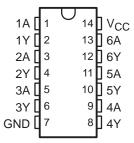
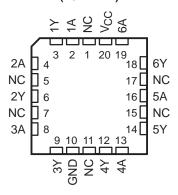
- Wide Operating Voltage Range of 2 V to 6 V
- Outputs Can Drive Up To 10 LSTTL Loads
- Low Power Consumption, 20-μA Max I_{CC}

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



- Typical t_{pd} = 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 [†]	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	PDIP – N	Tube of 25	SN74HCU04N	SN74HCU04N
		Tube of 50	SN74HCU04D	
	SOIC - D	Reel of 2500	SN74HCU04DR	HCU04
		Reel of 250	SN74HCU04DT	
-40°C to 85°C	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

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



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



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 _{CC}	–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 _{CC} or GND	±50 mA
Package thermal impedance, θ_{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 _{stg}	65°C to 150°C

[†] 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	154HCU)4	SN	174HCU0	4	
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage		2	5	6	2	5	6	V
		V _{CC} = 2 V	1.7			1.7			
ViH	High-level input voltage	V _{CC} = 4.5 V	3.6			3.6			V
		VCC = 6 V	4.8			4.8			
		V _{CC} = 2 V			0.5			0.5	
VIL	Low-level input voltage	V _{CC} = 4.5 V			1.35			1.35	V
		VCC = 6 V			1.8			1.8	
٧ _I	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_{CC} 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	TEOT 001	DITIONS	.,	T,	4 = 25°C	;	SN54H	CU04	SN74H	CU04	
PARAMETER	TEST CON	DITIONS	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT
			2 V	1.8			1.8		1.8		
		I _{OH} = -20 μA	4.5 V	4			4		4		
VOH	VOH VI = VCC 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		
			2 V			0.2		0.2		0.2	
		I _{OL} = 20 μA	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 _{OL} = 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 _i			2 V to 6 V		3	10		10		10	pF

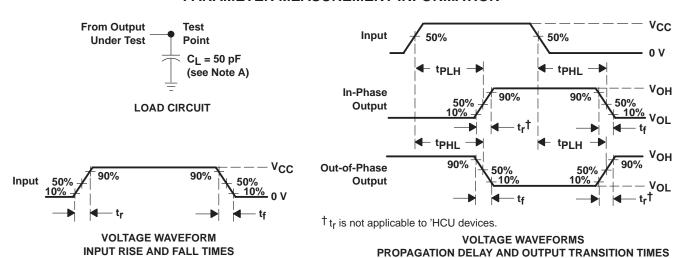
switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 1)

DADAMETED	FROM	TO (OUTPUT)	.,	T,	ղ = 25°C	;	SN54H	CU04	SN74H	CU04	LINUT										
PARAMETER	(INPUT)		vcc	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT										
			2 V		40	80		120		100											
^t pd	А	Υ	4.5 V		8	16		24		20	ns										
·			6 V		7	14		20		17											
			2 V		38	75		110		95											
tf		Υ	Υ	Υ	Υ	Υ	Υ	Υ	Y	Υ	Υ	Y	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 _{pd}	Power dissipation capacitance per inverter	No load	20	pF

PARAMETER MEASUREMENT INFORMATION



NOTES: A. C_I 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





4-Dec-2014

PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish (6)	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Sample
86010012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	86010012A SNJ54HCU 04FK	Sample
8601001CA	ACTIVE	CDIP	J	J 14 1 TBD A42 N / A for Pkg Type -55 to 125		-55 to 125	8601001CA SNJ54HCU04J	Sampl			
SN54HCU04J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54HCU04J	Sampl
SN74HCU04D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCU04	Sampl
SN74HCU04DBRE4	ACTIVE	SSOP	DB	14		TBD	Call TI	Call TI	-40 to 85		Sampl
SN74HCU04DBRG4	ACTIVE	SSOP	DB	14		TBD	Call TI	Call TI	-40 to 85		Samp
SN74HCU04DE4	ACTIVE	SOIC	D	14		TBD	Call TI	Call TI	-40 to 85		Samp
SN74HCU04DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCU04	Samp
SN74HCU04DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU CU SN	Level-1-260C-UNLIM	-40 to 85	HCU04	Samp
SN74HCU04DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCU04	Samp
SN74HCU04DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCU04	Samp
SN74HCU04DT	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCU04	Samp
SN74HCU04DTE4	ACTIVE	SOIC	D	14		TBD	Call TI	Call TI	-40 to 85		Samp
SN74HCU04DTG4	ACTIVE	SOIC	D	14		TBD	Call TI	Call TI	-40 to 85		Samp
SN74HCU04N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCU04N	Samp
SN74HCU04N3	OBSOLETI	E PDIP	N	14		TBD	Call TI	Call TI	-40 to 85		
SN74HCU04NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCU04N	Samp
SN74HCU04NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCU04	Samp



PACKAGE OPTION ADDENDUM



4-Dec-2014

Orderable Device	Status	Package Type	Package	Pins	Package	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
SN74HCU04NSRE4	ACTIVE	SO	NS	14		TBD	Call TI	Call TI	-40 to 85		Samples
SN74HCU04NSRG4	ACTIVE	so	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCU04	Samples
SN74HCU04PW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCU04	Sample
SN74HCU04PWE4	ACTIVE	TSSOP	PW	14		TBD	Call TI	Call TI	-40 to 85		Sample
SN74HCU04PWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCU04	Sample
SN74HCU04PWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU CU SN	Level-1-260C-UNLIM	-40 to 85	HCU04	Sample
SN74HCU04PWRE4	ACTIVE	TSSOP	PW	14		TBD	Call TI	Call TI	-40 to 85		Sample
SN74HCU04PWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCU04	Sample
SN74HCU04PWT	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCU04	Sample
SN74HCU04PWTE4	ACTIVE	TSSOP	PW	14		TBD	Call TI	Call TI	-40 to 85		Sample
SN74HCU04PWTG4	ACTIVE	TSSOP	PW	14		TBD	Call TI	Call TI	-40 to 85		Sample
SNJ54HCU04FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	86010012A SNJ54HCU 04FK	Sample
SNJ54HCU04J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	8601001CA SNJ54HCU04J	Sample

⁽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.

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

⁽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.

PACKAGE OPTION ADDENDUM



4-Dec-2014

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.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.
- (6) Lead/Ball Finish Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF SN54HCU04, SN74HCU04:

Catalog: SN74HCU04

Military: SN54HCU04

NOTE: Qualified Version Definitions:

- Catalog TI's standard catalog product
- Military QML certified for Military and Defense Applications

PACKAGE MATERIALS INFORMATION

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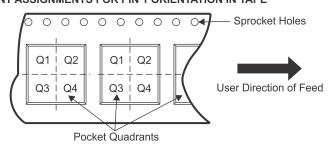
TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HCU04DR	SOIC	D	14	2500	330.0	16.8	6.5	9.5	2.3	8.0	16.0	Q1
SN74HCU04DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HCU04DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HCU04DRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HCU04DRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HCU04DT	SOIC	D	14	250	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HCU04PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HCU04PWT	TSSOP	PW	14	250	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

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*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HCU04DR	SOIC	D	14	2500	364.0	364.0	27.0
SN74HCU04DR	SOIC	D	14	2500	367.0	367.0	38.0
SN74HCU04DR	SOIC	D	14	2500	333.2	345.9	28.6
SN74HCU04DRG4	SOIC	D	14	2500	367.0	367.0	38.0
SN74HCU04DRG4	SOIC	D	14	2500	333.2	345.9	28.6
SN74HCU04DT	SOIC	D	14	250	367.0	367.0	38.0
SN74HCU04PWR	TSSOP	PW	14	2000	367.0	367.0	35.0
SN74HCU04PWT	TSSOP	PW	14	250	367.0	367.0	35.0

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**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- 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. 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



- 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 0.006 (0,15) each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AB.



D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M—1994.
- B. This drawing is subject to change without notice.
 - Sody length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
- E. Falls within JEDEC MO-153



PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



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.



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