

### Programmable Timer

This device consists of a 16-stage binary counter, an integrated oscillator for use with external capacitor and two resistors, a automatic power-on reset circuit, and output control logic.

Timing is initialized by turning on power, whereupon the power-on reset is enabled and initializes the counter. With the power already on, an external reset pulse can be applied. Upon release of the initial reset command, the oscillator will oscillate with a frequency determined by external RC network. The 16-stage counter divides the oscillator frequency to the extent determined by inputs A and B.

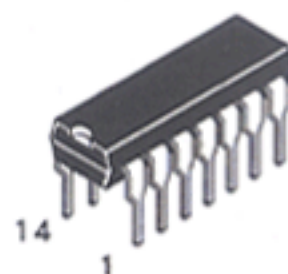
With Auto Reset pin set to a "0" the counter circuit is initialized by turning on power. Or with power already on, the counter circuit is reset when the Reset pin is set to a "1". Both types of reset will result in synchronously resetting all counter stages independent of counter state. Auto Reset pin when set to a "1" provides a low power operation.

The time select inputs (A and B) provide a two-bit address to output any one of four counter stages ( $2^8$ ,  $2^{10}$ ,  $2^{13}$  and  $2^{16}$ ). The  $2^n$  counts as shown in the Frequency Selection Table represents the Q output of the  $N^{th}$  state of the counter.

The Q/Q̄ select output control pin provides for a choice of output level. When the counter is in a reset condition and Q/Q̄ select pin is set to a "0" the Q output is a "1".

When the mode control pin is set to a "1", the selected count is continually transmitted to the output mode pin "0" and after a reset condition, counting commences, and after  $2^{n-1}$  counts the output changes state. An internal flip-flop latches this state and the output is not allowed to further change state. Reset pulse must be applied or a change in the mode pin level is required to reset the single cycle operation.

### DV4541B



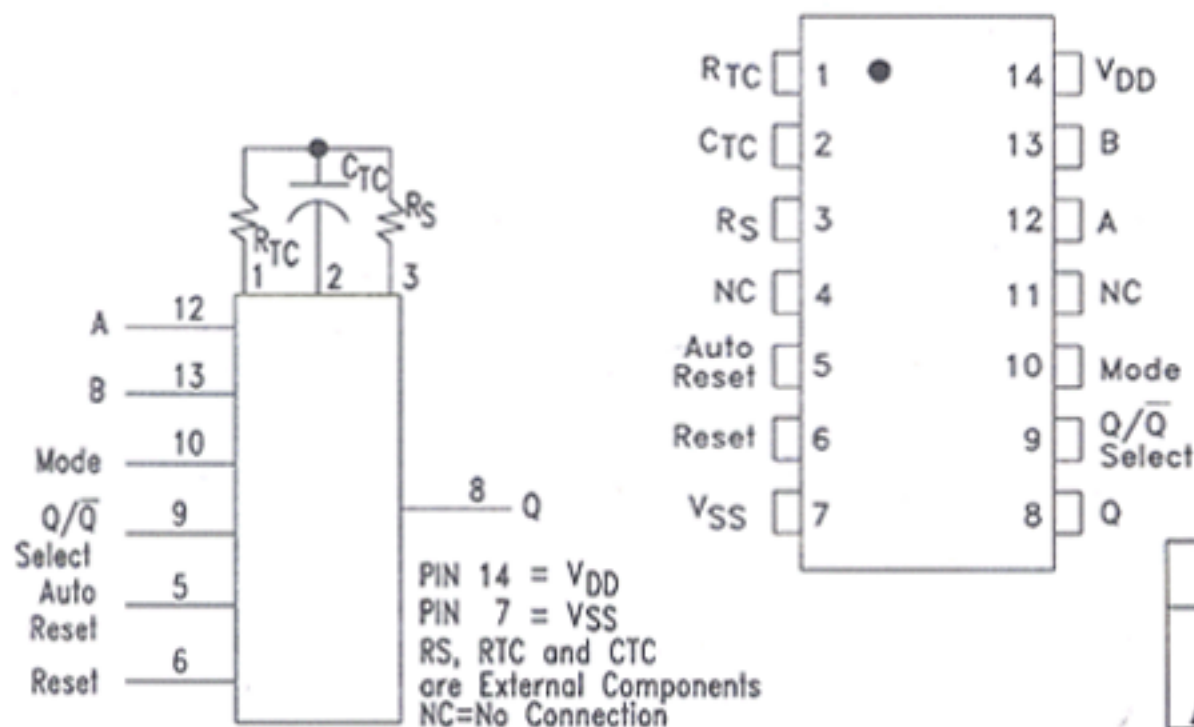
N Suffix  
Plastic DIP  
AVG-001 Case



D Suffix  
Plastic SOP  
AVG-002 Case

4541B

#### PIN ASSIGNMENT



#### FREQUENCY SELECTION TABLE

A	B	Number of Counter Stages $n$	Count $2^n$
0	0	13	8192
0	1	10	1024
1	0	8	256
1	1	16	65536



**ABSOLUTE MAXIMUM RATINGS**

Maximum ratings are those values beyond which damage to the device may occur.

Symbol	Parameter	Value	Unit
V <sub>DD</sub>	Supply Voltage (Referenced to V <sub>SS</sub> )	-0.5 to +18.0	V
V <sub>IN</sub> , V <sub>OUT</sub>	Input or Output Voltage	-0.5 to V <sub>DD</sub> +0.5	V
I <sub>IN</sub> , I <sub>OUT</sub>	DC Current Into or Out of Any Pin	± 10	mA
P <sub>D</sub>	Power Dissipation in Still Air, Derating: - 12 mW/°C from 65° to 85°C	500	mW
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C
TL	Lead Temperature, (8 Second Soldering)	260	°C

**ELECTRICAL CHARACTERISTICS** (Voltages Referenced to V<sub>SS</sub>)

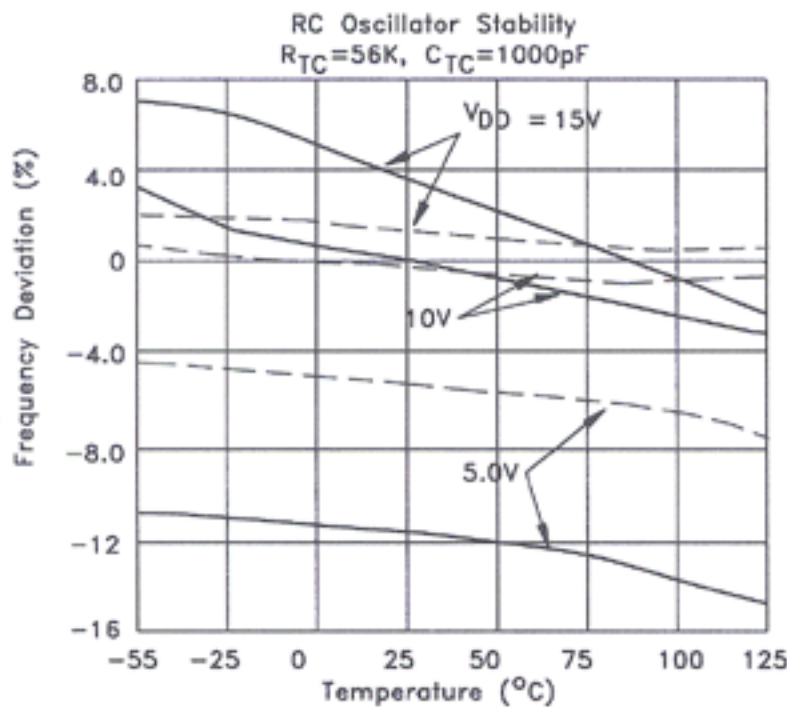
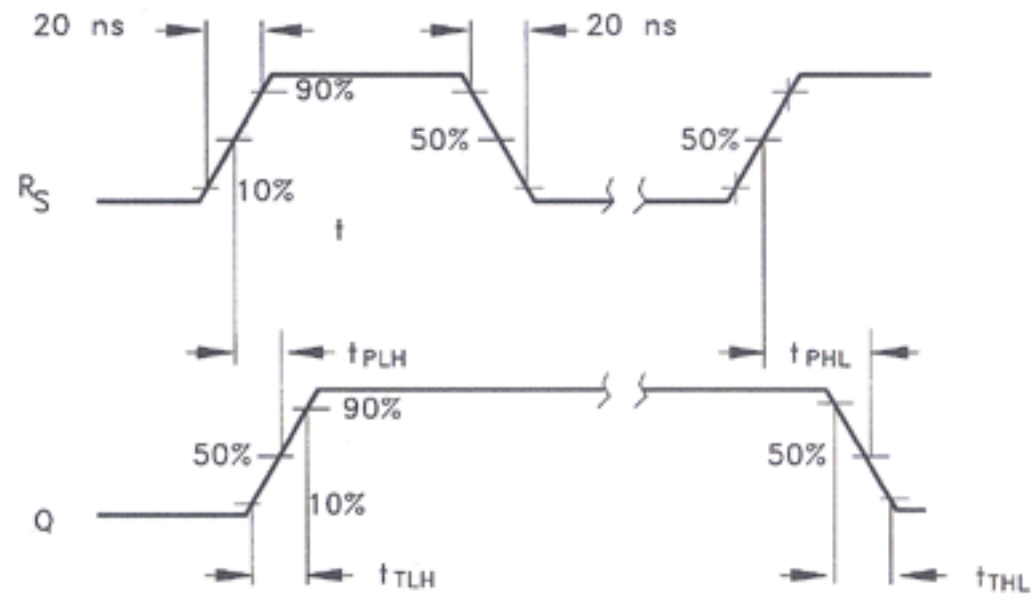
Symbol	Parameter		V <sub>DD</sub>	Guaranteed Limits							Unit
				-40°C		25°C			85°C		
						Min	Typ	Max	Min	Max	
V <sub>OL</sub>	Output Voltage	"0" Level	5.0	-	0.05	-	0	0.05	-	0.05	V <sub>dC</sub>
	V <sub>IN</sub> =V <sub>DD</sub> or 0		10	-	0.05	-	0	0.05	-	0.05	
			15	-	0.05	-	0	0.05	-	0.05	
V <sub>OH</sub>	V <sub>IN</sub> = 0 or V <sub>DD</sub>	"1" Level	5.0	4.95	-	4.95	5.0	-	4.95	-	V <sub>dC</sub>
			10	9.95	-	9.95	10	-	9.95	-	
			15	14.95	-	14.95	15	-	14.95	-	
V <sub>IL</sub>	Input Voltage (V <sub>O</sub> =4.5 or 0.5 V <sub>dC</sub> ) (V <sub>O</sub> =9.0 or 1.0 V <sub>dC</sub> ) (V <sub>O</sub> =13.5 or 1.5 V <sub>dC</sub> )	"0" Level	5.0	-	1.5	-	2.25	1.5	-	1.5	V <sub>dC</sub>
			10	-	3.0	-	4.50	3.0	-	3.0	
			15	-	4.0	-	6.75	4.0	-	4.0	
V <sub>IH</sub>	(V <sub>O</sub> =0.5 or 4.5 V <sub>dC</sub> ) (V <sub>O</sub> =1.0 or 9.0 V <sub>dC</sub> ) (V <sub>O</sub> =1.5 or 13.5 V <sub>dC</sub> )	"1" Level	5.0	3.5	-	3.5	2.75	-	3.5	-	V <sub>dC</sub>
			10	7.0	-	7.0	5.50	-	7.0	-	
			15	11	-	11	8.25	-	11	-	
I <sub>OH</sub>	Output Drive Current (V <sub>OH</sub> = 2.5 V <sub>dC</sub> ) (V <sub>OH</sub> = 4.6 V <sub>dC</sub> ) (V <sub>OH</sub> = 9.5 V <sub>dC</sub> ) (V <sub>OH</sub> = 13.5 V <sub>dC</sub> )	Source	5.0	-2.5	-	-2.1	-4.2	-	-1.7	-	mA <sub>dC</sub>
			5.0	-0.52	-	-0.44	-0.88	-	-0.36	-	
			10	-1.3	-	-1.1	-2.25	-	-0.9	-	
			15	-3.6	-	-3.0	-8.8	-	-2.4	-	
I <sub>OL</sub>	(V <sub>OL</sub> = 0.4 V <sub>dC</sub> ) (V <sub>OL</sub> = 0.5 V <sub>dC</sub> ) (V <sub>OL</sub> = 1.5 V <sub>dC</sub> )	Sink	5.0	0.52	-	0.44	0.88	-	0.36	-	mA <sub>dC</sub>
			10	1.3	-	1.1	2.25	-	0.9	-	
			15	3.6	-	3.0	8.8	-	2.4	-	
I <sub>IN</sub>	Input Current		15	-	±0.3	-	±0.00001	±0.3	-	±1.0	μA <sub>dC</sub>
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> =0	-	-	-	-	5.0	7.5	-	-	pF
I <sub>DD</sub>	Quiescent Current (Per Package)		5.0	-	20	-	0.005	20	-	150	μA <sub>dC</sub>
			10	-	40	-	0.010	40	-	300	
			15	-	80	-	0.015	80	-	600	

**SWITCHING CHARACTERISTICS** (C<sub>L</sub>=50 pF, T<sub>A</sub>=25°C)

Symbol	Characteristics	V <sub>DD</sub>	Min	Typ	Max	Unit
t <sub>TLH</sub> , t <sub>THL</sub>	Output Rise and Fall Time	5.0	-	100	200	ns
		10	-	50	100	
		15	-	40	80	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay Time: 2 <sup>8</sup> Output	5.0	-	3.5	10.5	μs
		10	-	1.25	3.8	
		15	-	0.9	2.9	
	2 <sup>16</sup> Output	5.0	-	6.0	18	
		10	-	3.5	10	
		15	-	2.5	7.5	
t <sub>WH</sub>	Clock Pulse Width	5.0	900	300	-	ns
		10	300	100	-	
		15	225	85	-	

Symbol	Characteristics	V <sub>DD</sub>	Min	Typ	Max	Unit
f <sub>cl</sub>	Clock Pulse Frequency (50% Duty Cycle)	5.0	-	1.5	0.75	MHz
		10	-	4.0	2.0	
		15	-	6.0	3.0	
t <sub>w</sub>	Reset Pulse Width	5.0	375	180	-	ns
		10	160	80	-	
		15	130	65	-	
t <sub>rem</sub>	Reset Removal Time	5.0	420	210	-	ns
		10	200	100	-	
		15	200	100	-	

## SWITCHING WAVEFORMS



Note:  
 - - - - - R<sub>TC</sub> = 56K, R<sub>S</sub> = 0, f = 10, 1.5 KHz @ V<sub>CC</sub> = 10V  
 ——— C = 1000pF, R<sub>S</sub> = 120K, f = 7.8KHz @ V<sub>DD</sub> = 10V  
 T<sub>A</sub> = 25 °C

