

74AHC04; 74AHCT04

Hex inverter

Rev. 03 — 7 February 2005

Product data sheet

1. General description

The 74AHC04; 74AHCT04 is a high-speed Si-gate CMOS device and is pin compatible with Low-power Schottky TTL (LSTTL). The device is specified in compliance with JEDEC standard No. 7A.

The 74AHC04; 74AHCT04 provides six inverting buffers.

2. Features

- Balanced propagation delays
- Input accepts voltages higher than V_{CC}
- Input levels:
 - ◆ CMOS levels: 74AHC04 only
 - ◆ TTL levels: 74AHCT04 only
- ESD protection:
 - ◆ HBM EIA/JESD22-A114-B exceeds 2000 V
 - ◆ MM EIA/JESD22-A115-A exceeds 200 V
- Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ and from $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$

3. Quick reference data

Table 1: Quick reference data

$GND = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $t_r = t_f \leq 3.0\text{ ns}$.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Type 74AHC04						
t_{PHL} , t_{PLH}	propagation delay nA to nY	$C_L = 15\text{ pF}$; $V_{CC} = 5\text{ V}$	-	3.0	-	ns
C_I	input capacitance	$V_I = V_{CC}$ or GND	-	3.0	-	pF
C_{PD}	power dissipation capacitance	$V_I = GND$ to V_{CC} ; $C_L = 50\text{ pF}$; $f_i = 1\text{ MHz}$	[1]	13.5	-	pF
Type 74AHCT04						
t_{PHL} , t_{PLH}	propagation delay nA to nY	$C_L = 15\text{ pF}$; $V_{CC} = 5\text{ V}$	-	3.0	-	ns
C_I	input capacitance	$V_I = V_{CC}$ or GND	-	3.0	-	pF
C_{PD}	power dissipation capacitance	$V_I = GND$ to $V_{CC} - 1.5\text{ V}$; $C_L = 50\text{ pF}$; $f_i = 1\text{ MHz}$	[1]	13.9	-	pF

[1] C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

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

f_i = input frequency in MHz;

PHILIPS

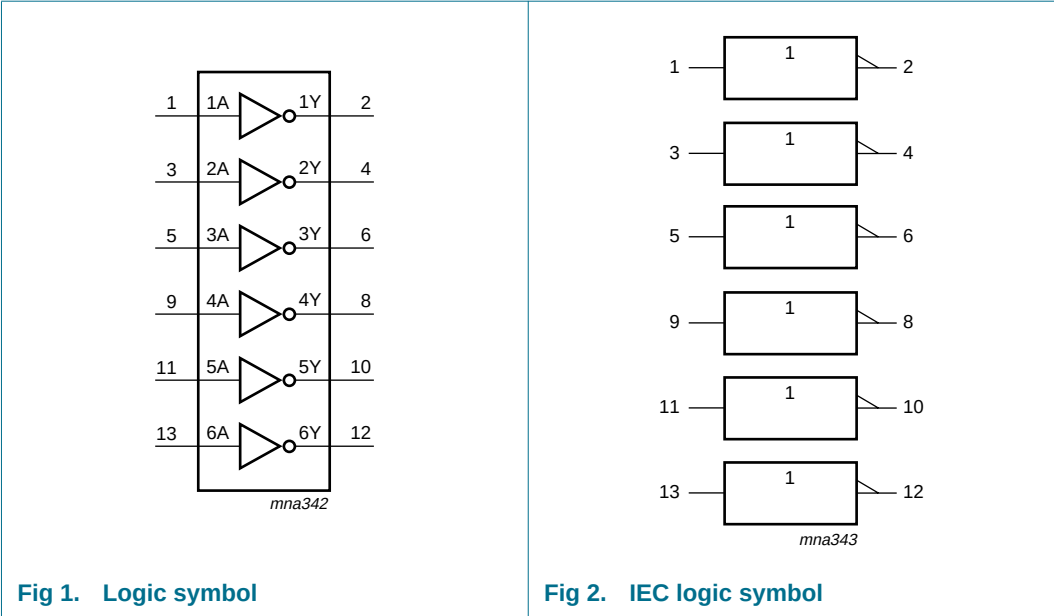
f_o = output frequency in MHz;
 C_L = output load capacitance in pF;
 V_{CC} = supply voltage in V;
 N = number of inputs switching;
 $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

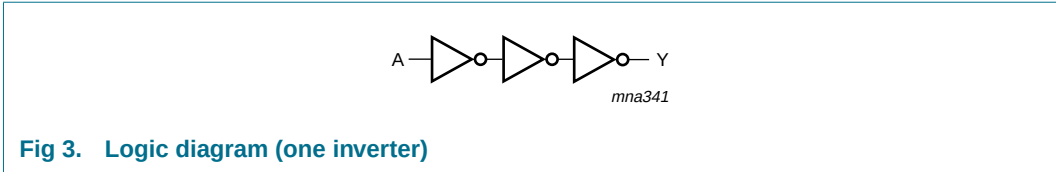
4. Ordering information

Table 2: Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AHC04D	−40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74AHC04PW	−40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74AHC04BQ	−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
74AHCT04D	−40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74AHCT04PW	−40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74AHCT04BQ	−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

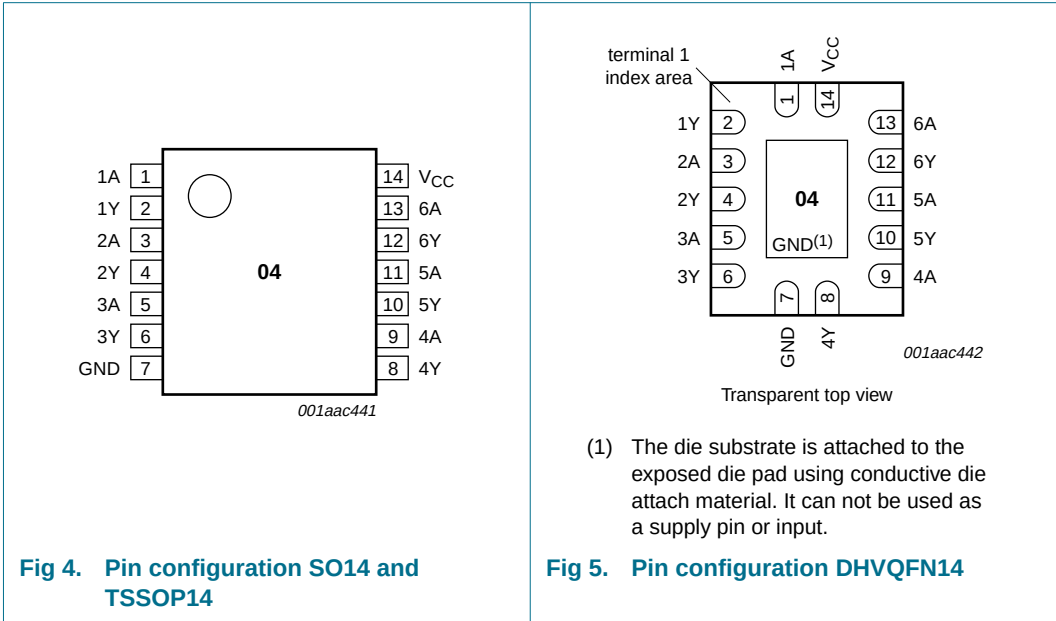
5. Functional diagram





6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3: Pin description

Symbol	Pin	Description
1A	1	data input
1Y	2	data output
2A	3	data input
2Y	4	data output
3A	5	data input
3Y	6	data output
GND	7	ground (0 V)
4Y	8	data output
4A	9	data input
5Y	10	data output
5A	11	data input

Table 3: Pin description ...continued

Symbol	Pin	Description
6Y	12	data output
6A	13	data input
V _{CC}	14	supply voltage

7. Functional description

7.1 Function table

Table 4: Function table [1]

Input nA	Output nY
L	H
H	L

[1] H = HIGH voltage level;
L = LOW voltage level.

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
V _I	input voltage range		-0.5	+7.0	V
I _{IK}	input diode current	V _I < -0.5 V	[1] -	-20	mA
I _{OK}	output diode current	V _O < -0.5 V or V _O > V _{CC} + 0.5 V	[1] -	±20	mA
I _O	output source or sink current	-0.5 V < V _O < V _{CC} + 0.5 V	-	±25	mA
I _{CC} , I _{GND}	V _{CC} or GND current		-	±75	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	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 SO14 packages: above 70 °C the value of P_{tot} derates linearly with 8 mW/K.

For TSSOP14 packages: above 60 °C the value of P_{tot} derates linearly with 5.5 mW/K.

For DHVQFN14 packages: above 60 °C the value of P_{tot} derates linearly with 4.5 mW/K.

9. Recommended operating conditions

Table 6: Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
74AHC04						
V _{CC}	supply voltage		2.0	5.0	5.5	V
V _I	input voltage		0	-	5.5	V
V _O	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		−40	+25	+125	°C
t _r , t _f	input rise and fall times	V _{CC} = 3.3 V ± 0.3 V	-	-	100	ns/V
		V _{CC} = 5 V ± 0.5 V	-	-	20	ns/V
74AHCT04						
V _{CC}	supply voltage		4.5	5.0	5.5	V
V _I	input voltage		0	-	5.5	V
V _O	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		−40	+25	+125	°C
t _r , t _f	input rise and fall times	V _{CC} = 5 V ± 0.5 V	-	-	20	ns/V

10. Static characteristics

Table 7: Static characteristics type 74AHC04

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = 25 \text{ °C}$						
V_{IH}	HIGH-level input voltage	$V_{CC} = 2.0 \text{ V}$	1.5	-	-	V
		$V_{CC} = 3.0 \text{ V}$	2.1	-	-	V
		$V_{CC} = 5.5 \text{ V}$	3.85	-	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 2.0 \text{ V}$	-	-	0.5	V
		$V_{CC} = 3.0 \text{ V}$	-	-	0.9	V
		$V_{CC} = 5.5 \text{ V}$	-	-	1.65	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH} \text{ or } V_{IL}$				
		$I_O = -50 \text{ } \mu\text{A}; V_{CC} = 2.0 \text{ V}$	1.9	2.0	-	V
		$I_O = -50 \text{ } \mu\text{A}; V_{CC} = 3.0 \text{ V}$	2.9	3.0	-	V
		$I_O = -50 \text{ } \mu\text{A}; V_{CC} = 4.5 \text{ V}$	4.4	4.5	-	V
		$I_O = -4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.58	-	-	V
		$I_O = -8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.94	-	-	V

Table 7: Static characteristics type 74AHC04 ...continued

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = 50\ \mu\text{A}$; $V_{CC} = 2.0\ \text{V}$	-	0	0.1	V
		$I_O = 50\ \mu\text{A}$; $V_{CC} = 3.0\ \text{V}$	-	0	0.1	V
		$I_O = 50\ \mu\text{A}$; $V_{CC} = 4.5\ \text{V}$	-	0	0.1	V
		$I_O = 4.0\ \text{mA}$; $V_{CC} = 3.0\ \text{V}$	-	-	0.36	V
		$I_O = 8.0\ \text{mA}$; $V_{CC} = 4.5\ \text{V}$	-	-	0.36	V
I_{LI}	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5\ \text{V}$	-	-	0.1	μA
I_{OZ}	3-state output OFF-state current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5\ \text{V}$	-	-	± 0.25	μA
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0\ \text{A}$; $V_{CC} = 5.5\ \text{V}$	-	-	4.0	μA
C_I	input capacitance	$V_I = V_{CC}$ or GND	-	3	10	pF
$T_{amb} = -40\ ^\circ\text{C}$ to $+85\ ^\circ\text{C}$						
V_{IH}	HIGH-level input voltage	$V_{CC} = 2.0\ \text{V}$	1.5	-	-	V
		$V_{CC} = 3.0\ \text{V}$	2.1	-	-	V
		$V_{CC} = 5.5\ \text{V}$	3.85	-	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 2.0\ \text{V}$	-	-	0.5	V
		$V_{CC} = 3.0\ \text{V}$	-	-	0.9	V
		$V_{CC} = 5.5\ \text{V}$	-	-	1.65	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = -50\ \mu\text{A}$; $V_{CC} = 2.0\ \text{V}$	1.9	-	-	V
		$I_O = -50\ \mu\text{A}$; $V_{CC} = 3.0\ \text{V}$	2.9	-	-	V
		$I_O = -50\ \mu\text{A}$; $V_{CC} = 4.5\ \text{V}$	4.4	-	-	V
		$I_O = -4.0\ \text{mA}$; $V_{CC} = 3.0\ \text{V}$	2.48	-	-	V
		$I_O = -8.0\ \text{mA}$; $V_{CC} = 4.5\ \text{V}$	3.8	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = 50\ \mu\text{A}$; $V_{CC} = 2.0\ \text{V}$	-	-	0.1	V
		$I_O = 50\ \mu\text{A}$; $V_{CC} = 3.0\ \text{V}$	-	-	0.1	V
		$I_O = 50\ \mu\text{A}$; $V_{CC} = 4.5\ \text{V}$	-	-	0.1	V
		$I_O = 4.0\ \text{mA}$; $V_{CC} = 3.0\ \text{V}$	-	-	0.44	V
		$I_O = 8.0\ \text{mA}$; $V_{CC} = 4.5\ \text{V}$	-	-	0.44	V
I_{LI}	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5\ \text{V}$	-	-	1.0	μA
I_{OZ}	3-state output OFF-state current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5\ \text{V}$	-	-	± 2.5	μA
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0\ \text{A}$; $V_{CC} = 5.5\ \text{V}$	-	-	40	μA
C_I	input capacitance	$V_I = V_{CC}$ or GND	-	-	10	pF
$T_{amb} = -40\ ^\circ\text{C}$ to $+125\ ^\circ\text{C}$						
V_{IH}	HIGH-level input voltage	$V_{CC} = 2.0\ \text{V}$	1.5	-	-	V
		$V_{CC} = 3.0\ \text{V}$	2.1	-	-	V
		$V_{CC} = 5.5\ \text{V}$	3.85	-	-	V

Table 7: Static characteristics type 74AHC04 ...continued

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IL}	LOW-level input voltage	$V_{CC} = 2.0\text{ V}$	-	-	0.5	V
		$V_{CC} = 3.0\text{ V}$	-	-	0.9	V
		$V_{CC} = 5.5\text{ V}$	-	-	1.65	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = -50\text{ }\mu\text{A}$; $V_{CC} = 2.0\text{ V}$	1.9	-	-	V
		$I_O = -50\text{ }\mu\text{A}$; $V_{CC} = 3.0\text{ V}$	2.9	-	-	V
		$I_O = -50\text{ }\mu\text{A}$; $V_{CC} = 4.5\text{ V}$	4.4	-	-	V
		$I_O = -4.0\text{ mA}$; $V_{CC} = 3.0\text{ V}$	2.40	-	-	V
		$I_O = -8.0\text{ mA}$; $V_{CC} = 4.5\text{ V}$	3.70	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = 50\text{ }\mu\text{A}$; $V_{CC} = 2.0\text{ V}$	-	-	0.1	V
		$I_O = 50\text{ }\mu\text{A}$; $V_{CC} = 3.0\text{ V}$	-	-	0.1	V
		$I_O = 50\text{ }\mu\text{A}$; $V_{CC} = 4.5\text{ V}$	-	-	0.1	V
		$I_O = 4.0\text{ mA}$; $V_{CC} = 3.0\text{ V}$	-	-	0.55	V
		$I_O = 8.0\text{ mA}$; $V_{CC} = 4.5\text{ V}$	-	-	0.55	V
I_{LI}	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5\text{ V}$	-	-	2.0	μA
I_{OZ}	3-state output OFF-state current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5\text{ V}$	-	-	± 10.0	μA
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$; $V_{CC} = 5.5\text{ V}$	-	-	80	μA
C_I	input capacitance	$V_I = V_{CC}$ or GND	-	-	10	pF

Table 8: Static characteristics type 74AHCT04

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = 25\text{ }^\circ\text{C}$						
V_{IH}	HIGH-level input voltage	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$	2.0	-	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$	-	-	0.8	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = -50\text{ }\mu\text{A}$; $V_{CC} = 4.5\text{ V}$	4.4	4.5	-	V
		$I_O = -8.0\text{ mA}$; $V_{CC} = 4.5\text{ V}$	3.94	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = 50\text{ }\mu\text{A}$; $V_{CC} = 4.5\text{ V}$	-	0	0.1	V
		$I_O = 8.0\text{ mA}$; $V_{CC} = 4.5\text{ V}$	-	-	0.36	V
I_{LI}	input leakage current	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 5.5\text{ V}$	-	-	0.1	μA
I_{OZ}	3-state output OFF-state current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND per input pin; other inputs at V_{CC} or GND; $I_O = 0\text{ A}$; $V_{CC} = 5.5\text{ V}$	-	-	± 0.25	μA
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$; $V_{CC} = 5.5\text{ V}$	-	-	4.0	μA

Table 8: Static characteristics type 74AHCT04 ...continued

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
ΔI_{CC}	additional quiescent supply current per input pin	$V_I = V_{CC} - 2.1$ V and other inputs at V_{CC} or GND; $I_O = 0$ A; $V_{CC} = 4.5$ V to 5.5 V	-	-	1.35	mA
C_I	input capacitance	$V_I = V_{CC}$ or GND	-	3	10	pF
$T_{amb} = -40$ °C to $+85$ °C						
V_{IH}	HIGH-level input voltage	$V_{CC} = 4.5$ V to 5.5 V	2.0	-	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 4.5$ V to 5.5 V	-	-	0.8	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = -50$ μ A; $V_{CC} = 4.5$ V	4.4	-	-	V
		$I_O = -8.0$ mA; $V_{CC} = 4.5$ V	3.8	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = 50$ μ A; $V_{CC} = 4.5$ V	-	-	0.1	V
		$I_O = 8.0$ mA; $V_{CC} = 4.5$ V	-	-	0.44	V
I_{LI}	input leakage current	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 5.5$ V	-	-	1.0	μ A
I_{OZ}	3-state output OFF-state 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; $V_{CC} = 5.5$ V	-	-	± 2.5	μ A
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	40	μ A
ΔI_{CC}	additional quiescent supply current per input pin	$V_I = V_{CC} - 2.1$ V other inputs at V_{CC} or GND; $I_O = 0$ A; $V_{CC} = 4.5$ V to 5.5 V	-	-	1.5	mA
C_I	input capacitance	$V_I = V_{CC}$ or GND	-	-	10	pF
$T_{amb} = -40$ °C to $+125$ °C						
V_{IH}	HIGH-level input voltage	$V_{CC} = 4.5$ V to 5.5 V	2.0	-	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 4.5$ V to 5.5 V	-	-	0.8	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = -50$ μ A; $V_{CC} = 4.5$ V	4.4	-	-	V
		$I_O = -8.0$ mA; $V_{CC} = 4.5$ V	3.70	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = 50$ μ A; $V_{CC} = 4.5$ V	-	-	0.1	V
		$I_O = 8.0$ mA; $V_{CC} = 4.5$ V	-	-	0.55	V
I_{LI}	input leakage current	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 5.5$ V	-	-	2.0	μ A
I_{OZ}	3-state output OFF-state 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; $V_{CC} = 5.5$ V	-	-	± 10.0	μ A
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	80	μ A
ΔI_{CC}	additional quiescent supply current per input pin	$V_I = V_{CC} - 2.1$ V and other inputs at V_{CC} or GND; $I_O = 0$ A; $V_{CC} = 4.5$ V to 5.5 V	-	-	1.5	mA
C_I	input capacitance	$V_I = V_{CC}$ or GND	-	-	10	pF

11. Dynamic characteristics

Table 9: Dynamic characteristics type 74AHC04

$GND = 0\text{ V}$; $t_r = t_f \leq 3.0\text{ ns}$; for waveform see [Figure 6](#); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
T _{amb} = 25 °C							
t _{PHL} , t _{PLH}	propagation delay nA to nY	V _{CC} = 3.0 V to 3.6 V	[1]				
		C _L = 15 pF	-	4.0	8.5	ns	
		C _L = 50 pF	-	6.0	11.4	ns	
		V _{CC} = 4.5 V to 5.5 V	[2]				
		C _L = 15 pF	-	3.0	5.5	ns	
		C _L = 50 pF	-	4.5	7.5	ns	
C _{PD}	power dissipation capacitance	V _I = GND to V _{CC} ; C _L = 50 pF; f _i = 1 MHz	[3]	-	13.5	-	pF
T _{amb} = -40 °C to +85 °C							
t _{PHL} , t _{PLH}	propagation delay nA to nY	V _{CC} = 3.0 V to 3.6 V					
		C _L = 15 pF	1.0	-	10.5	ns	
		C _L = 50 pF	1.0	-	13	ns	
		V _{CC} = 4.5 V to 5.5 V					
		C _L = 15 pF	1.0	-	6.5	ns	
		C _L = 50 pF	1.0	-	8.5	ns	
T _{amb} = -40 °C to +125 °C							
t _{PHL} , t _{PLH}	propagation delay nA to nY	V _{CC} = 3.0 V to 3.6 V					
		C _L = 15 pF	1.0	-	11.0	ns	
		C _L = 50 pF	1.0	-	14.5	ns	
		V _{CC} = 4.5 V to 5.5 V					
		C _L = 15 pF	1.0	-	7.0	ns	
		C _L = 50 pF	1.0	-	9.5	ns	

[1] Typical values are measured at $V_{CC} = 3.3\text{ V}$.

[2] Typical values are measured at $V_{CC} = 5.0\text{ V}$.

[3] 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.

Table 10: Dynamic characteristics type 74AHCT04

$GND = 0\text{ V}$; $t_r = t_f \leq 3.0\text{ ns}$; for waveform see [Figure 6](#); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = 25\text{ °C}$						
t_{PHL}, t_{PLH}	propagation delay nA to nY	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	[1]			
		$C_L = 15\text{ pF}$	-	3.0	6.7	ns
		$C_L = 50\text{ pF}$	-	4.5	7.7	ns
C_{PD}	power dissipation capacitance	$V_I = GND\text{ to }V_{CC} - 1.5\text{ V}$; $C_L = 50\text{ pF}$; $f_i = 1\text{ MHz}$	[2]	13.9	-	pF
$T_{amb} = -40\text{ °C to }+85\text{ °C}$						
t_{PHL}, t_{PLH}	propagation delay nA to nY	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$				
		$C_L = 15\text{ pF}$	1.0	-	7.5	ns
		$C_L = 50\text{ pF}$	1.0	-	8.5	ns
$T_{amb} = -40\text{ °C to }+125\text{ °C}$						
t_{PHL}, t_{PLH}	propagation delay nA to nY	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$				
		$C_L = 15\text{ pF}$	1.0	-	8.5	ns
		$C_L = 50\text{ pF}$	1.0	-	10.0	ns

[1] Typical values are measured at $V_{CC} = 5.0\text{ V}$.

[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;

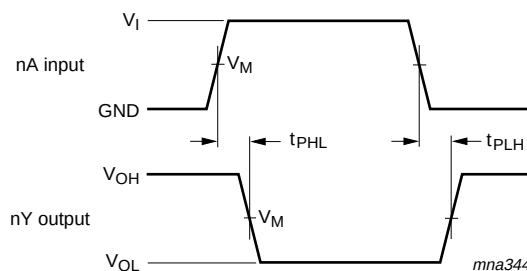
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

12. Waveforms



Measurement points are given in [Table 11](#).

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

Fig 6. The input (nA) to output (nY) propagation delay

Table 11: Measurement points

Type	Input	Output
	V_M	V_M
74AHC04	$0.5V_{CC}$	$0.5V_{CC}$
74AHCT04	1.5 V	$0.5V_{CC}$

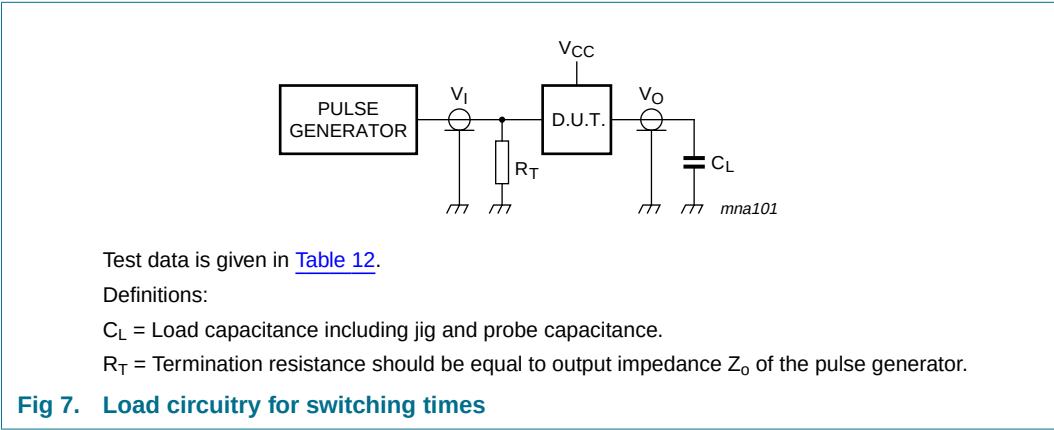


Table 12: Test data

Type	Input		Load
	V_I	t_r, t_f	C_L
74AHC04	V_{CC}	$\leq 3.0 \text{ ns}$	15 pF or 50 pF
74AHCT04	3.0 V	$\leq 3.0 \text{ ns}$	15 pF or 50 pF

13. Package outline

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

SOT108-1

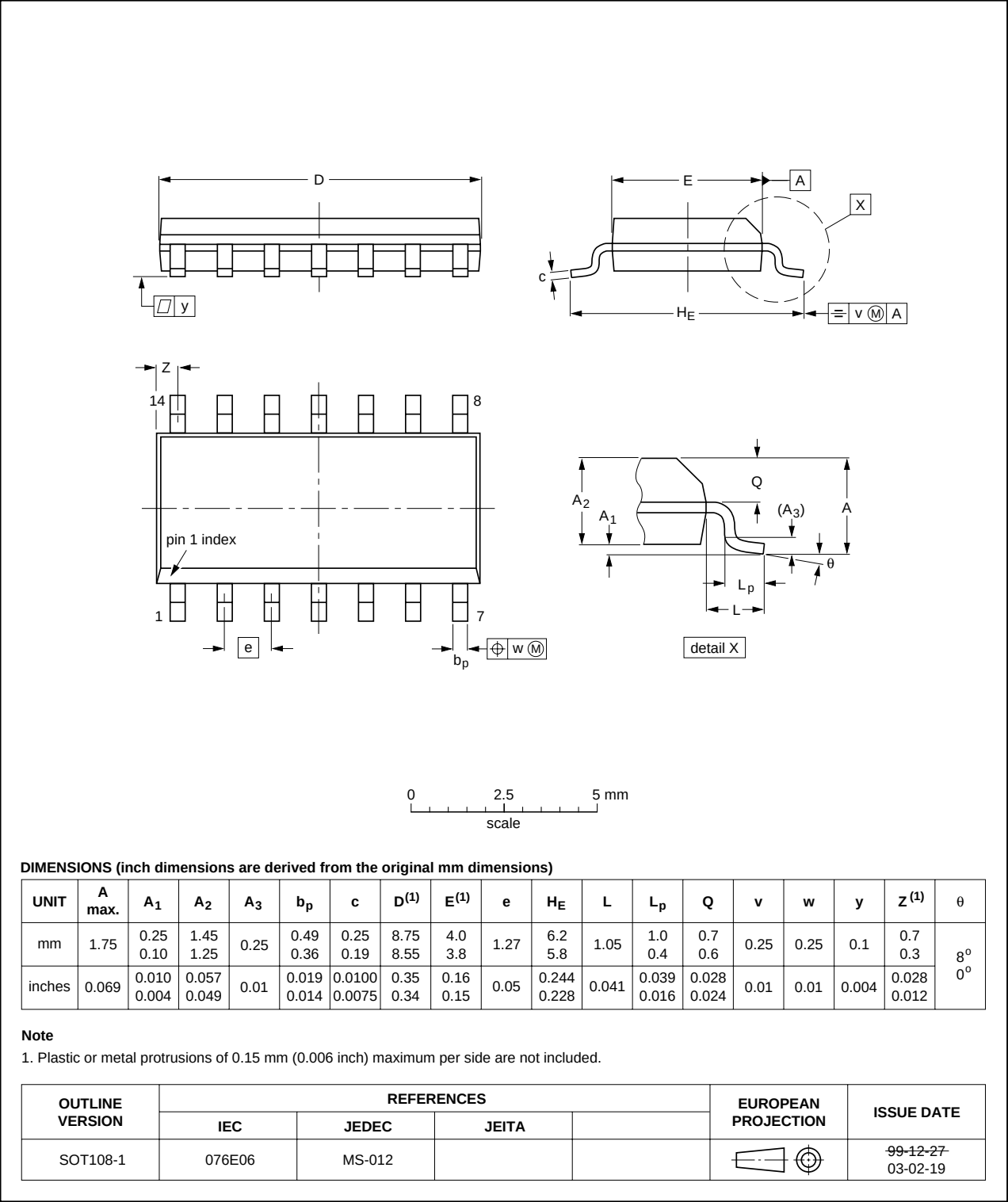
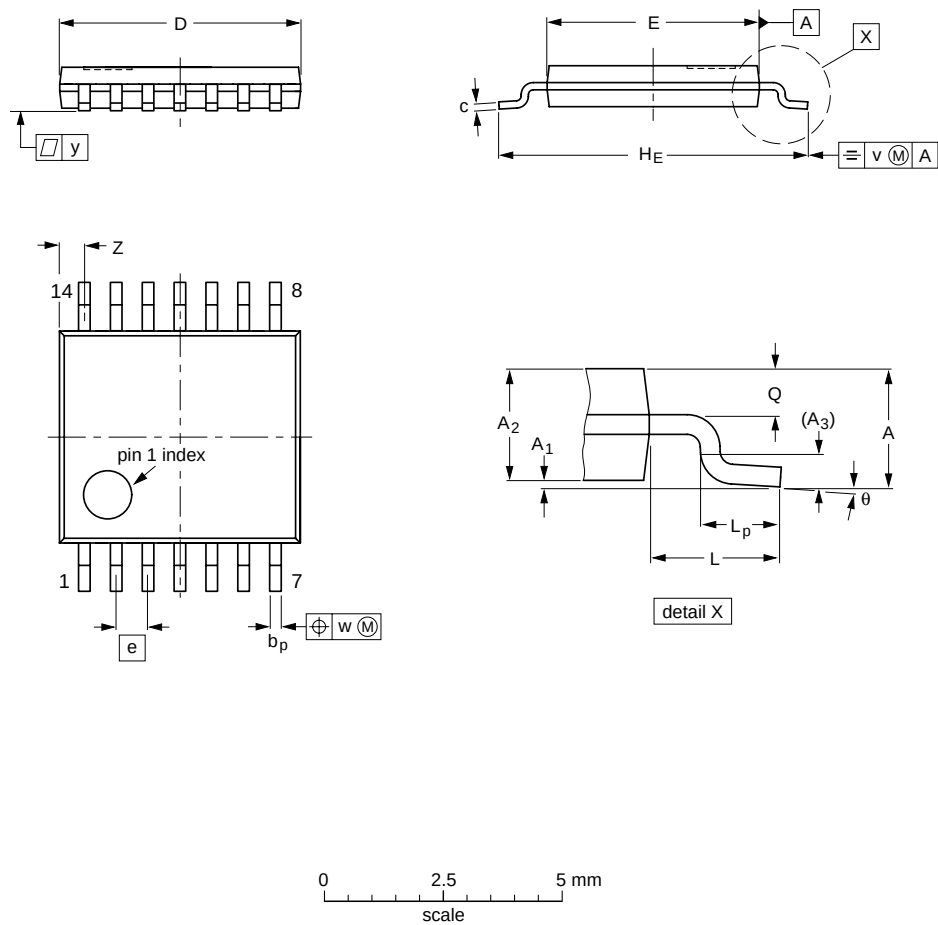


Fig 8. Package outline SOT108-1 (SO14)

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 9. 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

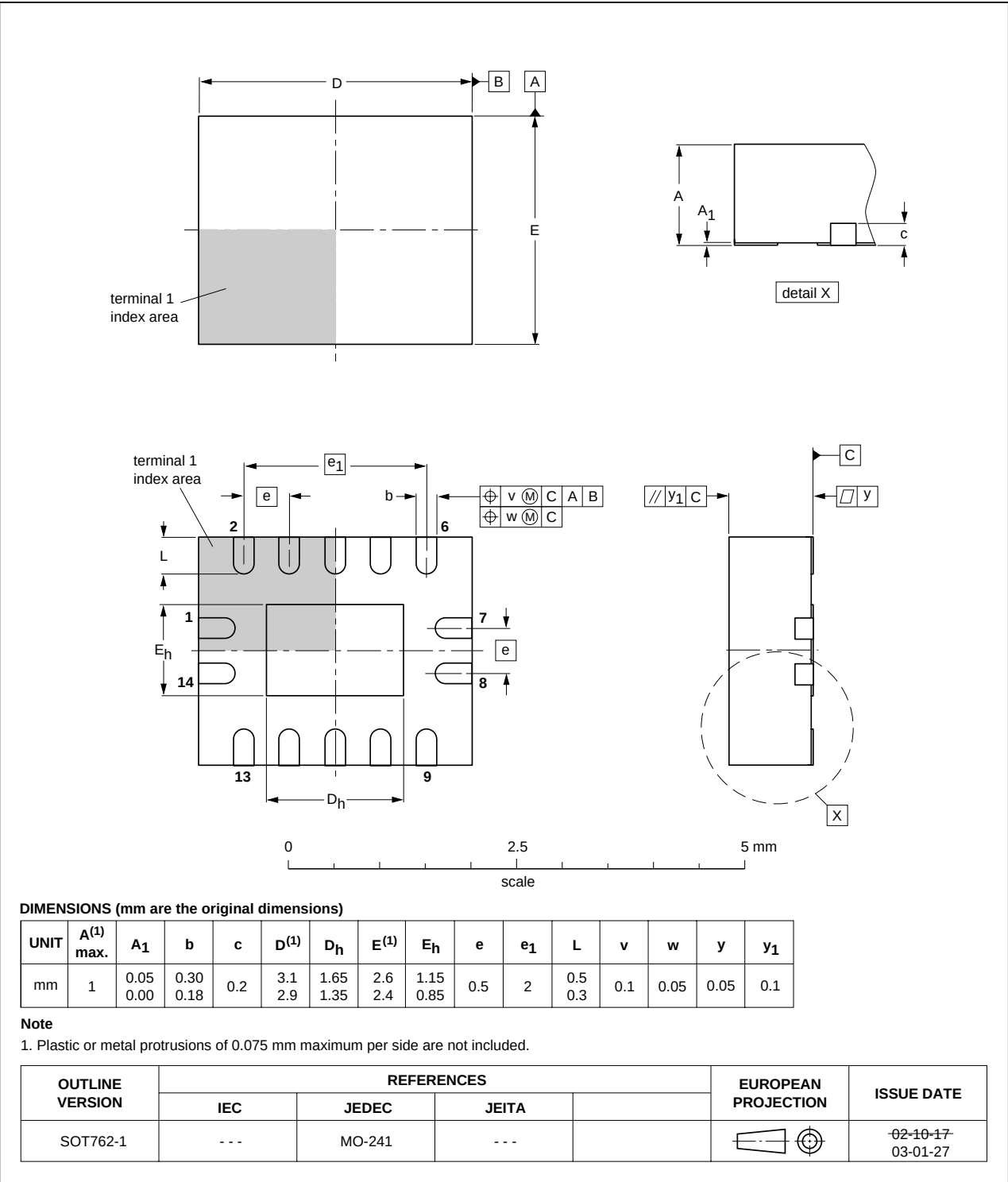


Fig 10. Package outline SOT762-1 (DHVQFN14)

14. Revision history

Table 13: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
74AHC_AHCT04_3	20050207	Product data sheet	-	9397 750 14503	74AHC_AHCT04_2
Modifications:					
- The format of this data sheet is redesigned to comply with the current presentation and information standard of Philips Semiconductors. - Added: type numbers 74AHC04BQ and 74AHCT04BQ (DHSVQFN14 package).					
74AHC_AHCT04_2	19990927	Product specification	-	9397 750 06286	74AHC_AHCT04_1
74AHC_AHCT04_1	19990225	Product specification	-	9397 750 05326	-

15. Data sheet status

Level	Data sheet status ^[1]	Product status ^{[2] [3]}	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

16. Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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