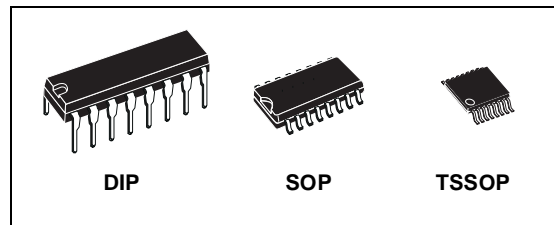




# M74HC174

## HEX D-TYPE FLIP FLOP WITH CLEAR

- HIGH SPEED :  
 $f_{MAX} = 66\text{MHz}$  (TYP.) at  $V_{CC} = 6\text{V}$
- LOW POWER DISSIPATION:  
 $I_{CC} = 4\mu\text{A}$  (MAX.) at  $T_A = 25^\circ\text{C}$
- HIGH NOISE IMMUNITY:  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 4\text{mA}$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \approx t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:  
 $V_{CC}$  (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH  
 74 SERIES 174



### ORDER CODES

PACKAGE	TUBE	T & R
DIP	M74HC174B1R	
SOP	M74HC174M1R	M74HC174RM13TR
TSSOP		M74HC174TTR

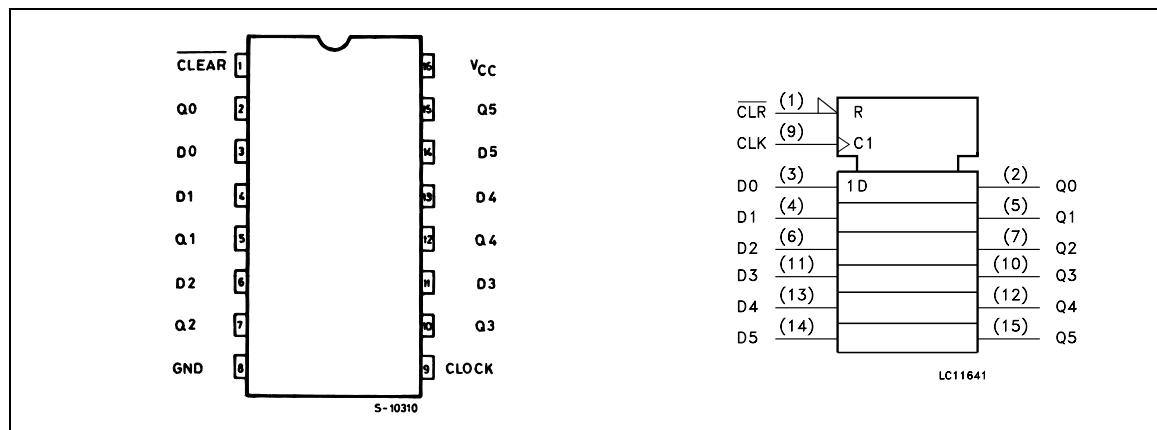
### DESCRIPTION

The M74HC174 is an high speed CMOS HEX D-TYPE FLIP FLOP WITH CLEAR fabricated with silicon gate C<sup>2</sup>MOS technology. Information signals applied to D inputs are transferred to the Q output on the positive going edge of the clock pulse. When the CLEAR input is

held low, the Q outputs are held low independently of the other inputs.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	-0.5 to +7	V
$V_I$	DC Input Voltage	-0.5 to $V_{CC} + 0.5$	V
$V_O$	DC Output Voltage	-0.5 to $V_{CC} + 0.5$	V
$I_{IK}$	DC Input Diode Current	$\pm 20$	mA
$I_{OK}$	DC Output Diode Current	$\pm 20$	mA
$I_O$	DC Output Current	$\pm 25$	mA
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current	$\pm 50$	mA
$P_D$	Power Dissipation	500(*)	mW
$T_{stg}$	Storage Temperature	-65 to +150	°C
$T_L$	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied

(\*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Value	Unit	
$V_{CC}$	Supply Voltage	2 to 6	V	
$V_I$	Input Voltage	0 to $V_{CC}$	V	
$V_O$	Output Voltage	0 to $V_{CC}$	V	
$T_{op}$	Operating Temperature	-55 to 125	°C	
$t_r, t_f$	Input Rise and Fall Time	$V_{CC} = 2.0V$	0 to 1000	ns
		$V_{CC} = 4.5V$	0 to 500	ns
		$V_{CC} = 6.0V$	0 to 400	ns

DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
V <sub>IH</sub>	High Level Input Voltage	2.0		1.5			1.5		1.5		V
		4.5		3.15			3.15		3.15		
		6.0		4.2			4.2		4.2		
V <sub>IL</sub>	Low Level Input Voltage	2.0				0.5		0.5		0.5	V
		4.5				1.35		1.35		1.35	
		6.0				1.8		1.8		1.8	
V <sub>OH</sub>	High Level Output Voltage	2.0	I <sub>O</sub> =-20 μA	1.9	2.0		1.9		1.9		V
		4.5	I <sub>O</sub> =-20 μA	4.4	4.5		4.4		4.4		
		6.0	I <sub>O</sub> =-20 μA	5.9	6.0		5.9		5.9		
		4.5	I <sub>O</sub> =-4.0 mA	4.18	4.31		4.13		4.10		
		6.0	I <sub>O</sub> =-5.2 mA	5.68	5.8		5.63		5.60		
V <sub>OL</sub>	Low Level Output Voltage	2.0	I <sub>O</sub> =20 μA		0.0	0.1		0.1		0.1	V
		4.5	I <sub>O</sub> =20 μA		0.0	0.1		0.1		0.1	
		6.0	I <sub>O</sub> =20 μA		0.0	0.1		0.1		0.1	
		4.5	I <sub>O</sub> =4.0 mA		0.17	0.26		0.33		0.40	
		6.0	I <sub>O</sub> =5.2 mA		0.18	0.26		0.33		0.40	
I <sub>I</sub>	Input Leakage Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND			± 0.1		± 1		± 1	μA
I <sub>CC</sub>	Quiescent Supply Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND			4		40		80	μA

AC ELECTRICAL CHARACTERISTICS ( $C_L = 50$  pF, Input  $t_r = t_f = 6$  ns)

Symbol	Parameter	Test Condition		Value						Unit		
		$V_{CC}$ (V)		$T_A = 25^\circ\text{C}$			$-40$ to $85^\circ\text{C}$		$-55$ to $125^\circ\text{C}$			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
$t_{TLH}$ $t_{THL}$	Output Transition Time	2.0			30	75		95		110	ns	
		4.5			8	15		19		22		
		6.0			7	13		16		19		
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time (CLOCK - Q)	2.0			68	135		170		205	ns	
		4.5			17	27		34		41		
		6.0			14	23		29		35		
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time (CLEAR - Q)	2.0			72	145		180		220	ns	
		4.5			18	29		36		44		
		6.0			15	25		31		37		
$f_{MAX}$	Maximum Clock Frequency	2.0			7.2	14		5.8		4.8	MHz	
		4.5			36	56		29		24		
		6.0			42	66		34		28		
$t_{W(H)}$ $t_{W(L)}$	Minimum Pulse Width (CLOCK)	2.0				24	75		95		110	ns
		4.5				6	15		19		22	
		6.0				5	13		16		19	
$t_{W(L)}$	Minimum Pulse Width (CLEAR)	2.0				24	75		95		110	ns
		4.5				6	15		19		22	
		6.0				5	13		16		19	
$t_s$	Minimum Set-up Time	2.0				28	75		95		110	ns
		4.5				7	15		19		22	
		6.0				6	13		16		19	
$t_h$	Minimum Hold Time	2.0					0		0		0	ns
		4.5					0		0		0	
		6.0					0		0		0	
$t_{REM}$	Minimum Removal Time	2.0				5	5		5		5	ns
		4.5				5	5		5		5	
		6.0				5	5		5		5	

## CAPACITIVE CHARACTERISTICS

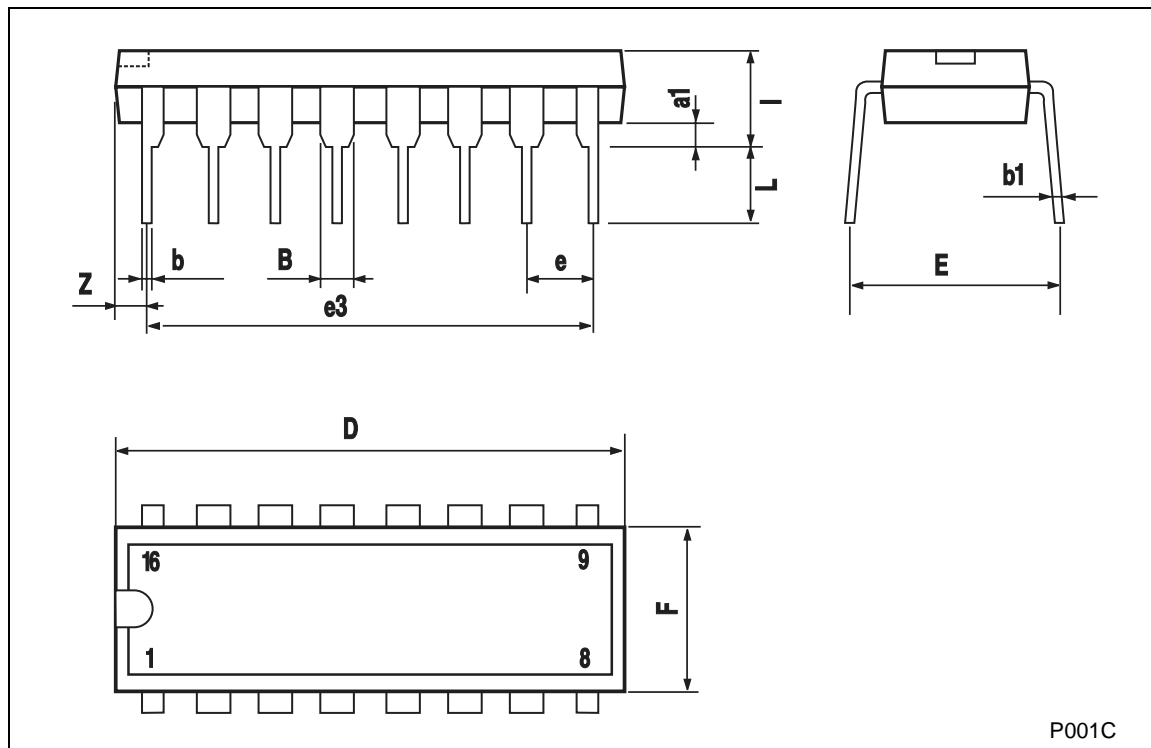
Symbol	Parameter	Test Condition		Value						Unit		
		$V_{CC}$ (V)		$T_A = 25^\circ\text{C}$			$-40$ to $85^\circ\text{C}$		$-55$ to $125^\circ\text{C}$			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
$C_{IN}$	Input Capacitance	5.0				5	10		10		10	pF
$C_{PD}$	Power Dissipation Capacitance (note 1)	5.0				40						pF

1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation.  $I_{CC(oper)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/6$  (per FLIP/FLOP)

And the total CPD when N pcs of FLIP-FLOP operate can be gained by the following equation :  $CPD(\text{total}) = 38 + 15 \times n$

**Plastic DIP-16 (0.25) MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C