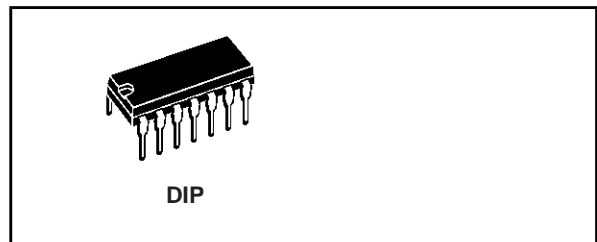# CC4024

RIPPLE-CARRY BINARY COUNTER/DIVIDERS 7 STAGE

- MEDIUM SPEED OPERATION :
  t_{PD} = 80ns (Typ.) at V_{DD} = 10V
- FULLY STATIC OPERATION
- COMMON RESET
- BUFFERED INPUTS AND OUTPUTS
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT
  I_I = 100nA (MAX) AT V_{DD} = 18V T_A = 25°C
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B " STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"

DESCRIPTION

The CC4024 is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages. The CC4024 is a ripple carry binary counter. All counter stages are master-slave flip-flops. The
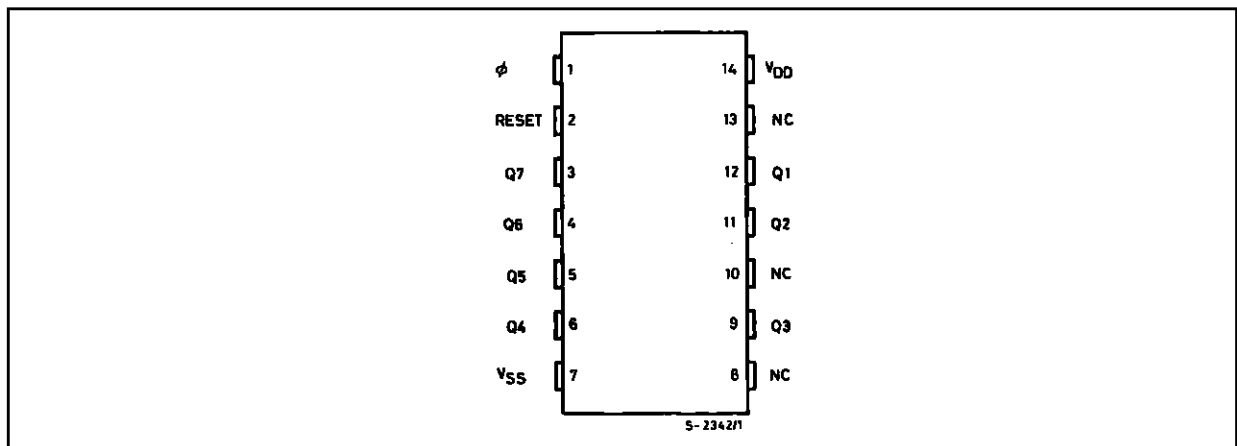

DIP

ORDER CODES

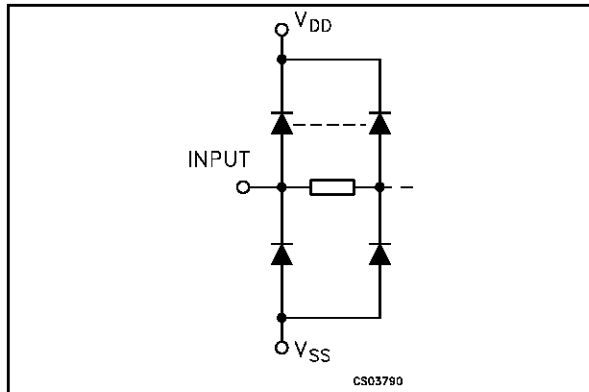| PACKAGE	TUBE	T & R
DIP	CC4024	

state of a counter advances one count on the negative transition of each input pulse; a high level on the RESET line resets the counter to its all zeros stage. Schmitt trigger action on the input pulse line permits unlimited clock rise and fall times.
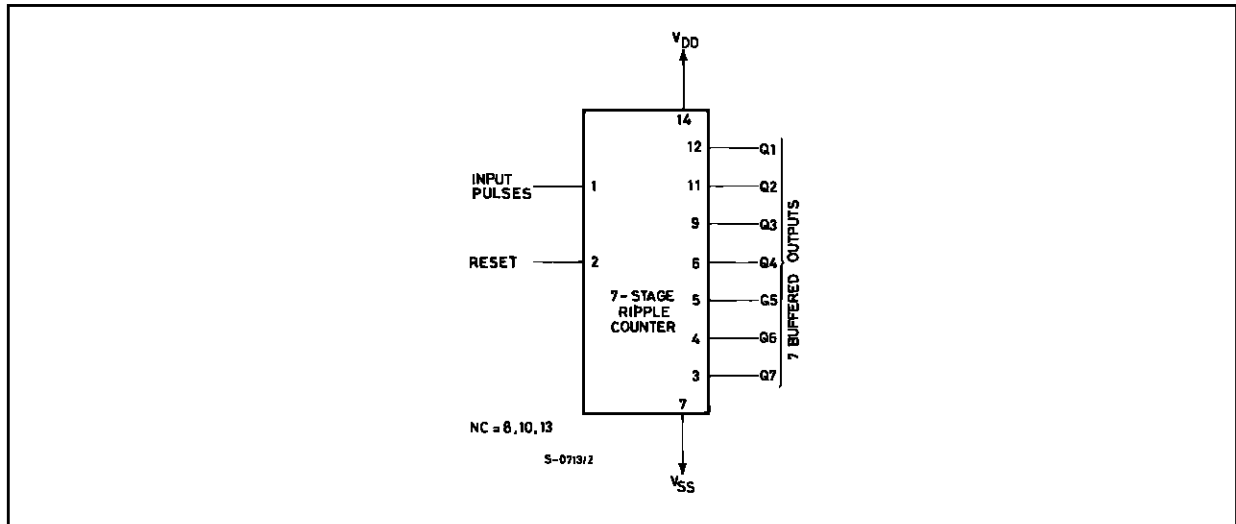All inputs and outputs are buffered

PIN CONNECTION

φ	1	14	V_{DD}
RESET	2	13	NC
Q7	3	12	Q1
Q6	4	11	Q2
Q5	5	10	NC
Q4	6	9	Q3
V_{SS}	7	8	NC

S-2342/1

IINPUT EQUIVALENT CIRCUIT

PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
12, 11, 9, 6, 5, 4, 3	Q1 to Q7	7 Buffered Outputs
8, 10, 13	NC	Not Connected
2	RESET	Reset Input
1	Φ	Input Pulses
7	V_{SS}	Negative Supply Voltage
14	V_{DD}	Positive Supply Voltage

FUNCTIONAL DIAGRAM

TRUTH TABLE

Φ	RESET	OUTPUT STATE
X	H	ALL OUTPUTS = "L"
⌐	L	NO CHANGE
⌐_	L	ADVANCE TO NEXT STATE

X : Don't Care

CC4024

LOGIC DIAGRAM

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	-0.5 to +20	V
V_I	DC Input Voltage	-0.5 to V_{DD} + 0.5	V
I_I	DC Input Current	± 10	mA
P_D	Power Dissipation per Package	200	mW
	Power Dissipation per Output Transistor	100	mW
T_{op}	Operating Temperature	-55 to +125	°C
T_{stg}	Storage Temperature	-65 to +150	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.
All voltage values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	3 to 1 8	V
V_I	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature	-55 to 125	°C

CC4024

DC SPECIFICATIONS

Symbol	Parameter	Test Condition				Value							Unit
		V_I (V)	V_O (V)	$|I_O|$ (μA)	V_{DD} (V)	$T_A = 25°C$			-40 to 85°C		-55 to 125°C		
						Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
I_L	Quiescent Current	0/5			5		0.04	5		150		150	μA
		0/10			10		0.04	10		300		300	
		0/15			15		0.04	20		600		600	
		0/18			18		0.08	100		3000		3000	
V_{OH}	High Level Output Voltage	0/5		<1	5	4.95			4.95		4.95		V
		0/10		<1	10	9.95			9.95		9.95		
		0/15		<1	15	14.95			14.95		14.95		
V_{OL}	Low Level Output Voltage	5/0		<1	5		0.05			0.05		0.05	V
		10/0		<1	10		0.05			0.05		0.05	
		15/0		<1	15		0.05			0.05		0.05	
V_{IH}	High Level Input Voltage		0.5/4.5	<1	5	3.5			3.5		3.5		V
			1/9	<1	10	7			7		7		
			1.5/13.5	<1	15	11			11		11		
V_{IL}	Low Level Input Voltage		4.5/0.5	<1	5			1.5		1.5		1.5	V
			9/1	<1	10			3		3		3	
			13.5/1.5	<1	15			4		4		4	
I_{OH}	Output Drive Current	0/5	2.5	<1	5	-1.36	-3.2		-1.1		-1.1		mA
		0/5	4.6	<1	5	-0.44	-1		-0.36		-0.36		
		0/10	9.5	<1	10	-1.1	-2.6		-0.9		-0.9		
		0/15	13.5	<1	15	-3.0	-6.8		-2.4		-2.4		
I_{OL}	Output Sink Current	0/5	0.4	<1	5	0.44	1		0.36		0.36		mA
		0/10	0.5	<1	10	1.1	2.6		0.9		0.9		
		0/15	1.5	<1	15	3.0	6.8		2.4		2.4		
I_I	Input Leakage Current	0/18	Any Input		18		$\pm10^{-5}$	±0.1		±1		±1	μA
C_I	Input Capacitance		Any Input				5	7.5					pF

The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD}=5V, 2V min. with V_{DD}=10V, 2.5V min. with V_{DD}=15V

DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25°C$, $C_L = 50pF$, $R_L = 200K\Omega$, $t_r = t_f = 20$ ns)

Symbol	Parameter	Test Condition		Value (*)			Unit
		V_{DD} (V)		Min.	Typ.	Max.	
INPUT-PULSE OPERATION							
t_{PLH} t_{PHL}	Propagation Delay Time ($\varnothing$ to Q1 Out)	5			180	360	ns
		10			80	160	
		15			65	130	
t_{PLH} t_{PHL}	Propagation Delay Time (Qn to Qn+1)	5			100	200	ns
		10			40	80	
		15			30	60	
t_{THL} t_{TLH}	Transition Time	5			100	200	ns
		10			50	100	
		15			40	80	
t_W	Minimum Input Pulse Width	5			70	140	ns
		10			30	60	
		15			20	40	
t_r, t_f	Input Pulse Rise and Fall Time	5		unlimited			μs
		10					
		15					
f_{max}	Maximum Clock Input Frequency	5		3.5	7		MHz
		10		8	16		
		15		12	24		
RESET OPERATION							
t_{PHL}	Propagation Delay Time	5			140	280	ns
		10			60	120	
		15			50	100	
t_W	Minimum Reset Pulse Width	5			100	200	ns
		10			40	80	
		15			30	60	
t_{REM}	Reset Removal Time	5			175	350	ns
		10			75	150	
		15			50	100	

(*) Typical temperature coefficient for all V_{DD} value is 0.3 %/°C.