FAIRCHILD

SEMICONDUCTOR™

CD4024BC
7-Stage Ripple Carry Binary Counter

General Description

The CD4024BC is a 7-stage ripple-carry binary counter. Buffered outputs are externally available from stages 1 through 7. The counter is reset to its logical "0" stage by a logical "1" on the reset input. The counter is advanced one count on the negative transition of each clock pulse.

Features

- Wide supply voltage range: 3.0V to 15V
- High noise immunity: 0.45 V_{DD} (typ.)
- Low power TTL compatibility: Fan out of 2 driving 74L or 1 driving 74LS
- High speed: 12 MHz (typ.)
    input pulse rate $V_{DD} - V_{SS} = 10V$
- Fully static operation

Ordering Code:

Order Number	Package Number	Package Description
CD4024BCM	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow Body
CD4024BCN	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram

Pin Assignments for DIP and SOIC

Top View

DS005957.prf

Logic Diagrams

Input Logic

CLOCK INPUT

RESET INPUT

OUTPUT

TO NEXT STAGE
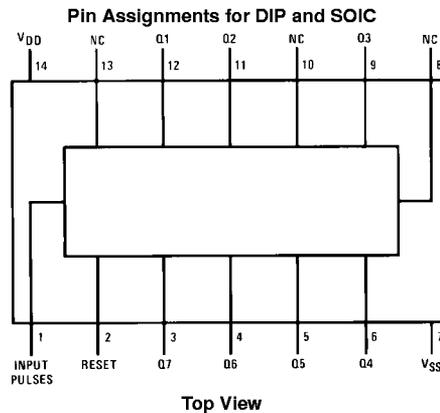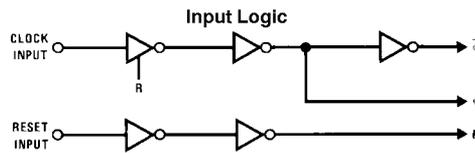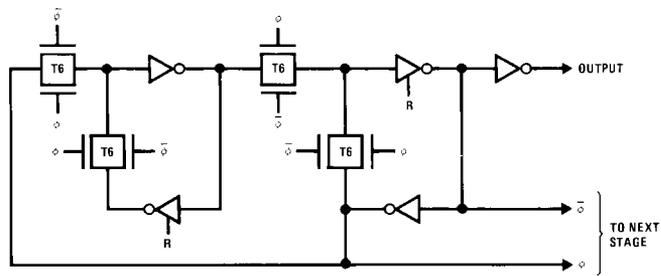
Flip-flop logic (1 of 7 identical stages).

Block Diagram

INPUT PULSES

RESET

F/F-1 F/F-2 F/F-3 F/F-4 F/F-5 F/F-6 F/F-7

Terminal no. 14 to V_{DD}
Terminal no. 7 to V_{SS}
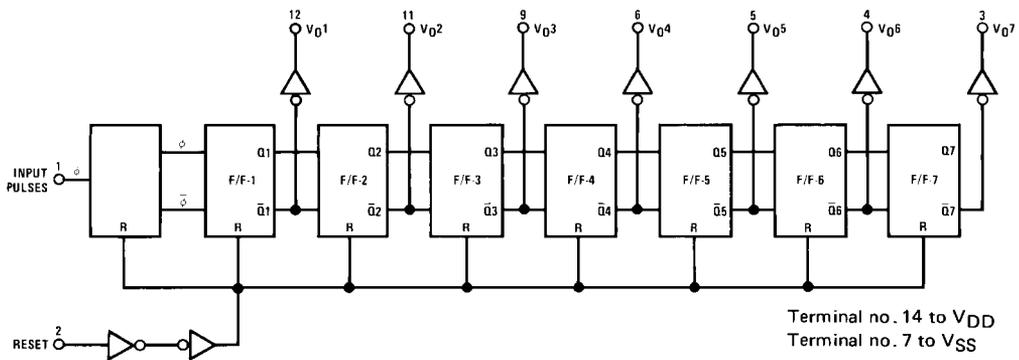
Absolute Maximum Ratings(Note 1)

(Note 2)

DC Supply Voltage (V_{DD})	−0.5 to +18 V_{DC}
Input Voltage (V_{IN})	−0.5 to V_{DD} +0.5 V_{DC}
Storage Temperature Range (T_S)	−65°C to +150°C
Power Dissipation (P_D)	
Dual-In-Line	700 mW
Small Outline	500 mW
Lead Temperature	
(Soldering, 10 seconds) (T_L)	260°C

Recommended Operating Conditions (Note 1)

DC Supply Voltage (V_{DD})	+3 to +15 V_{DC}
Input Voltage (V_{IN})	0 to V_{DD} V_{DC}
Operating Temperature Range (T_A)	−40°C to +85°C

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed, they are not meant to imply that the devices should be operated at these limits. The table of "Recommended Operating Conditions" and "Electrical Characteristics" provides conditions for actual device operation.

Note 2: V_{SS} = 0V unless otherwise specified.

DC Electrical Characteristics (Note 2)

Symbol	Parameter	Conditions	−40°C Min	−40°C Max	+25°C Min	+25°C Typ	+25°C Max	+85°C Min	+85°C Max	Units
I_{DD}	Quiescent Device Current	V_{DD} = 5V		20		0.3	20		150	μA
		V_{DD} = 10V		40		0.5	40		300	μA
		V_{DD} = 15V		60		0.7	80		600	μA
V_{OL}	LOW Level Output Voltage	$|I_O|$<1 μA								
		V_{DD} = 5V		0.05		0	0.05		0.05	V
		V_{DD} = 10V		0.05		0	0.05		0.05	V
		V_{DD} = 15V		0.05		0	0.05		0.05	V
V_{OH}	HIGH Level Output Voltage	$|I_O|$<1 μA								
		V_{DD} = 5V	4.95		4.95	5		4.95		V
		V_{DD} = 10V	9.95		9.95	10		9.95		V
		V_{DD} = 15V	14.95		14.95	15		14.95		V
V_{IL}	LOW Level Input Voltage	$|I_O|$<1 μA								
		V_{DD} = 5V, V_O = 0.5V or 4.5V		1.5		2	1.5		1.5	V
		V_{DD} = 10V, V_O = 1.0V or 9.0V		3.0		4	3.0		3.0	V
		V_{DD} = 15V, V_O = 1.5V or 13.5V		4.0		6	4.0		4.0	V
V_{IH}	HIGH Level Input Voltage	$|I_O|$<1 μA								
		V_{DD} = 5V, V_O = 0.5V or 4.5V	3.5		3.5	3		3.5		V
		V_{DD} = 10V, V_O = 1.0V or 9.0V	7.0		7.0	6		7.0		V
		V_{DD} = 15V, V_O = 1.5V or 13.5V	11.0		11.0	9		11.0		V
I_{OL}	LOW Level Output Current (Note 3)	V_{DD} = 5V, V_O = 0.4V	0.52		0.44	0.88		0.36		mA
		V_{DD} = 10V, V_O = 0.5V	1.3		1.1	2.25		0.9		mA
		V_{DD} = 15V, V_O = 1.5V	3.6		3.0	8.8		2.4		mA
I_{OH}	HIGH Level Output Current (Note 3)	V_{DD} = 5V, V_O = 4.6V	−0.52		−0.44	−0.88		−0.36		mA
		V_{DD} = 10V, V_O = 9.5V	−1.3		−1.1	−2.25		−0.9		mA
		V_{DD} = 15V, V_O = 13.5V	−3.6		−3.0	−8.8		−2.4		mA
I_{IN}	Input Current	V_{DD} = 15V, V_{IN} = 0V		−0.30		$−10^{-5}$	−0.30		−1.0	μA
		V_{DD} = 15V, V_{IN} = 15V		0.30		10^{-5}	0.30		1.0	μA

**Note 3:** I_{OH} and I_{OL} are tested one output at a time.

AC Electrical Characteristics (Note 4)

$T_A = 25°C$, $C_L = 50$ pF, $R_L = 200$ k, t_r and $t_f = 20$ ns unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{PHL}, t_{PLH}	Propagation Delay Time to Q1 Output	$V_{DD} = 5V$		185	350	ns
		$V_{DD} = 10V$		85	125	ns
		$V_{DD} = 15V$		70	100	ns
t_{THL}, t_{TLH}	Transition Time	$V_{DD} = 5V$		100	200	ns
		$V_{DD} = 10V$		50	100	ns
		$V_{DD} = 15V$		40	80	ns
t_{WL}, t_{WH}	Minimum Input Pulse Width	$V_{DD} = 5V$		75	200	ns
		$V_{DD} = 10V$		40	110	ns
		$V_{DD} = 15V$		35	90	ns
t_{RCL}, t_{FCL}	Input Rise and Fall Time	$V_{DD} = 5V$			15	μs
		$V_{DD} = 10V$			10	μs
		$V_{DD} = 15V$			8	μs
f_{CL}	Maximum Input Pulse Frequency	$V_{DD} = 5V$	1.5	5		MHz
		$V_{DD} = 10V$	4	12		MHz
		$V_{DD} = 15V$	5	15		MHz
t_{PHL}	Reset Propagation Delay Time	$V_{DD} = 5V$		185	350	ns
		$V_{DD} = 10V$		85	125	ns
		$V_{DD} = 15V$		70	100	ns
t_{WH}	Reset Minimum Pulse Width	$V_{DD} = 5V$		185	350	ns
		$V_{DD} = 10V$		85	125	ns
		$V_{DD} = 15V$		70	100	ns
C_{IN}	Input Capacitance (Note 5)	Any Input		5	7.5	pF

Note 4: AC Parameters are guaranteed by DC correlated testing.

Note 5: Capacitance is guaranteed by periodic testing.

Physical Dimensions inches (millimeters) unless otherwise noted

0.335 – 0.344
(8.509 – 8.738)

14 13 12 11 10 9 8

0.228 – 0.244
(5.791 – 6.198)

LEAD NO. 1
IDENT

1 2 3 4 5 6 7

30°
TYP

0.010
(0.254) MAX

0.150 – 0.157
(3.810 – 3.988)

0.010 – 0.020
(0.254 – 0.508) × 45°

8° MAX TYP
ALL LEADS

0.008 – 0.010
(0.203 – 0.254)
TYP ALL LEADS

0.004
(0.102)
ALL LEAD TIPS

0.016 – 0.050
(0.406 – 1.270)
TYP ALL LEADS

0.053 – 0.069
(1.346 – 1.753)

SEATING
PLANE

0.004 – 0.010
(0.102 – 0.254)

0.014
(0.356)

0.050
(1.270)
TYP

0.008
(0.203) TYP

0.014 – 0.020
(0.356 – 0.508) TYP

M14A (REV H)
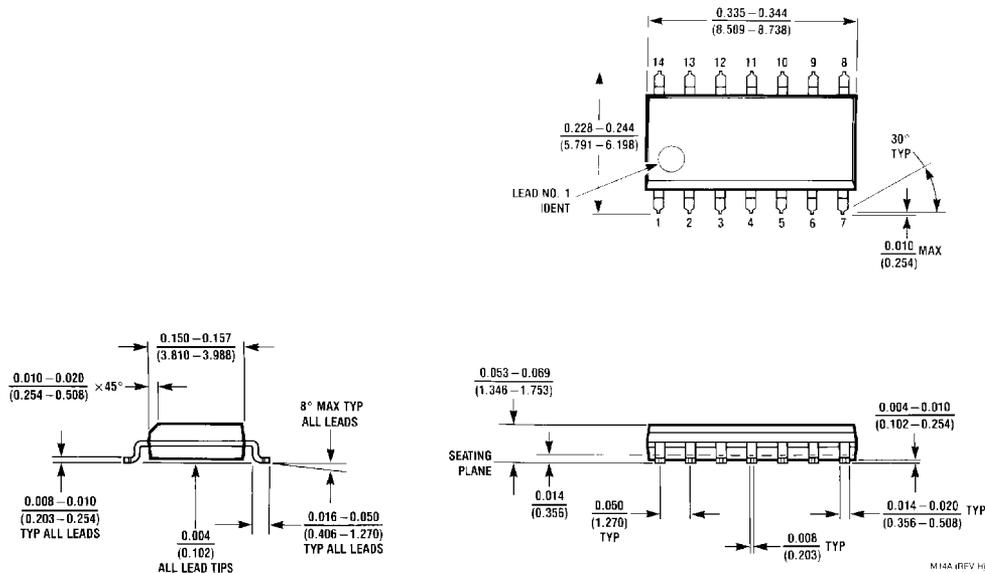
14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow Body
Package Number M14A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

0.740 – 0.770
(18.80   19.56)

0.090
(2.286)

14 13 12 11 10 9 8

0.250 ± 0.010
(6.350 ± 0.254)

PIN NO. 1
IDENT

1 2 3 4 5 6 7

0.092
(2.337) DIA

0.030 MAX
(0.762) DEPTH

OPTION 1

INDEX
AREA

14 13 12

PIN NO. 1
IDENT

1 2 3

OPTION 02

0.135 ± 0.005
(3.429 ± 0.127)

0.145 – 0.200
(3.683 – 5.080)

0.060 TYP
(1.524)

4° TYP
OPTIONAL

0.020
(0.508)
MIN

0.125 – 0.150
(3.175 – 3.810)

90° ± 4° TYP

0.075 ± 0.015
(1.905 ± 0.381)

0.014 – 0.023 TYP
(0.356 – 0.584)

0.100 ± 0.010 TYP
(2.540 ± 0.254)

0.050 ± 0.010 TYP
(1.270 – 0.254)

0.300 – 0.320
(7.620 – 8.128)

0.065
(1.651)

95° ± 5°

0.008 – 0.016 TYP
(0.203 – 0.406)

0.280
(7.112)
MIN

0.325 +0.040 −0.015

(8.255 +1.016 −0.381)

N14A REV F

14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N14A

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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