T-46-07-11

National Semiconductor

DM54ALS273/DM74ALS273
Octal D-Type Edge-Triggered Flip-Flop with Clear

General Description

These monolithic, positive-edge-triggered flip-flops utilize TTL circuitry to implement D-type flip-flop logic with a direct clear input.

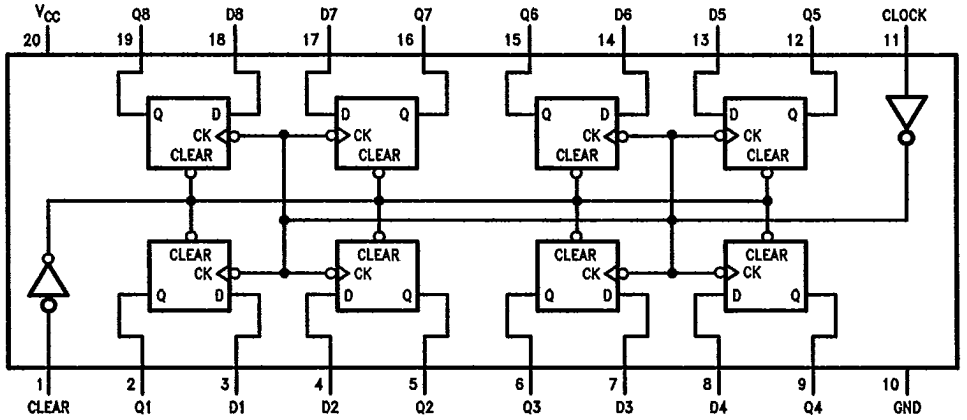
Information at the D inputs meeting the setup requirements is transferred to the Q outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When the clock input is at either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

Features

- Switching specifications at 50 pF
- Switching specifications guaranteed over full temperature and V_{CC} range
- Buffer-type outputs and improved AC offer significant advantage over 'LS273.
- Advanced oxide-isolated, ion-implanted Schottky TTL process
- Functionally and pin-for-pin compatible with 'LS273.

Connection Diagram

Dual-In-Line Package



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Order Number DM54ALS273J, DM74ALS273WM, DM74ALS273N or DM74ALS273SJ
See NS Package Number J20A, M20, M20D or N20A

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Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM54ALS	−55°C to +125°C
DM74ALS	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Typical θ_{JA}	
N Package	57.0°C/W
M Package	76.0°C/W

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

Recommended Operating Conditions

Symbol	Parameter		DM54ALS273			DM74ALS273			Units
			Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage		4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High Level Input Voltage		2			2			V
V_{IL}	Low Level Input Voltage				0.7			0.8	V
I_{OH}	High Level Output Current				−1			−2.6	mA
I_{OL}	Low Level Output Current				12			24	mA
f_{CLK}	Clock Frequency		0		30	0		35	MHz
$t_{W(CLK)}$	Width of Clock Pulse	High	16.5			14			ns
		Low	16.5			14			ns
t_W	Width of Clear Pulse	Low	10			10			ns
t_{SU}	Data Setup Time		10↑			10↑			ns
		Clear Inactive	15↑			15↑			
t_H	Data Hold Time		0↑			0↑			ns
T_A	Free Air Operating Temperature		−55		125	0		70	°C

The (↑) arrow indicates the positive edge of the Clock is used for reference.

Electrical Characteristics

over recommended operating free air temperature range. All typical values are measured at V_{CC} = 5V, T_A = 25°C.

Symbol	Parameter	Conditions		Min	Typ	Max	Units
V_{IK}	Input Clamp Voltage	V_{CC} = 4.5V, I_I = −18 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = 4.5V	54ALS I_{OH} = −1 mA	2.4	3.2		V
			74ALS I_{OH} = −2.6 mA	2.4	3.3		V
		I_{OH} = −400 μA	54/74ALS	V_{CC} − 2			V
V_{OL}	Low Level Output Voltage	V_{CC} = 4.5V	54/74ALS I_{OL} = 12 mA		0.25	0.4	V
			74ALS I_{OL} = 24 mA		0.35	0.5	V
I_I	Input Current @ Max. Input Voltage	V_{CC} = 5.5V, V_{IH} = 7V				0.1	mA
I_{IH}	High Level Input Current	V_{CC} = 5.5V, V_{IH} = 2.7V				20	μA
I_{IL}	Low Level Input Current	V_{CC} = 5.5V, V_{IL} = 0.4V				−0.2	mA
I_O	Output Drive Current	V_{CC} = 5.5V	V_O = 2.25V	−30		−112	mA
I_{CC}	Supply Current	V_{CC} = 5.5V Outputs Open	Outputs High		11	20	mA
			Outputs Low		19	29	mA

Switching Characteristics over recommended operating free air temperature range (Note 1).

Symbol	Parameter	Conditions	From	To	DM54ALS273		DM74ALS273		Units
					Min	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency	V_{CC} = 4.5V to 5.5V R_L = 500Ω C_L = 50 pF			30		35		MHz
t_{PHL}	Propagation Delay Time High to Low Level Output		Clear	Any Q	4	21.5	4	18	ns
t_{PLH}	Propagation Delay Time Low to High Level Output		Clock	Any Q	2	16.5	2	12	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		Clock	Any Q	3	16.5	3	15	ns

Note 1: See Section 1 for test waveforms and output load.

Function Table (Each Flip-Flop)

Inputs			Output Q
Clear	Clock	D	
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Q_0

L = Low State, H = High State, X = Don't Care
↑ = Positive Edge Transition, Q_0 = Previous Condition of Q

Logic Diagram

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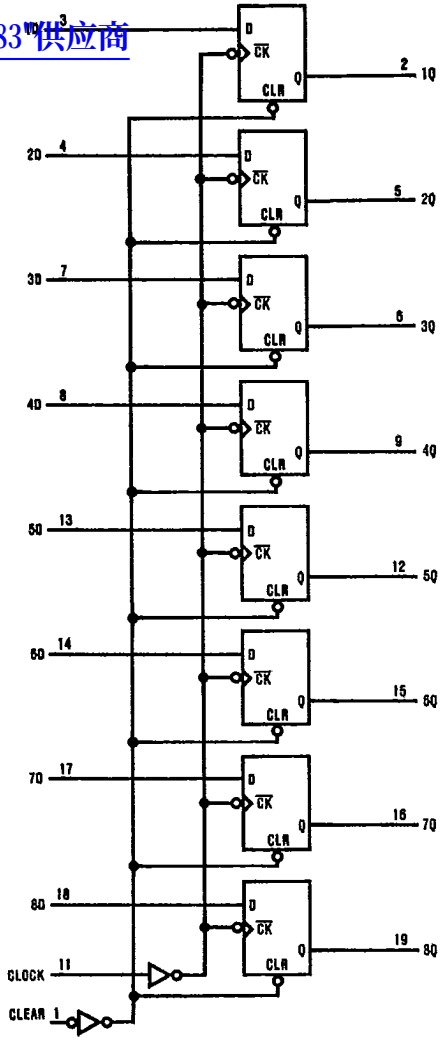

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