

CD4528BC

Dual Monostable Multivibrator

General Description

The CD4528B is a dual monostable multivibrator. Each device is retriggerable and resettable. Triggering can occur from either the rising or falling edge of an input pulse, resulting in an output pulse over a wide range of widths. Pulse duration and accuracy are determined by external timing components Rx and Cx.

Features

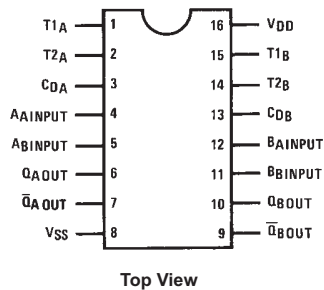
- Wide supply voltage range: 3.0V to 18V
- Separate reset available
- Quiescent current = 5.0 nA/package (typ.) at 5.0 V_{DC}
- Diode protection on all inputs
- Triggerable from leading or trailing edge pulse
- Capable of driving two low-power TTL loads or one low-power Schottky TTL load over the rated temperature range

Ordering Code:

Order Number	Package Number	Package Description
CD4528BCM	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
CD4528BCN	N16E	16-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

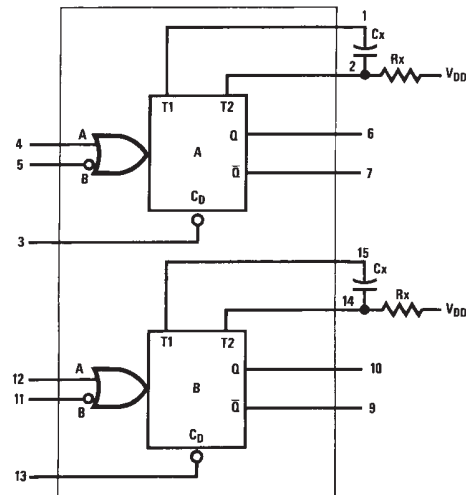


Truth Table

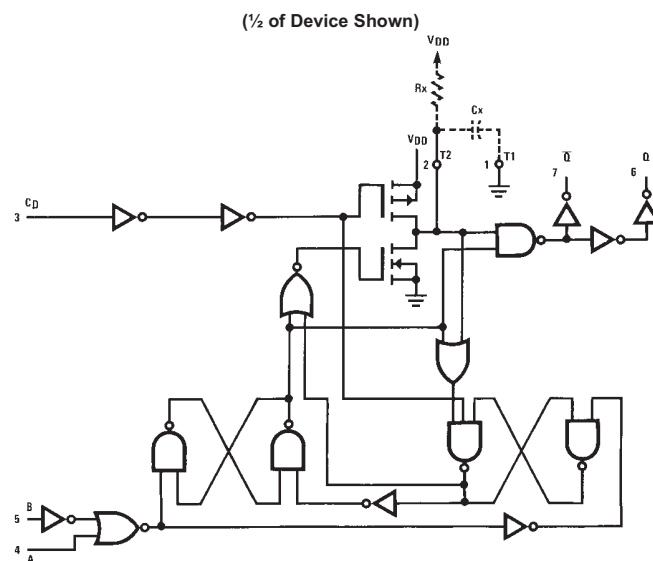
Inputs			Outputs	
Clear	A	B	Q	Q
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↓	⌋	⌋
H	↑	H	⌋	⌋

H = HIGH Level
L = LOW Level
↑ = Transition from LOW-to-HIGH
↓ = Transition from HIGH-to-LOW
⌋ = One HIGH Level Pulse
⌋ = One LOW Level Pulse
X = Irrelevant

Block Diagram



Logic Diagram



Note: Externally ground pins 1 and 15 to pin 8.

Absolute Maximum Ratings(Note 1)

(Note 2)

DC Supply Voltage (V_{DD}) $-0.5 V_{DC}$ to $+18 V_{DC}$
 Input Voltage, All Inputs (V_{IN}) $-0.5 V_{DC}$ to $V_{DD} + 0.5 V_{DC}$
 Storage Temperature Range (T_S) -65°C to $+150^{\circ}\text{C}$

Power Dissipation (P_D)

Dual-In-Line 700 mW

Small Outline 500 mW

Lead Temperature (T_L)(Soldering, 10 seconds) 260°C **Recommended Operating Conditions** (Note 2)DC Supply Voltage (V_{DD}) 3V to 15VInput Voltage (V_{IN}) 0V to V_{DD} V_{DC} Operating Temperature Range (T_A) -40°C to $+85^{\circ}\text{C}$

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

Note 2: $V_{SS} = 0\text{V}$ unless otherwise specified.**DC Electrical Characteristics** (Note 3)

Symbol	Parameter	Conditions	-40°C		$+25^{\circ}\text{C}$			$+85^{\circ}\text{C}$		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	$V_{DD} = 5\text{V}$		20		0.005	20		150	μA
		$V_{DD} = 10\text{V}$		40		0.010	40		300	μA
		$V_{DD} = 15\text{V}$		80		0.015	80		600	μA
V_{OL}	LOW Level Output Voltage	$V_{DD} = 5\text{V}$		0.05			0.05		0.05	V
		$V_{DD} = 10\text{V}$		0.05			0.05		0.05	V
		$V_{DD} = 15\text{V}$		0.05			0.05		0.05	V
V_{OH}	HIGH Level Output Voltage	$V_{DD} = 5\text{V}$	4.95		4.95	5.0		4.95		V
		$V_{DD} = 10\text{V}$	9.95		9.95	10.0		9.95		V
		$V_{DD} = 15\text{V}$	14.95		14.95	15.0		14.95		V
V_{IL}	LOW Level Input Voltage	$V_{DD} = 5\text{V}$, $V_O = 0.5\text{V}$ or 4.5V		1.5		2.25	1.5		1.5	V
		$V_{DD} = 10\text{V}$, $V_O = 1\text{V}$ or 9V		3.0		4.50	3.0		3.0	V
		$V_{DD} = 15\text{V}$, $V_O = 1.5\text{V}$ or 13.5V		4.0		6.75	4.0		4.0	V
V_{IH}	HIGH Level Input Voltage	$V_{DD} = 5\text{V}$, $V_O = 0.5\text{V}$ or 4.5V	3.5		3.5	2.75		3.5		V
		$V_{DD} = 10\text{V}$, $V_O = 1\text{V}$ or 9V	7.0		7.0	5.50		7.0		V
		$V_{DD} = 15\text{V}$, $V_O = 1.5\text{V}$ or 13.5V	11.0		11.0	8.25		11.0		V
I_{OL}	LOW Level Output Current (Note 4)	$V_{DD} = 5\text{V}$, $V_O = 0.4\text{V}$	0.52		0.44	0.88		0.36		mA
		$V_{DD} = 10\text{V}$, $V_O = 0.5\text{V}$	1.3		1.1	2.25		0.9		mA
		$V_{DD} = 15\text{V}$, $V_O = 1.5\text{V}$	3.6		3.0	8.8		2.4		mA
I_{OH}	HIGH Level Output Current (Note 4)	$V_{DD} = 5\text{V}$, $V_O = 4.6\text{V}$	-0.2		-0.16	-0.36		-0.12		mA
		$V_{DD} = 10\text{V}$, $V_O = 9.5\text{V}$	-0.5		-0.4	-0.9		-0.3		mA
		$V_{DD} = 15\text{V}$, $V_O = 13.5\text{V}$	-1.4		-1.2	-3.5		-1.0		mA
I_{IN}	Input Current	$V_{DD} = 15\text{V}$, $V_{IN} = 0\text{V}$		-0.3		-10^{-5}	-0.3		-1.0	μA
		$V_{DD} = 15\text{V}$, $V_{IN} = 15\text{V}$		0.3		10^{-5}	0.3		1.0	μA

Note 3: $V_{SS} = 0\text{V}$ unless otherwise specified.**Note 4:** I_{OH} and I_{OL} are tested one output at a time.

AC Electrical Characteristics (Note 5)T_A = 25°C, C_L = 50 pF, R_L = 200 kΩ, Input t_r = t_f = 20 ns, unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t _r	Output Rise Time	t _r = (3.0 ns/pF) C _L + 30 ns, V _{DD} = 5.0V t _r = (1.5 ns/pF) C _L + 15 ns, V _{DD} = 10.0V t _r = (1.1 ns/pF) C _L + 10 ns, V _{DD} = 15.0V		180 90 65	400 200 160	ns ns ns
t _f	Output Fall Time	t _f = (1.5 ns/pF) C _L + 25 ns, V _{DD} = 5.0V t _f = (0.75 ns/pF) C _L + 12.5 ns, V _{DD} = 10V t _f = (0.55 ns/pF) C _L + 9.5 ns, V _{DD} = 15.0V		100 50 35	200 100 80	ns ns ns
t _{PLH} t _{PHL}	Turn-Off, Turn-On Delay A or B to Q or $\overline{Q}$ C _x = 15 pF, R _x = 5.0 kΩ	t _{PLH} , t _{PHL} = (1.7 ns/pF) C _L + 240 ns, V _{DD} = 5.0V t _{PLH} , t _{PHL} = (0.66 ns/pF) C _L + 8 ns, V _{DD} = 10.0V t _{PLH} , t _{PHL} = (0.5 ns/pF) C _L + 65 ns, V _{DD} = 15.0V		230 100 65	500 250 150	ns ns ns
	Turn-Off, Turn-On Delay A or B to Q or $\overline{Q}$ C _x = 100 pF, R _x = 10 kΩ	t _{PLH} , t _{PHL} = (1.7 ns/pF) C _L + 620 ns, V _{DD} = 5.0V t _{PLH} , t _{PHL} = (0.66 ns/pF) C _L + 257 ns, V _{DD} = 10.0V t _{PLH} , t _{PHL} = (0.5 ns/pF) C _L + 185 ns, V _{DD} = 15.0V		230 100 65	500 250 150	ns ns ns
t _{WL} t _{WH}	Minimum Input Pulse Width A or B C _x = 15 pF, R _x = 5.0 kΩ	V _{DD} = 5.0V V _{DD} = 10.0V V _{DD} = 15V		60 20 20	150 50 50	ns ns ns
	C _x = 1000 pF, R _x = 10 kΩ	V _{DD} = 5.0V V _{DD} = 10.0V V _{DD} = 15.0V		60 20 20	150 50 50	ns ns ns
PW _{OUT}	Output Pulse Width Q or $\overline{Q}$ For C _x < 0.01 μF (See Graph for Appropriate V _{DD} Level) C _x = 15 pF, R _x = 5.0 kΩ	V _{DD} = 5.0V V _{DD} = 10.0V V _{DD} = 15.0V		550 350 300		ns ns ns
	For C _x > 0.01 μF Use PW _{out} = 0.2 R _x C _x ln [V _{DD} - V _{SS}] C _x = 10,000 pF, R _x = 10 kΩ	V _{DD} = 5.0V V _{DD} = 10.0V V _{DD} = 15.0V	15 10 15	29 37 42	45 90 95	μs μs μs
t _{PLH} t _{PHL}	Reset Propagation Delay, t _{PLH} , t _{PHL} C _x = 15 pF, R _x = 5.0 kΩ	V _{DD} = 5.0V V _{DD} = 10.0V V _{DD} = 15.0V		325 90 60	600 225 170	ns ns ns
	C _x = 1000 pF, R _x = 10 kΩ	V _{DD} = 5.0V V _{DD} = 10.0V V _{DD} = 15.0V		7.0 6.7 6.7		μs μs μs
t _{RR}	Minimum Retrigger Time C _x = 15 pF, R _x = 5.0 kΩ	V _{DD} = 5.0V V _{DD} = 10.0V V _{DD} = 15.0V		0 0 0		ns ns ns
	C _x = 1000 pF, R _x = 10 kΩ	V _{DD} = 5.0V V _{DD} = 10.0V V _{DD} = 15.0V		0 0 0		ns ns ns
Pulse Width Match between Circuits in the Same Package C _x = 10,000 pF, R _x = 10 kΩ		V _{DD} = 5.0V V _{DD} = 10.0V V _{DD} = 15.0V		6 8 8	25 35 35	% % %

Note 5: AC parameters are guaranteed by DC correlated testing.

Pulse Widths

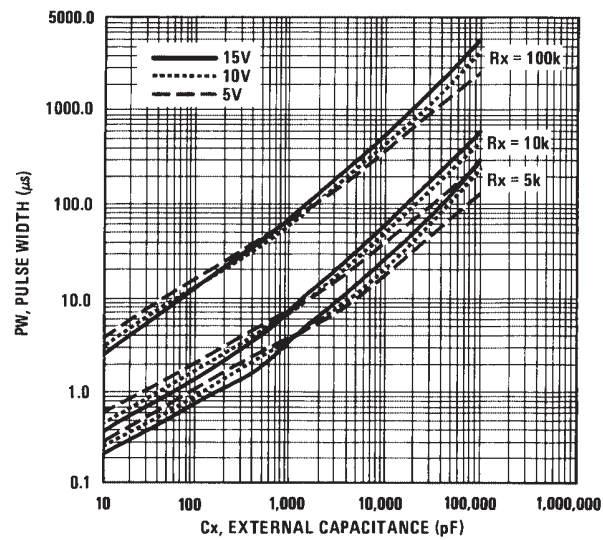
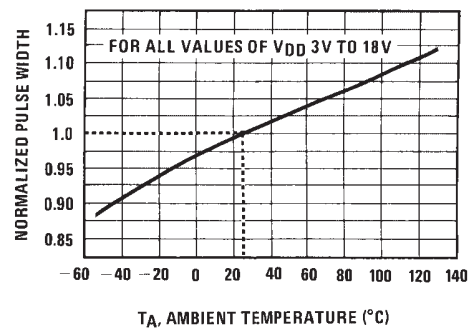
FIGURE 1. Pulse Width vs C_x 

FIGURE 2. Normalized Pulse Width vs Temperature

AC Test Circuits and Waveforms

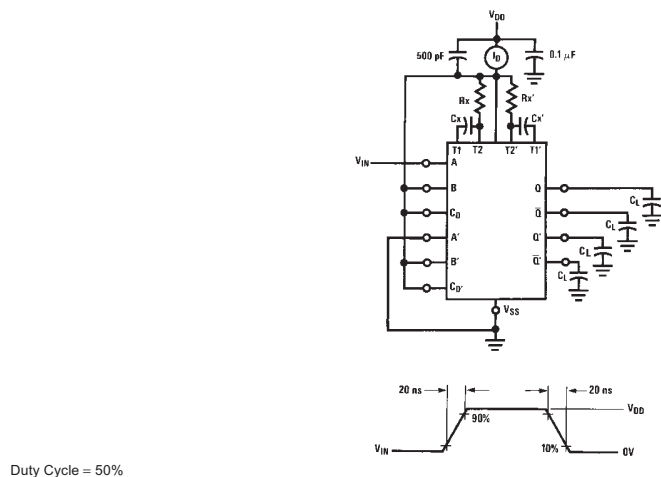
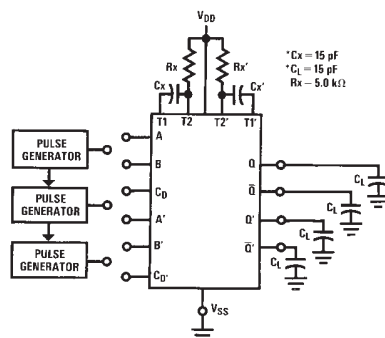


FIGURE 3. Power Dissipation Test Circuit and Waveforms



*Includes capacitance of probes, wiring, and fixture parasitic.

Note: AC test waveforms for PG1, PG2, and PG3 in Figure 4.

Input Connections

Characteristics	C_D	A	B
t_{PLH} , t_{PHL} , t_r , t_f , PW_{out} , PW_{in}	V_{DD}	PG1	V_{DD}
t_{PLH} , t_{PHL} , t_r , t_f , PW_{out} , PW_{in}	V_{DD}	V_{SS}	PG2
$t_{PLH(R)}$, $t_{PHL(R)}$, PW_{in}	PG3	PG1	PG2

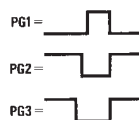


FIGURE 4. AC Test Circuit

AC Test Circuits and Waveforms (Continued)

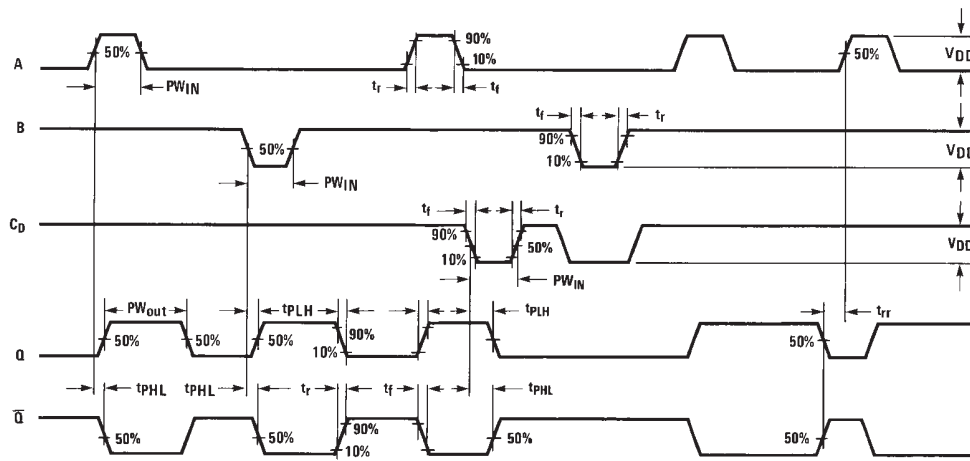
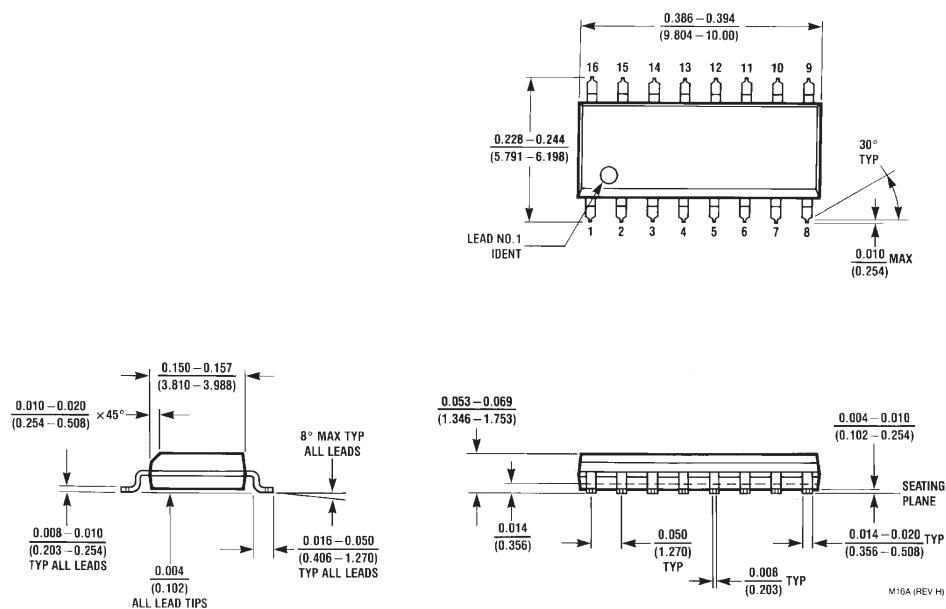


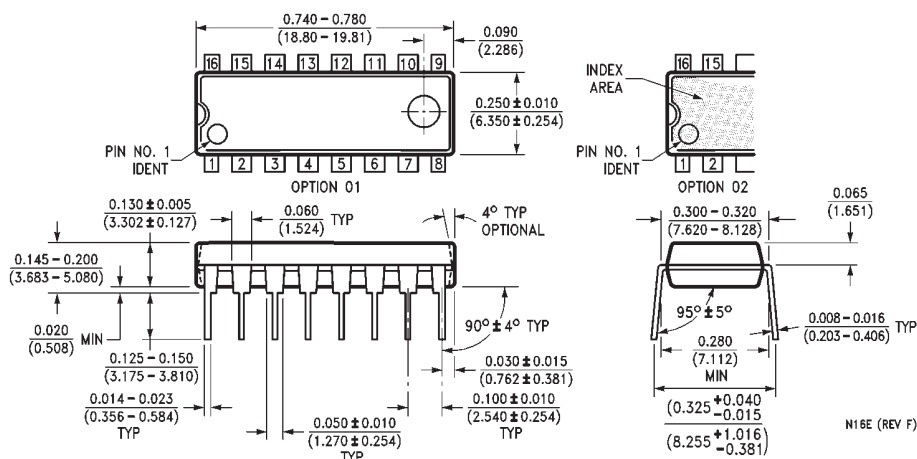
FIGURE 5. AC Test Waveforms

Physical Dimensions inches (millimeters) unless otherwise noted



16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
Package Number M16A

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



16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
Package Number N16E

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