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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.

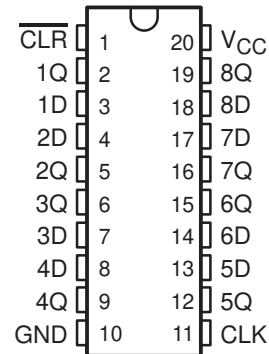
Information at the D inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When the clock input is 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.

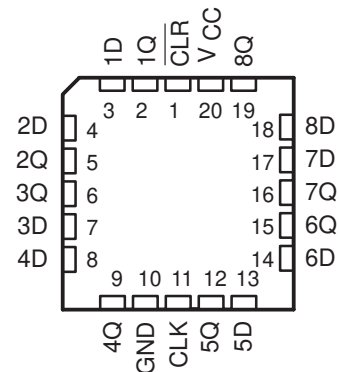
FUNCTION TABLE
(each flip-flop)

INPUTS			OUTPUT Q
CLEAR	CLOCK	D	
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Q ₀

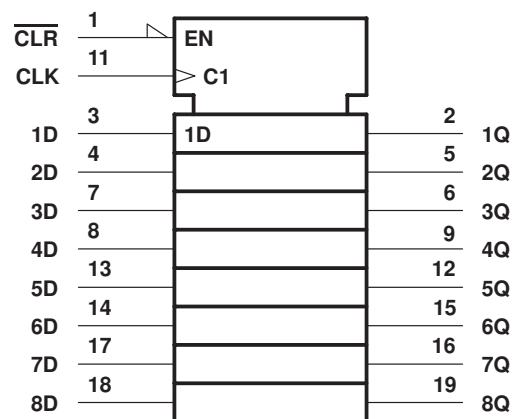
SN54273, SN74LS273 . . . J OR W PACKAGE
SN74273 . . . N PACKAGE
SN74LS273 . . . DW OR N PACKAGE
(TOP VIEW)



SN54LS273 . . . FK PACKAGE
(TOP VIEW)



logic symbol†



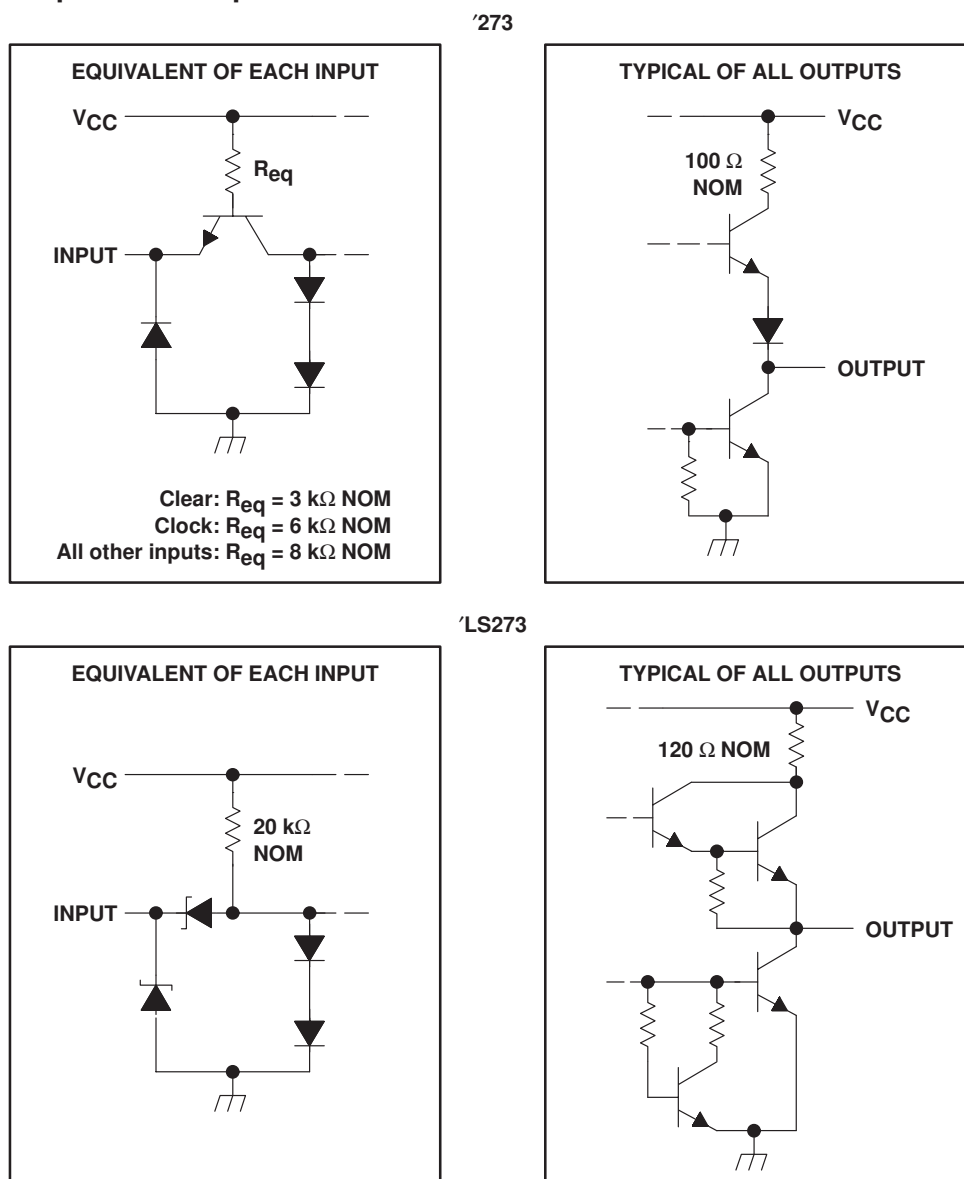
† This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12. Pin numbers shown are for the DW, J, N, and W packages.

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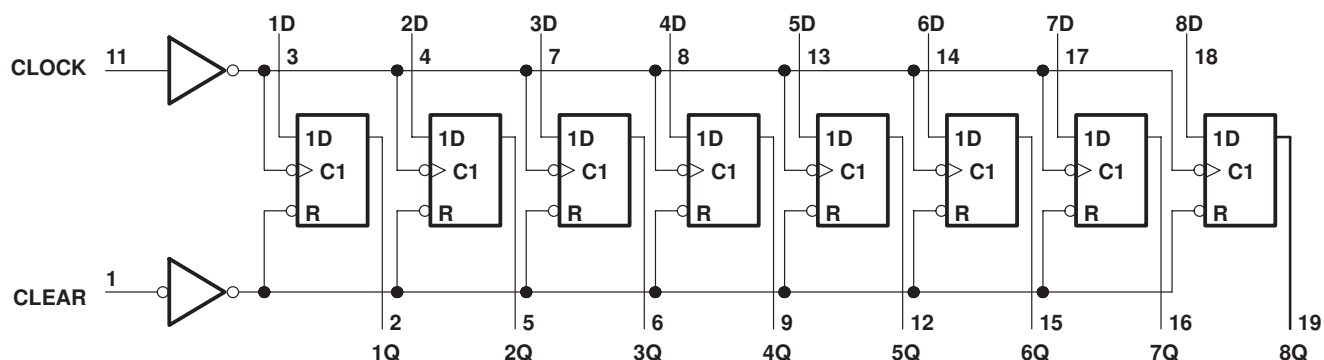
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schematics of inputs and outputs



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	μ 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 $\uparrow$			20 $\uparrow$			ns
	Clear inactive state	25 $\uparrow$			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	$V_{CC} = \text{MAX}$, $V_I = 2.4 \text{ V}$			80	μ A
		Clock or D				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.



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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°C to 125°C
SN74LS273	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

		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	μA
Low-level output current, I_{OL}				4			8	mA
Clock frequency, f_{clock}		0		30	0		30	MHz
Width of clock or clear pulse, t_w		20			20			ns
Setup time, t_{su}	Data input	20 $\uparrow$			20 $\uparrow$			ns
	Clear inactive state	25 $\uparrow$			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.



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

PARAMETER	TEST CONDITION [†]	SN54LS273			SN74LS273			UNIT
		MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	
V _{IH} High-level input voltage		2			2			V
V _{IL} Low-level input voltage				0.7			0.8	V
V _{IK} Input clamp voltage	V _{CC} = MIN, I _I = -18 mA			-1.5			-1.5	V
V _{OH} High-level output voltage	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = V _{ILmax} , I _{OH} = -400 µA	2.5	3.4		2.7	3.4		V
V _{OL} Low-level output voltage	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = V _{ILmax} , I _{OL} = 4 mA	0.25	0.4		0.25	0.4		V
				I _{OL} = 8 mA		0.35	0.5	
I _I Input current at maximum input voltage	V _{CC} = MAX, V _I = 7 V			0.1			0.1	mA
I _{IH} High-level input current	V _{CC} = MAX, V _I = 2.7 V			20			20	µA
I _{IL} Low-level input current	V _{CC} = MAX, V _I = 0.4 V			-0.4			-0.4	mA
I _{OS} Short-circuit output current [§]	V _{CC} = MAX	-20		-100	-20		-100	mA
I _{CC} Supply current	V _{CC} = 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_{CC} = 5 V, T_A = 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_{CC} is measured after a momentary ground, then 4.5 V, is applied to clock.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
f _{max} Maximum clock frequency	C _L = 15 pF, R _L = 2 kΩ, 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.



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