

SN54HCT534, SN74HCT534 OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

D2804, MARCH 1984—REVISED SEPTEMBER 1987

- Inputs are TTL-Voltage Compatible
- High-Current 3-State Inverting Outputs Can Drive Up to 15 LSTTL Loads
- 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

These 8-bit flip-flops feature three-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly attractive for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The eight flip-flops of the 'HCT534 are edge-triggered D-type flip-flops. On the positive transition of the clock, the Q outputs will be set to the complement of the logic states that were set up at the D inputs. The 'HCT534 is functionally equivalent to the 'HCT374 except for having inverted outputs.

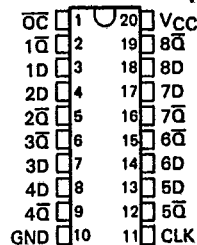
An output-control ($\overline{OC}$) input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or a high-impedance state. In the high-impedance state the outputs neither load nor drive the bus lines significantly.

The output control does not affect the internal operation of the flip-flops. Old data can be retained or new data can be entered while the outputs are off.

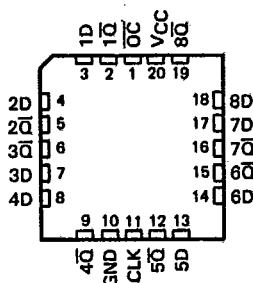
The SN54HCT534 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HCT534 is characterized for operation from -40°C to 85°C .

SN54HCT534 . . . J PACKAGE
SN74HCT534 . . . DW OR N PACKAGE

(TOP VIEW)



SN54HCT534 . . . FK PACKAGE
(TOP VIEW)



FUNCTION TABLE (EACH FLIP-FLOP)

INPUTS			OUTPUT
$\overline{OC}$	CLK	D	$\overline{Q}$
L	↑	H	L
L	↑	L	H
L	L	X	$\overline{Q}_0$
H	X	X	Z

2

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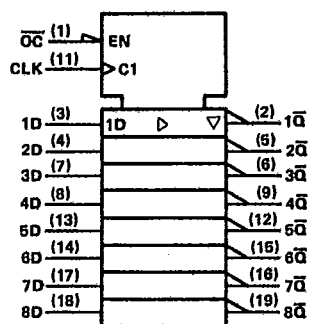
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2-467

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WITH 3-STATE OUTPUTS

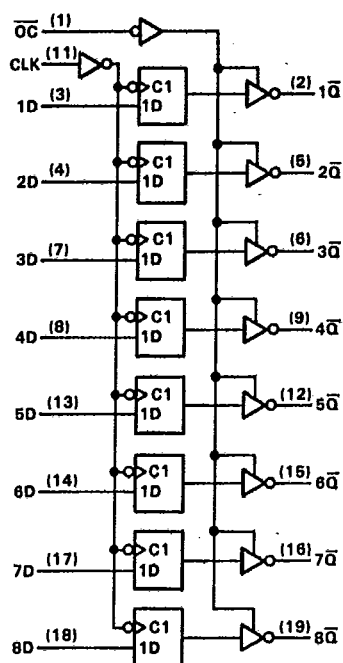
T-46-07-11

logic symbol†



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

logic diagram (positive logic)



SN54HCT534, SN74HCT534
OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS
WITH 3-STATE OUTPUTS

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absolute maximum ratings over operating free-air temperature range†

Supply voltage, V_{CC}	-0.5 V to 7 V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$)	± 20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	± 20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	± 35 mA
Continuous current through V_{CC} or GND pins	± 70 mA
Lead temperature 1,6 mm (1/16 in) from case for 60 s: FK or J package	300°C
Lead Temperature 1,6 mm (1/16 in) from case for 10 s: DW or N package	260°C
Storage temperature range	-65°C to 150°C

†Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

recommended operating conditions

		SN54HCT534			SN74HCT534			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	$V_{CC} = 4.5$ V to 5.5 V			2			V
V_{IL}	Low-level input voltage	$V_{CC} = 4.5$ V to 5.5 V			0			V
V_I	Input voltage	0			V_{CC}			V
V_O	Output voltage	0			V_{CC}			V
t_t	Input transition (rise and fall) times	0			500			ns
T_A	Operating free-air temperature	-55			-40			°C

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

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HCT534		SN74HCT534		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	$V_I = V_{IH}$ or V_{IL} , $I_{OH} = -20$ μ A	4.5 V	4.4	4.499		4.4		4.4		V
	$V_I = V_{IH}$ or V_{IL} , $I_{OH} = -8$ mA	4.5 V	3.98	4.30		3.7		3.84		
V_{OL}	$V_I = V_{IH}$ or V_{IL} , $I_{OH} = 20$ μ A	4.5 V		0.001	0.1		0.1		0.1	V
	$V_I = V_{IH}$ or V_{IL} , $I_{OL} = 8$ mA	4.5 V		0.17	0.26		0.4		0.33	
I_I	$V_I = V_{CC}$ or 0	5.5 V		± 0.1	± 100		± 1000		± 1000	nA
I_{OZ}	$V_O = V_{CC}$ or 0, $V_I = V_{IH}$ or V_{IL}	5.5 V		± 0.01	± 0.5		± 10		± 5	μ A
I_{CC}	$V_I = V_{CC}$ or 0, $I_O = 0$	5.5 V			8		160		80	μ A
$\Delta I_{CC}^\dagger$	One input at 0.5 V or 2.4 V Other inputs at 0 V or V_{CC}	5.5 V		1.4	2.4		3		2.9	mA
C_I		4.5 to 5.5 V		3	10		10		10	pF

† This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or V_{CC} .

2

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2-469

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WITH 3-STATE OUTPUTS

T-46-07-11

timing requirements over recommended operating free-air temperature range (unless otherwise noted)

	V _{CC}	T _A = 25°C		SN54HCT534		SN74HCT534		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock} Clock frequency	4.5 V	0	31	0	21	0	25	MHz
	5.5 V	0	36	0	23	0	28	
t _w Pulse duration	4.5 V	16		24		20		ns
CLK high or low	5.5 V	14		22		18		
t _{su} Setup time, data before CLK↑	4.5 V	20		30		25		ns
	5.5 V	17		27		23		
t _h Hold time, data after CLK↑	4.5 V	5		5		5		ns
	5.5 V	5		5		5		

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C_L = 50 pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25°C			SN54HCT534		SN74HCT534		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f _{max}			4.5 V	31	36		21		25		MHz
			5.5 V	36	40		23		28		
t _{pd}	CLK	Any $\bar{Q}$	4.5 V		28	36		48		45	ns
			5.5 V		26	32		43		41	
t _{en}	$\bar{OC}$	Any $\bar{Q}$	4.5 V		24	30		45		37	ns
			5.5 V		20	27		41		33	
t _{dis}	$\bar{OC}$	Any $\bar{Q}$	4.5 V		22	30		45		37	ns
			5.5 V		20	27		41		33	
t _t		Any $\bar{Q}$	4.5 V		10	12		18		16	ns
			5.5 V		9	11		16		14	

C _{pd}	Power dissipation capacitance per flip-flop	No load, T _A = 25°C	93 pF typ
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switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C_L = 150 pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25°C			SN54HCT534		SN74HCT534		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{pd}	CLK	Any $\bar{Q}$	4.5 V		38	46		69		57	ns
			5.5 V		36	41		62		51	
t _{en}	$\bar{OC}$	Any $\bar{Q}$	4.5 V		30	40		60		50	ns
			5.5 V		27	36		54		45	
t _t		Any $\bar{Q}$	4.5 V		18	42		63		53	ns
			5.5 V		16	38		57		48	

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