MOTOROLA

SN54LS/74LS75
SN54LS/74LS77

4-BIT D LATCH

LOW POWER SCHOTTKY

DESCRIPTION — The TTL/MSI SN54LS/74LS75 and SN54LS/74LS77 are latches used as temporary storage for binary information between processing units and input/output or indicator units. Information present at a data (D) input is transferred to the Q output when the Enable is HIGH and the Q output will follow the data input as long as the Enable remains HIGH. When the Enable goes LOW, the information (that was present at the data input at the time the transition occurred) is retained at the Q output until the Enable is permitted to go HIGH.

The SN54LS/74LS75 features complementary Q and $\overline{Q}$ output from a 4-bit latch and is available in the 16-pin packages. For higher component density applications the SN54LS/74LS77 4-bit latch is available in the 14-pin package with $\overline{Q}$ outputs omitted.

PIN NAMES

PIN NAMES		LOADING (Note a)	
		HIGH	LOW
D_1–D_4	Data Inputs	0.5 U.L.	0.25 U.L.
E_{0-1}	Enable Input Latches 0, 1	2.0 U.L.	1.0 U.L.
E_{2-3}	Enable Input Latches 2, 3	2.0 U.L.	1.0 U.L.
Q_1–Q_4	Latch Outputs (Note b)	10 U.L.	5(2.5) U.L.
$\overline{Q_1}$–$\overline{Q_4}$	Complimentary Latch Outputs (Note b)	10 U.L.	5(2.5) U.L.

Notes:
a. 1 Unit Load (U.L.) = 40 μA HIGH
b. The Output LOW drive factor is 2.5 U.L. for Military (54) and 5 U.L. for Commercial (74) Temperature Ranges.

TRUTH TABLE
(Each latch)

| t_n	t_{n+1}
D	Q
H	H
L	L

NOTES:
t_n = bit time before enable negative-going transition
t_{n+1} = bit time after enable negative-going transition

LOGIC SYMBOLS
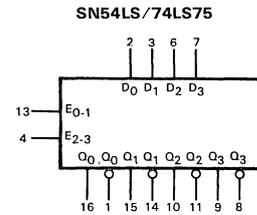
SN54LS/74LS75

V_{CC} = Pin 5
GND = Pin 12

SN54LS/74LS77
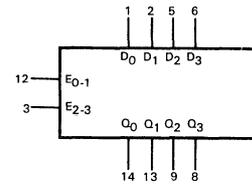
V_{CC} = Pin 4
GND = Pin 11
NC = Pin 7,10

CONNECTION DIAGRAMS
DIP (TOP VIEW)

SN54LS/74LS75
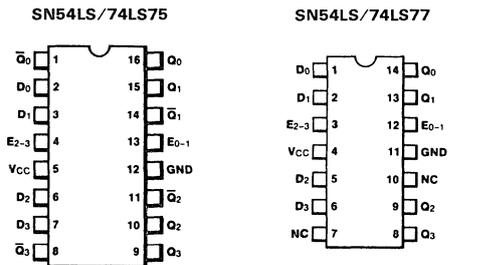
SN54LS/74LS77

J Suffix — Case 620-08 (Ceramic)
N Suffix — Case 648-05 (Plastic)

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

SYMBOL	PARAMETER		LIMITS			UNITS	TEST CONDITIONS
			MIN	TYP	MAX		
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage for All Inputs
V_{IL}	Input LOW Voltage	54			0.7	V	Guaranteed Input LOW Voltage for All Inputs
		74			0.8		
V_{IK}	Input Clamp Diode Voltage			−0.65	−1.5	V	V_{CC} = MIN, I_{IN} = −18 mA
V_{OH}	Output HIGH Voltage	54	2.5	3.5		V	V_{CC} = MIN, I_{OH} = MAX, V_{IN} = V_{IH} or V_{IL} per Truth Table
		74	2.7	3.5		V	
V_{OL}	Output LOW Voltage	54,74		0.25	0.4	V	I_{OL} = 4.0 mA / V_{CC} = V_{CC} MIN, V_{IN} = V_{IL} or V_{IH} per Truth Table
		74		0.35	0.5	V	I_{OL} = 8.0 mA
I_{IH}	Input HIGH Current	D Input / E Input			20 / 80	µA	V_{CC} = MAX, V_{IN} = 2.7 V
		D Input / E Input			0.1 / 0.4	mA	V_{CC} = MAX, V_{IN} = 7.0 V
I_{IL}	Input LOW Current	D Input / E Input			−0.4 / −1.6	mA	V_{CC} = MAX, V_{IN} = 0.4 V
I_{OS}	Short Circuit Current		−20		−100	mA	V_{CC} = MAX
I_{CC}	Power Supply Current				12	mA	V_{CC} = MAX

AC CHARACTERISTICS: T_A = 25°C, V_{CC} = 5.0 V

SYMBOL	PARAMETER		LIMITS		UNITS	TEST CONDITIONS
		MIN	TYP	MAX		
t_{PLH} t_{PHL}	Propagation Delay, Data to Q		15 9.0	27 17	ns	
t_{PLH} t_{PHL}	Propagation Delay, Data to $\overline{Q}$		12 7.0	20 15	ns	V_{CC} = 5.0 V C_L = 15 pF
t_{PLH} t_{PHL}	Propagation Delay, Enable to Q		15 14	27 25	ns	
t_{PLH} t_{PHL}	Propagation Delay, Enable to $\overline{Q}$		16 7.0	30 15	ns	

MOTOROLA SCHOTTKY TTL DEVICES

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

SYMBOL	PARAMETER		LIMITS			UNITS	TEST CONDITIONS	
			MIN	TYP	MAX			
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage for All Inputs	
V_{IL}	Input LOW Voltage	54			0.7	V	Guaranteed Input LOW Voltage for All Inputs	
		74			0.8			
V_{IK}	Input Clamp Diode Voltage			−0.65	−1.5	V	V_{CC} = MIN, I_{IN} = −18 mA	
V_{OH}	Output HIGH Voltage	54	2.5	3.5		V	V_{CC} = MIN, I_{OH} = MAX, V_{IN} = V_{IH} or V_{IL} per Truth Table	
		74	2.7	3.5		V		
V_{OL}	Output LOW Voltage	54,74		0.25	0.4	V	I_{OL} = 4.0 mA	V_{CC} = V_{CC} MIN, V_{IN} = V_{IL} or V_{IH} per Truth Table
		74		0.35	0.5	V	I_{OL} = 8.0 mA	
I_{IH}	Input HIGH Current	D Input E Input			20 80	μA	V_{CC} = MAX, V_{IN} = 2.7 V	
		D Input E Input			0.1 0.4	mA	V_{CC} = MAX, V_{IN} = 7.0 V	
I_{IL}	Input LOW Current	D Input E Input			−0.4 −1.6	mA	V_{CC} = MAX, V_{IN} = 0.4 V	
I_{OS}	Short Circuit Current		−20		−100	mA	V_{CC} = MAX	
I_{CC}	Power Supply Current				13	mA	V_{CC} = MAX	

AC CHARACTERISTICS: T_A = 25°C, V_{CC} = 5.0 V

SYMBOL	PARAMETER		LIMITS		UNITS	TEST CONDITIONS
		MIN	TYP	MAX		
t_{PLH} t_{PHL}	Propagation Delay, Data to Q		11 9.0	19 17	ns	V_{CC} = 5.0 V C_L = 15 pF
t_{PLH} t_{PHL}	Propagation Delay, Enable to Q		10 10	18 18	ns	

5

LOGIC DIAGRAM

GUARANTEED OPERATING RANGES

SYMBOL	PARAMETER		MIN	TYP	MAX	UNIT
V_{CC}	Supply Voltage	54	4.5	5.0	5.5	V
		74	4.75	5.0	5.25	
T_A	Operating Ambient Temperature Range	54	−55	25	125	°C
		74	0	25	70	
I_{OH}	Output Current — High	54 , 74			−0.4	mA
I_{OL}	Output Current — Low	54			4.0	mA
		74			8.0	

AC SETUP REQUIREMENTS: $T_A = 25°C$, $V_{CC} = 5.0$ V

SYMBOL	PARAMETER	LIMITS			UNITS	TEST CONDITIONS
		MIN	TYP	MAX		
t_W	Enable Pulse Width High	20			ns	
t_S	Setup Time	20			ns	$V_{CC} = 5.0$ V
t_h	Hold Time	0			ns	

AC WAVE FORMS
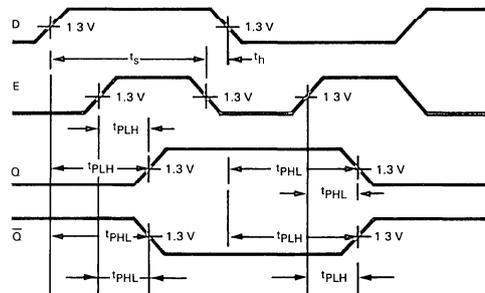
DEFINITION OF TERMS:

SETUP TIME (t_S) — is defined as the minimum time required for the correct logic level to be present at the logic input prior to the clock transition from HIGH-to-LOW in order to be recognized and transferred to the outputs.

HOLD TIME (t_h) — is defined as the minimum time following the clock transition from HIGH-to-LOW that the logic level must be maintained at the input in order to ensure continued recognition. A negative HOLD TIME indicates that the correct logic level may be released prior to the clock transition from HIGH-to-LOW and still be recognized.