

SN54F378, SN74F378 HEX D-TYPE FLIP-FLOPS WITH CLOCK ENABLE

D2932, MARCH 1987—REVISED JANUARY 1989

- Contains Six D-Type Flip-Flops with Single-Rail Outputs
- Buffered Common Enable Input
- Applications Include:
Buffer/Storage Registers
Shift Register
Pattern Generators
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

description

The SN54F378 and SN74F378 are positive-edge-triggered D-type flip-flops with a clock enable input. The 'F378 is similar to the 'F174, but features a common clock enable instead of a common clear.

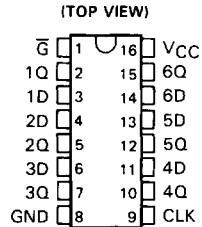
Information at the D inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse if the clock enable input \bar{G} is low. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going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

The SN54F378 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74F378 is characterized for operation from 0°C to 70°C .

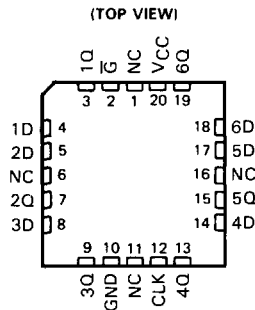
FUNCTION TABLE (EACH FLIP-FLOP)

INPUTS			OUTPUT
\bar{G}	CLOCK	DATA	Q
H	X	X	Q_0
L	↑	H	H
L	↑	L	L
X	L	X	Q_0

SN54F378 J PACKAGE
SN74F378 D OR N PACKAGE

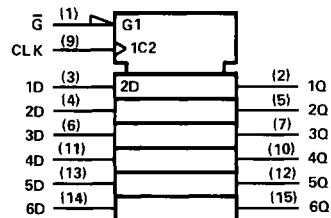


SN54F378 FK PACKAGE



NC—No internal connection

logic symbol†

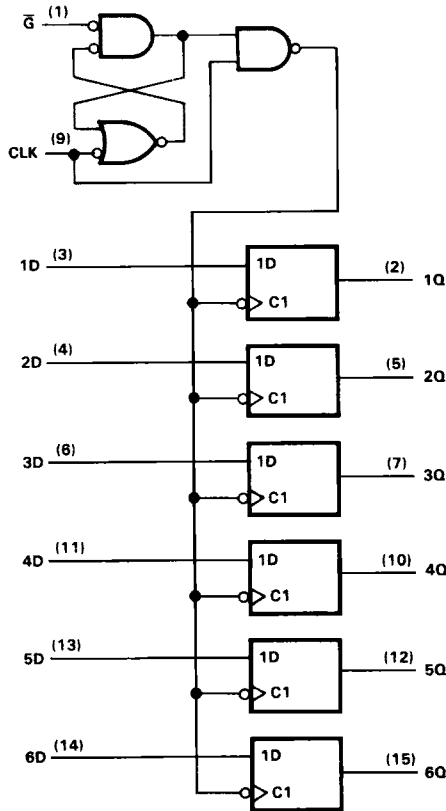


†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, and N packages.

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HEX D-TYPE FLIP-FLOPS WITH CLOCK ENABLE

logic diagram



Pin numbers shown are for D, J, and N packages.

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

Supply voltage, V_{CC}	-0.5 V to 7 V
Input voltage [†]	-1.2 V to 7 V
Input current	-30 mA to 5 mA
Voltage applied to any output in the high state	-0.5 V to V_{CC}
Current into any output in the low state	40 mA
Operating free-air temperature range: SN54F378	-55 °C to 125 °C
SN74F378	0 °C to 70 °C
Storage temperature range	-65 °C to 150 °C

[†]The input voltage ratings may be exceeded provided the input current ratings are observed.

SN54F378, SN74F378

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recommended operating conditions

	SN54F378			SN74F378			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V _{IH} High-level input voltage	2			2			V
V _{IL} Low-level input voltage			0.8			0.8	V
I _{IK} Input clamp current			-18			-18	mA
I _{OH} High-level output current			-1			-1	mA
I _{OL} Low-level output current			20			20	mA
T _A Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS	SN54F378			SN74F378			UNIT
		MIN	TYP [†]	MAX	MIN	TYP [†]	MAX	
V _{IK}	V _{CC} = 4.5 V, I _I = -18 mA			-1.2			-1.2	V
V _{OH}	V _{CC} = 4.5 V, I _{OH} = -1 mA	2.5	3.4		2.5	3.4		V
	V _{CC} = 4.75 V, I _{OH} = -1 mA				2.7			
V _{OL}	V _{CC} = 4.5 V, I _{OL} = 20 mA		0.3	0.5		0.3	0.5	V
I _I	V _{CC} = 5.5 V, V _I = 7 V			0.1			0.1	mA
I _{IH}	V _{CC} = 5.5 V, V _I = 2.7 V			20			20	μA
I _{IL}	V _{CC} = 5.5 V, V _I = 0.5 V			-0.6			-0.6	mA
I _{OS} [‡]	V _{CC} = 5.5 V, V _O = 0	-60		-150	-60		-150	mA
I _{CC}	V _{CC} = 5.5 V, See Note 1		30			30	45	mA

timing requirements

			V _{CC} = 5 V, T _A = 25°C		V _{CC} = 4.5 V to 5.5 V, T _A = MIN to MAX [‡]				UNIT
			'F378		SN54F378		SN74F378		
			MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock}	Clock frequency		0	80	0	70	0	80	MHz
t _{su}	Setup time before CLK [†]	Data high or low	4		5		4		ns
t _h	Hold time after CLK [†]	Data high or low	0		2		0		ns
t _{su}	Setup time before CLK [†]	\bar{G} high	4		4.5		4		ns
		\bar{G} low	10		13		10		
t _h	Hold time after CLK [†]	\bar{G} high or low	0		0		0		ns
		CLK high	4		5		4		
t _w	Pulse duration	CLK low	6		7.5		6		ns

[†]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 the duration of the short circuit should not exceed one second.

[§]For conditions shown as MIN or MAX, use the appropriate value specified under Recommended Operating Conditions.

NOTE 1: I_{CC} is measured with all outputs open, all data inputs and the enable input grounded, and the CLK input at 4.5 V after being momentarily grounded.

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Data Sheets

PRODUCT PREVIEW

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switching characteristics (see Note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 5 V, C _L = 50 pF, R _L = 500 Ω, T _A = 25°C			V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 500 Ω, T _A = MIN to MAX†			UNIT	
			'F378			SN54F378		SN74F378		
			MIN	TYP	MAX	MIN	MAX	MIN		MAX
f _{max}			80	100			80		MHz	
t _{PLH}	CLK	Any Q	2.2	5.1	7.5			2.2	8.5	ns
t _{PHL}			2.7	5.6	8.5			2.7	9.5	

†For conditions shown as MIN or MAX, use the appropriate value specified under Recommended Operating Conditions.

NOTE 2: Load circuits and waveforms are shown in Section 1.

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Data Sheets

PRODUCT PREVIEW