

# SN54LS673, SN54LS674, SN74LS673, SN74LS674 16-BIT SHIFT REGISTERS

SDLS195 – MARCH 1985 – REVISED MARCH 1988

## 'LS673

- 16-Bit Serial-In, Serial-Out Shift Register with 16-Bit Parallel-Out Storage Register
- Performs Serial-to-Parallel Conversion

## 'LS674

- 16-Bit Parallel-In, Serial-Out Shift Register
- Performs Parallel-to-Serial Conversion

## description

### SN54LS673, SN74LS673

The 'LS673 is a 16-bit shift register and a 16-bit storage register in a single 24-pin package. A three-state input/output (SER/Q15) port to the shift register allows serial entry and/or reading of data. The storage register is connected in a parallel data loop with the shift register and may be asynchronously cleared by taking the store-clear input low. The storage register may be parallel loaded with shift-register data to provide shift-register status via the parallel outputs. The shift register can be parallel loaded with the storage-register data upon command.

A high logic level at the chip-level ( $\overline{CS}$ ) input disables both the shift-register clock and the storage register clock and places SER/Q15 in the high-impedance state. The store-clear function is not disabled by the chip select.

Caution must be exercised to prevent false clocking of either the shift register or the storage register via the chip-select input. The shift clock should be low during the low-to-high transition of chip select and the store clock should be low during the high-to-low transition of chip select.

### SN54LS674, SN74LS674

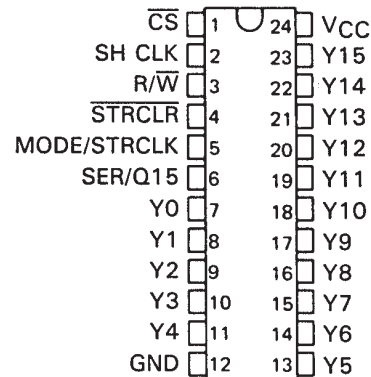
The 'LS674 is a 16-bit parallel-in, serial-out shift register. A three-state input/output (SER/Q15) port provides access for entering a serial data or reading the shift-register word in a recirculating loop.

The device has four basic modes of operation:

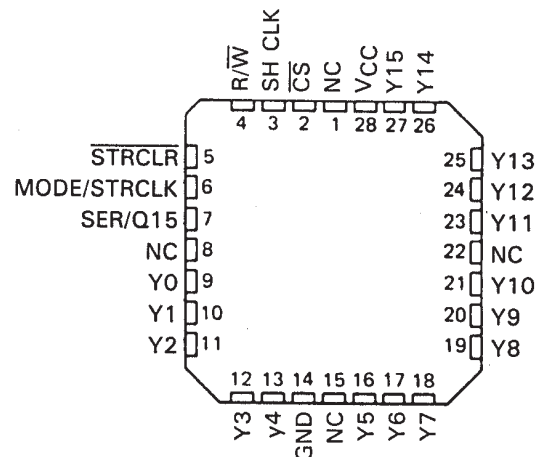
- 1) Hold (do nothing)
- 2) Write (serially via input/output)
- 3) Read (serially)
- 4) Load (parallel via data inputs)

Low-to-high-level changes at the chip select input should be made only when the clock input is low to prevent false clocking.

### SN54LS673 . . . J OR W PACKAGE SN74LS673 . . . DW OR N PACKAGE (TOP VIEW)



### SN54LS673 . . . FK PACKAGE (TOP VIEW)

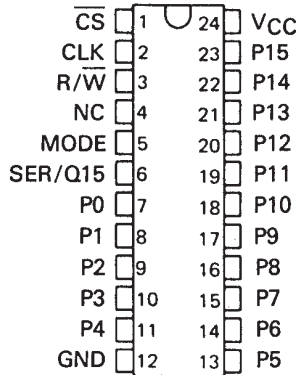


NC—No internal connection

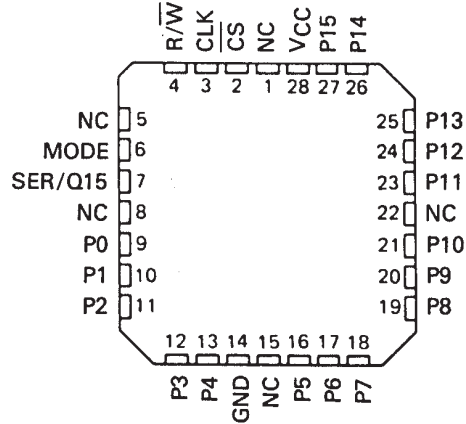
# SN54LS673, SN54LS674, SN74LS673, SN74LS674 16-BIT SHIFT REGISTERS

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SN54LS674 . . . J OR W PACKAGE  
SN74LS674 . . . DW OR N PACKAGE  
(TOP VIEW)



SN54LS674 . . . FK PACKAGE  
(TOP VIEW)



'LS673  
FUNCTION TABLE

INPUTS					SER/ Q15	SHIFT REGISTER FUNCTIONS				STORAGE REGISTER FUNCTIONS	
CS	R/W	SH CLK	STRCLR	MODE/ STRCLK		SHIFT	READ FROM SERIAL OUTPUT	WRITE INTO SERIAL INPUT	PARALLEL LOAD	CLEAR	LOAD
H	X	X	X	X	Z	NO	NO	NO	NO		NO
X	X	X	L	X						YES	
L	L	↓	X	X	Z	YES	NO	YES	NO		
L	H	X	X	X	Q15		YES	NO			NO
L	H	↓	X	L	Q14n	YES	YES	NO	NO		NO
L	H	↓	L	H	L	NO	YES		YES	YES	NO
L	H	↓	H	H	Y15n	NO	YES		YES	NO	NO
L	L	X	H	↑	Z		NO		NO	NO	YES

'LS674 FUNCTION TABLE

INPUTS				SER/ Q15	OPERATION
CS	R/W	MODE	CLK		
H	X	X	X	Z	Do nothing
L	L	X	↓	Z	Shift and write (serial load)
L	H	L	↓	Q14n	Shift and read
L	H	H	↓	P15	Parallel load

H = high level (steady state)  
L = low level (steady state)  
↑ = transition from low to high level  
↓ = transition from high to low level  
X = irrelevant (any input including transitions)  
Z = high impedance, input mode  
Q14n = content of 14th bit of the shift register before the most recent ↓ transition of the clock.  
Q15 = present content of 15th bit of the shift register  
Y15n = content of the 15th bit of the storage register before the most recent ↓ transition of the clock.  
P15 = level of input P15

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logic symbols†

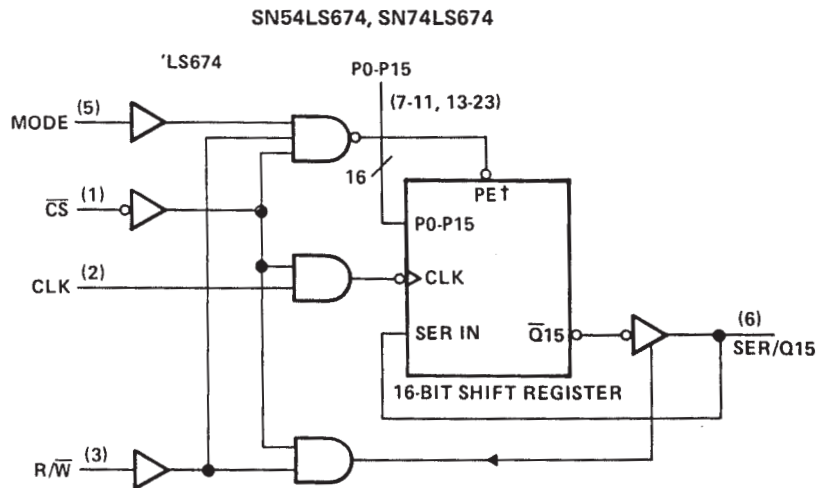
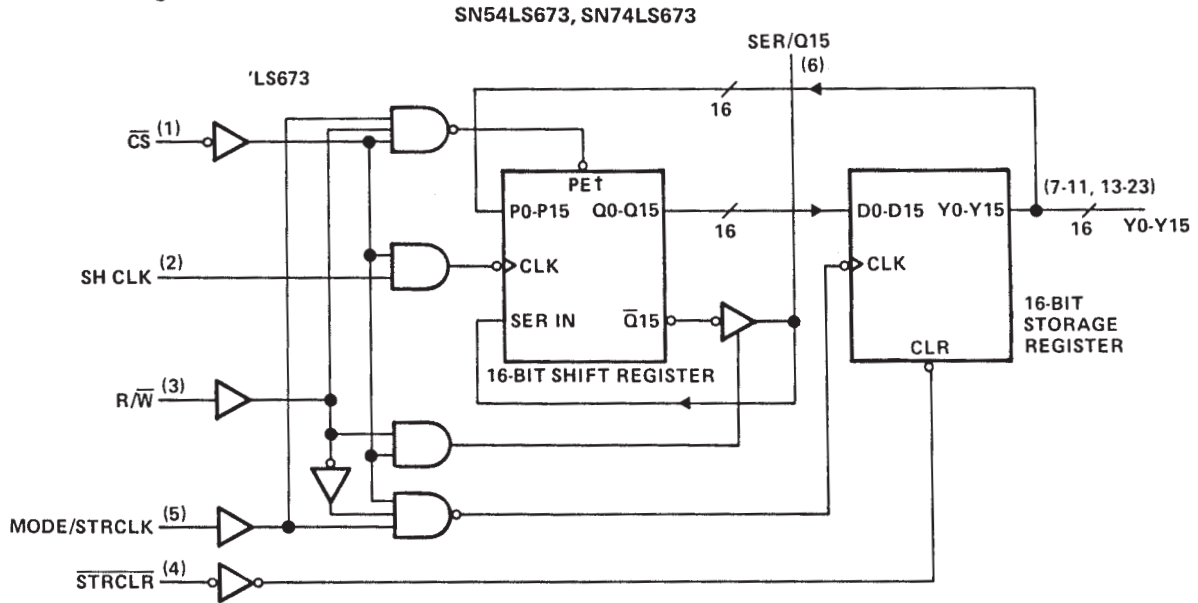


†These symbols are in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12. Pin numbers shown are for DW, J, N, and W packages.

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## functional block diagrams



†When PE is active, data is synchronously parallel loaded into the shift registers from the 16 P inputs and no shifting takes place. Pin numbers shown are for DW, J, N, and W packages.



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## 16-BIT SHIFT REGISTERS

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

PARAMETER		TEST CONDITIONS†	SN54LS'		SN74LS'		UNIT
			MIN	TYP‡	MAX	MIN	
V <sub>IH</sub>	High-level input voltage		2		2		V
V <sub>IL</sub>	Low-level input voltage			0.7		0.8	V
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA		-1.5		-1.5	V
V <sub>OH</sub>	High-level output voltage	SER/Q15	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,		2.4	3.1	V
		Y0 thru Y15¶	V <sub>IL</sub> = V <sub>ILmax</sub> , I <sub>OH</sub> = MAX		2.5	3.4	
V <sub>OL</sub>	Low-level output voltage	SER/Q15	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,	I <sub>OL</sub> = 12 mA	0.25	0.4	V
				I <sub>OL</sub> = 24 mA		0.35	
		Y0 thru Y15¶	V <sub>IL</sub> = V <sub>ILmax</sub>	I <sub>OL</sub> = 4 mA	0.25	0.4	
				I <sub>OL</sub> = 8 mA		0.35	
I <sub>OZH</sub>	Off-state output current, high-level voltage applied	SER/Q15	V <sub>CC</sub> = MAX, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>ILmax</sub> , V <sub>O</sub> = 2.7 V	40		40	μA
I <sub>OZL</sub>	Off-state output current, low-level voltage applied	SER/Q15	V <sub>CC</sub> = MAX, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>ILmax</sub> , V <sub>O</sub> = 0.4 V	-0.4		-0.4	mA
I <sub>I</sub>	Input current at maximum input voltage	SER/Q15	V <sub>CC</sub> = MAX	V <sub>I</sub> = 5.5 V	0.1	0.1	mA
		Others		V <sub>I</sub> = 7 V	0.1	0.1	
I <sub>IH</sub>	High-level input current	SER/Q15	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V		40	40	μA
		Others			20	20	
I <sub>IL</sub>	Low-level input current		V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V		-0.4	-0.4	mA
I <sub>OS</sub>	Short-circuit output current§	SER/Q15	V <sub>CC</sub> = MAX		-30	-130	mA
		Y0 thru Y15¶			-20	-100	
I <sub>CC</sub>	Supply current	'LS673	V <sub>CC</sub> = MAX		50	80	mA
		'LS674			25	40	

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

‡ All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

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

¶ 'LS673 only.

switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C, see note 2

PARAMETER	'LS673		'LS674		TEST CONDITIONS	MIN	TYP	MAX	UNIT
	FROM	TO	FROM	TO					
f <sub>max</sub>	SH CLK	SER/Q15	CLK	SER/Q15	R <sub>L</sub> = 667 Ω, C <sub>L</sub> = 45 pF	20	28		MHz
t <sub>PHL</sub>	STRCLR	Y0 thru Y15					25	40	ns
t <sub>PLH</sub>	MODE/ STRCLK	Y0 thru Y15			R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 15 pF		28	45	
t <sub>PHL</sub>							30	45	ns
t <sub>PLH</sub>	SH CLK	SER/Q15	CLK	SER/Q15	R <sub>L</sub> = 667 Ω, C <sub>L</sub> = 45 pF		21	33	
t <sub>PHL</sub>							26	40	ns
t <sub>PZH</sub>	CS, R/W	SER/Q15	CS, R/W	SER/Q15	R <sub>L</sub> = 667 Ω, C <sub>L</sub> = 45 pF		30	45	
t <sub>PZL</sub>							30	45	ns
t <sub>PHZ</sub>	CS, R/W	SER/Q15	CS, R/W	SER/Q15	R <sub>L</sub> = 667 Ω, C <sub>L</sub> = 5 pF		25	40	
t <sub>PLZ</sub>							25	40	ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.



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