SDLS121 - DECEMBER 1983 - REVISED MARCH 1988

- Package Options Include Plastic and Ceramic DIPs and Ceramic Flat Packages
- Dependable Texas Instruments Quality and Reliability

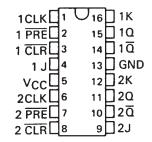
description

The '76 contains two independent J-K flip-flops with individual J-K, clock, preset, and clear inputs. The '76 is a positive-edge-triggered flip-flop. J-K input is loaded into the master while the clock is high and transferred to the slave on the high-to-low transition. For these devices the J and K inputs must be stable while the clock is high.

The 'LS76A contain two independent negativeedge-triggered flip-flops. The J and K inputs must be stable one setup time prior to the highto-low clock transition for predicatble operation. The preset and clear are asynchronous active low inputs. When low they override the clock and data inputs forcing the outputs to the steady state levels as shown in the function table.

The SN5476 and the SN54LS76A are characterized for operation over the full military temperature range of $-55\,^{\circ}\text{C}$ to $125\,^{\circ}\text{C}$. The SN7476 and the SN74LS76A are characterized for operation from $0\,^{\circ}\text{C}$ to $70\,^{\circ}\text{C}$.

SN5476, SN54LS76A . . . J PACKAGE SN7476 . . . N PACKAGE SN74LS76A . . . D OR N PACKAGE (TOP VIEW)



'76
FUNCTION TABLE

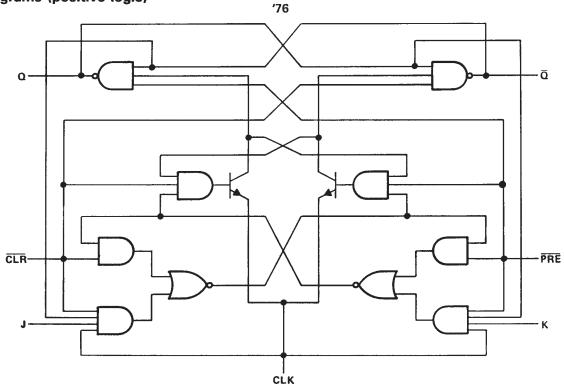
	IN	OUT	PUTS			
PRE	CLR	CLK	J	K	Q	ā
L	Н	X	Х	Х	Н	L
н	L	X	X	X	L.	н
L	L	X	X	X	н†	НŤ
н	Н	九	L	L	α ₀	$\overline{\alpha}_0$
н	Н	л	Н	L	н	L
н	Н	T	L	Н	L	Н
н	н	J.	Н	н	TOG	GLE

'LS76A FUNCTION TABLE

	IN	OUT				
PRE	CLR	CLK	J	K	Q	ā
L	Н	Х	Х	Х	Н	L
н	L	×	X	X	L	н
L	L	×	Х	Х	Н [†]	нt
н	н	1	L	L	α_0	$\overline{\alpha}_0$
Н	Н	1	Н	L	н	L
Н	н	1	L	Н	L	н
н	Н	1	Н	Н	TOG	GLE
Н	Н	Н	X	×	α_0	$\overline{\alpha}_0$

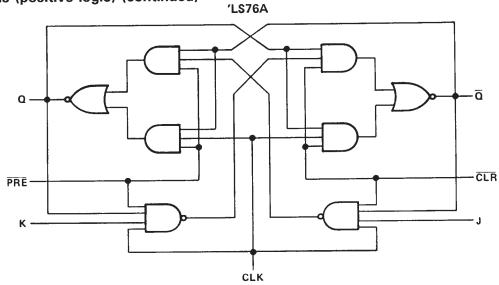
[†] This configuration is nonstable; that is, it will not persist when either preset or clear returns to its inactive (high) level.

logic diagrams (positive logic)

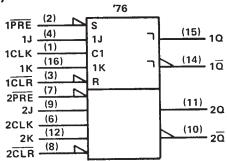


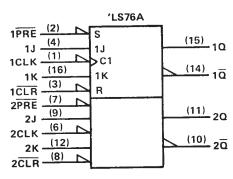






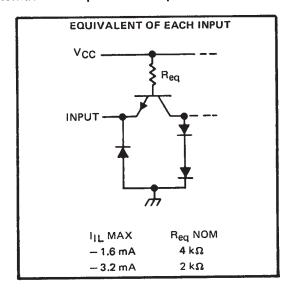
logic symbols†

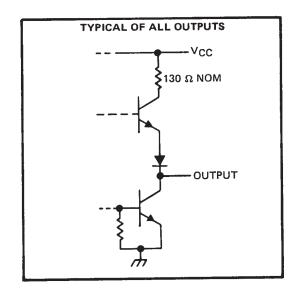




[†]These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

schematics of inputs and outputs





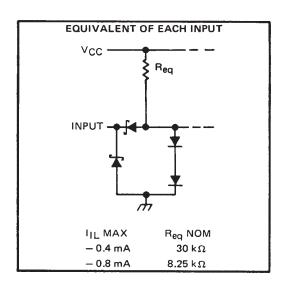


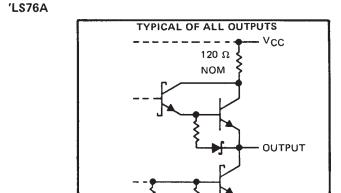
76

DUAL J-K FLIP-FLOPS WITH PRESET AND CLEAR

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schematics of inputs and outputs (continued)





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

Supply voltage, VCC (see Note 1)	7 V
Input voltage: '76	5.5 V
'LS76A	7 V
Operating free-air temperature range: SN54'	55°C to 125°C
SN74'	
Storage temperature range	65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.



recommended operating conditions

				SN5476	3		SN7476	3	
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Vcc	Supply voltage		4.5	5	5.5	4.75	5	5.25	V
VIH	High-level input voltage		2			2			V
VIL	Low-level input voltage				8.0			0.8	V
Іон	High-level output current				0.4			- 0.4	mA
loL	Low-level output current				16			16	mA
		CLK high	20			20			1
tw	Pulse duration	CLK low	47			47			ns
		PRE or CLR low	25			25			
t _{su}	Input setup time before CLK †		0			0			ns
th	Input hold time-data after CLK↓		0			0			ns
TA	Operating free-air temperature		- 55		125	0		70	°C

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

			aua†		SN5476			SN7476		UNIT
PARAMETER		TEST CONDITIONS [†]					MIN	TYP‡	MAX	UNIT
VIK	V _{CC} = MIN,	I _I = - 12 mA				- 1.5			– 1.5	٧
Voн	V _{CC} = MIN,	V _{IH} = 2 V,	V _{1L} = 0.8 V,	2.4	3.4		2.4	3.4		V
VOH	IOH = - 0.4 mA	4		2.4	5.4		2.4	<u> </u>		·
Va	V _{CC} = MIN,	V _{IH} = 2 V,	V _{IL} = 0.8 V,		0.2	0.4		0.2	0.4	V
VOL	IOL = 16 mA				0.2	0.4		0,2		
F ₁	V _{CC} = MAX,	V _I = 5.5 V				1			1	mA
J or K		V = 24V				40			40	μА
IH All other	V _{CC} = MAX,	V _I = 2.4 V		i		80			80	
JorK		V = 0.4.V				- 1.6			- 1.6	mA
All othe	VCC = MAX,	V _I = 0.4 V				- 3.2			- 3.2	
los§	V _{CC} = MAX			- 20		- 57	- 18		- 57	mA
ICC#	V _{CC} = MAX,	See Note 2			10	20	T	10	20	mA

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

NOTE 2: With all outputs open, ICC is measured with the Q and $\overline{\mathbf{Q}}$ outputs high in turn. At the time of measurement, the clock input is grounded.

switching characteristics, VCC = 5 V, TA = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
fmax				15	20		MHz
^t PLH	PRE or CLR	Q or Q			16	25	ns
tPHL.	PREGICEN	2012	$R_L = 400 \Omega$, $C_L = 15 pF$		25	40	ns
tPLH	CLK	Q or Q			16	25	ns
tPHL	CLK	Q or Q			25	40	ns

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



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

[§] Not more than one output should be shorted at a time.

[¶]Clear is tested with preset high and preset is tested with clear high.

[#]Average per flip-flop.

recommended operating conditions

-			S	N54LS7	6A	SI	N74LS7	6A	UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage		4.5	5	5.5	4.75	5	5.75	V
VIH	High-level input voltage		2			2			V
VIL	Low-level input voltage				0.7			0.8	
ЮН	High-level output current				- 0.4			0.4	mA
loL	Low-level output current				4			8	mA
fclock	Clock frequency		0		30	0		30	MHz
	D.I. dies	CLK high	20			20			ns
t _w	Pulse duration	PRE or CLR low	25			25			113
		data high or low	20			20			
t _{su}	Setup time before CLK↓	CLR inactive	20			20			ns
		PRE inactive	25			25			
th	Hold time-data after CLK↓		0			0			ns
TA	Operating free-air temperature		- 55		125	0		70	°C

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

				+	S	N54LS7	6A	S	N74LS7	6A	UNIT
	PARAMETER		TEST CONDITIONS [†]					MIN	TYP‡	MAX	UNIT
VIK		V _{CC} = MIN,	I ₁ = - 18 mA				– 1.5			- 1.5	V
Voн		V _{CC} = MIN, I _{OH} = - 0.4 mA	V _{IH} = 2 V,	VIL = MAX,	2.5	3.4		2.7	3.4		٧
.,		V _{CC} = MIN, I _{OL} = 4 mA	VIL = MAX,	V _{IH} = 2 V,		0.25	0.4		0.25	0.4	V
V _{OL}		V _{CC} = MIN,	VIL = MAX,	V _{IH} = 2 V,					0.35	0.5	V
	J or K						0.1			0.1	
I _E	CLR or PRE	V _{CC} = MAX,	V ₁ = 7 V				0.3	ļ		0.3	mA
-	CLK	7					0.4			0.4	
	J or K						20	<u> </u>		20	
ΉН	CLR or PRE	V _{CC} = MAX,	V ₁ = 2.7 V				60			60	μА
• • •	CLK						80			80	
	J or K						- 0.4			- 0.4	mA
HL	All other	V _{CC} = MAX,	V _I = 0.4 V				- 0.8			- 0.8	11114
los§		V _{CC} = MAX,	See Note 4		- 20	•	- 100	- 20		– 100	mA
	Total)	V _{CC} = MAX,	See Note 2			4	6		4	6	mA

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

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ}\text{C}$ (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
fmax				30	45		MHz
tPLH	555 015 014	0 0	$R_L = 2 k\Omega$, $C_L = 15 pF$		15	20	ns
tPHL	PRE, CLR or CLK	QorQ		<u> </u>	15	20	ns

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



[‡] 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: 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 input is

NOTE 4: For certain devices where state commutation can be caused by shorting an output to ground, an equivalent test may be performed with $V_0 = 2.25$ V and 2.125 V for the 54 family and the 74 family, respectively, with the minimum and maximum limits reduced to one half of their stated values.





31-May-2014

PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
5962-9557501QEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9557501QE A SNJ5476J	Samples
5962-9557501QFA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9557501QF A SNJ5476W	Samples
5962-9557501QFA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9557501QF A SNJ5476W	Samples
7601301EA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7601301EA SNJ54LS76AJ	Samples
7601301EA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7601301EA SNJ54LS76AJ	Samples
JM38510/00204BEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 00204BEA	Samples
JM38510/00204BEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 00204BEA	Samples
M38510/00204BEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 00204BEA	Samples
M38510/00204BEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 00204BEA	Samples
SN5476J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN5476J	Samples
SN5476J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN5476J	Samples
SN54LS76AJ	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54LS76AJ	Samples
SN54LS76AJ	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54LS76AJ	Samples
SN7476N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN7476N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN7476N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN7476N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74LS76AD	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	0 to 70		
SN74LS76AD	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	0 to 70		





www.ti.com 31-May-2014

Orderable Device	Status	Package Type	Package	Pins	Package	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
SN74LS76ADR	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	0 to 70		
SN74LS76ADR	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	0 to 70		
SN74LS76AN	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74LS76AN	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74LS76AN3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74LS76AN3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SNJ5476J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9557501QE A SNJ5476J	Samples
SNJ5476J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9557501QE A SNJ5476J	Samples
SNJ5476W	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9557501QF A SNJ5476W	Samples
SNJ5476W	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9557501QF A SNJ5476W	Samples
SNJ54LS76AJ	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7601301EA SNJ54LS76AJ	Samples
SNJ54LS76AJ	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7601301EA SNJ54LS76AJ	Samples
SNJ54LS76AW	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7601301FA SNJ54LS76AW	Samples
SNJ54LS76AW	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7601301FA SNJ54LS76AW	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.

TBD: The Pb-Free/Green conversion plan has not been defined.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

PACKAGE OPTION ADDENDUM



31-May-2014

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes. **Pb-Free** (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

- (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/Ball Finish Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF SN5476, SN54LS76A, SN7476, SN74LS76A:

Catalog: SN7476, SN74LS76A

Military: SN5476, SN54LS76A

NOTE: Qualified Version Definitions:

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

14 LEADS SHOWN



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package is hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
- E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F16)

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 GDFP2-F16



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.



D (R-PDS0-G16)

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 AC.



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