz	500 ns	≤ 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**



Dimensions (mm are the original dimensions)

Unit		A	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	max	1.2	0.15	1.05		0.28	0.2	12.6	6.2		8.3		0.8	0.50				0.8	8°
	nom				0.25					0.5		1			0.25	0.08	0.1		
	min		0.05	0.85		0.17	0.1	12.4	6.0		7.9		0.4	0.35				0.4	0°

Note
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.

sot362-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT362-1		MO-153				~~13-08-05~~ 24-01-05

Fig. 7. Package outline SOT362-1 (TSSOP48)

12. Abbreviations

Table 10. Abbreviations

Acronym	Description
ANSI	American National Standards Institute
BiCMOS	Bipolar Complementary Metal Oxide Semiconductor
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
ESDA	ElectroStatic Discharge Association
HBM	Human Body Model
JEDEC	Joint Electron Device Engineering Council

13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74ABT_ABTH162245A v.7	20240624	Product data sheet	-	74ABT_ABTH162245A v.6
Modifications:	• Section 2: ESD specification updated according to the latest JEDEC standard.			
74ABT_ABTH162245A v.6	20240222	Product data sheet	-	74ABT_ABTH162245A v.5
Modifications:	• Fig. 7: Updated package outline drawing SOT362-1 (TSSOP48).			
74ABT_ABTH162245A v.5	20210702	Product data sheet	-	74ABT_H162245A v.4
Modifications:	• Type number 74ABT162245ADL (SOT370-1 / SSOP48) removed. • Section 1 and Section 2 updated.			
74ABT_H162245A v.4	20190220	Product data sheet	-	74ABT_H162245A v.3
Modifications:	• Type number 74ABTH162245ADL (SOT370-1) removed.			
74ABT_H162245A v.3	20170831	Product data sheet	-	74ABT_H162245A v.2
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate.			
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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
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Date of release: 24 June 2024