

74BCT574

Octal D Flip-Flop with TRI-STATE® Outputs

General Description

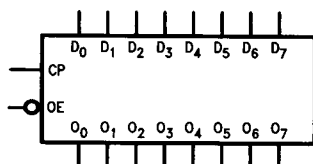
The 'BCT574 is a high-speed, low power octal flip-flop with a buffered common Clock (CP) and a buffered common Output Enable ($\overline{OE}$). The information presented to the D inputs is stored in the flip-flops on the LOW-to-HIGH Clock (CP) transition.

This device is functionally identical to the 'BCT374 but has a broadside pinout.

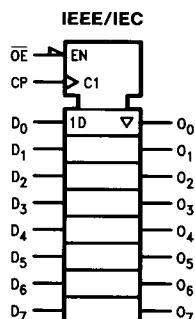
Features

- Inputs and outputs on opposite sides of package allowing easy interface with microprocessors
- Useful as input or output port for microprocessors
- Functionally identical to the 'BCT374
- TRI-STATE outputs for bus interfacing
- Guaranteed 4000V minimum ESD protection
- Guaranteed multiple output switching specifications
- Guaranteed 500 mA minimum latchup protection
- Low I_{CCZ} through BiCMOS techniques
- Nondestructive hot insertion capability
- High impedance in power down (I_{ZZ} and V_{ID})

Logic Symbols



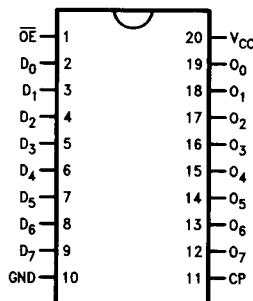
TL/F/10880-1



TL/F/10880-3

Connection Diagram

Pin Assignment
for DIP and SOIC



TL/F/10880-2

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Functional Description

The 'BCT574 consists of eight edge-triggered flip-flops with individual D-type inputs and TRI-STATE true outputs. The buffered clock and buffered Output Enable are common to all flip-flops. The eight flip-flops will store the state of their individual D inputs that meet the setup and hold time requirements on the LOW-to-HIGH Clock (CP) transition. With the Output Enable ($\overline{OE}$) LOW, the contents of the eight flip-flops are available at the outputs. When the $\overline{OE}$ is HIGH, the outputs go to the high impedance state. Operation of the $\overline{OE}$ input does not affect the state of the flip-flops.

Truth Table

Inputs			Internal Register	Output
D_n	CP	$\overline{OE}$		O_n
H	—	L	H	H
L	—	L	L	L
X	X	H	X	Z

H = HIGH Voltage Level

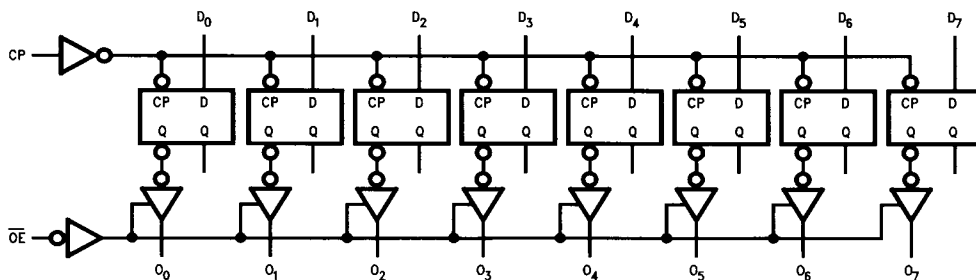
L = LOW Voltage Level

X = Immaterial

Z = High Impedance

— = LOW-to-HIGH Clock Transition

Logic Diagram



TL/F/10880-4

Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Storage Temperature	−65°C to +150°C
Ambient Temperature under Bias	−55°C to +125°C
Junction Temperature under Bias	
Plastic	−55°C to +150°C
V _{CC} Pin Potential to Ground Pin	−0.5V to +7.0V
Input Voltage (Note 2)	−0.5V to +7.0V
Input Current (Note 2)	−30 mA to +5.0 mA

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

Voltage Applied to Output in the Disable or Power-Off State in the High State	−0.5V to +5.5V −0.5V to V _{CC}
Current Applied to Output in LOW State (Max)	Twice the Rated I _{OL} (mA)
ESD Last Passing Voltage (Min)	4000V
Over Voltage Latchup	V _{CC} + 4.5V

Recommended Operating Conditions

Free Air Ambient Temperature	
Commercial	0°C to +70°C
Supply Voltage	
Commercial	+4.5V to +5.5V

DC Electrical Characteristics

Symbol	Parameter	74BCT			Units	V _{CC}	Conditions
		Min	Typ	Max			
V _{IH}	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V _{IL}	Input LOW Voltage		0.8		V		Recognized as a LOW Signal
V _{CD}	Input Clamp Diode Voltage		−1.2		V	Min	I _{IN} = −18 mA
V _{OH}	Output HIGH Voltage	2.4 2.0			V	Min	I _{OH} = −3 mA I _{OH} = −15 mA
V _{OL}	Output LOW Voltage		0.55		V	Min	I _{OL} = 64 mA
I _{IH}	Input HIGH Current		5		μA	Max	V _{IN} = 2.7V
I _{BVI}	Input HIGH Current Breakdown Test		7		μA	Max	V _{IN} = 7.0V
I _{IL}	Input LOW Current		−250		μA	Max	V _{IN} = 0.5V
I _{OZH}	Output Leakage Current		20		μA	0V–5.5V	V _{OUT} = 2.7V
I _{OZL}	Output Leakage Current		−20		μA	0V–5.5V	V _{OUT} = 0.5V
I _{OZ}	Output Leakage Current		±20		μA	0V–2.0V 1.6V–0V	$\overline{OE}$ = 2.0V, V _{OUT} = 0.5V or 2.7V (Power Up) $\overline{OE}$ = 2.0V, V _{OUT} = 0.5V or 2.7V (Power Down)
I _{OS}	Output Short-Circuit Current	−100	−225		mA	Max	V _{OUT} = 0V
I _{CEX}	Output HIGH Leakage Current		50		μA	Max	V _{OUT} = V _{CC}
V _{ID}	Input Leakage Test	4.75			V	0.0	I _{ID} = 1.9 μA All Other Pins Grounded
I _{ZZ}	Bus Drainage Test		100		μA	0.0	V _{OUT} = 5.25V
I _{CCH}	Power Supply Current	8	12		mA	Max	V _O = HIGH
I _{CCL}	Power Supply Current	30	48		mA	Max	V _O = LOW
I _{CCZ}	Power Supply Current	6	8		mA	Max	V _O = HIGH Z

AC Electrical Characteristics

Symbol	Parameter	74BCT			74BCT		Units
		T _A = +25°C V _{CC} = +5.0V C _L = 50 pF			T _A = Com V _{CC} = Com C _L = 50 pF		
		Min	Typ	Max	Min	Max	
f _{max}	Maximum Clock Frequency	77			77		MHz
t _{PLH}	Propagation Delay	2.8	6.5	9.4	2.8	9.4	ns
t _{PHL}	Clock to Output	2.8	5.5	8.9	2.8	8.9	
t _{PZH}	Output Enable Time	3.7	6.0	9.5	3.7	9.5	ns
t _{PZL}		3.7	6.5	9.5	3.7	9.5	
t _{PHZ}	Output Disable Time	1.3	4.5	7.5	1.3	7.5	ns
t _{PLZ}		1.3	4.5	6.9	1.3	6.9	

AC Operating Requirements

Symbol	Parameter	74BCT		74BCT		Units
		T _A = +25°C V _{CC} = +5.0V		T _A , V _{CC} = Com		
		Min	Max	Min	Max	
t _s (H) t _s (L)	Setup Time, HIGH or LOW D _n to CP	4.5 6.0		4.6 6.0		ns
t _h (H) t _h (L)	Hold Time, HIGH or LOW D _n to CP	0.0 0.0		0.0 0.0		
t _w (H) t _w (L)	CP Pulse Width HIGH or LOW	5.5 5.5		5.5 5.5		ns

Extended AC Electrical Characteristics

Symbol	Parameter	74BCT		74BCT		74BCT		Units
		T _A = Com V _{CC} = Com C _L = 50 pF 8 Outputs Switching (Note 1)		T _A = Com V _{CC} = Com C _L = 250 pF 1 Output Switching (Note 2)		T _A = Com V _{CC} = Com C _L = 250 pF 8 Outputs Switching (Notes 1, 2)		
		Min	Max	Min	Max	Min	Max	
t _{PLH}	Propagation Delay	4.0	10	6.0	12.0	7.0	15.0	ns
t _{PHL}	Clock to Output	4.0	9.5	5.0	9.5	6.0	12.0	

Note 1: This specification is guaranteed but not tested. The limits apply to propagation delays for all paths described switching in phase (i.e., all low-to-high, high-to-low, etc.).

Note 2: This specification is guaranteed but not tested. The limits represent propagation delays with 250 pF load capacitors in place of the 50 pF load capacitors in the standard AC load. This specification pertains to single output switching only.

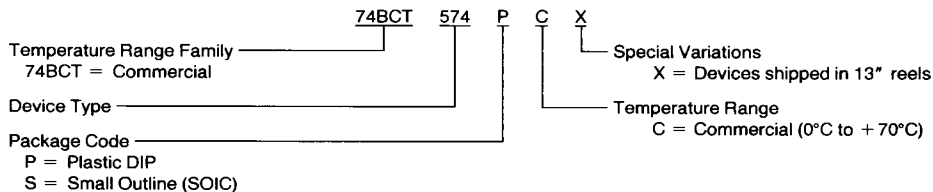
Extended AC Electrical Characteristics (Continued)

Capacitance

Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	6.0	pF	$V_{CC} = 5.0V$
C_{OUT}	Output Pin Capacitance	10.0	pF	$V_{CC} = 5.0V$

Ordering Information

The device number is used to form part of a simplified purchasing code where a package type and temperature range are defined as follows:



Physical Dimensions inches (millimeters)

