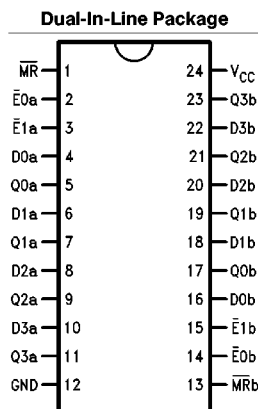


93L08 Dual 4-Bit Latch

General Description

The 93L08 is a dual 4-bit D-type latch designed for general purpose storage applications in digital systems. Each latch contains both an active LOW Master Reset input and active LOW Enable inputs.

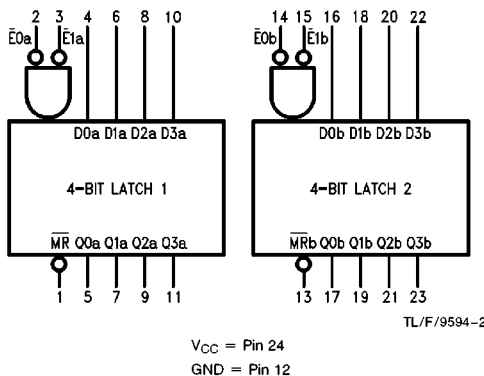
Connection Diagram



TL/F/9594-1

Order Number 93L08DMQB or 93L08FMQB
See NS Package Number J24A or W24C

Logic Symbol



Pin Names	Description
D0a-D3a } D0b-D3b }	Parallel Latch Inputs
$\overline{E}0a, \overline{E}1a, \overline{E}0b, \overline{E}1b,$	AND Enable Inputs (Active LOW)
$\overline{MR}a, \overline{MR}b$	Master Reset Inputs (Active LOW)
Q0a-Q3a } Q0b-Q3b }	Parallel Latch Outputs

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	
MIL	-55°C to +125°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	Min	Nom	Max	Units
V _{CC}	Supply Voltage	4.5	5	5.5	V
V _{IH}	High Level Input Voltage	2			V
V _{IL}	Low Level Input Voltage			0.7	V
I _{OH}	High Level Output Current			-400	μA
I _{OL}	Low Level Output Current			4.8	mA
T _A	Free Air Operating Temperature	-55		125	°C
t _s (H)	Setup Time HIGH, D _n to \bar{E}_n	8			ns
t _h (H)	Hold Time HIGH, D _n to \bar{E}_n	1			ns
t _s (L)	Setup Time LOW, D _n to \bar{E}_n	18			ns
t _h (L)	Hold Time LOW, D _n to \bar{E}_n	4			ns
t _w (L)	\bar{E}_n Pulse Width LOW	32			ns
t _w (L)	\overline{MR} Pulse Width LOW	30			ns
t _{rec}	Recovery Time, \overline{MR} to \bar{E}_n	10			ns

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 = -10 mA			-1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max, V _{IL} = Max, V _{IH} = Min	2.4			V
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max, V _{IH} = Min, V _{IL} = Max			0.3	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	Inputs		20	μA
			D _n		30	
I _{IL}	Low Level Input Current	V _{CC} = Max, V _I = 0.3V	Inputs		-400	μA
			D _n		-640	
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	-2.5		-25	mA
I _{CC}	Supply Current	V _{CC} = Max (Note 3)			29	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, and the duration should not exceed one second.

Note 3: I_{CC} is measured with all outputs open and all inputs grounded.

Switching Characteristics

$V_{CC} = +5.0V$, $T_A = +25^\circ C$ (See Section 3 for waveforms and load configurations)

Symbol	Parameter	$C_L = 15\text{ pF}$		Units
		Min	Max	
t_{PLH} t_{PHL}	Propagation Delay \bar{E}_n to Q_n		45 38	ns
t_{PLH} t_{PHL}	Propagation Delay D_n to Q_n		27 29	ns
t_{PHL}	Propagation Delay \overline{MR} to Q_n		30	ns

Functional Description

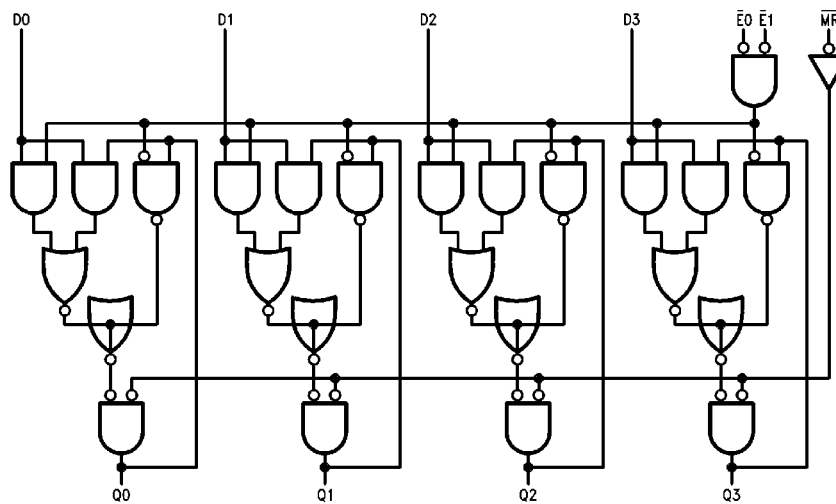
Data can be entered into the latch when both of the enable inputs are LOW. As long as this logic condition exists, the output of the latch will follow the input. If either of the enable inputs goes HIGH, the data present in the latch at that time is held in the latch and is no longer affected by data input. The master reset overrides all other input conditions and forces the outputs of all the latches LOW when a LOW signal is applied to the Master Reset input.

Truth Table

\overline{MR}	\bar{E}_0	\bar{E}_1	D	Q_n	Operation
H	L	L	L	L	Data Entry
H	L	L	H	L	Data Entry
H	L	H	X	Q_{n-1}	Hold
H	H	L	X	Q_{n-1}	Hold
H	H	H	X	Q_{n-1}	Hold
L	X	X	X	L	Reset

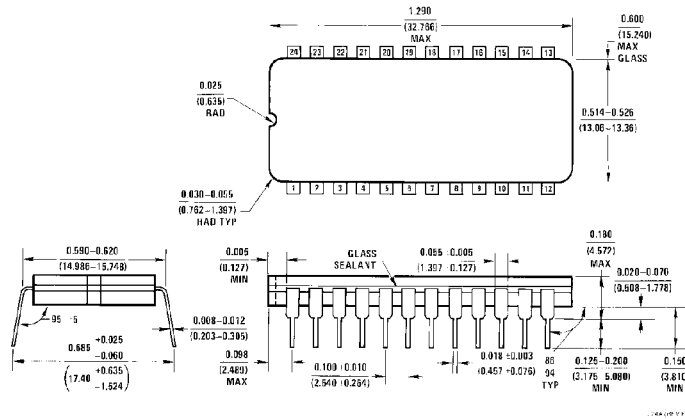
Q_{n-1} = Previous Output State
 Q_n = Present Output State
 H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial

Logic Diagram

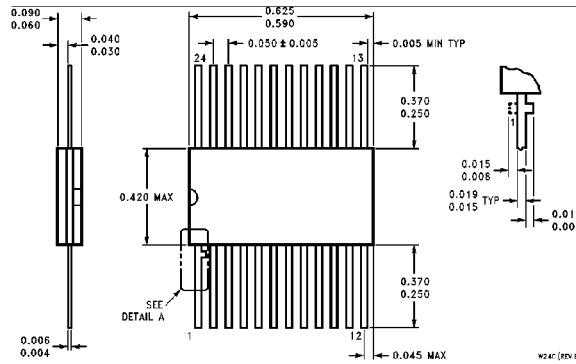


TL/F/9594-3

Physical Dimensions inches (millimeters)



24-Lead Ceramic Dual-In-Line Package (J)
Order Number 93L08DMQB
NS Package Number J24A



24-Lead Ceramic Flat Package (W)
Order Number 93L08FMQB
NS Package Number W24C

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is 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.



National Semiconductor Corporation
 1111 West Bardin Road
 Arlington, TX 76017
 Tel: 1(800) 272-9959
 Fax: 1(800) 737-7018

National Semiconductor Europe
 Fax: (+49) 0-180-530 85 86
 Email: cnjwge@tevm2.nsc.com
 Deutsch Tel: (+49) 0-180-530 85 85
 English Tel: (+49) 0-180-532 78 32
 Français Tel: (+49) 0-180-532 93 58
 Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
 13th Floor, Straight Block,
 Ocean Centre, 5 Canton Rd.
 Tsimshatsui, Kowloon
 Hong Kong
 Tel: (852) 2737-1600
 Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
 Tel: 81-043-299-2309
 Fax: 81-043-299-2408

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.