## 74AHC126-Q100; 74AHCT126-Q100

Quad buffer/line driver; 3-state

Rev. 1 — 10 July 2012

**Product data sheet** 

### 1. General description

The 74AHC126-Q100; 74AHCT126-Q100 is a high-speed Si-gate CMOS device and is pin compatible with Low-power Schottky TTL (LSTTL). It is specified in compliance with JEDEC standard No. 7A.

The 74AHC126-Q100; 74AHCT126-Q100 provides four non-inverting buffer/line drivers with 3-state outputs. The 3-state outputs (nY) are controlled by the output enable input (nOE). A LOW-level at pin nOE causes the outputs to assume a high-impedance OFF-state.

The 74AHC126-Q100; 74AHCT126-Q100 is identical to the 74AHC125-Q100; 74AHCT125-Q100 but has active HIGH output enable inputs.

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
- Balanced propagation delays
- All inputs have Schmitt trigger action
- Inputs accept voltages higher than V<sub>CC</sub>
- Input levels:
  - ◆ For 74AHC126-Q100: CMOS level
  - ◆ For 74AHCT126-Q100: TTL level
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ♦ MM JESD22-A115-A exceeds 200 V (C = 200 pf, R = 0 Ω)
- Multiple package options

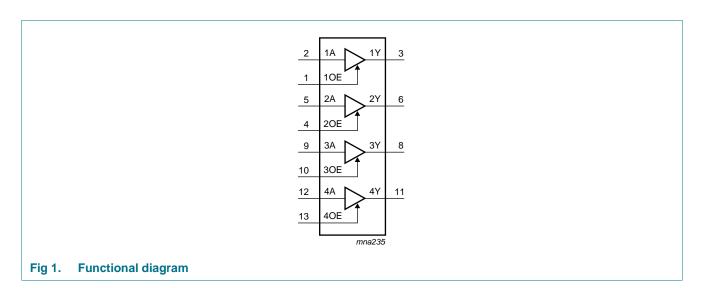


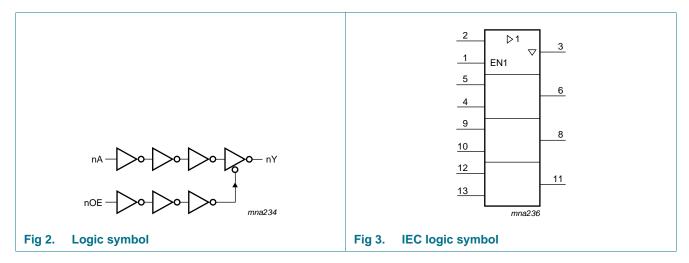
## 3. Ordering information

Table 1. Ordering information

Type number	Package										
	Temperature range	Name	Description	Version							
74AHC126D-Q100	–40 °C to +125 °C	SO14	plastic small outline package; 14 leads;	SOT108-1							
74AHCT126D-Q100			body width 3.9 mm								
74AHC126PW-Q100	−40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads;	SOT402-1							
74AHCT126PW-Q100			body width 4.4 mm								
74AHC126BQ-Q100	–40 °C to +125 °C	DHVQFN14		SOT762-1							
74AHCT126BQ-Q100			very thin quad flat package; no leads; 14 terminals; body 2.5 $\times$ 3 $\times$ 0.85 mm								

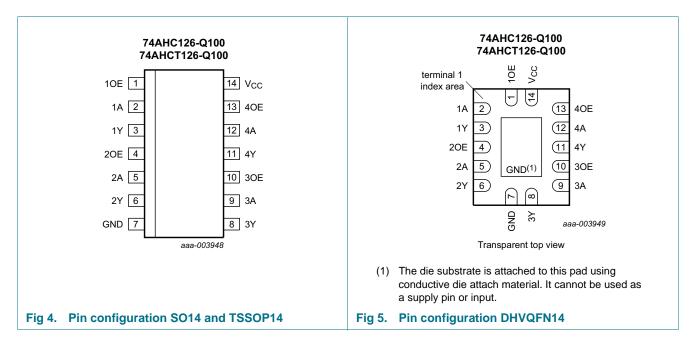
### 4. Functional diagram





### 5. Pinning information

#### 5.1 Pinning



#### 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
10E	1	output enable input 1 (active HIGH)
1A	2	data input 1
1Y	3	data output 1
20E	4	output enable input 2 (active HIGH)
2A	5	data input 2
2Y	6	data output 2
GND	7	ground (0 V)
3Y	8	data output 3
3A	9	data input 3
30E	10	output enable input 3 (active HIGH)
4Y	11	data output 4
4A	12	data input 4
40E	13	output enable input 4 (active HIGH)
V <sub>CC</sub>	14	supply voltage

### 6. Functional description

Table 3. Function table[1]

Control	Input	Output
nOE	nA	nY
Н	L	L
Н	Н	Н
L	X	Z

<sup>[1]</sup> H = HIGH voltage state;

L = LOW voltage state;

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
VI	input voltage		-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	$V_1 < -0.5 \text{ V}$	<u>[1]</u> –20	-	mA
I <sub>OK</sub>	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$	<u>[1]</u> –20	+20	mA
Io	output current	$V_{O} = -0.5 \text{ V to } (V_{CC} + 0.5 \text{ V})$	-25	+25	mA
I <sub>CC</sub>	supply current		-	+75	mA
$I_{GND}$	ground current		<b>-75</b>	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	$T_{amb} = -40  ^{\circ}\text{C} \text{ to } +125  ^{\circ}\text{C}$	[2] _	500	mW

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

<sup>[2]</sup> For SO14 packages: above 70 °C the value of  $P_{tot}$  derates linearly at 8 mW/K. For TSSOP14 packages: above 60 °C the value of  $P_{tot}$  derates linearly at 5.5 mW/K. For DHVQFN14 packages: above 60 °C the value of  $P_{tot}$  derates linearly at 4.5 mW/K.

## 8. Recommended operating conditions

Table 5. Operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
74AHC126-Q100	0					
V <sub>CC</sub>	supply voltage		2.0	5.0	5.5	V
VI	input voltage		0	-	5.5	V
Vo	output voltage		0	-	$V_{CC}$	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	-	-	100	ns/V
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	-	-	20	ns/V
74AHCT126-Q10	00					
V <sub>CC</sub>	supply voltage		4.5	5.0	5.5	V
VI	input voltage		0	-	5.5	V
Vo	output voltage		0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	-	-	20	ns/V

### 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 1	to +85 °C	–40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
74AHC1	26-Q100	'					•		•	
V <sub>IH</sub>	HIGH-level	V <sub>CC</sub> = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
	input voltage	V <sub>CC</sub> = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
		V <sub>CC</sub> = 5.5 V	3.85	-	-	3.85	-	3.85	-	V
$V_{IL}$	LOW-level	V <sub>CC</sub> = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
	input voltage	V <sub>CC</sub> = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V <sub>CC</sub> = 5.5 V	-	-	1.65	-	1.65	-	1.65	V
V <sub>OH</sub>	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$								
	output voltage	$I_O = -50 \mu A; V_{CC} = 2.0 V$	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	-	-	3.80	-	3.70	-	V
V <sub>OL</sub>	LOW-level	$V_I = V_{IH}$ or $V_{IL}$								
	output voltage	$I_O = 50 \mu A; V_{CC} = 2.0 V$	-	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 mA; $V_{CC}$ = 4.5 V	-	-	0.36	-	0.44	-	0.55	V

 Table 6.
 Static characteristics ...continued

At recommended operating conditions; 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	
II	input leakage current	$V_{I} = 5.5 \text{ V or GND};$ $V_{CC} = 0 \text{ V to 5.5 V}$	-	-	0.1	-	1.0	-	2.0	μΑ
I <sub>OZ</sub>	OFF-state output current	$V_I = V_{IH}$ or $V_{IL}$ ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±0.25	-	±2.5	-	±10.0	μΑ
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	2.0	-	20	-	40	μΑ
Cı	input capacitance	$V_I = V_{CC}$ or GND	-	3	10	-	10	-	10	pF
Co	output capacitance		-	4	-	-	-	-	-	pF
74AHCT	126-Q100									
V <sub>IH</sub>	HIGH-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2.0	-	-	2.0	-	2.0	-	V
V <sub>IL</sub>	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	$I_{O} = -50 \ \mu A$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_0 = -8.0 \text{ mA}$	3.94	-	-	3.80	-	3.70	-	V
$V_{OL}$	LOW-level	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	I <sub>O</sub> = 50 μA	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 8.0 \text{ mA}$	-	-	0.36	-	0.44	-	0.55	V
II	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
l <sub>OZ</sub>	OFF-state output current	$V_I = V_{IH}$ or $V_{IL}$ ; $V_O = V_{CC}$ or GND per input pin; other inputs at $V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	±0.25	-	±2.5	-	±10.0	μА
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	2.0	-	20	-	40	μА
$\Delta I_{CC}$	additional supply current	per input pin; $V_I = V_{CC} - 2.1 \text{ V}$ ; other pins at $V_{CC}$ or GND; $I_O = 0 \text{ A}$ ; $V_{CC} = 4.5 \text{ V}$ to 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
C <sub>I</sub>	input capacitance	$V_I = V_{CC}$ or GND	-	3	10	-	10	-	10	pF
Co	output capacitance		-	4	-	-	-	-	-	pF

## 10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

Symbol	Parameter	Conditions			25 °C		-40 °C	to +85 °C	-40 °C	to +125 °C	Unit
				Min	Typ[1]	Max	Min	Max	Min	Max	
74AHC1	26-Q100						'	'		'	
t <sub>pd</sub>	propagation	nA to nY; see Figure 6	[2]								
	delay	$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$									
		C <sub>L</sub> = 15 pF		-	4.7	8.0	1.0	9.5	1.0	10.0	ns
		C <sub>L</sub> = 50 pF		-	6.7	11.5	1.0	13.0	1.0	14.5	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$									
		C <sub>L</sub> = 15 pF		-	3.3	5.5	1.0	6.5	1.0	7.0	ns
		$C_{L} = 50 \text{ pF}$		-	4.7	7.5	1.0	8.5	1.0	9.5	ns
t <sub>en</sub>	enable time	nOE to nY; see Figure 7	[3]								
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$									
		C <sub>L</sub> = 15 pF		-	5.3	8.0	1.0	9.5	1.0	10.0	ns
		$C_{L} = 50 \text{ pF}$		-	7.6	11.5	1.0	13.0	1.0	14.5	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$									
		C <sub>L</sub> = 15 pF		-	3.6	5.3	1.0	6.1	1.0	7.0	ns
		$C_{L} = 50 \text{ pF}$		-	5.1	7.6	1.0	8.7	1.0	9.5	ns
t <sub>dis</sub>	disable time	nOE to nY; see Figure 7	[4]								
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$									
		C <sub>L</sub> = 15 pF		-	6.6	9.7	1.0	11.5	1.0	12.5	ns
		C <sub>L</sub> = 50 pF		-	9.4	13.2	1.0	15.0	1.0	16.5	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$									
		C <sub>L</sub> = 15 pF		-	4.7	6.8	1.0	8.0	1.0	8.5	ns
		C <sub>L</sub> = 50 pF		-	6.7	8.8	1.0	10.0	1.0	11.0	ns
C <sub>PD</sub>	power dissipation capacitance	$f_i = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC}$	<u>[5]</u>	-	10	-	-	-	-	-	pF
74AHCT	126-Q100; V <sub>C</sub>	<sub>CC</sub> = 4.5 V to 5.5 V									
$t_{pd}$		nA to nY; see Figure 6	[2]								
	delay	C <sub>L</sub> = 15 pF		-	3.0	5.5	1.0	6.5	1.0	7.0	ns
		$C_L = 50 pF$		-	4.3	7.5	1.0	8.5	1.0	9.5	ns
t <sub>en</sub>	enable time	nOE to nY; see Figure 7	[3]								
		C <sub>L</sub> = 15 pF		-	3.3	5.1	1.0	6.0	1.0	6.5	ns
		$C_L = 50 pF$		-	4.7	7.1	1.0	8.0	1.0	9.0	ns
t <sub>dis</sub>	disable time	nOE to nY; see Figure 7	<u>[4]</u>								
		C <sub>L</sub> = 15 pF		-	4.8	6.8	1.0	8.0	1.0	8.5	ns
		C <sub>L</sub> = 50 pF		-	6.9	8.9	1.0	10.0	1.0	11.5	ns
$C_{PD}$	power dissipation capacitance	$f_i = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC}$	<u>[5]</u>	-	12	-	-	-	-	-	pF

- Typical values are measured at nominal supply voltage ( $V_{CC} = 3.3 \text{ V}$  and  $V_{CC} = 5.0 \text{ V}$ ). [1]
- t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- ten is the same as tPZL and tPZH.
- [4]  $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ .
- [5]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).

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

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

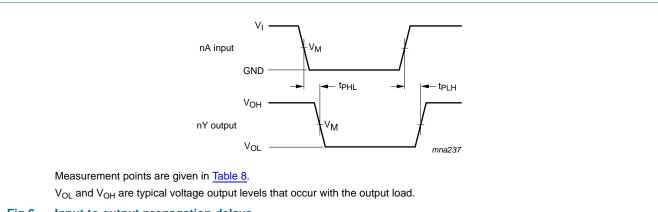
C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

 $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

#### 11. Waveforms



Input to output propagation delays Fig 6.

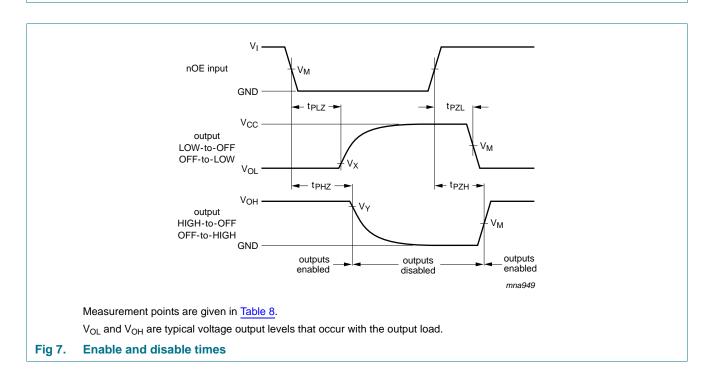
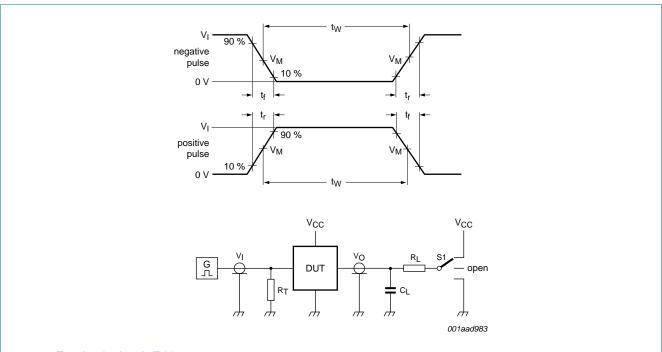


Table 8. Measurement points

Туре	Input	Output						
	V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>				
74AHC126-Q100	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V <sub>OL</sub> + 0.3 V	$V_{OH} - 0.3 V$				
74AHCT126-Q100	1.5 V	$0.5 \times V_{CC}$	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> – 0.3 V				



Test data is given in Table 9.

Definitions test circuit:

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

C<sub>L</sub> = load capacitance including jig and probe capacitance.

R<sub>L</sub> = load resistance.

S1 = test selection switch.

Fig 8. Test circuitry for measuring switching times

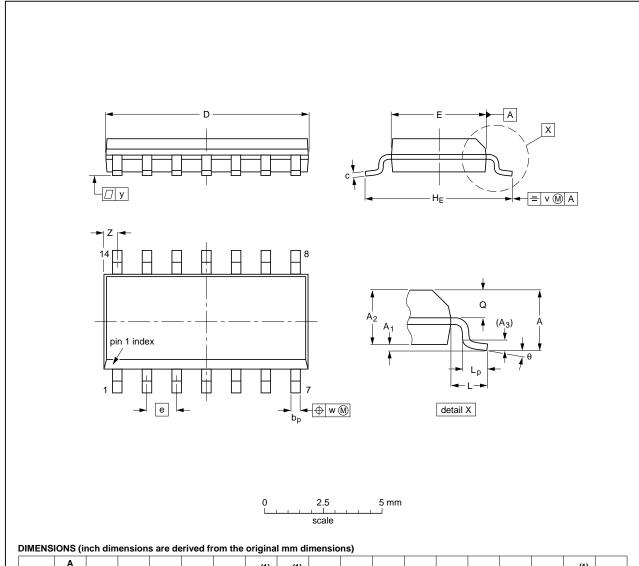
Table 9. Test data

Туре	Input		Load		S1 position			
	VI	t <sub>r</sub> , t <sub>f</sub>	C <sub>L</sub>	$R_L$	t <sub>PHL</sub> , t <sub>PLH</sub>	t <sub>PZH</sub> , t <sub>PHZ</sub>	t <sub>PZL</sub> , t <sub>PLZ</sub>	
74AHC126-Q100	$V_{CC}$	$\leq$ 3.0 ns	15 pF, 50 pF	1 kΩ	open	GND	V <sub>CC</sub>	
74AHCT126-Q100	3.0 V	≤ 3.0 ns	15 pF, 50 pF	1 kΩ	open	GND	V <sub>CC</sub>	

### 12. Package outline

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	bp	С	D <sup>(1)</sup>	E <sup>(1)</sup>	е	HE	L	Lp	Q	v	w	у	z <sup>(1)</sup>	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8°
inches	0.069	0.010 0.004	0.057 0.049	0.01	1	0.0100 0.0075	0.35 0.34	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	0°

#### Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA	PROJECTION		
SOT108-1	076E06	MS-012			<del>99-12-27</del> 03-02-19	

Fig 9. Package outline SOT108-1 (SO14)

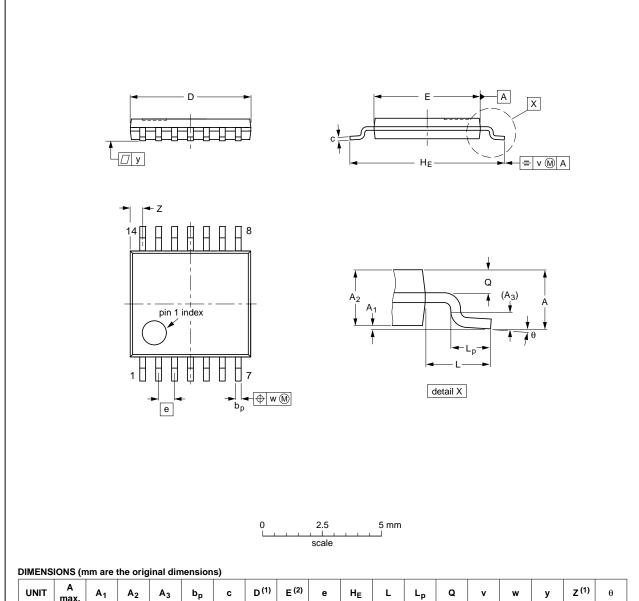
74AHC\_AHCT126\_Q100

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TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1



						-,												
UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	bp	С	D <sup>(1)</sup>	E (2)	е	HE	L	Lp	Q	٧	w	у	Z <sup>(1)</sup>	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.72 0.38	8° 0°

- 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.

OUTLINE		REFER	EUROPEAN	ISSUE DATE			
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE	
SOT402-1		MO-153				<del>99-12-27</del> 03-02-18	

Fig 10. Package outline SOT402-1 (TSSOP14)

74AHC\_AHCT126\_Q100

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DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm SOT762-1

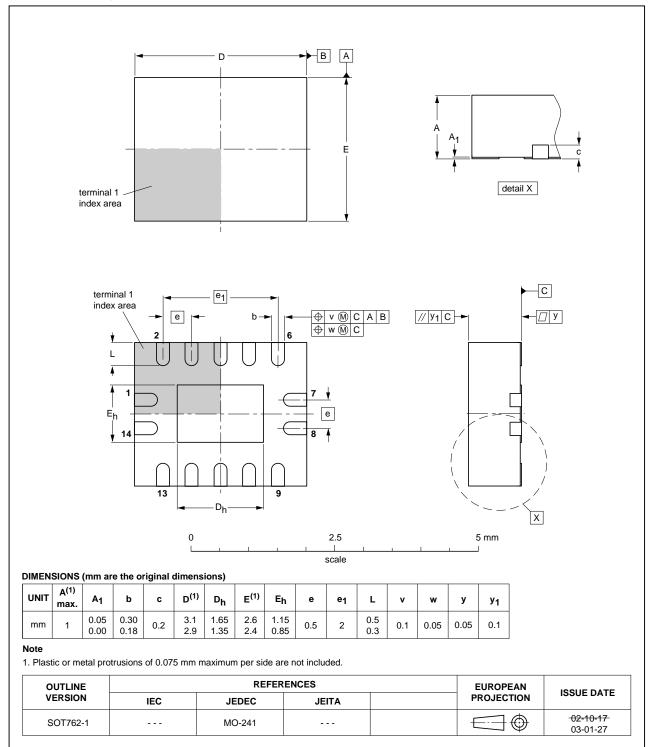


Fig 11. Package outline SOT762-1 (DHVQFN14)

74AHC\_AHCT126\_Q100

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### 13. Abbreviations

#### Table 10. Abbreviations

Acronym	Description
CDM	Charged Device Model
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model
LSTTL	Low-power Schottky Transistor-Transistor Logic
MM	Machine Model
MIL	Military

## 14. Revision history

#### Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT126_Q100 v.1	20120710	Product data sheet	-	-

### 15. Legal information

#### 15.1 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.
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Product [short] data sheet	Production	This document contains the product specification.

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- [2] The term 'short data sheet' is explained in section "Definitions"
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#### **NXP Semiconductors**

## 74AHC126-Q100; 74AHCT126-Q100

Quad buffer/line driver; 3-state

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#### **NXP Semiconductors**

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