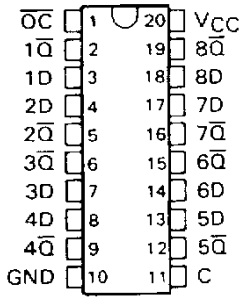
SN54HCT533, SN74HCT533
OCTAL D-TYPE TRANSPARENT LATCHES WITH 3-STATE OUTPUTS

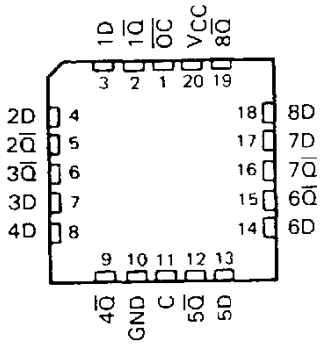
D2804, MARCH 1984—REVISED SEPTEMBER 1987

- **Inputs are TTL-Voltage Compatible**
- **8 Latches in a Single Package**
- **High-Current 3-State Inverting Outputs Can Drive Up to 15 LSTTL Loads**
- **Full Parallel Access for Loading**
- **Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**
- **Dependable Texas Instruments Quality and Reliability**

SN54HCT533 . . . J PACKAGE
SN74HCT533 . . . DW OR N PACKAGE
(TOP VIEW)



SN54HCT533 . . . FK PACKAGE
(TOP VIEW)



description

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

The eight latches of the 'HCT533 are transparent D-type latches. While the enable (C) is high, the $\overline{Q}$ outputs will follow the complements of the D inputs. When the enable is taken low, the $\overline{Q}$ outputs will be latched at the inverses of the levels that were set up at the D inputs. The 'HCT533 is functionally equivalent to the 'HCT373 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 high-impedance third state and increased drive provide the capability to drive the bus lines in a bus-organized system without need for interface or pull-up components.

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

The SN54HCT533 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74HCT533 is characterized for operation from −40°C to 85°C.

FUNCTION TABLE
(EACH LATCH)

INPUTS			OUTPUT
$\overline{OC}$	ENABLE C	D	$\overline{Q}$
L	H	H	L
L	H	L	H
L	L	X	$\overline{Q}_0$
H	X	X	Z

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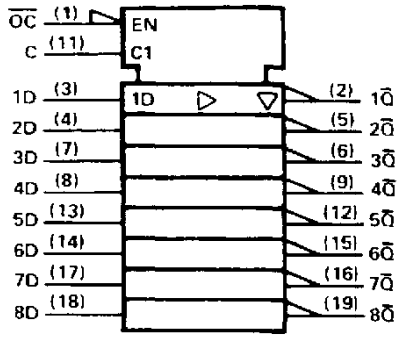
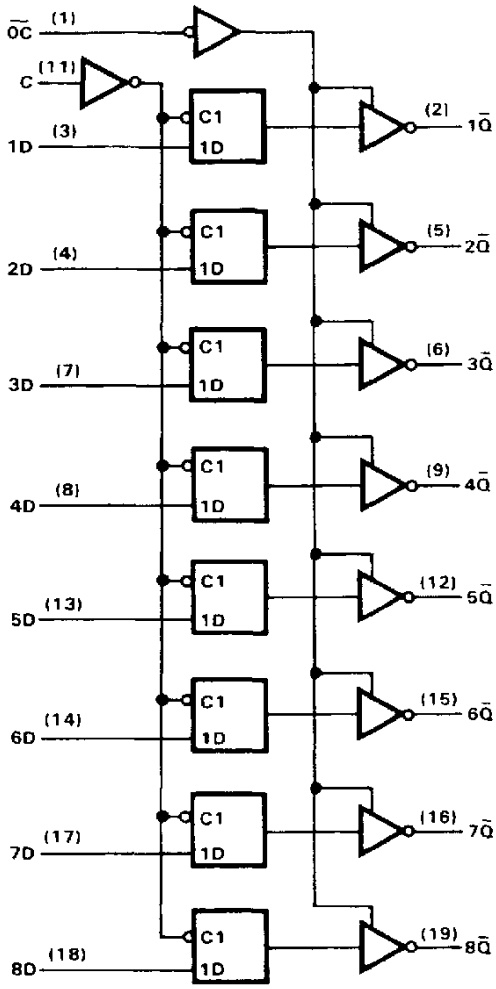
logic symbol†



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

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range†

Supply voltage range, 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

			SN54HCT533			SN74HCT533			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			2			V
V_{IL}	Low-level input voltage	V_{CC} = 4.5 V to 5.5 V	0		0.8	0		0.8	V
V_I	Input voltage		0		V_{CC}	0		V_{CC}	V
V_O	Output voltage		0		V_{CC}	0		V_{CC}	V
t_t	Input transition (rise and fall) times		0		500	0		500	ns
T_A	Operating free-air temperature		−55		125	−40		85	°C

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

PARAMETER	TEST CONDITIONS	V_{CC}	T_A = 25°C			SN54HCT533		SN74HCT533		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	V_I = V_{IH} or V_{IL}, I_{OH} = −20 μA	4.5 V	4.4	4.499		4.4		4.4		V
	V_I = V_{IH} or V_{IL}, I_{OH} = −6 mA	4.5 V	3.98	4.30		3.7		3.84		
V_{OL}	V_I = V_{IH} or V_{IL}, I_{OH} = 20 μA	4.5 V		0.001	0.1		0.1		0.1	V
	V_I = V_{IH} or V_{IL}, I_{OL} = 6 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	μA
I_{CC}	V_I = V_{CC} or 0, I_O = 0	5.5 V			8		160		80	μA
ΔI_{CC}	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

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

		V_{CC}	T_A = 25°C		SN54HCT533		SN74HCT533		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration, enable C high	4.5 V	20		30		25		ns
		5.5 V	17		27		23		
t_{su}	Setup time, data before enable C↓	4.5 V	10		15		13		ns
		5.5 V	9		14		12		
t_h	Hold time, data after enable C↓	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			SN54HCT533		SN74HCT533		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	D	$\overline{Q}$	4.5 V		38	35		53		44	ns
			5.5 V		24	32		48		40	
t_{pd}	C	Any $\overline{Q}$	4.5 V		30	35		53		44	ns
			5.5 V		28	32		48		40	
t_{en}	$\overline{OC}$	Any $\overline{Q}$	4.5 V		29	35		53		44	ns
			5.5 V		25	32		48		40	
t_{dis}	$\overline{OC}$	Any $\overline{Q}$	4.5 V		25	35		53		44	ns
			5.5 V		24	32		48		40	
t_t		Any $\overline{Q}$	4.5 V		10	12		18		15	ns
			5.5 V		9	11		16		14	

C_{pd}	Power dissipation capacitance per latch	No load, T_A = 25°C	50 pF typ

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			SN54HCT533		SN74HCT533		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	D	$\overline{Q}$	4.5 V		36	52		79		65	ns
			5.5 V		32	47		71		59	
t_{pd}	C	Any $\overline{Q}$	4.5 V		40	52		79		65	ns
			5.5 V		38	47		71		59	
t_{en}	$\overline{OC}$	Any $\overline{Q}$	4.5 V		35	52		79		65	ns
			5.5 V		29	47		71		59	
t_t		Any $\overline{Q}$	4.5 V		18	42		63		53	ns
			5.5 V		16	38		57		48	

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

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