74AHC2G241-Q100; 74AHCT2G241-Q100

Dual buffer/line driver; 3-state

Rev. 1 — 12 November 2013

Product data sheet

1. General description

The 74AHC2G241-Q100 and 74AHCT2G241-Q100 are high-speed Si-gate CMOS devices. They provide a dual non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs 1OE and 2OE. A HIGH level at pin 1OE causes output 1Y to assume a high-impedance OFF-state. A LOW level at pin 2OE causes output 2Y to assume a high-impedance OFF-state. Schmitt-trigger action at all inputs makes the circuit highly tolerant for slower input rise and fall times.

The AHC device has CMOS input switching levels and supply voltage range 2 V to 5.5 V.

The AHCT device has TTL input switching levels and supply voltage range 4.5 V to 5.5 V.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - ◆ Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- Multiple package options
- ESD protection:
 - MIL-STD-883, method 3015 exceeds 2000 V
 - HBM JESD22-A114F exceeds 2000 V
 - lacktriangle MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)



3. Ordering information

Table 1. Ordering information

Type number	Package										
	Temperature range	Name	Description	Version							
74AHC2G241DP-Q100	–40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package;	SOT505-2							
74AHCT2G241DP-Q100			8 leads; body width 3 mm; lead length 0.5 mm								
74AHC2G241DC-Q100	–40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package;	SOT765-1							
74AHCT2G241DC-Q100			8 leads; body width 2.3 mm								

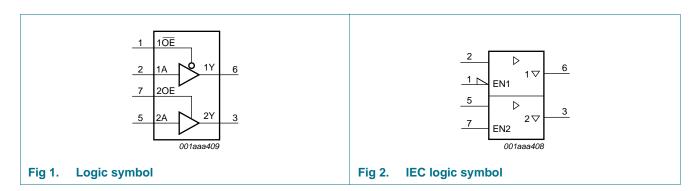
4. Marking

Table 2. Marking

Type number	Marking code ^[1]
74AHC2G241DP-Q100	A241
74AHCT2G241DP-Q100	C241
74AHC2G241DC-Q100	A41
74AHCT2G241DC-Q100	C41

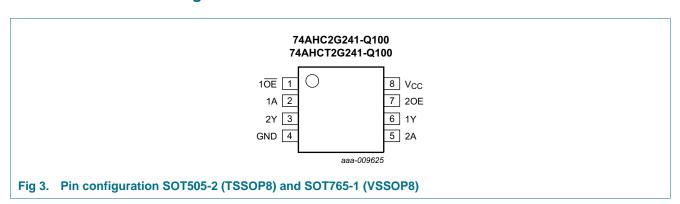
^[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
1 OE	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 [1]

Input		Output	Input		Output
1OE	1A	1Y	20E	2A	2Y
L	L	L	Н	L	L
L	Н	Н	Н	Н	Н
Н	X	Z	L	X	Z

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

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	$V_1 < -0.5 V$	<u>[1]</u> –20	-	mA
I _{OK}	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$	<u>[1]</u> _	±20	mA
Io	output current	$-0.5 \text{ V} < \text{V}_{\text{O}} < \text{V}_{\text{CC}} + 0.5 \text{ V}$	-	±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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	[2] _	250	mW

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

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter Conditions		74AH	C2G241	-Q100	74AH	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
$\Delta t/\Delta V$	input transition rise	V_{CC} = 3.3 V \pm 0.3 V	-	-	100	-	-	-	ns/V
	and fall rate	V_{CC} = 5.0 V \pm 0.5 V	-	-	20	-	-	20	ns/V

^[2] For TSSOP8 package: above 55 °C the value of P_{tot} derates linearly with 2.5 mW/K. For VSSOP8 package: above 110 °C the value of P_{tot} derates linearly with 8 mW/K.

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 1	to +125 °C	Uni
			Min	Тур	Max	Min	Max	Min	Max	
74AHC2	G241-Q100									
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	$I_O = -50 \mu A$; $V_{CC} = 2.0 \text{ V}$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_O = -50 \mu A$; $V_{CC} = 3.0 \text{ V}$	2.9	3.0	-	2.9	-	2.9	-	V
		$I_{O} = -50 \mu A; V_{CC} = 4.5 V$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_{O} = -4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.58	-	-	2.48	-	2.40	-	V
		$I_{O} = -8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.94	-	-	3.8	-	3.70	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL}								
	output voltage	$I_O = 50 \mu A$; $V_{CC} = 2.0 \text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A; V_{CC} = 3.0 \text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A; V_{CC} = 4.5 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
		$I_O = 8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
l _{OZ}	OFF-state output current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	0.25	-	2.5	-	10	μΑ
l _l	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	10	-	40	μΑ
Cı	input capacitance		-	1.5	10	-	10	-	10	pF
74AHCT	2G241-Q100									
V _{IH}	HIGH-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2.0	-	-	2.0	-	2.0	-	V
V _{IL}	LOW-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	-	-	8.0	-	0.8	-	0.8	V
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	I _O = -50 μA	4.4	4.5	-	4.4	-	4.4	-	V
		$I_{O} = -8.0 \text{ mA}$	3.94	-	-	3.8	-	3.70	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
01	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

74AHC_AHCT2G241_Q100

 Table 7.
 Static characteristics ... continued

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

Symbol	Parameter	Conditions		25 °C		–40 °C t	o +85 °C	-40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
I_{OZ}	OFF-state output current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	0.25	-	2.5	-	10	μΑ
I _I	input leakage current	$V_I = 5.5 \text{ V or GND};$ $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	-	-	0.1	-	1.0	-	2.0	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	10	-	40	μΑ
ΔI_{CC}	additional supply current	per input pin; $V_I = 3.4 \text{ V}$; other inputs at V_{CC} or GND; $I_O = 0 \text{ A}$; $V_{CC} = 5.5 \text{ V}$	-	-	1.35	-	1.5	-	1.5	mA
Cı	input capacitance		-	1.5	10	-	10	-	10	pF

11. Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V; for test circuit see Figure 7.

Symbol	Parameter	Conditions			25 °C		-40 °C	to +85 °C	-40 °C t	o +125 °C	Unit
				Min	Тур	Max	Min	Max	Min	Max	
74AHC2	G241-Q100										
t _{pd}	propagation	nA to nY; see Figure 4	[1]								
	delay	$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	[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
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[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 Figure 5	[1]								
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	[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
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[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
		2OE to 2Y; see Figure 6	<u>[1]</u>								
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	[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
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[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

 Table 8.
 Dynamic characteristics ...continued

GND = 0 V; for test circuit see Figure 7.

Symbol	Parameter	Conditions			25 °C		-40 °C t	o +85 °C	-40 °C t	o +125 °C	Unit
				Min	Тур	Max	Min	Max	Min	Max	
t _{dis}	disable time	1OE to 1Y; see Figure 5	<u>[1]</u>							1	
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	[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
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]								
		$C_{L} = 15 \text{ pF}$		-	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
		2OE to 2Y; see Figure 6	<u>[1]</u>								
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	[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
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[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; $C_L = 50 \text{ pF}$; $f_i = 1 \text{ MHz}$; $V_I = \text{GND to } V_{CC}$	<u>[4]</u>	-	10	-	-	-	-	-	pF
74AHCT	2G241-Q100										
t _{pd}	propagation	nA to nY; see Figure 4	<u>[1]</u>								
	delay	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[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 Figure 5	[1]								
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[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
		2OE to 2Y; see Figure 6	[1]								
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[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

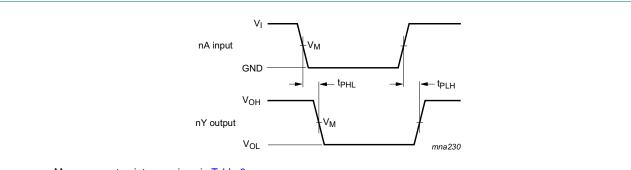
 Table 8.
 Dynamic characteristics ...continued

GND = 0 V; for test circuit see <u>Figure 7</u>.

Symbol	Parameter	Conditions			25 °C		-40 °C 1	to +85 °C	-40 °C t	o +125 °C	Unit
				Min	Тур	Max	Min	Max	Min	Max	
t _{dis}	disable time	1OE to 1Y; see Figure 5	<u>[1]</u>					•			
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[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
		2OE to 2Y; see Figure 6	<u>[1]</u>								
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[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; $C_L = 50 \text{ pF}$; $f_i = 1 \text{ MHz}$; $V_I = \text{GND to } V_{CC}$	<u>[4]</u>	-	10	-	-	-	-	-	pF

- [1] 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} .
- [2] Typical values are measured at $V_{CC} = 3.3 \text{ V}$.
- [3] Typical values are measured at $V_{CC} = 5.0 \text{ V}$.
- [4] C_{PD} is used to determine the dynamic power dissipation P_D (μW).
 - $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ where:
 - f_i = input frequency in MHz;
 - fo = output frequency in MHz;
 - C_L = output load capacitance in pF;
 - V_{CC} = supply voltage in V.

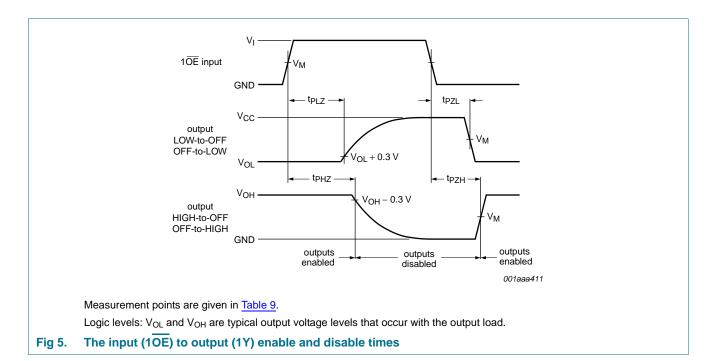
12. Waveforms and test circuit



Measurement points are given in <u>Table 9</u>.

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

Fig 4. The input (nA) to output (nY) propagation delays



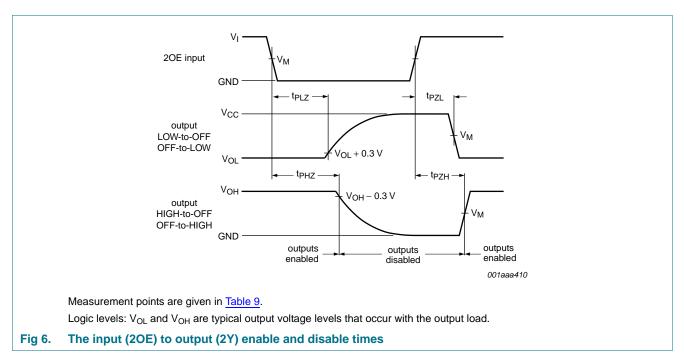
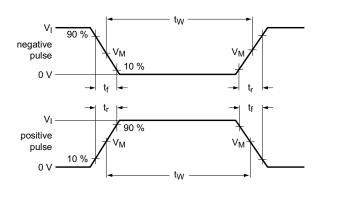
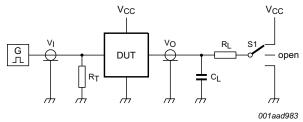


Table 9. Measurement points

Туре	Input	Output
	V _M	V _M
74AHC2G241-Q100	0.5V _{CC}	0.5V _{CC}
74AHCT2G241-Q100	1.5 V	0.5V _{CC}





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 resistance.

S1 = Test selection switch.

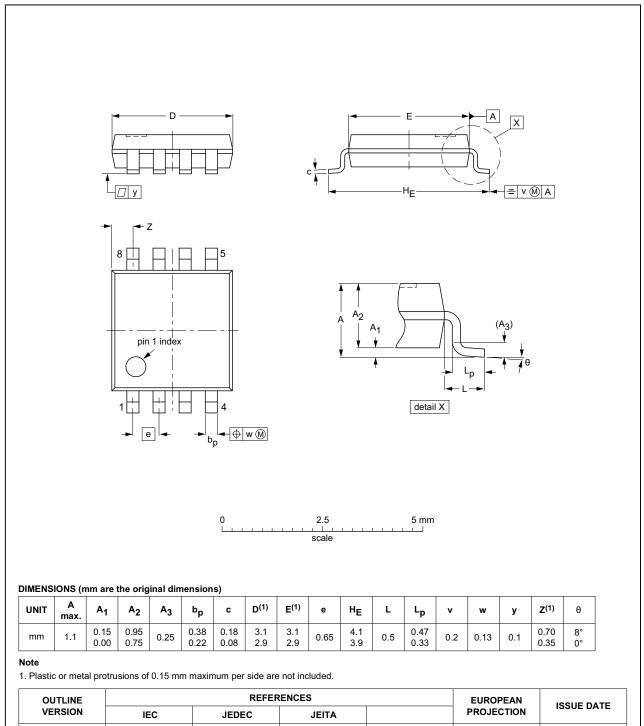
Fig 7. Test circuit for measuring switching times

Table 10. Test data

Туре	Input		Load		S1 position				
	VI	t _r , t _f	C _L	R_L	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}		
74AHC2G241-Q100	V_{CC}	\leq 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}		
74AHCT2G241-Q100	3 V	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}		

13. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2



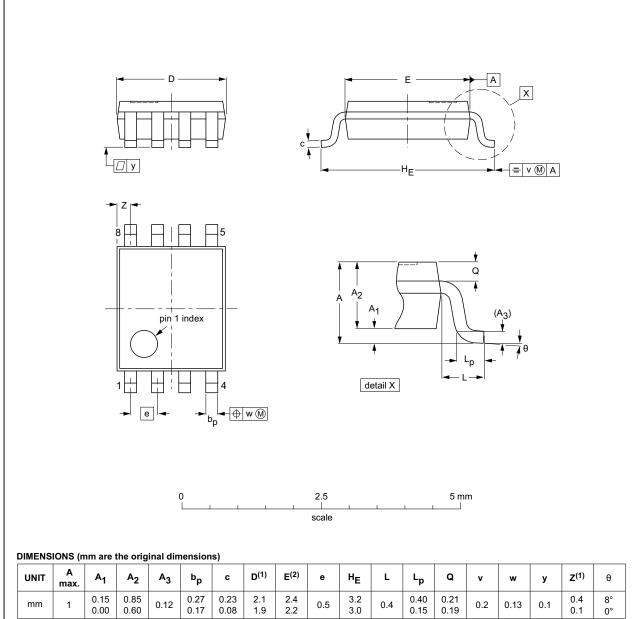
OUTLINE		REFER	EUROPEAN	ISSUE DATE			
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE	
SOT505-2						02-01-16	

Package outline SOT505-2 (TSSOP8)

74AHC_AHCT2G241_Q100

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1



UNIT	. A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E ⁽²⁾	е	HE	L	Lp	Q	v	w	у	Z ⁽¹⁾	θ
mm	1	0.15 0.00	0.85 0.60	0.12	0.27 0.17	0.23 0.08	2.1 1.9	2.4 2.2	0.5	3.2 3.0	0.4	0.40 0.15	0.21 0.19	0.2	0.13	0.1	0.4 0.1	8°

- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT765-1		MO-187				02-06-07

Fig 9. Package outline SOT765-1 (VSSOP8)

74AHC_AHCT2G241_Q100

14. Abbreviations

Table 11. Abbreviations

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

15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT2G241_Q100 v.1	20131112	Product data sheet	-	-

16. Legal information

16.1 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.
- [2] The term 'short data sheet' is explained in section "Definitions"
- 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 URL https://www.nxp.com.

16.2 Definitions

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For more information, please visit: http://www.nxp.com

For sales office addresses, please send an email to: salesaddresses@nxp.com

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