

CD4528BC,CD4528BM

CD4528BM CD4528BC Dual Monostable Multivibrator



Literature Number: SNOS370A

CD4528BM/CD4528BC Dual Monostable Multivibrator

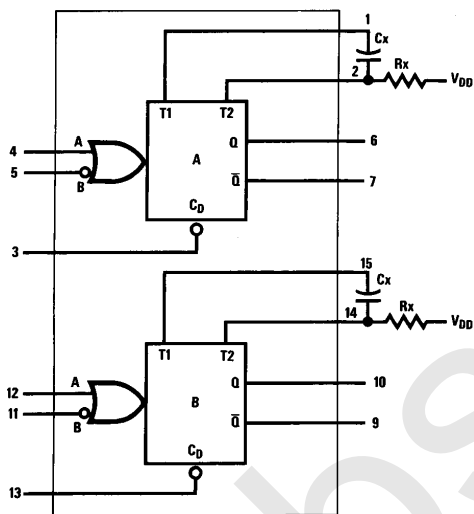
General Description

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

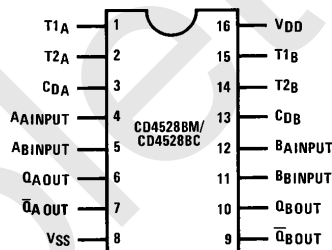
- Wide supply voltage range 3.0V to 18V
- Separate reset available
- Quiescent current = 5.0 nA/package (typ.) at 5.0 V_{DC}
- Diode protection on all inputs
- Triggerable from leading or trailing edge pulse
- Capable of driving two low-power TTL loads or one low-power Schottky TTL load over the rated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

Connection Diagrams



TL/F/5998-1

Dual-In-Line Package



TL/F/5998-2

Top View

Order Number CD4528B

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

Absolute Maximum Ratings (Notes 1 & 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

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 15V

Input Voltage (V_{IN}) 0V to V_{DD}

Operating Temperature Range (T_A)
CD4528BM -55°C to $+125^{\circ}\text{C}$
CD4528BC -40°C to $+85^{\circ}\text{C}$

DC Electrical Characteristics CD4528BM (Note 2)

Symbol	Parameter	Conditions	-55°C		$+25^{\circ}\text{C}$			$+125^{\circ}\text{C}$		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	$V_{DD} = 5\text{V}$		5	0.005		5		150	μA
		$V_{DD} = 10\text{V}$		10	0.010		10		300	μA
		$V_{DD} = 15\text{V}$		20	0.015		20		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 3)	$V_{DD} = 5\text{V}, V_O = 0.4\text{V}$	0.64		0.51	0.88		0.36		mA
		$V_{DD} = 10\text{V}, V_O = 0.5\text{V}$	1.6		1.3	2.25		0.9		mA
		$V_{DD} = 15\text{V}, V_O = 1.5\text{V}$	4.2		3.4	8.8		2.4		mA
I_{OH}	High Level Output Current (Note 3)	$V_{DD} = 5\text{V}, V_O = 4.6\text{V}$	-0.25		-0.2	-0.36		-0.14		mA
		$V_{DD} = 10\text{V}, V_O = 9.5\text{V}$	-0.62		-0.5	-0.9		-0.35		mA
		$V_{DD} = 15\text{V}, V_O = 13.5\text{V}$	-1.8		-1.5	-3.5		-1.1		mA
I_{IN}	Input Current	$V_{DD} = 15\text{V}, V_{IN} = 0\text{V}$		-0.1		-10^{-5}	-0.1		-1.0	μA
		$V_{DD} = 15\text{V}, V_{IN} = 15\text{V}$		0.1		10^{-5}	0.1		1.0	μA

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.

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

DC Electrical Characteristics CD4528BC (Note 2)

Symbol	Parameter	Conditions	− 40°C		+ 25°C			+ 85°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I _{DD}	Quiescent Device Current	V _{DD} = 5V		20		0.005	20		150	μA
		V _{DD} = 10V		40		0.010	40		300	μA
		V _{DD} = 15V		80		0.015	80		600	μA
V _{OL}	Low Level Output Voltage	V _{DD} = 5V		0.05			0.05		0.05	V
		V _{DD} = 10V		0.05			0.05		0.05	V
		V _{DD} = 15V		0.05			0.05		0.05	V
V _{OH}	High Level Output Voltage	V _{DD} = 5V	4.95		4.95	5.0		4.95		V
		V _{DD} = 10V	9.95		9.95	10.0		9.95		V
		V _{DD} = 15V	14.95		14.95	15.0		14.95		V
V _{IL}	Low Level Input Voltage	V _{DD} = 5V, V _O = 0.5V or 4.5V		1.5		2.25	1.5		1.5	V
		V _{DD} = 10V, V _O = 1V or 9V		3.0		4.50	3.0		3.0	V
		V _{DD} = 15V, V _O = 1.5V or 13.5V		4.0		6.75	4.0		4.0	V
V _{IH}	High Level Input Voltage	V _{DD} = 5V, V _O = 0.5V or 4.5V	3.5		3.5	2.75		3.5		V
		V _{DD} = 10V, V _O = 1V or 9V	7.0		7.0	5.50		7.0		V
		V _{DD} = 15V, V _O = 1.5V or 13.5V	11.0		11.0	8.25		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	−0.2		−0.16	−0.36		−0.12		mA
		V _{DD} = 10V, V _O = 9.5V	−0.5		−0.4	−0.9		−0.3		mA
		V _{DD} = 15V, V _O = 13.5V	−1.4		−1.2	−3.5		−1.0		mA
I _{IN}	Input Current	V _{DD} = 15V, V _{IN} = 0V		−0.3		−10 ^{−5}	−0.3		−1.0	μA
		V _{DD} = 15V, V _{IN} = 15V		0.3		10 ^{−5}	0.3		1.0	μA

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} = 0V unless otherwise specified.

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

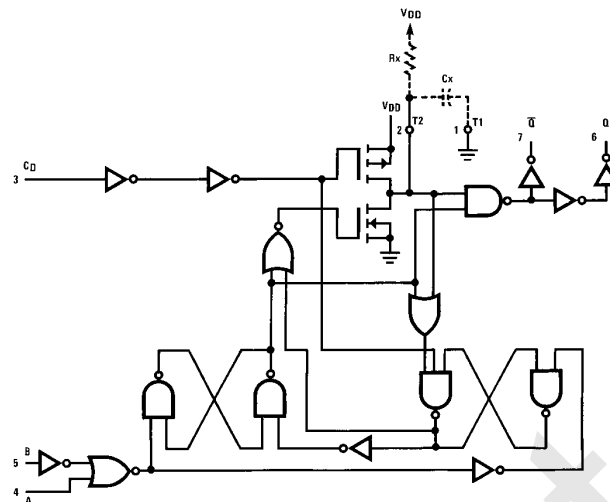
AC Electrical Characteristics* CD4528BM

T_A = 25°C, C_L = 50 pF, R_L = 200 kΩ, Input t_r = t_f = 20 ns, unless otherwise specified

Parameter	Conditions	Min	Typ	Max	Units
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
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
Turn-Off, Turn-On Delay A or B to Q or $\bar{Q}$ 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 $\bar{Q}$ 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
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
Output Pulse Width Q or $\bar{Q}$ 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
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	% % %
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
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

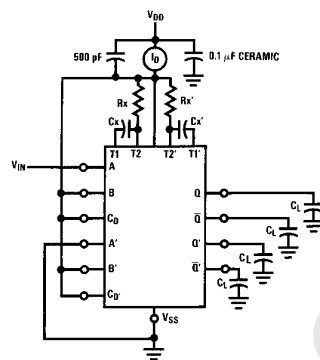
*AC parameters are guaranteed by DC correlated testing.

Logic Diagrams (1/2 of Device Shown)

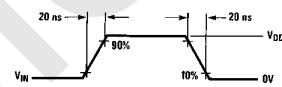


Note: Externally ground pins 1 and 15 to pin 8.

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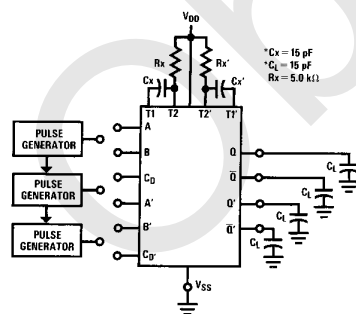
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Duty Cycle = 50%

TL/F/5998-10

FIGURE 1. Power Dissipation Test Circuit and Waveforms



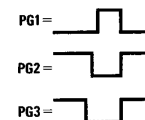
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Input Connections

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

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

Note: AC test waveforms for PG1, PG2, and PG3 on next page.



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FIGURE 2. AC Test Circuit

Logic Diagrams (1/2 of Device Shown) (Continued)

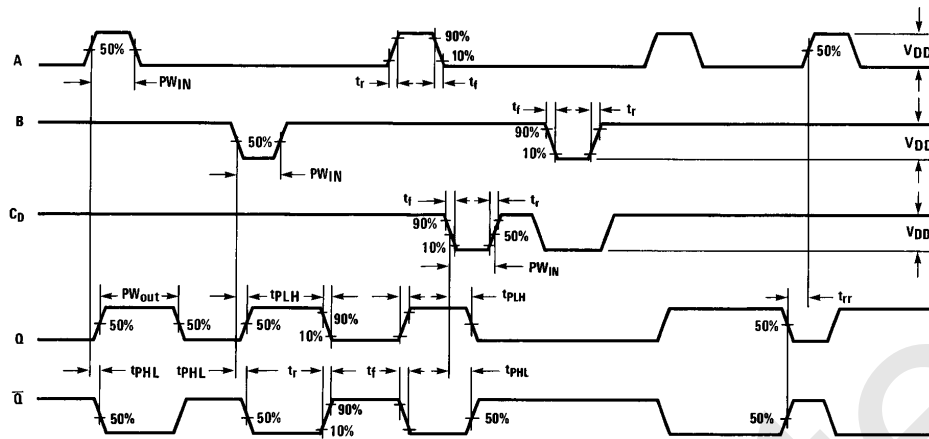


FIGURE 3. AC Test Waveforms

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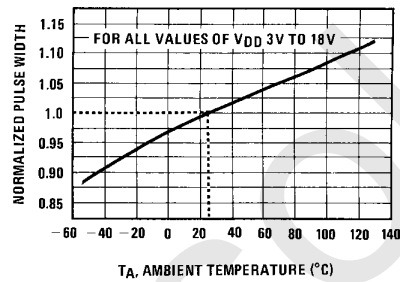


FIGURE 4. Normalized Pulse Width vs Temperature

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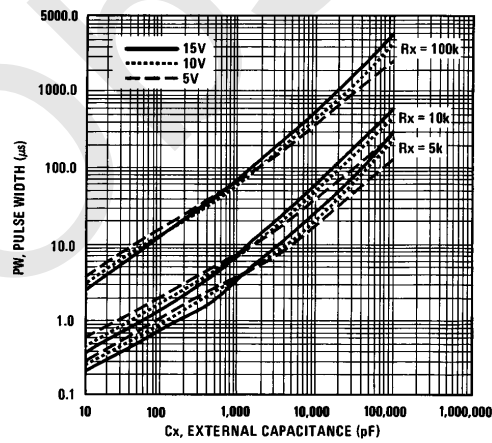
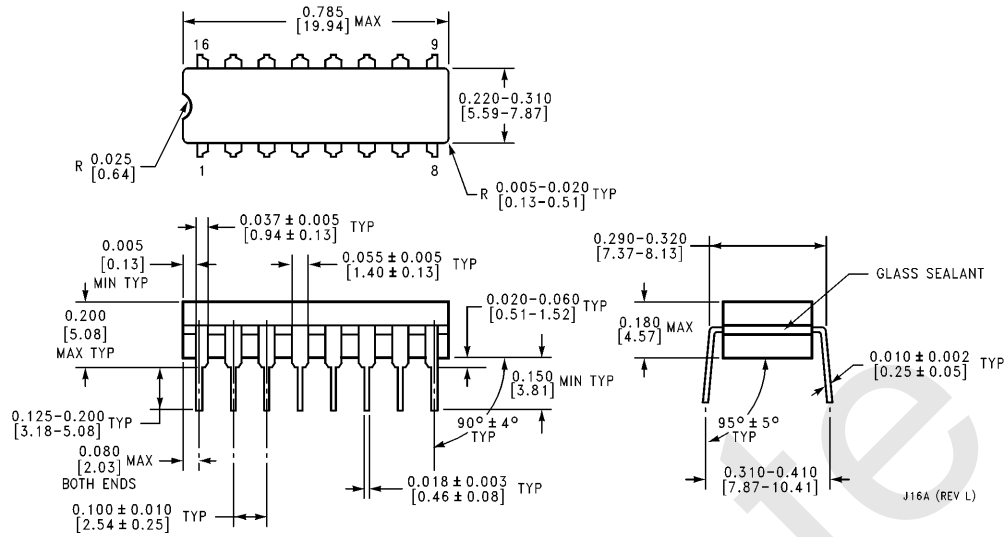


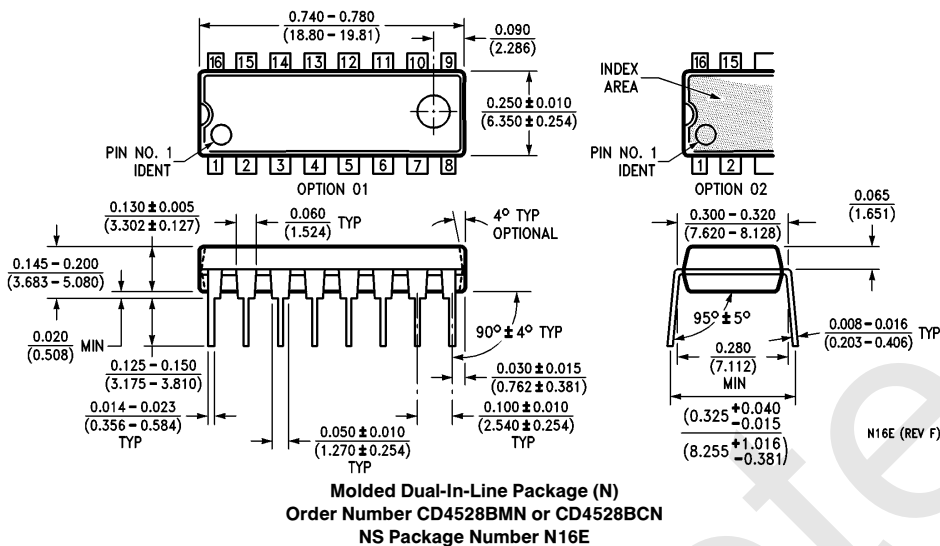
FIGURE 5. Pulse Width vs C_x

TL/F/5998-9

Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number CD4528BMJ or CD4528BCJ
NS Package Number J16A



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