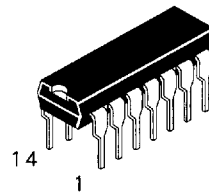


Dual D-Type Flip-Flop

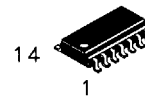
This device is a dual D-Type Flip-flop constructed with MOS P-Channel and N-Channel enhancement mode devices in a single monolithic structure. Each flip-flop has independent Data, Set, Reset, and Clock inputs and complementary outputs.

- 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
- Highest noise immunity at 12V supply

DV4013B

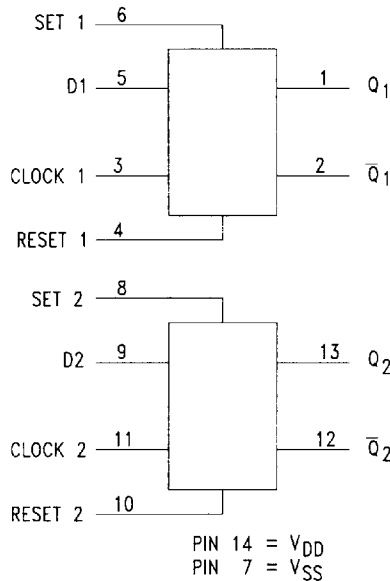


N Suffix
Plastic DIP
AVG-001 Case

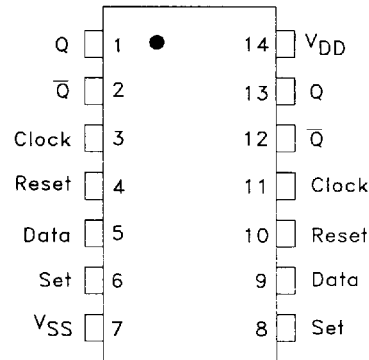


D Suffix
Plastic SOP
AVG-002 Case

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PIN ASSIGNMENT



TRUTH TABLE

Clock	D	Reset	Set	Q	$\bar{Q}$
↑	0	0	0	0	1
↑	1	0	0	1	0
↓	X	0	0	No Change	
X	X	1	0	0	1
X	X	0	1	1	0
X	X	1	1	1	1

↑ = Low to High Transition

↓ = High to Low Transition

X = Don't Care

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: 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	-2.5	-	-2.1	-4.2	-	-1.7	-	mA _{dc}
			5.0	-0.52	-	-0.44	-0.88	-	-	-	
			10	-1.3	-	-1.1	-2.25	-	0.36	-	
			15	-3.6	-	-3.0	-8.8	-	-0.9	-	
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	-	4	-	0.002	4	-	30	μA _{dc}
			10	-	8	-	0.004	8	-	60	
			15	-	16	-	0.006	16	-	120	

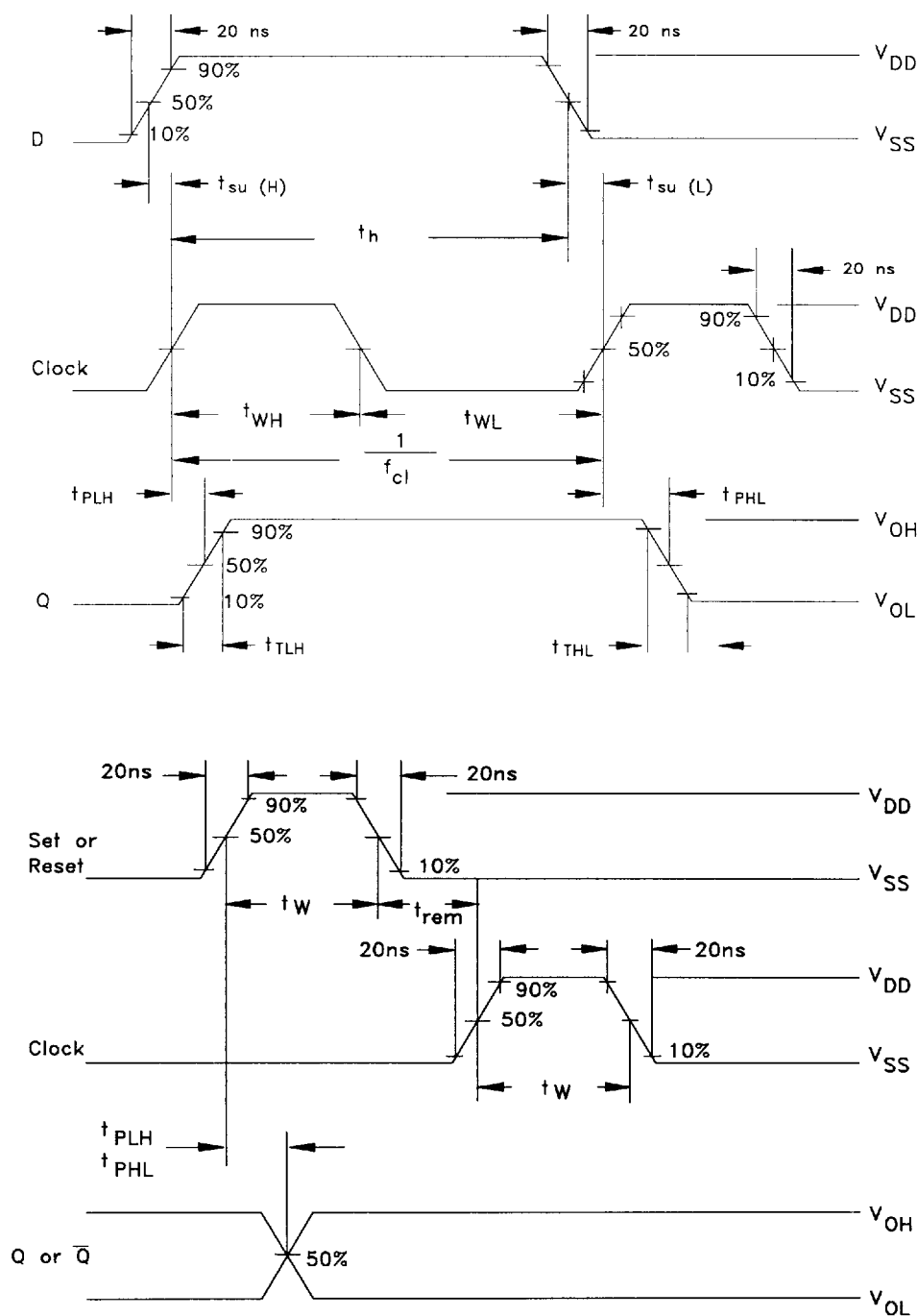
SWITCHING CHARACTERISTICS (C_L=50 pF, T_A=25°C)

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 and Set to Q, $\bar{Q}$	5.0	-	175	350	ns
		10	-	75	150	
		15	-	50	100	
	Reset to Q, $\bar{Q}$	5.0	-	350	450	
		10	-	100	200	
		15	-	75	150	
t _{WL} , t _{WH}	Clock, Set and Reset Pulse Width	5.0	250	125	-	ns
		10	100	50	-	
		15	70	35	-	
f _{cl}	Clock Pulse Frequency	5.0	-	4.0	2.0	MHz
		10	-	10	5.0	
		15	-	14	7.0	
t _{TLH} , t _{THL}	Clock Pulse Rise and Fall Time	5.0	-	-	15	μs
		10	-	-	5	
		15	-	-	4	
t _{su}	Setup Time (Data must be valid for 250 ns with a 5V supply, 100 ns with 10V, and 70 ns with 15V)	5.0	40	20	-	ns
		10	20	10	-	
		15	15	7.5	-	

SWITCHING CHARACTERISTICS (Continued)

Symbol	Characteristics	V _{DD}	Min	Typ	Max	Unit
t _h	Hold Time (Data must be valid for 250 ns with a 5V supply, 100 ns with 10V, and 70 ns with 15V)	5.0	40	20	-	ns
		10	20	10	-	
		15	15	7.5	-	
t _{rem}	Removal Times Set	5.0	80	0	-	ns
		10	45	5	-	
		15	35	5	-	
	Reset	5.0	50	-35	-	
		10	30	-10	-	
		15	25	-5	-	

SWITCHING WAVEFORMS



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