

**9314,DM9314**

***9314/DM9314 Quad Latch***



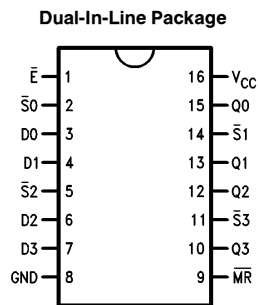
Literature Number: SNOS378A

## 9314/DM9314 Quad Latch

### General Description

The '9314 is a multifunctional 4-bit latch designed for general purpose storage applications in high speed digital systems. All outputs have active pull-up circuitry to provide high capacitance drive and to provide low impedance in both logic states for good noise immunity.

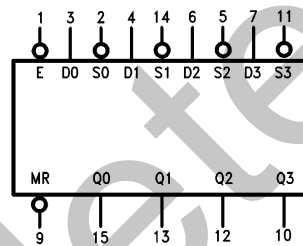
### Connection Diagram



TL/F/9788-1

Order Number 9314DMQB, 9314FMQB or DM9314N  
See NS Package Number J16A, N16E or W16A

### Logic Symbol



V<sub>CC</sub> = Pin 16  
GND = Pin 8

TL/F/9788-2

Pin Names	Description
$\bar{E}$	Enable Input (Active LOW)
D0-D3	Data Inputs
$\bar{S}0-\bar{S}3$	Set Inputs (Active LOW)
$\bar{MR}$	Master Reset Input (Active LOW)
Q0-Q3	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	
Military	−55°C to +125°C
Commercial	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	Military			Commercial			Units
		Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub>	High Level Input Voltage	2			2			V
V <sub>IL</sub>	Low Level Input Voltage			0.8			0.8	V
I <sub>OH</sub>	High Level Output Current			−0.8			−0.8	mA
I <sub>OL</sub>	Low Level Output Current			16			16	mA
T <sub>A</sub>	Free Air Operating Temperature	−55		125	0		70	°C
t <sub>s</sub> (H)	Setup Time HIGH or LOW	5.0			5.0			ns
t <sub>s</sub> (L)	D <sub>n</sub> to $\bar{E}$	18			18			ns
t <sub>h</sub> (H)	Hold Time HIGH or LOW	0			0			ns
t <sub>h</sub> (L)	D <sub>n</sub> to $\bar{E}$	5.0			5.0			ns
t <sub>s</sub> (H)	Setup Time HIGH, D <sub>n</sub> to $\bar{S}_n$	8.0			8.0			ns
t <sub>h</sub> (L)	Hold Time LOW, D <sub>n</sub> to $\bar{S}_n$	8.0			8.0			ns
t <sub>w</sub> (L)	$\bar{E}$ Pulse Width LOW	18			18			ns
t <sub>w</sub> (L)	$\overline{MR}$ Pulse Width LOW	18			18			ns
t <sub>rec</sub>	Recovery Time, $\overline{MR}$ to $\bar{E}$	0			0			ns

## Electrical Characteristics

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

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V <sub>I</sub>	Input Clamp Voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = −12 mA			−1.5	V
V <sub>OH</sub>	High Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OH</sub> = Max V <sub>IL</sub> = Max	2.4	3.4		V
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max V <sub>IH</sub> = Min		0.2	0.4	V
I <sub>I</sub>	Input Current @ Max Input Voltage	V <sub>CC</sub> = Min, V <sub>I</sub> = 5.5V			1	mA
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.4V			40	μA
		Data Inputs			60	
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V			−1.6	mA
		Data Inputs			−2.7	
I <sub>OS</sub>	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 2)	MIL	−20	−70	mA
			COM	−20	−70	
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = Max			55	mA

Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

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

### Switching Characteristics $V_{CC} = +5.0V$ , $T_A = +25^\circ C$ (See Section 1 for waveforms and load configurations)

Symbol	Parameter	$C_L = 15\text{ pF}$		Units
		Min	Max	
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\bar{E}$ to $Q_n$		24	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $D_n$ to $Q_n$		12 24	ns
$t_{PLH}$	Propagation Delay $\overline{MR}$ to $Q_n$		18	ns
$t_{PHL}$	Propagation Delay $\bar{S}_n$ to $Q_n$		24	ns

### Functional Description

The '9314 consists of four latches with a common active LOW Enable input and active LOW Master Reset input. When the Enable goes HIGH, data present in the latches is stored and the state of the latch is no longer affected by the  $\bar{S}_n$  and  $D_n$  inputs. The Master Reset when activated overrides all other input conditions forcing all latch outputs LOW. Each of the four latches can be operated in one of two modes:

**D-TYPE LATCH**—For D-type operation the  $\bar{S}$  input of a latch is held LOW. While the common Enable is active the latch output follows the D input. Information present at the latch output is stored in the latch when the Enable goes HIGH.

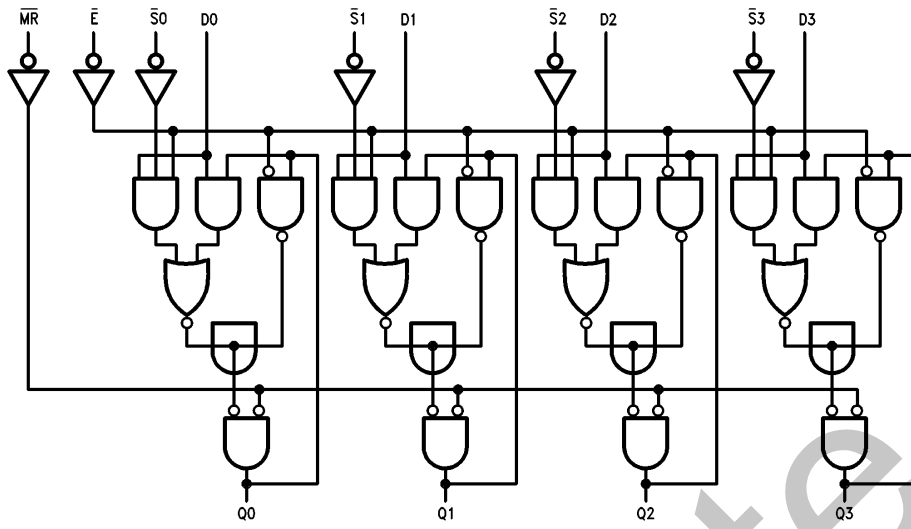
**SET/RESET LATCH**—During set/reset operation when the common Enable is LOW a latch is reset by a LOW on the D input, and can be set by a LOW on the  $\bar{S}$  input if the D input is HIGH. If both  $\bar{S}$  and D inputs are LOW, the D input will dominate and the latch will be reset. When the Enable goes HIGH, the latch remains in the last state prior to disablement. The two modes of latch operation are shown in the Truth Table.

### Truth Table

$\overline{MR}$	$\bar{E}$	D	$\bar{S}$	$Q_n$	Operation
H	L	L	L	L	D Mode
H	L	H	L	H	
H	H	X	X	$Q_{n-1}$	
H	L	L	L	L	R/S Mode
H	L	H	L	H	
H	L	L	H	L	
H	L	H	H	$Q_{n-1}$	
H	H	X	X	$Q_{n-1}$	
L	X	X	X	L	Reset

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

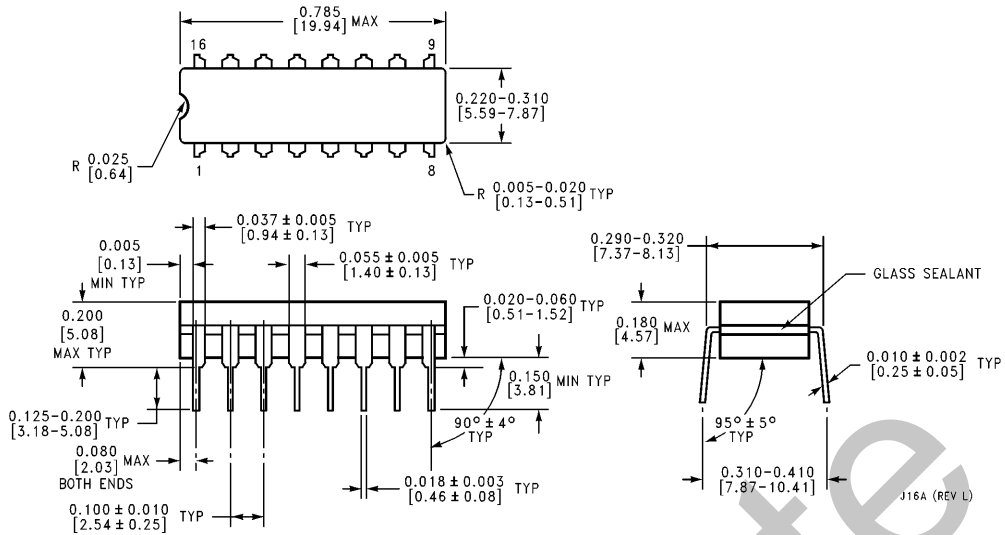
### Logic Diagram



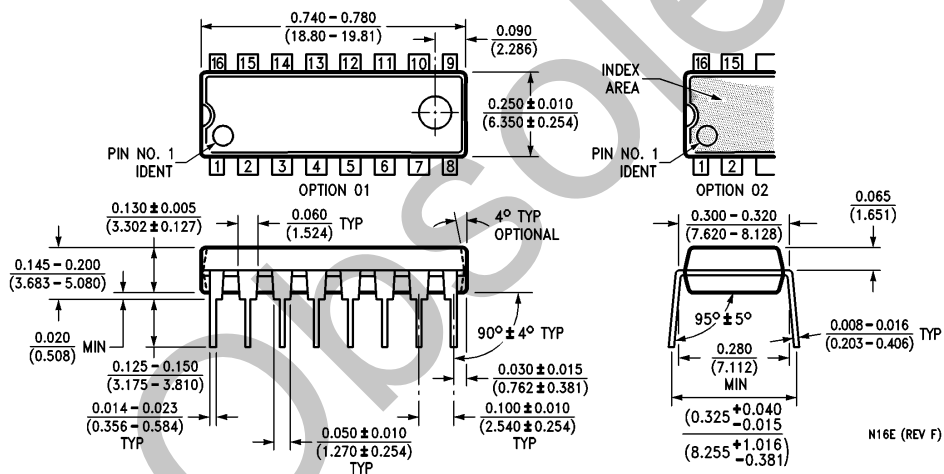
TL/F/9788-3

Obsolete

**Physical Dimensions** inches (millimeters)

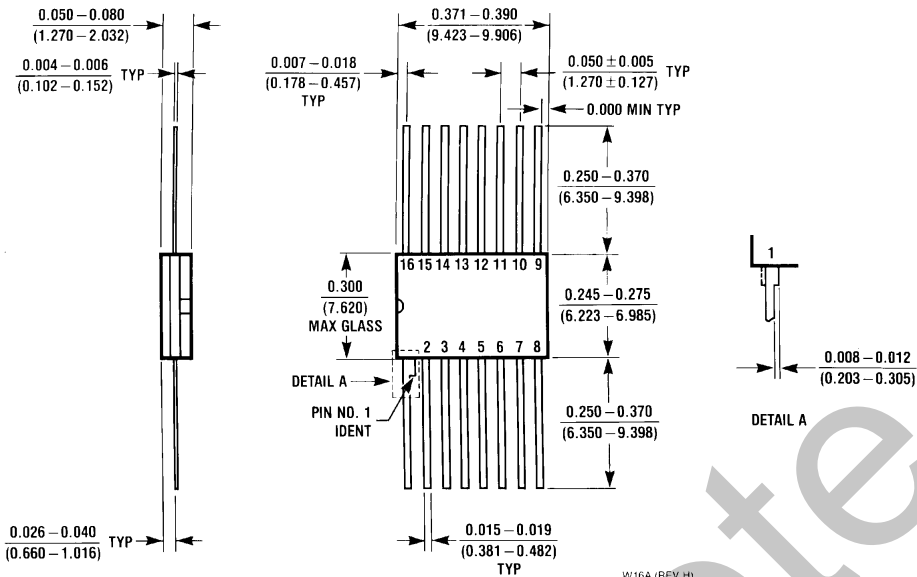


**16-Lead Ceramic Dual-In-Line Package (J)**  
 Order Number 9314DMQB  
 NS Package Number J16A



**16-Lead Molded Dual-In-Line Package (N)**  
 Order Number DM9314N  
 NS Package Number N16E

**Physical Dimensions** inches (millimeters) (Continued)



**16-Lead Ceramic Flat Package (W)**  
**Order Number 9314FMQB**  
**NS Package Number W16A**

**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.**  
 19th 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.

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

### Products

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Mobile Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
Transportation and Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>

TI E2E Community Home Page

[e2e.ti.com](http://e2e.ti.com)

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2011, Texas Instruments Incorporated