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## Quality Overview

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-35835
  - Class Q Military
  - Class V Space Level
- Qualified Suppliers List of Distributors (QSLD)
  - Rochester is a critical supplier to DLA and meets all industry and DLA standards.

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The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OEM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

# SN54HC534, SN74HC534 OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

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- High-Current 3-State Inverting Outputs Can Drive up to 15 LSTTL Loads
- Package Options Include Plastic Small-Outline (DW) and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

These 8-bit flip-flops feature 3-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.

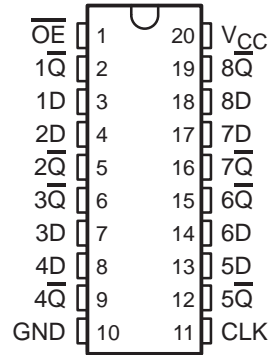
The eight flip-flops of the 'HC534 are edge-triggered D-type flip-flops. On the positive transition of the clock (CLK) input, the  $\bar{Q}$  outputs are set to the complement of the logic states that were set up at the data (D) inputs. The 'HC534 are functionally equivalent to the 'HC374, but the 'HC534 have inverted outputs.

An output-enable ( $\overline{OE}$ ) input places the eight outputs in either a normal logic state (high or low logic levels) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without interface or pullup components.

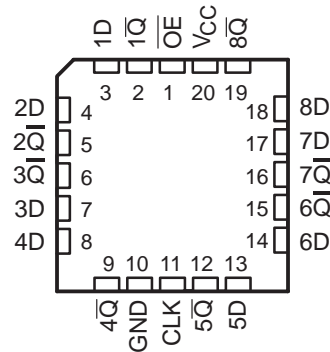
$\overline{OE}$  does not affect the internal operations of the flip-flops. Old data can be retained or new data can be entered while the outputs are off.

The SN54HC534 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74HC534 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

SN54HC534 . . . J OR W PACKAGE  
SN74HC534 . . . DW OR N PACKAGE  
(TOP VIEW)



SN54HC534 . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE  
(each flip-flop)

INPUTS			OUTPUT
$\overline{OE}$	CLK	D	$\bar{Q}$
L	$\uparrow$	H	L
L	$\uparrow$	L	H
L	H or L	X	$\bar{Q}_0$
H	X	X	Z



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 **TEXAS  
INSTRUMENTS**

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SCLS311A – JANUARY 1996 – REVISED MAY 1997

## recommended operating conditions

		SN54HC534			SN74HC534			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	2	5	6	2	5	6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V		1.5	1.5		V	
		V <sub>CC</sub> = 4.5 V		3.15	3.15			
		V <sub>CC</sub> = 6 V		4.2	4.2			
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V		0	0.5	0	0.5	V
		V <sub>CC</sub> = 4.5 V		0	1.35	0	1.35	
		V <sub>CC</sub> = 6 V		0	1.8	0	1.8	
V <sub>I</sub>	Input voltage	0		V <sub>CC</sub>	0		V <sub>CC</sub>	V
V <sub>O</sub>	Output voltage	0		V <sub>CC</sub>	0		V <sub>CC</sub>	V
t <sub>t</sub>	Input transition (rise and fall) time	V <sub>CC</sub> = 2 V		0	1000	0	1000	ns
		V <sub>CC</sub> = 4.5 V		0	500	0	500	
		V <sub>CC</sub> = 6 V		0	400	0	400	
T <sub>A</sub>	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 <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54HC534		SN74HC534		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20 μA	2 V	1.9	1.998		1.9		1.9	V	
			4.5 V	4.4	4.499		4.4		4.4		
			6 V	5.9	5.999		5.9		5.9		
		I <sub>OH</sub> = -6 mA	4.5 V	3.98	4.3		3.7		3.84		
		I <sub>OH</sub> = -7.8 mA	6 V	5.48	5.8		5.2		5.34		
V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20 μA	2 V		0.002	0.1		0.1		V	
			4.5 V		0.001	0.1		0.1			0.1
			6 V		0.001	0.1		0.1			0.1
		I <sub>OL</sub> = 6 mA	4.5 V		0.17	0.26		0.4			0.33
		I <sub>OL</sub> = 7.8 mA	6 V		0.15	0.26		0.4			0.33
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0	6 V		±0.1	±100		±1000		±1000	nA	
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or 0, V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	6 V		±0.01	±0.5		±10		±5	μA	
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0	6 V			8		160		80	μA	
C <sub>i</sub>		2 V to 6 V		3	10		10		10	pF	

**SN54HC534, SN74HC534**  
**OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS**  
**WITH 3-STATE OUTPUTS**

SCLS311A – JANUARY 1996 – REVISED MAY 1997

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

	$V_{CC}$	$T_A = 25^\circ\text{C}$		SN54HC534		SN74HC534		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
$f_{\text{clock}}$ Clock frequency	2 V	0	6	0	4.2	0	5	MHz
	4.5 V	0	31	0	21	0	25	
	6 V	0	36	0	25	0	29	
$t_w$ Pulse duration, CLK high or low	2 V	80		120		100		ns
	4.5 V	16		24		20		
	6 V	14		20		17		
$t_{su}$ Setup time, data before CLK $\uparrow$	2 V	100		150		125		ns
	4.5 V	20		30		25		
	6 V	17		26		21		
$t_h$ Hold time, data after CLK $\uparrow$	2 V	5		5		5		ns
	4.5 V	5		5		5		
	6 V	5		5		5		

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC534		SN74HC534		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$f_{\text{max}}$			2 V	6	11		4.2		5	MHz	
			4.5 V	31	36		21		25		
			6 V	36	40		25		29		
$t_{pd}$	CLK	Any $\bar{Q}$	2 V		88	180		270		225	ns
			4.5 V		28	36		54		45	
			6 V		24	31		46		38	
$t_{en}$	$\overline{OE}$	Any $\bar{Q}$	2 V		77	150		225		190	ns
			4.5 V		26	30		45		38	
			6 V		23	26		38		32	
$t_{dis}$	$\overline{OE}$	Any $\bar{Q}$	2 V		51	150		225		190	ns
			4.5 V		25	30		45		38	
			6 V		23	26		38		32	
$t_t$		Any $\bar{Q}$	2 V		28	60		90		75	ns
			4.5 V		8	12		18		15	
			6 V		6	10		15		13	



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**WITH 3-STATE OUTPUTS**

SCLS311A – JANUARY 1996 – REVISED MAY 1997

switching characteristics over recommended operating free-air temperature range,  $C_L = 150$  pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC534		SN74HC534		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	CLK	Any $\bar{Q}$	2 V	105	230	345	290	ns			
			4.5 V	35	46	69	58				
			6 V	31	39	58	49				
$t_{en}$	$\overline{OE}$	Any $\bar{Q}$	2 V	95	200	300	250	ns			
			4.5 V	32	40	60	50				
			6 V	29	34	51	43				
$t_t$		Any $\bar{Q}$	2 V	60	210	315	265	ns			
			4.5 V	17	42	63	53				
			6 V	14	36	53	45				

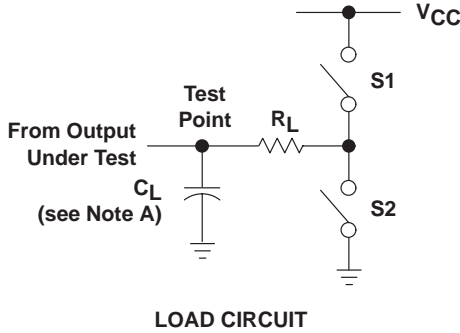
operating characteristics,  $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance per flip-flop	No load	100	pF

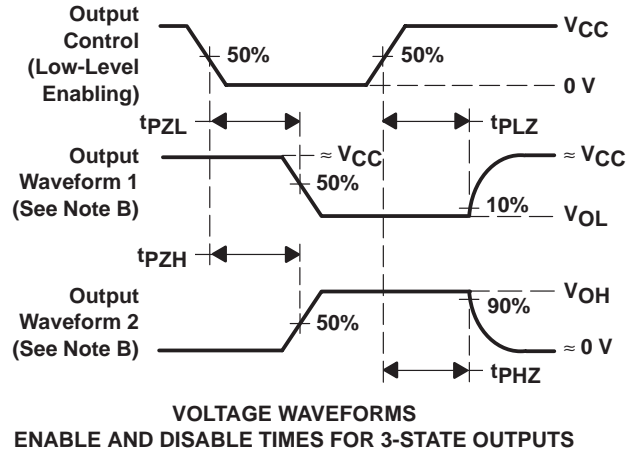
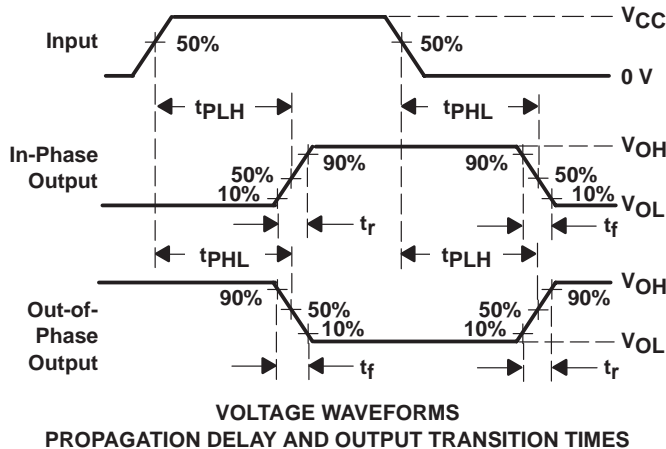
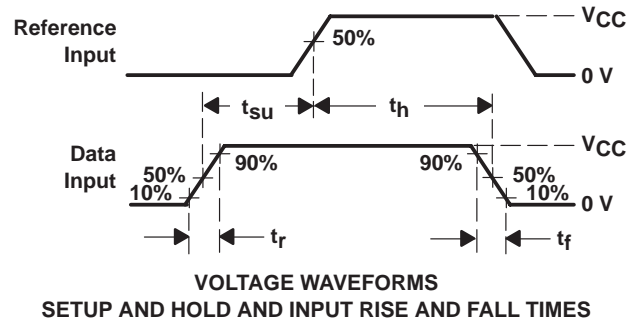
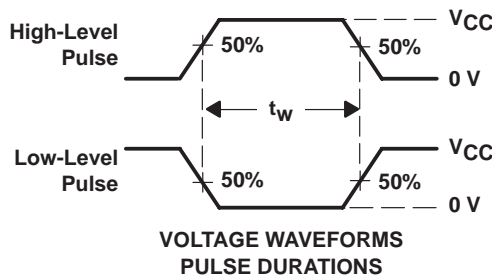
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SCLS311A – JANUARY 1996 – REVISED MAY 1997

## PARAMETER MEASUREMENT INFORMATION



PARAMETER	$R_L$	$C_L$	S1	S2
$t_{en}$	1 k $\Omega$	50 pF or 150 pF	Open	Closed
			Closed	Open
$t_{dis}$	1 k $\Omega$	50 pF	Open	Closed
			Closed	Open
$t_{pd}$ or $t_t$	—	50 pF or 150 pF	Open	Open



- NOTES: A.  $C_L$  includes probe and test-fixture capacitance.  
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
 C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r = 6$  ns,  $t_f = 6$  ns.  
 D. For clock inputs,  $f_{max}$  is measured when the input duty cycle is 50%.  
 E. The outputs are measured one at a time with one input transition per measurement.  
 F.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .  
 G.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .  
 H.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 1. Load Circuit and Voltage Waveforms

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