National Semiconductor

5495A/DM7495
4-Bit Parallel Access Shift Registers

General Description

These 4-bit registers feature parallel and serial inputs, parallel outputs, mode control, and two clock inputs. The registers have three modes of operation.

Parallel (broadside) load
Shift right (the direction Q_A toward Q_D)
Shift left (the direction Q_D toward Q_A)

Parallel loading is accomplished by applying the four bits of data and taking the mode control input high. The data is loaded into the associated flip-flops and appears at the outputs after the high-to-low transition of the clock-2 input. During loading, the entry of serial data is inhibited.

Shift right is accomplished on the high-to-low transition of clock 1 when the mode control is low; shift left is accomplished on the high-to-low transition of clock 2 when the mode control is high by connecting the output of each flip-flop to the parallel input of the previous flip-flop (Q_D to input C, etc.) and serial data is entered at input D. The clock input may be applied simultaneously to clock 1 and clock 2 if both modes can be clocked from the same source.

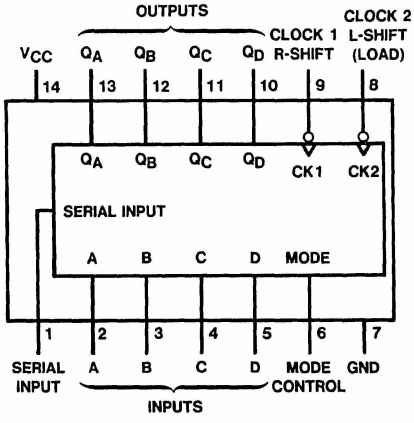
Changes at the mode control input should normally be made while both clock inputs are low; however, conditions described in the last three lines of the truth table will also ensure that register contents are protected.

Features

- Typical maximum clock frequency 36 MHz
- Typical power dissipation 250 mW

Connection Diagram

Dual-In-Line Package



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Order Number 5495ADMQB, 5495AFMQB or DM7495N
See NS Package Number J14A, N14A or W14B

Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range	
54A	−55°C to +125°C
DM74	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

Recommended Operating Conditions

Symbol	Parameter		5495A			DM7495			Units
			Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage		4.5	5	5.5	4.75	5	5.25	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				−0.8			−0.8	mA
I_{OL}	Low Level Output Current				16			16	mA
f_{CLK}	Clock Frequency (Note 4)		0		25	0		25	MHz
t_W	Clock Pulse Width (Note 4)		15	11		15			ns
t_{SU}	Data Setup Time (Note 4)		20	10		20	10		ns
t_{EN}	Time to Enable Clock (Note 4)	Clock 1	20			20			ns
		Clock 2	15			15			
t_H	Data Hold Time (Note 4)		0	−10		0	−10		ns
t_{IN}	Time to Inhibit Clock 1 or Clock 2 (Note 4)		10			10			ns
T_A	Free Air Operating Temperature		−55		125	0		70	°C

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −12 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max V_{IL} = Max, V_{IH} = Min		2.4	3.4		V
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max V_{IH} = Min, V_{IL} = Max			0.2	0.4	V
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 5.5V				1	mA
I_{IH}	High Level Input Current	V_{CC} = Max V_I = 2.4V	Mode			80	μA
			Others			40	
I_{IL}	Low Level Input Current	V_{CC} = Max V_I = 0.4V	Mode			−3.2	mA
			Others			−1.6	
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 2)	DM54	−18		−57	mA
			DM74	−18		−57	
I_{CC}	Supply Current	V_{CC} = Max (Note 3)			50	75	mA

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time.

Note 3: I_{CC} is measured with all outputs and serial input open; A, B, C, and D inputs grounded: Mode Control at 4.5V: and a momentary 3V, then ground, applied to both clock inputs.

Note 4: T_A = 25°C and V_{CC} = 5V.

Switching Characteristics at V_{CC} = 5V and T_A = 25°C (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	From (Input) To (Output)	R_L = 400Ω, C_L = 15 pF		Units
			Min	Max	
f_{MAX}	Maximum Clock Frequency		25		MHz
t_{PHL}	Propagation Delay Time High to Low Level Output	Clock to Output		35	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Clock to Output		35	ns

Function Table

Inputs								Outputs			
Mode Control	Clocks		Serial	Parallel				Q_A	Q_B	Q_C	Q_D
	2(L)	1(R)		A	B	C	D				
H	H	X	X	X	X	X	X	Q_{A0}	Q_{B0}	Q_{C0}	Q_{D0}
H	↓	X	X	a	b	c	d	a	b	c	d
H	↓	X	X	Q_{B}†	Q_{C}†	Q_{D}†	d	Q_{Bn}	Q_{Cn}	Q_{Dn}	d
L	L	H	X	X	X	X	X	Q_{A0}	Q_{B0}	Q_{C0}	Q_{D0}
L	X	↓	H	X	X	X	X	H	Q_{An}	Q_{Bn}	Q_{Cn}
L	X	↓	L	X	X	X	X	L	Q_{An}	Q_{Bn}	Q_{Cn}
↑	L	L	X	X	X	X	X	Q_{A0}	Q_{B0}	Q_{C0}	Q_{D0}
↓	L	L	X	X	X	X	X	Q_{A0}	Q_{B0}	Q_{C0}	Q_{D0}
↓	L	H	X	X	X	X	X	Q_{A0}	Q_{B0}	Q_{C0}	Q_{D0}
↑	H	L	X	X	X	X	X	Q_{A0}	Q_{B0}	Q_{C0}	Q_{D0}
↑	H	H	X	X	X	X	X	Q_{A0}	Q_{B0}	Q_{C0}	Q_{D0}

†Shifting left requires external connection of Q_B to A, Q_C to B, Q_D to C. Serial data is entered at input D.

H = High Level (Steady State), L = Low Level (Steady State), X = Don't Care (Any input, including transitions)

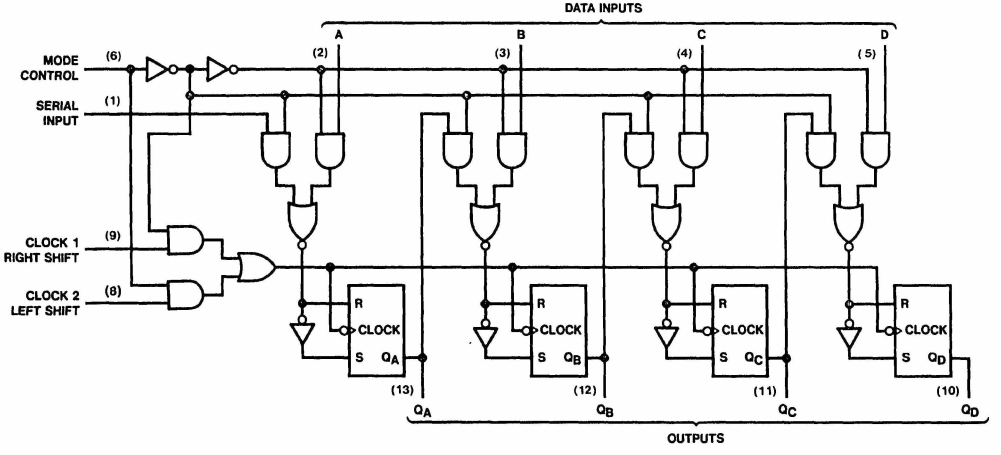
↓ = Transition from high to low level, ↑ = Transition from low to high level

a, b, c, d = The level of steady, state input at inputs A, B, C, or D, respectively.

Q_{A0}, Q_{B0}, Q_{C0}, Q_{D0} = The level of Q_A, Q_B, Q_C, Q_D, respectively, before the indicated steady state input conditions were established.

Q_{An}, Q_{Bn}, Q_{Cn}, Q_{Dn} = The level of Q_A, Q_B, Q_C, Q_D, respectively, before the most recent ↓ transition of the clock.

Logic Diagram



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