

SN54F74, SN74F74

DUAL POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH CLEAR AND PRESET

SDFS046A – MARCH 1987 – REVISED OCTOBER 1993

- Package Options Include Plastic Small-Outline Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs

description

These devices contain two independent positive-edge-triggered D-type flip-flops. A low level at the preset ($\overline{\text{PRE}}$) or clear ($\overline{\text{CLR}}$) inputs sets or resets the outputs regardless of the levels of the other inputs. When $\overline{\text{PRE}}$ and $\overline{\text{CLR}}$ are inactive (high), data at the data (D) input meeting the setup time requirements is transferred to the outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level and is not directly related to the rise time of the clock pulse. Following the hold-time interval, data at the D input may be changed without affecting the levels at the outputs.

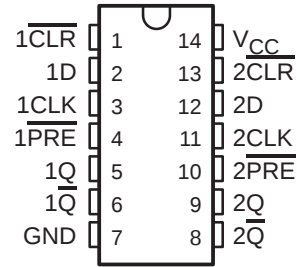
The SN54F74 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74F74 is characterized for operation from 0°C to 70°C .

FUNCTION TABLE

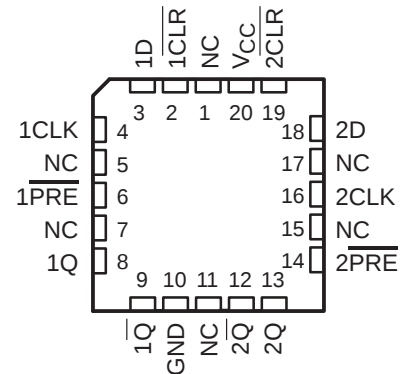
INPUTS				OUTPUTS	
$\overline{\text{PRE}}$	$\overline{\text{CLR}}$	CLK	D	Q	$\overline{\text{Q}}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	$\text{H}^{\dagger}$	$\text{H}^{\dagger}$
H	H	$\uparrow$	H	H	L
H	H	$\uparrow$	L	L	H
H	H	L	X	Q_0	$\overline{\text{Q}}_0$

$\dagger$ The output levels are not guaranteed to meet the minimum levels for V_{OH} . Furthermore, this configuration is nonstable; that is, it will not persist when $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ returns to its inactive (high) level.

SN54F74 . . . J PACKAGE
SN74F74 . . . D OR N PACKAGE
(TOP VIEW)



SN54F74 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

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The logic diagram shows a 3-bit counter implemented with three T flip-flops (TG) and various logic gates. The inputs are PRE, CLK, D, and $\overline{\text{CLR}}$. The outputs are C, Q, and $\overline{Q}$. The circuit includes inverters, AND gates, OR gates, and T flip-flops. The clock signal CLK is inverted and then inverted again to produce C and $\overline{C}$. The PRE signal is connected to the clock input of the first T flip-flop. The D input is connected to the D input of the first T flip-flop. The $\overline{\text{CLR}}$ signal is connected to the clear input of the first T flip-flop. The output of the first T flip-flop is C. The output of the second T flip-flop is Q. The output of the third T flip-flop is $\overline{Q}$.

Supply voltage range, V_{CC}		-0.5 V to 7 V
Input voltage range, V_I (see Note 1)		-1.2 V to 7 V
Input current range		-30 mA to 5 mA
Voltage range applied to any output in the high state		-0.5 V to V_{CC}
Current into any output in the low state		40 mA
Operating free-air temperature range: SN54F74		-55°C to 125°C
SN74F74		0°C to 70°C
Storage temperature range		-65°C to 150°C

NOTE 1: The input voltage ratings may be exceeded provided the input current ratings are observed.

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recommended operating conditions

		SN54F74			SN74F74			UNIT
		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			0.8			0.8	V
I_{IK}	Input clamp current			–18			–18	mA
I_{OH}	High-level output current			–1			–1	mA
I_{OL}	Low-level output current			20			20	mA
T_A	Operating free-air temperature	–55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		SN54F74		SN74F74		UNIT
				MIN	TYP†	MAX	MIN	
V_{IK}		$V_{CC} = 4.5\text{ V}$, $I_I = -18\text{ mA}$				–1.2	–1.2	V
V_{OH}		$V_{CC} = 4.5\text{ V}$, $I_{OH} = -1\text{ mA}$		2.5	3.4	2.5	3.4	V
		$V_{CC} = 4.75\text{ V}$, $I_{OH} = -1\text{ mA}$				2.7		
V_{OL}		$V_{CC} = 4.5\text{ V}$, $I_{OL} = 20\text{ mA}$		0.3	0.5	0.3	0.5	V
I_I		$V_{CC} = 5.5\text{ V}$, $V_I = 7\text{ V}$			0.1		0.1	mA
I_{IH}		$V_{CC} = 5.5\text{ V}$, $V_I = 2.7\text{ V}$			20		20	μA
I_{IL}	Data, CLK	$V_{CC} = 5.5\text{ V}$, $V_I = 0.5\text{ V}$			–0.6		–0.6	mA
	PRE or CLR				–1.8		–1.8	
$I_{OS}^\ddagger$		$V_{CC} = 5.5\text{ V}$, $V_O = 0$		–60	–150	–60	–150	mA
I_{CC}		$V_{CC} = 5.5\text{ V}$, See Note 2		10.5	16	10.5	16	mA

† All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

‡ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

NOTE 2: I_{CC} is measured with D, CLK, and PRE grounded then with D, CLK, and CLR grounded.

timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

			V _{CC} = 5 V, T _A = 25°C		SN54F74		SN74F74		UNIT
			'F74						
			MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock}	Clock frequency		0	100	0	80	0	100	MHz
t _w	Pulse duration		CLK high, $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ low		4		4		ns
			CLK low		5		6		
t _{su}	Setup time, data before CLK↑		High		2		3		ns
			Low		3		4		
	Setup time, inactive-state before CLK↑§		$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ to CLK		2		3		
t _h	Hold time, data after CLK↑		High		1		2		ns
			Low		1		2		

§ Inactive-state setup time is also referred to as recovery time.



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switching characteristics (see Note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 5 V, C _L = 50 pF, R _L = 500 Ω, T _A = 25°C			V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 500 Ω, T _A = MIN to MAX†				UNIT
			‘F74			SN54F74		SN74F74		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f _{max}			100	145		80		100		MHz
t _{PLH}	CLK	Q or $\overline{Q}$	3	4.9	6.8	3.8	8.5	3	7.8	ns
t _{PHL}			3.6	5.8	8	4.4	10.5	3.6	9.2	
t _{PLH}	$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$	Q or $\overline{Q}$	2.4	4.2	6.1	3.2	8	2.4	7.1	ns
t _{PHL}			2.7	6.6	9	3.5	11.5	2.7	10.5	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 3: Load circuits and waveforms are shown in Section 1.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
5962-9759201Q2A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9759201Q2A SNJ54F 74FK
5962-9759201QCA	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9759201QC A SNJ54F74J
5962-9759201QDA	Active	Production	CFP (W) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9759201QD A SNJ54F74W
JM38510/34101B2A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 34101B2A
JM38510/34101B2A.A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 34101B2A
JM38510/34101BCA	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 34101BCA
JM38510/34101BCA.A	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 34101BCA
JM38510/34101BDA	Active	Production	CFP (W) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 34101BDA
JM38510/34101BDA.A	Active	Production	CFP (W) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 34101BDA
M38510/34101B2A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 34101B2A
M38510/34101BCA	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 34101BCA
M38510/34101BDA	Active	Production	CFP (W) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 34101BDA
SN54F74J	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54F74J
SN54F74J.A	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54F74J
SN74F74D	Obsolete	Production	SOIC (D) 14	-	-	Call TI	Call TI	0 to 70	F74
SN74F74DR	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	F74
SN74F74DR.A	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	F74

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74F74DRG4	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	F74
SN74F74N	Active	Production	PDIP (N) 14	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74F74N
SN74F74N.A	Active	Production	PDIP (N) 14	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74F74N
SN74F74NE4	Active	Production	PDIP (N) 14	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74F74N
SN74F74NSR	Active	Production	SOP (NS) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74F74
SN74F74NSR.A	Active	Production	SOP (NS) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74F74
SNJ54F74FK	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9759201Q2A SNJ54F74FK
SNJ54F74FK.A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9759201Q2A SNJ54F74FK
SNJ54F74J	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9759201QC A SNJ54F74J
SNJ54F74J.A	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9759201QC A SNJ54F74J
SNJ54F74W	Active	Production	CFP (W) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9759201QD A SNJ54F74W
SNJ54F74W.A	Active	Production	CFP (W) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9759201QD A SNJ54F74W

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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OTHER QUALIFIED VERSIONS OF SN54F74, SN74F74 :

- Catalog : [SN74F74](#)
- Military : [SN54F74](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74F74DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74F74NSR	SOP	NS	14	2000	330.0	16.4	8.1	10.4	2.5	12.0	16.0	Q1

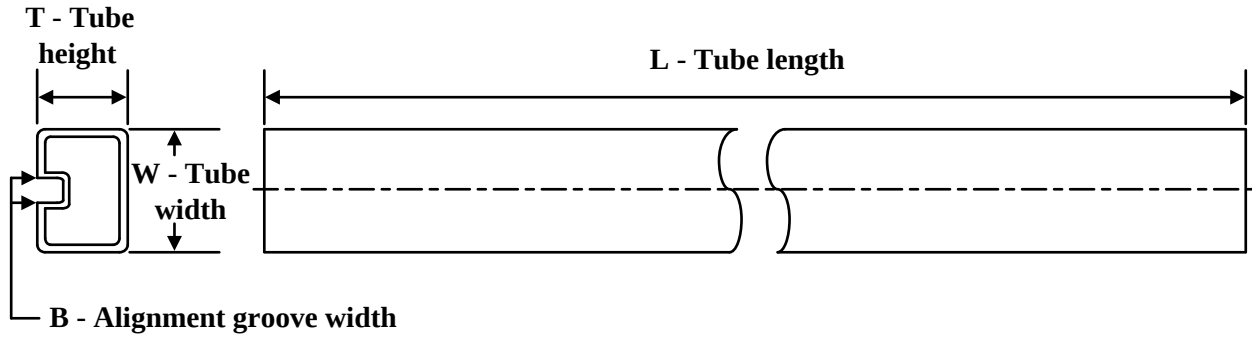
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74F74DR	SOIC	D	14	2500	353.0	353.0	32.0
SN74F74NSR	SOP	NS	14	2000	353.0	353.0	32.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-9759201Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9759201QDA	W	CFP	14	25	506.98	26.16	6220	NA
JM38510/34101B2A	FK	LCCC	20	55	506.98	12.06	2030	NA
JM38510/34101B2A.A	FK	LCCC	20	55	506.98	12.06	2030	NA
JM38510/34101BDA	W	CFP	14	25	506.98	26.16	6220	NA
JM38510/34101BDA.A	W	CFP	14	25	506.98	26.16	6220	NA
M38510/34101B2A	FK	LCCC	20	55	506.98	12.06	2030	NA
M38510/34101BDA	W	CFP	14	25	506.98	26.16	6220	NA
SN74F74N	N	PDIP	14	25	506	13.97	11230	4.32
SN74F74N	N	PDIP	14	25	506	13.97	11230	4.32
SN74F74N.A	N	PDIP	14	25	506	13.97	11230	4.32
SN74F74N.A	N	PDIP	14	25	506	13.97	11230	4.32
SN74F74NE4	N	PDIP	14	25	506	13.97	11230	4.32
SN74F74NE4	N	PDIP	14	25	506	13.97	11230	4.32
SNJ54F74FK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54F74FK.A	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54F74W	W	CFP	14	25	506.98	26.16	6220	NA
SNJ54F74W.A	W	CFP	14	25	506.98	26.16	6220	NA

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



GENERIC PACKAGE VIEW

FK 20

LCCC - 2.03 mm max height

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



4229370VA\

J 14

GENERIC PACKAGE VIEW

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

4040083-5/G

J0014A**PACKAGE OUTLINE****CDIP - 5.08 mm max height**

CERAMIC DUAL IN LINE PACKAGE



4214771/A 05/2017

NOTES:

1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
5. Falls within MIL-STD-1835 and GDIP1-T14.

EXAMPLE BOARD LAYOUT

J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



LAND PATTERN EXAMPLE
NON-SOLDER MASK DEFINED
SCALE: 5X



4214771/A 05/2017

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



4040049/E 12/2002

NOTES:

- A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
-  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 The 20 pin end lead shoulder width is a vendor option, either half or full width.

D0014A**PACKAGE OUTLINE****SOIC - 1.75 mm max height**

SMALL OUTLINE INTEGRATED CIRCUIT



4220718/A 09/2016

NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm, per side.
5. Reference JEDEC registration MS-012, variation AB.

EXAMPLE BOARD LAYOUT

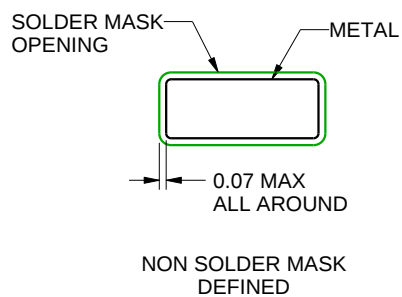
D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE
SCALE:8X



SOLDER MASK DETAILS

4220718/A 09/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:8X

4220718/A 09/2016

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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