National Semiconductor

June 1989

5474/DM5474/DM7474 Dual Positive-Edge-Triggered D Flip-Flops with Preset, Clear and Complementary Outputs

General Description

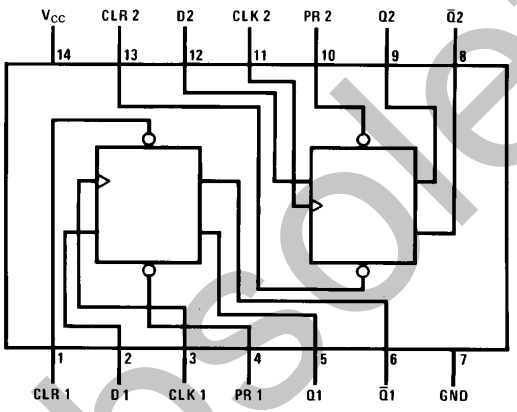
This device contains two independent positive-edge-triggered D flip-flops with complementary outputs. The information on the D input is accepted by the flip-flops on the positive going edge of the clock pulse. The triggering occurs at a voltage level and is not directly related to the transition time of the rising edge of the clock. The data on the D input may be changed while the clock is low or high without affecting the outputs as long as the data setup and hold times are not violated. A low logic level on the preset or clear inputs will set or reset the outputs regardless of the logic levels of the other inputs.

Features

- Alternate Military/Aerospace device (5474) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

Connection Diagram

Dual-In-Line Package



TL/F/6526–1

Order Number 5474DMQB, 5474FMQB, DM5474J, DM5474W, DM7474M or DM7474N
See NS Package Number J14A, M14A, N14A or W14B

Function Table

Inputs				Outputs	
PR	CLR	CLK	D	Q	$\overline{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H*	H*
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q_0	$\overline{Q}_0$

H = High Logic Level
X = Either Low or High Logic Level
L = Low Logic Level
↑ = Positive-going transition of the clock.
* = This configuration is nonstable; that is, it will not persist when either the preset and/or clear inputs return to their inactive (high) level.
Q_0 = The output logic level of Q before the indicated input conditions were established.

Absolute Maximum Ratings (Note)

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

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range	
DM54 and 54	−55°C to +125°C
DM74	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

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		DM5474			DM7474			Units
			Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage		4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High Level Input Voltage		2			2			V
V_{IL}	Low Level Input Voltage				0.8			0.8	V
I_{OH}	High Level Output Current				−0.4			−0.4	mA
I_{OL}	Low Level Output Current				16			16	mA
f_{CLK}	Clock Frequency (Note 2)		0		15	0		15	MHz
t_W	Pulse Width (Note 2)	Clock High	30			30			ns
		Clock Low	37			37			
		Clear Low	30			30			
		Preset Low	30			30			
t_{SU}	Input Setup Time (Notes 1 & 2)		20 ↑			20 ↑			ns
t_H	Input Hold Time (Notes 1 & 2)		5 ↑			5 ↑			ns
T_A	Free Air Operating Temperature		−55		125	0		70	°C

Note 1: The symbol (↑) indicates the rising edge of the clock pulse is used for reference.

Note 2: $T_A = 25°C$ and $V_{CC} = 5V$.

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 3)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −12 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max V_{IL} = Max, V_{IH} = Min		2.4	3.4		V
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max V_{IH} = Min, V_{IL} = Max			0.2	0.4	V
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 5.5V				1	mA
I_{IH}	High Level Input Current	V_{CC} = Max V_I = 2.4V	D			40	μA
			Clock			80	
			Clear			120	
			Preset			40	
I_{IL}	Low Level Input Current	V_{CC} = Max V_I = 0.4V (Note 6)	D			−1.6	mA
			Clock			−3.2	
			Clear			−3.2	
			Preset			−1.6	
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 4)	DM54	−20		−55	mA
			DM74	−18		−55	
I_{CC}	Supply Current	V_{CC} = Max (Note 5)			17	30	mA

Note 3: All typicals are at $V_{CC} = 5V$, $T_A = 25°C$.

Note 4: Not more than one output should be shorted at a time.

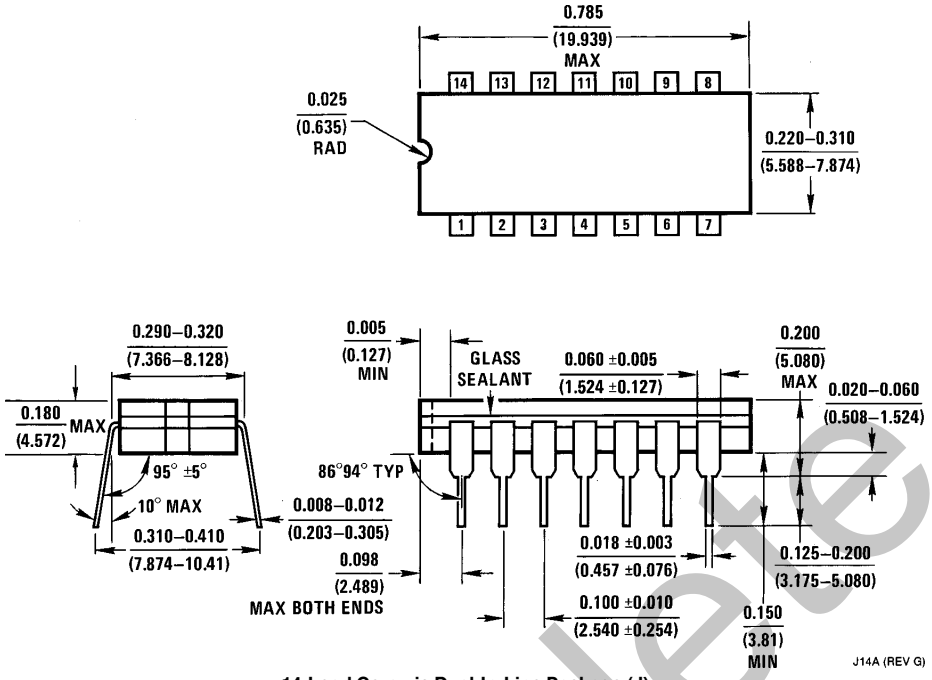
Note 5: With all outputs open, I_{CC} is measured with the Q and $\overline{Q}$ outputs high in turn. At the time of measurement the clock is grounded.

Note 6: Clear is tested with preset high and preset is tested with clear high.

Switching Characteristics at $V_{CC} = 5V$ and $T_A = 25°C$ (See Section 1 for Test Waveforms and Output Load)

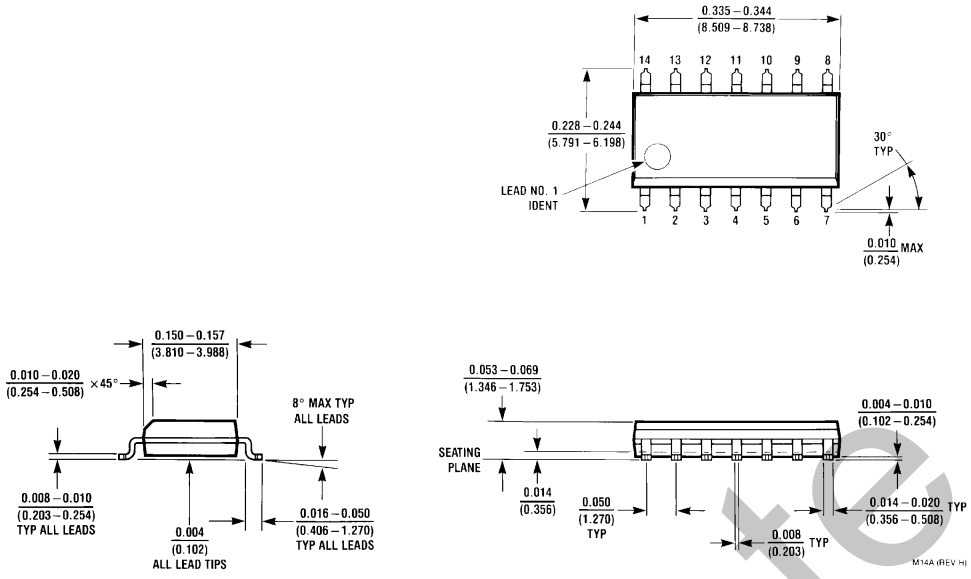
Symbol	Parameter	From (Input) To (Output)	$R_L = 400\Omega$, $C_L = 15$ pF		Units
			Min	Max	
f_{MAX}	Maximum Clock Frequency		15		MHz
t_{PHL}	Propagation Delay Time High to Low Level Output	Preset to $\overline{Q}$		40	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Preset to Q		25	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Clear to Q		40	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Clear to $\overline{Q}$		25	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Clock to Q or $\overline{Q}$		40	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Clock to Q or $\overline{Q}$		25	ns

Physical Dimensions inches (millimeters)

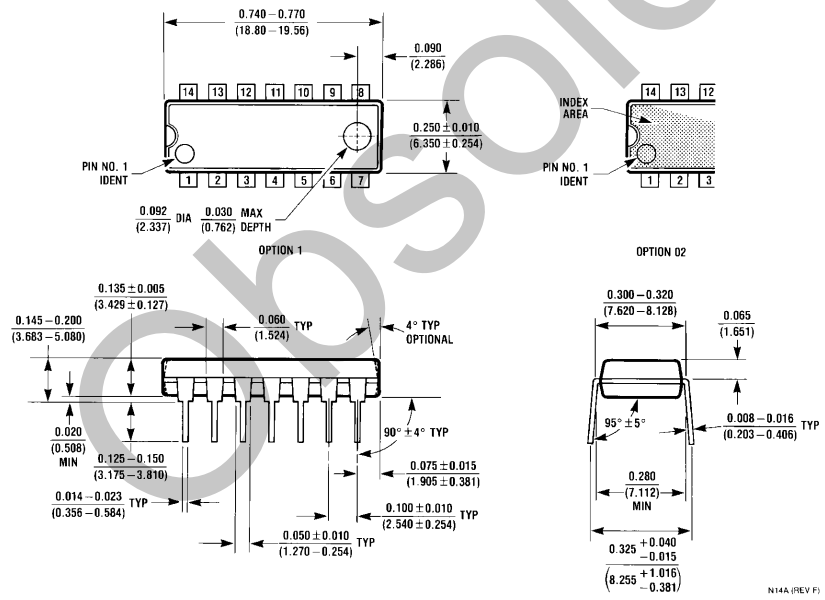


14-Lead Ceramic Dual-In-Line Package (J)
Order Number 5474DMQB or DM5474J
NS Package Number J14A

Physical Dimensions inches (millimeters) (Continued)

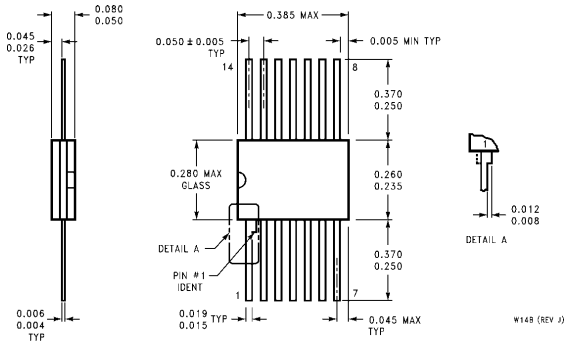


14-Lead Small Outline Molded Package (M)
Order Number DM7474M
NS Package Number M14A



14-Lead Molded Dual-In-Line Package (N)
Order Number DM7474N
NS Package Number N14A

Physical Dimensions inches (millimeters) (Continued)



14-Lead Ceramic Flat Package (W)
Order Number 5474FMQB or DM5474W
NS Package Number W14B

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