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 °C to +85 °C and from –40 °C to +125 °C

3. Quick reference data

Table 1: Quick reference data

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Type 74AHC04							
t_{PHL}, t_{PLH}	propagation delay nA to nY	C_L = 15 pF; V_{CC} = 5 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 pF; f_i = 1 MHz	[1]	-	13.5	-	pF
Type 74AHCT04							
t_{PHL}, t_{PLH}	propagation delay nA to nY	C_L = 15 pF; V_{CC} = 5 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 V; C_L = 50 pF; f_i = 1 MHz	[1]	-	13.9	-	pF

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

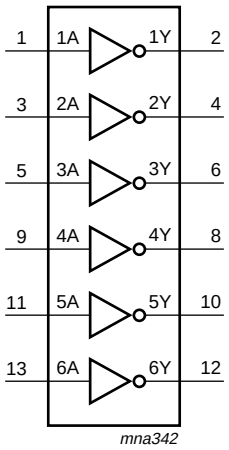


Fig 1. Logic symbol

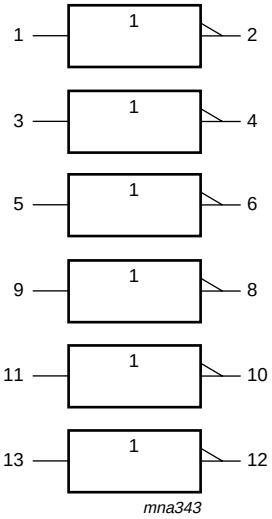


Fig 2. IEC logic symbol

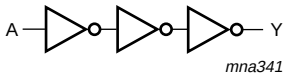


Fig 3. Logic diagram (one inverter)

6. Pinning information

6.1 Pinning

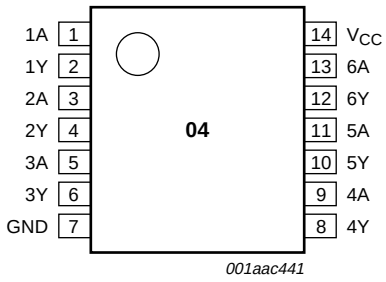
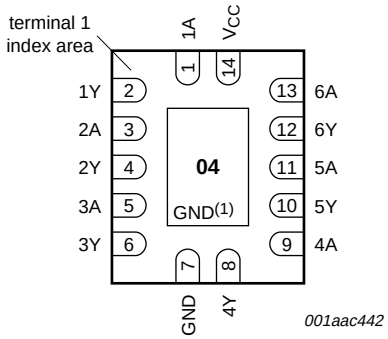


Fig 4. Pin configuration SO14 and TSSOP14



Transparent top view

(1) The die substrate is attached to the exposed die pad using conductive die attach material. It can not be used as a supply pin or input.

Fig 5. Pin configuration DHVQFN14

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	$–0.5 \text{ V} < V_O < V_{CC} + 0.5$ 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 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	-	-	V
		V_{CC} = 3.0 V	2.1	-	-	V
		V_{CC} = 5.5 V	3.85	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	-	0.5	V
		V_{CC} = 3.0 V	-	-	0.9	V
		V_{CC} = 5.5 V	-	-	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	-	V
		I_O = –50 µA; V_{CC} = 3.0 V	2.9	3.0	-	V
		I_O = –50 µA; V_{CC} = 4.5 V	4.4	4.5	-	V
		I_O = –4.0 mA; V_{CC} = 3.0 V	2.58	-	-	V
		I_O = –8.0 mA; V_{CC} = 4.5 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 µA; V_{CC} = 2.0 V	-	0	0.1	V
		I_O = 50 µA; V_{CC} = 3.0 V	-	0	0.1	V
		I_O = 50 µA; V_{CC} = 4.5 V	-	0	0.1	V
		I_O = 4.0 mA; V_{CC} = 3.0 V	-	-	0.36	V
		I_O = 8.0 mA; V_{CC} = 4.5 V	-	-	0.36	V
I_{LI}	input leakage current	$V_I = V_{CC}$ or GND; V_{CC} = 5.5 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 V	-	-	±0.25	µA
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	4.0	µA
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} = 2.0 V	1.5	-	-	V
		V_{CC} = 3.0 V	2.1	-	-	V
		V_{CC} = 5.5 V	3.85	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	-	0.5	V
		V_{CC} = 3.0 V	-	-	0.9	V
		V_{CC} = 5.5 V	-	-	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	-	-	V
		I_O = −50 µA; V_{CC} = 3.0 V	2.9	-	-	V
		I_O = −50 µA; V_{CC} = 4.5 V	4.4	-	-	V
		I_O = −4.0 mA; V_{CC} = 3.0 V	2.48	-	-	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 µA; V_{CC} = 2.0 V	-	-	0.1	V
		I_O = 50 µA; V_{CC} = 3.0 V	-	-	0.1	V
		I_O = 50 µA; V_{CC} = 4.5 V	-	-	0.1	V
		I_O = 4.0 mA; V_{CC} = 3.0 V	-	-	0.44	V
		I_O = 8.0 mA; V_{CC} = 4.5 V	-	-	0.44	V
I_{LI}	input leakage current	$V_I = V_{CC}$ or GND; V_{CC} = 5.5 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 V	-	-	±2.5	µA
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	40	µA
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} = 2.0 V	1.5	-	-	V
		V_{CC} = 3.0 V	2.1	-	-	V
		V_{CC} = 5.5 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 V	-	-	0.5	V
		V_{CC} = 3.0 V	-	-	0.9	V
		V_{CC} = 5.5 V	-	-	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	-	-	V
		I_O = –50 μA; V_{CC} = 3.0 V	2.9	-	-	V
		I_O = –50 μA; V_{CC} = 4.5 V	4.4	-	-	V
		I_O = –4.0 mA; V_{CC} = 3.0 V	2.40	-	-	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 μA; V_{CC} = 2.0 V	-	-	0.1	V
		I_O = 50 μA; V_{CC} = 3.0 V	-	-	0.1	V
		I_O = 50 μA; V_{CC} = 4.5 V	-	-	0.1	V
		I_O = 4.0 mA; V_{CC} = 3.0 V	-	-	0.55	V
		I_O = 8.0 mA; V_{CC} = 4.5 V	-	-	0.55	V
I_{LI}	input leakage current	$V_I = V_{CC}$ or GND; V_{CC} = 5.5 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 V	-	-	±10.0	μA
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 5.5 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 °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 μA; V_{CC} = 4.5 V	4.4	4.5	-	V
		I_O = –8.0 mA; V_{CC} = 4.5 V	3.94	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_O = 50 μA; V_{CC} = 4.5 V	-	0	0.1	V
		I_O = 8.0 mA; V_{CC} = 4.5 V	-	-	0.36	V
I_{LI}	input leakage current	$V_I = V_{IH}$ or V_{IL}; V_{CC} = 5.5 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 A; V_{CC} = 5.5 V	-	-	±0.25	μA
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 5.5 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}				
		$I_O = -50$ µA; $V_{CC} = 4.5$ 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}				
		$I_O = 50$ µA; $V_{CC} = 4.5$ 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	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; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	±2.5	µA
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	40	µA
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}				
		$I_O = -50$ µA; $V_{CC} = 4.5$ 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}				
		$I_O = 50$ µA; $V_{CC} = 4.5$ 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	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; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	±10.0	µA
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	80	µA
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 V; $t_r = t_f \leq 3.0$ 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 V.

[2] Typical values are measured at V_{CC} = 5.0 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

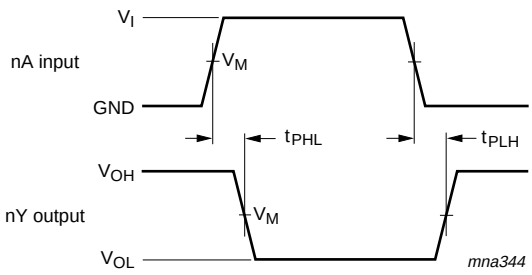
GND = 0 V; $t_r = t_f \leq 3.0$ ns; for waveform see Figure 6; for test circuit see Figure 7.

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

[1] Typical values are measured at V_{CC} = 5.0 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



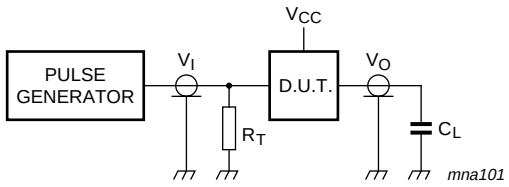
Measurement points are given in Table 11.

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	$0.5V_{CC}$



Test data is given in Table 12.

Definitions:

C_L = Load capacitance including jig and probe capacitance.

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

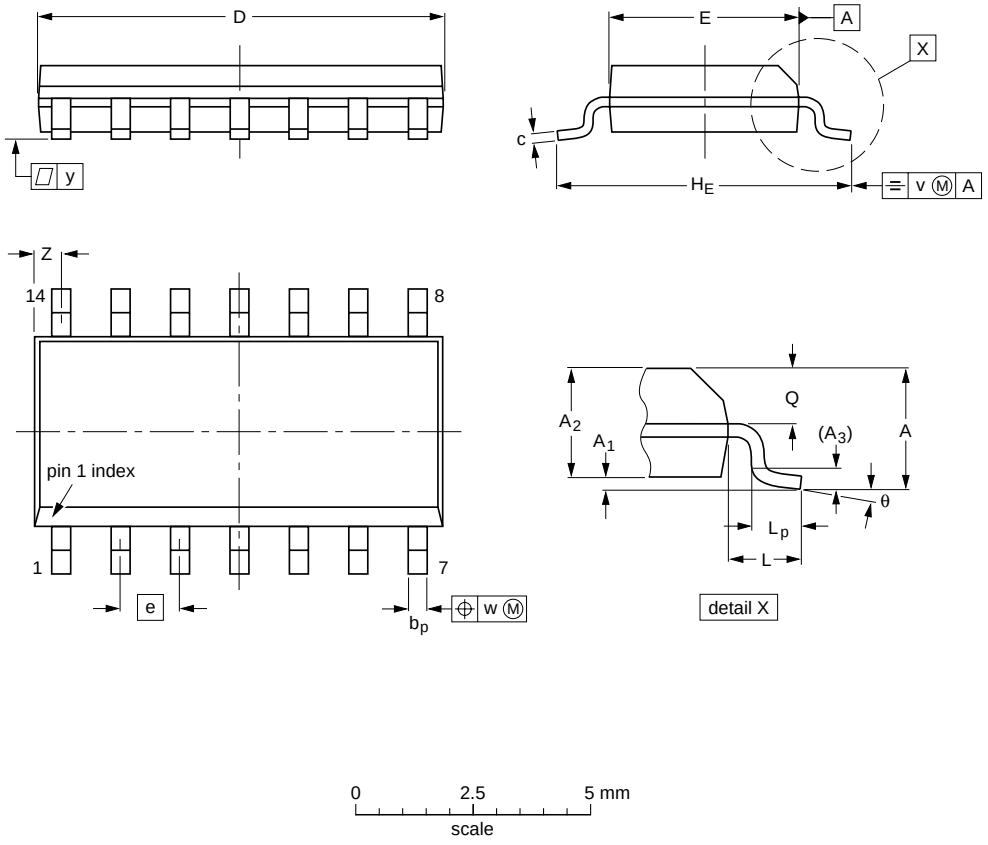
Fig 7. Load circuitry for switching times

Table 12: Test data

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

13. 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	

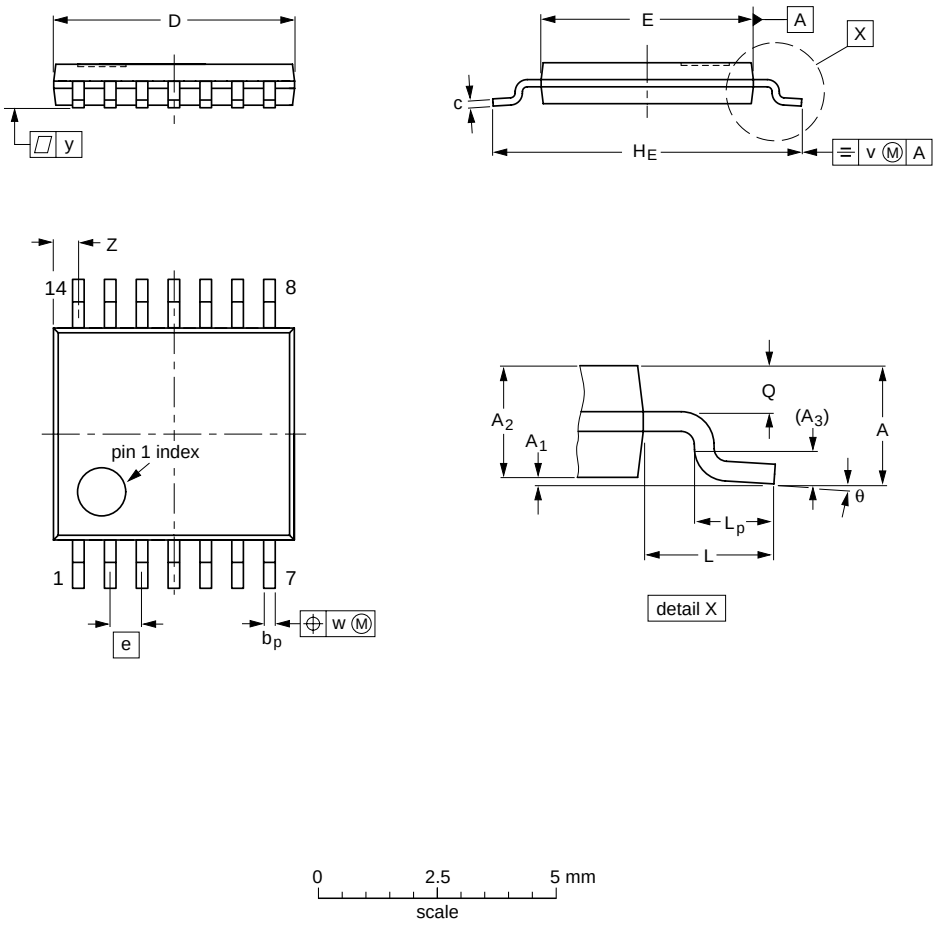
Note

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 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^o 0^o

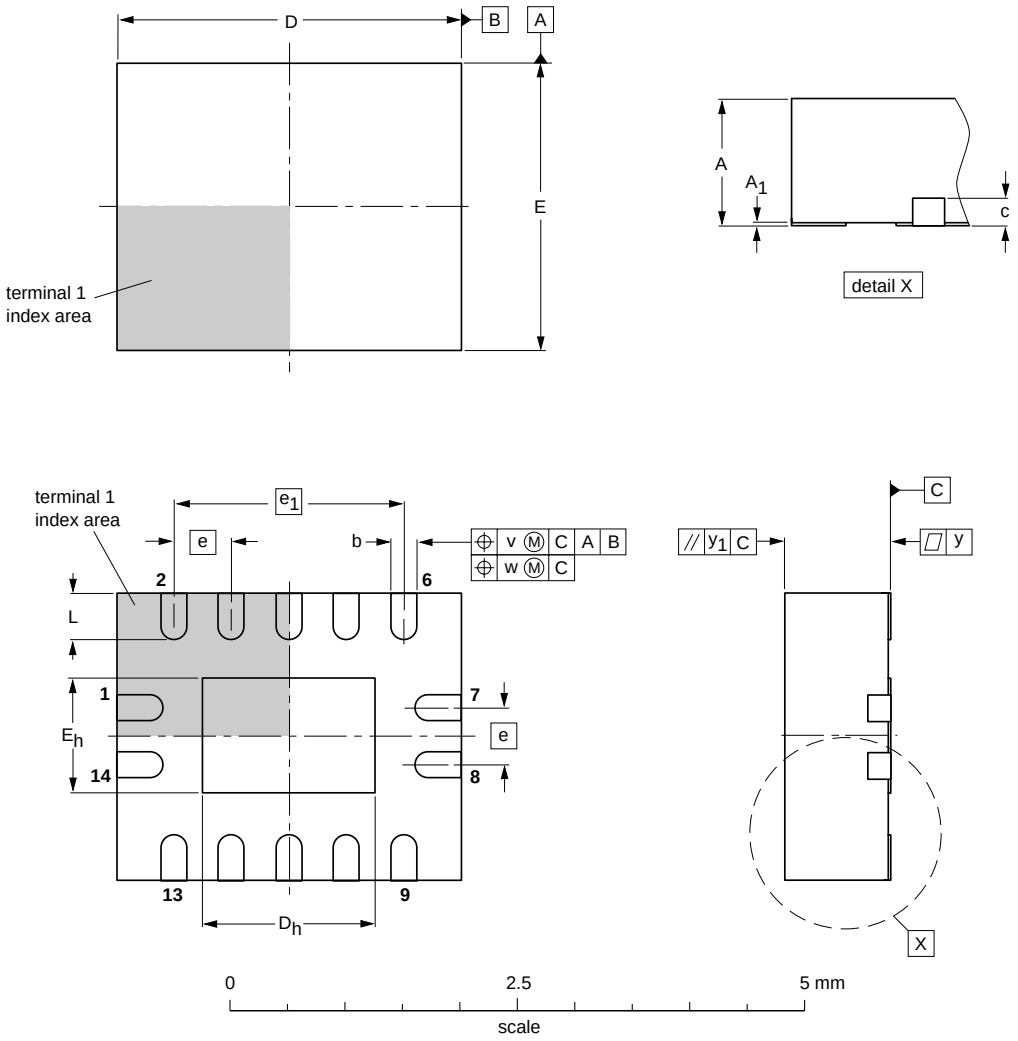
Notes

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 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**



DIMENSIONS (mm are the original dimensions)

UNIT	$A^{(1)}$ max.	A_1	b	c	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	L	v	w	y	y_1
mm	1	0.05 0.00	0.30 0.18	0.2	3.1 2.9	1.65 1.35	2.6 2.4	1.15 0.85	0.5	2	0.5 0.3	0.1	0.05	0.05	0.1

Note

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT762-1	- - -	MO-241	- - -			~~02-10-17~~ 03-01-27

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 (DHVQFN14 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.

Application information — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

17. Disclaimers

Life support — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

Right to make changes — Philips Semiconductors reserves the right to make changes in the products - including circuits, standard cells, and/or software - described or contained herein in order to improve design and/or performance. When the product is in full production (status ‘Production’), relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

18. Contact information

For additional information, please visit: **http://www.semiconductors.philips.com**

For sales office addresses, send an email to: **sales.addresses@www.semiconductors.philips.com**

19. Contents

Date of release: 7 February 2005
Document number: 9397 750 14503

Published in The Netherlands