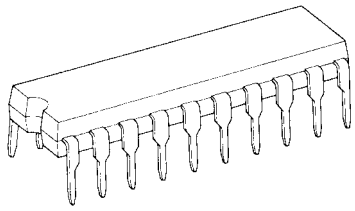
TOSHIBA Bi-CMOS Digital Integrated Circuit Silicon Monolithic

TD74BC574P,TD74BC574F

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

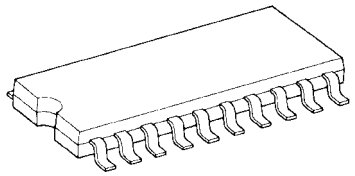
The TD74BC574P/TD74BC574F is a high-speed 8-bit flip-flop fabricated with silicon gate Bi-CMOS technology. It achieves the high-speed operation equivalent to the FAST family while maintaining the Bi-CMOS low-power dissipation.
The TD74BC574P/F is a non-inverting flip-flop. Each bit is individually controlled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

TD74BC574P



DIP20-P-300-2.54A

TD74BC574F



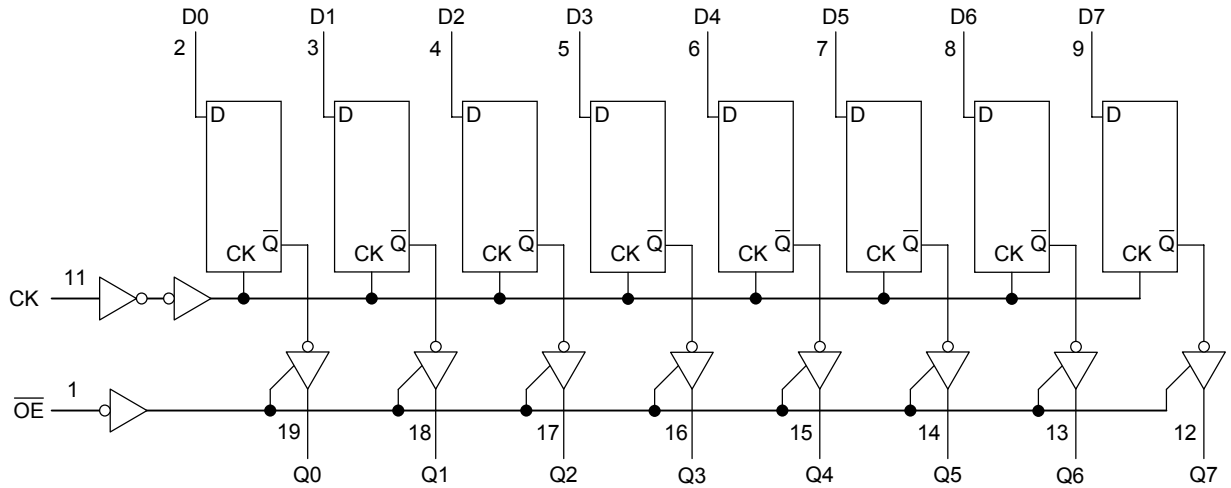
SOP20-P-300-1.27

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

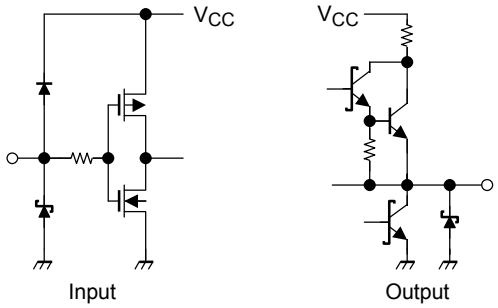
Features

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

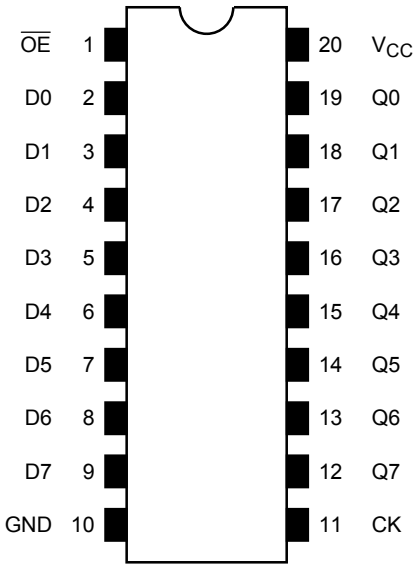
Logic Diagram



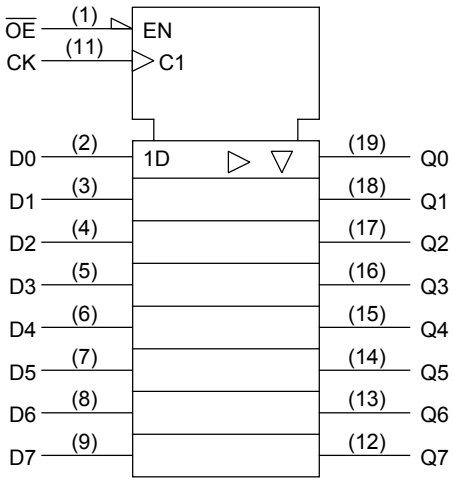
Input Protection Circuit and Output Equivalent Circuit



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	°C

Note 1: Ta = 25°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	°C

Electrical Characteristics

DC Characteristics (unless otherwise specified, V_{CC} = 4.5 V to 5.5 V, Ta = −40°C to 85°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 mA	4.5	—	—	−1.2	V
Output voltage	High level	V_{OH}	I_{OH} = −3.0 mA	4.5	2.4	3.4	—	V
			I_{OH} = −3.0 mA	4.75	2.7	3.4	—	
	Low level	V_{OL}	I_{OL} = 24 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 V	5.5	—	—	±1.0	
		I_{IL}	V_{IN} = 0.5 V or GND	5.5	—	—	±1.0	
3-state OFF leakage current		I_{OZH}	V_O = 2.7 V	5.5	—	—	50	μA
		I_{OZL}	V_O = 0.5 V	5.5	—	—	−50	
Output short current (Note 2)		I_{OS}	V_O = 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	mA
		I_{CCH}	V_{IN} = V_{CC} or ground All outputs are high.	5.5	—	10	50	μA
		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 V Other inputs: V_{CC} or GND	—	—	—	1.5	mA
		ΔI_{CC2}	One input: V_{IN} = V_{CC} − 2.1 V Other inputs: V_{CC} or GND	—	—	—	1.5	

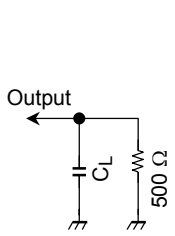
Note 1: Typical value is measured at V_{CC} = 5.0 V and Ta = 25°C.

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

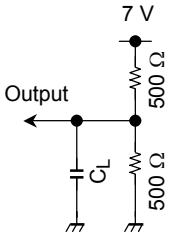
AC Characteristics (Input $t_r = t_f = 2.5$ ns)

Characteristics		Symbol	Test Condition	Ta = 25°C, V_{CC} = 5.0 V			Ta = −40°C to 85°C, V_{CC} = 5.0 V ± 10 %		Unit
				Min	Typ.	Max	Min	Max	
Propagation delay time	CK-Q	t_{pLH}	C_L = 50 pF	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.



Note 2



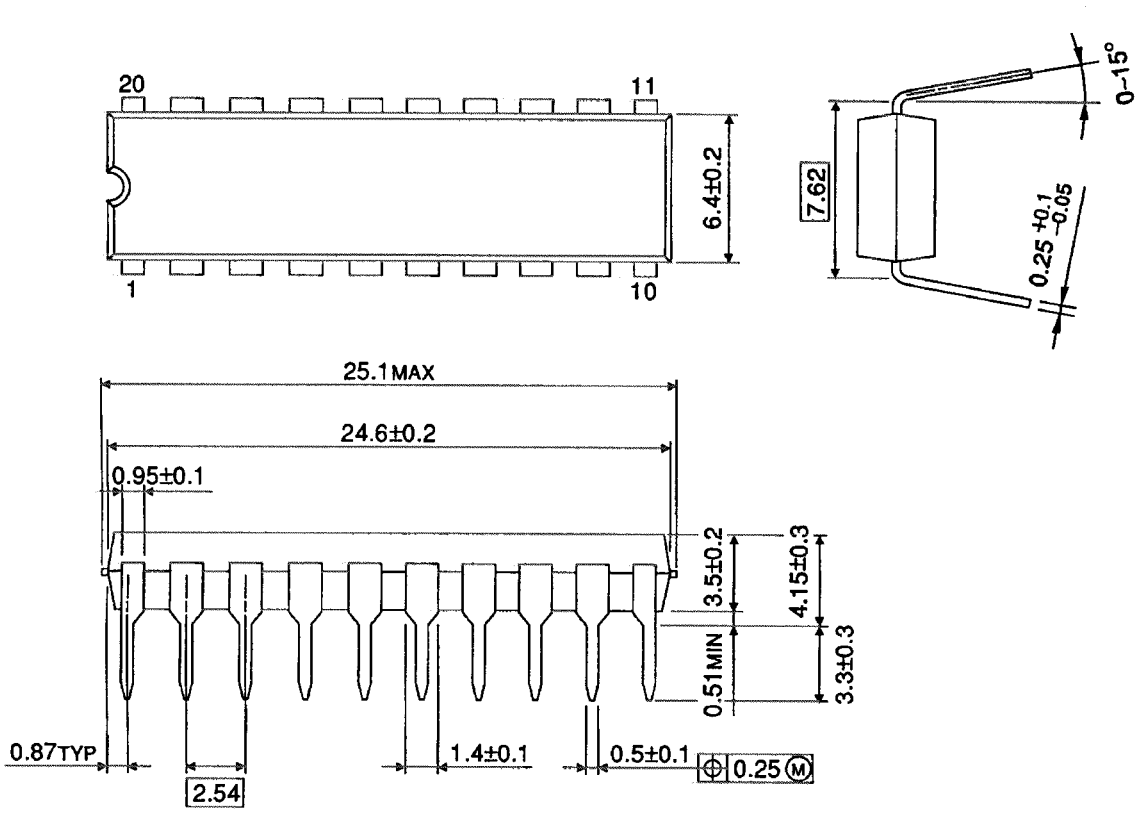
Note 3

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

Characteristics		Symbol	Test Condition	Ta = 25°C, V_{CC} = 5.0 V			Ta = −40°C to 85°C, V_{CC} = 5.0 V ± 10 %		Unit
				Min	Typ.	Max	Min	Max	
Pulse width	CK	$t_{w\ (L)}$	C_L = 50 pF R_L = 500 Ω	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

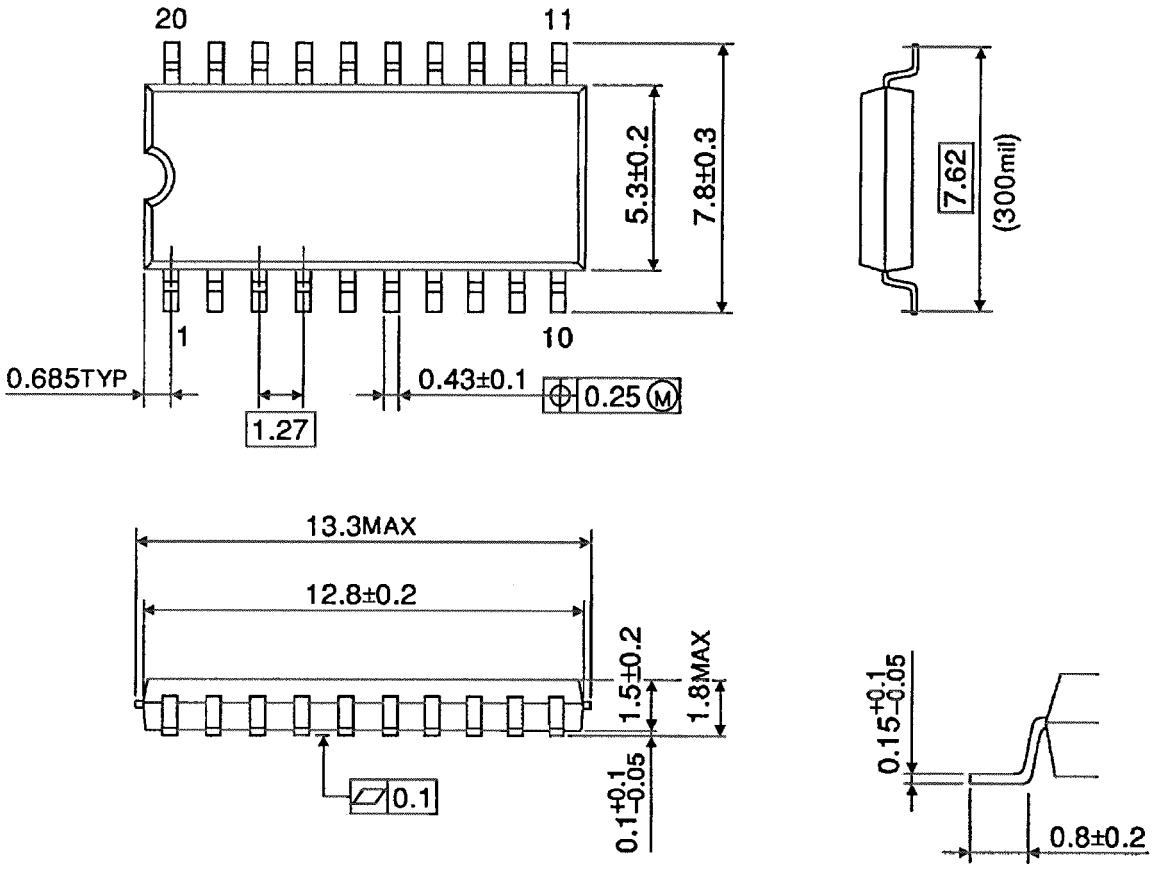
DIP20-P-300-2.54A Unit : mm



Weight: 1.48 g (typ.)

Package Dimensions

SOP20-P-300-1.27 Unit : mm



Weight: 0.25 g (typ.)

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