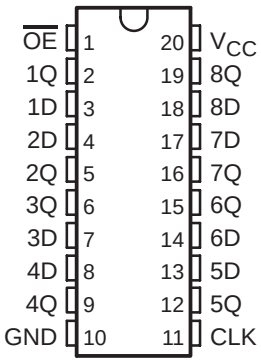
- **State-of-the-Art BiCMOS Design Significantly Reduces I_{CCZ}**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **High-Impedance State During Power Up and Power Down**
- **3-State True Outputs Drive Bus Lines or Buffer-Memory Address Registers**
- **Full Parallel Access for Loading**
- **Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic 300-mil DIPs (N)**

DW OR N PACKAGE
(TOP VIEW)



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 SN64BCT374 are edge-triggered D-type flip-flops. On the positive transition of the clock (CLK) input, the Q outputs are 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 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.

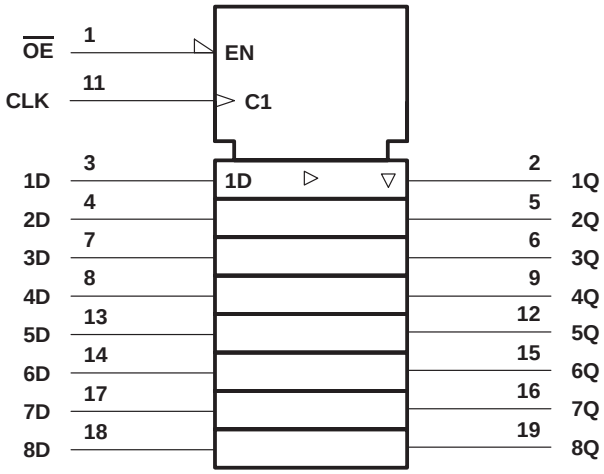
The outputs are in a high-impedance state during power up and power down when the supply voltage is less than approximately 3 V.

The SN64BCT374 is characterized for operation from −40°C to 85°C and 0°C to 70°C.

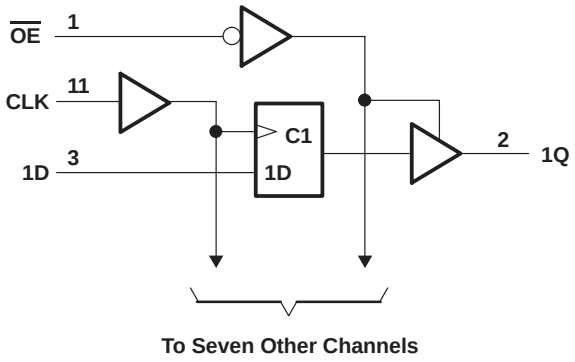
FUNCTION TABLE
(each flip-flop)

INPUTS			OUTPUT
$\overline{OE}$	CLK	D	Q
L	↑	H	H
L	↑	L	L
L	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 . . . . . 128 mA
Operating free-air temperature range . . . . . −40°C to 85°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 (see Note 2)

		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			−15	mA
I_{OL}	Low-level output current			64	mA
$\Delta t/\Delta V_{CC}$	Power-up ramp rate	2			μs/V
T_A	Operating free-air temperature	−40		85	°C

NOTE 2: Unused or floating inputs must be held high or low.

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

PARAMETER	TEST CONDITIONS			MIN	TYP†	MAX	UNIT
V_{IK}	V_{CC} = 4.5 V,	I_I = −18 mA				−1.2	V
V_{OH}	V_{CC} = 4.5 V	I_{OH} = −3 mA		2.4	3.3		V
		I_{OH} = −15 mA		2	3.1		
V_{OL}	V_{CC} = 4.5 V,	I_{OL} = 64 mA			0.42	0.55	V
I_I	V_{CC} = 5.5 V,	V_I = 5.5 V				0.4	mA
I_{IH}	V_{CC} = 5.5 V,	V_I = 2.7 V				20	µA
I_{IL}	V_{CC} = 5.5 V,	V_I = 0.5 V				−0.6	mA
I_{OS}‡	V_{CC} = 5.5 V,	V_O = 0		−100		−225	mA
I_{OZ}	V_{CC} = 0 to 2.3 V (power up)	V_O = 2.7 V or 0.5 V,	$\overline{OE}$ = 0.8 V			±50	µA
	V_{CC} = 1.8 V to 0 (power down)					±50	
I_{OZH}	V_{CC} = 5.5 V,	V_O = 2.7 V				50	µA
I_{OZL}	V_{CC} = 5.5 V,	V_O = 0.5 V				−50	µA
I_{CCL}	V_{CC} = 5.5 V,	Outputs open			37	60	mA
I_{CCH}	V_{CC} = 5.5 V,	Outputs open			2	5	mA
I_{CCZ}	V_{CC} = 5.5 V,	Outputs open			5	8	mA
C_i	V_{CC} = 5 V,	V_I = 2.5 V or 0.5 V			6		pF
C_o	V_{CC} = 5 V,	V_O = 2.5 V or 0.5 V			10		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 range of supply voltage (unless otherwise noted)

		V_{CC} = 5 V, T_A = 25°C		V_{CC} = 4.5 V to 5.5 V				UNIT
				T_A = −40°C to 85°C		T_A = 0°C to 70°C		
		MIN	MAX	MIN	MAX	MIN	MAX	
f_{clock}	Clock frequency		70		70		70	MHz
t_w	Pulse duration, CLK high	7		7		7		ns
t_{su}	Setup time, data before CLK↑	6.5		6.5		6.5		ns
t_h	Hold time, data after CLK↑	0		0		0		ns

switching characteristics over recommended range of supply voltage, C_L = 50 pF (unless otherwise noted) (see Note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 5 V, T_A = 25°C			T_A = −40°C to 85°C		T_A = 0°C to 70°C		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f_{max}			70			70		70		MHz
t_{PLH}	CLK	Q	2	7.2	9.1	2	11.6	2	10.6	ns
t_{PHL}			2	7.1	8.8	2	10.6	2	10	
t_{PZH}	$\overline{OE}$	Q	1	8.3	10.1	1	12.7	1	12.3	ns
t_{PZL}			1	8.6	10.6	1	13	1	12.7	
t_{PHZ}	$\overline{OE}$	Q	1	4.7	6.3	1	7.1	1	6.8	ns

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

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