



# SN54AS194, SN74AS194 4-BIT BIDIRECTIONAL UNIVERSAL SHIFT REGISTERS

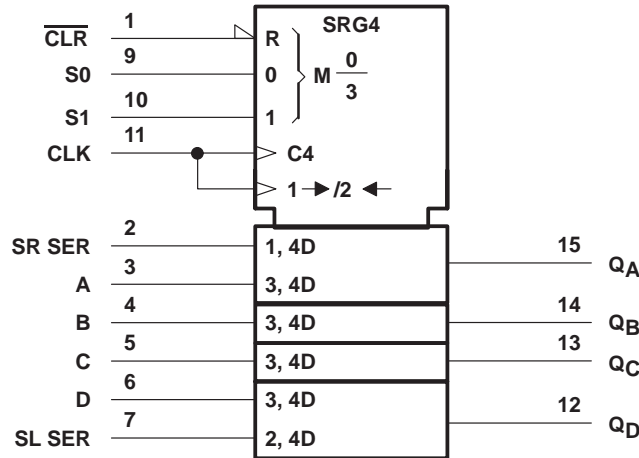
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FUNCTION TABLE

$\overline{\text{CLR}}$	MODE		CLK	INPUTS				OUTPUTS					
	S1	S0		SERIAL		PARALLEL				QA	QB	QC	QD
				LEFT	RIGHT	A	B	C	D				
L	X	X	X	X	X	X	X	X	X	L	L	L	L
H	X	X	L	X	X	X	X	X	X	QA0	QB0	QC0	QD0
H	H	H	↑	X	X	a	b	c	d	a	b	c	d
H	L	H	↑	X	H	X	X	X	X	H	QAn	QBn	QCn
H	L	H	↑	X	L	X	X	X	X	L	QAn	QBn	QCn
H	H	L	↑	H	X	X	X	X	X	QBn	QCn	QDn	H
H	H	L	↑	L	X	X	X	X	X	QBn	QCn	QDn	L
H	L	L	X	X	X	X	X	X	X	QA0	QB0	QC0	QD0

H = high level (steady state); L = low level (steady state); X = irrelevant (any input, including transitions); ↑ = transition from low to high level; a, b, c, d = the level of steady-state input at inputs A, B, C, or D, respectively; QA0, QB0, QC0, QD0 = the level of QA, QB, QC, or QD, respectively, before the indicated steady-state input conditions were established; QAn, QBn, QCn, QDn = the level of QA, QB, QC, respectively, before the most recent ↑ transition of the clock.

## logic symbol†

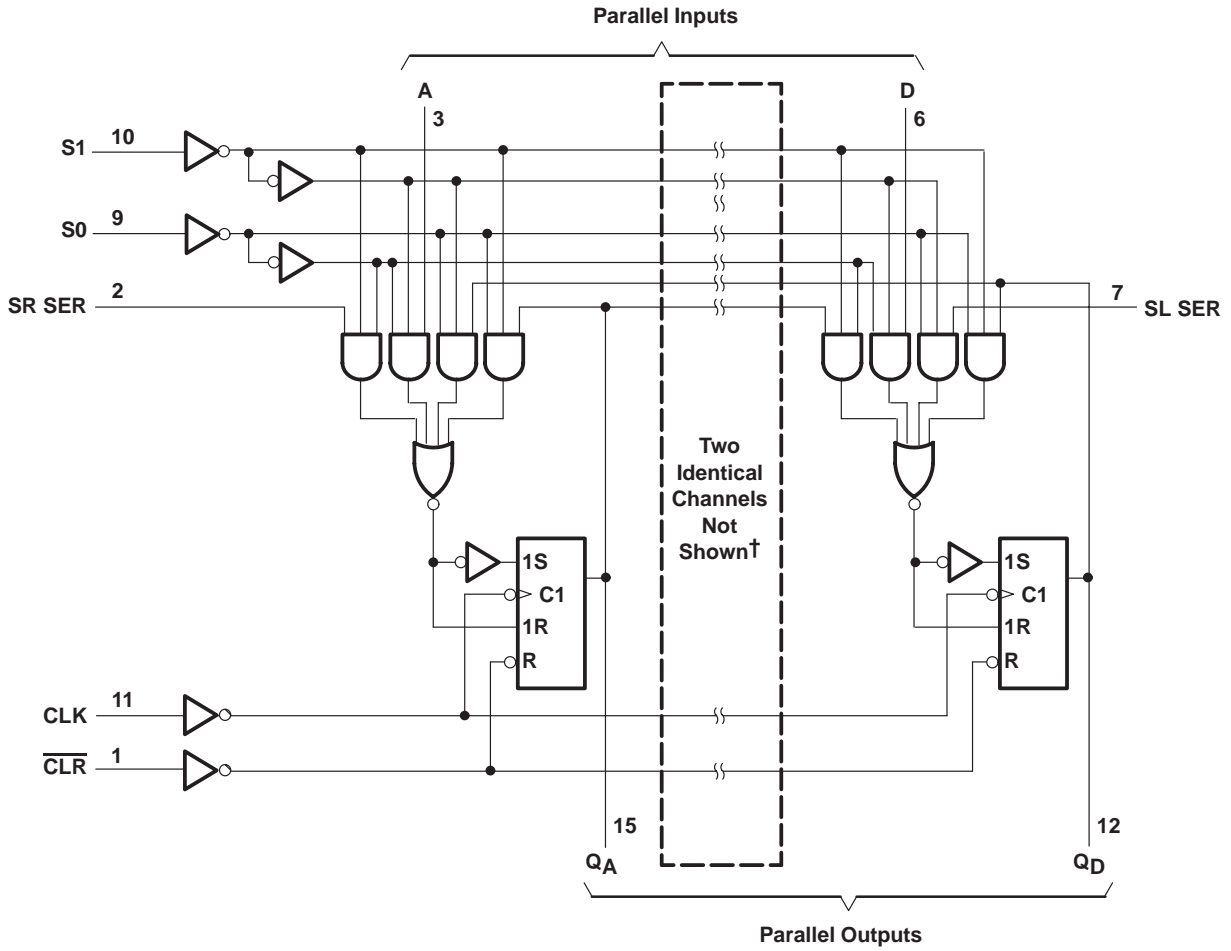


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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## logic diagram (positive logic)



† I/O ports not shown:  $Q_B$  (14) and  $Q_C$  (13)  
Pin numbers shown are for the D, J, and N packages.

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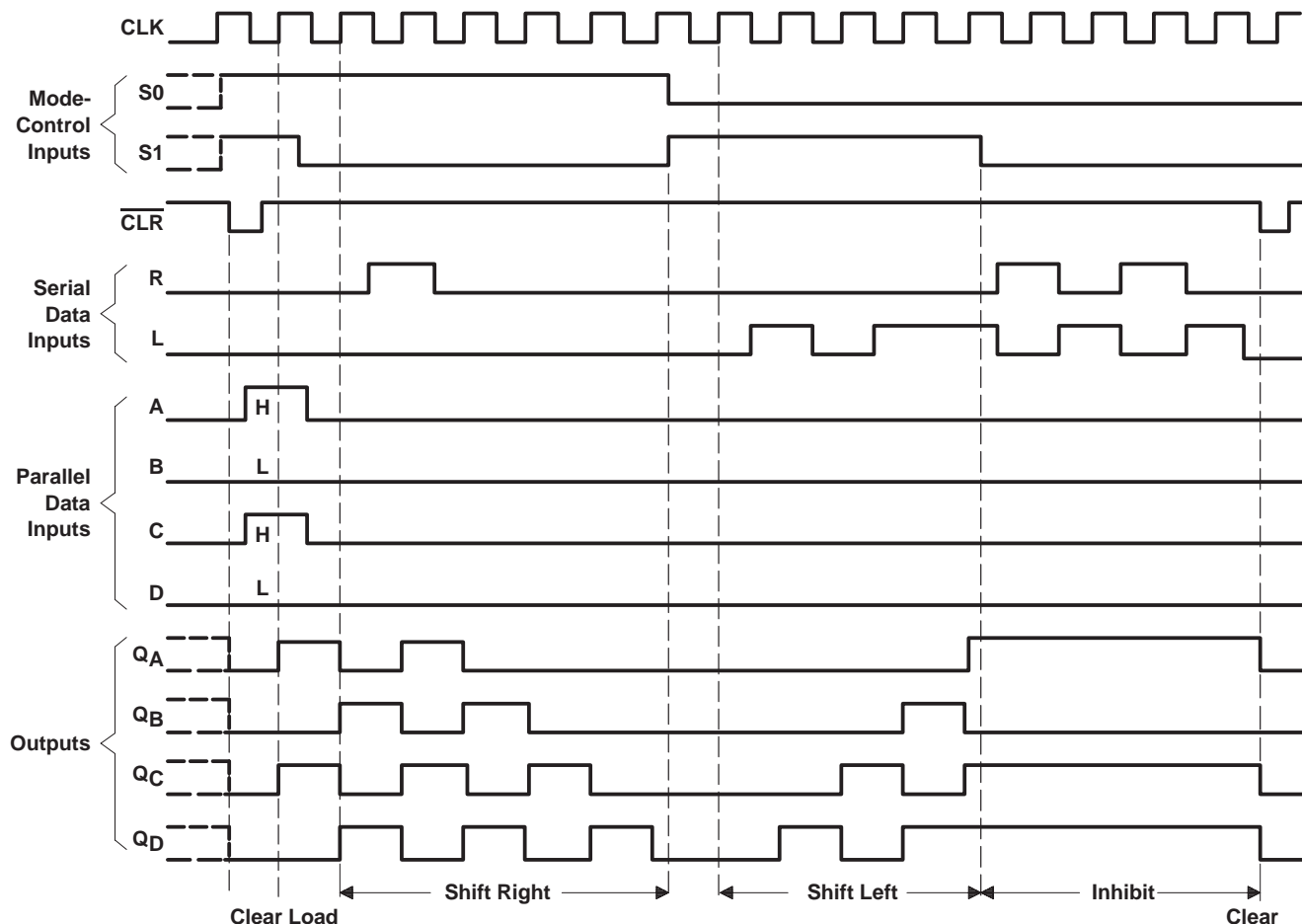


Figure 1. Typical Clear, Load, Right-Shift, and Clear Sequences

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

Supply voltage, $V_{CC}$	7 V
Input voltage, $V_I$	7 V
Operating free-air temperature range, $T_A$ : SN54AS194	-55°C to 125°C
SN74AS194	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.

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## recommended operating conditions

		SN54AS194			SN74AS194			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
$I_{OH}$	High-level output current			-2			-2	mA
$I_{OL}$	Low-level output current			20			20	mA
$f_{clock}^*$	Clock frequency	0		75	0		80	MHz
$t_w^*$	Pulse duration	$\overline{CLR}$		4		4.5		ns
		CLK high		4		4		
		CLK low		6		7		
$t_{su}^*$	Setup time before CLK $\uparrow$	Select		9		9.5		ns
		Data		3.5		4		
		Clear inactive state		6		6		
$t_h^*$	Hold time, data after CLK $\uparrow$			0.5		0.5		ns
$T_A$	Operating free-air temperature	-55		125	0		70	°C

\* On products compliant to MIL-STD-883, Class B, these parameters are based on characterization data, but are not production tested.

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

PARAMETER		TEST CONDITIONS		SN54AS194			SN74AS194			UNIT
				MIN	TYP $\dagger$	MAX	MIN	TYP $\dagger$	MAX	
$V_{IK}$		$V_{CC} = 4.5\text{ V}$ ,	$I_I = -18\text{ mA}$			-1.2			-1.2	V
$V_{OH}$		$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ ,	$I_{OH} = -2\text{ mA}$	$V_{CC}-2$			$V_{CC}-2$			V
$V_{OL}$		$V_{CC} = 4.5\text{ V}$ ,	$I_{OL} = 20\text{ mA}$		0.35	0.5		0.35	0.5	V
$I_I$	Data, CLK, $\overline{CLR}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 7\text{ V}$			0.1		0.1		mA
	Mode, SL, SR					0.2		0.2		
$I_{IH}$	Data, CLK, $\overline{CLR}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$			20		20		$\mu\text{A}$
	Mode, SL, SR					40		40		
$I_{IL}$	Data, CLK, $\overline{CLR}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.4\text{ V}$			-0.5		-0.5		mA
	Mode, SL, SR					-1		-1		
$I_{O\ddagger}$		$V_{CC} = 5.5\text{ V}$ ,	$V_O = 2.25\text{ V}$	-30		-112	-30		-112	mA
$I_{CC}$		$V_{CC} = 5.5\text{ V}$	Outputs high		30	49		30	43	mA
			Outputs low		38	60		38	53	

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

$\ddagger$  The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

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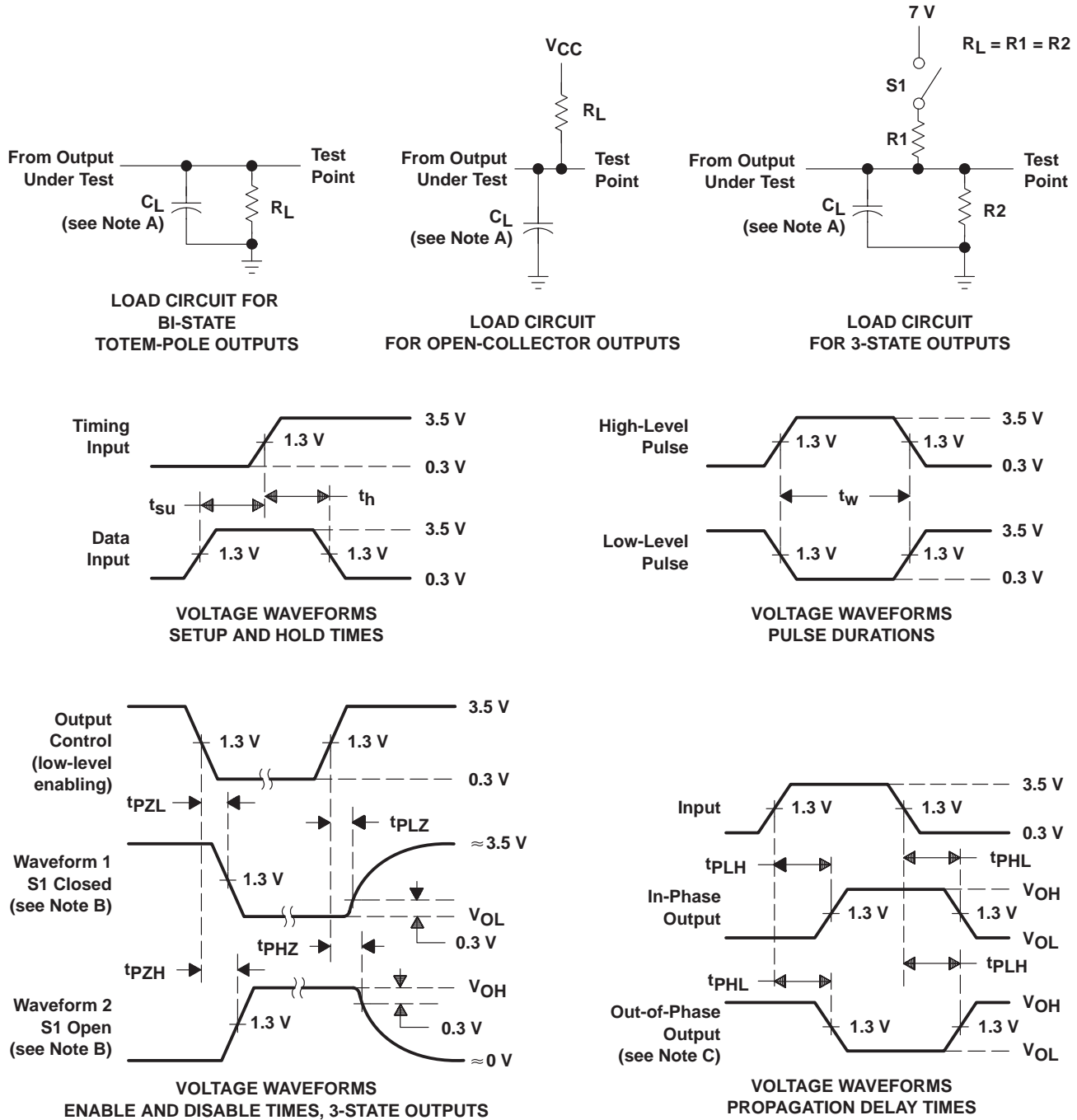
### switching characteristics (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	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
			SN54AS194		SN74AS194		
			MIN	MAX	MIN	MAX	
f <sub>max</sub> *			75		80		MHz
t <sub>PLH</sub>	CLK	Any Q	2.5	8	3	7	ns
t <sub>PHL</sub>			2.5	8	3	7	
t <sub>PHL</sub>	$\overline{\text{CLR}}$	Any Q	3.5	13	4	12	ns

\* On products compliant to MIL-STD-883, Class B, these parameters are based on characterization data, but are not production tested.

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

PARAMETER MEASUREMENT INFORMATION  
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
 C. When measuring propagation delay items of 3-state outputs, switch S1 is open.  
 D. All input pulses have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.  
 E. The outputs are measured one at a time with one transition per measurement.

Figure 2. Load Circuits and Voltage Waveforms

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