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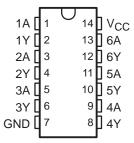
# www.Jameco.com + 1-800-831-4242

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Jameco Part Number 1014789

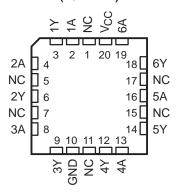
- Wide Operating Voltage Range of 2 V to 6 V
- Outputs Can Drive Up To 10 LSTTL Loads
- Low Power Consumption, 20-μA Max I<sub>CC</sub>

SN54HCU04 . . . J OR W PACKAGE SN74HCU04 . . . D, DB, N, NS, OR PW PACKAGE (TOP VIEW)



- Typical t<sub>pd</sub> = 7 ns
- ±4-mA Output Drive at 5 V
- Low Input Current of 1 μA Max
- Unbuffered Outputs

SN54HCU04 . . . FK PACKAGE (TOP VIEW)



NC - No internal connection

## description/ordering information

The 'HCU04 devices contain six independent inverters. They perform the Boolean function  $Y = \overline{A}$  in positive logic.

#### **ORDERING INFORMATION**

TA	PACKA	GE <sup>†</sup>	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	PDIP – N	Tube of 25	SN74HCU04N	SN74HCU04N
		Tube of 50	SN74HCU04D	
	SOIC - D	Reel of 2500	SN74HCU04DR	HCU04
–40°C to 85°C		Reel of 250	SN74HCU04DT	
	SOP - NS	Reel of 2000	SN74HCU04NSR	HCU04
	SSOP - DB	Reel of 2000	SN74HCU04DBR	HU04
		Reel of 90	SN74HCU04PW	
	TSSOP - PW	Reel of 2000	SN74HCU04PWR	HCU04
		Reel of 250	SN74HCU04PWT	
	CDIP – J	Tube of 25	SNJ54HCU04J	SNJ54HCU04J
−55°C to 125°C	CFP – W	Tube of 150	SNJ54HCU04W	SNJ54HCU04W
	LCCC – FK	Tube of 55	SNJ54HCU04FK	SNJ54HCU04FK

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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#### **FUNCTION TABLE** (each inverter)

INPUT A	OUTPUT Y
Н	L
L	Н

## logic diagram (positive logic)



# absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage range, V <sub>CC</sub>	–0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see N	ote 1) ±20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (s	ee Note 1) ±20 mA
Continuous output current, $I_O(V_O = 0 \text{ to } V_{CC})$	±25 mA
Continuous current through V <sub>CC</sub> or GND	±50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): D	package 86°C/W
DE	B package 96°C/W
N	package 80°C/W
NS	S package 76°C/W
PV	V package 113°C/W
Storage temperature range, T <sub>stg</sub>	65°C to 150°C

<sup>†</sup> Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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

2. The package thermal impedance is calculated in accordance with JESD 51-7.

#### recommended operating conditions (see Note 3)

			SI	SN54HCU04			SN74HCU04			
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT	
VCC	Supply voltage		2	5	6	2	5	6	V	
		V <sub>CC</sub> = 2 V	1.7			1.7				
V <sub>IH</sub> High-level input voltage	V <sub>CC</sub> = 4.5 V	3.6			3.6			V		
		VCC = 6 V	4.8			4.8				
		V <sub>CC</sub> = 2 V			0.5			0.5		
VIL	Low-level input voltage	V <sub>CC</sub> = 4.5 V			1.35			1.35	V	
		VCC = 6 V			1.8			1.8		
٧ <sub>I</sub>	Input voltage		0		VCC	0		VCC	V	
VO	Output voltage	_	0		VCC	0		VCC	V	
TA	Operating free-air temperature		-55		125	-40		85	°C	

NOTE 3: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, Implications of Slow or Floating CMOS Inputs, literature number SCBA004.



# electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

24244555	TEST CONDITIONS		.,	T,	4 = 25°C	;	SN54H	CU04	SN74H	CU04	LINIT
PARAMETER	TEST CON	DITIONS	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT
			2 V	1.8			1.8		1.8		
VOH		I <sub>OH</sub> = -20 μA	4.5 V	4			4		4		
	$V_I = V_{CC}$ or GND		6 V	5.5			5.5		5.5		V
		$I_{OH} = -4 \text{ mA}$	4.5 V	3.98			3.7		3.84		
		$I_{OH} = -5.2 \text{ mA}$	6 V	5.48			5.2		5.34		
		l <sub>OL</sub> = 20 μA	2 V			0.2		0.2		0.2	
			4.5 V			0.5		0.5		0.5	
VOL	$V_I = V_{CC}$ or GND		6 V			0.5		0.5		0.5	V
		$I_{OL} = 4 \text{ mA}$	4.5 V			0.26		0.4		0.33	
		I <sub>OL</sub> = 5.2 mA	6 V			0.26		0.4		0.33	
lį	$V_I = V_{CC}$ or 0	·	6 V			±100		±1000		±1000	nA
Icc	$V_I = V_{CC}$ or 0,	IO = 0	6 V			2		40		20	μΑ
C <sub>i</sub>			2 V to 6 V		3	10		10		10	pF

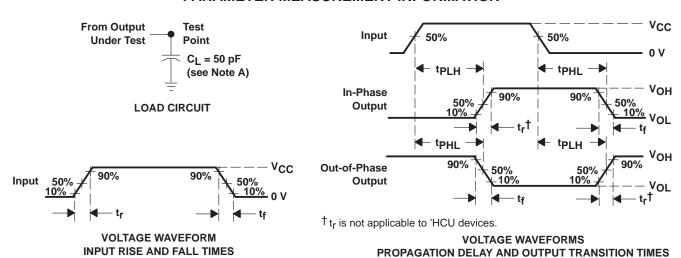
# switching characteristics over recommended operating free-air temperature range, $C_L$ = 50 pF (unless otherwise noted) (see Figure 1)

DADAMETED	FROM	то	.,	T <sub>A</sub> = 25°C			SN54HCU04		SN74HCU04		LINUT
PARAMETER	(INPUT)	(OUTPUT)	vcc	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT
	t <sub>pd</sub> A Y		2 V		40	80		120		100	
<sup>t</sup> pd		Y	4.5 V		8	16		24		20	ns
·			6 V		7	14		20		17	
			2 V		38	75		110		95	
t <sub>f</sub>		Υ	4.5 V		8	15		22		19	ns
			6 V		6	13		19		16	

# operating characteristics, $T_A = 25^{\circ}C$

	PARAMETER	TEST CONDITIONS	TYP	UNIT
C <sub>pd</sub>	Power dissipation capacitance per inverter	No load	20	pF

## PARAMETER MEASUREMENT INFORMATION



NOTES: A. C<sub>I</sub> includes probe and test-fixture capacitance.

- B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  1 MHz,  $Z_O = 50 \ \Omega$ ,  $t_f = 6 \ ns$ ,  $t_f = 6 \ ns$ .
- C. The outputs are measured one at a time, with one input transition per measurement.
- D.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 1. Load Circuit and Voltage Waveforms

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4-Jun-2007

# **PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
86010012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
8601001CA	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
SN54HCU04J	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
SN74HCU04D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04DBR	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04DBRE4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04DBRG4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04DT	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04DTE4	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04DTG4	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74HCU04N3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI
SN74HCU04NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74HCU04NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04NSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04NSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04PW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04PWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04PWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04PWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04PWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04PWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS &	CU NIPDAU	Level-1-260C-UNLIM



#### PACKAGE OPTION ADDENDUM

4-Jun-2007

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
						no Sb/Br)		
SN74HCU04PWT	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04PWTE4	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HCU04PWTG4	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SNJ54HCU04FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ54HCU04J	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

**Pb-Free** (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

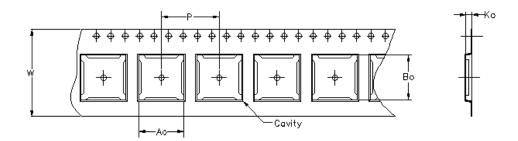
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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Carrier tape design is defined largely by the component lentgh, width, and thickness.

Ao =	Dimension	designed	to	accommodate	the	component	width.				
Bo =	Dímension	designed	to	accommodate	the	component	length.				
Ko =	Dímension	designed	to	accommodate	the	component	thickness.				
W = Overall width of the carrier tape.											
P =	Pitch betwe	en succes	ssiv	e cavity center	·s.						



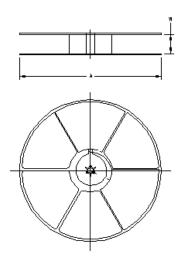
## TAPE AND REEL INFORMATION



# **PACKAGE MATERIALS INFORMATION**

16-Jul-2007

Device	Package	Pins	Site	Reel Diameter (mm)	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HCU04DBR	DB	14	MLA	330	16	8.2	6.6	2.5	12	16	Q1
SN74HCU04DR	D	14	FMX	330	16	6.5	9.0	2.1	8	16	Q1
SN74HCU04DR	D	14	MLA	330	16	6.5	9.0	2.1	8	16	Q1
SN74HCU04NSR	NS	14	MLA	330	16	8.2	10.5	2.5	12	16	Q1
SN74HCU04PWR	PW	14	MLA	330	12	7.0	5.6	1.6	8	12	Q1

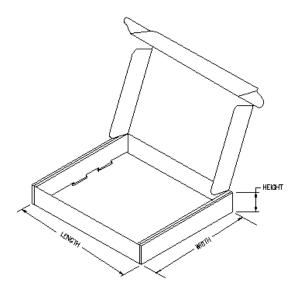


# TAPE AND REEL BOX INFORMATION

Device	Package	Pins	Site	Length (mm)	Width (mm)	Height (mm)
SN74HCU04DBR	DB	14	MLA	346.0	346.0	33.0
SN74HCU04DR	D	14	FMX	342.9	336.6	28.58
SN74HCU04DR	D	14	MLA	346.0	346.0	33.0
SN74HCU04NSR	NS	14	MLA	346.0	346.0	33.0
SN74HCU04PWR	PW	14	MLA	346.0	346.0	29.0



16-Jul-2007



# 14 LEADS SHOWN



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package is hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
- E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

#### FK (S-CQCC-N\*\*)

#### **28 TERMINAL SHOWN**

#### **LEADLESS CERAMIC CHIP CARRIER**



NOTES: A. All linear dimensions are in inches (millimeters).

- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a metal lid.
- D. The terminals are gold plated.
- E. Falls within JEDEC MS-004



# N (R-PDIP-T\*\*)

# PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
- The 20 pin end lead shoulder width is a vendor option, either half or full width.



# D (R-PDSO-G14)

# PLASTIC SMALL-OUTLINE PACKAGE



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AB.



# **MECHANICAL DATA**

# NS (R-PDSO-G\*\*)

# 14-PINS SHOWN

## PLASTIC SMALL-OUTLINE PACKAGE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.



# DB (R-PDSO-G\*\*)

# PLASTIC SMALL-OUTLINE

#### **28 PINS SHOWN**



NOTES: A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.

D. Falls within JEDEC MO-150

# PW (R-PDSO-G\*\*)

#### 14 PINS SHOWN

# PLASTIC SMALL-OUTLINE PACKAGE



NOTES: A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.

D. Falls within JEDEC MO-153