74AHC126; 74AHCT126

Quad buffer/line driver; 3-state

Rev. 5 — 28 April 2020 Product data sheet

1. General description

The 74AHC126; 74AHCT126 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 are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

2. Features

- Balanced propagation delays
- All inputs have Schmitt-trigger action
- Inputs accept voltages higher than V_{CC}
- Input levels:
  - For 74AHC126: CMOS level
  - For 74AHCT126: TTL level
- ESD protection:
  - HBM JESD22-A114E exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
  - CDM JESD22-C101C exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AHC126D	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74AHCT126D				
74AHC126PW	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74AHCT126PW				
74AHC126BQ	-40 °C to +125 °C	DHVQFN14	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm	SOT762-1
74AHCT126BQ				

4. Functional diagram

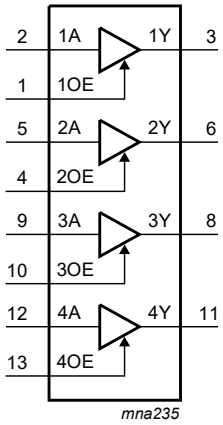


Fig. 1. Functional diagram

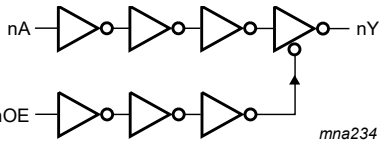


Fig. 2. Logic symbol

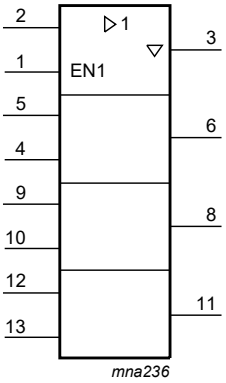


Fig. 3. IEC logic symbol

5. Pinning information

5.1. Pinning

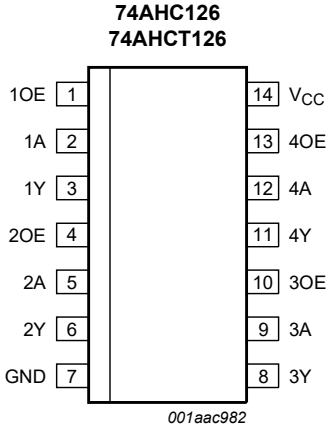
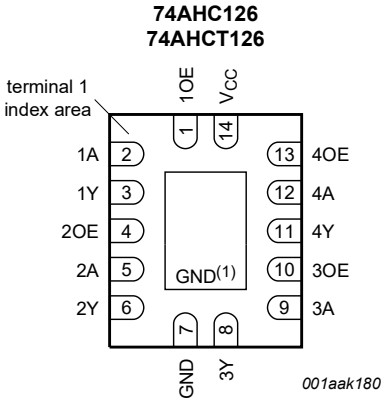


Fig. 4. Pin configuration SOT108-1 (SO14) and SOT402-1 (TSSOP14)



Transparent top view

(1) This is not a ground pin. There is no electrical or mechanical requirement to solder the pad. In case soldered, the solder land should remain floating or connected to GND.

Fig. 5. Pin configuration SOT762-1 (DHVQFN14)

5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
1OE	1	output enable input 1 (active HIGH)
1A	2	data input 1
1Y	3	data output 1
2OE	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
3OE	10	output enable input 3 (active HIGH)
4Y	11	data output 4
4A	12	data input 4
4OE	13	output enable input 4 (active HIGH)
V_{CC}	14	supply voltage

6. Functional description

Table 3. Function table

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

Control	Input	Output
nOE	**nA**	**nY**
H	L	L
H	H	H
L	X	Z

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
I_{IK}	input clamping current	V_I < -0.5 V	[1]	-20	-	mA
I_{OK}	output clamping current	V_O < -0.5 V or V_O > V_{CC} + 0.5 V	[1]	-20	+20	mA
I_O	output current	V_O = -0.5 V to (V_{CC} + 0.5 V)		-25	+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 °C to +125 °C	[2]	-	500	mW

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

[2] For SOT108-1 (SO14) package: P_{tot} derates linearly with 10.1 mW/K above 100 °C.
For SOT402-1 (TSSOP14) package: P_{tot} derates linearly with 7.3 mW/K above 81 °C.
For SOT762-1 (DHVQFN14) package: P_{tot} derates linearly with 9.6 mW/K above 98 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	74AHC126			74AHCT126			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
V_I	input voltage		0	-	5.5	0	-	5.5	V
V_O	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 fall rate	V_{CC} = 3.0 V to 3.6 V	-	-	100	-	-	-	ns/V
		V_{CC} = 4.5 V to 5.5 V	-	-	20	-	-	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 to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74AHC126										
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
		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 input voltage	V_{CC} = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
		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 output voltage	V_I = V_{IH} or V_{IL}								
		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	-	-	3.80	-	3.70	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}								
		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_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_{OZ}	OFF-state output current	V_I = V_{IH} or V_{IL}; V_O = V_{CC} or GND; V_{CC} = 5.5 V	-	-	±0.25	-	±2.5	-	±10.0	µA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	2.0	-	20	-	40	µA
C_I	input capacitance	V_I = V_{CC} or GND	-	3	10	-	10	-	10	pF
C_O	output capacitance		-	4	-	-	-	-	-	pF

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74AHCT126										
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 output voltage	V_I = V_{IH} or V_{IL}; V_{CC} = 4.5 V								
		I_O = -50 µA	4.4	4.5	-	4.4	-	4.4	-	V
		I_O = -8.0 mA	3.94	-	-	3.80	-	3.70	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}; V_{CC} = 4.5 V								
		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_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_{OZ}	OFF-state output current	V_I = V_{IH} or V_{IL}; V_O = V_{CC} or GND; V_{CC} = 5.5 V	-	-	±0.25	-	±2.5	-	±10.0	µA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	2.0	-	20	-	40	µA
ΔI_{CC}	additional supply current	per input pin; V_I = V_{CC} - 2.1 V; other pins at V_{CC} or GND; I_O = 0 A; V_{CC} = 4.5 V to 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
C_I	input capacitance	V_I = V_{CC} or GND	-	3	10	-	10	-	10	pF
C_O	output capacitance		-	4	-	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

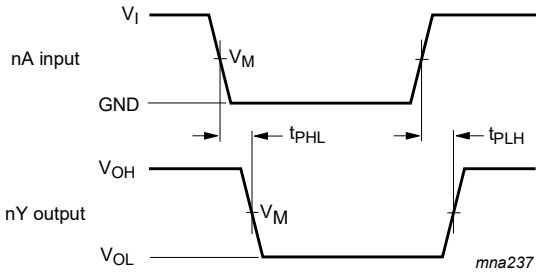
Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 8.

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
74AHC126										
t_{pd}	propagation delay	nA to nY; see Fig. 6 [2]								
		V_{CC} = 3.0 V to 3.6 V								
		C_L = 15 pF	-	4.7	8.0	1.0	9.5	1.0	10.0	ns
		C_L = 50 pF	-	6.7	11.5	1.0	13.0	1.0	14.5	ns
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 15 pF	-	3.3	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

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_{en}	enable time	nOE to nY; see Fig. 7 [3]								
		V_{CC} = 3.0 V to 3.6 V								
		C_L = 15 pF	-	5.3	8.0	1.0	9.5	1.0	10.0	ns
		C_L = 50 pF	-	7.6	11.5	1.0	13.0	1.0	14.5	ns
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 15 pF	-	3.6	5.3	1.0	6.1	1.0	7.0	ns
		C_L = 50 pF	-	5.1	7.6	1.0	8.7	1.0	9.5	ns
t_{dis}	disable time	nOE to nY; see Fig. 7 [4]								
		V_{CC} = 3.0 V to 3.6 V								
		C_L = 15 pF	-	6.6	9.7	1.0	11.5	1.0	12.5	ns
		C_L = 50 pF	-	9.4	13.2	1.0	15.0	1.0	16.5	ns
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 15 pF	-	4.7	6.8	1.0	8.0	1.0	8.5	ns
		C_L = 50 pF	-	6.7	8.8	1.0	10.0	1.0	11.0	ns
C_{PD}	power dissipation capacitance	f_i = 1 MHz; V_I = GND to V_{CC} [5]	-	10	-	-	-	-	-	pF
74AHCT126										
t_{pd}	propagation delay	nA to nY; see Fig. 6 [2]								
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 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_{en}	enable time	nOE to nY; see Fig. 7 [3]								
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 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_{dis}	disable time	nOE to nY; see Fig. 7 [4]								
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 15 pF	-	4.8	6.8	1.0	8.0	1.0	8.5	ns
		C_L = 50 pF	-	6.9	8.9	1.0	10.0	1.0	11.5	ns
C_{PD}	power dissipation capacitance	f_i = 1 MHz; V_I = GND to V_{CC} [5]	-	12	-	-	-	-	-	pF

[1] Typical values are measured at nominal supply voltage (V_{CC} = 3.3 V and V_{CC} = 5.0 V).
[2] t_{pd} is the same as t_{PLH} and t_{PHL}.
[3] t_{en} is the same as t_{PZL} and t_{PZH}.
[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 µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
f_i = input frequency in MHz;
f_o = output frequency in MHz;
C_L = 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 the outputs.

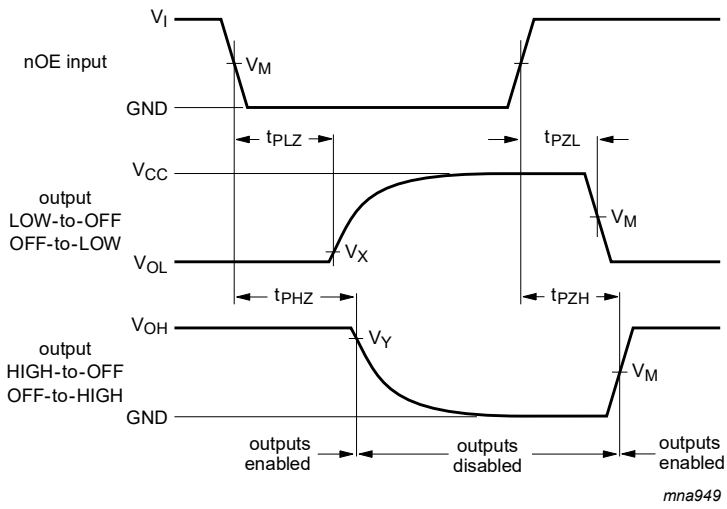
10.1. Waveforms and test circuit



Measurement points are given in Table 8.

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

Fig. 6. Input to output propagation delays



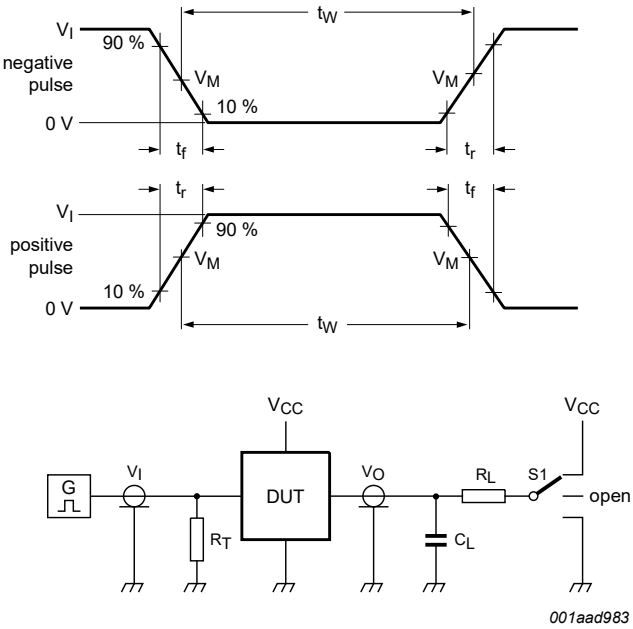
Measurement points are given in Table 8.

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

Fig. 7. Enable and disable times

Table 8. Measurement points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
74AHC126	0.5 x V_{CC}	0.5 x V_{CC}	V_{OL} + 0.3 V	V_{OH} - 0.3 V
74AHCT126	1.5 V	0.5 x V_{CC}	V_{OL} + 0.3 V	V_{OH} - 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_L = load capacitance including jig and probe capacitance.

R_L = load resistance.

S1 = test selection switch.

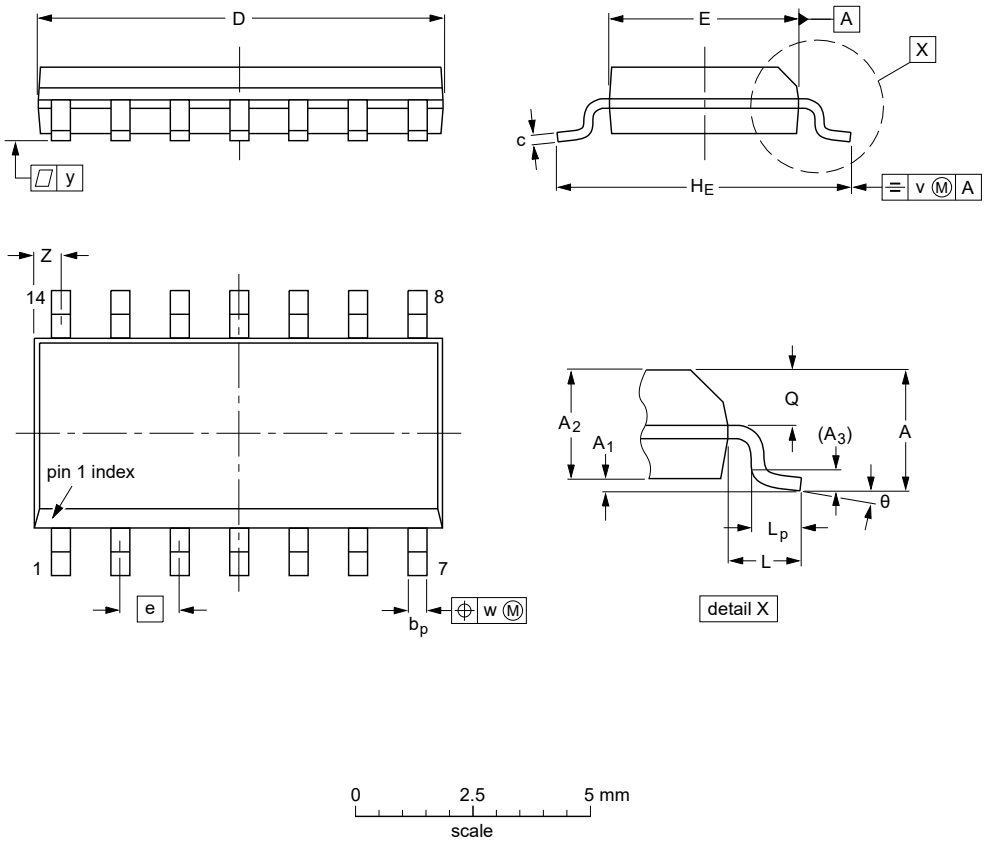
Fig. 8. Test circuit for measuring switching times

Table 9. Test data

Type	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}
74AHC126	V_{CC}	≤ 3.0 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}
74AHCT126	3.0 V	≤ 3.0 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}

11. Package outline

SO14: plastic small outline package; 14 leads; body width 3.9 mm **SOT108-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	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^{o} 0^{o}
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	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	

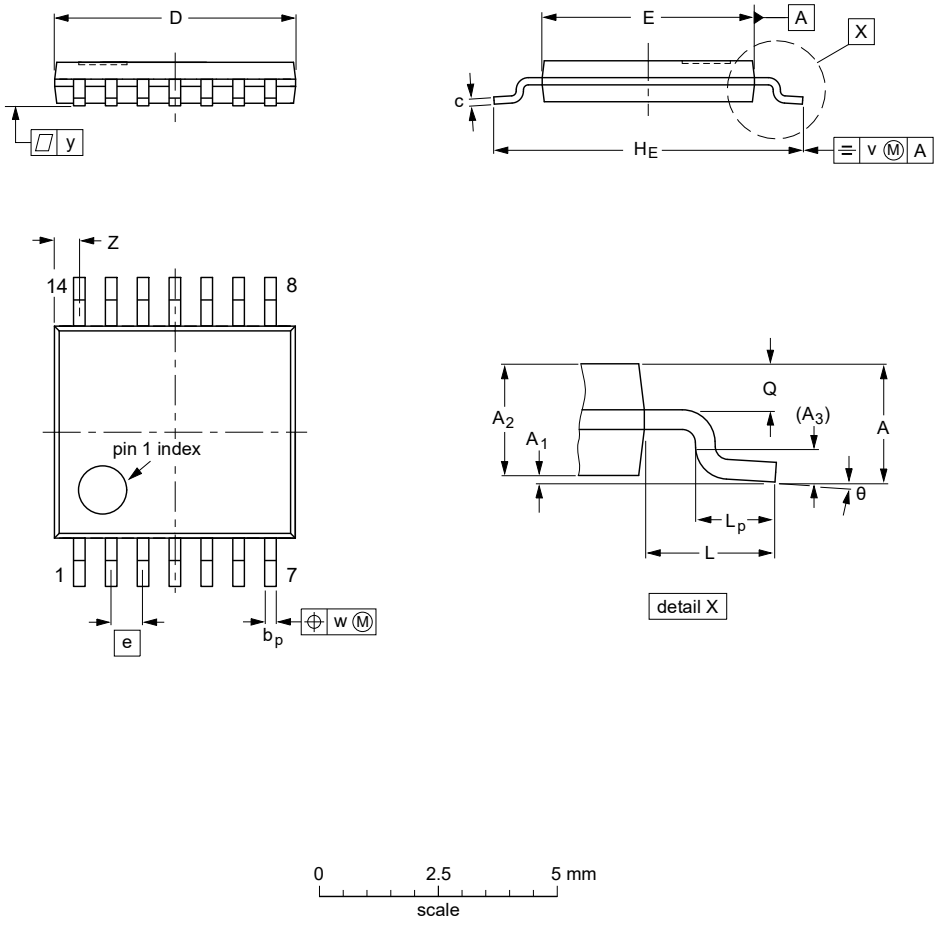
Note

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT108-1	076E06	MS-012				~~99-12-27~~ 03-02-19

Fig. 9. Package outline SOT108-1 (SO14)

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm **SOT402-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	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°

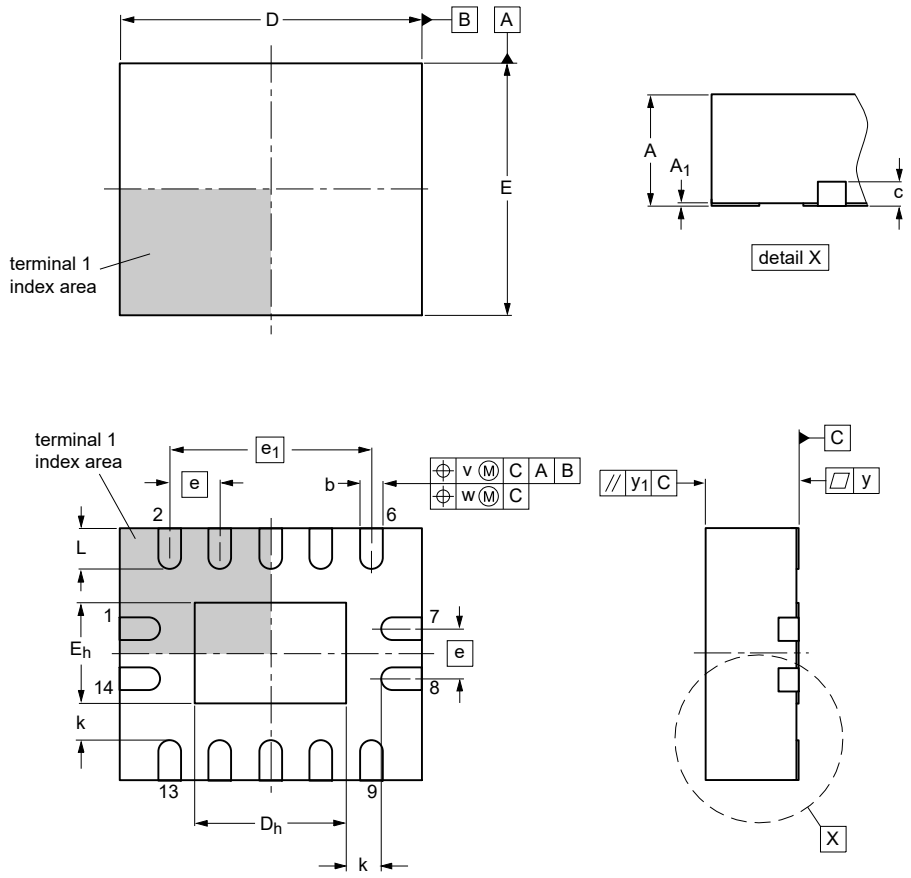
Notes

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 VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT402-1		MO-153				~~99-12-27~~ 03-02-18

Fig. 10. Package outline SOT402-1 (TSSOP14)

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**



Dimensions (mm are the original dimensions)

Unit		$A^{(1)}$	A_1	b	c	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	k	L	v	w	y	y_1
	max	1	0.05	0.30		3.1	1.65	2.6	1.15				0.5				
mm	nom		0.02	0.25	0.2	3.0	1.50	2.5	1.00	0.5	2		0.4	0.1	0.05	0.05	0.1
	min		0.00	0.18		2.9	1.35	2.4	0.85			0.2	0.3				

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

sot762-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT762-1		MO-241				~~15-04-10~~ 15-05-05

Fig. 11. Package outline SOT762-1 (DHVQFN14)

12. Abbreviations

Table 10. Abbreviations

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

13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT126 v.5	20200428	Product data sheet	-	74AHC_AHCT126 v.4
Modifications:	• 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. • Section 1: updated. • Table 4: Derating values for P_{tot} total power dissipation have been updated. • Table 6: Conditions for I_{OZ} corrected. • Package outline drawing of SOT762-1 (Fig. 11) modified.			
74AHC_AHCT126 v.4	20090812	Product data sheet	-	74AHC_AHCT126 v.3
Modifications:	• Added type numbers 74AHC126BQ and 74AHCT126BQ (DHVQFN14 package)			
74AHC_AHCT126 v.3	20080425	Product data sheet	-	74AHC_AHCT126 v.2
74AHC_AHCT126 v.2	19990929	Product specification	-	74AHC_AHCT126 v.1
74AHC_AHCT126 v.1	19990112	Preliminary specification	-	-

14. 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.

[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 https://www.nexperia.com.

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Date of release: 28 April 2020

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