

CMOS HEX TYPE D FLIP-FLOP

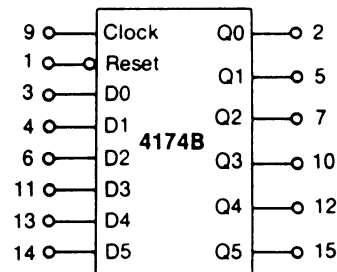
FEATURES:

- Static Operation
- All Inputs and Outputs Buffered
- Diode Protection on All Inputs
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Output Compatible with Two HTL Loads, Two Low-Power TTL Loads or One Low-Power Schottky TTL Load
- Functional Equivalent to TTL 74174

DESCRIPTION:

The 4174B hex type D flip-flop is constructed with MOS P-channel and N-channel enhancement mode devices in a single monolithic structure. Data on the D inputs which meets the setup time requirements is transferred to the Q outputs on the positive edge of the clock pulse. All six flip-flops share common clock and reset inputs. The reset is active low, and independent of the clock.

CONNECTION DIAGRAM



V_{DD} = Pin 16
 V_{SS} = Pin 8

MAXIMUM RATINGS (Voltages referenced to V_{SS})

Rating	Symbol	Value	Unit
DC Supply Voltage	V_{DD}	-0.5 to +18	Vdc
Input Voltage, All Inputs	V_{in}	-0.5 to $V_{DD} + 0.5$	Vdc
DC Current Drain per Pin	I	10	mAdc
Operating Temperature Range—C, D, F, H E	T_A	-55 to +125 -40 to +85	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit. For proper operation it is recommended that V_{in} and V_{out} be constrained to the range $V_{SS} < (V_{in} \text{ or } V_{out}) < V_{DD}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}).

TRUTH TABLE (Positive Logic)

INPUTS			OUTPUT
Clock	Data	Reset	Q
	0	1	0
	1	1	1
	X	1	Q
X	X	0	0

No
Change

X = Don't Care

SWITCHING CHARACTERISTICS* ($C_L = 50 \text{ pF}$, $T_A = 25^\circ\text{C}$)

Characteristic	Symbol	V_{DD} Vdc	All Types			Unit
			Min	Typ	Max	
Output Rise and Fall Time	t_r, t_f	5.0	—	100	200	ns
		10	—	50	100	
		15	—	40	80	
Propagation Delay Time—Clock to Q	t_{PLH}, t_{PHL}	5.0	—	150	300	ns
		10	—	70	140	
		15	—	50	100	
Propagation Delay Time—Reset to Q	t_{PHL}	5.0	—	250	500	ns
		10	—	100	200	
		15	—	75	150	
Minimum Clock Pulse Width	PW_C	5.0	—	75	150	ns
		10	—	45	90	
		15	—	35	70	
Minimum Reset Pulse Width	PW_R	5.0	—	100	200	ns
		10	—	50	100	
		15	—	40	80	
Maximum Clock Pulse Frequency	PRF	5.0	2.0	7.0	—	MHz
		10	5.0	12.0	—	
		15	6.5	15.5	—	
Maximum Clock Pulse Rise and Fall Time	t_r, t_f	5.0	15	—	—	μs
		10	15	—	—	
		15	15	—	—	
Data Setup Time	t_{setup}	5.0	—	20	40	ns
		10	—	10	20	
		15	—	0	15	
Data Hold Time	t_{hold}	5.0	—	40	80	ns
		10	—	20	40	
		15	—	15	30	
Reset Removal Time**	t_{rem}	5.0	—	125	250	ns
		10	—	50	100	
		15	—	40	80	

*The formulas given are for the typical characteristics only.

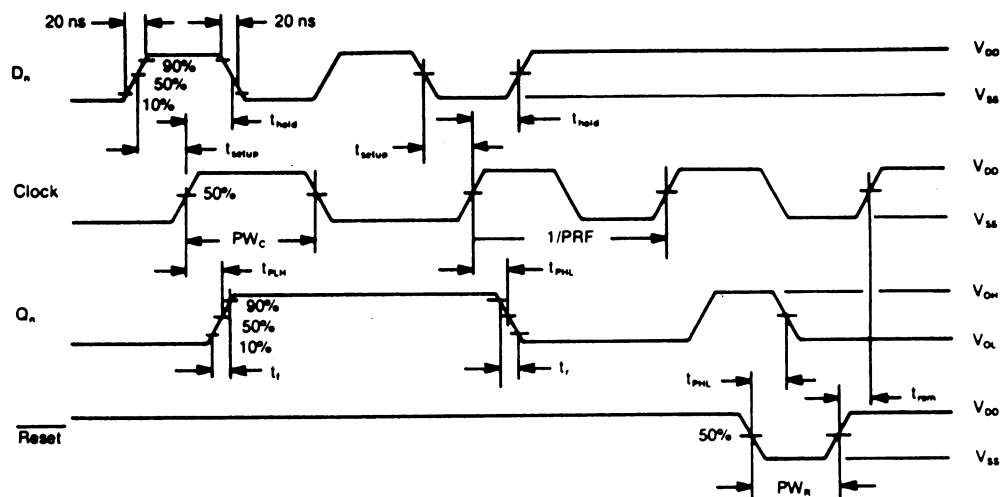
**The reset signal must be high prior to a positive-going transition of the clock.

STATIC CHARACTERISTICS¹

PARAMETER	V_{DD} (Vdc)	CONDITIONS	T_{LOW}^2		+25°C			T_{HIGH}^2		Units
			Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
QUIESCENT DEVICE CURRENT	I_{DD}	$V_{IN} = V_{SS}$ or V_{DD} All valid input combinations	—	5	—	0.005	5	—	150	μA_{dc}
			—	10	—	0.010	10	—	300	
			—	20	—	0.015	20	—	600	

NOTES: ¹ Remaining Static Electrical Characteristics are listed under "4000B Series Family Specifications".² $T_{LOW} = -55^\circ\text{C}$ for C $= -40^\circ\text{C}$ for E $T_{HIGH} = +125^\circ\text{C}$ for C $= +85^\circ\text{C}$ for E

TIMING DIAGRAM



FUNCTIONAL BLOCK DIAGRAM

