



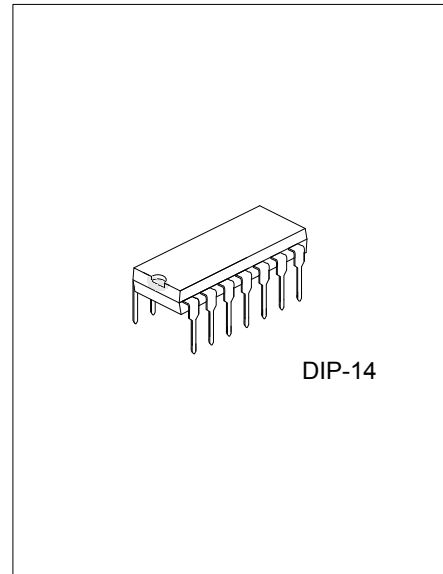
### 7-STAGE RIPPLE COUNTER BINARY COUNTER / DIVIDERS

#### DESCRIPTION

The UTC **UCD4024B** is a 7-stage ripple counter with short propagation delays and high maximum clock rates. The Reset input has standard noise immunity, however the Clock input has increased noise immunity due to Hysteresis. The output of each counter stage is buffered.

#### FEATURES

- \* Diode Protection on All Inputs
- \* Output Transitions Occur on the Falling Edge of the Clock Pulse
- \* Supply Voltage Range = 3.0V to 18V
- \* Capable of Driving Two Low-power TTL Loads or One Low-power Schottky TTL Load Over the Rated Temperature Range

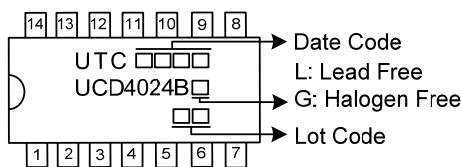


#### ORDERING INFORMATION

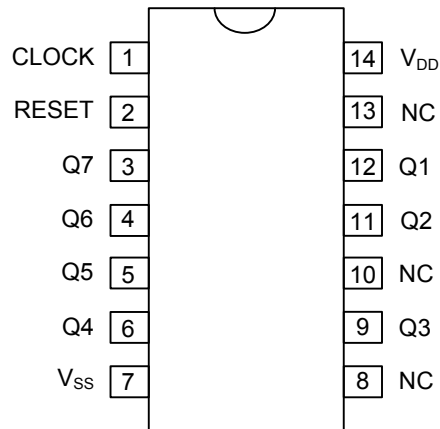
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UCD4024BL-D14-T	UCD4024BG-D14-T	DIP-14	Tube

<p>UCD4024BG-D14-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube</p> <p>(2) D14: DIP-14</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



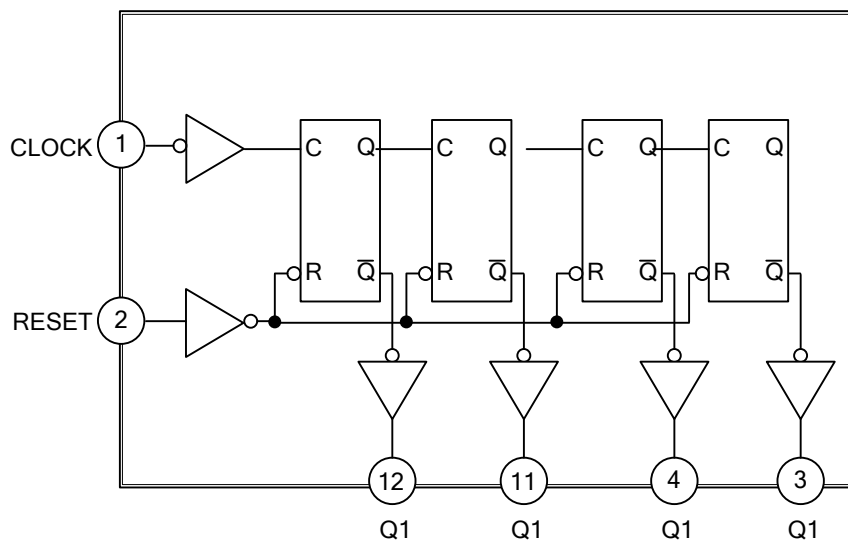
■ PIN CONFIGURATION



■ TRUTH TABLE

CLOCK	RESET	STATE
L	L	No Change
L	H	All Outputs Low
H	L	No Change
H	H	All Outputs Low
↑	L	No Change
↑	H	All Outputs Low
↓	L	Advance One Count
↓	H	All Outputs Low

■ BLOCK DIAGRAM



Q3 = PIN 9  
 Q4 = PIN 6  
 Q5 = PIN 5

### ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
DC Supply Voltage Range	$V_{DD}$	-0.5 ~ +18	V
Input or Output Voltage Range (DC or Transient)	$V_{IN}, V_{OUT}$	-0.5 ~ $V_{DD}+0.5$	V
Input or Output Current (DC or Transient) per Pin	$I_{IN}, I_{OUT}$	±10	mA
Power Dissipation, per Package (Note 2)	$P_D$	500	mW
Storage Temperature Range	$T_{STG}$	-65 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{DD}$	3 ~ 18	V
Operating Temperature	$T_A$	-40 ~ +125	°C

### ■ ELECTRICAL CHARACTERISTICS (Voltages Referenced to $V_{SS}$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP (Note 1)	MAX	UNIT
High-level Input Voltage	$V_{IH}$	$V_{DD}=5V, V_{OUT}=0.5$ or $4.5V$	3.5			V
		$V_{DD}=10V, V_{OUT}=1.0$ or $9.0V$	7.0			V
		$V_{DD}=15V, V_{OUT}=1.5$ or $13.5V$	11			V
Low-level Input Voltage	$V_{IL}$	$V_{DD}=5V, V_{OUT}=4.5$ or $0.5V$			1.5	V
		$V_{DD}=10V, V_{OUT}=9.0$ or $1.0V$			3.0	V
		$V_{DD}=15V, V_{OUT}=13.5$ or $1.5V$			4.0	V
High-level Output Voltage	$V_{OH}$	$V_{DD}=5V, V_{IN}=0$ or $V_{DD}$	4.95	5.0		V
		$V_{DD}=10V, V_{IN}=0$ or $V_{DD}$	9.95	10		V
		$V_{DD}=15V, V_{IN}=0$ or $V_{DD}$	14.95	15		V
Low-level Output Voltage	$V_{OL}$	$V_{DD}=5V, V_{IN}=0$ or $V_{DD}$		0	0.05	V
		$V_{DD}=10V, V_{IN}=0$ or $V_{DD}$		0	0.05	V
		$V_{DD}=15V, V_{IN}=0$ or $V_{DD}$		0	0.05	V
High-Level Output Current	$I_{OH}$	$V_{DD}=5V, V_{OH}=2.5V$	-1.6	-3.2		mA
		$V_{DD}=5V, V_{OH}=4.6V$	-0.51	-1		mA
		$V_{DD}=10V, V_{OH}=9.5V$	-1.3	-2.6		mA
		$V_{DD}=15V, V_{OH}=13.5V$	-3.4	-6.8		mA
Low-Level Output Current	$I_{OL}$	$V_{DD}=5V, V_{OL}=0.4V$	0.51	1		mA
		$V_{DD}=10V, V_{OL}=0.5V$	1.3	2.6		mA
		$V_{DD}=15V, V_{OL}=1.5V$	3.4	6.8		mA
Input Current	$I_{in}$	$V_{DD}=15V$			±0.1	µA
Quiescent Current	$I_{DD}$	$V_{DD}=5V$	Per Package		5	µA
		$V_{DD}=10V$			10	µA
		$V_{DD}=15V$			20	µA

Notes: 1. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

2. The formulas given are for the typical characteristics only at 25°C.

### ■ SWITCHING CHARACTERISTICS (Note 1)

( $C_L = 50\text{pF}$ ,  $R_L = 200\text{k}\Omega$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP (Note 2)	MAX	UNIT
Propagation Delay Time	Clock to $Q_1$	$t_{PLH} / t_{PHL}$	$V_{DD} = 5.0\text{V}$		160	360	ns
			$V_{DD} = 10\text{V}$		90	160	ns
			$V_{DD} = 15\text{V}$		70	130	ns
	$Q_n$ to $Q_{n+1}$		$V_{DD} = 5.0\text{V}$		110	330	ns
			$V_{DD} = 10\text{V}$		70	80	ns
			$V_{DD} = 15\text{V}$		45	60	ns
	Reset to $Q_n$		$V_{DD} = 5.0\text{V}$		140	280	ns
			$V_{DD} = 10\text{V}$		60	120	ns
			$V_{DD} = 15\text{V}$		50	100	ns
Transition Time	$t_{TLH} / t_{THL}$	$V_{DD} = 5\text{V}$		115	200	ns	
		$V_{DD} = 10\text{V}$		65	100	ns	
		$V_{DD} = 15\text{V}$		55	80	ns	
Clock Pulse Width	$t_{WH}$	$V_{DD} = 5\text{V}$		200		ns	
		$V_{DD} = 10\text{V}$		600		ns	
		$V_{DD} = 15\text{V}$		40		ns	
Reset Pulse Width	$t_{WH}$	$V_{DD} = 5\text{V}$		375		ns	
		$V_{DD} = 10\text{V}$		200		ns	
		$V_{DD} = 15\text{V}$		150		ns	
Reset Removal Time	$t_{rem}$	$V_{DD} = 5\text{V}$		250		ns	
		$V_{DD} = 10\text{V}$		75		ns	
		$V_{DD} = 15\text{V}$		50		ns	
Input Pulse Frequency	$f_{cl}$	$V_{DD} = 5\text{V}$		2.5		MHz	
		$V_{DD} = 10\text{V}$		8.0		MHz	
		$V_{DD} = 15\text{V}$		12		MHz	

Notes: 1. The formulas given are for the typical characteristics only at  $25^\circ\text{C}$ .

2. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

### ■ OPERATING CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Capacitance	$C_{IN}$	$V_{IN} = 0$		5.0		pF

■ TEST CIRCUIT

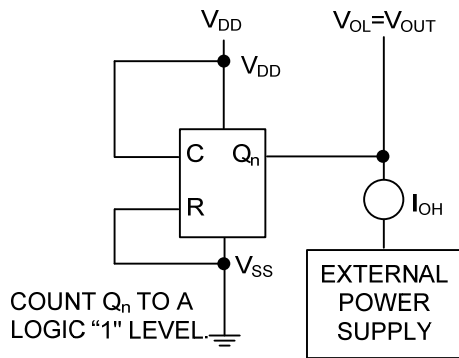


Figure 1. Typical Output Source Characteristics Test Circuit

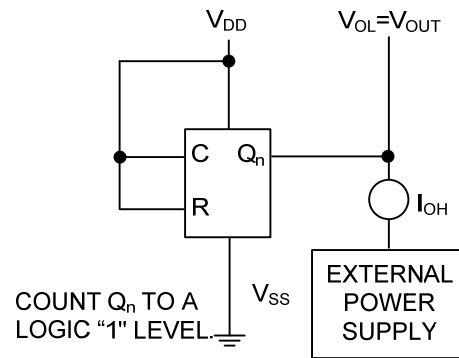


Figure 2. Typical Output Sink Characteristics Test Circuit

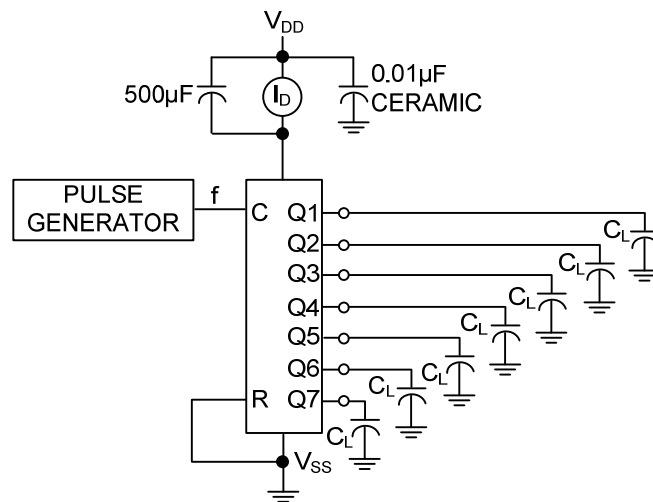
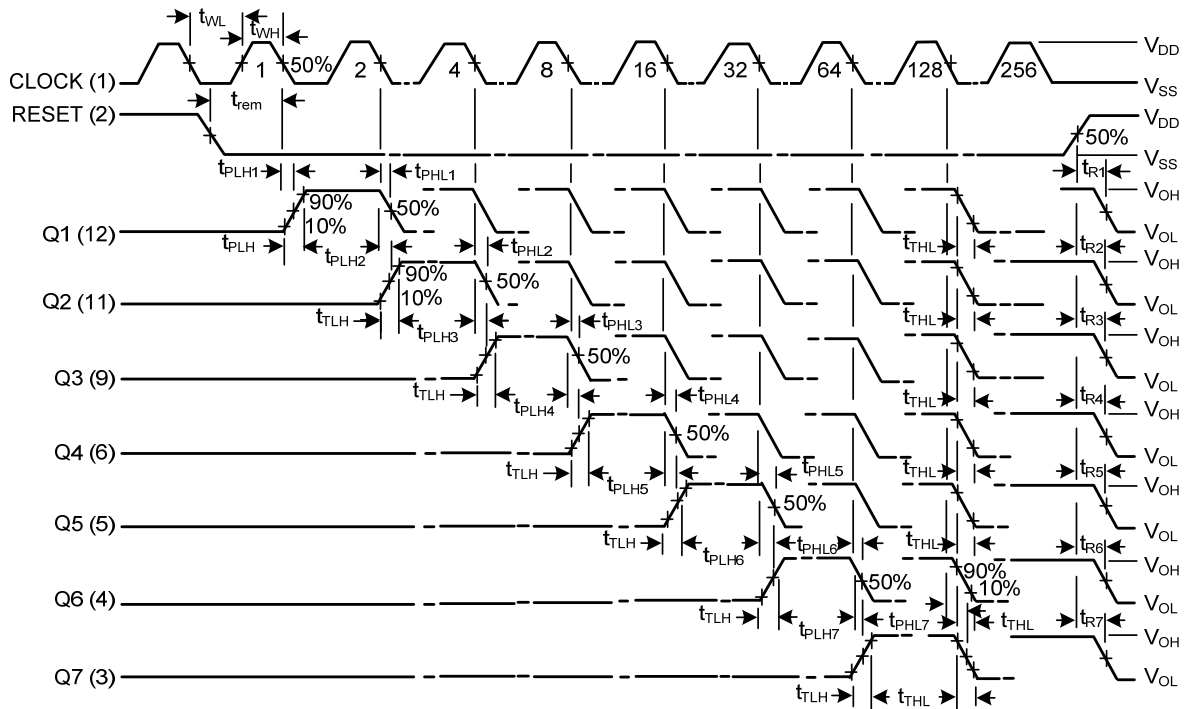


Figure 3. Power Dissipation Test Circuit

■ FUNCTIONAL WAVEFORMS



Input  $t_{TLH}$  and  $t_{THL}$ =20ns

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