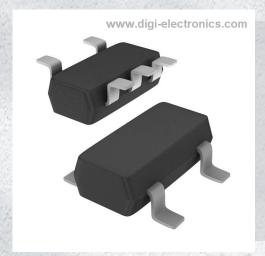


74AHC1GU04GV,125 Datasheet



https://www.DiGi-Electronics.com

DiGi Electronics Part Number 74AHC1GU04GV,125-DG

Manufacturer Nexperia USA Inc.

Manufacturer Product Number 74AHC1GU04GV,125

Description IC INVERTER 1CH 1-INP SC74A

Detailed Description Inverter IC 1 Channel SC-74A



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

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Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
74AHC1GU04GV,125	Nexperia USA Inc.
Series:	Product Status:
74AHC	Active
Logic Type:	Number of Circuits:
Inverter	1
Number of Inputs:	Features:
1	
Voltage - Supply:	Current - Quiescent (Max):
2V ~ 5.5V	1 μΑ
Current - Output High, Low:	Input Logic Level - Low:
8mA, 8mA	0.3V ~ 1.1V
Input Logic Level - High:	Max Propagation Delay @ V, Max CL:
1.7V ~ 4.4V	7ns @ 5V, 50pF
Operating Temperature:	Mounting Type:
-40°C ~ 125°C	Surface Mount
Supplier Device Package:	Package / Case:
SC-74A	SC-74A, SOT-753
Base Product Number:	
74AHC1GU04	

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8542.39.0001	

74AHC1GU04

Unbuffered inverter Rev. 7 — 6 September 2023

Product data sheet

1. General description

The 74AHC1GU04 is a single unbuffered inverter. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

2. Features and benefits

- Wide supply voltage range from 2.0 to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- · High noise immunity
- CMOS low power dissipation
- · Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- · Symmetrical output impedance
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Specified from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package								
	Temperature range	Name	Version						
74AHC1GU04GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1					
74AHC1GU04GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	<u>SOT753</u>					

4. Marking

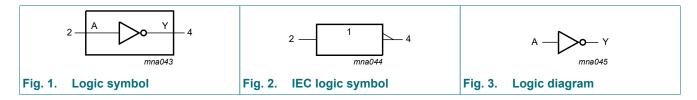
Table 2. Marking codes

Type number	Marking [1]			
74AHC1GU04GW	AD			
74AHC1GU04GV	AU4			

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

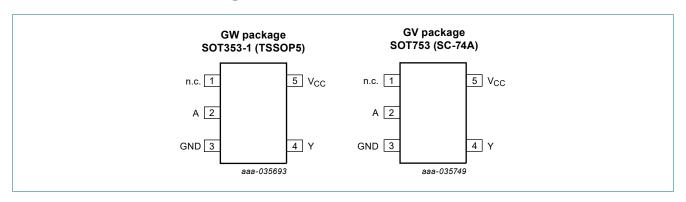


5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
n.c.	1	not connected
A	2	data input
GND	3	ground (0 V)
Υ	4	data output
V _{CC}	5	supply voltage

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level

Input	Output
A	Υ
L	Н
Н	L

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		-0.5	+7.0	V
I _{IK}	input clamping current	V _I < -0.5 V	-20	-	mA
VI	input voltage	[1]	-0.5	+7.0	V
I _{OK}	output clamping current	$V_{O} < -0.5 \text{ V or } V_{O} > V_{CC} + 0.5 \text{ V}$	-	±20	mA
I _O	output current	-0.5 V < V _O < V _{CC} + 0.5 V	-	±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]	-	250	mW

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

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V _{CC}	supply voltage		2.0	5.0	5.5	V
VI	input voltage		0	-	5.5	V
Vo	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 3.3 V ± 0.3 V	-	-	100	ns/V
		V _{CC} = 5.0 V ± 0.5 V	-	-	20	ns/V

10. Static characteristics

Table 7. Static characteristics

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	Тур	Max	Min	Max	Min	Max	
V _{IH}	HIGH-level	V _{CC} = 2.0 V	1.7	-	-	1.7	-	1.7	-	V
	input voltage	V _{CC} = 3.0 V	2.4	-	-	2.4	-	2.4	-	V
		V _{CC} = 5.5 V	4.4	-	-	4.4	-	4.4	-	V
V_{IL}	V _{IL} LOW-level input voltage	V _{CC} = 2.0V	-	-	0.3	-	0.3	-	0.3	V
		V _{CC} = 3.0 V	-	-	0.6	-	0.6	-	0.6	V
		V _{CC} = 5.5 V	-	-	1.1	-	1.1	-	1.1	V

^[2] For SOT353-1 (TSSOP5) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C. For SOT753 (SC-74A) package: P_{tot} derates linearly with 3.8 mW/K above 85 °C.

74AHC1GU04

Unbuffered inverter

Symbol Parameter		Conditions		25 °C		-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
V _{OH}	HIGH-level	V _I = V _{IH} or V _{IL}								
	output voltage	$I_O = -50 \mu A; V_{CC} = 2.0 V$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_O = -50 \mu A; V_{CC} = 3.0 V$	2.9	3.0	-	2.9	-	2.9	-	V
		I_{O} = -50 μ A; V_{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		$I_O = -4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.58	-	-	2.48	-	2.40	-	V
		I_{O} = -8.0 mA; V_{CC} = 4.5 V	3.94	-	-	3.8	-	3.70	-	V
V _{OL}	LOW-level	V _I = V _{IH} or V _{IL}								
	output voltage	$I_O = 50 \mu A; V_{CC} = 2.0 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A; V_{CC} = 3.0 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A; V_{CC} = 4.5 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
		$I_O = 8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	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	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	10	-	40	μΑ
Cı	input capacitance		-	1.5	10	-	10	-	10	pF

11. Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V; $t_r = t_f = \le 3.0$ ns. For test circuit see Fig. 5.

Symbol	Parameter	Conditions	25 °C		-40 °C to +85 °C		-40 °C to +125 °C		Unit	
			Min	Тур	Max	Min	Max	Min	Max	
t _{pd}	propagation	A to Y; see <u>Fig. 4</u> [1]								
	delay	V _{CC} = 3.0 V to 3.6 V [2]								
		C _L = 15 pF	-	3.4	7.1	1.0	8.5	1.0	10.0	ns
		C _L = 50 pF	-	4.9	10.6	1.0	12.0	1.0	13.5	ns
		V _{CC} = 4.5 V to 5.5 V [3]								
		C _L = 15 pF	-	2.6	5.5	1.0	6.0	1.0	7.0	ns
		C _L = 50 pF	-	3.6	7.0	1.0	8.0	1.0	9.0	ns
C _{PD}	power dissipation capacitance	per buffer; V _I = GND to V _{CC} [4]	-	14	-	-	-	-	-	pF

- [4] C_{PD} is used to determine the dynamic power dissipation P_D (μ W). $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:

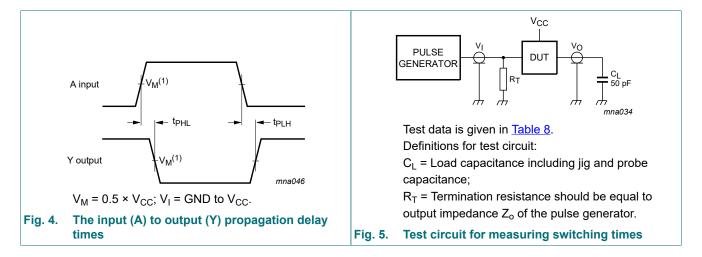
 f_i = input frequency in MHz;

f_o = output frequency in MHz;

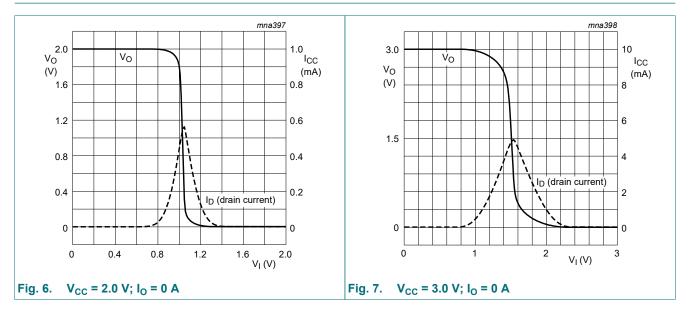
C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volts.

11.1. Waveform and test circuit



12. Typical transfer characteristics



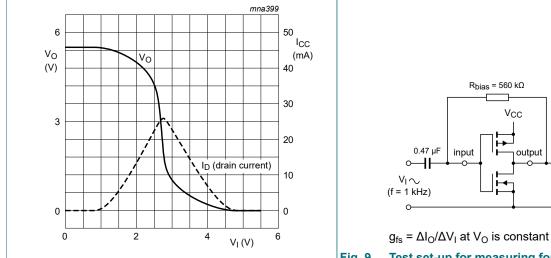
Nexperia

74AHC1GU04

Unbuffered inverter

GND

mna050



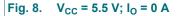
Test set-up for measuring forward Fig. 9. transconductance

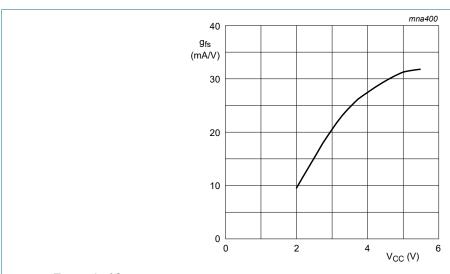
 $R_{bias} = 560 \text{ k}\Omega$

Vcc

output

100 μF





 T_{amb} = 25 °C

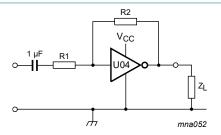
Fig. 10. Typical forward transconductance (g_{fs}) as a function of the supply voltage

13. Application information

Some applications are:

- Linear amplifier (see Fig. 11)
- In crystal oscillator design (see Fig. 12)

Remark: All values given are typical unless otherwise specified.



Maximum $V_{o(p-p)} = V_{CC} - 1.5 \text{ V}$ centered at $0.5 \times V_{CC}$.

$$G_V = -\frac{G_{\text{Ol}}}{1 + \frac{R1}{R2}(1 + G_{\text{Ol}})}$$
 where:

Gol = open loop gain;

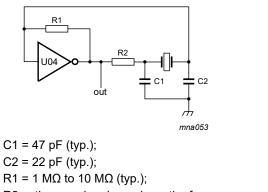
 G_v = voltage gain;

 $R1 \ge 3 \text{ k}\Omega$, $R2 \le 1 \text{ M}\Omega$;

 $Z_L > 10 \text{ k}\Omega; G_{ol} = 20 \text{ (typ.)};$

Typical unity gain bandwidth product is 5 MHz.

Fig. 11. Used as a linear amplifier



C2 = 22 pF (typ.);

R1 = 1 M Ω to 10 M Ω (typ.);

R2 optimum value depends on the frequency and required stability against changes in V_{CC} or average minimum I_{CC}.

 I_{CC} is typically 2 mA at V_{CC} = 3 V and f = 1 MHz.

Fig. 12. Crystal oscillator configuration

Table 9. External components for resonator (f < 1 MHz)

All values given are typical and must be used as an initial set-up.

Frequency	R1	R2	C1	C2
10 kHz to 15.9 kHz	22 ΜΩ	220 kΩ	56 pF	20 pF
16 kHz to 24.9 kHz	22 ΜΩ	220 kΩ	56 pF	10 pF
25 kHz to 54.9 kHz	22 ΜΩ	100 kΩ	56 pF	10 pF
55 kHz to 129.9 kHz	22 ΜΩ	100 kΩ	47 pF	5 pF
130 kHz to 199.9 kHz	22 ΜΩ	47 kΩ	47 pF	5 pF
200 kHz to 349.9 kHz	22 ΜΩ	47 kΩ	47 pF	5 pF
350 kHz to 600 kHz	22 ΜΩ	47 kΩ	47 pF	5 pF

Table 10. Optimum value for R2

Frequency	R2	Optimum for		
3 kHz	2.0 kΩ	minimum required I _{CC}		
	8.0 kΩ	minimum influence due to change in V _{CC}		
6 kHz	1.0 kΩ	minimum required I _{CC}		
	4.7 kΩ	minimum influence by V _{CC}		
10 kHz	0.5 kΩ	minimum required I _{CC}		
	2.0 kΩ	minimum influence by V _{CC}		
14 kHz	0.5 kΩ	minimum required I _{CC}		
	1.0 kΩ	minimum influence by V _{CC}		
>14 kHz	-	replace R2 by C3 with a typical value of 35 pF		

14. Package outline

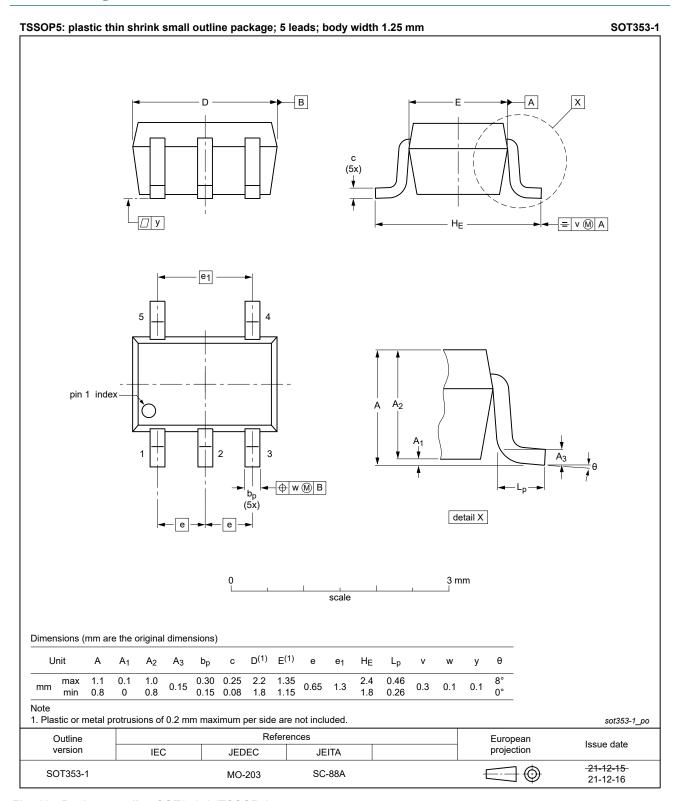


Fig. 13. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads **SOT753** Α HE = v M A 5 Q 2 3 detail X ⊕ w M B 2 mm scale **DIMENSIONS** (mm are the original dimensions) $^{\rm H}{\rm E}$ UNIT Q Α1 bp С Ε е L_p w У 1.1 0.100 0.40 0.26 3.1 1.7 3.0 0.6 0.33 mm 0.95 0.2 0.2 0.1 0.9 0.013 0.10 2.7 1.3 2.5 0.23 0.2 REFERENCES OUTLINE VERSION **EUROPEAN ISSUE DATE** PROJECTION IEC **JEDEC** JEITA 02-04-16 $\bigoplus \bigoplus$

Fig. 14. Package outline SOT753 (SC-74A)

SOT753

SC-74A

06-03-16

15. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model

16. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74AHC1GU04 v.7	20230906	Product data sheet	-	74AHC1GU04 v.6	
Modifications:	 Title corrected (errata). Section 2: ESD specification updated according to the latest JEDEC standard. 				
74AHC1GU04 v.6	20220112	Product data sheet	-	74AHC1GU04 v.5	
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 and Section 2 updated. Fig. 13: Package outline drawing for SOT353-1 (TSSOP5) has changed. Table 5: Derating values for Ptot total power dissipation updated. 				
74AHC1GU04 v.5	20070710	Product data sheet	-	74AHC1GU04 v.4	
Modifications:	 The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. Legal texts have been adapted to the new company name where appropriate. Package SOT353 changed to SOT353-1 in Section 3 and Section 14. Quick reference data and Soldering sections removed. 				
74AHC1GU04 v.4	20020528	Product specification	-	74AHC1GU04 v.3	
74AHC1GU04 v.3	20020215	Product specification	-	74AHC1GU04 v.2	
74AHC1GU04 v.2	20010427	Product specification	-	74AHC1GU04 v.1	
74AHC1GU04 v.1	19990519	Product specification	-	-	

17. 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.

- Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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