

TOSHIBA Bi-CMOS Digital Integrated Circuit Silicon Monolithic

TD74BC574P, TD74BC574F

Octal D-Type Flip-Flop with 3-State Outputs (Non-Inverted)

The TD74BC574P/TD74BC574F is a high-speed 8-bit flip-flop fabricated with silicon gate Bi-CMOS technology. It achieves the high-speed operation equivalent to the FAST family while maintaining the Bi-CMOS low-power dissipation.

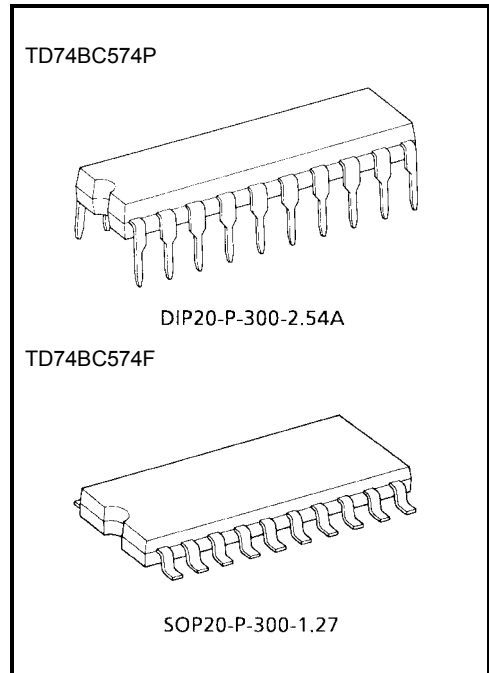
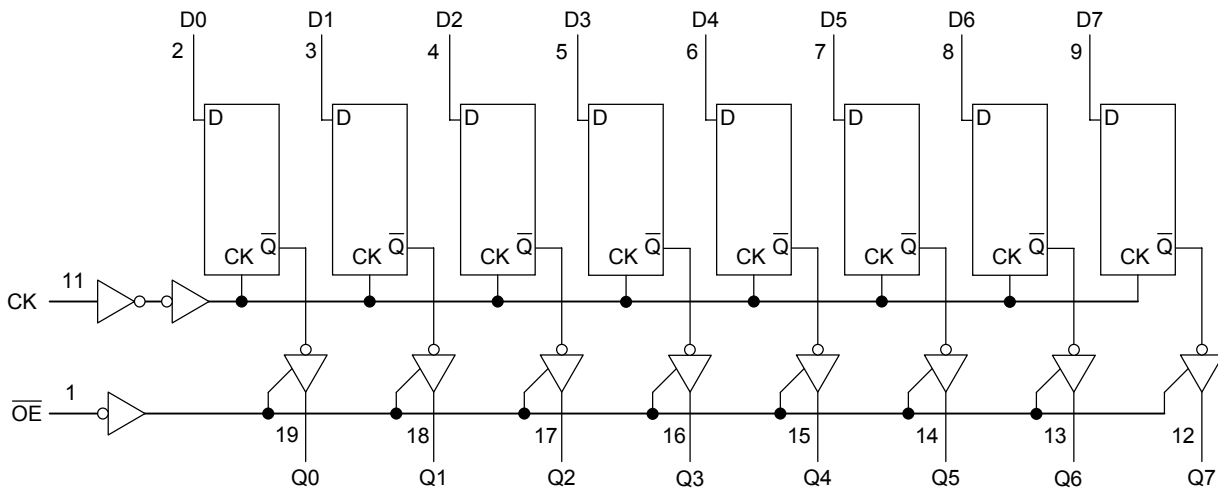
The TD74BC574P/F is a non-inverting flip-flop. Each bit is individually controlled by a clock input (CK) and an output enable input (\overline{OE}). When the \overline{OE} input is high, all eight outputs are in the high-impedance state, which facilitates the interface with bus lines.

All inputs are equipped with resistors and diodes to protect against Electrostatic Discharge (ESD).

Features

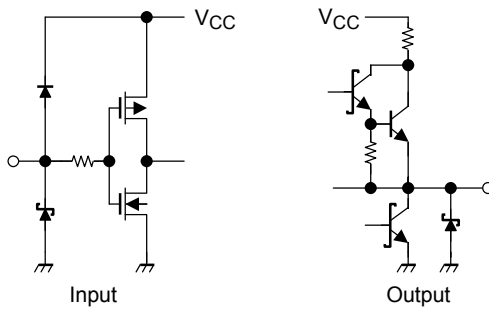
- High-speed operation $t_{pd} = 8.8 \text{ ns (typ.)}$
- Symmetrical output impedance $I_{OH} = -3 \text{ mA (max)}$
 $I_{OL} = 24 \text{ mA (max)}$
- Low power dissipation $I_{CCD} = 7 \text{ mA (typ.)}$
 $I_{CCZ} = 10 \mu\text{A (typ.)}$
- Operating temperature range $T_a = -40^\circ\text{C to } 85^\circ\text{C}$
- High ESD protection 2000 V (MIL standard)
- Pin and function compatible with FAST (74F574)

Logic Diagram

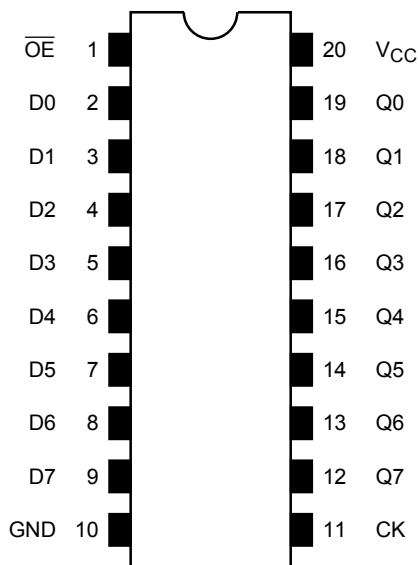


Weight
 DIP20-P-300-2.54A : 1.48 g (typ.)
 SOP20-P-300-1.27 : 0.25 g (typ.)

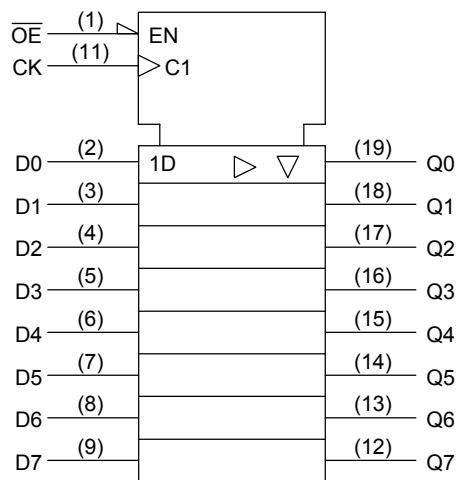
Input Protection Circuit and Output Equivalent Circuit



Pin Assignment (top view)



Logic Symbol



Truth Table

Inputs			Outputs
\overline{OE}	CK	D	Q
H	X	X	Z
L		X	Qn
L		L	L
L		H	H

X: Don't care

Z: High impedance

Qn: No change

Absolute Maximum Ratings

Characteristics	Symbol	Rating	Unit	
Power supply voltage	V_{CC}	-0.5 to 7.0	V	
Input voltage	V_{IN}	-1.2 to $V_{CC} + 0.5$	V	
Output voltage	V_O	-0.5 to $V_{CC} + 0.5$	V	
Input clamp diode current	I_{IK}	± 30	mA	
Output clamp diode current	I_{OK}	-30	mA	
Output current (output low state)	I_{OL}	48	mA	
Power dissipation	BC574P	P_D	1380 (Note 1)	mW
	BC574F		860 (Note 1)	
Storage temperature	T_{stg}	-65 to 150	$^{\circ}C$	

Note 1: $T_a = 25^{\circ}C$

Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit	
Power supply voltage	V_{CC}	4.5	5.0	5.5	V	
Input voltage	V_{IN}	0	—	V_{CC}	V	
Output voltage	V_O	0	—	V_{CC}	V	
Output current	High level	I_{OH}	—	—	-3	mA
	Low level	I_{OL}	—	—	24	
Operating temperature	T_{opr}	-40	25	85	$^{\circ}C$	

Electrical Characteristics

DC Characteristics (unless otherwise specified, $V_{CC} = 4.5\text{ V to }5.5\text{ V}$, $T_a = -40^\circ\text{C to }85^\circ\text{C}$)

Characteristics		Symbol	Test Condition	V_{CC}	Min	Typ. (Note 1)	Max	Unit
Input voltage	High level	V_{IH}	—	—	2.0	—	—	V
	Low level	V_{IL}	—	—	—	—	0.8	
Input clamp voltage		V_{IK}	$I_{IK} = -18\text{ mA}$	4.5	—	—	-1.2	V
Output voltage	High level	V_{OH}	$I_{OH} = -3.0\text{ mA}$	4.5	2.4	3.4	—	V
			$I_{OH} = -3.0\text{ mA}$	4.75	2.7	3.4	—	
	Low level	V_{OL}	$I_{OL} = 24\text{ mA}$	4.5	—	—	0.5	
Input current (all input pins)		I_I	$V_{IN} = V_{CC}$	5.5	—	—	± 1.0	μA
		I_{IH}	$V_{IN} = 2.7\text{ V}$	5.5	—	—	± 1.0	
		I_{IL}	$V_{IN} = 0.5\text{ V or GND}$	5.5	—	—	± 1.0	
3-state OFF leakage current		I_{OZH}	$V_O = 2.7\text{ V}$	5.5	—	—	50	μA
		I_{OZL}	$V_O = 0.5\text{ V}$	5.5	—	—	-50	
Output short current (Note 2)		I_{OS}	$V_O = \text{GND}$	5.5	-60	—	-180	mA
Quiescent supply current (total)		I_{CCL}	$V_{IN} = V_{CC}$ or ground All outputs are low.	5.5	—	20	27	μA
		I_{CCH}	$V_{IN} = V_{CC}$ or ground All outputs are high.	5.5	—	10	50	
		I_{CCZ}	$V_{IN} = V_{CC}$ or ground All outputs are in the high-impedance state.	5.5	—	10	50	
Quiescent supply current (each bit)		ΔI_{CC1}	One input: $V_{IN} = 0.5\text{ V}$ Other inputs: V_{CC} or GND	—	—	—	1.5	mA
		ΔI_{CC2}	One input: $V_{IN} = V_{CC} - 2.1\text{ V}$ Other inputs: V_{CC} or GND	—	—	—	1.5	

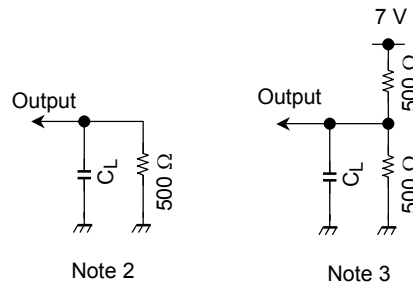
Note 1: Typical value is measured at $V_{CC} = 5.0\text{ V}$ and $T_a = 25^\circ\text{C}$.

Note 2: Only one output at a time should be shorted. Duration should not exceed one second.

AC Characteristics (Input $t_r = t_f = 2.5$ ns)

Characteristics	Symbol	Test Condition	Ta = 25°C VCC = 5.0 V			Ta = -40°C to 85°C VCC = 5.0 V ± 10 %		Unit
			Min	Typ.	Max	Min	Max	
Propagation delay time	CK-Q	t_{pLH}	3.0	8.8	11.5	3.0	13.0	ns
		t_{pHL}	3.0	8.8	11.0	3.0	13.0	
3-state output enable time	\overline{OE} -Q	t_{pZH}	3.0	10.4	12.5	3.0	14.5	ns
		t_{pZL}	3.0	8.2	9.5	3.0	13.5	
3-state output disable time	\overline{OE} -Q	t_{pHZ}	3.0	6.5	9.5	3.0	11.5	ns
		t_{pLZ}	3.0	5.8	8.5	3.0	10.0	
Maximum clock frequency	f_{MAX}		100	—	—	70	—	MHz
Dynamic supply current	I_{CCD}	f = 1 MHz Output open	—	7	12	—	15	mA

Note 1: When measuring t_{pLH} , t_{pHL} , t_{pZH} and t_{pHZ} , the output pin should be connected as shown in Note 2.
When measuring t_{pZL} , and t_{pLZ} , the output pin should be connected as shown in Note 3.



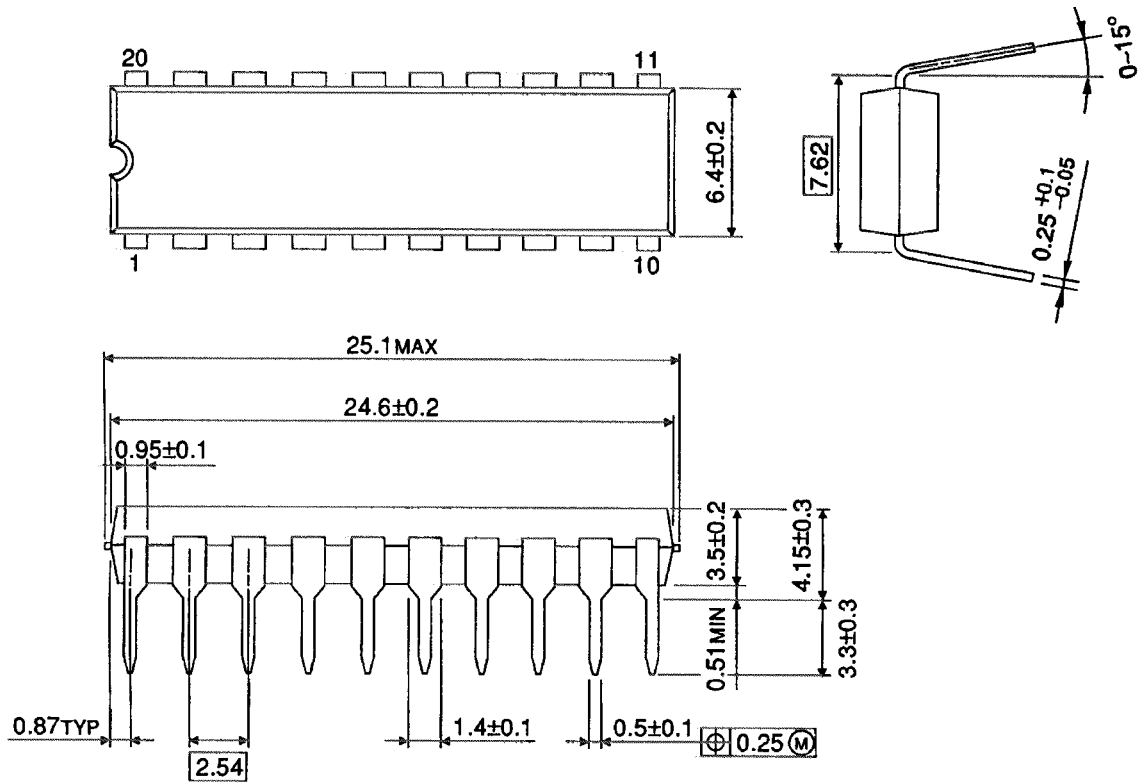
AC Characteristics (Input $t_r = t_f = 2.5$ ns)

Characteristics	Symbol	Test Condition	Ta = 25°C VCC = 5.0 V			Ta = -40°C to 85°C VCC = 5.0 V ± 10 %		Unit
			Min	Typ.	Max	Min	Max	
Pulse width	CK	t_w (L)	6	—	—	6	—	ns
		t_w (H)	7	—	—	7	—	
Setup time	D-CK	t_s (L)	2	—	—	2	—	ns
		t_s (H)	2	—	—	2	—	
Hold time	D-CK	t_h (L)	2	—	—	2	—	ns
		t_h (H)	2	—	—	2	—	

Package Dimensions

DIP20-P-300-2.54A

Unit : mm

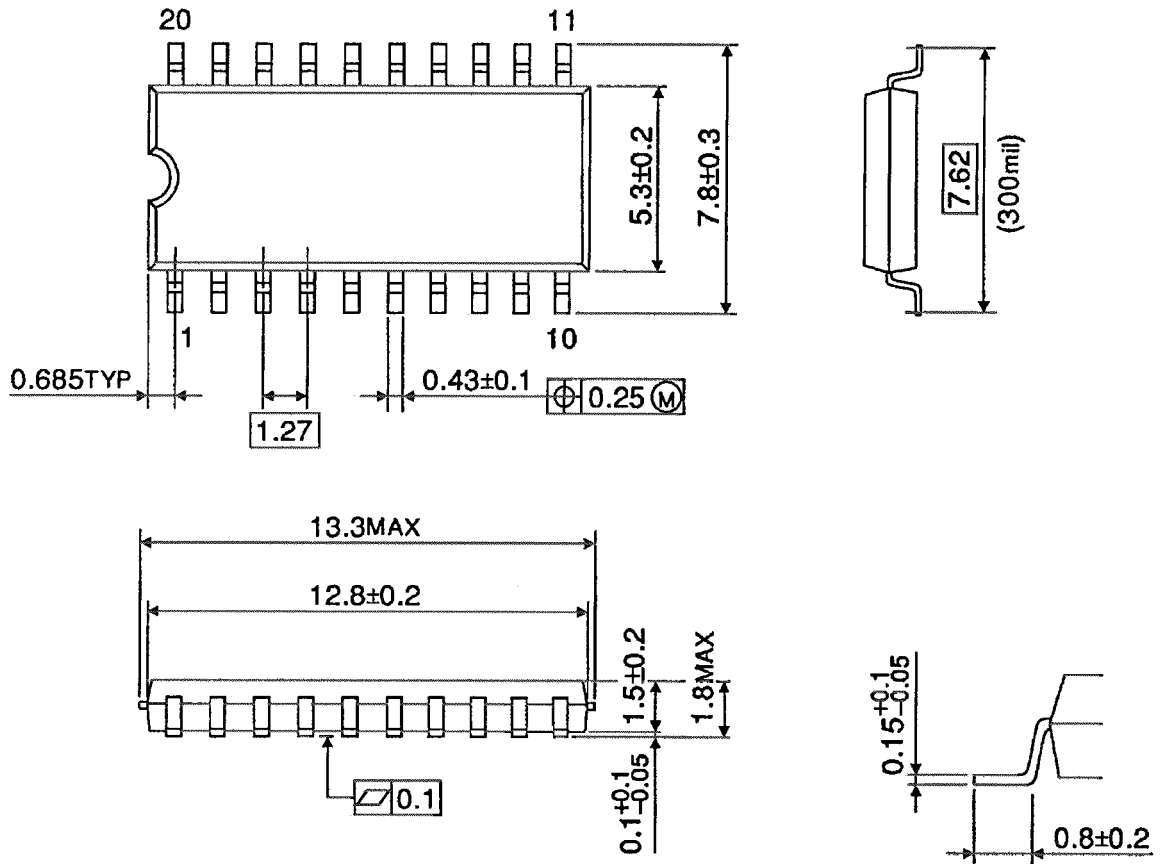


Weight: 1.48 g (typ.)

Package Dimensions

SOP20-P-300-1.27

Unit : mm



Weight: 0.25 g (typ.)

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