

# SN54273, SN54LS273, SN74273, SN74LS273 OCTAL D-TYPE FLIP-FLOP WITH CLEAR

SDLS090 – OCTOBER 1976 – REVISED MARCH 1988

- Contains Eight Flip-Flops With Single-Rail Outputs
- Buffered Clock and Direct Clear Inputs
- Individual Data Input to Each Flip-Flop
- Applications Include:
  - Buffer/Storage Registers
  - Shift Registers
  - Pattern Generators

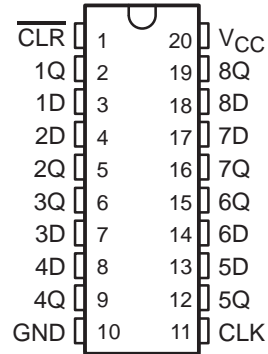
## description

These monolithic, positive-edge-triggered flip-flops utilize TTL circuitry to implement D-type flip-flop logic with a direct clear input.

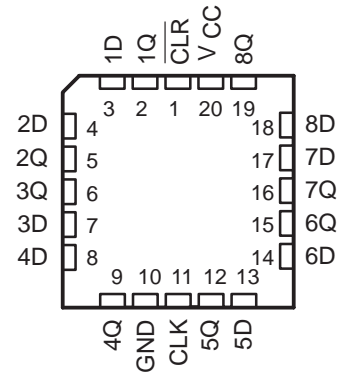
Information at the D inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When the clock input is at either the high or low level, the D input signal has no effect at the output.

These flip-flops are guaranteed to respond to clock frequencies ranging from 0 to 30 megahertz while maximum clock frequency is typically 40 megahertz. Typical power dissipation is 39 milliwatts per flip-flop for the '273 and 10 milliwatts for the 'LS273.

SN54273, SN74LS273 . . . J OR W PACKAGE  
SN74273 . . . N PACKAGE  
SN74LS273 . . . DW OR N PACKAGE  
(TOP VIEW)



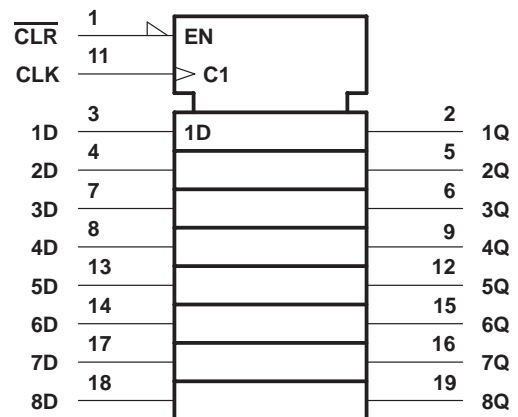
SN54LS273 . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE  
(each flip-flop)

INPUTS			OUTPUT Q
CLEAR	CLOCK	D	
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Q <sub>0</sub>

## logic symbol†

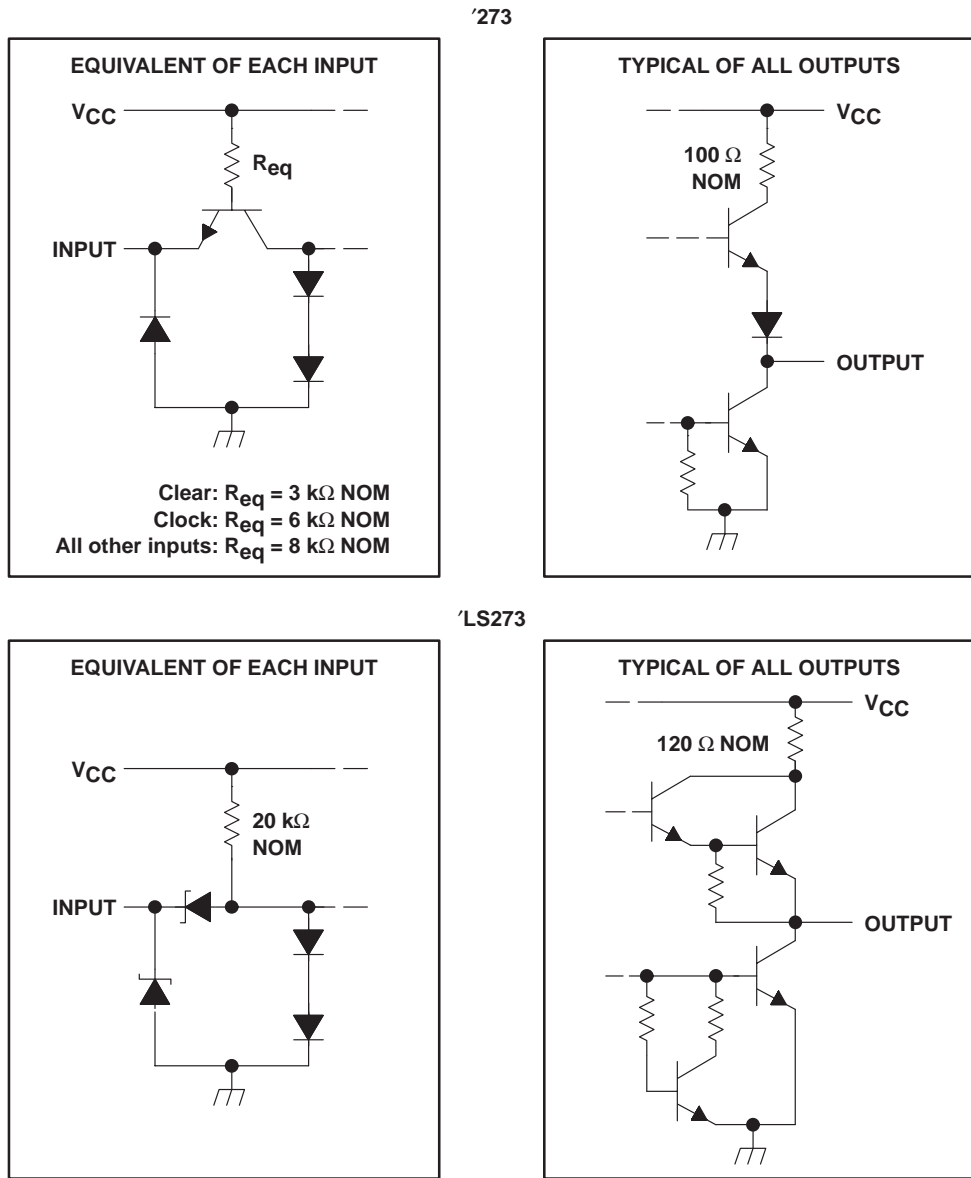


† This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12. Pin numbers shown are for the DW, J, N, and W packages.

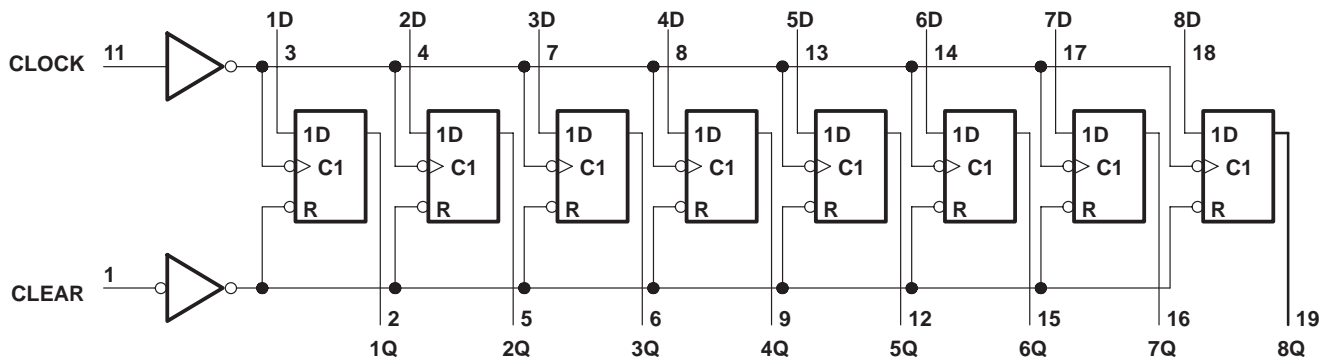
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## schematics of inputs and outputs



## logic diagram (positive logic)



Pin numbers shown are for the DW, J, N, and W packages.

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## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, $V_{CC}$ (see Note 1) .....	7 V
Input voltage . . . . .	5.5 V
Operating free-air temperature range, $T_A$ : SN54273 .....	-55°C to 125°C
SN74273 .....	0°C to 70°C
Storage temperature range .....	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

## recommended operating conditions

	SN54273			SN74273			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, $V_{CC}$	4.5	5	5.5	4.75	5	5.25	V
High-level output current, $I_{OH}$			-800			-800	$\mu$ A
Low-level output current, $I_{OL}$			16			16	mA
Clock frequency, $f_{clock}$	0		30	0		30	MHz
Width of clock or clear pulse, $t_w$	16.5			16.5			ns
Setup time, $t_{su}$	Data input		20 $\uparrow$	Data input		20 $\uparrow$	ns
	Clear inactive state		25 $\uparrow$	Clear inactive state		25 $\uparrow$	
Data hold time, $t_h$	5 $\uparrow$			5 $\uparrow$			ns
Operating free-air temperature, $T_A$	-55		125	0		70	°C

$\uparrow$  The arrow indicates that the rising edge of the clock pulse is used for reference.

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS $\dagger$	MIN	TYP $\ddagger$	MAX	UNIT
$V_{IH}$	High-level input voltage		2			V
$V_{IL}$	Low-level input voltage				0.8	V
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}$ , $I_I = -12 \text{ mA}$			-1.5	V
$V_{OH}$	High-level output voltage	$V_{CC} = \text{MIN}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OH} = -800 \mu\text{A}$	2.4	3.4		V
$V_{OL}$	Low-level output voltage	$V_{CC} = \text{MIN}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OH} = 16 \text{ mA}$			0.4	V
$I_I$	Input current at maximum input voltage	$V_{CC} = \text{MAX}$ , $V_I = 5.5 \text{ V}$			1	mA
$I_{IH}$	High-level input current	Clear			80	$\mu$ A
		Clock or D	$V_{CC} = \text{MAX}$ , $V_I = 2.4 \text{ V}$		40	
$I_{IL}$	Low-level input current	Clear	$V_{CC} = \text{MAX}$ , $V_I = 0.4 \text{ V}$		-3.2	mA
		Clock or D			-1.6	
$I_{OS}$	Short-circuit output current $\S$	$V_{CC} = \text{MAX}$	-18		-57	mA
$I_{CC}$	Supply current	$V_{CC} = \text{MAX}$ , See Note 2		62	94	mA

$\dagger$  For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

$\ddagger$  All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

$\S$  Not more than one output should be shorted at a time.

NOTE 2: With all outputs open and 4.5 V applied to all data and clear inputs,  $I_{CC}$  is measured after a momentary ground, then 4.5 V, is applied to clock.

# SN54273, SN54LS273, SN74273, SN74LS273 OCTAL D-TYPE FLIP-FLOP WITH CLEAR

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## switching characteristics, $V_{CC} = 5\text{ V}$ , $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$f_{\max}$	Maximum clock frequency	$C_L = 15\text{ pF}$ , $R_L = 400\ \Omega$ , See Note 3	30	40		MHz
$t_{PHL}$	Propagation delay time, high-to-low-level output from clear			18	27	ns
$t_{PLH}$	Propagation delay time, low-to-high-level output from clock			17	27	ns
$t_{PHL}$	Propagation delay time, high-to-low-level output from clock			18	27	ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage	7 V
Operating free-air temperature range, $T_A$ : SN54LS273	$-55^\circ\text{C}$ to $125^\circ\text{C}$
SN74LS273	$0^\circ\text{C}$ to $70^\circ\text{C}$
Storage temperature range	$-65^\circ\text{C}$ to $150^\circ\text{C}$

NOTE 1: Voltage values are with respect to network ground terminal.

## recommended operating conditions

	SN54LS273			SN74LS273			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, $V_{CC}$	4.5	5	5.5	4.75	5	5.25	V
High-level output current, $I_{OH}$			-400			-400	$\mu\text{A}$
Low-level output current, $I_{OL}$			4			8	mA
Clock frequency, $f_{\text{clock}}$	0		30	0		30	MHz
Width of clock or clear pulse, $t_w$	20			20			ns
Setup time, $t_{su}$	Data input			20 $\uparrow$			ns
	Clear inactive state			25 $\uparrow$			
Data hold time, $t_h$	5 $\uparrow$			5 $\uparrow$			ns
Operating free-air temperature, $T_A$	-55		125	0		70	$^\circ\text{C}$

$\uparrow$  The arrow indicates that the rising edge of the clock pulse is used for reference.

# SN54273, SN54LS273, SN74273, SN74LS273 OCTAL D-TYPE FLIP-FLOP WITH CLEAR

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**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

PARAMETER	TEST CONDITIONST	SN54LS273			SN74LS273			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V <sub>IH</sub> High-level input voltage		2			2			V
V <sub>IL</sub> Low-level input voltage				0.7			0.8	V
V <sub>IK</sub> Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA			-1.5			-1.5	V
V <sub>OH</sub> High-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>ILmax</sub> , I <sub>OH</sub> = -400 μA	2.5	3.4		2.7	3.4		V
V <sub>OL</sub> Low-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>ILmax</sub> , I <sub>OL</sub> = 4 mA	0.25	0.4		0.25	0.4		V
					0.35	0.5		
I <sub>I</sub> Input current at maximum input voltage	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V			0.1			0.1	mA
I <sub>IH</sub> High-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V			20			20	μA
I <sub>IL</sub> Low-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V			-0.4			-0.4	mA
I <sub>OS</sub> Short-circuit output current§	V <sub>CC</sub> = MAX	-20		-100	-20		-100	mA
I <sub>CC</sub> Supply current	V <sub>CC</sub> = MAX, See Note 2		17	27		17	27	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

§ Not more than one output should be shorted at a time and duration of short circuit should not exceed one second.

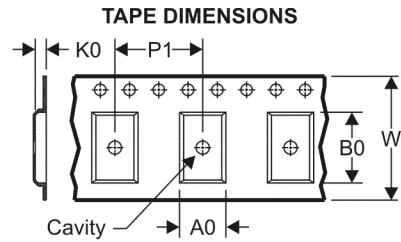
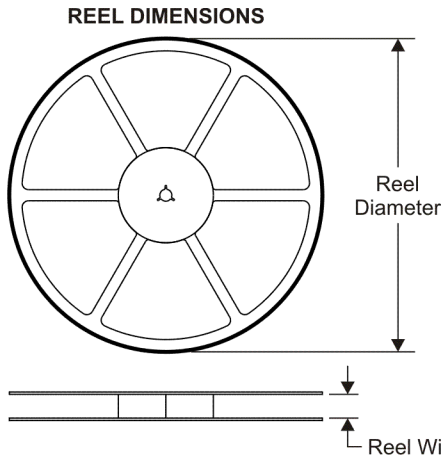
NOTE 2: With all outputs open and 4.5 V applied to all data and clear inputs, I<sub>CC</sub> is measured after a momentary ground, then 4.5 V, is applied to clock.

## switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
f <sub>max</sub> Maximum clock frequency	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ, See Note 3	30	40		MHz
t <sub>PHL</sub> Propagation delay time, high-to-low-level output from clear			18	27	ns
t <sub>PLH</sub> Propagation delay time, low-to-high-level output from clock			17	27	ns
t <sub>PHL</sub> Propagation delay time, high-to-low-level output from clock			18	27	ns

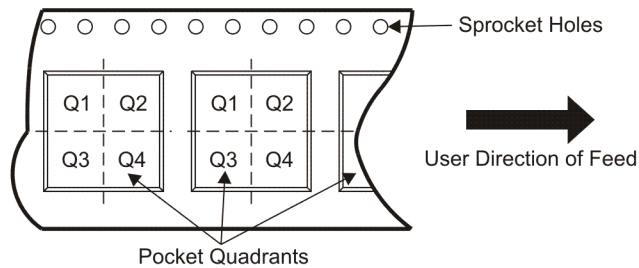
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

**TAPE AND REEL INFORMATION**



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LS273DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
SN74LS273NSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	2.5	12.0	24.0	Q1

**TAPE AND REEL BOX DIMENSIONS**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS273DWR	SOIC	DW	20	2000	346.0	346.0	41.0
SN74LS273NSR	SO	NS	20	2000	346.0	346.0	41.0

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