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 (PRE) or clear (CLR) inputs sets or resets the outputs regardless of the levels of the other inputs. When PRE and 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.

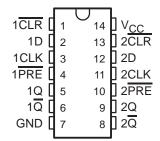
The SN54F74 is characterized for operation over the full military temperature range of -55° C to 125°C. The SN74F74 is characterized for operation from 0°C to 70°C.

FUNCTION TABLE

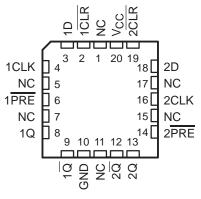
	INP	UTS		OUTI	PUTS
PRE	CLR	CLK	D	Q	Ø
L	Н	Х	Χ	Н	L
Н	L	X	Χ	L	Н
L	L	X	Χ	H [†]	H [†]
Н	Н	\uparrow	Н	Н	L
Н	Н	\uparrow	L	L	Н
Н	Н	L	Χ	Q ₀	\overline{Q}_0

[†] 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 PRE or CLR returns to its inactive (high) level.

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



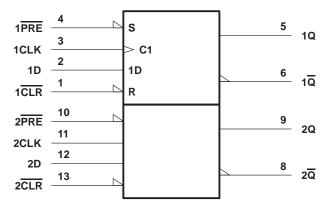
SN54F74 . . . FK PACKAGE (TOP VIEW)



NC - No internal connection

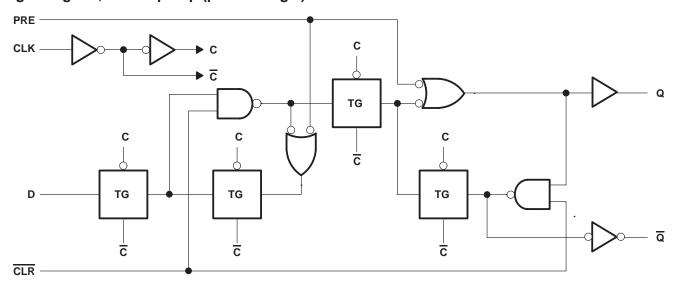
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logic symbol†



[†] This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the D, J, and N packages.

logic diagram, each flip-flop (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

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	\dots -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

[‡] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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



SN54F74, SN74F74 **DUAL POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOPS** WITH CLEAR AND PRESET

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recommended operating conditions

			SN54F74		9	N74F74		UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
VIH	High-level input voltage	2			2			V
V _{IL}	Low-level input voltage			0.8			0.8	V
ΙK	Input clamp current			-18			-18	mA
IOH	High-level output current			-1			- 1	mA
lOL	Low-level output current			20			20	mA
TA	Operating free-air temperature	-55		125	0		70	°C

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

	ARAMETER	TEC	T CONDITIONS	,	SN54F74			N74F74		UNIT
PF	ARAWETER	TEST CONDITIONS			TYP	MAX	MIN	TYP	MAX	UNIT
VIK		$V_{CC} = 4.5 \text{ V},$	I _I = -18 mA			-1.2			-1.2	V
V/01.1		$V_{CC} = 4.5 \text{ V},$	$I_{OH} = -1 \text{ mA}$	2.5	3.4		2.5	3.4		V
VOH		$V_{CC} = 4.75 V$,	$I_{OH} = -1 \text{ mA}$				2.7			٧
VOL		$V_{CC} = 4.5 \text{ V},$	$I_{OL} = 20 \text{ mA}$		0.3	0.5		0.3	0.5	V
Ц		$V_{CC} = 5.5 V,$	V _I = 7 V			0.1			0.1	mA
lіН		$V_{CC} = 5.5 \text{ V},$	V _I = 2.7 V			20			20	μΑ
1	Data, CLK	V _{CC} = 5.5 V,	V _I = 0.5 V			- 0.6			- 0.6	mA
IIL	PRE or CLR	v CC = 5.5 v,	V = 0.5 V			- 1.8			- 1.8	IIIA
los‡		$V_{CC} = 5.5 \text{ V},$	V _O = 0	-60		-150	-60		-150	mA
ICC		$V_{CC} = 5.5 \text{ V},$	See Note 2		10.5	16		10.5	16	mA

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

			V _{CC} = 5 V, T _A = 25°C		SN54	F74	SN74	F74	UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock}	Clock frequency		0	100	0	80	0	100	MHz
	Pulse duration	CLK high, PRE or CLR low	4		4		4		20
t _W	ruise duration	CLK low	5		6		5		ns
	Saturations data hatara CLIVA	High	2		3		2		
t _{su}	Setup time, data before CLK↑	Low	3		4		3		ns
	Setup time, inactive-state before CLK↑§	PRE or CLR to CLK	2		3		2		
. .	Hold time, data after CLK↑	High	1		2		1		no
t _h	Holu tille, uata alter CLN	Low	1		2		1		ns

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



[†] All typical values are at V_{CC} = 5 V, T_A = 25°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: ICC is measured with D, CLK, and PRE grounded then with D, CLK, and CLR grounded.

SN54F74, SN74F74 DUAL POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH CLEAR AND PRESET SDFS046A – MARCH 1987 – REVISED OCTOBER 1993

switching characteristics (see Note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	C _I R _I	CC = 5 V _ = 50 p _ = 500 s _ = 25°C	F, Ω,	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 500 Ω, T_A = MIN to MAX [†] SN54F74 SN74F74				UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f _{max}			100	145		80		100		MHz
tPLH	CLK	0.57	3	4.9	6.8	3.8	8.5	3	7.8	ns
t _{PHL}	CLK	Q or Q	3.6	5.8	8	4.4	10.5	3.6	9.2	115
t _{PLH}	PRE or CLR	Q or $\overline{\mathbb{Q}}$	2.4	4.2	6.1	3.2	8	2.4	7.1	ns
t _{PHL}	FRE OF CLR	QUIQ	2.7	6.6	9	3.5	11.5	2.7	10.5	115

[†] 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.



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PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9759201Q2A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9759201Q2A SNJ54F 74FK	Samples
5962-9759201QCA	ACTIVE	CDIP	J	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9759201QC A SNJ54F74J	Samples
5962-9759201QDA	ACTIVE	CFP	W	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9759201QD A SNJ54F74W	Samples
JM38510/34101B2A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 34101B2A	Samples
JM38510/34101BCA	ACTIVE	CDIP	J	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 34101BCA	Samples
JM38510/34101BDA	ACTIVE	CFP	W	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 34101BDA	Samples
M38510/34101B2A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 34101B2A	Samples
M38510/34101BCA	ACTIVE	CDIP	J	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 34101BCA	Samples
M38510/34101BDA	ACTIVE	CFP	W	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 34101BDA	Samples
SN54F74J	ACTIVE	CDIP	J	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54F74J	Samples
SN74F74D	ACTIVE	SOIC	D	14	50	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	F74	Samples
SN74F74DG4	ACTIVE	SOIC	D	14	50	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	F74	Samples
SN74F74DR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	F74	Samples
SN74F74DRG4	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	F74	Samples
SN74F74N	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74F74N	Samples
SN74F74NE4	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74F74N	Samples

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Orderable Device	Status (1)	Package Type	Package Drawing		Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
SN74F74NSR	ACTIVE	SO	NS	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	74F74	Samples
SN74F74NSRG4	ACTIVE	SO	NS	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	74F74	Samples
SNJ54F74FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9759201Q2A SNJ54F 74FK	Samples
SNJ54F74J	ACTIVE	CDIP	J	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9759201QC A SNJ54F74J	Samples
SNJ54F74W	ACTIVE	CFP	W	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9759201QD A SNJ54F74W	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) RoHS: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

- (3) MSL, Peak Temp. The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.
- (6) Lead finish/Ball material Orderable Devices 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.

PACKAGE OPTION ADDENDUM

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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

PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing		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	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

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*All dimensions are nominal

Device	Package Type	pe Package Drawing P		SPQ	Length (mm)	Width (mm)	Height (mm)
SN74F74DR	SOIC	D	14	2500	853.0	449.0	35.0
SN74F74NSR	SO	NS	14	2000	853.0	449.0	35.0

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a metal lid.
- D. Falls within JEDEC MS-004



MECHANICAL DATA

NS (R-PDSO-G**)

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



- 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.



W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only.
- E. Falls within MIL STD 1835 GDFP1-F14



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





CERAMIC DUAL IN LINE PACKAGE



- 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 hermitically sealed with a ceramic lid using glass frit.
- His package is remitted by sealed with a ceramic its using glass mit.
 Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
 Falls within MIL-STD-1835 and GDIP1-T14.



CERAMIC DUAL IN LINE PACKAGE



D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AB.



D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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.



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