FAIRCHILD SEMICONDUCTOR™

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DM74LS164
8-Bit Serial In/Parallel Out Shift Register

General Description

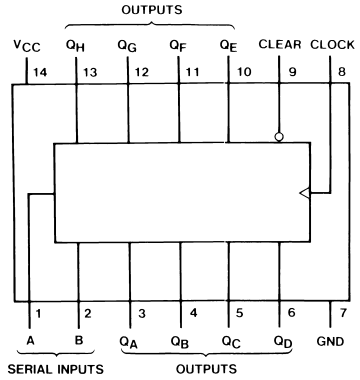
These 8-bit shift registers feature gated serial inputs and an asynchronous clear. A low logic level at either input inhibits entry of the new data, and resets the first flip-flop to the low level at the next clock pulse, thus providing complete control over incoming data. A high logic level on either input enables the other input, which will then determine the state of the first flip-flop. Data at the serial inputs may be changed while the clock is high or low, but only information meeting the setup and hold time requirements will be entered. Clocking occurs on the low-to-high level transition of the clock input. All inputs are diode-clamped to minimize transmission-line effects.

Features

- Gated (enable/disable) serial inputs
- Fully buffered clock and serial inputs
- Asynchronous clear
- Typical clock frequency 36 MHz
- Typical power dissipation 80 mW

Connection Diagram

Dual-In-Line Package



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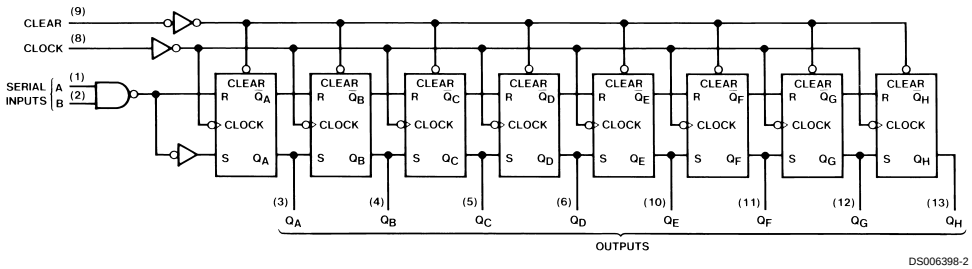
Order Number 54LS164DMQB, 54LS164FMQB, 54LS164LMQB, DM54LS164J, DM54LS164W, DM74LS164M or DM74LS164N
See Package Number E20A, J14A, M14A, N14A or W14B

Function Table

Inputs				Outputs			
Clear	**Clock**	**A**	**B**	Q_A	Q_B	...	Q_H
L	X	X	X	L	L	...	L
H	L	X	X	Q_{A0}	Q_{B0}	...	Q_{H0}
H	↑	H	H	H	Q_{An}	...	Q_{Gn}
H	↑	L	X	L	Q_{An}	...	Q_{Gn}
H	↑	X	L	L	Q_{An}	...	Q_{Gn}

H = High Level (steady state), L = Low Level (steady state)
X = Don't Care (any input, including transitions)
↑ = Transition from low to high level
Q_{A0}, Q_{B0}, Q_{H0} = The level of Q_A, Q_B, or Q_H, respectively, before the indicated steady-state input conditions were established.
Q_{An}, Q_{Gn} = The level of Q_A or Q_G before the most recent ↑ transition of the clock; indicates a one-bit shift.

Logic Diagram



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Absolute Maximum Ratings (Note 1)

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM54LS and 54LS	−55˚C to +125˚C
DM74LS	0˚C to +70˚C
Storage Temperature Range	−65˚C to +150˚C

Recommended Operating Conditions

Symbol	Parameter		DM54LS164			DM74LS164			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				0.7			0.8	V
I_{OH}	High Level Output Current				−0.4			−0.4	mA
I_{OL}	Low Level Output Current				4			8	mA
f_{CLK}	Clock Frequency (Note 5)		0		25	0		25	MHz
t_W	Pulse Width	Clock	20			20			ns
	(Note 5)	Clear	20			20			
t_{SU}	Data Setup Time (Note 5)		17			17			ns
t_H	Data Hold Time (Note 5)		5			5			ns
t_{REL}	Clear Release Time (Note 5)		30			30			ns
T_A	Free Air Operating Temperature		−55		125	0		70	˚C

Note 1: *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" tables will define the conditions for actual device operation.*

Electrical Characteristics

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

Symbol	Parameter	Conditions		Min	Typ (Note 2)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −18 mA				−1.5	V
V_{OH}	High Level Output	V_{CC} = Min, I_{OH} = Max	DM54	2.5	3.4		V
	Voltage	V_{IL} = Max, V_{IH} = Min	DM74	2.7	3.4		
V_{OL}	Low Level Output	V_{CC} = Min, I_{OL} = Max	DM54		0.25	0.4	
	Voltage	V_{IL} = Max, V_{IH} = Min	DM74		0.35	0.5	V
		I_{OL} = 4 mA, V_{CC} = Min	DM74		0.25	0.4	
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 7V				0.1	mA
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.7V				20	µA
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V				−0.4	mA
I_{OS}	Short Circuit	V_{CC} = Max	DM54	−20		−100	mA
	Output Current	(Note 3)	DM74	−20		−100	
I_{CC}	Supply Current	V_{CC} = Max (Note 4)			16	27	mA

Note 2: All typicals are at V_{CC} = 5V, T_A = 25˚C.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 4: I_{CC} is measured with all outputs open, the SERIAL input grounded, the CLOCK input at 2.4V, and a momentary ground, then 4.5V, applied to the CLEAR input.

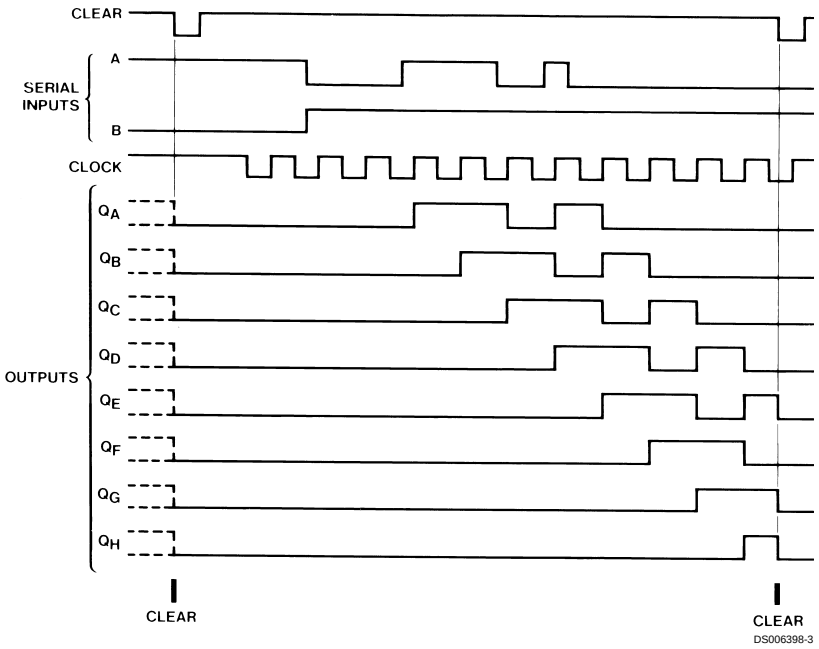
Note 5: T_A = 25˚C and V_{CC} = 5V.

Switching Characteristics

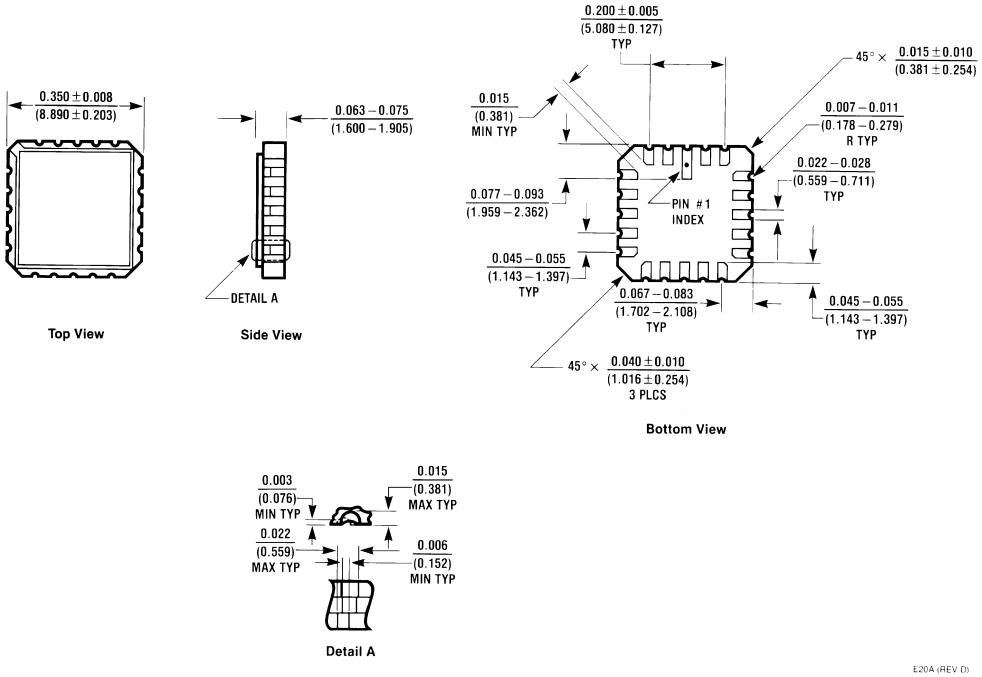
at V_{CC} = 5V and T_A = 25˚C

Symbol	Parameter	From (Input) To (Output)	R_L = 2 kΩ				Units
			C_L = 15 pF		C_L = 50 pF		
			Min	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency		25				MHz
t_{PLH}	Propagation Delay Time Low to High Level Output	Clock to Output		27		30	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Clock to Output		32		40	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Clear to Output		36		45	ns

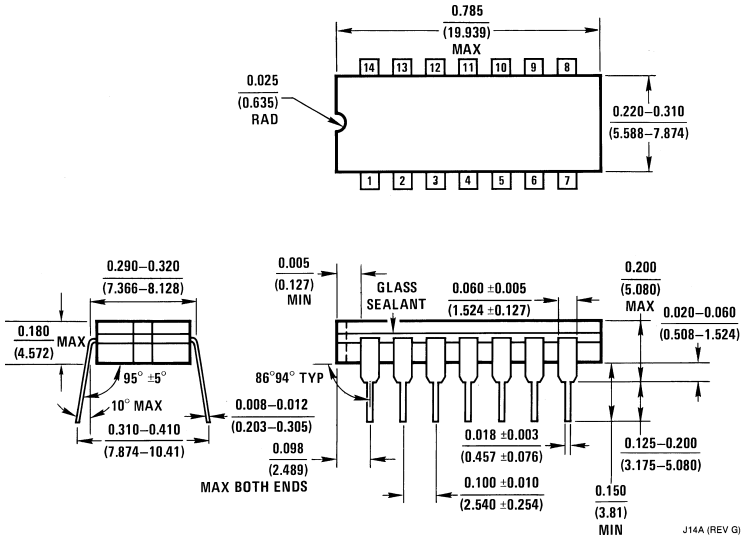
Timing Diagram



Physical Dimensions inches (millimeters) unless otherwise noted

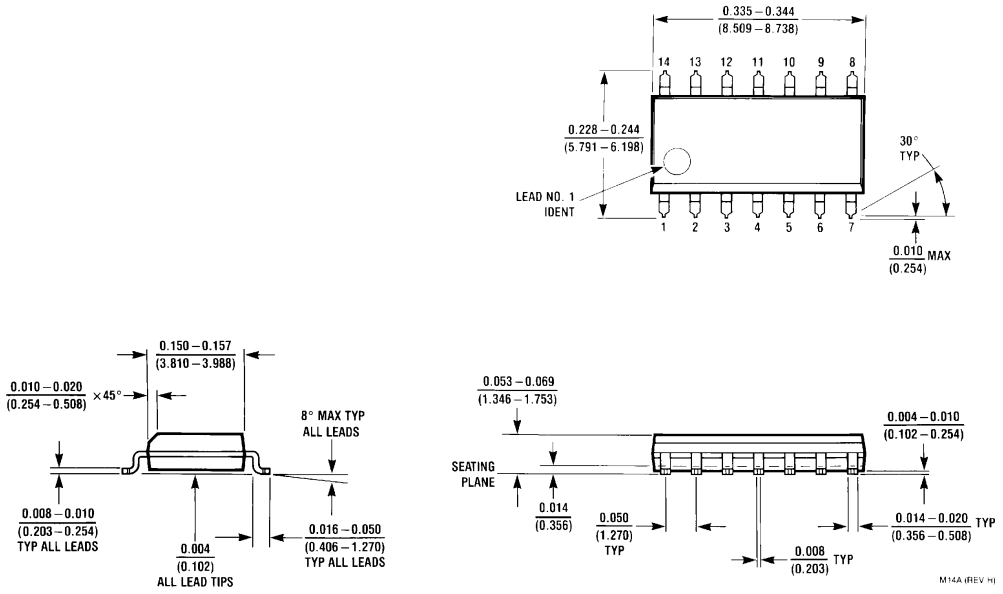


Ceramic Leadless Chip Carrier Package (E)
Order Number 54LS164LMQB
Package Number E20A

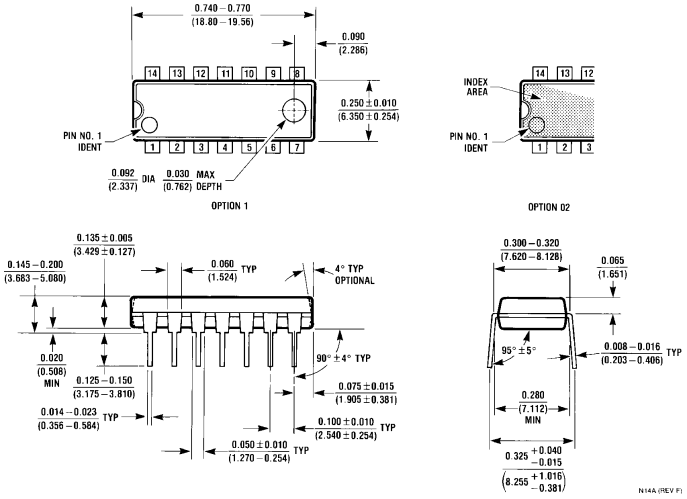


14-Lead Ceramic Dual-In-Line Package (J)
Order Number 54LS164DMQB or DM54LS164J
Package Number J14A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

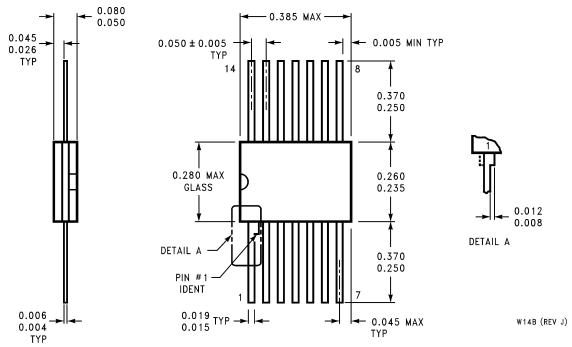


14-Lead Small Outline Molded Package (M)
Order Number DM74LS164M
Package Number M14A



14-Lead Molded Dual-In-Line Package (N)
Order Number DM74LS164N
Package Number N14A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



14-Lead Ceramic Flat Package (W)
Order Number 54LS164FMQB or DM54LS164W
Package Number W14B

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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