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DM54ALS174/DM54ALS175/DM74ALS174/DM74ALS175 Hex/Quad D Flip-Flop with Clear

General Description

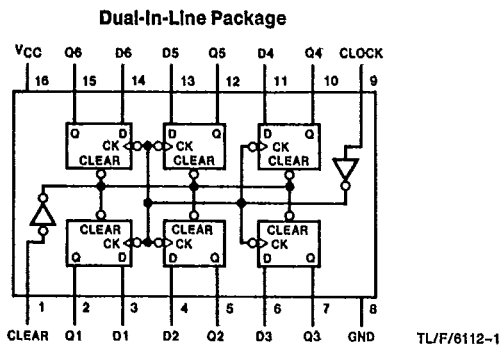
These positive-edge-triggered flip-flops utilize TTL circuitry to implement D-type flip-flop logic. Both have an asynchronous clear input, and the quad (175) version features complementary outputs from each flip-flop.

Information at the D inputs meeting the setup time 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

- Advanced oxide-isolated ion-implanted Schottky TTL process
- Pin and functional compatible with LS family counterpart
- Typical clock frequency maximum is 80 MHz
- Switching performance guaranteed over full temperature and V_{CC} supply range
- 54ALS174 contains six flip-flops with separate D inputs and Q outputs
- 54ALS175 contains four flip-flops with separate D inputs and both Q and \bar{Q} outputs

Connection Diagrams

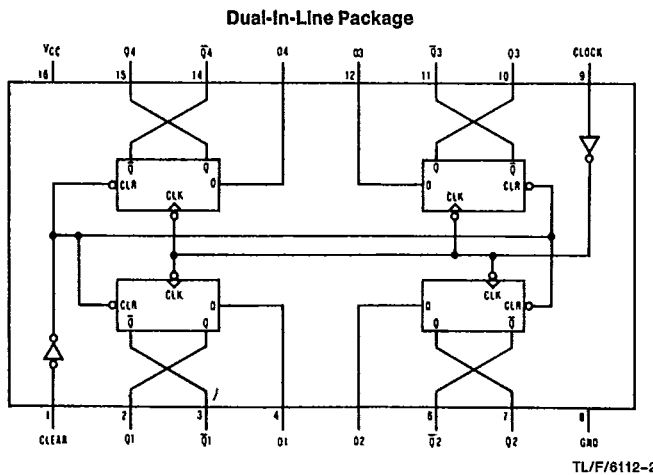


Order Number DM54ALS174J, DM74ALS174M,
DM74ALS174N or DM74ALS174SJ
See NS Package Number J16A, M16A, M16D or N16A

Function Table

Inputs			Outputs	
Clear	Clock	D	Q	\bar{Q} *
L	X	X	L	H
H	↑	H	H	L
H	↑	L	L	H
H	L	X	Q_0	\bar{Q}_0

H = High Level (steady state)
L = Low Level (steady state)
X = Don't Care
↑ = Transition from Low to High Level
 Q_0 = the level of Q before the indicated steady-state input conditions were established
*applies to 54ALS175/74ALS175 only



Order Number DM54ALS175J,
DM74ALS175M, DM74ALS175N or
DM74ALS175SJ
See NS Package Number J16A,
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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	77.9°C/W
M Package	107.3°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	DM54ALS174,175			DM74ALS174,175			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			-0.4			-0.4	mA
I _{OL}	Low Level Output Current			4			8	mA
t _w	Pulse Width	Clock High or Low	12.5		10			ns
		Clear Low	15		10			
t _{SETUP}	Setup Time (Note 1)	Data Input	15 ↑		10 ↑			ns
		Clear Inactive State	8 ↑		6 ↑			
t _{HOLD}	Data Hold Time (Note 1)	0 ↑			0 ↑			ns
f _{CLOCK}	Clock Frequency	0		40	0		50	MHz
T _A	Free Air Operating Temperature	-55		125	0		70	°C

Note 1: The symbol ↑ indicates that the rising edge of the clock is used as 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 _{IN} = -18 mA			-1.5	V
V _{OH}	High Level Output Voltage	I _{OH} = -400 μA V _{CC} = 4.5V to 5.5V	V _{CC} - 2	V _{CC} - 1.6		V
V _{OL}	Low Level Output Voltage	V _{CC} = 4.5V	DM54/74 I _{OL} = 4 mA	0.25	0.4	V
			DM74 I _{OL} = 8 mA	0.35	0.5	
I _I	Input Current at Max Input Voltage	V _{CC} = 5.5V, V _{IN} = 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 _{IN} = 0.4V			-0.1	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 Clock = 4.5V Clear = GND D Input = GND	ALS174	11	19	mA
			ALS175	8	14	



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

Symbol	Parameter	Conditions	DM54ALS174,175		DM74ALS174,175		Units
			Min	Max	Min	Max	
f _{MAX}	Maximum Clock Frequency	R _L = 500Ω C _L = 50 pF V _{CC} = 4.5V to 5.5V	40		50		MHz
t _{PLH}	Propagation Delay Time Low to High Level Output From Clear (175 Only)		5	20	5	18	ns
t _{PHL}	Propagation Delay Time High to Low Level Output From Clear		8	30	8	23	ns
t _{PLH}	Propagation Delay Time Low to High Level Output From Clock		3	20	3	15	ns
t _{PHL}	Propagation Delay Time High to Low Level Output From Clock		5	24	5	17	ns

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

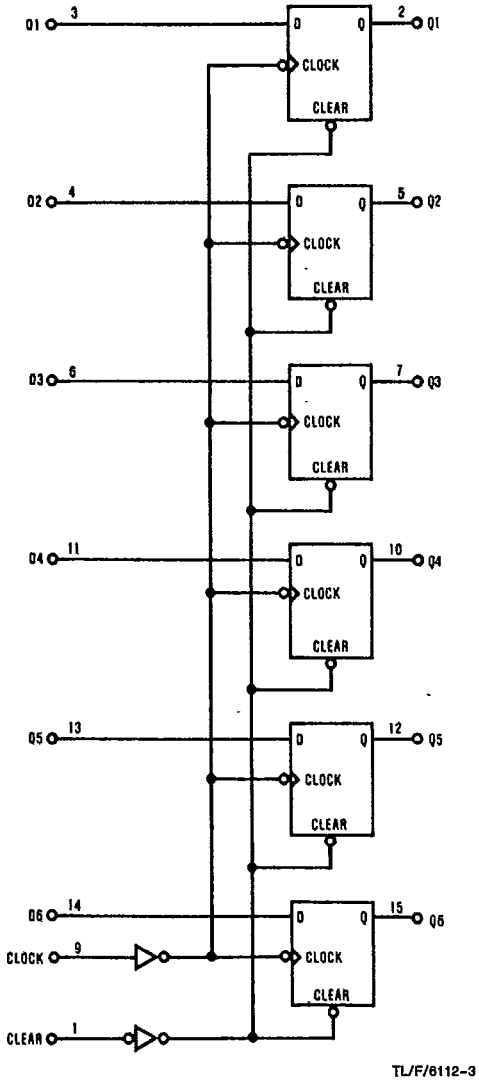
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Logic Diagrams

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