National Semiconductor

54LS377/DM74LS377
Octal D Flip-Flop with Common Enable and Clock

General Description

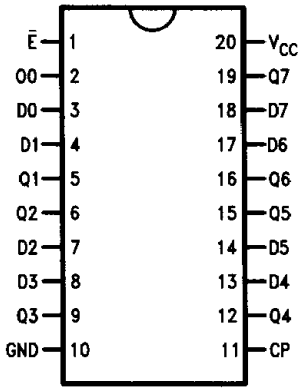
The 'LS377 is an 8-bit register built using advanced low power Schottky technology. This register consists of eight D-type flip-flops with a buffered common clock and a buffered common input enable. The device is packaged in the space-saving (0.3 inch row spacing) 20-pin package.

Features

- 8-bit high speed parallel registers
- Positive edge-triggered D-type flip-flops
- Fully buffered common clock and enable inputs

Connection Diagram

Dual-In-Line Package



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Order Number 54LS377DMQB, 54LS377FMQB, 54LS377LMQB, DM74LS377WM or DM74LS377N
See NS Package Number E20A, J20A, M20B, N20A or W20A

Pin Names	Description
$\overline{E}$	Enable Input (Active LOW)
D0–D7	Data Inputs
CP	Clock Pulse Input (Active Rising Edge)
Q0–Q7	Flip-Flop 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	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	54LS377			DM74LS377			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) t_s (L)	Setup Time HIGH or LOW D_n to CP	20 20			10 10			ns
t_h (H) t_h (L)	Hold Time HIGH or LOW D_n to CP	5.0 5.0			5.0 5.0			ns
t_s (H) t_s (L)	Setup Time HIGH or LOW $\overline{E}$ to CP	10 20			10 20			ns
t_h (H) t_h (L)	Hold Time HIGH or LOW $\overline{E}$ to CP	5.0 5.0			5.0 5.0			ns
t_w (H) t_w (L)	CP Pulse Width HIGH or LOW	20 20			20 20			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				0.1	mA
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.7V				20.0	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 2)	54LS	−20		−100	mA
			DM74	−20		−100	
I_{CC}	Supply Current	V_{CC} = Max				28	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°C (See Section 1 for waveforms and load configurations)

Symbol	Parameter	R_L = 2 kΩ, C_L = 15 pF		Units
		Min	Max	
f_{max}	Maximum Clock Frequency	30		MHz
t_{PLH} t_{PHL}	Propagation Delay CP to Q_n		25 25	ns

Functional Description

The 'LS377 consists of eight edge-triggered D flip-flops with individual D inputs and Q outputs. The Clock (CP) and Enable input ($\overline{E}$) are common to all flip-flops.

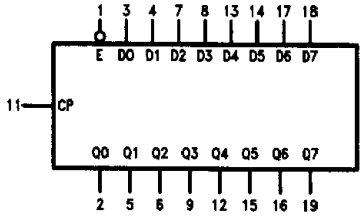
When $\overline{E}$ is LOW, new data is entered into the register on the next LOW-to-HIGH transition of CP. When $\overline{E}$ is HIGH, the register will retain the present data independent of the CP.

Truth Table

Inputs			Output
$\overline{E}$	CP	D_n	Q_n
H	X	X	No Change
L	↗	H	H
L	↗	L	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

Logic Symbol



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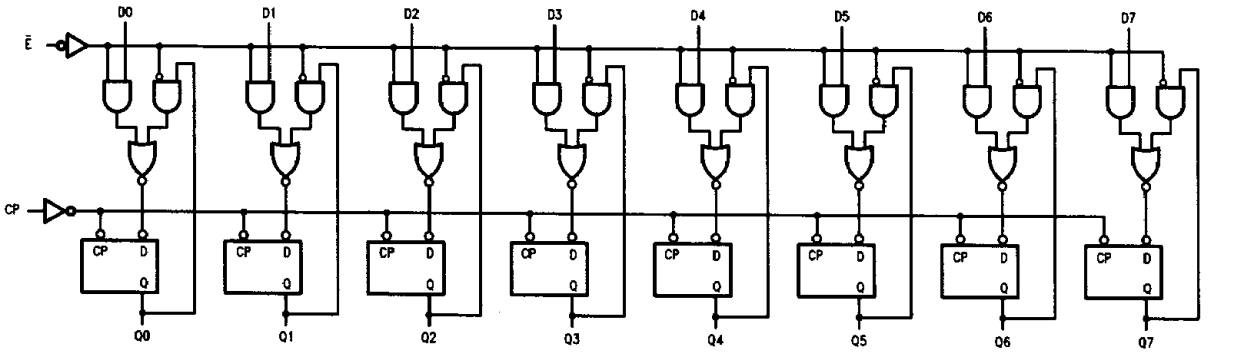
V_{CC} = Pin 20
GND = Pin 10

Logic Diagram



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