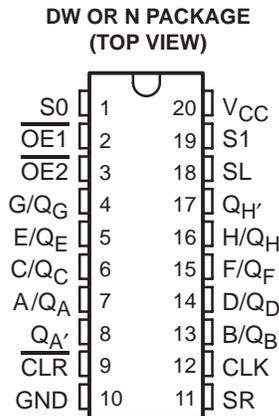


# SN74F323

## 8-BIT UNIVERSAL SHIFT-STORAGE REGISTER WITH SYNCHRONOUS CLEAR AND 3-STATE OUTPUTS

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- **Four Modes of Operation:**
  - Hold (Store)
  - Shift Right
  - Shift Left
  - Load Data
- **Operates With Outputs Enabled or at High Impedance**
- **3-State Outputs Drive Bus Lines Directly**
- **Can Be Cascaded for N-Bit Word Lengths**
- **Synchronous Clear**
- **Applications:**
  - Stacked or Push-Down Registers
  - Buffer Storage
  - Accumulator Registers
- **Package Options Include Plastic Small-Outline Packages and Standard Plastic 300-mil DIPs**



### description

This 8-bit universal register features multiplexed I/O ports to achieve full 8-bit data handling in a single 20-pin package. Two function-select (S0, S1) and two output-enable ( $\overline{OE1}$ ,  $\overline{OE2}$ ) inputs can be used to choose the modes of operation listed in the function table.

Synchronous parallel loading is accomplished by taking both S0 and S1 high. This places the 3-state outputs in a high-impedance state and permits data that is applied on the I/O ports to be clocked into the register. Reading out of the register can be accomplished while the outputs are enabled in any mode. Clearing occurs synchronously when the clear (CLR) input is low. Taking either  $\overline{OE1}$  or  $\overline{OE2}$  high disables the outputs but this has no effect on clearing, shifting, or storage of data.

The SN74F323 is characterized for operation from 0°C to 70°C.

**FUNCTION TABLE**

MODE	INPUTS						I/O PORTS								OUTPUTS			
	$\overline{CLR}$	S1	S0	$\overline{OE1}^\dagger$	$\overline{OE2}^\dagger$	CLK	SL	SR	A/QA	B/QB	C/QC	D/QD	E/QE	F/QF	G/QG	H/QH	QA'	QH'
Clear	L	X	L	L	L	↑	X	X	L	L	L	L	L	L	L	L	L	L
	L	L	X	L	L	↑	X	X	L	L	L	L	L	L	L	L	L	L
	L	H	H	X	X	↑	X	X	X	X	X	X	X	X	X	X	L	L
Hold	H	L	L	L	L	X	X	X	QA0	QB0	QC0	QD0	QE0	QF0	QG0	QH0	QA0	QH0
	H	X	X	L	L	L	X	X	QA0	QB0	QC0	QD0	QE0	QF0	QG0	QH0	QA0	QH0
Shift Right	H	L	H	L	L	↑	X	H	H	QA <sub>n</sub>	QB <sub>n</sub>	QC <sub>n</sub>	QD <sub>n</sub>	QE <sub>n</sub>	QF <sub>n</sub>	QG <sub>n</sub>	H	QH <sub>n</sub>
	H	L	H	L	L	↑	X	L	L	QA <sub>n</sub>	QB <sub>n</sub>	QC <sub>n</sub>	QD <sub>n</sub>	QE <sub>n</sub>	QF <sub>n</sub>	QG <sub>n</sub>	L	QH <sub>n</sub>
Shift Left	H	H	L	L	L	↑	H	X	QB <sub>n</sub>	QC <sub>n</sub>	QD <sub>n</sub>	QE <sub>n</sub>	QF <sub>n</sub>	QG <sub>n</sub>	QH <sub>n</sub>	H	QB <sub>n</sub>	H
	H	H	L	L	L	↑	L	X	QB <sub>n</sub>	QC <sub>n</sub>	QD <sub>n</sub>	QE <sub>n</sub>	QF <sub>n</sub>	QG <sub>n</sub>	QH <sub>n</sub>	L	QB <sub>n</sub>	L
Load	H	H	H	X	X	↑	X	X	a	b	c	d	e	f	g	h	a	h

NOTE: a . . . h = the level of the steady-state input at inputs A through H, respectively. These data inputs are loaded into the flip-flops while the flip-flop outputs are isolated from the I/O terminals.

† When one or both output-enable inputs are high the eight I/O terminals are disabled to the high-impedance state; however, sequential operation or clearing of the register is not affected.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

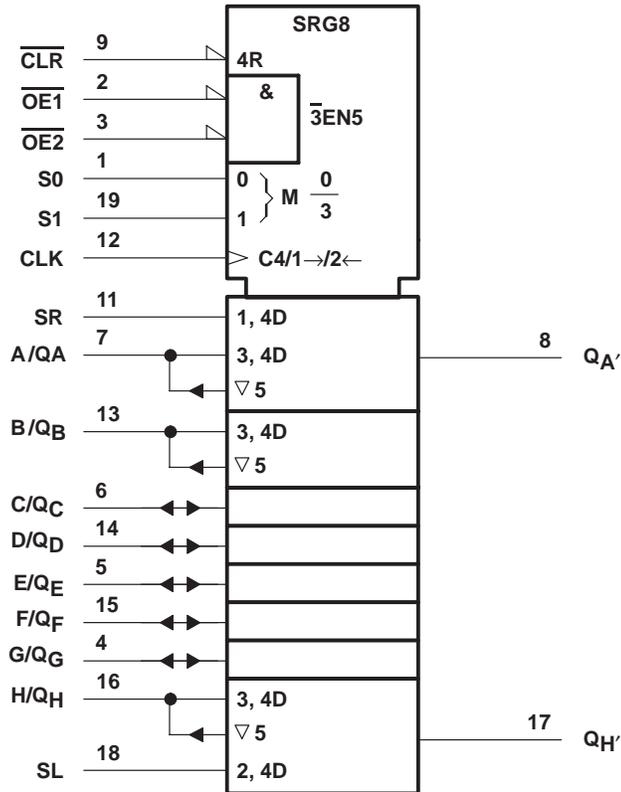


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**SN74F323**  
**8-BIT UNIVERSAL SHIFT-STORAGE REGISTER**  
**WITH SYNCHRONOUS CLEAR AND 3-STATE OUTPUTS**

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logic symbol†



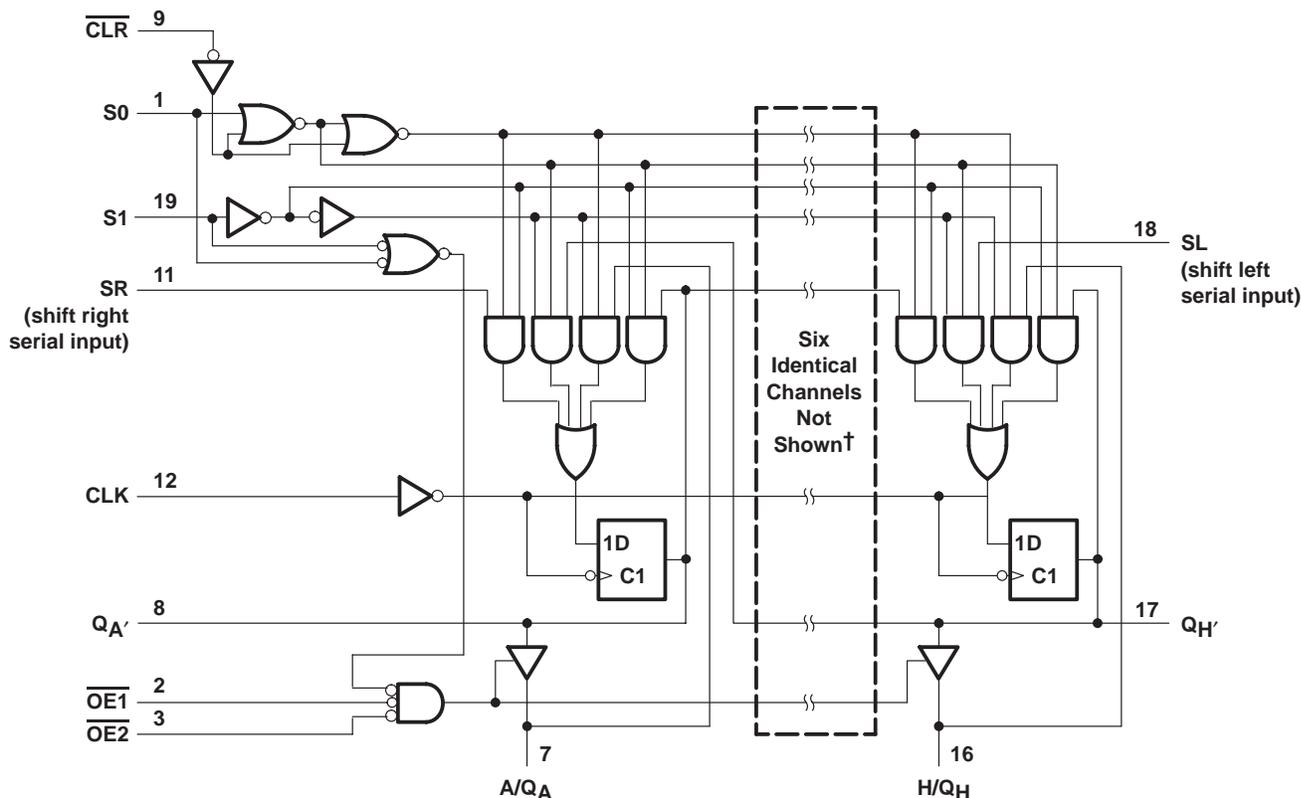
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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## 8-BIT UNIVERSAL SHIFT-STORAGE REGISTER WITH SYNCHRONOUS CLEAR AND 3-STATE OUTPUTS

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### logic diagram (positive logic)



† I/O ports not shown: B/Q<sub>B</sub> (13), C/Q<sub>C</sub> (6), D/Q<sub>D</sub> (14), E/Q<sub>E</sub> (5), F/Q<sub>F</sub> (15), and G/Q<sub>G</sub> (4).

### 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 disabled or power-off state .....	-0.5 V to 5.5 V
Voltage range applied to any output in the high state .....	-0.5 V to $V_{CC}$
Current into any output in the low state: $Q_A'$ or $Q_H'$ .....	40 mA
$Q_A$ thru $Q_H$ .....	48 mA
Operating free-air temperature range .....	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.



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## 8-BIT UNIVERSAL SHIFT-STORAGE REGISTER WITH SYNCHRONOUS CLEAR AND 3-STATE OUTPUTS

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### recommended operating conditions

		MIN	NOM	MAX	UNIT
$V_{CC}$	Supply voltage	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			V
$V_{IL}$	Low-level input voltage			0.8	V
$I_{IK}$	Input clamp current			-18	mA
$I_{OH}$	High-level output current	$Q_A'$ or $Q_H'$		-1	mA
		$Q_A$ thru $Q_H$		-3	
$I_{OL}$	Low-level output current	$Q_A'$ or $Q_H'$		20	mA
		$Q_A$ thru $Q_H$		24	
$T_A$	Operating free-air temperature	0		70	°C

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
$V_{IK}$		$V_{CC} = 4.5\text{ V}$ ,	$I_I = -18\text{ mA}$			-1.2	V
$V_{OH}$	$Q_A'$ or $Q_H'$	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -1\text{ mA}$	2.5	3.4		V
	$Q_A$ thru $Q_H$		$I_{OH} = -1\text{ mA}$	2.5	3.4		
			$I_{OH} = -3\text{ mA}$	2.4	3.3		
	Any output	$V_{CC} = 4.75\text{ V}$ ,	$I_{OH} = -1\text{ mA to } -3\text{ mA}$	2.7			
$V_{OL}$	$Q_A'$ or $Q_H'$	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 20\text{ mA}$		0.3	0.5	V
	$Q_A$ thru $Q_H$		$I_{OL} = 24\text{ mA}$		0.35	0.5	
$I_I$	A thru H	$V_{CC} = 5.5\text{ V}$	$V_I = 5.5\text{ V}$			1	mA
	Any other		$V_I = 7\text{ V}$			0.1	
$I_{IH}‡$	A thru H	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$			70	µA
	Any other					20	
$I_{IL}‡$	A thru H	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.5\text{ V}$			-0.65	mA
	S0 or S1					-1.2	
	Any other					-0.6	
$I_{OS}§$		$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0$	-60		-150	mA
$I_{CC}$		$V_{CC} = 5.5\text{ V}$ ,	See Note 2		68	95	mA

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

‡ For I/O ports ( $Q_A$  thru  $Q_H$ ), the parameters  $I_{IH}$  and  $I_{IL}$  include the off-state output current.

§ 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  $\overline{OE1}$ ,  $\overline{OE2}$ , and CLK at 4.5 V.

# SN74F323

## 8-BIT UNIVERSAL SHIFT-STORAGE REGISTER WITH SYNCHRONOUS CLEAR AND 3-STATE OUTPUTS

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

			V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C		MIN	MAX	UNIT
			MIN	MAX			
f <sub>clock</sub>	Clock frequency		0	70	0	70	MHz
t <sub>w</sub>	Pulse duration	CLK high or low	7		7		ns
t <sub>su</sub>	Setup time before CLK↑	S0 or S1	High or low	8.5	8.5		ns
		A/Q <sub>A</sub> thru H/Q <sub>H</sub> , SR, or SL	High or low	5	5		
		CLR	High or low	10	10		
t <sub>h</sub>	Hold time after CLK↑	S0 or S1	High or low	0	0		ns
		A/Q <sub>A</sub> thru H/Q <sub>H</sub> , SR, or SL	High or low	2	2		
		CLR	High or low	0	0		

### switching characteristics (see Note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = 25°C			V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX†		UNIT
			MIN	TYP	MAX	MIN	MAX	
f <sub>max</sub>			70	100		70		MHz
t <sub>PLH</sub>	CLK	Q <sub>A'</sub> or Q <sub>H'</sub>	3.2	6.6	9	3.2	10	ns
t <sub>PHL</sub>			2.7	6.1	8.5	2.7	9.5	
t <sub>PLH</sub>	CLK	Q <sub>A</sub> thru Q <sub>H</sub>	3.2	6.6	9	3.2	10	ns
t <sub>PHL</sub>			4.2	8.1	11	4.2	12	
t <sub>PZH</sub>	$\overline{OE1}$ or $\overline{OE2}$	Q <sub>A</sub> thru Q <sub>H</sub>	2.7	5.6	8	2.7	9	ns
t <sub>PZL</sub>			3.2	6.6	10	3.2	11	
t <sub>PHZ</sub>	$\overline{OE1}$ or $\overline{OE2}$	Q <sub>A</sub> thru Q <sub>H</sub>	1.7	4.1	6	1.7	7	ns
t <sub>PLZ</sub>			1.2	3.6	5.5	1.2	6.5	

† 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 Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
SN74F323DW	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI
SN74F323DWR	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI
SN74F323N	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI

<sup>(1)</sup> 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.

<sup>(2)</sup> 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.

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

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**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)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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