

4516B Presettable Binary Up/Down Counter

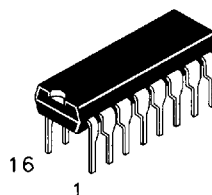
This device is a synchronous up/down binary counter constructed with MOS P-Channel and N-Channel enhancement mode devices in a monolithic structure.

This device can be preset by applying the desired binary value to the Preset Inputs and bringing the Preset Enable (PE) High. By applying a high for up counting or a low for down counting to the UP/DOWN input, the direction of counting can be controlled. The state of the counter changes on the positive transition of the Clock input.

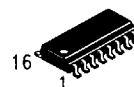
Cascading can be accomplished by connecting the Carry Out to the Carry In of the next stage while clocking each counter in parallel. The outputs (Q0, Q1, Q2, Q3) can be reset to a low state by applying a high to the Reset pin.

- Supply voltage range = 3.0 Vdc to 18 Vdc
- All outputs buffered
- Capable of driving 4 Low Power TTL loads or one LS TTL load over the rated temperature range
- Diode protection on all inputs

DV4516B

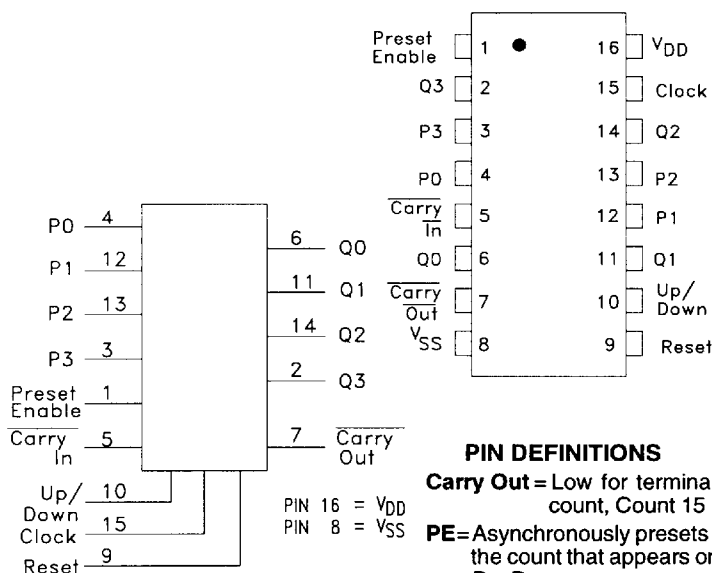


N Suffix
Plastic DIP
AVG-003 Case



D Suffix
Plastic SOP
AVG-004 Case

PIN ASSIGNMENT



PIN DEFINITIONS

Carry Out = Low for terminal count, Count 15

PE = Asynchronously presets the count that appears on P0-P3

TRUTH TABLE

Carry In	Up/Down	Preset Enable	Reset	Clock	Action
1	X	0	0	X	No Count
0	1	0	0	↑	Count Up
0	0	0	0	↑	Count Down
X	X	1	0	X	Preset
X	X	X	1	X	Reset

X=Don't Care

Carry Out indicates Terminal Count

↑ = Low to High Transition

ABSOLUTE MAXIMUM RATINGS

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

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

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Symbol	Parameter		V _{DD}	Guaranteed Limits							Unit
				-40°C		<25°C			<85°C		
				Min	Max	Min	Typ	Max	Min	Max	
V _{OL}	Output Voltage V _{IN} =V _{DD} or 0	"0" Level	5.0	-	0.05	-	0	0.05	-	0.05	V _{dc}
			10	-	0.05	-	0	0.05	-	0.05	
			15	-	0.05	-	0	0.05	-	0.05	
V _{OH}	V _{IN} = 0 or V _{DD}	"1" Level	5.0	4.95	-	4.95	5.0	-	4.95	-	V _{dc}
			10	9.95	-	9.95	10	-	9.95	-	
			15	14.95	-	14.95	15	-	14.95	-	
V _{IL}	Input Voltage (V _O =4.5 or 0.5 V _{dc}) (V _O =9.0 or 1.0 V _{dc}) (V _O =13.5 or 1.5 V _{dc})	"0" Level	5.0	-	1.5	-	2.25	1.5	-	1.5	V _{dc}
			10	-	3.0	-	4.50	3.0	-	3.0	
			15	-	4.0	-	6.75	4.0	-	4.0	
V _{IH}	(V _O =0.5 or 4.5 V _{dc}) (V _O =1.0 or 9.0 V _{dc}) (V _O =1.5 or 13.5 V _{dc})	"1" Level	5.0	3.5	-	3.5	2.75	-	3.5	-	V _{dc}
			10	7.0	-	7.0	5.50	-	7.0	-	
			15	11	-	11	8.25	-	11	-	
I _{OH}	Output Drive Current (V _{OH} = 2.5 V _{dc}) (V _{OH} = 4.6 V _{dc}) (V _{OH} = 9.5 V _{dc}) (V _{OH} = 13.5 V _{dc})	Source	5.0	-3.0	-	-2.4	-4.2	-	-1.7	-	mA _{dc}
			5.0	-0.52	-	-0.44	-0.88	-	-0.36	-	
			10	-1.3	-	-1.3	-2.25	-	-0.9	-	
			15	-4.2	-	-3.4	-8.8	-	-2.4	-	
I _{OL}	(V _{OL} = 0.4 V _{dc}) (V _{OL} = 0.5 V _{dc}) (V _{OL} = 1.5 V _{dc})	Sink	5.0	0.52	-	0.44	0.88	-	0.36	-	mA _{dc}
			10	1.3	-	1.1	2.25	-	0.9	-	
			15	3.6	-	3.0	8.8	-	2.4	-	
I _{IN}	Input Current		15	-	±0.3	-	±0.00001	±0.3	-	±1.0	μA _{dc}
C _{IN}	Input Capacitance	V _{IN} =0	-	-	-	-	5.0	7.5	-	-	pF
I _{DD}	Quiescent Current (Per Package)		5.0	-	20	-	0.005	20	-	150	μA _{dc}
		10	-	40	-	0.010	40	-	300		
		15	-	80	-	0.015	80	-	600		

SWITCHING CHARACTERISTICS (C_L=50 pF, T_A=25°C)

Symbol	Characteristics	V _{DD}	Min	Typ	Max	Unit
t _{TLH} , t _{THL}	Output Rise and Fall Time	5.0	-	100	200	ns
		10	-	50	100	
		15	-	40	80	
t _{PLH} , t _{PHL}	Propagation Delay Time, Clock to Q	5.0	-	315	630	ns
		10	-	130	260	
		15	-	100	200	
		5.0	-	315	630	
		10	-	130	260	
		15	-	100	200	
		5.0	-	180	360	
		10	-	80	160	
		15	-	60	120	
		5.0	-	315	630	
		10	-	130	360	
		15	-	100	200	
		5.0	-	550	1100	
		10	-	225	450	
		15	-	150	300	
t _{WH}	Clock Pulse Width	5.0	350	200	-	ns
		10	170	100	-	
		15	140	75	-	
t _w	Reset Pulse Width	5.0	380	190	-	ns
		10	200	100	-	
		15	160	80	-	
f _{cl}	Clock Pulse Frequency	5.0	-	3.0	1.5	MHz
		10	-	6.0	3.0	
		15	-	8.0	4.0	

SWITCHING CHARACTERISTICS (continued)

Symbol	Characteristics	V _{DD}	Min	Typ	Max	Unit
t_{rem}	Preset Removal Time The Preset Signal must be low prior to a positive-going transition of the clock.	5.0	650	325	-	ns
		10	230	115	-	
		15	180	90	-	
t_{TLH} , t_{THL}	Clock Rise and Fall Time	5.0	-	-	15	μ s
		10	-	-	5	
		15	-	-	4	
t_{su}	$\overline{C_{IN}}$ to Clock Setup Time	5.0	260	130	-	ns
		10	120	60	-	
		15	100	50	-	
	Up/Down to Clock Setup Time	5.0	500	250	-	ns
		10	200	100	-	
		15	150	75	-	
	Pn to PE Setup Time	5.0	-40	-120	-	ns
		10	-30	-70	-	
		15	-25	-50	-	
t_h	Clock to $\overline{C_{IN}}$ Hold Time	5.0	0	-60	-	ns
		10	20	-20	-	
		15	20	0	-	
	Clock to Up/Down Hold Time	5.0	-70	-160	-	ns
		10	-10	-60	-	
		15	0	-40	-	
	PE to Pn Hold Time	5.0	480	240	-	ns
		10	420	210	-	
		15	420	210	-	
t_{WH}	Preset Enable Pulse Width	5.0	200	100	-	ns
		10	100	50	-	
		15	80	40	-	

SWITCHING WAVEFORMS

