Dual buffer/line driver; 3-state Rev. 5 — 1 September 2023

Product data sheet

1. General description

The 74AHC2G241; 74AHCT2G241 is a dual buffer/line driver with 3-state outputs. The device can be used as two 1-bit buffers or one 2-bit buffer. The device features two output enables ($1\overline{OE}$ and 2OE), each controlling one of the 3-state outputs. A HIGH on $n\overline{OE}$ or LOW on nOE causes the associated output to assume a high-impedance OFF-state. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

2. Features and benefits

- Wide supply voltage range from 2.0 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- Input levels:
 - For 74AHC2G241: CMOS level
 - For 74AHCT2G241: TTL level
- CMOS low power dissipation
- Symmetrical output impedance
- High noise immunity
- Balanced propagation delays
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- 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 and from -40 °C to +125 °C

3. Ordering information

Type number				
	Temperature range	Name	Description	Version
74AHC2G241DP	-40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	<u>SOT505-2</u>
74AHC2G241DC 74AHCT2G241DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	<u>SOT765-1</u>

4. Marking

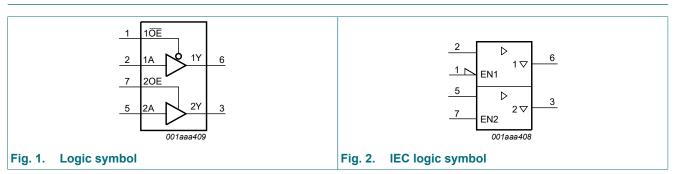
Table 2. Marking							
Type number	Marking code[1]						
74AHC2G241DP	A241						
74AHC2G241DC	A41						
74AHCT2G241DC	C41						

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

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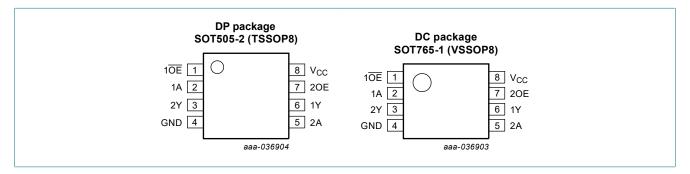
Dual buffer/line driver; 3-state

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
10E	1	output enable input (active LOW)
1A	2	data input
2Y	3	data output
GND	4	ground (0 V)
2A	5	data input
1Y	6	data output
20E	7	output enable input (active HIGH)
V _{CC}	8	supply voltage

7. Functional description

Table 4. Function table

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

Input	Output		Input	Output	
1 0E	1A	1Y	20E	2A	2Y
L	L	L	Н	L	L
L	Н	Н	Н	Н	Н
Н	Х	Z	L	Х	Z

8. Limiting values

Table 5. 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
VI	input voltage		-0.5	+7.0	V
I _{IK}	input clamping current	V ₁ < -0.5 V [1]	-20	-	mA
I _{OK}	output clamping current	$V_{\rm O} < -0.5 \text{ V or } V_{\rm O} > V_{\rm CC} + 0.5 \text{ V}$ [1]	-	±20	mA
lo	output current	$-0.5 V < V_O < V_{CC} + 0.5 V$	-	±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	$T_{amb} = -40 \text{ °C to } +125 \text{ °C}$ [2]	-	250	mW

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

[2] For SOT505-2 (TSSOP8) package: P_{tot} derates linearly with 4.6 mW/K above 96 °C.

For SOT765-1 (VSSOP8) package: Ptot derates linearly with 4.9 mW/K above 99 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions 74AHC2G241		41	74,	Unit			
			Min	Тур	Max	Min	Тур	Max	
V _{CC}	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
VI	input voltage		0	-	5.5	0	-	5.5	V
Vo	output voltage		0	-	V _{CC}	0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and	V _{CC} = 3.3 V ± 0.3 V	-	-	100	-	-	-	ns/V
	fall rate	V _{CC} = 5.0 V ± 0.5 V	-	-	20	-	-	20	ns/V

10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions		25 °C		-40 °C	to +85 °C	-40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	1
74AHC2	G241	1								
V _{IH}	HIGH-level	V _{CC} = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
	input voltage	V _{CC} = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
		V _{CC} = 5.5 V	3.85	-	-	3.85	-	3.85	-	V
V _{IL}	LOW-level	V _{CC} = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
	input voltage	V _{CC} = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V _{CC} = 5.5 V	-	-	1.65	-	1.65	-	1.65	V
V _{OH}	HIGH-level	V _I = V _{IH} or V _{IL}								
	output voltage	I _O = -50 μA; V _{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I _O = -50 μA; V _{CC} = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	V
		I _O = -50 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -4.0 mA; V _{CC} = 3.0 V	2.58	-	-	2.48	-	2.40	-	V
		I _O = -8.0 mA; V _{CC} = 4.5 V	3.94	-	-	3.8	-	3.70	-	V
V _{OL}	LOW-level	V _I = V _{IH} or V _{IL}								
	output voltage	I _O = 50 μA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 50 μA; V _{CC} = 3.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 50 μA; V _{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 4.0 mA; V _{CC} = 3.0 V	-	-	0.36	-	0.44	-	0.55	V
		I _O = 8.0 mA; V _{CC} = 4.5 V	-	-	0.36	-	0.44	-	0.55	V
I _{OZ}	OFF-state output current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 V$	-	-	0.25	-	2.5	-	10	μA
I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μA
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	1.0	-	10	-	40	μA
CI	input capacitance		-	1.5	10	-	10	-	10	pF

Dual buffer/line driver; 3-state

Symbol	Parameter	Conditions		25 °C		-40 °C	to +85 °C	-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
74AHCT	2G241	-					L	1		
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	0.8	V
V _{OH}	HIGH-level	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
	output voltage	l _O = -50 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -8.0 mA	3.94	-	-	3.8	-	3.70	-	V
V _{OL}	LOW-level	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
	output voltage	I _O = 50 μA	-	0	0.1	-	0.1	-	0.1	V
		I _O = 8.0 mA	-	-	0.36	-	0.44	-	0.55	V
I _{OZ}	OFF-state output current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 V$	-	-	0.25	-	2.5	-	10	μA
lı	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μA
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	1.0	-	10	-	40	μA
ΔI _{CC}	additional supply current	per input pin; V _I = 3.4 V; other inputs at V _{CC} or GND; $I_O = 0 A$; V _{CC} = 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
Cı	input capacitance		-	1.5	10	-	10	-	10	pF

74AHC_AHCT2G241

11. Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V; for test circuit see Fig. 6.

Symbol	Parameter	Conditions			25 °C		-40 °C	to +85 °C	-40 °C to +125 °C		Unit
				Min	Тур	Max	Min	Max	Min	Max	
74AHC2	G241							1			1
t _{pd}	propagation	nA to nY; see Fig. 3	[1]								
	delay	V _{CC} = 3.0 V to 3.6 V	[2]								
		C _L = 15 pF		-	4.7	8.0	1.0	9.5	1.0	11.5	ns
		C _L = 50 pF		-	6.6	11.5	1.0	13.0	1.0	14.5	ns
		V_{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	3.4	5.5	1.0	6.5	1.0	7.0	ns
		C _L = 50 pF		-	4.7	7.5	1.0	8.5	1.0	9.5	ns
t _{en}	enable time	10E to 1Y; see Fig. 4	[1]								
		V _{CC} = 3.0 V to 3.6 V	[2]								
		C _L = 15 pF		-	5.0	8.0	1.0	9.5	1.0	11.5	ns
		C _L = 50 pF		-	6.9	11.5	1.0	13.0	1.0	14.5	ns
		V _{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	3.6	5.1	1.0	6.0	1.0	6.5	ns
		C _L = 50 pF		-	4.9	7.5	1.0	8.5	1.0	9.5	ns
		20E to 2Y; see Fig. 5	[1]								
		V _{CC} = 3.0 V to 3.6 V	[2]								
		C _L = 15 pF		-	4.9	8.0	1.0	9.5	1.0	10.0	ns
		C _L = 50 pF		-	7.0	11.5	1.0	13.0	1.0	14.5	ns
		V_{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	3.6	5.6	1.0	6.3	1.0	7.0	ns
		C _L = 50 pF		-	5.4	8.0	1.0	9.0	1.0	9.5	ns
dis	disable time	10E to 1Y; see Fig. 4	[1]								
		V _{CC} = 3.0 V to 3.6 V	[2]								
		C _L = 15 pF		-	6.0	9.7	1.0	11.5	1.0	12.5	ns
		C _L = 50 pF		-	8.3	13.2	1.0	15.0	1.0	16.5	ns
		V_{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	4.1	6.8	1.0	8.0	1.0	8.5	ns
		C _L = 50 pF		-	5.7	8.8	1.0	10.0	1.0	11.0	ns
		20E to 2Y; see Fig. 5	[1]								
		V _{CC} = 3.0 V to 3.6 V	[2]								
		C _L = 15 pF		-	6.3	9.7	1.0	11.5	1.0	12.5	ns
		C _L = 50 pF		-	9.0	13.2	1.0	15.0	1.0	16.5	ns
		V_{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	4.3	6.8	1.0	8.0	1.0	8.5	ns
		C _L = 50 pF		-	6.1	8.8	1.0	10.0	1.0	11.0	ns
C _{PD}	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}; f_i = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC}$	[4]	-	10	-	-	-	-	-	pF

Dual buffer/line driver; 3-state

Symbol	Parameter	Conditions			25 °C		-40 °C	to +85 °C	-40 °C to +125 °C		Unit
				Min	Тур	Max	Min	Мах	Min	Max	-
74AHCT	2G241								1	1	1
t _{pd}	propagation	nA to nY; see Fig. 3	[1]								
	delay	V_{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	3.4	5.5	1.0	6.5	1.0	7.0	ns
		C _L = 50 pF		-	4.7	7.5	1.0	8.5	1.0	9.5	ns
t _{en}	enable time	1OE to 1Y; see Fig. 4	[1]								
		V_{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	3.9	5.1	1.0	6.0	1.0	6.5	ns
		C _L = 50 pF		-	5.1	7.5	1.0	8.5	1.0	9.5	ns
		20E to 2Y; see Fig. 5	[1]								
		V_{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	3.4	5.6	1.0	6.3	1.0	6.5	ns
		C _L = 50 pF		-	4.8	7.5	1.0	9.0	1.0	9.5	ns
t _{dis}	disable time	1OE to 1Y; see Fig. 4	[1]								
		V_{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	4.5	6.8	1.0	8.0	1.0	8.5	ns
		C _L = 50 pF		-	6.1	8.8	1.0	10.0	1.0	11.0	ns
		20E to 2Y; see Fig. 5	[1]								
		V_{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	4.0	6.8	1.0	8.0	1.0	8.5	ns
		C _L = 50 pF		-	5.7	8.8	1.0	10.0	1.0	11.0	ns
C _{PD}	power dissipation capacitance	per buffer; C _L = 50 pF; f _i = 1 MHz; V _I = GND to V _{CC}	[4]	-	10	-	-	-	-	-	pF

[1] t_{pd} is the same as t_{PLH} and t_{PHL} .

 t_{en} is the same as t_{PZL} and $t_{\text{PZH}}.$

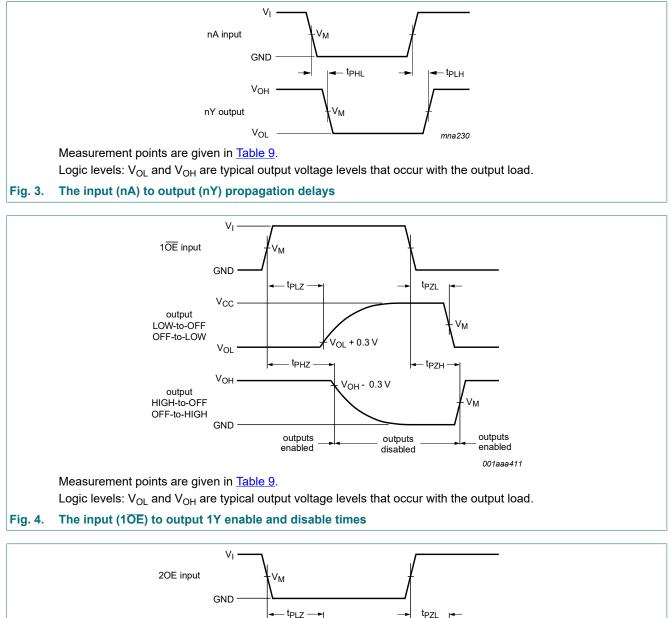
- t_{dis} is the same as t_{PLZ} and t_{PHZ} . Typical values are measured at V_{CC} = 3.3 V. [2]
- [2] Typical values are measured at $V_{CC} = 3.5$ V. [3] Typical values are measured at $V_{CC} = 5.0$ V. [4] C_{PD} is used to determine the dynamic power dissipation $P_D (\mu W)$. $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ where: f_i = input frequency in MHz; fo = output frequency in MHz;

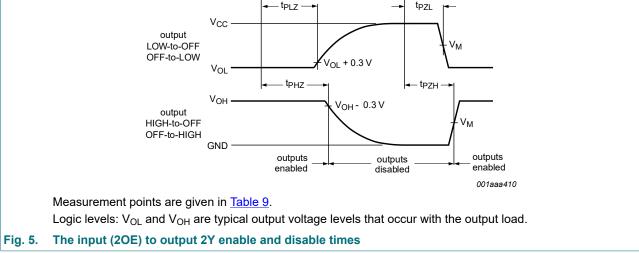
 C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volts.

Dual buffer/line driver; 3-state







74AHC_AHCT2G241

Dual buffer/line driver; 3-state

Table	9.	Measurement points
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Туре	Input	Output	
	V _M	V _M	
74AHC2G241	0.5V _{CC}	0.5V _{CC}	
74AHCT2G241	1.5 V	0.5V _{CC}	

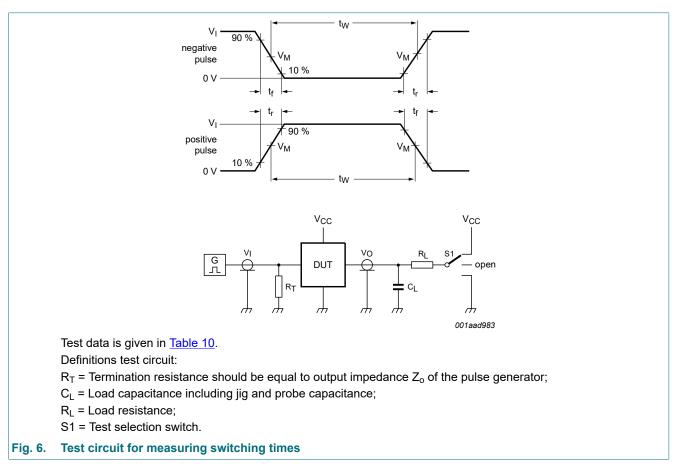


Table 10. Test data

Туре	Input		Load		S1 position		
	VI	t _r , t _f	CL	RL	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}
74AHC2G241	V _{CC}	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}
74AHCT2G241	3 V	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}

Dual buffer/line driver; 3-state

12. Package outline

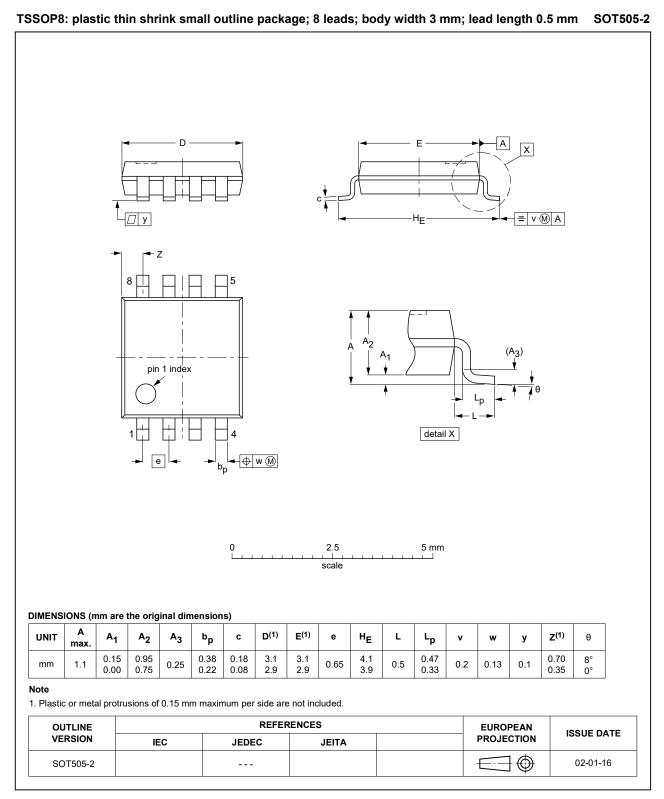
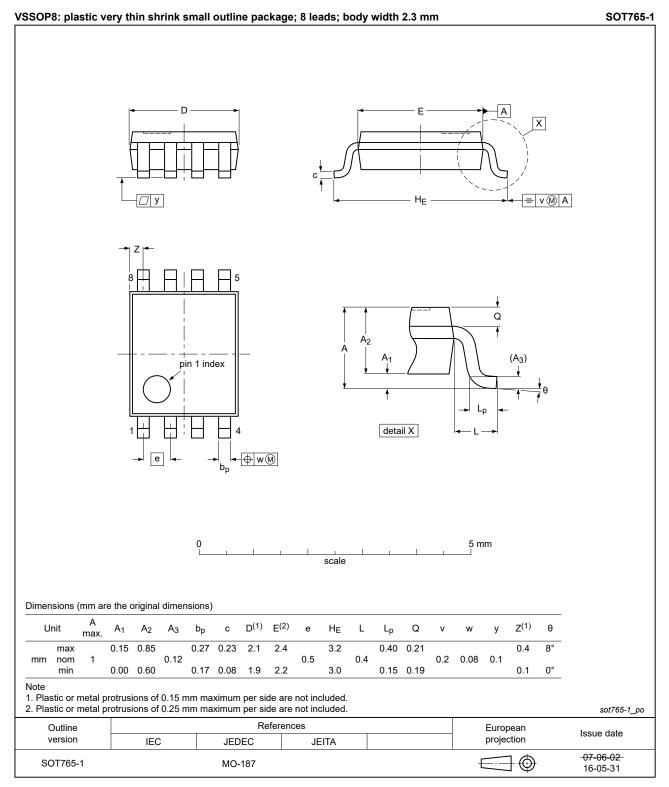


Fig. 7. Package outline SOT505-2 (TSSOP8)

74AHC_AHCT2G241

Dual buffer/line driver; 3-state





13. Abbreviations

Table 11. Abbreviations			
Acronym	Description		
CDM	Charged Device Model		
CMOS	Complementary Metal-Oxide Semiconductor		
DUT	Device Under Test		
ESD	ElectroStatic Discharge		
НВМ	Human Body Model		
TTL	Transistor-Transistor Logic		

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74AHC_AHCT2G241 v.5	20230901	Product data sheet	-	74AHC_AHCT2G241 v.4		
Modifications:	 <u>Section 1</u> and <u>Section 2</u> updated. <u>Section 2</u>: ESD specification updated according to the latest JEDEC standard. <u>Section 8</u>: Derating values for P_{tot} total power dissipation updated. 					
74AHC_AHCT2G241 v.4	20190116	Product data sheet	-	74AHC_AHCT2G241 v.3		
Modifications:	guidelines o • Legal texts l	 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. Type numbers 74AHCT2G241DP, 74AHC2G241GD and 74AHCT2G241GD removed. 				
74AHC_AHCT2G241 v.3	20130513	Product data sheet	-	74AHC_AHCT2G241 v.2		
Modifications:	• For type number 74AHC2G241GD and 74AHCT2G241GD XSON8U has changed to XSON8.					
74AHC_AHCT2G241 v.2	20090113	Product data sheet	-	74AHC_AHCT2G241 v.1		
Modifications:	 The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. Legal texts have been adapted to the new company name where appropriate. Added type number 74AHC2G241GD and 74AHCT2G241GD (XSON8U package). 					
74AHC_AHCT2G241 v.1	20040310	Product data	-	-		

15. 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.

 Please consult the most recently issued document before initiating or completing a design.

- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <u>https://www.nexperia.com</u>.

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Product data sheet

Rev. 5 — 1 September 2023

Contents

1. General description	1
2. Features and benefits	1
3. Ordering information	1
4. Marking	1
5. Functional diagram	2
6. Pinning information	2
6.1. Pinning	2
6.2. Pin description	2
7. Functional description	3
8. Limiting values	3
9. Recommended operating conditions	3
10. Static characteristics	4
11. Dynamic characteristics	6
11.1. Waveforms and test circuit	8
12. Package outline	10
13. Abbreviations	12
14. Revision history	12
15. Legal information	13

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