

# SN54F534, SN74F534 OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

D2932, MARCH 1987—REVISED JANUARY 1989

- 3-State Bus-Driving Inverting Outputs
- Buffered Control Inputs
- 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 'F534 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 'F534 is equivalent to the 'F374 except for having inverted outputs.

A buffered output-control 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 provide the capability to drive the bus lines in a bus-organized system without need for interface or pull-up components.

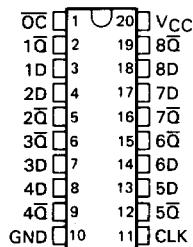
The output control does not affect the internal operation of the flip-flops. Old data can be retained or new data can be entered while the outputs are off.

The SN54F534 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74F534 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

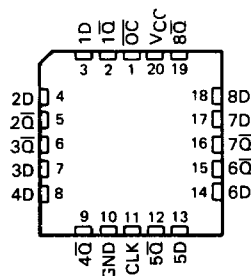
**FUNCTION TABLE**  
(EACH FLIP-FLOP)

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

SN54F534 . . . J PACKAGE  
SN74F534 . . . DW OR N PACKAGE  
(TOP VIEW)



SN54F534 . . . FK PACKAGE  
(TOP VIEW)



**PRODUCTION DATA** documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

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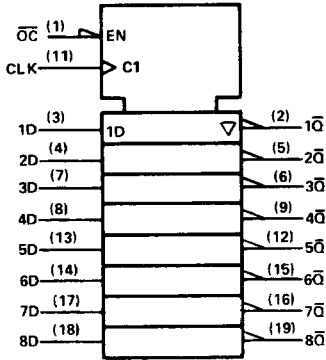
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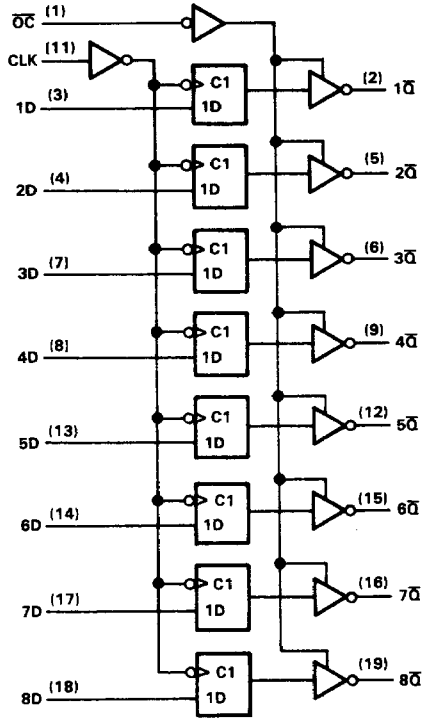
Data Sheets

**SN54F534, SN74F534**  
**OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS**

logic symbol†



logic diagram (positive logic)



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

# SN54F534, SN74F534

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

### absolute maximum ratings over operating free-air temperature range

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 disabled or power-off state .....	-0.5 V to 5.5 V
Voltage applied to any output in the high state .....	-0.5 V to $V_{CC}$
Current into any output in the low state: SN54F534 .....	40 mA
SN74F534 .....	48 mA
Operating free-air temperature range: SN54F534 .....	-55°C to 125°C
SN74F534 .....	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.

### recommended operating conditions

		SN54F534			SN74F534			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			V
$I_{IK}$	Input clamp current				-18			mA
$I_{OH}$	High-level output current				-3			mA
$I_{OL}$	Low-level output current				24			mA
$T_A$	Operating free-air temperature	-55			125			°C

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

PARAMETER	TEST CONDITIONS		SN54F534			SN74F534			UNIT
			MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	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
	$V_{CC} = 4.5$ V,	$I_{OH} = -3$ mA	2.4	3.3		2.4	3.3		
	$V_{CC} = 4.75$ V,	$I_{OH} = -1$ mA to -3 mA				2.7			
$V_{OL}$	$V_{CC} = 4.5$ V,	$I_{OL} = 20$ mA	0.3			0.5			V
	$V_{CC} = 4.5$ V,	$I_{OL} = 24$ mA				0.35			
$I_{OZH}$	$V_{CC} = 5.5$ V,	$V_O = 2.7$ V				50			$\mu$ A
$I_{OZL}$	$V_{CC} = 5.5$ V,	$V_O = 0.5$ V				-50			$\mu$ A
$I_I$	$V_{CC} = 5.5$ V,	$V_I = 7$ V				0.1			mA
$I_{IH}$	$V_{CC} = 5.5$ V,	$V_I = 2.7$ V				20			$\mu$ A
$I_{IL}$	$V_{CC} = 5.5$ V,	$V_I = 0.5$ V				-0.6			mA
$I_{OS}^{\S}$	$V_{CC} = 5.5$ V,	$V_O = 0$	-60			-150			mA
$I_{CCZ}$	$V_{CC} = 5.5$ V,	See Note 1	55			86			mA

<sup>‡</sup> All typical values are at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$ .

<sup>\S</sup> Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

NOTE 1:  $I_{CC}$  is measured with  $\overline{OC}$  at 4.5 V, all other inputs grounded.



timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Note 2)

			V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C		V <sub>CC</sub> = 4.5 V to 5.5 V, T <sub>A</sub> = MIN to MAX†				UNIT
			'F534		SN54F534		SN74F534		
			MIN	MAX	MIN	MAX	MIN	MAX	
f <sub>clock</sub>	Clock frequency		0	100	0	60	0	70	MHz
t <sub>su</sub>	Setup time before CLK†	Data high	2		2.5		2		ns
		Data low	2		2		2		
t <sub>h</sub>	Hold time after CLK†	Data high	2		2		2		ns
		Data low	2		2.5		2		
t <sub>w</sub>	Pulse duration	CLK high	7		7		7		ns
		CLK low	6		6		6		

switching characteristics (see Note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 5 V, C <sub>L</sub> = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T <sub>A</sub> = 25°C			V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T <sub>A</sub> = MIN to MAX†				UNIT
			'F534			SN54F534		SN74F534		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f <sub>max</sub>			100			60		70		MHz
t <sub>PLH</sub>	CLK	Q	3.2	6.1	8.5	3.2	10.5	3.2	10	ns
t <sub>PHL</sub>			3.2	6.1	8.5	3.2	11	3.2	10	
t <sub>PZH</sub>	OC	Q	1.2	8.6	11.5	1.2	14	1.2	12.5	ns
t <sub>PZL</sub>			1.2	5.4	7.5	1.2	10	1.2	8.5	
t <sub>PHZ</sub>	OC	Q	1.2	4.9	7	1.2	8	1.2	8	ns
t <sub>PLZ</sub>			1.2	3.9	5.5	1.2	7.5	1.2	6.5	

† 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.