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# 74HC126; 74HCT126

Quad buffer/line driver; 3-state

Rev. 3 — 22 September 2014

**Product data sheet** 

### 1. General description

The 74HC126; 74HCT126 is a quad buffer/line driver with 3-state outputs controlled by the output enable inputs (nOE). A LOW on nOE causes the outputs to assume a high-impedance OFF-state. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{\rm CC}$ .

#### 2. Features and benefits

- Inverting outputs
- Complies with JEDEC standard no. 7A
- Input levels:
  - ◆ For 74HC126: CMOS level
  - ◆ For 74HCT126: TTL level
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

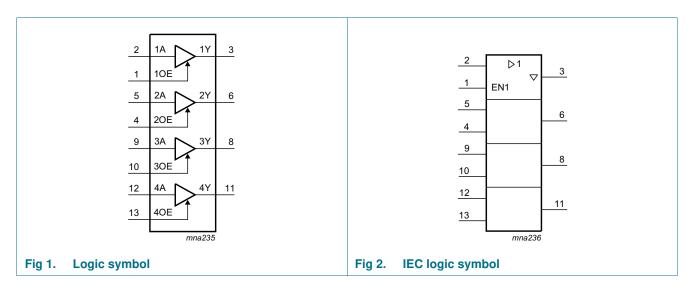
### 3. Ordering information

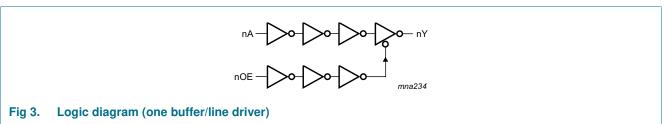
Table 1. Ordering information

Type number	Package				
	Temperature range	Name	Description	Version	
74HC126N	–40 °C to +125 °C	DIP14	plastic dual in-line package; 14 leads (300 mil)	SOT27-1	
74HCT126N					
74HC126D	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads;	SOT108-1	
74HCT126D			body width 3.9 mm		
74HC126DB	-40 °C to +125 °C	SSOP14	plastic shrink small outline package; 14 leads;	SOT337-1	
74HCT126DB			body width 5.3 mm		
74HC126PW	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads;	SOT402-1	
74HCT126PW			body width 4.4 mm		



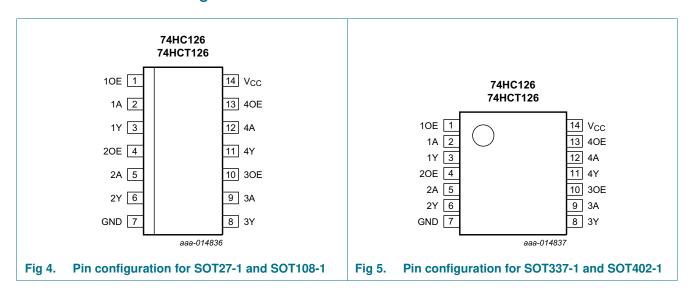
### 4. Functional diagram





### 5. Pinning information

#### 5.1 Pinning



### 5.2 Pin description

Table 2. Pin description

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

### 6. Functional description

Table 3. Function table[1]

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

<sup>[1]</sup> 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 <sub>CC</sub>	supply voltage			-0.5	+7	V
I <sub>IK</sub>	input clamping current	$V_I < -0.5 \text{ V or } V_I > V_{CC} + 0.5 \text{ V}$	[1]	-	±20	mA
I <sub>OK</sub>	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$	[1]	-	±20	mA
Io	output current	$-0.5 \text{ V} < \text{V}_{\text{O}} < \text{V}_{\text{CC}} + 0.5 \text{ V}$		-	±35	mA
I <sub>CC</sub>	supply current			-	70	mA
I <sub>GND</sub>	ground current			-70	-	mA
T <sub>stg</sub>	storage temperature			-65	+150	°C
P <sub>tot</sub>	total power dissipation	$T_{amb} = -40  ^{\circ}\text{C} \text{ to } +125  ^{\circ}\text{C}$				
		DIP14 package	[2]	-	750	mW
		SO14 and (T)SSOP14 packages	[3]	-	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 DIP14 package:  $P_{tot}$  derates linearly with 12 mW/K above 70 °C.

<sup>[3]</sup> For SO14 package:  $P_{tot}$  derates linearly with 8 mW/K above 70 °C. For (T)SSOP14 packages:  $P_{tot}$  derates linearly with 5.5 mW/K above 60 °C.

### 8. Recommended operating conditions

Table 5. Recommended operating conditions

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

Symbol	Parameter	Conditions	74HC126			74HCT126			Unit
			Min	Тур	Max	Min	Тур	Max	
V <sub>CC</sub>	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
VI	input voltage		0	-	V <sub>CC</sub>	0	-	$V_{CC}$	V
Vo	output voltage		0	-	V <sub>CC</sub>	0	-	$V_{CC}$	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	-40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 2.0 \text{ V}$	-	-	625	-	-	-	ns/V
		$V_{CC} = 4.5 \text{ V}$	-	1.67	139	-	1.67	139	ns/V
		$V_{CC} = 6.0 \text{ V}$	-	-	83	-	-	-	ns/V

### 9. Static characteristics

#### Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	T <sub>ar</sub>	<sub>nb</sub> = 25	°C		: –40 °C 85 °C		= –40 °C 125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
74HC126	6									
$V_{IH}$	HIGH-level	V <sub>CC</sub> = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
	input voltage	V <sub>CC</sub> = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V <sub>CC</sub> = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
$V_{IL}$	LOW-level	V <sub>CC</sub> = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
	input voltage	V <sub>CC</sub> = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
	V <sub>CC</sub> = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V	
V <sub>OH</sub>	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$								
output voltage	$I_{O} = -20 \mu A$ ; $V_{CC} = 2.0 \text{ V}$	1.9	2.0	-	1.9	-	1.9	-	V	
		$I_O = -20 \mu A$ ; $V_{CC} = 4.5 \text{ V}$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_{O} = -20 \mu A; V_{CC} = 6.0 V$	5.9	6.0	-	5.9	-	5.9	-	V
		$I_{O} = -6.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.98	4.32	-	3.84	-	3.7	-	V
		$I_{O} = -7.8 \text{ mA}; V_{CC} = 6.0 \text{ V}$	5.48	5.81	-	5.34	-	5.2	-	V
$V_{OL}$	LOW-level	$V_I = V_{IH}$ or $V_{IL}$								
	output voltage	$I_O = 20 \mu A; V_{CC} = 2.0 \text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \mu A; V_{CC} = 4.5 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \mu A; V_{CC} = 6.0 \text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 6.0 mA; V <sub>CC</sub> = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		$I_O = 7.8 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	0.16	0.26	-	0.33	-	0.4	V
l <sub>l</sub>	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$	-	-	±0.1	-	±1.0	-	±1.0	μΑ
l <sub>OZ</sub>	OFF-state output current	$V_{I} = V_{IH}$ or $V_{IL}$ ; $V_{O} = V_{CC}$ or GND; other inputs at $V_{CC}$ or GND; $V_{CC} = 6.0$ V; $I_{O} = 0$ A	-	±0.5	-	±5.0	-	±10	-	μΑ

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 Table 6.
 Static characteristics ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Tar	<sub>nb</sub> = 25	°C		: –40 °C 85 °C		= –40 °C 125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 6.0 \text{ V}$	-	-	8.0	-	80	-	160	μА
Cı	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT1	26			•	'					
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	8.0	V
V <sub>OH</sub>	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 \text{ V}$								
output voltage	$I_O = -20 \mu A$	4.4	4.5	-	4.4	-	4.4	-	٧	
		$I_{O} = -6.0 \text{ mA}$	3.98	4.32	-	3.84	-	3.7	-	٧
$V_{OL}$	LOW-level	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	I <sub>O</sub> = 20 μA	-	0	0.1	-	0.1	-	0.1	٧
		I <sub>O</sub> = 6.0 mA	-	0.16	0.26	-	0.33	-	0.4	٧
II	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±0.1	-	±1.0	-	±1.0	μА
I <sub>OZ</sub>	OFF-state output current	$V_I = V_{IH}$ or $V_{IL}$ ; $V_O = V_{CC}$ or GND; other inputs at $V_{CC}$ or GND; $V_{CC} = 5.5$ V; $I_O = 0$ A	-	-	±0.5	-	±5.0	-	±10	μА
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	8.0	-	80	-	160	μΑ
Δl <sub>CC</sub>	additional supply current	per input pin; $I_O = 0$ A; $V_I = V_{CC} - 2.1$ V; other inputs at $V_{CC}$ or GND; $V_{CC} = 4.5$ V to 5.5 V; nA, nOE inputs	-	100	360	-	450	-	490	μА
Cı	input capacitance		-	3.5	-	-	-	-	-	pF

### 10. Dynamic characteristics

#### Table 7. Dynamic characteristics

 $GND = 0 \ V; \ C_L = 50 \ pF;$  for test circuit, see Figure 8.

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C		T <sub>amb</sub> = -40 °	Unit		
			Min	Тур	Max	Max (85 °C)	Max (125 °C)	
74HC126	,							
t <sub>pd</sub>	propagation delay	nA to nY; see Figure 6						
		V <sub>CC</sub> = 2.0 V	-	30	100	125	150	ns
		V <sub>CC</sub> = 4.5 V	-	11	20	25	30	ns
		V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF	-	9	-	-	-	ns
		V <sub>CC</sub> = 6.0 V	-	9	17	21	26	ns

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**Table 7. Dynamic characteristics** ...continued  $GND = 0 \ V; \ C_L = 50 \ pF;$  for test circuit, see <u>Figure 8</u>.

Symbol	Parameter	Conditions		Tar	<sub>nb</sub> = 25	°C	T <sub>amb</sub> = -40 °	C to +125 °C	Unit
				Min	Тур	Max	Max (85 °C)	Max (125 °C)	
t <sub>en</sub>	enable time	nOE to nY; see Figure 7	[1]						
		V <sub>CC</sub> = 2.0 V		-	41	125	155	190	ns
		V <sub>CC</sub> = 4.5 V		-	15	25	31	38	ns
		V <sub>CC</sub> = 6.0 V		-	12	21	26	32	ns
t <sub>dis</sub>	disable time	nOE to nY; see Figure 7	[1]						
		V <sub>CC</sub> = 2.0 V		-	41	125	155	190	ns
		V <sub>CC</sub> = 4.5 V		-	15	25	31	38	ns
		V <sub>CC</sub> = 6.0 V		-	12	21	26	32	ns
t <sub>t</sub>	transition time	see Figure 6	[1]						
		V <sub>CC</sub> = 2.0 V		-	14	60	75	90	ns
		V <sub>CC</sub> = 4.5 V		-	5	12	15	18	ns
		V <sub>CC</sub> = 6.0 V		-	4	10	13	15	ns
C <sub>PD</sub>	power dissipation capacitance	per package; V <sub>I</sub> = GND to V <sub>CC</sub>	[2]	-	23	-	-	-	pF
74HCT12	26				-		•	-1	
t <sub>pd</sub>	propagation delay	nA to nY; see Figure 6	[1]						
		V <sub>CC</sub> = 4.5 V		-	14	24	30	36	ns
		V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF		-	11	-	-	-	ns
t <sub>en</sub>	enable time	nOE to nY; see Figure 7; V <sub>CC</sub> = 4.5 V	[1]	-	13	25	31	38	ns
t <sub>dis</sub>	disable time	nOE to nY; see Figure 7; V <sub>CC</sub> = 4.5 V	[1]	-	18	28	35	42	ns
t <sub>t</sub>	transition time	V <sub>CC</sub> = 4.5 V; see Figure 6	[1]	-	5	12	15	18	ns
$C_{PD}$	power dissipation capacitance	per package; V <sub>I</sub> = GND to V <sub>CC</sub> - 1.5 V	[2]	-	24	-	-	-	pF

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

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

 $t_{\text{dis}}$  is the same as  $t_{\text{PLZ}}$  and  $t_{\text{PHZ}}$ .

 $t_{t}$  is the same as  $t_{\text{THL}}$  and  $t_{\text{TLH}}.$ 

[2]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).

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

 $f_i$  = input frequency in MHz;

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

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

 $V_{CC}$  = supply voltage in V;

N = number of inputs switching;

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

### 11. Waveforms and test circuit

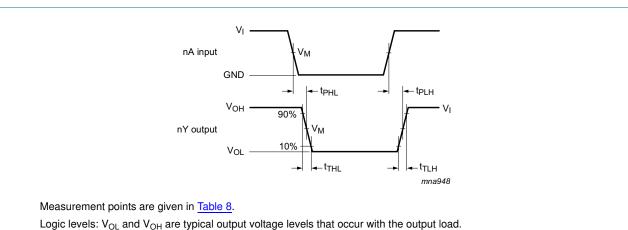


Fig 6. Input (nA) to output (nY) propagation delays

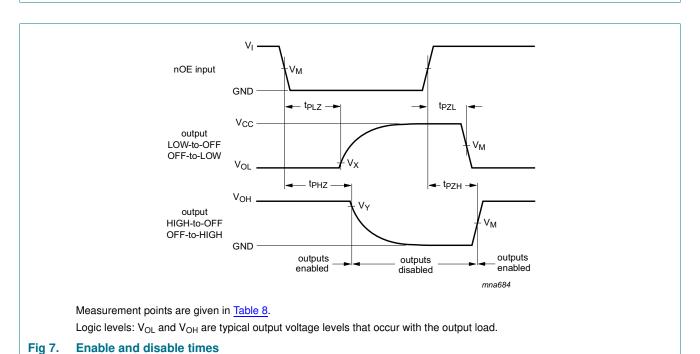
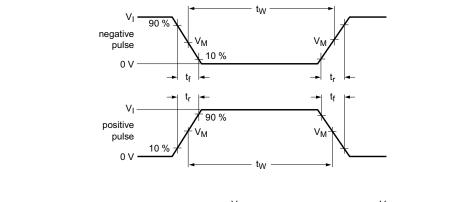
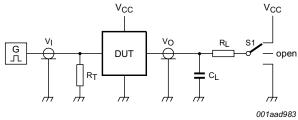


Table 8. Measurement points

Туре	Input	Output					
	V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>			
74HC126	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	0.1V <sub>CC</sub>	0.9V <sub>CC</sub>			
74HCT126	1.3 V	1.3 V	0.1V <sub>CC</sub>	0.9V <sub>CC</sub>			





Test data is given in Table 9.

Definitions test circuit:

 $R_T$  = Termination resistance should be equal to output impedance  $Z_0$  of the pulse generator.

 $C_L$  = Load capacitance including jig and probe capacitance.

 $R_L$  = Load resistance.

S1 = Test selection switch.

Fig 8. Test circuit for measuring switching times

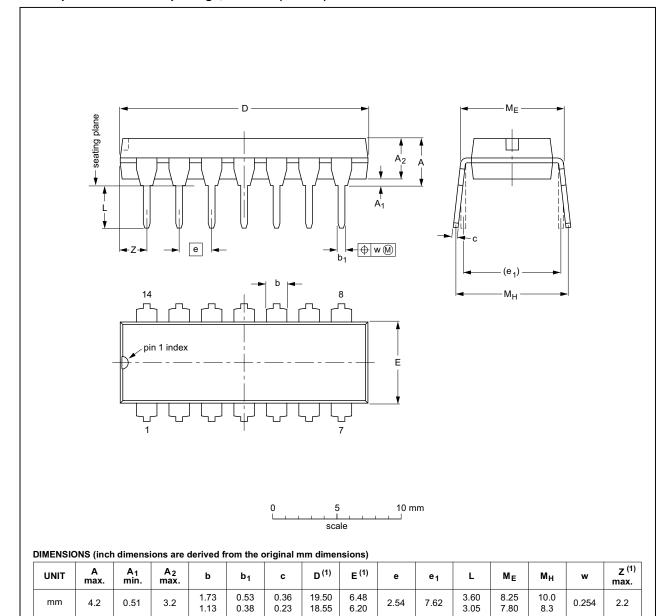
Table 9. Test data

Туре	Input		Load		S1 position			
	VI	t <sub>r</sub> , t <sub>f</sub>	CL	R <sub>L</sub>	t <sub>PHL</sub> , t <sub>PLH</sub>	t <sub>PZH</sub> , t <sub>PHZ</sub>	t <sub>PZL</sub> , t <sub>PLZ</sub>	
74HC126	V <sub>CC</sub>	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V <sub>CC</sub>	
74HCT126	3 V	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V <sub>CC</sub>	

### 12. Package outline

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1



#### Note

inches

0.17

1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

0.068

0.044

0.021

0.015

0.014

0.009

0.77

0.14

0.3

0.32

0.39

OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA	PROJECTION	ISSUE DATE	
SOT27-1	050G04	MO-001	SC-501-14		<del>99-12-27</del> 03-02-13	

Fig 9. Package outline SOT27-1 (DIP14)

0.02

0.13

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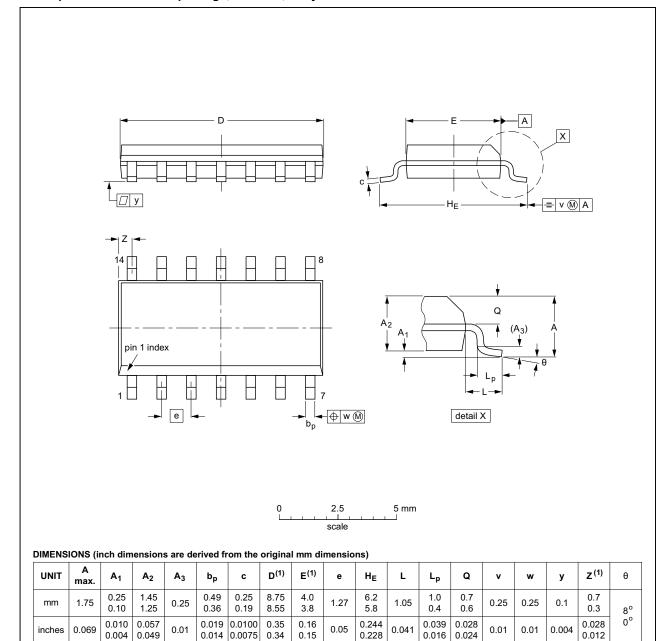
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0.01

0.087

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

SOT108-1



#### Note

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

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

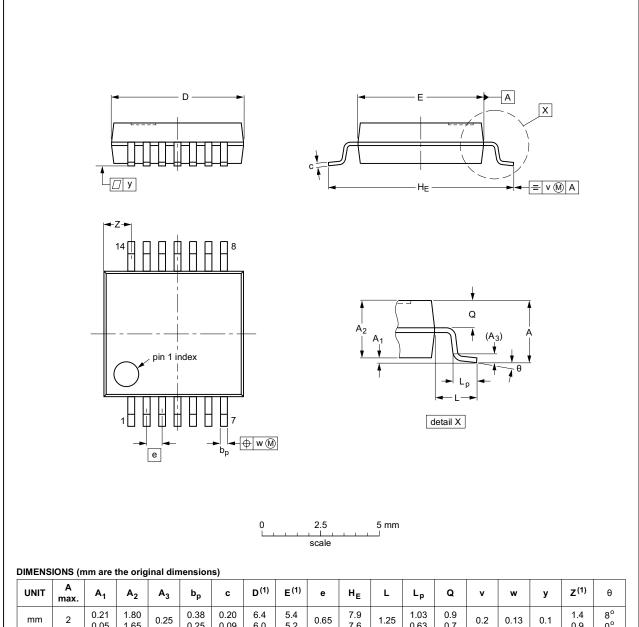
Fig 10. Package outline SOT108-1 (SO14)

74HC\_HCT126

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SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm

SOT337-1



UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	<b>A</b> <sub>3</sub>	b <sub>p</sub>	C	D <sup>(1)</sup>	E <sup>(1)</sup>	е	HE	L	Lp	Q	v	w	у	Z <sup>(1)</sup>	θ
mm	2	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	6.4 6.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	1.4 0.9	8° 0°

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

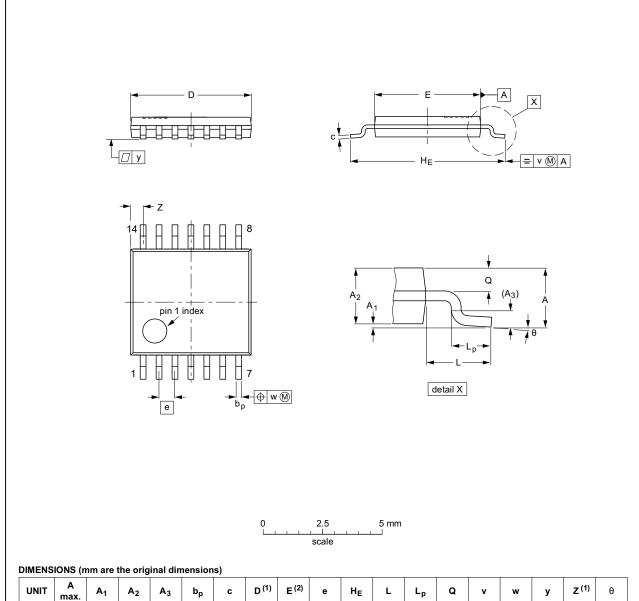
OUTLINE VERSION		REFER	RENCES	EUROPEAN	ISSUE DATE	
	IEC	JEDEC	JEITA	PROJECTION	ISSUE DATE	
SOT337-1		MO-150			<del>99-12-27</del> 03-02-19	

Fig 11. Package outline SOT337-1 (SSOP14)

74HC\_HCT126

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>	<b>A</b> <sub>3</sub>	bp	С	D <sup>(1)</sup>	E (2)	е	HE	L	Lp	Q	v	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°

#### Notes

- 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	
	VERSION	VERSION IEC	VERSION IEC JEDEC	VERSION IEC JEDEC JEITA	VERSION IEC JEDEC JEITA	VERSION IEC JEDEC JEITA PROJECTION	

Fig 12. Package outline SOT402-1 (TSSOP14)

74HC\_HCT126

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### 13. Abbreviations

#### Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

### 14. Revision history

#### Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes				
74HC_HCT126 v.3	20140922	Product data sheet	-	74HC_HCT126_CNV v.2				
Modifications:	<ul> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> </ul>							
	<ul> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>							
74HC_HCT126_CNV v.2	19901201	Product specification	-	-				

### 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.
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"
- [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 URL http://www.nxp.com.

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## 74HC126; 74HCT126

#### Quad buffer/line driver; 3-state

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