CD4541 CMOS Programmable Timer High Voltage Types

1. General Description

1.1 Description

CD4541 programmable timer consists of a 16-stage binary counter, an oscillator that is controlled by external R-C components (2 resistors and a capacitor), an automatic power-on reset circuit, and output control logic. The counter increments on edge clock transitions and can also be reset via the MASTER RESET input.

The output from this timer is the Q or $\overline{Q}$ output from the 8th,10th, 13th, or 16th counter stage. The desired stage is chosen using time-select inputs A and B (see Frequency Select Table).

The output is available in either of two modes selectable via the MODE input, pin 10 (see Truth Table). When this MODE input is a logic “1”, the output will be a continuous square wave having a frequency equal to the oscillator frequency divided by 2^N. With the MODE input set to logic “0” and after a MASTER RESET is initiated, the output (assuming Q output has been selected) changes from a low to a high state after 2^{N-1} counts and remains in that state until another MASTER RESET pulse is applied or the MODE input is set to a logic “1”.

Timing is initialized by setting the AUTO RESET input (pin 5) to logic “0” and turning power on. If pin 5 is set to logic “1”, the AUTO RESET circuit is disabled and counting will not start until after a positive MASTER RESET pulse is applied and returns to a low level. For reliable automatic power-on reset, VDD should be greater than 5V.

The RC oscillator, shown in Figure 3.3, oscillates with a frequency determined by the RC network and is calculated using:

$$f = \frac{1}{2.3\ R_{TC}C_{TC}}$$

Where f is between 1kHz and 100kHz and $R_S \geq 10k\Omega$ and $= 2R_{TC}$

1.2 Features

- Wide range of digital and analog signal levels: Digital: 3V to 18V
- Low Symmetrical Output Resistance
- Built-In Low-Power RC Oscillator
- Oscillator Frequency Range . . . . . DC to 100kHz
- External Clock (Applied to Pin 3) can be Used Instead of Oscillator
- Operates as 2^N Frequency Divider or as a Single-Transition Timer
- Q/Q Select Provides Output Logic Level Flexibility
- AUTO or MASTER RESET Disables Oscillator During Reset to Reduce Power Dissipation
- Symmetrical Output Characteristics
- 100% Tested for Quiescent Current at 18V
- 5V, 10V, and 15V Parametric Ratings

1.3 Device Information

PART NUMBER	PACKAGE
CD4541	DIP
	SOP
	TSSOP

2. Pin Description and Functional Diagram

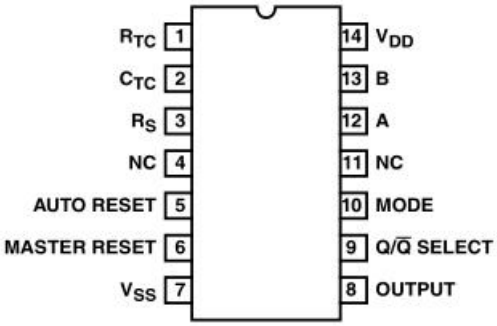


Figure 2.1: Top View

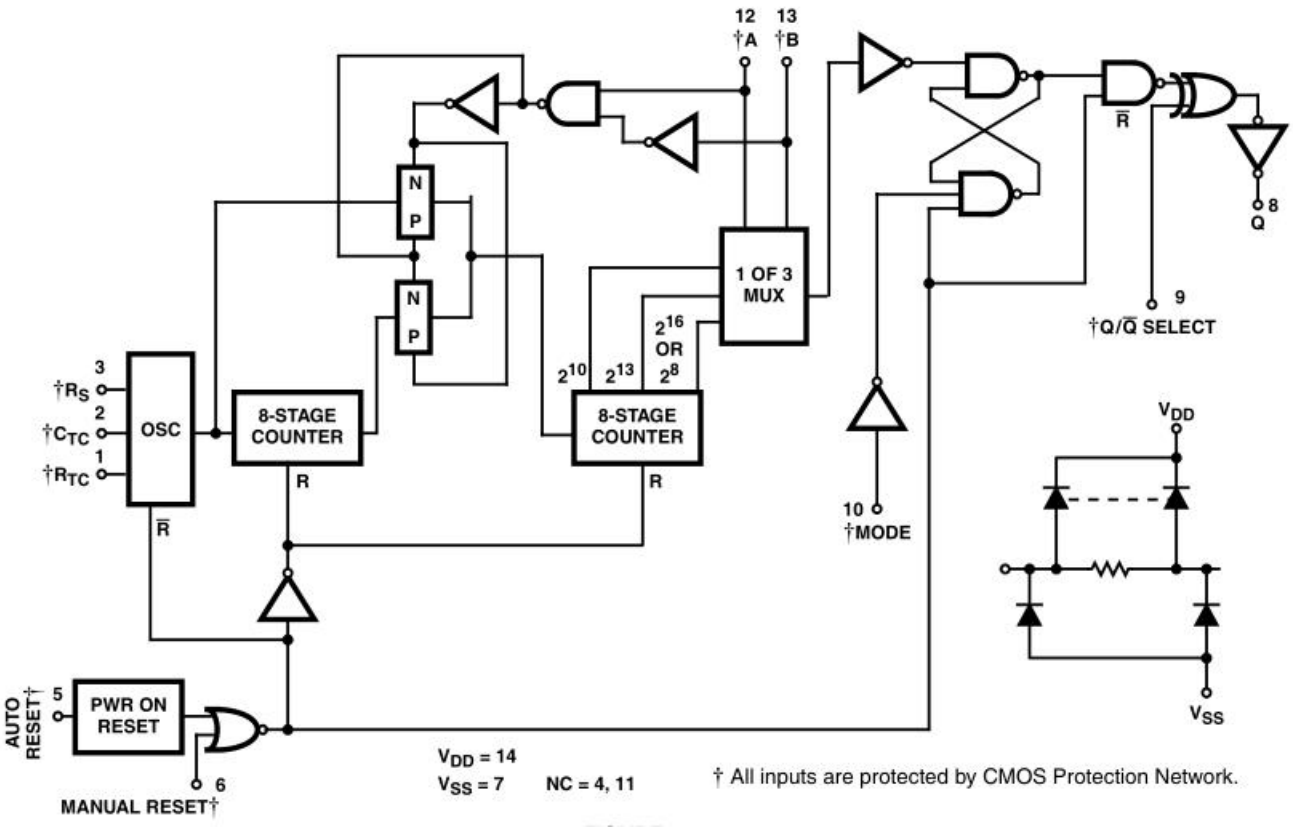


Figure 2.2: Functional Diagram

PIN No.	NAME	I/O	FUNCTION
1	RTC	I	
2	CTC	I	
3	RS	I	
4	NC		Not Connect
5	AUTO RESET	I	AUTO RESET ON(0),AUTO RESET OFF(1)
6	MASTER RESET	I	MASTER RESET ON(1),MASTER RESET OFF(0)
7	VSS		GND
8	OUTPUT	O	
9	$Q/\overline{Q}$ SELECT	O	Output initially Low after Reset(Q),Output initially High after Reset($\overline{Q}$)
10	MODE	I	Single Transition Mode(0),Recycle Mode(1)
11	NC		Not Connect
12	A	I	
13	B	I	
14	VDD		Power Input

3. System Diagram

3.1 Frequency Table

A	B	NO. OF STAGES N	COUNT 2^N
0	0	13	8192
0	1	10	1024
1	0	8	256
1	1	16	65536

CD4541 FREQUENCY SELECTION TABLE

3.2 Truth Table

PIN	STATE	
	0	1
5	Auto Reset On	Auto Reset Disable
6	Master Reset Off	Master Reset On
9	Output Initially Low After Reset (Q)	Output Initially High After Reset ($\overline{Q}$)
10	Single Transition Mode	Recycle Mode

3.3 RC OSCILLATOR CIRCUIT

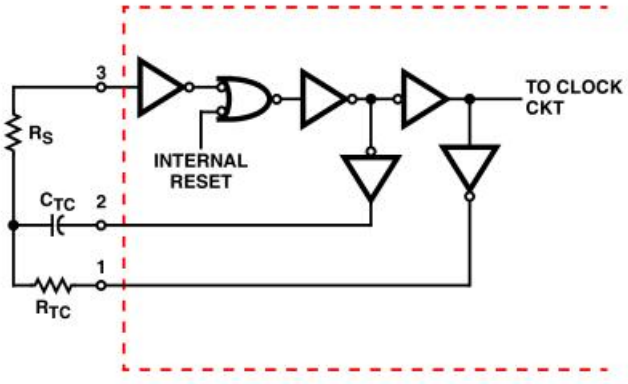


Figure 3.3：RC OSCILLATOR CIRCUIT

4. Specifications

4.1 Absolute Maximum Ratings

Symbol	Parameter	MIN	MAX	Unit
V_{DD}	DC Supply Voltage Range (Voltage Referenced to VSS Terminals)	-0.5	20	V
V_I	Input Voltage Range, All Inputs	0.5	VDD+0.5	V
T_J	Junction Temperature		125	℃
T_{OP}	Operating Temperature	-40	85	℃

Absolute maximum ratings are those values beyond which the device could be permanently damaged,These are stress ratings only,which do not imply functional operation of the device at these or any other conditions beyond those indicated under normal operating conditions.

4.2 Electrical Characteristics

(T_a=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Symbol	Parameter	Test Condition			MIN	TYP	MAX	Unit
		VO	VIN	VDD				
I_{DD}	Supply Current	--	0,5	5	--	0.0	1	uA
		--	0,10	10	--	0.0	1	uA
		--	0,15	15	--	0.0	1	uA
		--	0,18	18	--	0.0	1	uA
I_{OL}	Output Low (Sink) Current	0.4	0,5	5	2	4	--	mA
		0.5	0,10	10	5	10	--	mA
		1.5	0,15	15	15	35	--	mA
I_{OH}	Output High (Source) Current	4.6	0,5	5	-1	-2.5	--	mA
		2.5	0,5	5	-5	-10	--	mA
		9.5	0,10	10	-2	-5	--	mA
		13.5	0,15	15	-10	-20	--	mA
V_{OL}	Output Voltage: Low-Level	--	0,5	5	--	0	0.05	V
		--	0,10	10	--	0	0.05	V
		--	0,15	15	--	0	0.05	V
V_{OH}	Output Voltage: High-Leve	--	0,5	5	4.95	5	--	V
		--	0,10	10	9.95	10	--	V
		--	0.15	15	14.95	15	--	V
V_{IL}	Input Low Voltage	0.5, 4.5	--	5	--	--	1.5	V
		1, 9	--	10	--	--	3	V
		1.5, 13.5	--	15	--	--	4	V
V_{IH}	Input High Voltage	0.5, 4.5	--	5	3.5	--	--	V
		1, 9	--	10	7	--	--	V
		1.5, 13.5	--	15	11	--	--	V
I_I	Input Current	--	0, 18	18	--	0.0	±1	uA

5. Digital Timer Application

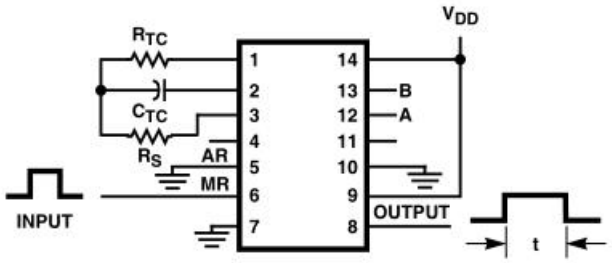


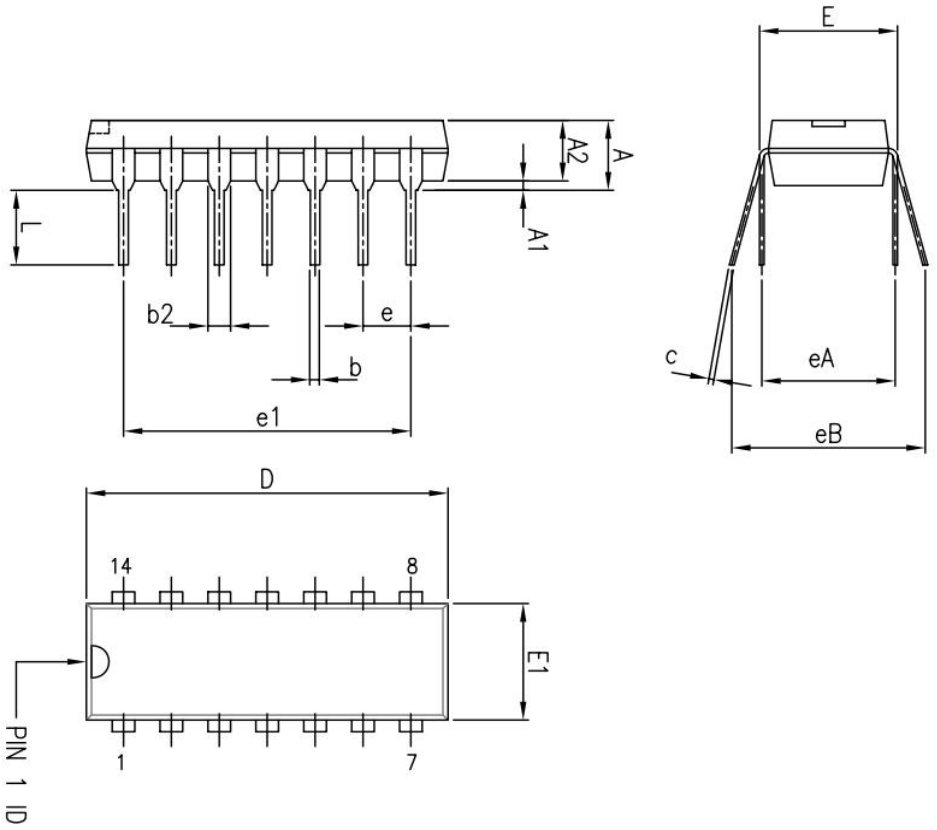
Figure 5.1：Didital Timer Application Circuit

6. Ordering Information

Orderable Device	Package Type	Pins	Packing	Package Qty
CD4541ND14ATBE	DIP	14	Tube	25
CD4541NS14ARDQ	SOP	14	Tape & Reel	4000
CD4541TS14ARBQ	TSSOP	14	Tape & Reel	2000

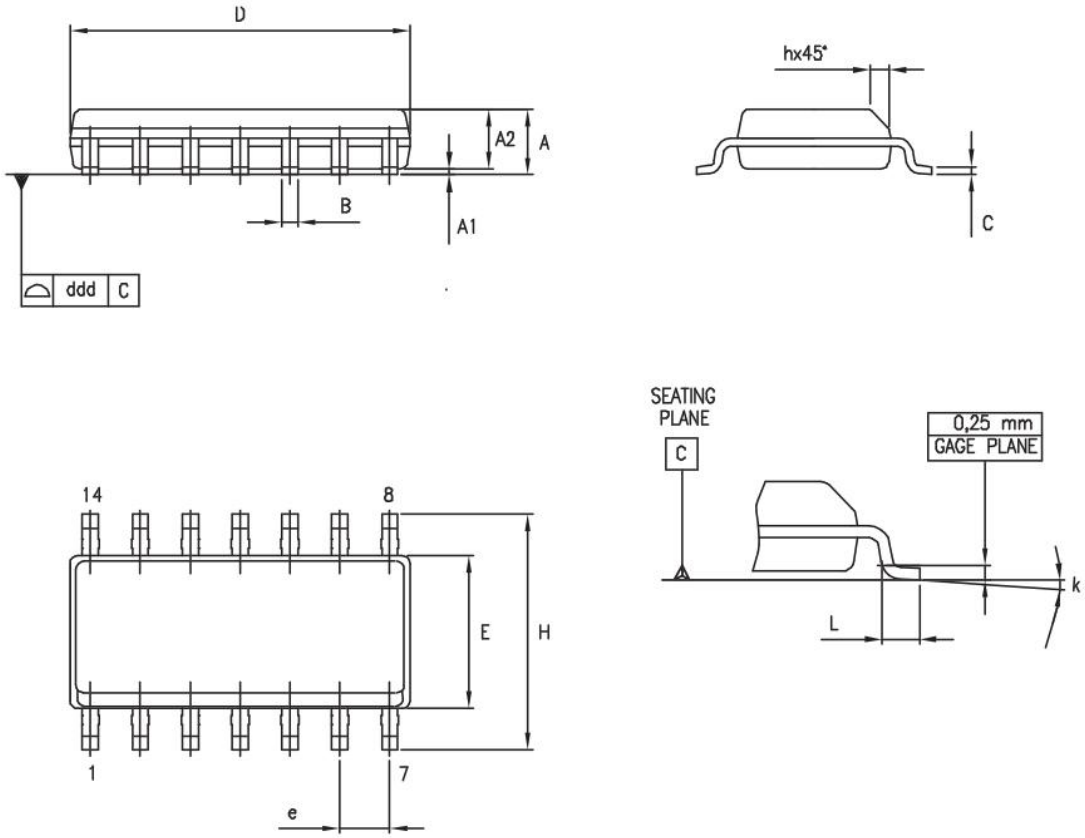
7. Package Information

7.1 DIP14



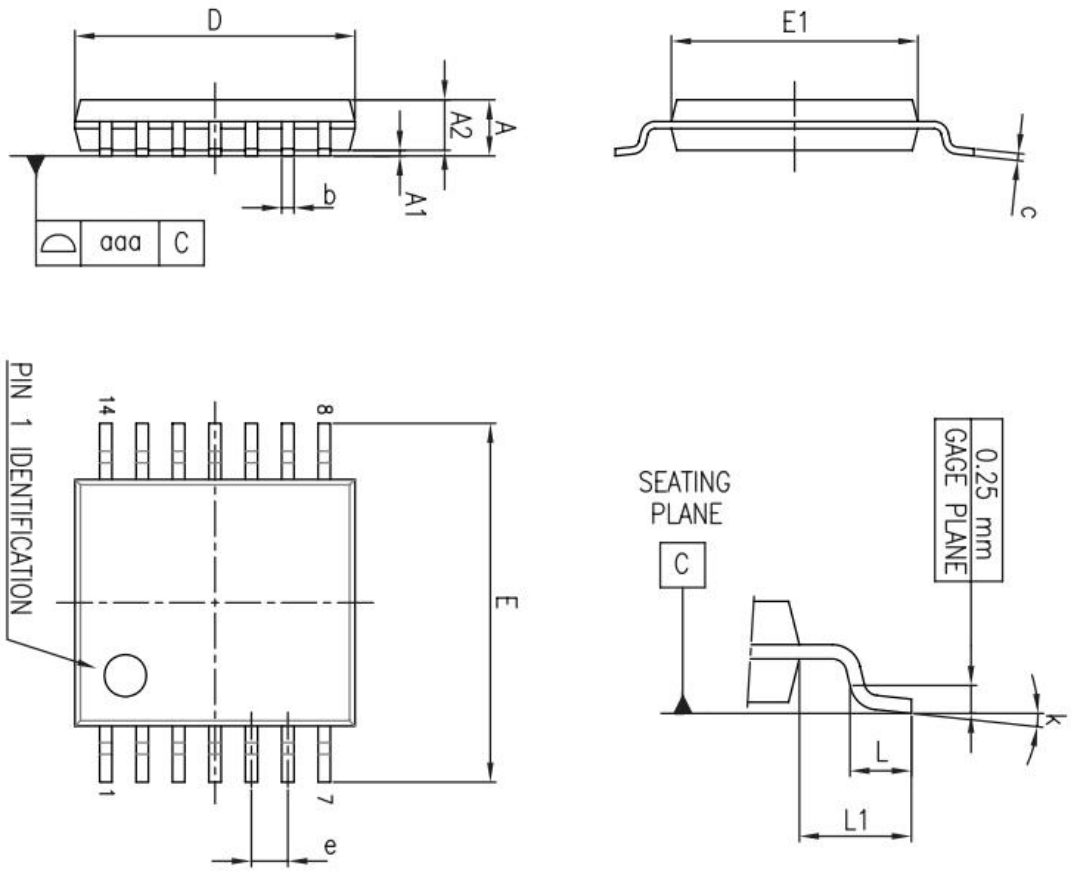
Dimensions						
Ref.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			5.33			0.21
A1	0.38			0.015		
A2	2.92	3.30	4.95	0.11	0.13	0.19
b	0.36	0.46	0.56	0.014	0.018	0.022
b2	1.14	1.52	1.78	0.04	0.06	0.07
c	0.20	0.25	0.36	0.007	0.009	0.01
D	18.67	19.05	19.69	0.73	0.75	0.77
E	7.62	7.87	8.26	0.30	0.31	0.32
E1	6.10	6.35	7.11	0.24	0.25	0.28
e		2.54			0.10	
e1		15.24			0.60	
eA		7.62			0.30	
eB			10.92			0.43
L	2.92	3.30	3.81	0.11	0.13	0.15

7.2 SOP14



Dimensions						
Ref.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	1.35		1.75	0.05		0.068
A1	0.10		0.25	0.004		0.009
A2	1.10		1.65	0.04		0.06
B	0.33		0.51	0.01		0.02
C	0.19		0.25	0.007		0.009
D	8.55		8.75	0.33		0.34
E	3.80		4.0	0.15		0.15
e		1.27			0.05	
H	5.80		6.20	0.22		0.24
h	0.25		0.50	0.009		0.02
L	0.40		1.27	0.015		0.05
k	8° (max.)					
ddd			0.10			0.004

7.3 TSSOP14



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.20			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.90	5.00	5.10	0.193	0.197	0.201
E	6.20	6.40	6.60	0.244	0.252	0.260
E1	4.30	4.40	4.50	0.169	0.173	0.176
e		0.65			0.0256	
L	0.45	0.60	0.75	0.018	0.024	0.030
L1		1.00			0.039	
k	0°		8°	0°		8°
aaa			0.10			0.004