FAIRCHILD

SEMICONDUCTOR ™

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 Fairchild Semiconductor Sales Office/Distributor for specifications.

Connection Diagram

Dual-In-Line Package

DS006526-1
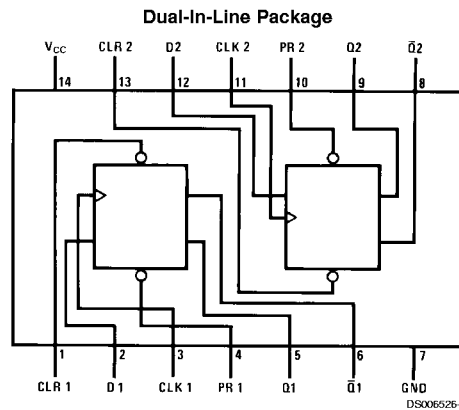
Order Number 5474DMQB, 5474FMQB, DM5474J, DM5474W, DM7474M or DM7474N
See Package Number J14A, M14A, N14A or W14B

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 (Note 1)	H (Note 1)
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.

Note 1: 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 2)

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

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 4)		0		15	0		15		MHz
t_W	Pulse Width	Clock High	30			30				
	(Note 4)	Clock Low	37			37				ns
		Clear Low	30			30				
		Preset Low	30			30				
t_{SU}	Input Setup Time (Notes 3, 4)		20↑			20↑				ns
t_H	Input Hold Time (Notes 3, 4)		5↑			5↑				ns
T_A	Free Air Operating Temperature		−55		125	0		70		˚C

Note 2: 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.

Note 3: The symbol (↑) indicates the rising edge of the clock pulse is used for reference.

Note 4: 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 5)	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 8)	D			−1.6	mA
			Clock			−3.2	
			Clear			−3.2	
			Preset			−1.6	
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 6)	DM54	−20		−55	mA
			DM74	−18		−55	
I_{CC}	Supply Current	V_{CC} = Max (Note 7)			17	30	mA

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

Note 6: Not more than one output should be shorted at a time.

Note 7: 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.
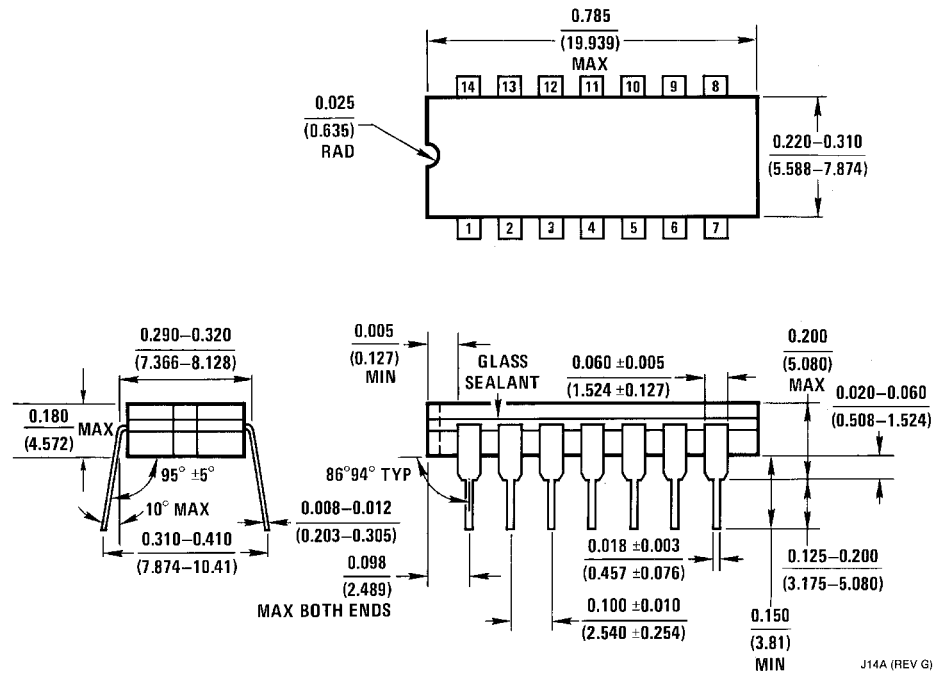
Electrical Characteristics (Continued)

Note 8: 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) unless otherwise noted

0.785
(19.939)
MAX

14 13 12 11 10 9 8

0.025
(0.635)
RAD

0.220−0.310
(5.588−7.874)

1 2 3 4 5 6 7

0.290−0.320
(7.366−8.128)

0.005
(0.127)
MIN

GLASS
SEALANT

0.060 ±0.005
(1.524 ±0.127)

0.200
(5.080)
MAX

0.020−0.060
(0.508−1.524)

0.180
(4.572) MAX

95° ±5°

86°−94° TYP

10° MAX

0.008−0.012
(0.203−0.305)

0.310−0.410
(7.874−10.41)

0.098
(2.489)
MAX BOTH ENDS

0.018 ±0.003
(0.457 ±0.076)

0.100 ±0.010
(2.540 ±0.254)

0.125−0.200
(3.175−5.080)

0.150
(3.81)
MIN

J14A (REV G)

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

0.335 − 0.344
(8.509 − 8.738)

14 13 12 11 10 9 8

0.228−0.244
(5.791 − 6.198)

LEAD NO. 1
IDENT

1 2 3 4 5 6 7

30°
TYP

0.010 MAX
(0.254)

0.150 − 0.157
(3.810 − 3.988)

0.010 − 0.020
(0.254 − 0.508) × 45°

8° MAX TYP
ALL LEADS

0.053 − 0.069
(1.346 − 1.753)

0.004 − 0.010
(0.102 − 0.254)

SEATING
PLANE

0.008 − 0.010
(0.203 − 0.254)
TYP ALL LEADS

0.004
(0.102)
ALL LEAD TIPS

0.016 − 0.050
(0.406 − 1.270)
TYP ALL LEADS

0.014
(0.356)

0.050
(1.270)
TYP

0.008
(0.203) TYP

0.014 − 0.020 TYP
(0.356 − 0.508)

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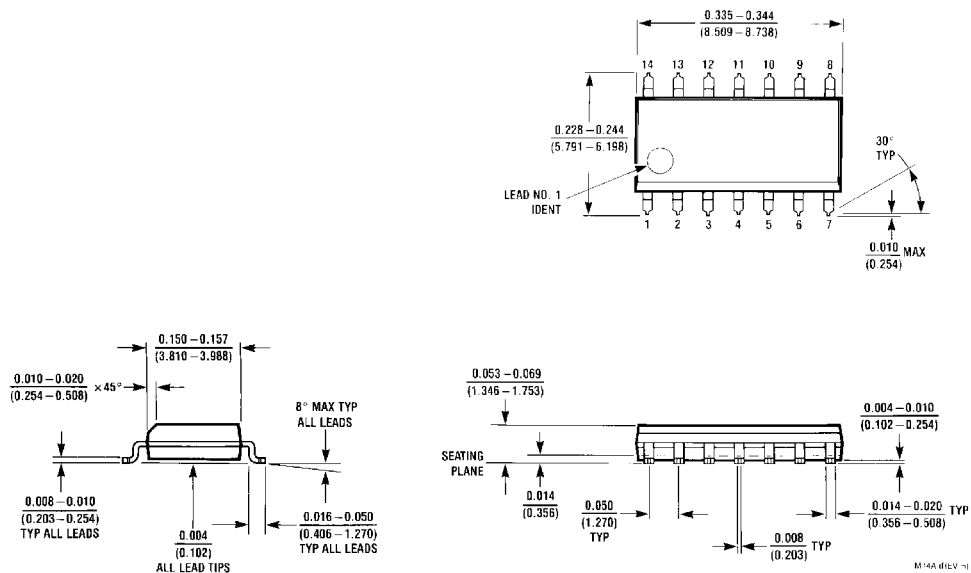
14-Lead Small Outline Molded Package (M)
Order Number DM7474M
Package Number M14A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

0.740 − 0.770
(18.80 − 19.56)

0.090
(2.286)

0.250 ± 0.010
(6.350 ± 0.254)

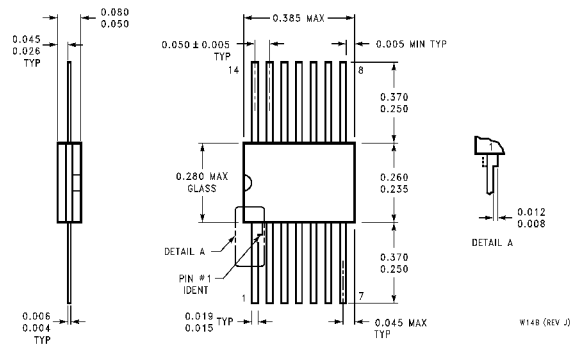PIN NO. 1
IDENT

0.092
(2.337) DIA

0.030 MAX
(0.762) DEPTH

OPTION 1

INDEX
AREA

PIN NO. 1
IDENT

OPTION 02

0.135 ± 0.005
(3.429 ± 0.127)

0.145 − 0.200
(3.683 − 5.080)

0.060 TYP
(1.524)

4° TYP
OPTIONAL

0.020
(0.508)
MIN

0.125 − 0.150
(3.175 − 3.810)

90° + 4° TYP

0.014 − 0.023 TYP
(0.356 − 0.584)

0.075 ± 0.015
(1.905 ± 0.381)

0.100 ± 0.010 TYP
(2.540 ± 0.254)

0.050 ± 0.010 TYP
(1.270 0.254)

0.300 − 0.320
(7.620 − 8.128)

0.065
(1.651)

95° ± 5°

0.008 − 0.016 TYP
(0.203 − 0.406)

0.280
(7.112)
MIN

0.325 +0.040
−0.015

(8.255 +1.016
−0.381)

N14A (REV F)

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

0.080
0.050

0.045
0.026
TYP

0.050 ± 0.005
TYP

0.385 MAX

0.005 MIN TYP

14

8

0.370
0.250

0.280 MAX
GLASS

0.260
0.235

DETAIL A

PIN #1
IDENT

1

7

0.370
0.250

0.012
0.008

DETAIL A

0.006
0.004
TYP

0.019 TYP
0.015

0.045 MAX
TYP

W14B (REV J)

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