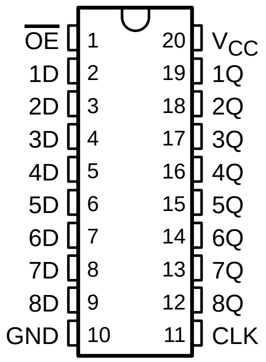
SN54BCT574, SN74BCT574
OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

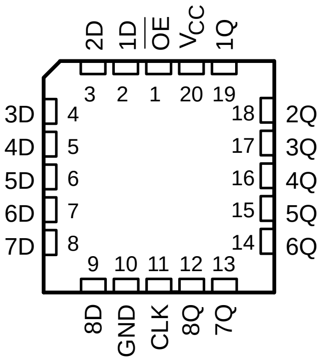
SCBS074B – SEPTEMBER 1991 – REVISED NOVEMBER 1993

- **State-of-the-Art BiCMOS Design Significantly Reduces I_{CCZ}**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **Full Parallel Access for Loading**
- **Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK) and Flatpacks (W), and Plastic and Ceramic 300-mil DIPs (J, N)**

SN54BCT574 . . . J OR W PACKAGE
SN74BCT574 . . . DW OR N PACKAGE
(TOP VIEW)



SN54BCT574 . . . FK PACKAGE
(TOP VIEW)



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 ′BCT574 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.

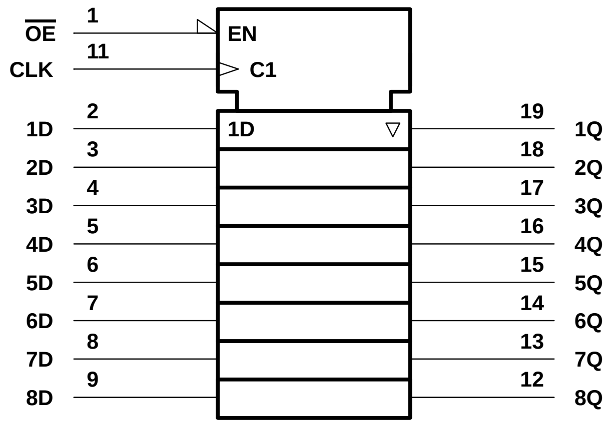
The output enable ($\overline{OE}$) does not affect the internal operations of the flip-flops. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

The SN54BCT574 is characterized for operation over the full military temperature range of –55°C to 125°C. The SN74BCT574 is characterized for operation from 0°C to 70°C.

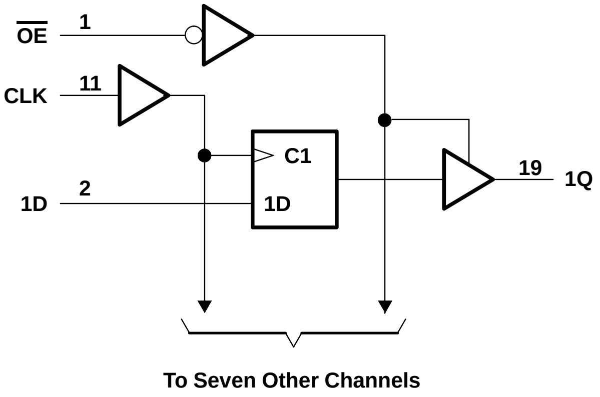
FUNCTION TABLE
(each flip-flop)

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

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)		– 0.5 V to 7 V
Voltage range applied to any output in the disabled or power-off state, V_O		– 0.5 V to 5.5 V
Voltage range applied to any output in the high state, V_O		– 0.5 V to V_{CC}
Input clamp current, I_{IK} ($V_I < 0$)		–30 mA
Current into any output in the low state, I_O:	SN54BCT574	96 mA
	SN74BCT574	128 mA
Operating free-air temperature range:	SN54BCT574	– 55°C to 125°C
	SN74BCT574	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 and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

recommended operating conditions

		SN54BCT574			SN74BCT574			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			0.8	V
I_{IK}	Input clamp current			–18			–18	mA
I_{OH}	High-level output current			–12			–15	mA
I_{OL}	Low-level output current			48			64	mA
T_A	Operating free-air temperature	–55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS		SN54BCT574			SN74BCT574			UNIT
			MIN	TYP†	MAX	MIN	TYP†	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} = –3 mA	2.4	3.3		2.4	3.3		V
		I_{OH} = –12 mA	2	3.2					
		I_{OH} = –15 mA				2	3.1		
V_{OL}	V_{CC} = 4.5 V	I_{OL} = 48 mA		0.38	0.55				V
		I_{OL} = 64 mA					0.42	0.55	
I_I	V_{CC} = 5.5 V,	V_I = 5.5 V			0.4			0.4	mA
I_{IH}	V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	μA
I_{IL}	V_{CC} = 5.5 V,	V_I = 0.5 V			–0.6			–0.6	mA
I_{OS}‡	V_{CC} = 5.5 V,	V_O = 0	–100		–225	–100		–225	mA
I_{OZH}	V_{CC} = 5.5 V,	V_O = 2.7 V			50			50	μA
I_{OZL}	V_{CC} = 5.5 V,	V_O = 0.5 V			–50			–50	μA
I_{CCL}	V_{CC} = 5.5 V,	Outputs open		38.1	62		38.1	62	mA
I_{CCH}	V_{CC} = 5.5 V,	Outputs open		4.9	8		4.9	8	mA
I_{CCZ}	V_{CC} = 5.5 V,	Outputs open		4.5	8		4.9	8	mA
C_i	V_{CC} = 5 V,	V_I = 2.5 V or 0.5 V					5.5		pF
C_o	V_{CC} = 5 V,	V_O = 2.5 V or 0.5 V					8		pF

† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

			V_{CC} = 5 V, T_A = 25°C		SN54BCT574		SN74BCT574		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
f_{clock}	Clock frequency		0	77	0	77	0	77	MHz
t_w	Pulse duration, CLK high or low		6.5		6.5		6.5		ns
t_{su}	Setup time, data before CLK↑	High	4.5		4.5		4.5		ns
		Low	6		6		6		
t_h	Hold time, data after CLK↑	High or low	0		1		0		ns

switching characteristics over recommended ranges of supply voltage and operating free-air temperature, C_L = 50 pF (unless otherwise noted) (see Note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 5 V, T_A = 25°C			SN54BCT574		SN74BCT574		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f_{max}			77			77		77		MHz
t_{PLH}	CLK	Q	2.2	6.5	8.6	2.2	11.2	2.2	10	ns
t_{PHL}			2.8	6.1	8	2.8	9.7	2.8	8.9	
t_{PZH}	$\overline{OE}$	Q	2.5	6.4	8.1	2.5	10.9	2.5	10.4	ns
t_{PZL}			3.7	7.3	9.2	3.7	11.3	3.7	10.9	
t_{PHZ}	$\overline{OE}$	Q	1	4.4	7.4	1	8	1	7.5	ns
t_{PLZ}			1.3	4.2	5.8	1.3	7.1	1.3	6.4	

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

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