

74AHCT245A

Octal bus transceiver; 3-state

Rev. 2 — 26 October 2016

Product data sheet

1. General description

The 74AHCT245A is an 8-bit transceiver with 3-state outputs. The device features an output enable (\overline{OE}) and send/receive (DIR) for direction control. A HIGH on \overline{OE} causes the outputs to assume a high-impedance OFF-state.

The 74AHCT245A is designed to operate over a V_{CC} range from 4.5 V to 5.5 V. The inputs are TTL compatible, which allows the device to be used to translate from 3.3 V to 5 V.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

This device is fully specified for partial Power-down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

2. Features and benefits

- Direct interface with TTL levels
- Supply voltage range from 4.5 V to 5.5 V
- Typical t_{pd} of 3.0 ns at 5 V
- Typical $V_{OL(p)} < 0.8$ V at $V_{CC} = 5$ V, $T_{amb} = 25$ °C
- Typical $V_{OH(v)} > 2.3$ V at $V_{CC} = 5$ V, $T_{amb} = 25$ °C
- Supports mixed-mode voltage operation on all ports
- I_{OFF} circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA per JESD 78 Class II
- ESD protection:
 - ◆ HBM ANSI/ESDA/JEDEC JS-001 Class 2 exceeds 3 kV
 - ◆ MM JESD22-A115-A exceeds 200 V
 - ◆ CDM JESD22-C101E exceeds 2 kV
- Specified from -40 °C to $+85$ °C and from -40 °C to $+125$ °C

3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74AHCT245APW	-40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1

4. Functional diagram

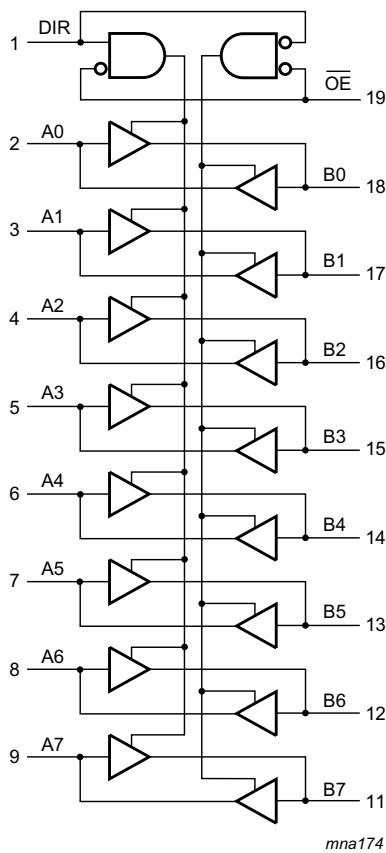


Fig 1. Logic symbol

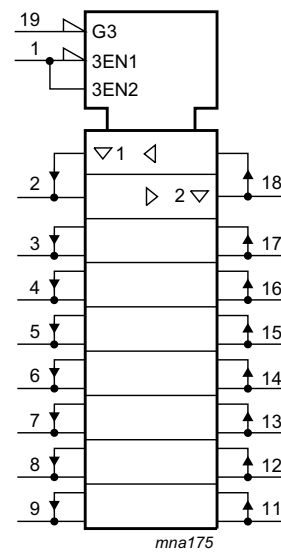
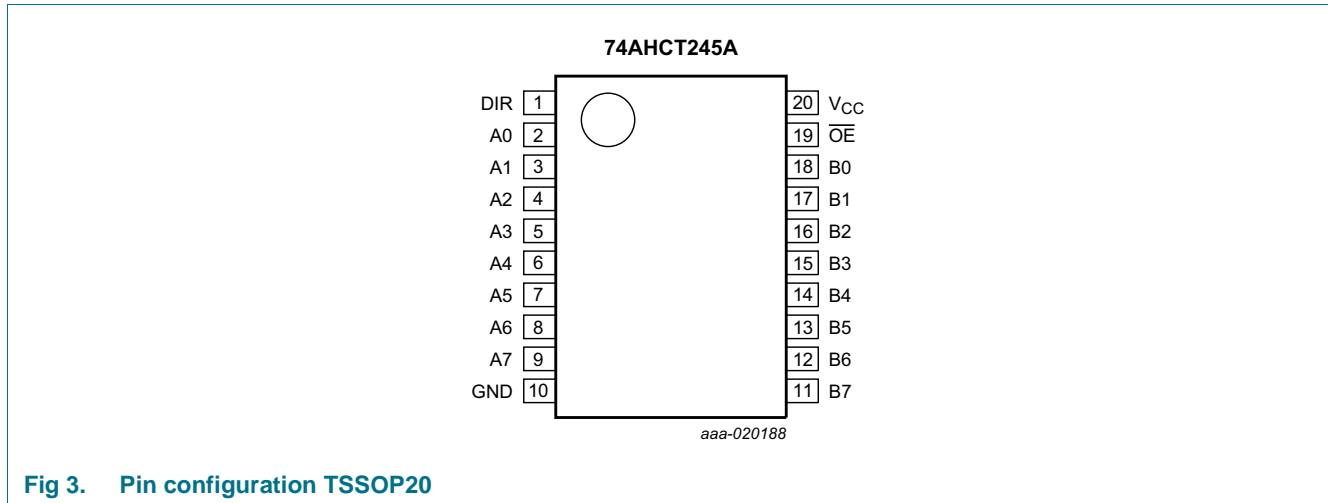


Fig 2. IEC logic symbol

5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
DIR	1	direction control
A0 to A7	2, 3, 4, 5, 6, 7, 8, 9	data input/output
GND	10	ground (0 V)
B0 to B7	18, 17, 16, 15, 14, 13, 12, 11	data input/output
$\overline{\text{OE}}$	19	output enable input (active LOW)
V _{CC}	20	supply voltage

6. Functional description

Table 3. Function table^[1]

Input		Input/output		
$\overline{\text{OE}}$	DIR	An	Bn	
L	L	A = B	input	
L	H	input	B = A	
H	X	Z	Z	

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

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.5	+7.0	V
V_{I}	input voltage		-0.5	+7.0	V
V_{O}	output voltage	active mode	-0.5	$V_{\text{CC}} + 0.5$	V
		power-down or 3-state mode	-0.5	+7.0	V
I_{IK}	input clamping current	$V_{\text{I}} < 0 \text{ V}$	-20	-	mA
I_{OK}	output clamping current	$V_{\text{O}} < 0 \text{ V}$	-20	-	mA
I_{O}	output current	$V_{\text{O}} = 0 \text{ V to } V_{\text{CC}}$	-	± 25	mA
I_{CC}	supply current		-	75	mA
I_{GND}	ground current		-75	-	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	$T_{\text{amb}} = -40 \text{ °C to } +125 \text{ °C}$	-	500	mW

[1] If the input current ratings are observed, the minimum input voltage ratings may be exceeded.

[2] If the output current ratings are observed, the output voltage ratings may be exceeded.

[3] This value is limited to 7.0 V maximum.

[4] For TSSOP20 package: above 100 °C, the value of P_{tot} derates linearly with 10 mW/K.

8. Recommended operating conditions

Table 5. Recommended operating conditions

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		4.5	5.5	V
V_I	input voltage		0	5.5	V
V_O	output voltage	active mode	0	V_{CC}	V
		power-down or 3-state mode	0	5.5	V
T_{amb}	ambient temperature		-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	-	20	ns/V

9. Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
V_{IH}	HIGH-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2	-	-	2	-	2	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	-	-	0.8	-	0.8	-	0.8	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
		$I_O = -50 \mu\text{A}$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_O = -8 \text{ mA}$	3.94	-	-	3.8	-	3.7	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
		$I_O = 50 \mu\text{A}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 8 \text{ mA}$	-	-	0.36	-	0.44	-	0.55	V
I_{OZ}	OFF-state output current	$V_{CC} = 5.5 \text{ V}; V_I = V_{IH} \text{ or } V_{IL}; V_O = \text{GND to } 5.5 \text{ V}$	-	-	± 0.25	-	± 2.5	-	± 2.5	μA
I_{OFF}	power-off leakage current	$V_I \text{ or } V_O = \text{GND to } 5.5 \text{ V}; V_{CC} = 0 \text{ V}$	-	-	0.5	-	5	-	5	μA
I_I	input leakage current	$V_I = V_{CC} \text{ or } \text{GND}; V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	-	-	± 0.1	-	± 1	-	± 1	μA
I_{CC}	supply current	$V_I = V_{CC} \text{ or } \text{GND}; I_O = 0 \text{ A}; V_{CC} = 5.5 \text{ V}$	-	-	2	-	20	-	20	μA
ΔI_{CC}	additional supply current	per input pin; $V_I = 3.4 \text{ V}; I_O = 0 \text{ A};$ other pins at V_{CC} or GND; $V_{CC} = 5.5 \text{ V}$	-	-	1.35	-	1.5	-	1.5	mA

10. Dynamic characteristics

Table 7. Dynamic characteristics
GND = 0 V. For test circuit, see Figure 6.

Symbol	Parameter	Conditions	25 °C			−40 °C to +85 °C		−40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	Min	Max	
t _{pd}	propagation delay	An to Bn or Bn to An; see Figure 4								
		V _{CC} = 4.5 V to 5.5 V								
		C _L = 15 pF	-	3.0	7.7	1	8.5	1	10	ns
		C _L = 50 pF	-	4.8	8.7	1	9.5	1	11	ns
t _{en}	enable time	OE to An or OE to Bn; see Figure 5								
		V _{CC} = 4.5 V to 5.5 V								
		C _L = 15 pF	-	4.5	13.8	1	15	1	17	ns
		C _L = 50 pF	-	6.3	14.8	1	16	1	17.5	ns
t _{dis}	disable time	OE to An or OE to Bn; see Figure 5								
		V _{CC} = 4.5 V to 5.5 V								
		C _L = 15 pF	-	3.4	10.2	1	11.1	1	12.2	ns
		C _L = 50 pF	-	5.7	15.4	1	16.5	1	18	ns
t _{sk(o)}	output skew time	V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF	-	-	1	-	1	-	1	ns
C _I	input capacitance	V _I = V _{CC} or GND; V _{CC} = 5 V	-	2	6	-	6	-	6	pF
C _{I/O}	input/output capacitance	V _O = V _{CC} or GND; V _{CC} = 5 V	-	5.5	-	-	-	-	-	pF
C _{PD}	power dissipation capacitance	per buffer; [3] C _L = 0 pF; f = 10 MHz; V _I = GND to V _{CC}	-	9	-	-	-	-	-	pF

[1] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 5 V.

[2] t_{pd} is the same as t_{PLH} and t_{PHL}.
 t_{en} is the same as t_{PZL} and t_{PZH}.
 t_{dis} is the same as t_{PLZ} and t_{PHZ}.

[3] C_{PD} is used to determine the dynamic power dissipation P_D (μW).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

f_i = input frequency in MHz;

f_o = output frequency in MHz;

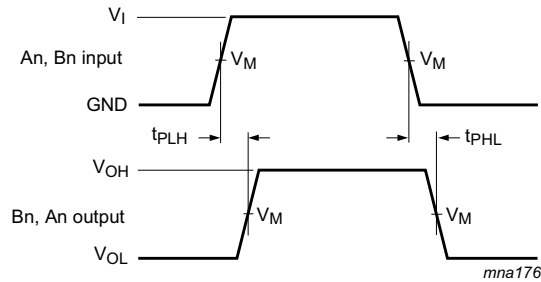
C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volts.

Table 8. Noise characteristics
 GND = 0 V. For test circuit, see [Figure 6](#).

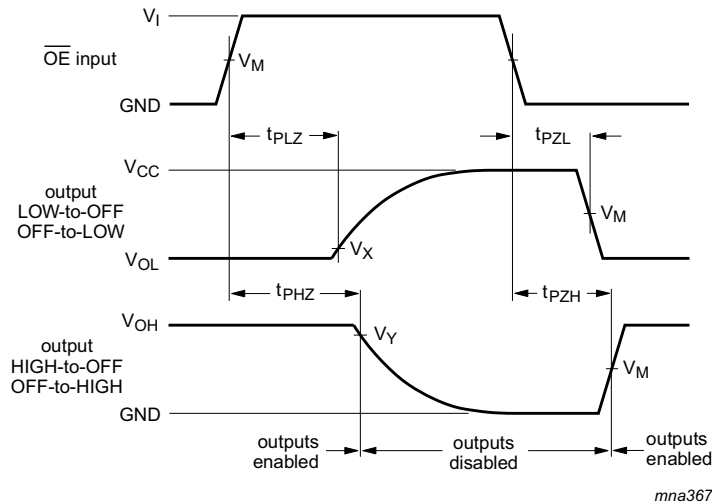
Symbol	Parameter	Conditions	T _{amb} = 25 °C			Unit
			Min	Typ	Max	
V_{CC} = 5 V; C_L = 50 pF						
V _{OL(p)}	LOW-level output voltage (peak)		-	0.5	1.5	V
V _{OL(v)}	LOW-level output voltage (valley)		-1.5	-0.3	-	V
V _{OH(v)}	HIGH-level output voltage (valley)		-	4.5	-	V
V _{IH(AC)}	AC HIGH-level input voltage	dynamic	2	-	-	V
V _{IL(AC)}	AC LOW-level input voltage	dynamic	-	-	0.8	V

11. Waveforms



Measurement points are given in [Table 9](#).
 VOL and VOH are typical voltage output levels that occur with the output load.

Fig 4. Propagation delay input (An, Bn) to output (Bn, An)

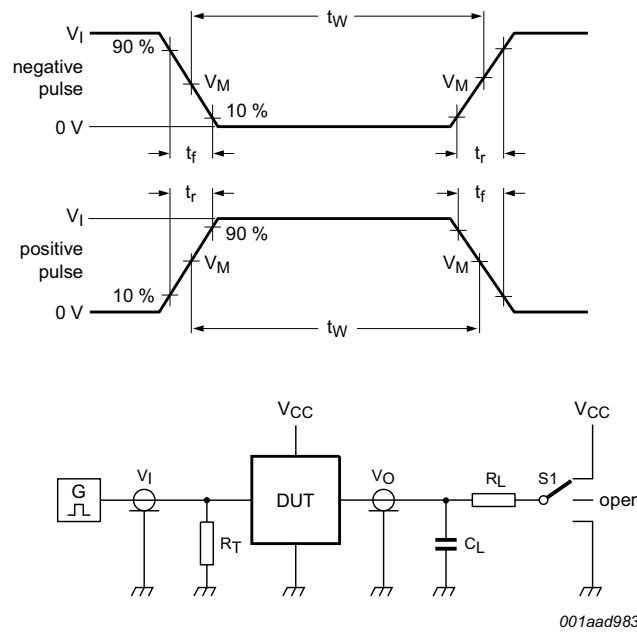


Measurement points are given in [Table 9](#).
 VOL and VOH are typical voltage output levels that occur with the output load.

Fig 5. Enable and disable times

Table 9. Measurement points

Input	Output		
V_M	V_M	V_X	V_Y
1.5 V	$0.5V_{CC}$	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$



Test data is given in [Table 10](#).

Definitions test circuit:

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

C_L = Load capacitance including jig and probe capacitance

R_L = Load resistor

S1 = Test selection switch

Fig 6. Test circuit for measuring switching times

Table 10. Test data

Input		Load		S1 position		
V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
GND to 3.0 V	3.0 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}

12. Package outline

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1

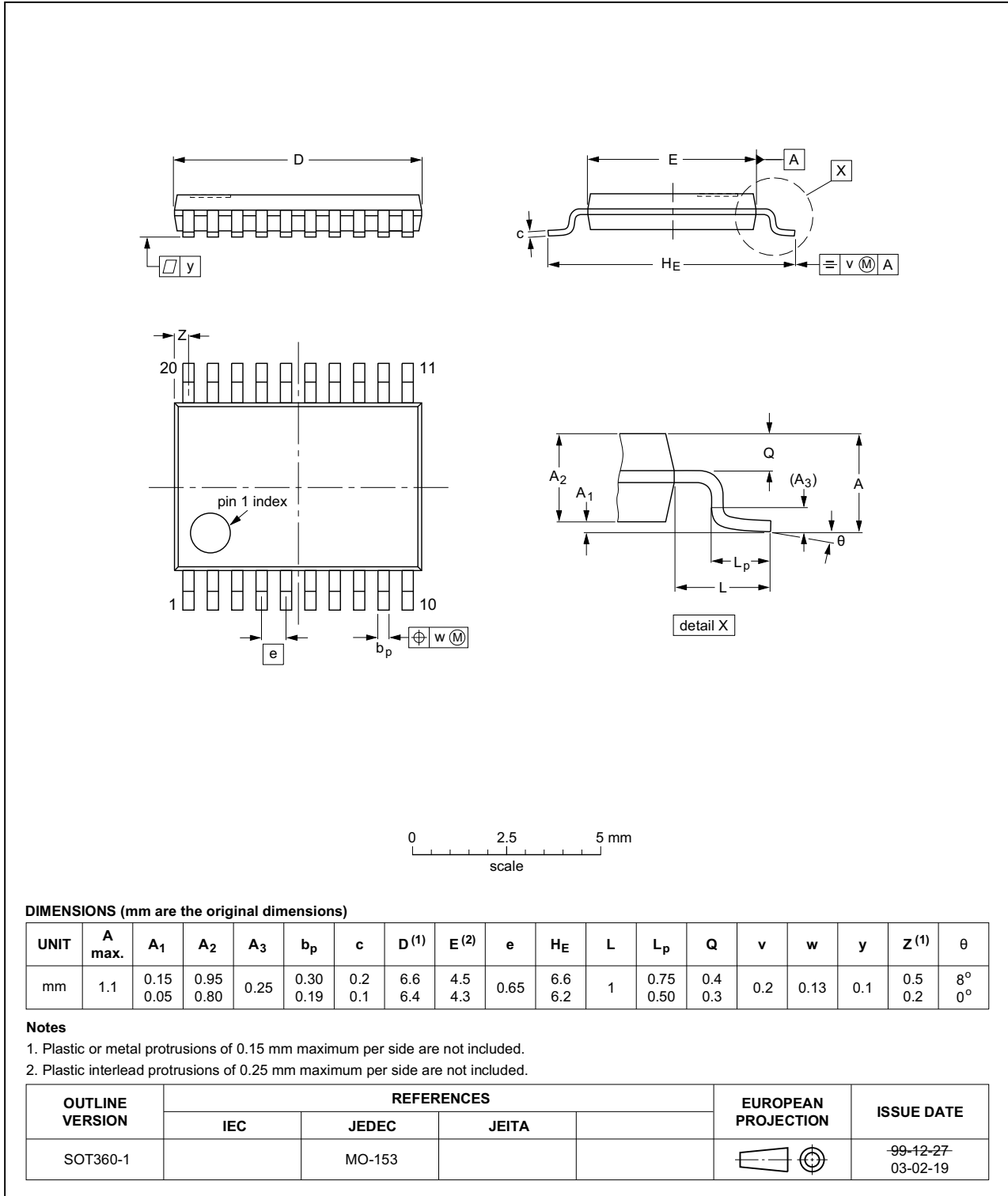


Fig 7. Package outline SOT360-1 (TSSOP20)

13. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charge Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHCT245A v.2	20161026	Product data sheet	-	74AHCT245A v.1
Modifications:	• Type number 74AHCT245ABQ removed.			
74AHCT245A v.1	20160602	Product data sheet	-	-

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Document status ^{[1][2]}	Product status ^[3]	Definition
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