74HC126-Q100; 74HCT126-Q100

Quad buffer/line driver; 3-state

Rev. 1 — 20 March 2013 Product data sheet

1. General description

The 74HC126-Q100; 74HCT126-Q100 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_{CC}.

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
- Inverting outputs
- Complies with JEDEC standard no. 7A
- Input levels:
  - For 74HC126-Q100: CMOS level
  - For 74HCT126-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
74HC126D-Q100	−40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74HCT126D-Q100				
74HC126PW-Q100	−40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74HCT126PW-Q100				

4. Functional diagram

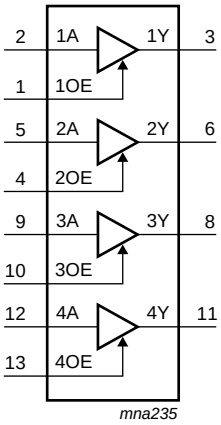


Fig 1. Logic symbol

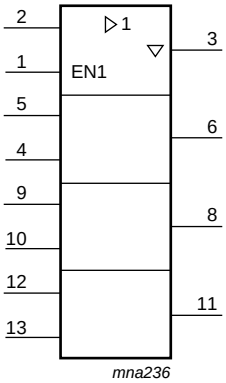


Fig 2. IEC logic symbol

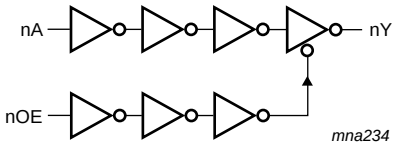


Fig 3. Logic diagram

5. Pinning information

5.1 Pinning

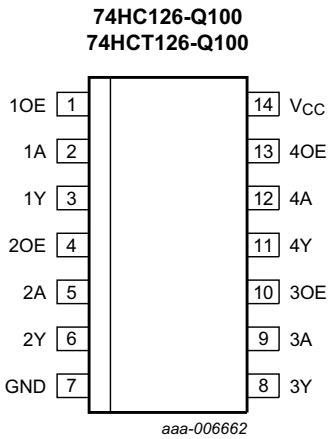


Fig 4. Pin configuration for SO14

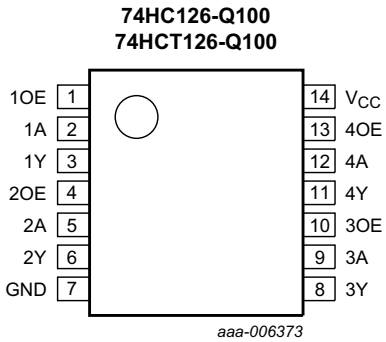


Fig 5. Pin configuration for TSSOP14

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1OE, 2OE, 3OE, 4OE	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_{CC}	14	supply voltage

6. Functional description

Table 3. Function selection[1]

Inputs		Output
nOE	**nA**	**nY**
H	L	L
H	H	H
L	X	Z

[1] 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_{CC}	supply voltage			–0.5	+7	V
I_{IK}	input clamping current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V	[1]	-	±20	mA
I_{OK}	output clamping current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V	[1]	-	±20	mA
I_O	output current	-0.5 V $< V_O < V_{CC} + 0.5$ V		-	±35	mA
I_{CC}	supply current			-	70	mA
I_{GND}	ground current			–70	-	mA
T_{stg}	storage temperature			–65	+150	°C
P_{tot}	total power dissipation	SO14 and TSSOP14 packages	[2]	-	500	mW

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

[2] For SO14 package: P_{tot} derates linearly with 8 mW/K above 70 °C.
For TSSOP14 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-Q100			74HCT126-Q100			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V_I	input voltage		0	-	V_{CC}	0	-	V_{CC}	V
V_O	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 and fall rate	V_{CC} = 2.0 V	-	-	625	-	-	-	ns/V
		V_{CC} = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V_{CC} = 6.0 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_{amb} = 25 °C			T_{amb} = –40 °C to +85 °C		T_{amb} = –40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC126-Q100										
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
		V_{CC} = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V_{CC} = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
		V_{CC} = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
		V_{CC} = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}								
		I_O = –20 μA; V_{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I_O = –20 μA; V_{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I_O = –20 μA; V_{CC} = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		I_O = –6.0 mA; V_{CC} = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
		I_O = –7.8 mA; V_{CC} = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}								
		I_O = 20 μA; V_{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 20 μA; V_{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 20 μA; V_{CC} = 6.0 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 6.0 mA; V_{CC} = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I_O = 7.8 mA; V_{CC} = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V
I_I	input leakage current	V_I = V_{CC} or GND; V_{CC} = 6.0 V	-	-	±0.1	-	±1.0	-	±1.0	μA

Table 6. Static characteristics *…continued*

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

Symbol	Parameter	Conditions	T_{amb} = 25 °C			T_{amb} = –40 °C to +85 °C		T_{amb} = –40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
I_{OZ}	OFF-state output current	per input pin; $V_I = V_{IH}$ 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	-	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 6.0 V	-	-	8.0	-	80	-	160	μA
C_I	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT126-Q100										
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V	-	1.2	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 = –20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I_O = –6.0 mA	3.98	4.32	-	3.84	-	3.7	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}; V_{CC} = 4.5 V								
		I_O = 20 μA;	-	0	0.1	-	0.1	-	0.1	V
		I_O = 6.0 mA;	-	0.16	0.26	-	0.33	-	0.4	V
I_I	input leakage current	$V_I = V_{CC}$ or GND; V_{CC} = 5.5 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I_{OZ}	OFF-state output current	per input pin; $V_I = V_{IH}$ 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	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	8.0	-	80	-	160	μA
ΔI_{CC}	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	μA
C_I	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_{amb} = 25 °C			T_{amb} = –40 °C to +125 °C		Unit
				Min	Typ	Max	Max (85 °C)	Max (125 °C)	
74HC126-Q100									
t_{pd}	propagation delay	nA to nY; see Figure 6	[1]						
		V_{CC} = 2.0 V		-	30	100	125	150	ns
		V_{CC} = 4.5 V		-	11	20	25	30	ns
		V_{CC} = 5.0 V; C_L = 15 pF		-	9	-	-	-	ns
		V_{CC} = 6.0 V		-	9	17	21	26	ns
t_{en}	enable time	nOE to nY; see Figure 7	[1]						
		V_{CC} = 2.0 V		-	41	125	155	190	ns
		V_{CC} = 4.5 V		-	15	25	31	38	ns
		V_{CC} = 6.0 V		-	12	21	26	32	ns
t_{dis}	disable time	nOE to nY; see Figure 7	[1]						
		V_{CC} = 2.0 V		-	41	125	155	190	ns
		V_{CC} = 4.5 V		-	15	25	31	38	ns
		V_{CC} = 6.0 V		-	12	21	26	32	ns
t_t	transition time	see Figure 6	[1]						
		V_{CC} = 2.0 V		-	14	60	75	90	ns
		V_{CC} = 4.5 V		-	5	12	15	18	ns
		V_{CC} = 6.0 V		-	4	10	13	15	ns
C_{PD}	power dissipation capacitance	per package; V_I = GND to V_{CC}	[2]	-	23	-	-	-	pF
74HCT126-Q100									
t_{pd}	propagation delay	nA to nY; see Figure 6	[1]						
		V_{CC} = 4.5 V		-	14	24	30	36	ns
		V_{CC} = 5.0 V; C_L = 15 pF		-	11	-	-	-	ns
t_{en}	enable time	nOE to nY; see Figure 7	[1]						
		V_{CC} = 4.5 V		-	13	25	31	38	ns
t_{dis}	disable time	nOE to nY; see Figure 7	[1]						
		V_{CC} = 4.5 V		-	18	28	35	42	ns
t_t	transition time	V_{CC} = 4.5 V; see Figure 6	[1]	-	5	12	15	18	ns

Table 7. Dynamic characteristics

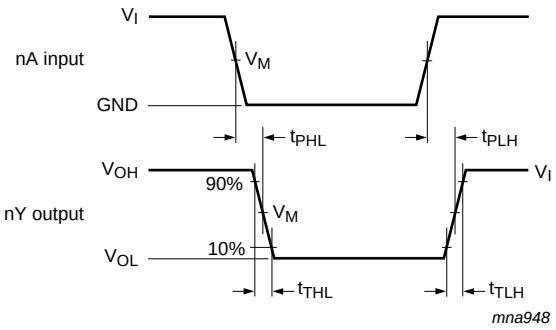
GND = 0 V; C_L = 50 pF; for test circuit see Figure 8.

Symbol	Parameter	Conditions		T_{amb} = 25 °C			T_{amb} = –40 °C to +125 °C		Unit
				Min	Typ	Max	Max (85 °C)	Max (125 °C)	
C_{PD}	power dissipation capacitance	per package; V_I = GND to V_{CC} − 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_{dis} is the same as t_{PLZ} and t_{PHZ}.
t_t is the same as t_{THL} and t_{TLH}.

[2] C_{PD} is used to determine the dynamic power dissipation (P_D in µW):
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$ 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;
$\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

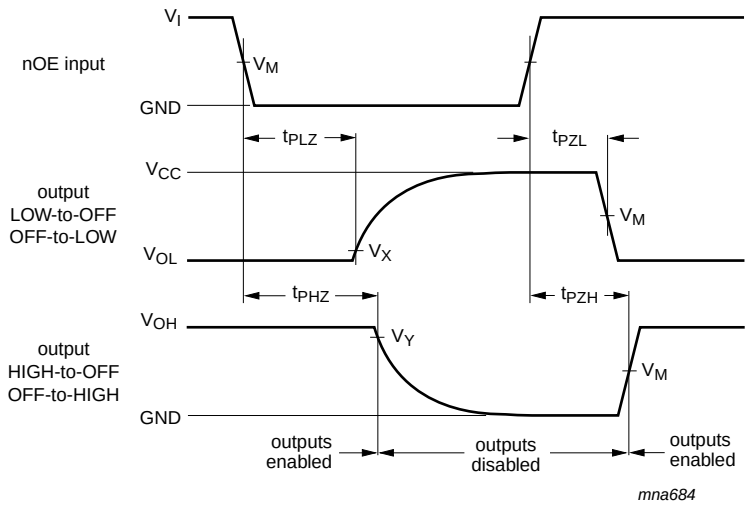
11. Waveforms



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



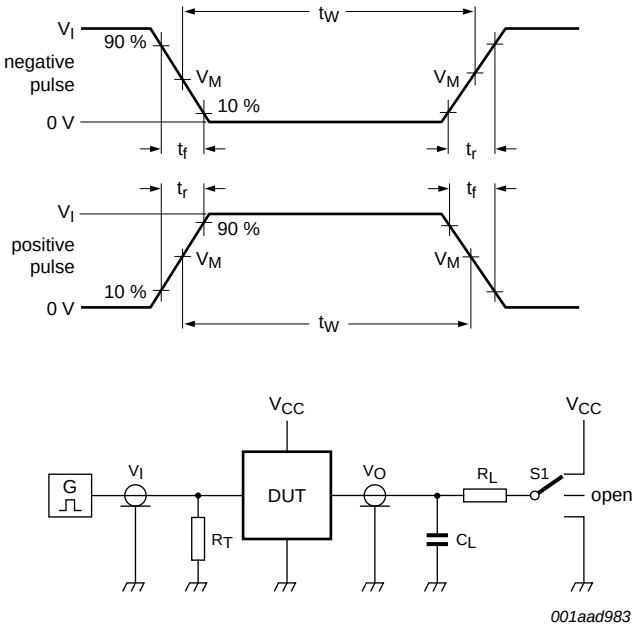
Measurement points are given in Table 8.

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

Fig 7. 3-state enable and disable times

Table 8. Measurement points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
74HC126-Q100	$0.5V_{CC}$	$0.5V_{CC}$	$0.1V_{CC}$	$0.9V_{CC}$
74HCT126-Q100	1.3 V	1.3 V	$0.1V_{CC}$	$0.9V_{CC}$



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

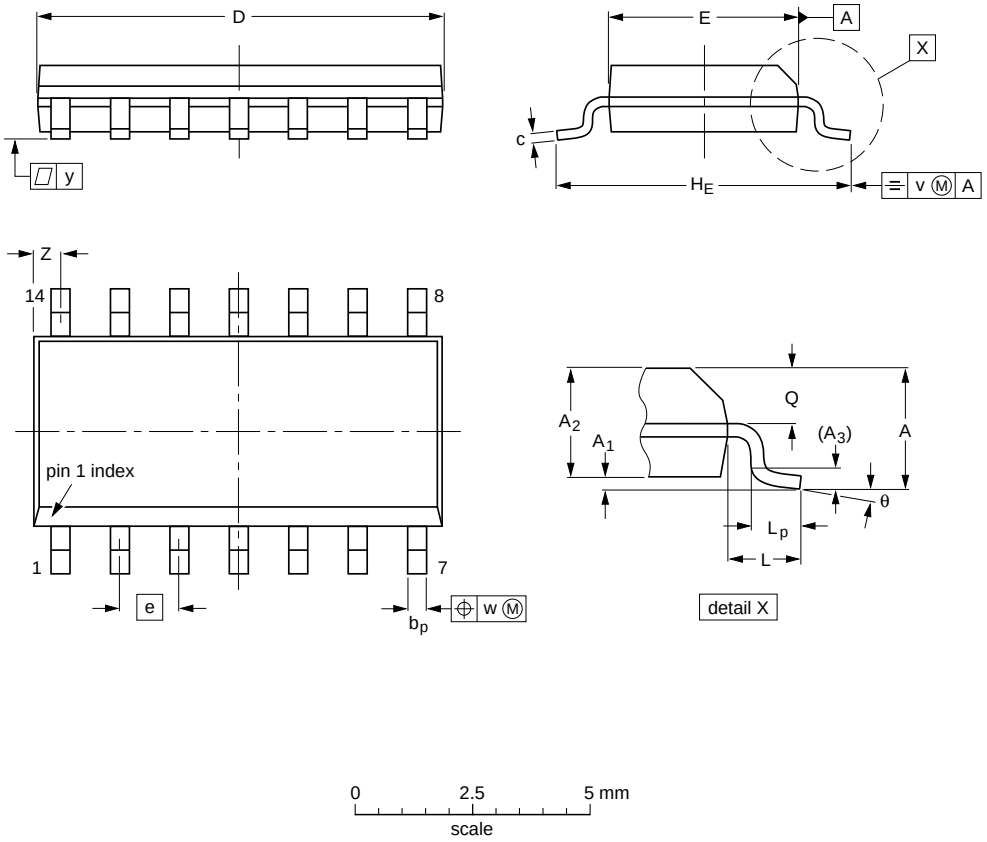
Fig 8. Test circuit for measuring switching times

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}
74HC126-Q100	V_{CC}	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}
74HCT126-Q100	3 V	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}

12. 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	

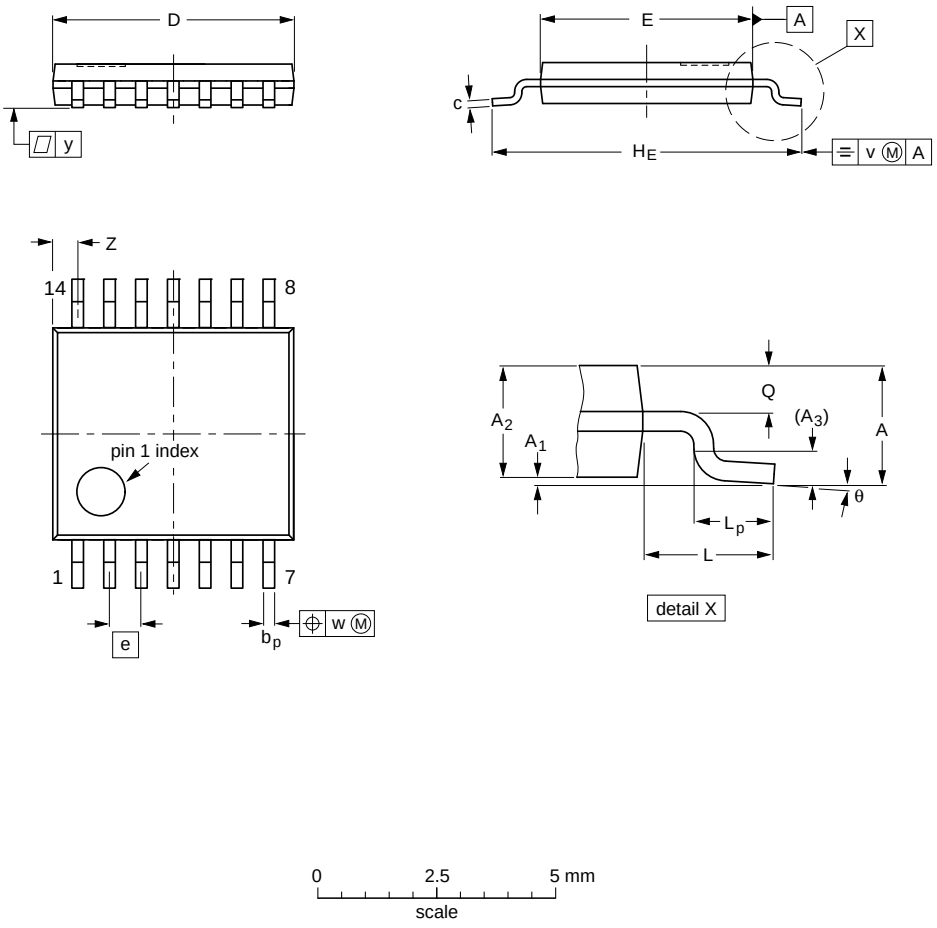
Note

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^o 0^o

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)

13. Abbreviations

Table 10. Abbreviations

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

14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT126_Q100 v.1	20130320	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.
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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