TEXAS INSTRUMENTS

CD74HC4518, CD54HC4520, CD74HC4520, CD74HCT4520

High-Speed CMOS Logic
Dual Synchronous Counters

Features

- **Positive or Negative Edge Triggering**
- **Synchronous Internal Carry Propagation**
- **Fanout (Over Temperature Range)**
  - **Standard Outputs . . . . 10 LSTTL Loads**
  - **Bus Driver Outputs . . . . 15 LSTTL Loads**
- **Wide Operating Temperature Range . . . -55°C to 125°C**
- **Balanced Propagation Delay and Transition Times**
- **Significant Power Reduction Compared to LSTTL Logic ICs**
- **HC Types**
  - **2V to 6V Operation**
  - **High Noise Immunity: N_{IL} = 30%, N_{IH} = 30% of V_{CC} at V_{CC} = 5V**
- **HCT Types**
  - **4.5V to 5.5V Operation**
  - **Direct LSTTL Input Logic Compatibility, V_{IL}= 0.8V (Max), V_{IH} = 2V (Min)**
  - **CMOS Input Compatibility, $I_I \leq 1\mu A$ at V_{OL}, V_{OH}**

Description

The CD74HC4518 is a dual BCD up-counter. The 'HC4520 and CD74HCT4520 are dual binary up-counters. Each device consists of two independent internally synchronous 4-stage counters. The counter stages are D-type flip-flops having interchangeable CLOCK and ENABLE lines for incrementing on either the positive-going or the negative-going transition of CLOCK. The counters are cleared by high levels on the MASTER RESET lines. The counter can be cascaded in the ripple mode by connecting Q_3 to the ENABLE input of the subsequent counter while the CLOCK input of the latter is held low.
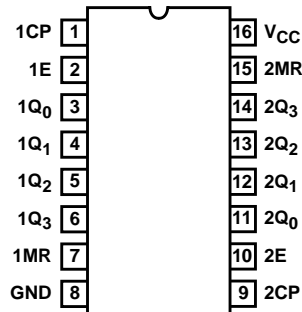
Ordering Information

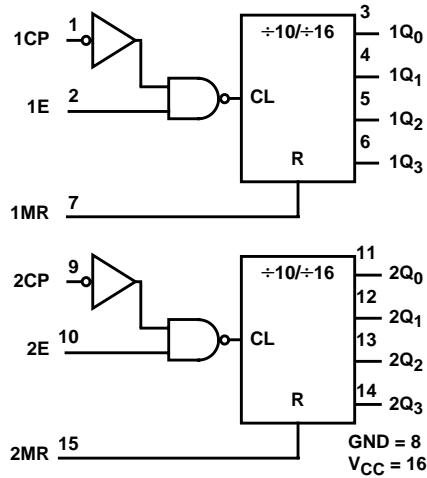| PART NUMBER	TEMP. RANGE (^{o}C)	PACKAGE
CD54HC4520F3A	-55 to 125	16 Ld CERDIP
CD74HC4518E	-55 to 125	16 Ld PDIP
CD74HC4520E	-55 to 125	16 Ld PDIP
CD74HC4520M	-55 to 125	16 Ld SOIC
CD74HC4520MT	-55 to 125	16 Ld SOIC
CD74HC4520M96	-55 to 125	16 Ld SOIC
CD74HCT4520E	-55 to 125	16 Ld PDIP
CD74HCT4520M	-55 to 125	16 Ld SOIC
CD74HCT4520MT	-55 to 125	16 Ld SOIC
CD74HCT4520M96	-55 to 125	16 Ld SOIC

NOTE: When ordering, use the entire part number. The suffix 96 denotes tape and reel. The suffix T denotes a small-quantity reel of 250.

Pinout

CD54HC4520
(CERDIP)
CD74HC4518
(PDIP)
CD74HC4520, CD74HCT4520,
(PDIP, SOIC)
TOP VIEW

1CP [1]	[16] V_{CC}
1E [2]	[15] 2MR
$1Q_0$ [3]	[14] $2Q_3$
$1Q_1$ [4]	[13] $2Q_2$
$1Q_2$ [5]	[12] $2Q_1$
$1Q_3$ [6]	[11] $2Q_0$
1MR [7]	[10] 2E
GND [8]	[9] 2CP

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Functional Diagram

1CP 1 — $\div 10 / \div 16$ — 3 1Q$_0$
1E 2 — CL — 4 1Q$_1$
— 5 1Q$_2$
R — 6 1Q$_3$
1MR 7

2CP 9 — $\div 10 / \div 16$ — 11 2Q$_0$
2E 10 — CL — 12 2Q$_1$
— 13 2Q$_2$
R — 14 2Q$_3$
2MR 15

GND = 8
V$_{CC}$ = 16

TRUTH TABLE

CP	E	MR	OUTPUT STATE
↑	H	L	Increment Counter
L	↓	L	Increment Counter
↓	X	L	No Change
X	↑	L	No Change
↑	L	L	No Change
H	↓	L	No Change
X	X	H	Q$_0$ thru Q$_3$ = L

H   = High State.

L   = Low State.

↑   = High-to-Low Transition.

↓   = Low-to-High Transition.

X   = Don't Care.

CD74HC4518, CD54HC4520, CD74HC4520, CD74HCT4520

Absolute Maximum Ratings

DC Supply Voltage, V_{CC} . . . . -0.5V to 7V
DC Input Diode Current, I_{IK}
   For V_I < -0.5V or V_I > V_{CC} + 0.5V . . . . ±20mA
DC Output Diode Current, I_{OK}
   For V_O < -0.5V or V_O > V_{CC} + 0.5V . . . . ±20mA
DC Output Source or Sink Current per Output Pin, I_O
   For V_O > -0.5V or V_O < V_{CC} + 0.5V . . . . ±25mA
DC V_{CC} or Ground Current, I_{CC} . . . . ±50mA

Operating Conditions

Temperature Range, T_A . . . . -55°C to 125°C
Supply Voltage Range, V_{CC}
   HC Types . . . . .2V to 6V
   HCT Types . . . . .4.5V to 5.5V
DC Input or Output Voltage, V_I, V_O . . . . 0V to V_{CC}
Input Rise and Fall Time
   2V . . . . 1000ns (Max)
   4.5V. . . . . 500ns (Max)
   6V . . . . 400ns (Max)

Thermal Information

Thermal Resistance (Typical, Note 1) θ_{JA} (°C/W)
   E (PDIP) Package 67
   M (SOIC) Package. 73
Maximum Junction Temperature . . . . 150°C
Maximum Storage Temperature Range . . . .-65°C to 150°C
Maximum Lead Temperature (Soldering 10s) . . . . 300°C
  (SOIC - Lead Tips Only)

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

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

DC Electrical Specifications

PARAMETER	SYMBOL	TEST CONDITIONS V_I (V)	I_O (mA)	V_{CC} (V)	25°C MIN	TYP	MAX	-40°C TO 85°C MIN	MAX	-55°C TO 125°C MIN	MAX	UNITS
HC TYPES												
High Level Input Voltage	V_{IH}	-	-	2	1.5	-	-	1.5	-	1.5	-	V
				4.5	3.15	-	-	3.15	-	3.15	-	V
				6	4.2	-	-	4.2	-	4.2	-	V
Low Level Input Voltage	V_{IL}	-	-	2	-	-	0.5	-	0.5	-	0.5	V
				4.5	-	-	1.35	-	1.35	-	1.35	V
				6	-	-	1.8	-	1.8	-	1.8	V
High Level Output Voltage CMOS Loads	V_{OH}	V_{IH} or V_{IL}	-0.02	2	1.9	-	-	1.9	-	1.9	-	V
			-0.02	4.5	4.4	-	-	4.4	-	4.4	-	V
			-0.02	6	5.9	-	-	5.9	-	5.9	-	V
High Level Output Voltage TTL Loads			-	-	-	-	-	-	-	-	-	V
			-4	4.5	3.98	-	-	3.84	-	3.7	-	V
			-5.2	6	5.48	-	-	5.34	-	5.2	-	V
Low Level Output Voltage CMOS Loads	V_{OL}	V_{IH} or V_{IL}	0.02	2	-	-	0.1	-	0.1	-	0.1	V
			0.02	4.5	-	-	0.1	-	0.1	-	0.1	V
			0.02	6	-	-	0.1	-	0.1	-	0.1	V
Low Level Output Voltage TTL Loads			-	-	-	-	-	-	-	-	-	V
			4	4.5	-	-	0.26	-	0.33	-	0.4	V
			5.2	6	-	-	0.26	-	0.33	-	0.4	V
Input Leakage Current	I_I	V_{CC} or GND	-	6	-	-	±0.1	-	±1	-	±1	µA
Quiescent Device Current	I_{CC}	V_{CC} or GND	0	6	-	-	8	-	80	-	160	µA

DC Electrical Specifications (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS		V$_{CC}$ (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
		V$_I$ (V)	I$_O$ (mA)		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
HCT TYPES												
High Level Input Voltage	V$_{IH}$	-	-	4.5 to 5.5	2	-	-	2	-	2	-	V
Low Level Input Voltage	V$_{IL}$	-	-	4.5 to 5.5	-	-	0.8	-	0.8	-	0.8	V
High Level Output Voltage CMOS Loads	V$_{OH}$	V$_{IH}$ or V$_{IL}$	-0.02	4.5	4.4	-	-	4.4	-	4.4	-	V
High Level Output Voltage TTL Loads			-4	4.5	3.98	-	-	3.84	-	3.7	-	V
Low Level Output Voltage CMOS Loads	V$_{OL}$	V$_{IH}$ or V$_{IL}$	0.02	4.5	-	-	0.1	-	0.1	-	0.1	V
Low Level Output Voltage TTL Loads			4	4.5	-	-	0.26	-	0.33	-	0.4	V
Input Leakage Current	I$_I$	V$_{CC}$ and GND	0	5.5	-	-	±0.1	-	±1	-	±1	µA
Quiescent Device Current	I$_{CC}$	V$_{CC}$ or GND	0	5.5	-	-	8	-	80	-	160	µA
Additional Quiescent Device Current Per Input Pin: 1 Unit Load	ΔI$_{CC}$ (Note 2)	V$_{CC}$ -2.1	-	4.5 to 5.5	-	100	360	-	450	-	490	µA

NOTE:

2. For dual-supply systems theoretical worst case (V$_I$ = 2.4V, V$_{CC}$ = 5.5V) specification is 1.8mA.

HCT Input Loading Table

INPUT	UNIT LOADS
MR	1.2
CP	0.25
ENABLE	0.5

NOTE: Unit Load is ΔI$_{CC}$ limit specified in DC Electrical Table, e.g., 360µA max at 25°C.

Prerequisite for Switching Specifications

PARAMETER	SYMBOL	V$_{CC}$ (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
HC TYPES										
Maximum Clock Frequency	f$_{MAX}$	2	6	-	-	5	-	4	-	MHz
		4.5	30	-	-	24	-	20	-	MHz
		6	35	-	-	28	-	24	-	MHz
CP Pulse Width	t$_W$	2	80	-	-	100	-	120	-	ns
		4.5	16	-	-	20	-	24	-	ns
		6	14	-	-	17	-	20	-	ns
MR Pulse Width	t$_W$	2	100	-	-	125	-	150	-	ns
		4.5	20	-	-	25	-	30	-	ns
		6	17	-	-	21	-	26	-	ns

Prerequisite for Switching Specifications (Continued)

PARAMETER	SYMBOL	V_{CC} (V)	25°C MIN	25°C TYP	25°C MAX	-40°C TO 85°C MIN	-40°C TO 85°C MAX	-55°C TO 125°C MIN	-55°C TO 125°C MAX	UNITS
Set-up Time, Enable to CP	t_{SU}	2	80	-	-	100	-	120	-	ns
		4.5	16	-	-	20	-	24	-	ns
		6	14	-	-	17	-	20	-	ns
Removal Time, MR to CP	t_{REM}	2	0	-	-	0	-	0	-	ns
		4.5	0	-	-	0	-	0	-	ns
		6	0	-	-	0	-	0	-	ns
Set-up Time, CP to Enable	t_{SU}	2	80	-	-	100	-	120	-	ns
		4.5	16	-	-	20	-	24	-	ns
		6	14	-	-	17	-	20	-	ns
Removal Time, MR to Enable	t_{REM}	2	0	-	-	0	-	0	-	ns
		4.5	0	-	-	0	-	0	-	ns
		6	0	-	-	0	-	0	-	ns
HCT TYPES										
Maximum Clock Frequency	f_{MAX}	4.5	25	-	-	20	-	17	-	MHz
Clock Pulse Width	t_W	4.5	20	-	-	25	-	30	-	ns
MR Pulse Width	t_W	4.5	20	-	-	25	-	30	-	ns
Set-up Time, Enable to CP	t_{SU}	4.5	16	-	-	20	-	24	-	ns
Removal Time, MR tp Enable	t_{REM}	4.5	0	-	-	0	-	0	-	ns

Switching Specifications Input t_r, t_f = 6ns

PARAMETER	SYMBOL	TEST CONDITIONS	V_{CC} (V)	25°C MIN	25°C TYP	25°C MAX	-40°C TO 85°C MIN	-40°C TO 85°C MAX	-55°C TO 125°C MIN	-55°C TO 125°C MAX	UNITS
HC TYPES											
Propagation Delay CP to Q_n	t_{PLH}, t_{PHL}	C_L = 50pF	2	-	-	240	-	300	-	360	ns
		C_L = 50pF	4.5	-	-	48	-	60	-	72	ns
		C_L = 15pF	5	-	20	-	-	-	-	-	ns
		C_L = 50pF	6	-	-	41	-	51	-	61	ns
Enable to Q_n	t_{PLH}, t_{PHL}	C_L = 50pF	2	-	-	240	-	300	-	360	ns
		C_L = 50pF	4.5	-	-	48	-	60	-	72	ns
		C_L = 15pF	5	-	20	-	-	-	-	-	ns
		C_L = 50pF	6	-	-	41	-	51	-	61	ns
MR to Q_n	t_{PLH}, t_{PHL}	C_L = 50pF	2	-	-	150	-	190	-	225	ns
		C_L = 50pF	4.5	-	-	30	-	38	-	45	ns
		C_L = 15pF	5	-	12	-	-	-	-	-	ns
		C_L = 50pF	6	-	-	26	-	33	-	38	ns
Output Transition Time	t_{THL}, t_{TLH}	C_L = 50pF	2	-	-	75	-	95	-	110	ns
		C_L = 50pF	4.5	-	-	15	-	19	-	22	ns
		CL = 50pF	6			13		16		19	ns
Input Capacitance	C_{IN}	C_L = 50pF	-	-	-	10	-	10	-	10	pF
Maximum Clock Frequency	f_{MAX}	CL = 15pF	5		60						MHz
Power Dissipation Capacitance (Note 3, 4)	C_{PD}	C_L = 15pF	5	-	33	-	-	-	-	-	pF

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Switching Specifications Input t_r, t_f = 6ns   **(Continued)**

PARAMETER	SYMBOL	TEST CONDITIONS	V_{CC} (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
HCT TYPES											
Propagation Delay											
CP to Q_n	t_{PLH}, t_{PHL}	C_L = 50pF	4.5	-	-	53	-	66	-	80	ns
		C_L = 15pF	5	-	22	-	-	-	-	-	ns
Enable to Q_n	t_{PLH}, t_{PHL}	C_L = 50pF	4.5	-	-	55	-	69	-	83	ns
		C_L = 15pF	5	-	23	-	-	-	-	-	ns
MR to Q_n	t_{PLH}, t_{PHL}	C_L = 50pF	4.5	-	-	35	-	44	-	53	ns
		C_L = 15pF	5	-	14	-	-	-	-	-	ns
Output Transition Time	t_{THL}, t_{TLH}	C_L = 50pF	4.5	-	-	15	-	19	-	22	ns
Input Capacitance	C_{IN}	C_L = 50pF	-	-	-	10	-	10	-	10	pF
Maximum Clock Frequency	f_{MAX}	CL = 15pF	5	-	50	-	-	-	-	-	MHz
Power Dissipation Capacitance (Note 3,4)	C_{PD}	-	5	-	33	-	-	-	-	-	pF

NOTES:

3. C_{PD} is used to determine the dynamic power consumption, per counter.

4. $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$ where f_i = Input Frequency, C_L = Output Load Capacitance, V_{CC} = Supply Voltage.
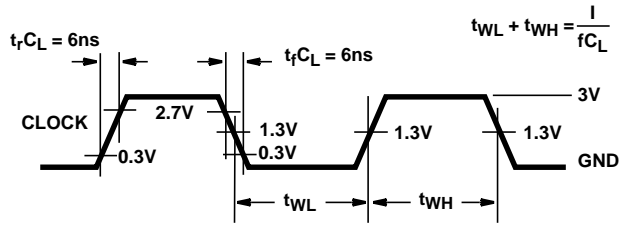
Timing Diagram
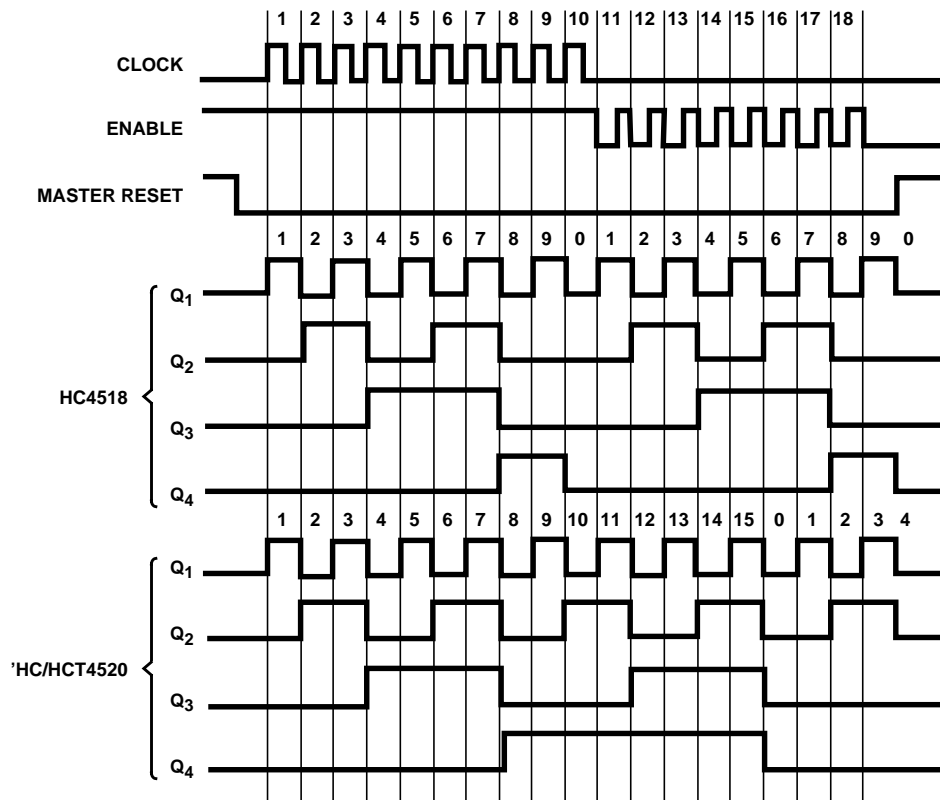
FIGURE 1.

Waveforms
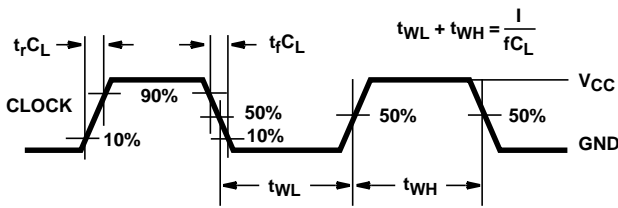
NOTE: Outputs should be switching from 10% V_{CC} to 90% V_{CC} in accordance with device truth table. For f_{MAX}, input duty cycle = 50%.

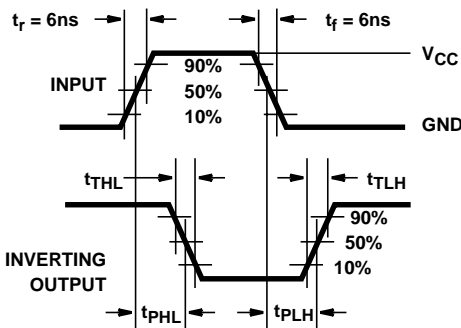**FIGURE 2. HC CLOCK PULSE RISE AND FALL TIMES AND PULSE WIDTH**

NOTE: Outputs should be switching from 10% V_{CC} to 90% V_{CC} in accordance with device truth table. For f_{MAX}, input duty cycle = 50%.

FIGURE 3. HCT CLOCK PULSE RISE AND FALL TIMES AND PULSE WIDTH

FIGURE 4. HC TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC
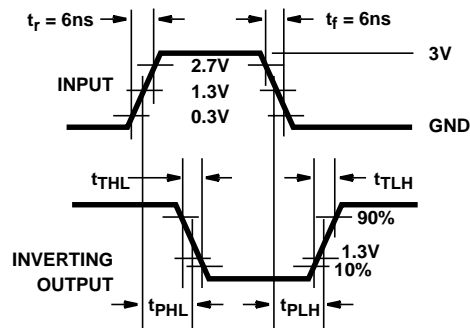
FIGURE 5. HCT TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC
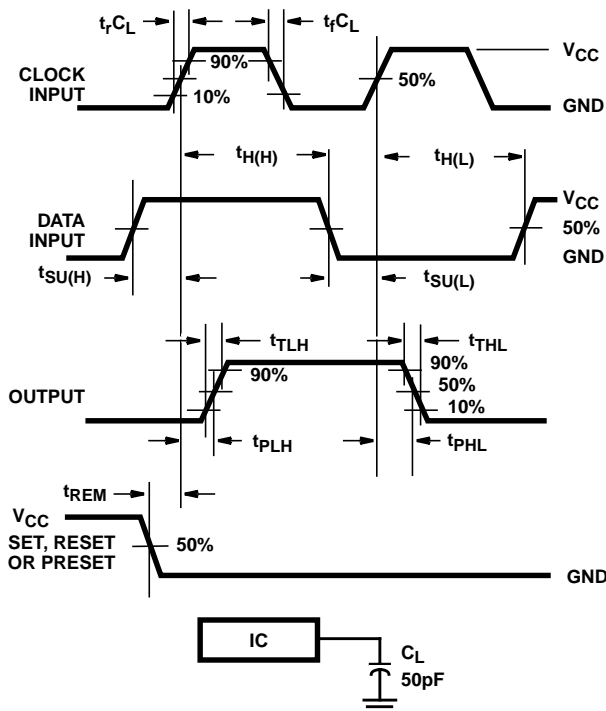

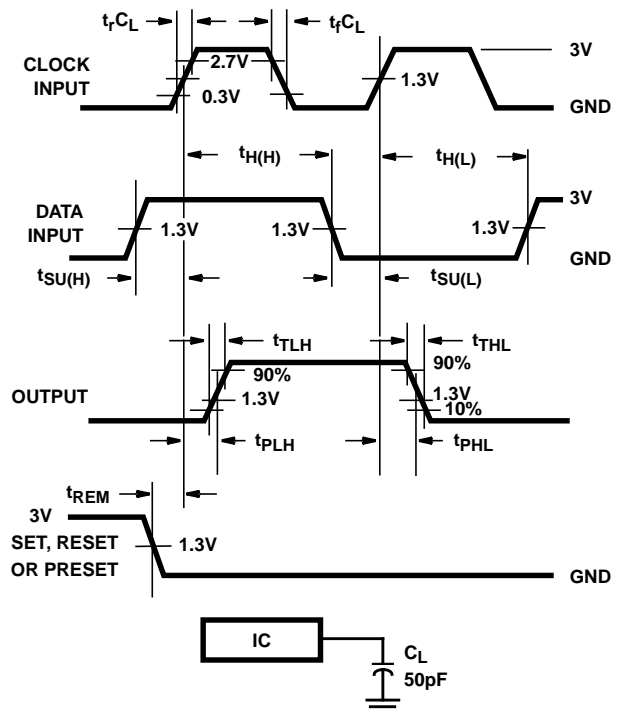**FIGURE 6. HC SETUP TIMES, HOLD TIMES, REMOVAL TIME, AND PROPAGATION DELAY TIMES FOR EDGE TRIGGERED SEQUENTIAL LOGIC CIRCUITS**

FIGURE 7. HCT SETUP TIMES, HOLD TIMES, REMOVAL TIME, AND PROPAGATION DELAY TIMES FOR EDGE TRIGGERED SEQUENTIAL LOGIC CIRCUITS

PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
5962-8995401EA	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
CD54HC4520F	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
CD54HC4520F3A	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
CD74HC4518E	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD74HC4518EE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD74HC4520E	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD74HC4520EE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD74HC4520M	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC4520M96	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC4520M96E4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC4520ME4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC4520MT	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC4520MTE4	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT4520E	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD74HCT4520EE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD74HCT4520M	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT4520M96	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT4520M96E4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT4520ME4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT4520MT	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT4520MTE4	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

[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) 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.
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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DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	——	——	——	——
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)

B

14   8

1   7

0.065 (1,65)
0.045 (1,14)

C

0.005 (0,13) MIN

0.060 (1,52)
0.015 (0,38)

0.200 (5,08) MAX

Seating Plane

0.130 (3,30) MIN

0.026 (0,66)
0.014 (0,36)

0.100 (2,54)

A

0°−15°

0.014 (0,36)
0.008 (0,20)

4040083/F 03/03

NOTES: 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.

N (R−PDIP−T**)

PLASTIC DUAL−IN−LINE PACKAGE

16 PINS SHOWN

DIM / PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS−001 VARIATION /C\	AA	BB	AC	AD

0.260 (6,60) / 0.240 (6,10)

0.070 (1,78) / 0.045 (1,14) /D\

0.045 (1,14) / 0.030 (0,76) /D\

0.020 (0,51) MIN

0.200 (5,08) MAX

Seating Plane

0.125 (3,18) MIN

0.100 (2,54)

0.021 (0,53) / 0.015 (0,38)

⊕ 0.010 (0,25) Ⓜ

14/18 Pin Only
20 Pin vendor option /D\

0.325 (8,26) / 0.300 (7,62)

0.015 (0,38)

Gauge Plane

0.010 (0,25) NOM

0.430 (10,92) MAX

4040049/E   12/2002

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

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D (R−PDSO−G16) PLASTIC SMALL−OUTLINE PACKAGE

0.394 (10,00)
0.386 (9,80)

16　　9

0.244 (6,20)
0.228 (5,80)

0.157 (4,00)
0.150 (3,80)

1　　8

Pin 1
Index Area

0.050 (1,27)

0.020 (0,51)
0.012 (0,31)

⌖ 0.010 (0,25) Ⓜ

0.069 (1,75) Max

0.010 (0,25)
0.004 (0,10)

0.010 (0,25)
0.007 (0,17)

0.004 (0,10)

Gauge Plane

Seating Plane

0.010 (0,25)　0°−8°

0.050 (1,27)
0.016 (0,40)

4040047−4/F 07/2004

NOTES:　A.　All linear dimensions are in inches (millimeters).
B.　This drawing is subject to change without notice.
C.　Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
D.　Falls within JEDEC MS−012 variation AC.

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