74HC273D-HX/74HC273D-HX OCTAL D-TYPE FLIP-FLOPS WITH CLEAR

DESCRIPTION

The 74HC273D-HX/74HC273D-HX devices are positive-edge-triggered D-type flip-flops with a direct active low clear (CLR) input.

Information at the data (D) inputs meeting the setup time requirements is transferred to the Q outputs on the positive- going edge of the clock (CLK) pulse. Clock triggering occurs at a particular voltage level and is not related directly to the transition time of the positive-going pulse. When CLK is at either the high or low level, the D input has no effect at the output.

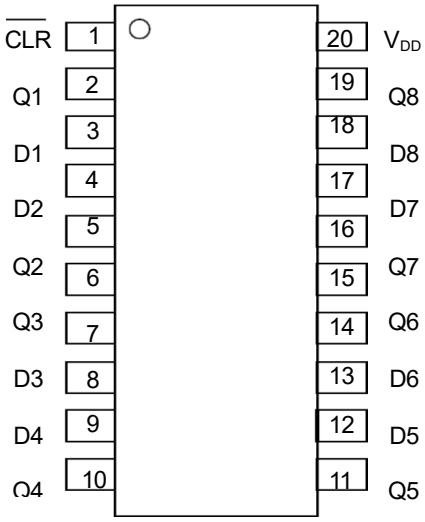
FEATURES

- ★ Wide Operating Voltage Range of 2V to 6V
- ★ Low Power Consumption, 80-μA Maximum ICC
- ★ Typical t_{PD} = 12ns
- ★ ±4mA Output Drive at 5V
- ★ Low Input Current of 1μA Maximum
- ★ Contain Eight Flip-Flops With Single-Rail Outputs
- ★ Direct Clear Input
- ★ Individual Data Input to Each Flip-Flop
- ★ Latch-up performance ≤ 250 mA
- ★ ESD protection:

- HBM: ANSI/ESDA/JEDEC JS-001 2023 exceeds 2000 V
- CDM: ANSI/ESDA/JEDEC JS-002 2022 exceeds 1500 V

- ★ Package Option:DIP-20 and SOP-20

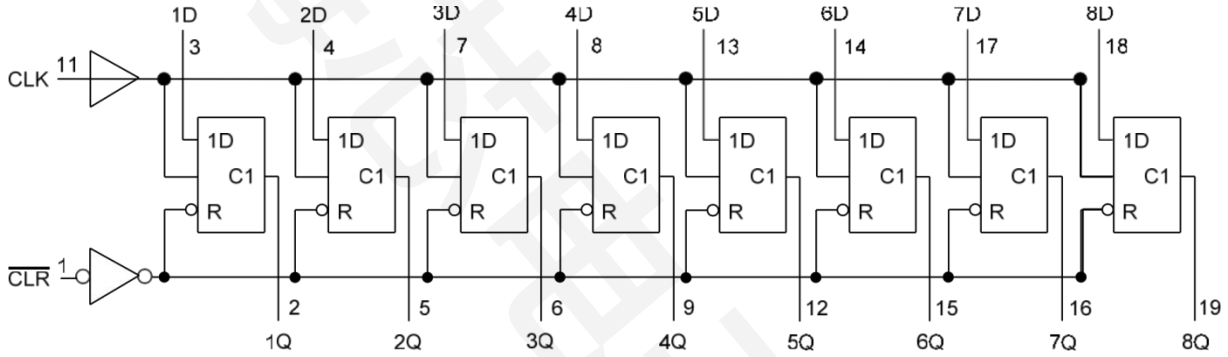
PIN CONFIGURATION



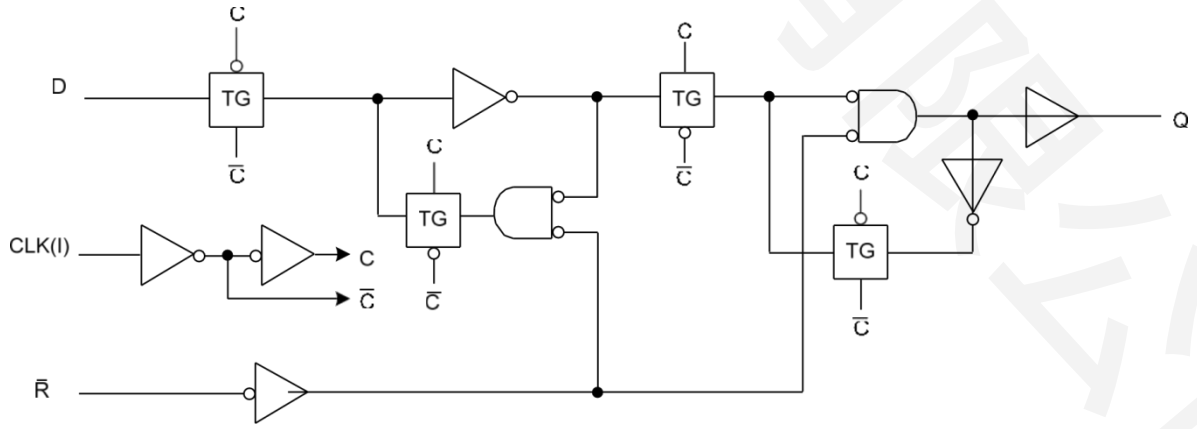
INPUTS			OUTPUT
$\overline{CLR}$	CLK	D	Q
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Q0

Note:H = High voltage level； L = Low voltage level； X = Don't care

FUNCTIONAL BLOCK DIAGRAM



LOGIC DIAGRAM, EACH FLIP-FLOP (POSITIVE LOGIC)



ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Supply Voltage	V_{CC}	-	-0.5 ~ 7.0	V
V_{CC} or GND Current	I_{CC}	-	±50	mA
Continuous Output Current	I_{OUT}	VOUT=0 ~ VCC	±25	mA
Input Clamp Current	I_{IK}	VIN<0 or VIN<VCC	±20	mA
Output Clamp Current	I_{OK}	VIN<0 or VOUT>VCC	±20	mA
Storage Temperature Range	T_{STG}	-	-65 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

RECOMMENDED OPERATING COMDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}	-	2	5	6	V
High-Level Input Voltage	V_{IH}	V_{CC}=2V	1.5	-	-	V
		V_{CC}=4.5V	3.15	-	-	V
		V_{CC}=6V	4.2	-	-	V
Low-Level Input Voltage	V_{IL}	V_{CC}=2V	-	-	0.5	V
		V_{CC}=4.5V	-	-	1.35	V
		V_{CC}=6V	-	-	1.8	V
Input Voltage	V_{IN}	-	0	-	VCC	V
Output Voltage	V_{OUT}	-	0	-	VCC	V
Input Transition Rise or Fall Rate	t_R, t_F	V_{CC}=2V	-	-	1000	ns
		V_{CC}=4.5V	-	-	500	ns
		V_{CC}=6V	-	-	400	ns
Operating Temperature	T_A	-	-40	-	+125	°C

ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	T_A=25°C			T_A=-40~+125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
High-Level Output Voltage	V_{OH}	V_{CC}=2V, I_{OH}=-20μA	1.9	1.998	-	1.9	-	-	V
		V_{CC}=4.5V, I_{OH}=-20μA	4.4	4.499	-	4.4	-	-	V
		V_{CC}=6V, I_{OH}=-20μA	5.9	5.999	-	5.9	-	-	V
		V_{CC}=4.5V, I_{OH}=-4mA	3.98	4.32	-	3.7	-	-	V
		V_{CC}=6V, I_{OH}=-5.2mA	5.48	5.81	-	5.2	-	-	V
Low-Level Output Voltage	V_{OL}	V_{CC}=2V, I_{OL}=20μA	-	0.002	0.1	-	-	0.1	V
		V_{CC}=4.5V, I_{OL}=20μA	-	0.003	0.1	-	-	0.1	V
		V_{CC}=6V, I_{OL}=20μA	-	0.003	0.1	-	-	0.1	V
		V_{CC}=4.5V, I_{OL}=4mA	-	0.15	0.26	-	-	0.4	V
		V_{CC}=6V, I_{OL}=5.2mA	-	0.16	0.26	-	-	0.4	V
Input Leakage Current	$I_{I(LEAK)}$	V_{CC}=6V, V_I=V_{CC} or 0	-	±0.1	±100	-	-	±100	μA
Quiescent Supply Current	I_{CC}	V_{CC}=6V, V_I=V_{CC} or 0, I_{OUT}=0	-	-	8	-	-	160	μA

SWITCHING CHARACTERISTICS (C_L=50pF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	T_A=25°C			T_A=-40~+125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Maximum clock pulse frequency	f_{MAX}	V_{CC}=2.0V	5	11	-	4	-	-	MHz
		V_{CC}=4.5V	27	50	-	20	-	-	MHz
		V_{CC}=6.0V	32	60	-	24	-	-	MHz
Propagation delay from input ($\overline{CLR}$) to output (Any)	t_{PHL}	V_{CC}=2.0V	-	41	160	-	-	225	ns
		V_{CC}=4.5V	-	15	32	-	-	45	ns
		V_{CC}=6.0V	-	12	27	-	-	38	ns
Propagation delay from input (CLK) to output (Any)	t_{PD}	V_{CC}=2.0V	-	44	160	-	-	225	ns
		V_{CC}=4.5V	-	15	32	-	-	45	ns
		V_{CC}=6.0V	-	13	27	-	-	38	ns
Propagation delay to output (Any)	t_t	V_{CC}=2.0V	-	19	75	-	-	110	ns
		V_{CC}=4.5V	-	7	15	-	-	22	ns
		V_{CC}=6.0V	-	6	13	-	-	19	ns

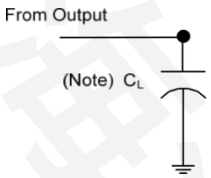
TIMING REQUIREMENTS (Input: t_R, t_F≤2.5ns; P_{RR}≤1MHz)

PARAMETER		SYMBOL	Conditions	T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
Clock frequency		f_{CLOCK}	V_{CC}= 2V	-	-	5	-	-	4	MHZ
			V_{CC}=4.5V	-	-	27	-	-	20	MHZ
			V_{CC}=6V	-	-	32	-	-	24	MHZ
Pulse duration	CLK high or low	t_W	V_{CC}= 2V	-	80	-	120	-	-	ns
			V_{CC}=4.5V	-	16	-	24	-	-	ns
			V_{CC}=6V	-	14	-	20	-	-	ns
	$\overline{CLR}$ low		V_{CC}= 2V	-	80	-	120	-	-	ns
			V_{CC}=4.5V	-	16	-	24	-	-	ns
			V_{CC}=6V	-	14	-	20	-	-	ns
Setup time before CLK↑	Data	t_{SU}	V_{CC}= 2V	-	100	-	120	-	-	ns
			V_{CC}=4.5V	-	20	-	24	-	-	ns
			V_{CC}=6V	-	17	-	20	-	-	ns
	$\overline{CLR}$ inactive		V_{CC}= 2V	-	100	-	120	-	-	ns
			V_{CC}=4.5V	-	20	-	24	-	-	ns
			V_{CC}=6V	-	17	-	20	-	-	ns
Hold time ,data after CLK↑		t_H	V_{CC}= 2V	-	0	-	-6	-	-	ns
			V_{CC}=4.5V	-	0	-	-2	-	-	ns
			V_{CC}=6V	-	0	-	-2	-	-	ns

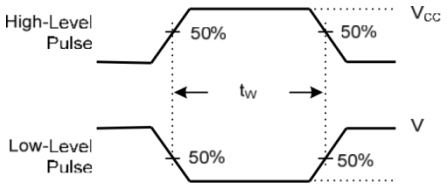
OPERATING CHARACTERISTICS (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Capacitance	C_I	V_{CC}=2V~6V	-	3	10	pF
Power Dissipation Capacitance per flip-flop	C_{PD}	No load.	-	35	-	pF

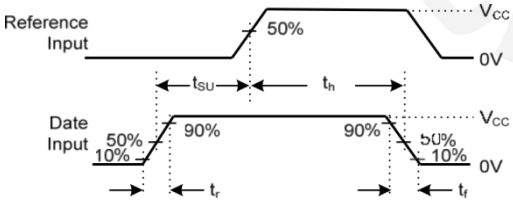
TEST CIRCUIT AND WAVEFORMS



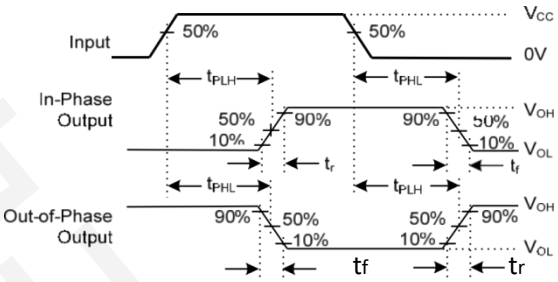
Load circuit



voltage waveforms pulse Durations



voltage waveforms setup and Hold Times



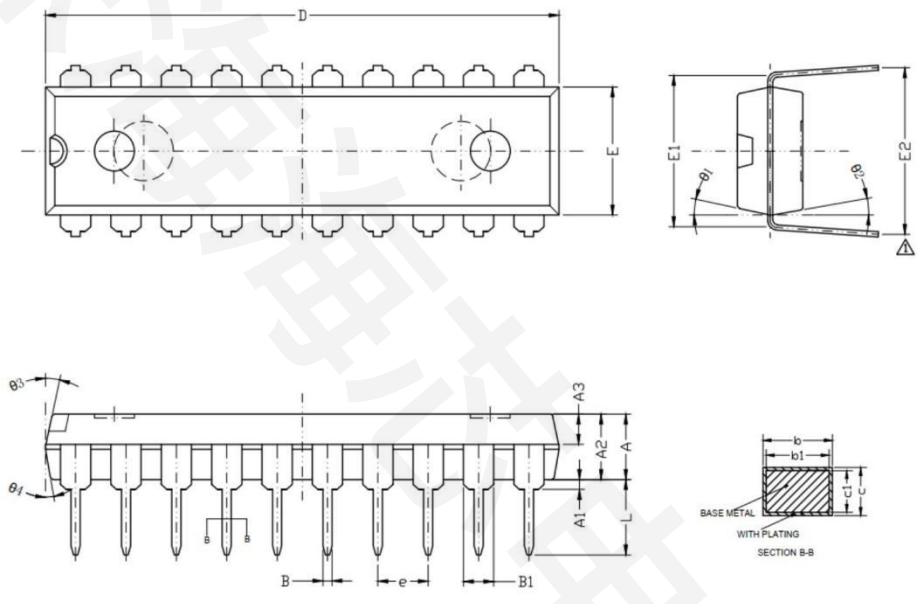
Voltage Waveforms Propagation Delay and Output Transition Times

Notes:

1. C_L includes probe and jig capacitance.
2. All input pulses are supplied by generators having the following characteristics: PRR ≤1MHz, Z_O = 50Ω, t_r = 6ns, t_f = 6ns.
3. For clock inputs, fmax is measured when the input duty cycle is 50%.
4. The outputs are measured one at a time with one input transition per measurement.

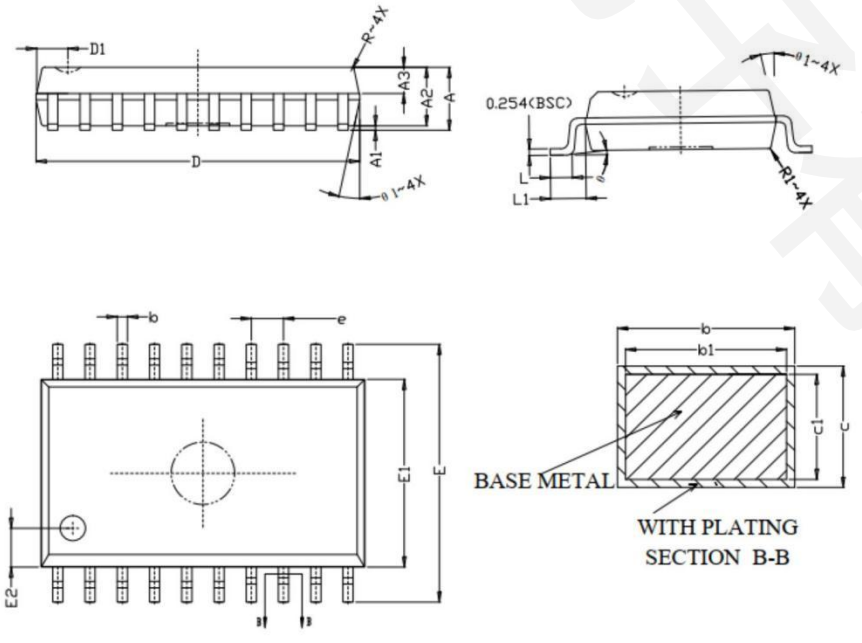
PACKAGE INFORMATION

74HC273N-HX DIP 20 package information



SYMBOL	MILLIMETER		
	MIN	MIN	MAX
A	3.60	3.80	4.00
A1	0.51	--	--
A2	3.20	3.30	3.40
A3	1.47	1.52	1.57
B	0.44	--	0.53
B1	1.52(BSC)		
b	0.44	--	0.53
b1	0.43	0.46	0.48
c	0.25	--	0.31
c1	0.24	0.25	0.26
D	25.7	25.9	26.1
E	6.35	6.55	6.75
E1	7.62(BSC)		
E2	8.00	8.40	8.80
e	2.54(BSC)		
L	3.00	--	3.60
θ1	8°	~	14°
θ2	6°	~	12°
θ3	8°	~	14°
θ4	6°	~	12°

74HC273D-HX SOP 20 package information



SYMBOL	MILLIMETER		
	MIN	MIN	MAX
A	--	--	2.615
A1	0.10	--	0.30
A2	2.29	2.34	2.39
A3	0.99	1.043	1.07
b	0.39	--	0.47
b1	0.38	0.41	0.44
c	0.25	--	0.29
c1	0.24	0.25	0.26
D	12.65	12.75	12.85
D1	1.225(BSC)		
E	10.10	10.30	10.50
E1	7.40	7.50	7.60
E2	1.55(BSC)		
e	1.27(BSC)		
L	0.854	0.864	0.874
L1	1.403(REF)		
θ	0°	~	8°
θ1	6°	~	15°
R/R1	R1.27(BSC)		