

54LS256/DM74LS256 Dual 4-Bit Addressable Latch

General Description

The 'LS256 is a dual 4-bit addressable latch with common control inputs; these include two Address inputs (A0, A1), an active LOW enable input ($\overline{E}$) and an active LOW Clear input (CL). Each latch has a Data input (D) and four outputs (Q0–Q3).

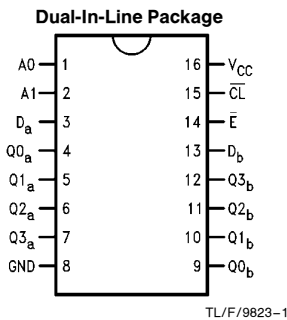
When the Enable ($\overline{E}$) is HIGH and the Clear input ($\overline{CL}$) is LOW, all outputs (Q0–Q3) are LOW. Dual 4-channel demultiplexing occurs when the $\overline{CL}$ and $\overline{E}$ are both LOW. When $\overline{CL}$ is HIGH and $\overline{E}$ is LOW, the selected output (Q0–Q3), determined by the Address inputs, follows D. When the $\overline{E}$ goes HIGH, the contents of the latch are stored. When operating in the addressable latch mode ($\overline{E}$ = LOW, $\overline{CL}$ = HIGH), changing more than one bit of the Address (A0, A1)

could impose a transient wrong address. Therefore, this should be done only while in the memory mode ($\overline{E}$ = $\overline{CL}$ = HIGH).

Features

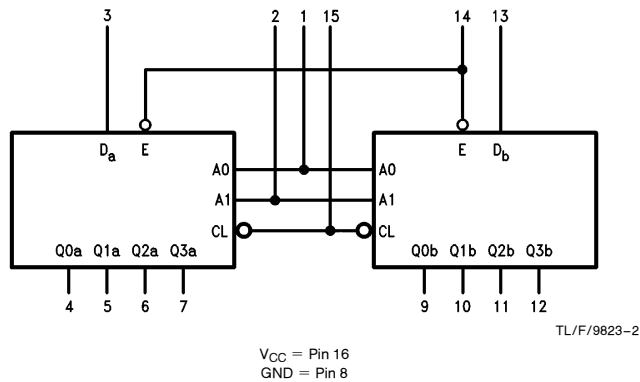
- Serial-to-parallel capability
- Output from each storage bit available
- Random (addressable) data entry
- Easily expandable
- Active low common clear

Connection Diagram



**Order Number 54LS256DMQB,
54LS256FMQB or DM74LS256N
See NS Package Number J16A,
N16E or W16A**

Logic Symbol



Pin Names	Description
A0, A1	Common Address Inputs
Da, Db	Data Inputs
$\overline{E}$	Common Enable Input (Active LOW)
$\overline{CL}$	Conditional Clear Input (Active LOW)
Q0a–Q3a	Side A Latch Outputs
Q0b–Q3b	Side B Latch Outputs

Truth Table

Inputs				Outputs				Mode
$\overline{CL}$	$\overline{E}$	A0	A1	Q0	Q1	Q2	Q3	
L	H	X	X	L	L	L	L	Clear
L	L	L	L	D	L	L	L	Demultiplex
L	L	H	L	L	D	L	L	
L	L	L	H	L	L	D	L	
L	L	H	H	L	L	L	D	
H	H	X	X	Q_{t-1}	Q_{t-1}	Q_{t-1}	Q_{t-1}	Memory
H	L	L	L	D	Q_{t-1}	Q_{t-1}	Q_{t-1}	Addressable Latch
H	L	H	L	Q_{t-1}	D	Q_{t-1}	Q_{t-1}	
H	L	L	H	Q_{t-1}	Q_{t-1}	D	Q_{t-1}	
H	L	H	H	Q_{t-1}	Q_{t-1}	Q_{t-1}	D	

$t-1$ = Bit time before address change or rising edge of E

H = HIGH Voltage Level

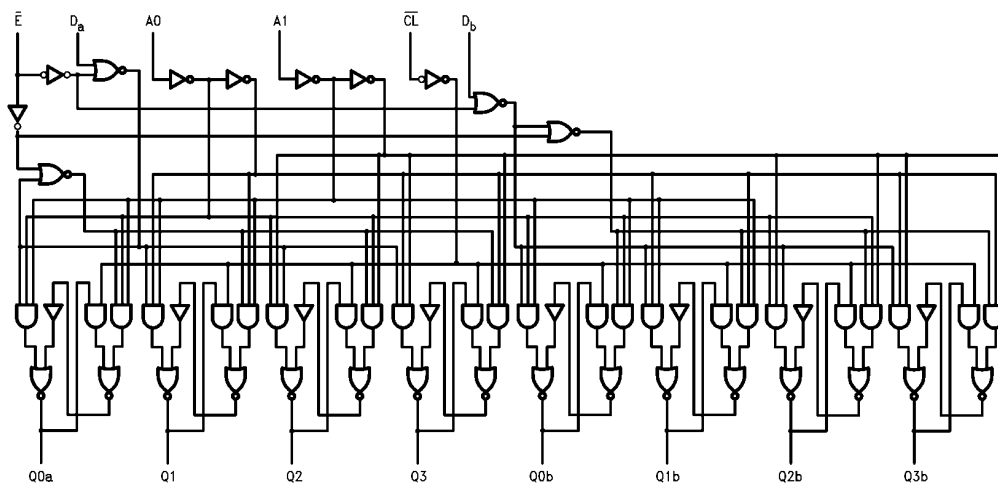
L = LOW Voltage Level

X = Immaterial

Mode Selection

$\overline{E}$	$\overline{CL}$	Mode
L	H	Addressable Latch
H	H	Memory
L	L	Active HIGH 4-Channel Demultiplexers
H	L	Clear

Logic Diagram



TL/F/9823-3

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
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	54LS256			DM74LS256			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
T _A	Free Air Operating Temperature	-55		125	0		70	°C
t _s (H)	Setup Time HIGH, D _n to $\bar{E}$	20			20			ns
t _h (H)	Hold Time HIGH, D _n to $\bar{E}$	0			0			ns
t _s (L)	Setup Time LOW, D _n to $\bar{E}$	15			15			ns
t _h (L)	Hold Time LOW, D _n to $\bar{E}$	0			0			ns
t _s (H) t _s (L)	Setup Time HIGH or LOW, A _n to $\bar{E}$	0			0			ns
t _w (L)	$\bar{E}$ Pulse Width LOW	17			17			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 = -18 mA			-1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max	54LS 2.5			V
			DM74 2.7	3.4		
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IH} = Min	54LS		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 = 10V	Inputs		0.1	mA
			$\bar{E}$		0.2	
I _{IH}	High Level Input Current	V _{CC} = Max, V _I = 2.7V	Inputs		20	μA
			$\bar{E}$		40	
I _{IL}	Low Level Input Current	V _{CC} = Max, V _I = 0.4V	Inputs		-0.4	mA
			$\bar{E}$		-0.8	
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	54LS	-20	-100	mA
			DM74	-20	-100	
I _{CC}	Supply Current	V _{CC} = Max			25	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.

Switching Characteristics

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

Symbol	Parameter	$R_L = 2\text{ k}\Omega$ $C_L = 15\text{ pF}$	Units
		Max	
t_{PLH} t_{PHL}	Propagation Delay $\bar{E}$ to Q_n	27 24	ns
t_{PLH} t_{PHL}	Propagation Delay D_n to Q_n	30 20	ns
t_{PLH} t_{PHL}	Propagation Delay A_n to Q_n	30 29	ns
t_{PLH}	Propagation Delay $\overline{CL}$ to Q_n	18	ns

The image contains three mechanical drawings of the J16A package:

- Top View:** Shows a rectangular package with 16 pins on the left and 9 pins on the right. Dimensions include a total width of 0.785 ± 0.005 [19.94] MAX, a pin pitch of 0.037 ± 0.005 [0.94 $\pm$ 0.13] TYP, and a pin diameter of 0.025 [0.64]. A fillet radius R is specified as $0.005-0.020$ TYP [0.13-0.51].
- Side View:** Shows the package height and pin dimensions. The body height is $0.220-0.310$ [5.59-7.87]. The pin height is $0.125-0.200$ [3.18-5.08] TYP. The pin thickness is 0.018 ± 0.003 [0.46 $\pm$ 0.08] TYP. The pin angle is $90^\circ \pm 4^\circ$ TYP.
- Detail View:** Shows the package with glass sealant. Dimensions include a sealant thickness of 0.010 ± 0.002 [0.25 $\pm$ 0.05] TYP, a sealant width of 0.180 [4.57] MAX, and a sealant angle of $95^\circ \pm 5^\circ$ TYP. The package width is $0.290-0.320$ [7.37-8.13].

0.740 - 0.780
(18.80 - 19.81)

0.090
(2.286)

0.250 ± 0.010
(6.350 ± 0.254)

PIN NO. 1 IDENT

OPTION 01

0.130 ± 0.005
(3.302 ± 0.127)

0.060
(1.524) TYP

4° TYP OPTIONAL

90° ± 4° TYP

0.125 - 0.150
(3.175 - 3.810)

0.014 - 0.023
(0.356 - 0.584) TYP

0.050 ± 0.010
(1.270 ± 0.254) TYP

0.030 ± 0.015
(0.762 ± 0.381) TYP

0.100 ± 0.010
(2.540 ± 0.254) TYP

INDEX AREA

PIN NO. 1 IDENT

OPTION 02

0.300 - 0.320
(7.620 - 8.128)

0.065
(1.651)

95° ± 5°

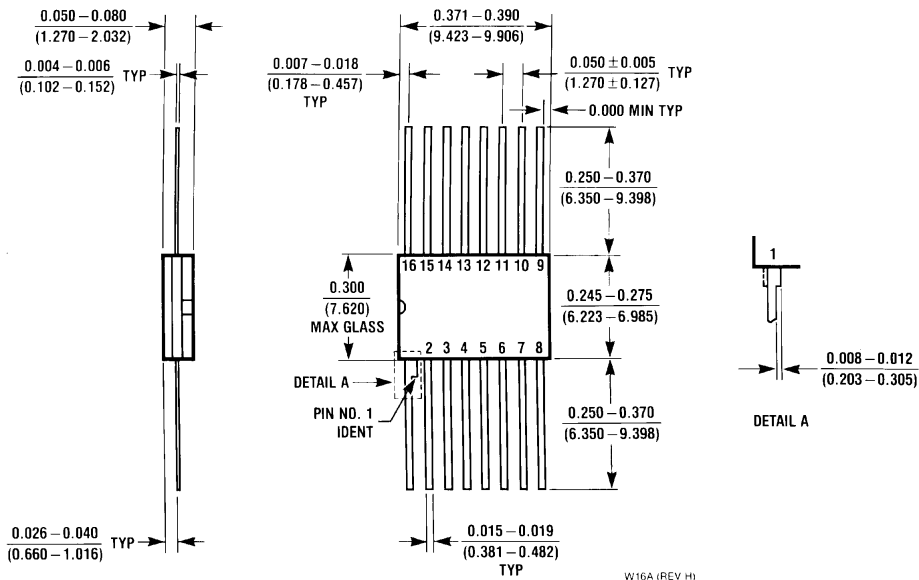
0.280
(7.112) MIN

0.008 - 0.016
(0.203 - 0.406) TYP

(0.325 + 0.040 - 0.015)
(8.255 + 1.016 - 0.381)

N16E (REV F)

5

Physical Dimensions inches (millimeters) (Continued)

16-Lead Ceramic Flat Package (W)
Order Number 54LS256FMQB
NS Package Number W16A

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