

- Fully independent clear input
- Synchronous operation
- Cascading circuitry provided internally
- Individual preset each flip-flop
- Alternate Military/Aerospace device (54LS193) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

TL/F/6406-1

**Order Number 54LS193DMQB, 54LS193FMQB, 54LS193LMQB,
DM54LS193J, DM54LS193W, DM74LS193M or DM74LS193N
See NS Package Number E20A, J16A, M16A, N16E or W16A**

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	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

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	DM54LS193			DM74LS193			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 1)	0		25	0		25	MHz
	Clock Frequency (Note 2)	0		20	0		20	MHz
t _W	Pulse Width of Any Input (Note 6)	20			20			ns
t _{SU}	Data Setup Time (Note 6)	20			20			ns
t _H	Data Hold Time (Note 6)	0			0			ns
t _{REL}	Release Time (Note 6)	40			40			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 3)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = −18 mA			−1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max, V _{IH} = Min	DM54 2.5	3.4		V
			DM74 2.7	3.4		
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IL} = Max, V _{IH} = Min	DM54	0.25	0.4	V
			DM74	0.35	0.5	
		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 Output Current	V _{CC} = Max (Note 4)	DM54 −20		−100	mA
			DM74 −20		−100	
I _{CC}	Supply Current	V _{CC} = Max (Note 5)		19	34	mA

Note 1: C_L = 15 pF, R_L = 2 kΩ, I_A = 25°C and V_{CC} = 5V.

Note 2: C_L = 50 pF, R_L = 2 kΩ, I_A = 25°C and V_{CC} = 5V.

Note 3: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 4: Not more than one output should be shorted at a time, and the duration should not exceed one second.

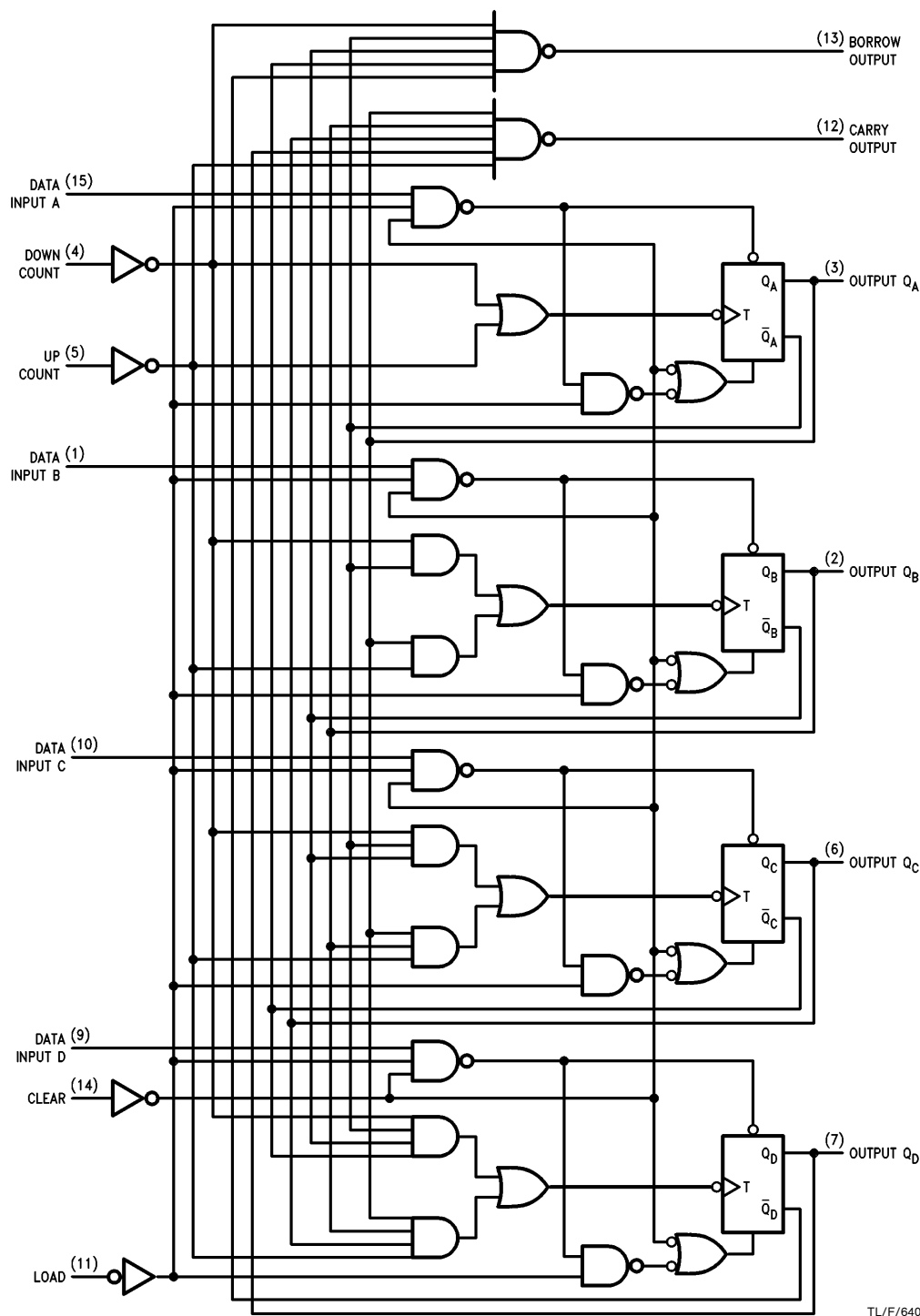
Note 5: I_{CC} is measured with all outputs open, CLEAR and LOAD inputs grounded, and all other inputs at 4.5V.

Note 6: T_A = 25°C and V_{CC} = 5V.

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

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		20		MHz
t _{PLH}	Propagation Delay Time Low to High Level Output	Count Up to Carry		26		30	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	Count Up to Carry		24		36	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	Count Down to Borrow		24		29	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	Count Down to Borrow		24		32	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	Either Count to Any Q		38		45	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	Either Count to Any Q		47		54	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	Load to Any Q		40		41	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	Load to Any Q		40		47	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	Clear to Any Q		35		44	ns

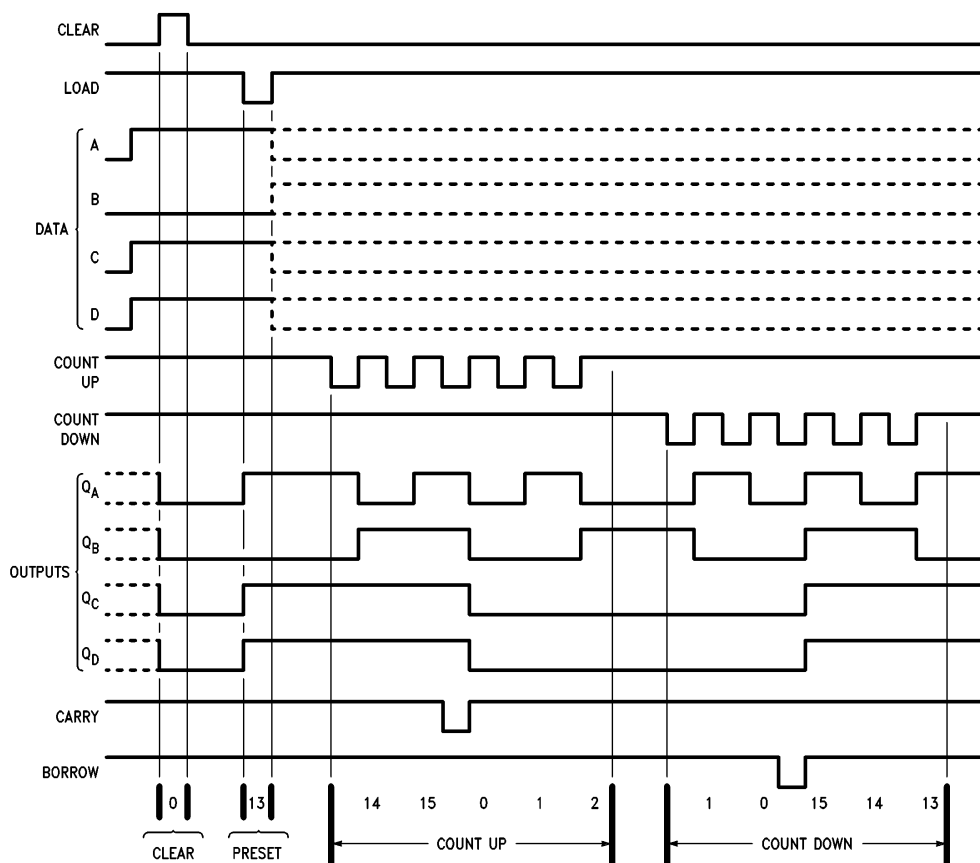
Logic Diagram



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Timing Diagrams

Typical Clear, Load, and Count Sequences

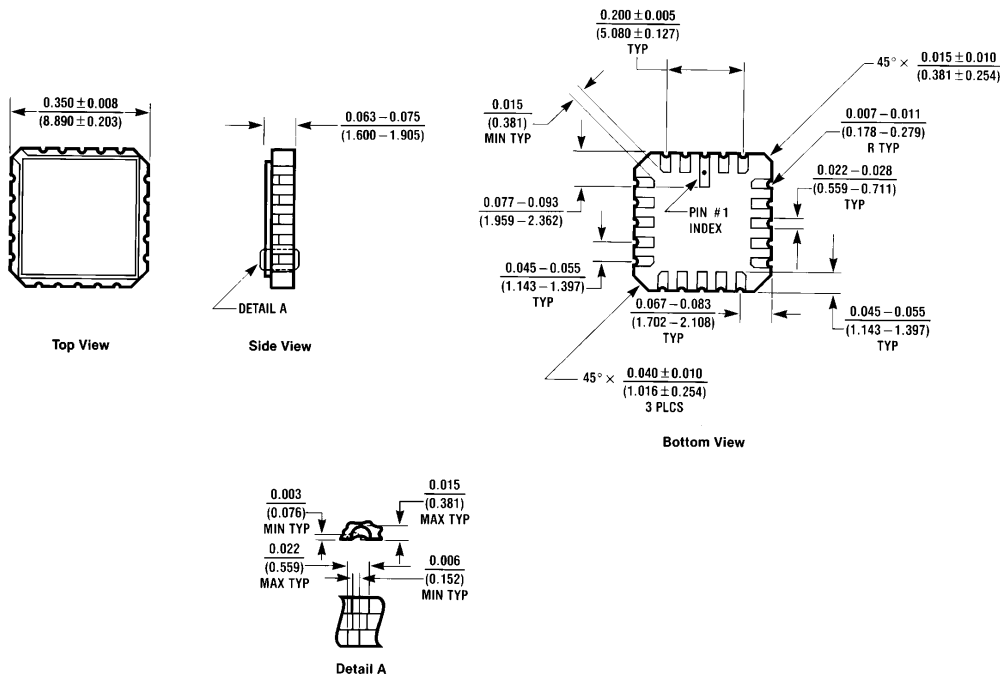


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Note A: Clear overrides load, data, and count inputs.

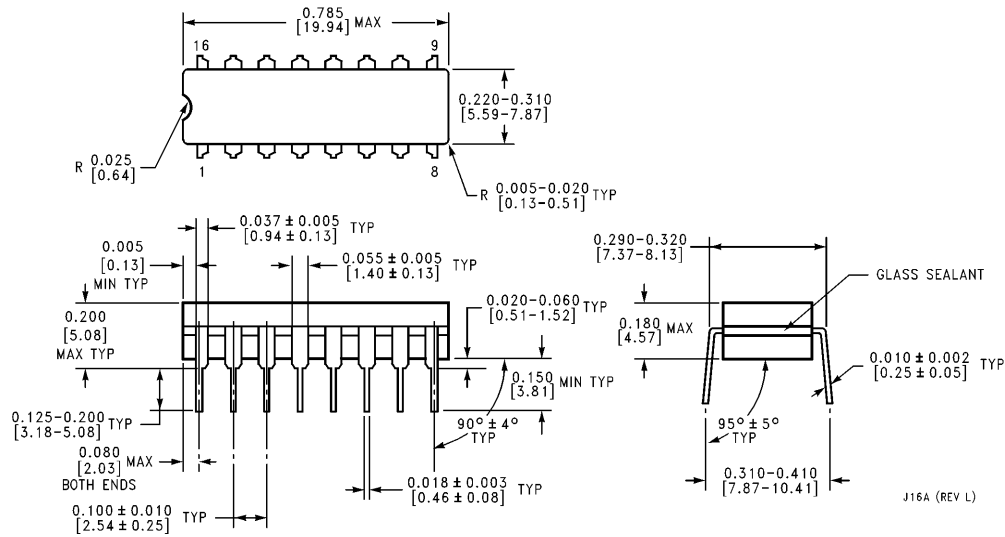
Note B: When counting up, count-down input must be high; when counting down, count-up input must be high.

Physical Dimensions inches (millimeters)



Ceramic Leadless Chip Carrier Package (E)
Order Number 54LS193LMQB
NS Package Number E20A

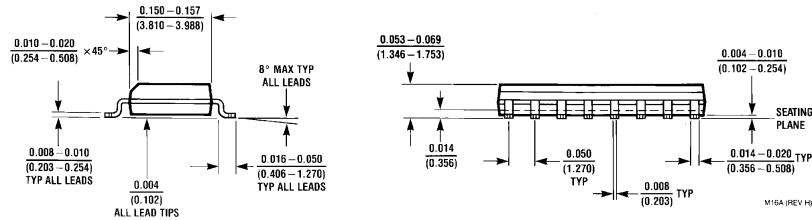
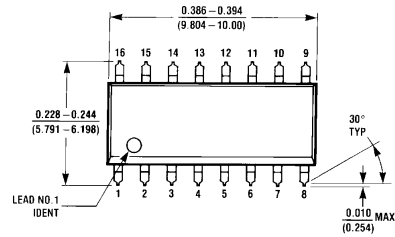
E20A (REV D)



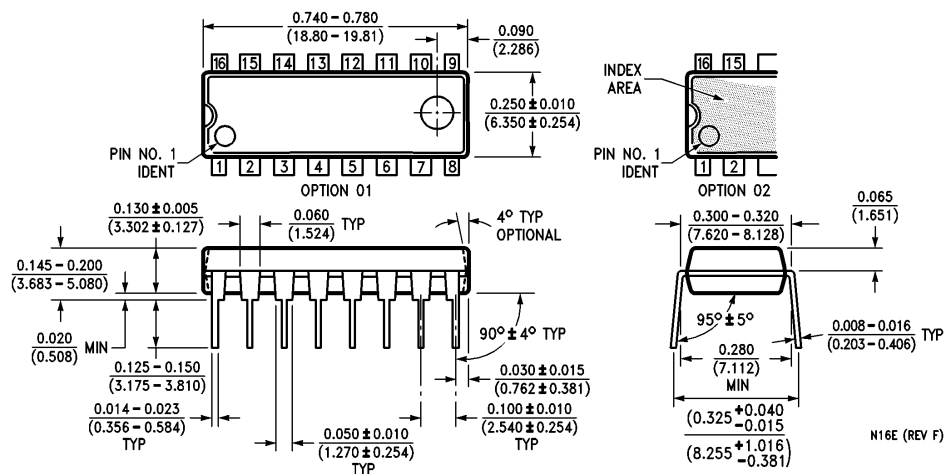
16-Lead Ceramic Dual-In-Line Package (J)
Order Number 54LS193DMQB or DM54LS193J
NS Package Number J16A

J16A (REV L)

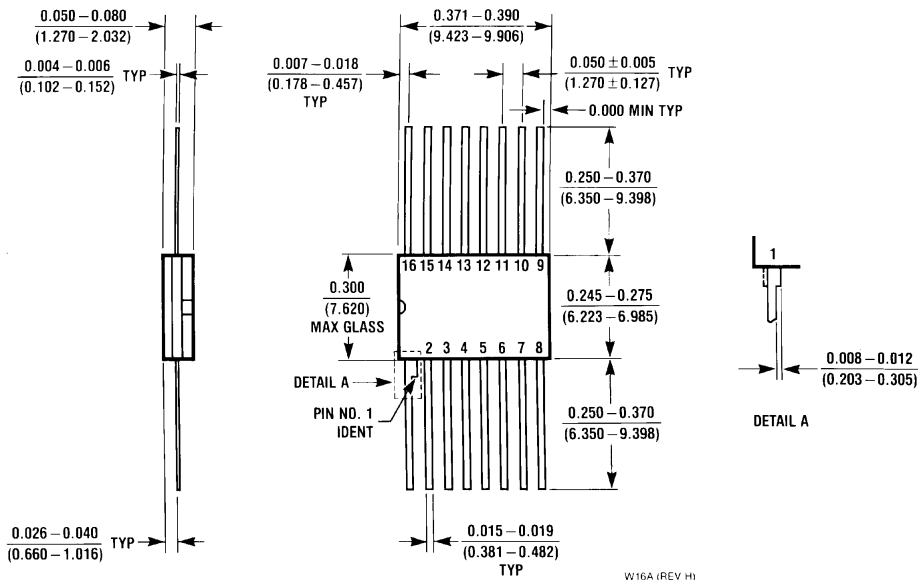
Physical Dimensions inches (millimeters) (Continued)



16-Lead Small Outline Molded Package (M)
Order Number DM74LS193M
NS Package Number M16A



16-Lead Molded Dual-In-Line Package (N)
Order Number DM74LS193N
NS Package Number N16E

Physical Dimensions inches (millimeters) (Continued)

16-Lead Ceramic Flat Package (W)
Order Number 54LS193FMQB or DM54LS193W
NS Package Number W16A

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