

DATA SHEET

For a complete data sheet, please also download:

- The IC06 74HC/HCT/HCU/HCMOS Logic Family Specifications
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Information
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Outlines

74HC/HCT393

Dual 4-bit binary ripple counter

Product specification
File under Integrated Circuits, IC06

December 1990

Dual 4-bit binary ripple counter

74HC/HCT393

FEATURES

- Two 4-bit binary counters with individual clocks
- Divide-by any binary module up to 28 in one package
- Two master resets to clear each 4-bit counter individually
- Output capability: standard
- I_{CC} category: MSI

GENERAL DESCRIPTION

The 74HC/HCT393 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT393 are 4-bit binary ripple counters with separate clocks ($\overline{1CP}$ and $\overline{2CP}$) and master reset (1MR and 2MR) inputs to each counter. The operation of each half of the "393" is the same as the "93" except no external clock connections are required.

The counters are triggered by a HIGH-to-LOW transition of the clock inputs. The counter outputs are internally connected to provide clock inputs to succeeding stages. The outputs of the ripple counter do not change synchronously and should not be used for high-speed address decoding.

The master resets are active-HIGH asynchronous inputs to each 4-bit counter identified by the "1" and "2" in the pin description.

A HIGH level on the nMR input overrides the clock and sets the outputs LOW.

QUICK REFERENCE DATA

GND = 0 V; T_{amb} = 25 °C; t_r = t_f = 6 ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t _{PHL} / t _{PLH}	propagation delay n \overline{CP} to nQ ₀	C _L = 15 pF; V _{CC} = 5 V	12	20	ns
	nQ to nQ _{n+1}		5	6	ns
	nMR to nQ _n		11	15	ns
f _{max}	maximum clock frequency		99	53	MHz
C _I	input capacitance		3.5	3.5	pF
C _{PD}	power dissipation capacitance per counter	notes 1 and 2	23	25	pF

Notes

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

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

f_i = input frequency in MHz

f_o = output frequency in MHz

∑ (C_L × V_{CC}² × f_o) = sum of outputs

C_L = output load capacitance in pF

V_{CC} = supply voltage in V

2. For HC the condition is V_I = GND to V_{CC}
For HCT the condition is V_I = GND to V_{CC} – 1.5 V

ORDERING INFORMATION

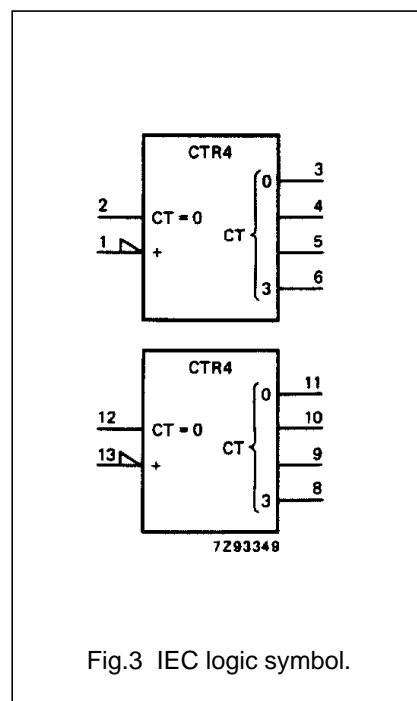
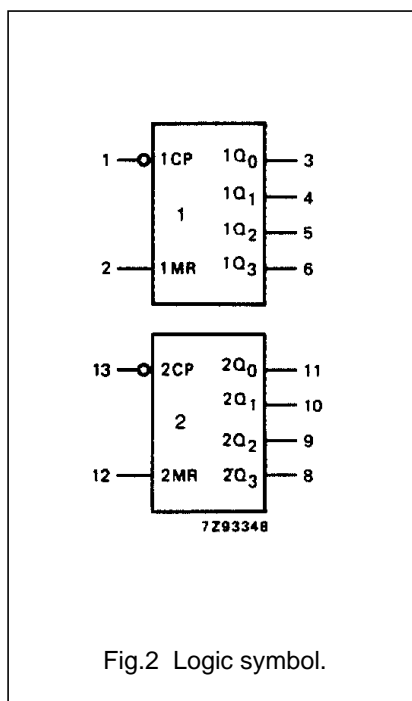
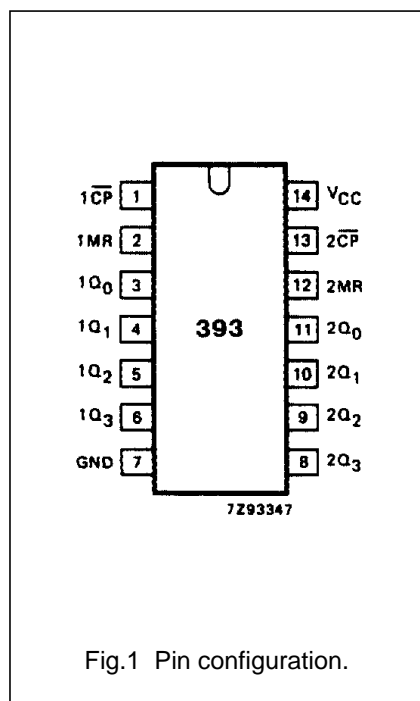
See "74HC/HCT/HCU/HCMOS Logic Package Information".

Dual 4-bit binary ripple counter

74HC/HCT393

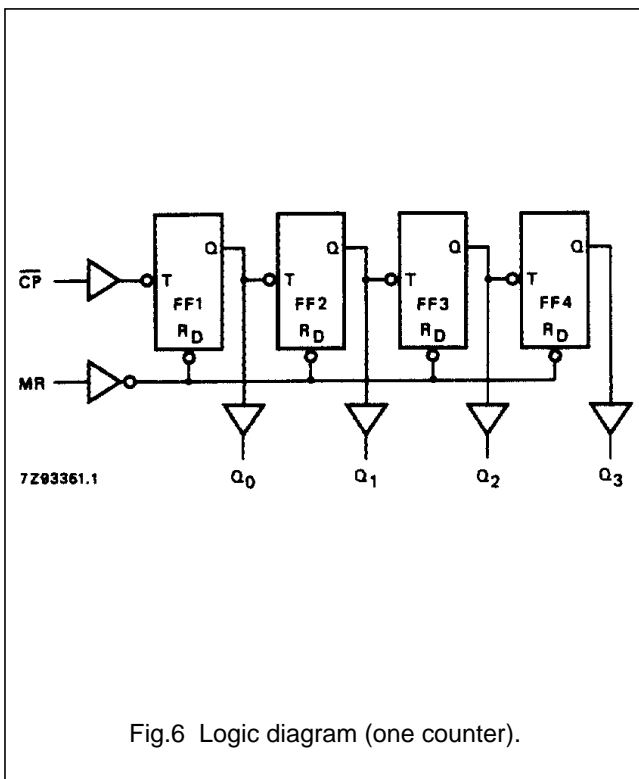
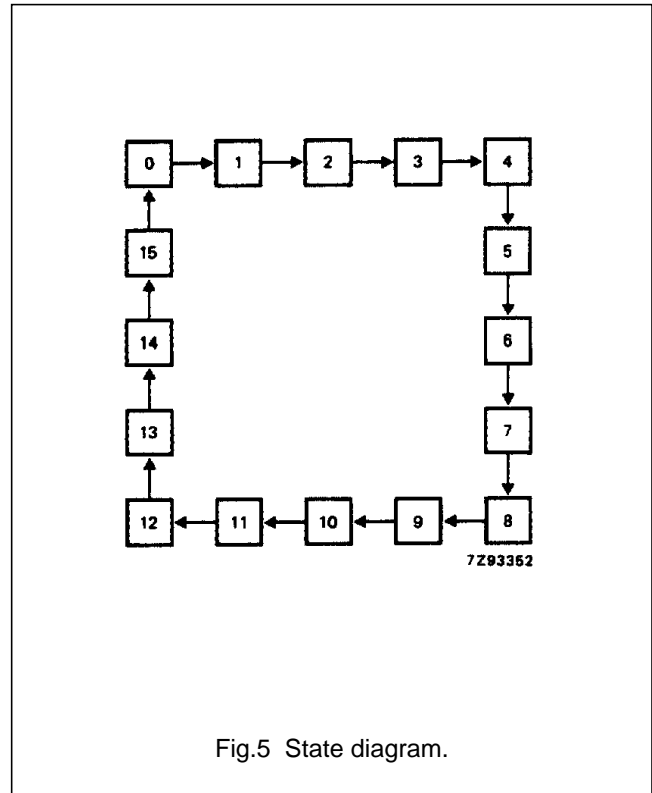
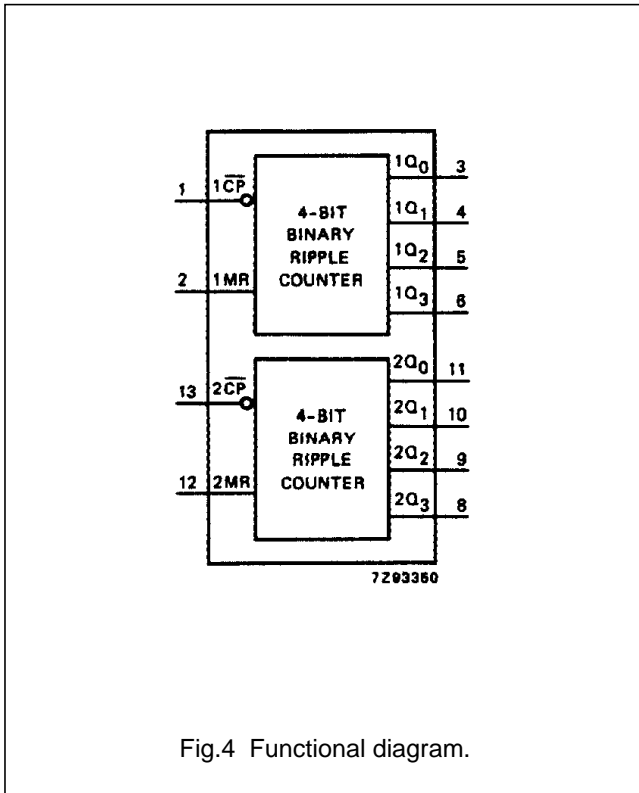
PIN DESCRIPTION

PIN NO.	SYMBOL	NAME AND FUNCTION
1, 13	$1\overline{CP}$, $2\overline{CP}$	clock inputs (HIGH-to-LOW, edge-triggered)
2, 12	1MR, 2MR	asynchronous master reset inputs (active HIGH)
3, 4, 5, 6, 11, 10, 9, 8	$1Q_0$ to $1Q_3$, $2Q_0$ to $2Q_3$	flip-flop outputs
7	GND	ground (0 V)
14	V_{CC}	positive supply voltage



Dual 4-bit binary ripple counter

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COUNT SEQUENCE FOR 1 COUNTER

COUNT	OUTPUTS			
	Q ₀	Q ₁	Q ₂	Q ₃
0	L	L	L	L
1	H	L	L	L
2	L	H	L	L
3	H	H	L	L
4	L	L	H	L
5	H	L	H	L
6	L	H	H	L
7	H	H	H	L
8	L	L	L	H
9	H	L	L	H
10	L	H	L	H
11	H	H	L	H
12	L	L	H	H
13	H	L	H	H
14	L	H	H	H
15	H	H	H	H

Notes

- H = HIGH voltage level
L = LOW voltage level

Dual 4-bit binary ripple counter

74HC/HCT393

DC CHARACTERISTICS FOR 74HC

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Output capability: standard

I_{CC} category: MSI

AC CHARACTERISTICS FOR 74HC

GND = 0 V; t_r = t_f = 6 ns; C_L = 50 pF

SYMBOL	PARAMETER	T _{amb} (°C)						UNIT	TEST CONDITIONS		
		74HC							V _{CC} (V)	WAVEFORMS	
		+25			-40 to +85		-40 to +125				
		min.	typ.	max.	min.	max.	min.				max.
t _{PHL} / t _{PLH}	propagation delay nCP to nQ ₀		41 15 12	125 25 21		155 31 26		190 38 32	ns	2.0 4.5 6.0	Fig.7
t _{PHL} / t _{PLH}	propagation delay nQ _n to nQ _{n+1}		14 5 4	45 9 8		55 11 9		70 14 12	ns	2.0 4.5 6.0	Fig.7
t _{PHL}	propagation delay nMR to nQ _n		39 14 11	140 28 24		175 35 30		210 42 36	ns	2.0 4.5 6.0	Fig.8
t _{THL} / t _{TLH}	output transition time		19 7 6	75 15 13		95 19 16		110 22 19	ns	2.0 4.5 6.0	Fig.7
t _w	clock pulse width HIGH or LOW	80 16 14	17 6 5		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig.7
t _w	master reset pulse width; HIGH	80 16 14	19 7 6		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig.8
t _{rem}	removal time nMR to nCP	5 5 5	3 1 1		5 5 5		5 5 5		ns	2.0 4.5 6.0	Fig.8
f _{max}	maximum clock pulse frequency	6 30 35	30 90 107		5 24 28		4 20 24		MHz	2.0 4.5 6.0	Fig.7

Dual 4-bit binary ripple counter

74HC/HCT393

DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Output capability: standard

I_{CC} category: MSI

Note to HCT types

The value of additional quiescent supply current (ΔI_{CC}) for a unit load of 1 is given in the family specifications.

To determine ΔI_{CC} per input, multiply this value by the unit load coefficient shown in the table below.

INPUT	UNIT LOAD COEFFICIENT
1 \overline{CP}	0.4
2 \overline{CP}	0.4
1MR	1.0
2MR	1.0

AC CHARACTERISTICS FOR 74HCT

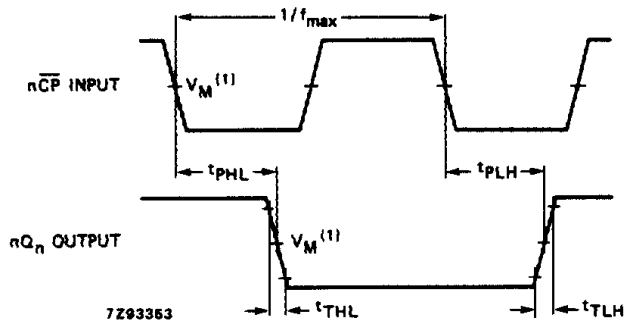
GND = 0 V; $t_r = t_f = 6$ ns; $C_L = 50$ pF

SYMBOL	PARAMETER	T _{amb} (°C)							UNIT	TEST CONDITIONS	
		74HCT								V _{CC} (V)	WAVEFORMS
		+25			-40 to +85		-40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t _{PHL} / t _{PLH}	propagation delay n \overline{CP} to nQ ₀		15	25		31		38	ns	4.5	Fig.7
t _{PHL} / t _{PLH}	propagation delay nQ _n to nQ _{n+1}		6	10		13		15	ns	4.5	Fig.7
t _{PHL}	propagation delay nMR to nQ _n		18	32		40		48	ns	4.5	Fig.8
t _{THL} / t _{TLH}	output transition time		7	15		19		22	ns	4.5	Fig.7
t _w	clock pulse width HIGH or LOW	19	11		24		29		ns	4.5	Fig.7
t _w	master reset pulse width; HIGH	16	6		20		24		ns	4.5	Fig.8
t _{rem}	removal time nMR to n \overline{CP}	5	0		5		5		ns	4.5	Fig.8
f _{max}	maximum clock pulse frequency	27	48		22		18		MHz	4.5	Fig.7

Dual 4-bit binary ripple counter

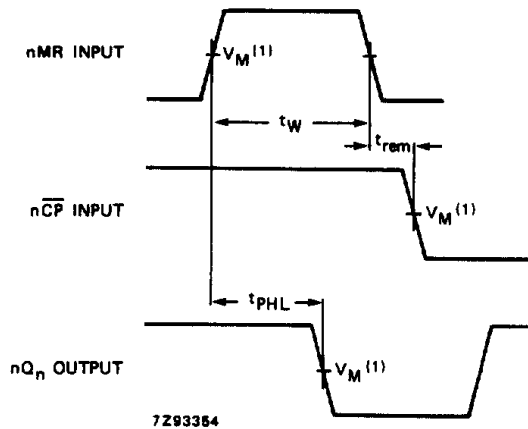
74HC/HCT393

AC WAVEFORMS



(1) HC : $V_M = 50\%$; $V_I = \text{GND to } V_{CC}$.
 HCT: $V_M = 1.3 \text{ V}$; $V_I = \text{GND to } 3 \text{ V}$.

Fig.7 Waveforms showing the clock (\overline{nCP}) to output ($1Q_n, 2Q_n$) propagation delays, the clock pulse width, the output transition times and the maximum clock frequency.



(1) HC : $V_M = 50\%$; $V_I = \text{GND to } V_{CC}$.
 HCT: $V_M = 1.3 \text{ V}$; $V_I = \text{GND to } 3 \text{ V}$.

Fig.8 Waveforms showing the master reset (\overline{nMR}) pulse width, the master reset to output (Q_n) propagation delays and the master reset to clock (\overline{nCP}) removal time.

PACKAGE OUTLINES

See "74HC/HCT/HCU/HCMOS Logic Package Outlines".

74HC/HCT393; Dual 4-bit binary ripple counter

Information as of 2003-04-23

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General description	Features	Applications	Datasheet
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Products & packages	Parametrics	Similar products	

General description

The 74HC/HCT393 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT393 are 4-bit binary ripple counters with separate clocks (1CP and 2 CP) and master reset (1MR and 2MR) inputs to each counter. The operation of each half of the '393' is the same as the '93' except no external clock connections are required.

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The master resets are active-HIGH asynchronous inputs to each 4-bit counter identified by the "1" and "2" in the pin description.

A HIGH level on the nMR input overrides the clock and sets the outputs LOW.

Features




- Two 4-bit binary counters with individual clocks
- Divide-by any binary module up to 28 in one package
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Datasheet

<u>Type number</u>	<u>Title</u>	<u>Publication release date</u>	<u>Datasheet status</u>	<u>Page count</u>	<u>File size (kB)</u>	<u>Datasheet</u>
74HC/HCT393	Dual 4-bit binary ripple counter	12/1/1990	Product specification	7	45	Download

Additional datasheet info

To complete the device datasheet with package and family information, also download the following PDF files. The "Logic Package Information" document is required to determine in which package(s) this device is available.

Document	Description
1  HCT_FAMILY_SPECIFICATIONS	HC/T Family Specifications, The IC06 74HC/HCT/HCMOS Logic Family Specifications
2  HCT_PACKAGE_INFO	HC/T Package Info, The IC06 74HC/HCT/HCMOS Logic Package Information
3  HCT_PACKAGE_OUTLINES	HC/T Package Outlines, The IC06 74HC/HCT/HCMOS Logic Package Outlines

Parametrics

Type number	Package	Description	Propagation Delay(ns)	Voltage	No. of Pins	Power Dissipation Considerations	Logic Switching Levels	Output Drive Capability
74HC393D	SOT108-1 (SO14)	Dual 4-Bit Binary Ripple Counter	15	5 Volts +	14	Low Power or Battery Applications	CMOS	Low
74HC393DB	SOT337-1 (SSOP14)	Dual 4-Bit Binary Ripple Counter	15	5 Volts +	14	Low Power or Battery Applications	CMOS	Low
74HC393N	SOT27-1 (DIP14)	Dual 4-Bit Binary Ripple Counter	15	5 Volts +	14	Low Power or Battery Applications	CMOS	Low
74HC393PW	SOT402-1 (TSSOP14)	Dual 4-Bit Binary Ripple Counter	15	5 Volts +	14	Low Power or Battery Applications	CMOS	Low
74HCT393D	SOT108-1 (SO14)	Dual 4-Bit Binary Ripple Counter; TTL Enabled	15	5 Volts +	14	Low Power or Battery Applications	TTL	Low
74HCT393DB	SOT337-1 (SSOP14)	Dual 4-Bit Binary Ripple Counter; TTL Enabled	15	5 Volts +	14	Low Power or Battery Applications	TTL	Low
74HCT393N	SOT27-1 (DIP14)	Dual 4-Bit Binary Ripple Counter; TTL Enabled	15	5 Volts +	14	Low Power or Battery Applications	TTL	Low

74HCT393PW	SOT402-1 (TSSOP14)	Dual 4-Bit Binary Ripple Counter; TTL Enabled	15	5 Volts +	14	Low Power or Battery Applications	TTL	Low
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▣ Products, packages, availability and ordering

<u>Type number</u>	<u>North American type number</u>	<u>Ordering code (12NC)</u>	<u>Marking/Packing</u> IC packing info	<u>Package</u>	<u>Device status</u>	<u>Buy online</u>
74HC393D	74HC393D	9337 141 10652	Standard Marking * Tube, CECC	SOT108-1 (SO14)	Full production	order this <input type="checkbox"/>
	74HC393D-T	9337 141 10653	Standard Marking * Reel Pack, SMD, 13", CECC	SOT108-1 (SO14)	Full production	order this <input type="checkbox"/>
74HC393DB	74HC393DB	9351 874 20112	Standard Marking * Tube	SOT337-1 (SSOP14)	Full production	order this <input type="checkbox"/>
	74HC393DB-T	9351 874 20118	Standard Marking * Reel Pack, SMD, 13"	SOT337-1 (SSOP14)	Full production	order this <input type="checkbox"/>
74HC393N	74HC393N	9336 690 90652	Standard Marking * Tube, CECC	SOT27-1 (DIP14)	Full production	order this <input type="checkbox"/>
74HC393PW	74HC393PW	9351 874 30112	Standard Marking * Tube	SOT402-1 (TSSOP14)	Full production	order this <input type="checkbox"/>
	74HC393PW-T	9351 874 30118	Standard Marking * Reel Pack, SMD, 13"	SOT402-1 (TSSOP14)	Full production	order this <input type="checkbox"/>
74HCT393D	74HCT393D	9337 141 20652	Standard Marking * Tube, CECC	SOT108-1 (SO14)	Full production	order this <input type="checkbox"/>
	74HCT393D-T	9337 141 20653	Standard Marking * Reel Pack, SMD, 13", CECC	SOT108-1 (SO14)	Full production	order this <input type="checkbox"/>
74HCT393DB	74HCT393DB	9351 858 40112	Standard Marking * Tube	SOT337-1 (SSOP14)	Full production	order this <input type="checkbox"/>
	74HCT393DB-T	9351 858 40118	Standard Marking * Reel Pack, SMD, 13"	SOT337-1 (SSOP14)	Full production	order this <input type="checkbox"/>
74HCT393N	74HCT393N	9336 692 10652	Standard Marking * Tube, CECC	SOT27-1 (DIP14)	Full production	order this <input type="checkbox"/>
74HCT393PW	74HCT393PW	9351 884 50112	Standard Marking * Tube	SOT402-1 (TSSOP14)	Full production	order this <input type="checkbox"/>
	74HCT393PW-T	9351 884 50118	Standard Marking * Reel Pack, SMD, 13"	SOT402-1 (TSSOP14)	Full production	order this <input type="checkbox"/>

Products in the above table are all in production. Some variants are discontinued; [click here](#) for information on these variants.

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▣ [74HC/HCT393](#) links to the similar products page containing an overview of products that are similar in function or related to the type number(s) as listed on this page. The similar products page includes products from the same catalog tree(s), relevant selection guides and products from the same functional category.

▣ Support & tools

▣ [HC/T Family Specifications, The IC06 74HC/HCT/HCMOS Logic Family Specifications](#)(date 01-Mar-98)

▣ [HC/T User Guide](#)(date 01-Nov-97)

▣ Email/translate this product information

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