

# SN74F574 OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOP WITH 3-STATE OUTPUTS

SDFS005A – D3034, SEPTEMBER 1987 – REVISED OCTOBER 1993

- Eight D-Type Flip-Flops in a Single Package
- 3-State Bus-Driving True Outputs
- Full Parallel Access for Loading
- Buffered Control Inputs
- Package Options Include Plastic Small-Outline Packages and Standard Plastic 300-mil DIPs

## description

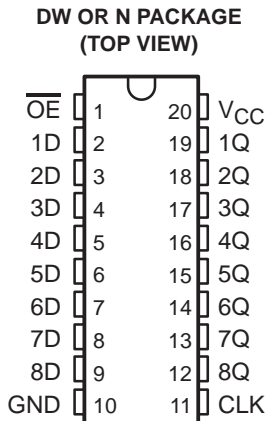
This 8-bit flip-flop features 3-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. It is particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The eight flip-flops of the SN74F574 are edge-triggered D-type flip-flops. On the positive transition of the clock (CLK) input, the Q outputs will be set to the logic levels that were set up at the data (D) inputs.

A buffered output enable ( $\overline{OE}$ ) 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 state and increased drive provide the capability to drive bus lines without need for interface or pullup components.

The output enable ( $\overline{OE}$ ) 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 in the high-impedance state.

The SN74F574 is characterized for operation from 0°C to 70°C.



**FUNCTION TABLE**  
(each flip-flop)

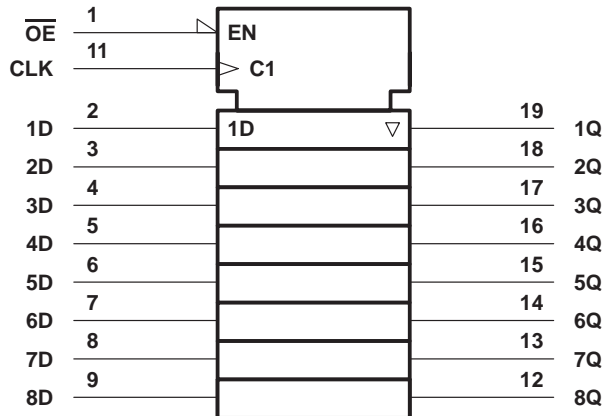
INPUTS			OUTPUT Q
$\overline{OE}$	CLK	D	
L	↑	H	H
L	↑	L	L
L	L	X	$Q_0$
H	X	X	Z

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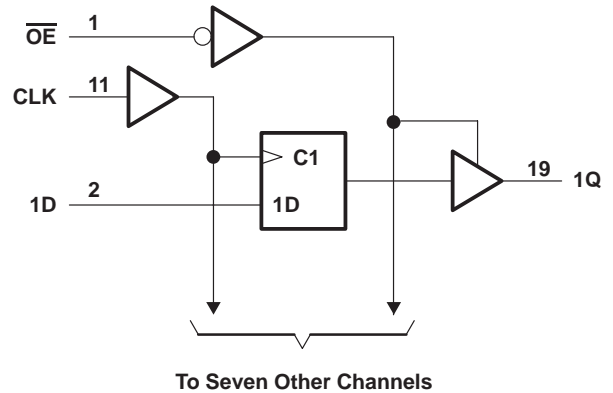
## OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOP WITH 3-STATE OUTPUTS

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### logic symbol†



### logic diagram (positive logic)



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

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

Supply voltage range, $V_{CC}$ .....	-0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1) .....	-1.2 V to 7 V
Input current range .....	-30 mA to 5 mA
Voltage range applied to any output in the disabled or power-off state .....	-0.5 V to 5.5 V
Voltage range applied to any output in the high state .....	-0.5 V to $V_{CC}$
Current into any output in the low state .....	48 mA
Operating free-air temperature range .....	0°C to 70°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.

NOTE 1: The input-voltage ratings may be exceeded provided the input-current ratings are observed.

### recommended operating conditions

		MIN	NOM	MAX	UNIT
$V_{CC}$	Supply voltage	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	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	0		70	°C

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

PARAMETER	TEST CONDITIONS		MIN	TYP <sup>†</sup>	MAX	UNIT
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ ,	$I_I = -18\text{ mA}$			-1.2	V
$V_{OH}$	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -1\text{ mA}$	2.5	3.4		V
		$I_{OH} = -3\text{ mA}$	2.4	3.3		
	$V_{CC} = 4.75\text{ V}$ ,	$I_{OH} = -1\text{ mA to } -3\text{ mA}$	2.7			
$V_{OL}$	$V_{CC} = 4.5\text{ V}$ ,	$I_{OL} = 24\text{ mA}$		0.35	0.5	V
$I_{OZH}$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 2.7\text{ V}$			50	$\mu\text{A}$
$I_{OZL}$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0.5\text{ V}$			-50	$\mu\text{A}$
$I_I$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 7\text{ V}$			0.1	mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$			20	$\mu\text{A}$
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.5\text{ V}$			-0.6	mA
$I_{OS}^{\ddagger}$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0$	-60		-150	mA
$I_{CCZ}$	$V_{CC} = 5.5\text{ V}$ ,	See Note 2		55	86	mA

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

<sup>‡</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 2:  $I_{CCZ}$  is measured with  $\overline{OE}$  at 4.5 V and all other inputs grounded.

### timing requirements

		$V_{CC} = 5\text{ V}$ , $T_A = 25^\circ\text{C}$		$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $T_A = \text{MIN to MAX}^{\S}$		UNIT
		MIN	MAX	MIN	MAX	
$f_{\text{clock}}$	Clock frequency	0	100	0	100	MHz
$t_w$	Pulse duration	CLK high	7	7		ns
		CLK low	6	6		
$t_{su}$	Setup time before CLK $\uparrow$	Data high	2	2		ns
		Data low	2	2		
$t_h$	Hold time after CLK $\uparrow$	Data high	2	2		ns
		Data low	2	2		

### switching characteristics (see Note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5\text{ V}$ , $C_L = 50\text{ pF}$ , $R_L = 500\ \Omega$ , $T_A = 25^\circ\text{C}$			$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $C_L = 50\text{ pF}$ , $R_L = 500\ \Omega$ , $T_A = \text{MIN to MAX}^{\S}$		UNIT
			MIN	TYP	MAX	MIN	MAX	
$f_{\text{max}}$			100			100		MHz
$t_{PLH}$	CLK	Any Q	3.2	6.1	8.5	3.2	10	ns
$t_{PHL}$			3.2	6.1	8.5	3.2	10	
$t_{PZH}$	$\overline{OE}$	Any Q	1.2	8.6	11.5	1.2	12.5	ns
$t_{PZL}$			1.2	4.9	7.5	1.2	8.5	
$t_{PHZ}$	$\overline{OE}$	Any Q	1.2	4.9	7	1.2	8	ns
$t_{PLZ}$			1.2	3.9	5.5	1.2	6.5	

<sup>§</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 3: Load circuits and waveforms are shown in Section 1.





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