TOSHIBA CMOS Digital Integrated Circuit　Silicon Monolithic

TC74HCT273AP,TC74HCT273AF,TC74HCT273AFW

Octal D-Type Flip Flop with Clear

The TC74HCT273A is a high speed CMOS OCTAL D-TYPE FLIP FLOP fabricated with silicon gate C^2MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

Their inputs are compatible with TTL, NMOS, and CMOS output voltage levels.

Information signals applied to D inputs are transferred to the Q outputs on the positive going edge of the clock pulse.
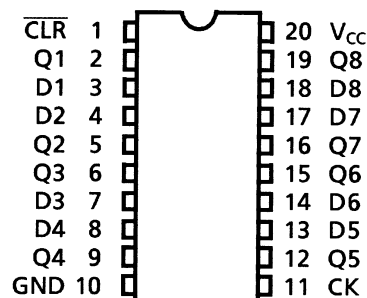
When the $\overline{\text{CLR}}$ input is held "L", the Q outputs are at a low logic level independent of the other inputs.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.
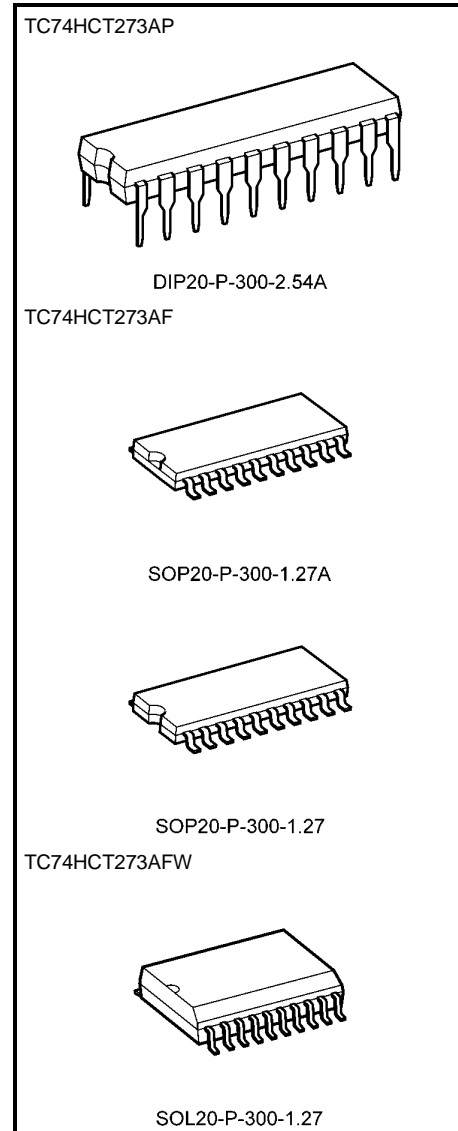
Features

- High speed: f_{max} = 90 MHz (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 4 μA (max) at Ta = 25°C
- Compatible with TTL outputs: V_{IH} = 2.0 V (min)
    V_{IL} = 0.8 V (max)
- Wide interfacing ability: LSTTL, NMOS, CMOS
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: $|I_{OH}|$ = I_{OL} = 4 mA (min)
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Pin and function compatible with 74LS273

Pin Assignment


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CLR   1        20  Vcc
 Q1   2        19  Q8
 D1   3        18  D8
 D2   4        17  D7
 Q2   5        16  Q7
 Q3   6        15  Q6
 D3   7        14  D6
 D4   8        13  D5
 Q4   9        12  Q5
GND  10        11  CK
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(TOP　VIEW)

Note: xxxFW (JEDEC SOP) is not available in Japan.

TC74HCT273AP

DIP20-P-300-2.54A

TC74HCT273AF

SOP20-P-300-1.27A

SOP20-P-300-1.27

TC74HCT273AFW

SOL20-P-300-1.27

Weight
DIP20-P-300-2.54A　　　: 1.30 g (typ.)
SOP20-P-300-1.27A　　　: 0.22 g (typ.)
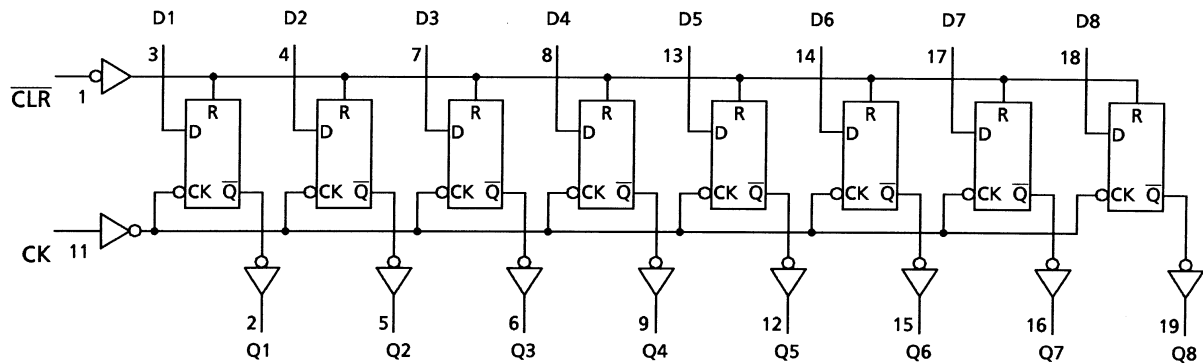SOP20-P-300-1.27　　　: 0.22 g (typ.)
SOL20-P-300-1.27　　　: 0.46 g (typ.)

2006-02-01

IEC Logic Symbol
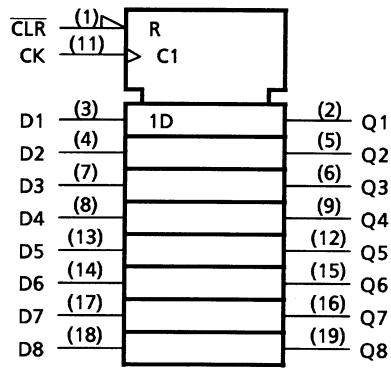
Truth Table

Inputs			Output	Function
$\overline{CLR}$	D	CK	Q	
L	X	X	L	Clear
H	L	⤒	L	—
H	H	⤒	H	—
H	X	⤓	Q_n	No Change

X: Don't care

System Diagram

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5~7	V
DC input voltage	V_{IN}	−0.5~V_{CC} + 0.5	V
DC output voltage	V_{OUT}	−0.5~V_{CC} + 0.5	V
Input diode current	I_{IK}	±20	mA
Output diode current	I_{OK}	±20	mA
DC output current	I_{OUT}	±25	mA
DC V_{CC}/ground current	I_{CC}	±50	mA
Power dissipation	P_D	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T_{stg}	−65~150	°C

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Note 2: 500 mW in the range of Ta = −40~65°C. From Ta = 65 to 85°C a derating factor of −10 mW/°C shall be applied until 300 mW.

Recommended Operating Conditions (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	4.5~5.5	V
Input voltage	V_{IN}	0~V_{CC}	V
Output voltage	V_{OUT}	0~V_{CC}	V
Operating temperature	T_{opr}	−40~85	°C
Input rise and fall time	t_r, t_f	0~500	ns

Note: The recommended operating conditions are required to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		V_{CC} (V)	Ta = 25°C			Ta = −40~85°C		Unit
					Min	Typ.	Max	Min	Max	
High-level input voltage	V_{IH}	—		4.5~5.5	2.0	—	—	2.0	—	V
Low-level input voltage	V_{IL}	—		4.5~5.5	—	—	0.8	—	0.8	V
High-level output voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −20 µA	4.5	4.4	4.5	—	4.4	—	V
			I_{OH} = −4 mA	4.5	4.18	4.31	—	4.13	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 µA	4.5	—	0.0	0.1	—	0.1	V
			I_{OL} = 4 mA	4.5	—	0.17	0.26	—	0.33	
Input leakage current	I_{IN}	V_{IN} = V_{CC} or GND		5.5	—	—	±0.1	—	±1.0	µA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	4.0	—	40.0	µA
	I_C	Per input: V_{IN} = 0.5 V or 2.4 V Other input: V_{CC} or GND		5.5	—	—	2.0	—	2.9	mA

Timing Requirements (input: $t_r = t_f = 6$ ns)

Characteristics	Symbol	Test Condition		Ta = 25°C		Ta = −40 ~85°C	Unit
			V_{CC} (V)	Typ.	Limit	Limit	
Minimum pulse width (CK)	$t_{W(L)}$ $t_{W(H)}$	—	4.5	—	15	19	ns
			5.5	—	14	17	
Minimum pulse width ($\overline{CLR}$)	$t_{W(L)}$	—	4.5	—	15	19	ns
			5.5	—	14	17	
Minimum set-up time	t_s	—	4.5	—	10	13	ns
			5.5	—	10	13	
Minimum hold time	t_h	—	4.5	—	5	6	ns
			5.5	—	10	13	
Minimum removal time ($\overline{CLR}$)	t_{rem}	—	4.5	—	10	13	ns
			5.5	—	9	12	
Clock frequency	f	—	4.5	—	30	24	MHz
			5.5	—	35	28	

AC Characteristics ($C_L = 15$ pF, $V_{CC} = 5$ V, Ta = 25°C, input: $t_r = t_f = 6$ ns)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Output transition time	t_{TLH} t_{THL}	—	—	4	8	ns
Propagation delay time (CK-Q)	t_{pLH} t_{pHL}	—	—	15	25	ns
Propagation delay time ($\overline{CLR}$ -Q)	t_{pHL} t_{pHL}	—	—	18	28	ns
Maximum clock frequency	f_{max}	—	40	90	—	MHz

AC Characteristics (C_L = 50 pF, input: t_r = t_f = 6 ns)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Ta = 25°C Min	Ta = 25°C Typ.	Ta = 25°C Max	Ta = −40~85°C Min	Ta = −40~85°C Max	Unit
Output transition time	t_{TLH}	—	4.5	—	9	15	—	19	ns
	t_{THL}		5.5	—	8	14	—	18	
Propagation delay time (CK-Q)	t_{pLH}	—	4.5	—	19	30	—	38	ns
	t_{pHL}		5.5	—	17	27	—	34	
Propagation delay time ($\overline{CLR}$ -Q)	t_{pLH}	—	4.5	—	22	32	—	40	ns
	t_{pHL}		5.5	—	18	29	—	36	
Maximum clock frequency	f_{max}	—	4.5	30	71	—	24	—	MHz
			5.5	35	81	—	28	—	
Input capacitance	C_{IN}	—		—	5	10	—	10	pF
Power dissipation capacitance	C_{PD} (Note)	—		—	29	—	—	—	pF

Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

I_{CC} (opr) = $C_{PD} \cdot V_{CC} \cdot f_{IN}$ + I_{CC}/8 (per flip flop)

And the total C_{PD} when n pcs. of flip flop operate can be gained by the following equation:

C_{PD} (total) = $18 + 11 \cdot n$

Package Dimensions

DIP20-P-300-2.54A   Unit : mm
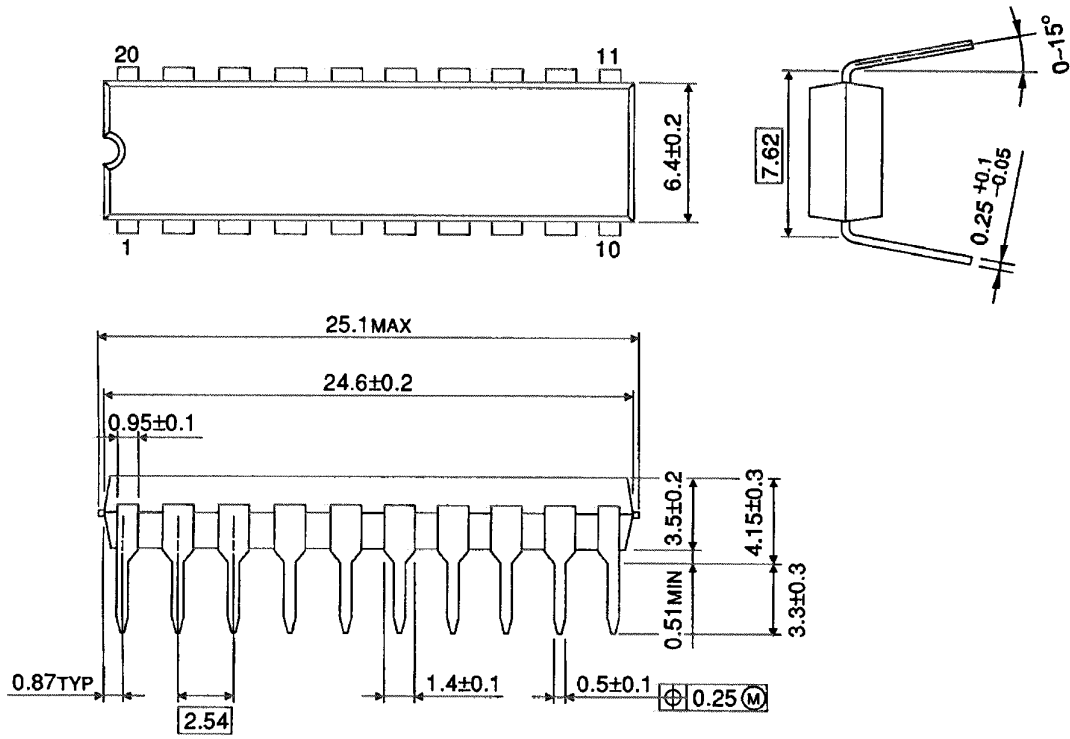
Weight: 1.30 g (typ.)

Package Dimensions

SOP20-P-300-1.27A   Unit: mm
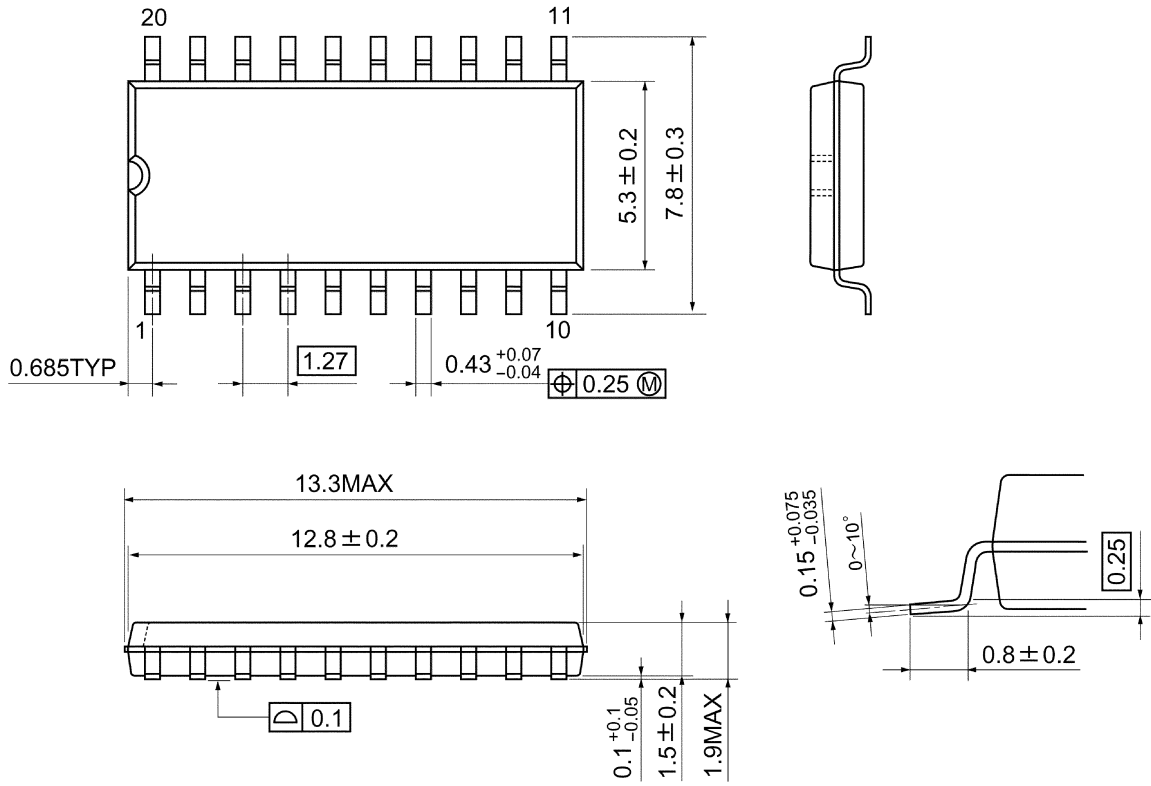
Weight: 0.22 g (typ.)

Package Dimensions

SOP20-P-300-1.27   Unit : mm
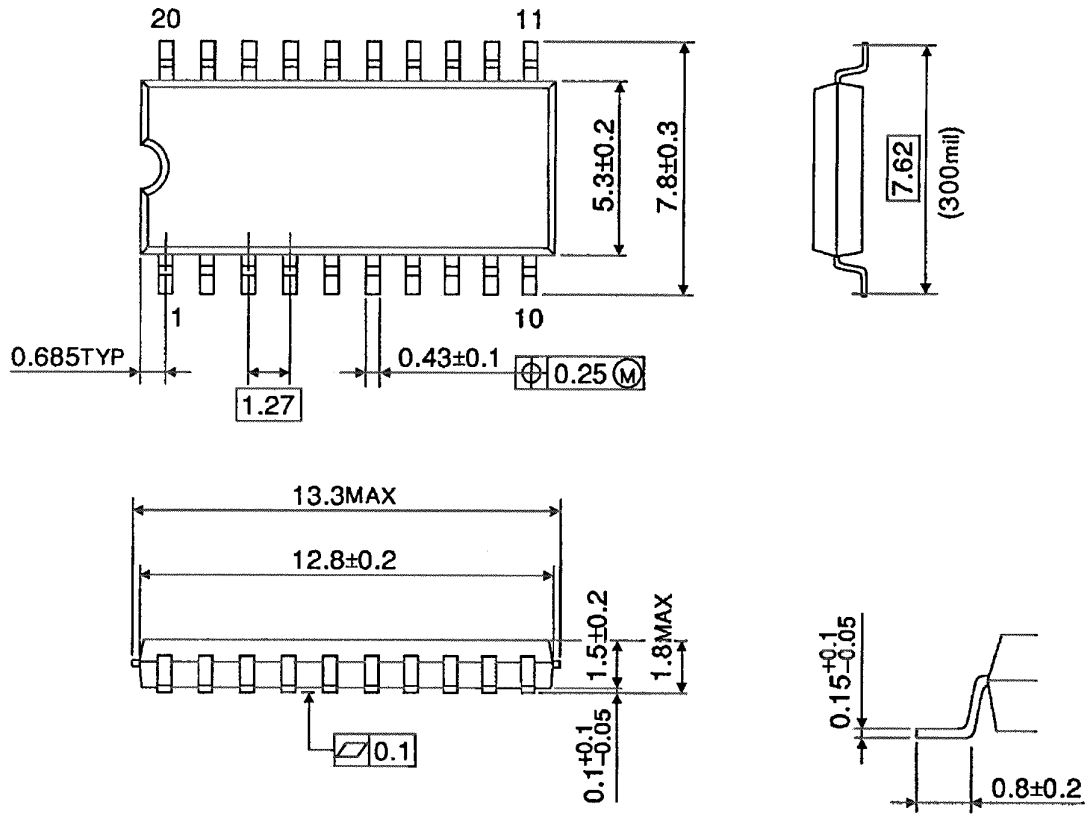
Weight: 0.22 g (typ.)

Package Dimensions (Note)

SOL20-P-300-1.27   Unit : mm
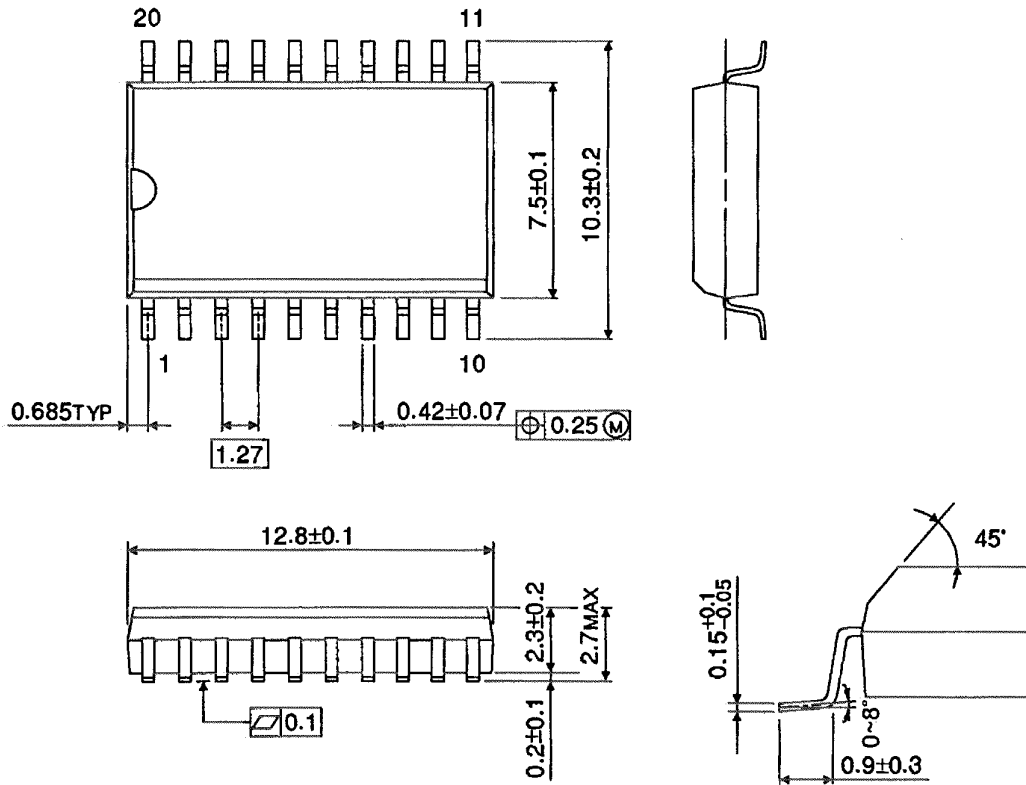
Note: This package is not available in Japan.

Weight: 0.46 g (typ.)

Note: Lead (Pb)-Free Packages

DIP20-P-300-2.54A   SOP20-P-300-1.27A

RESTRICTIONS ON PRODUCT USE