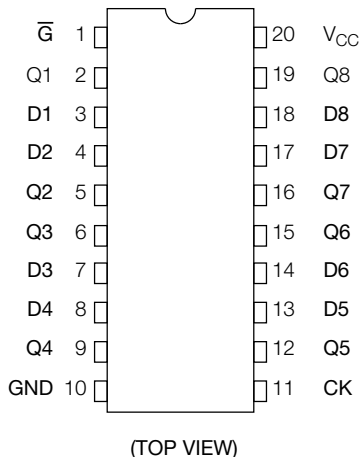


### Features:

- **High Speed:**  $f_{MAX} = 140\text{MHz}$  (typ.) at  $V_{CC} = 5\text{V}$
- **Low Power Dissipation:**  $I_{CC} = 8\mu\text{A}$  (max.) at  $T_a = 25^\circ\text{C}$
- **High Noise Immunity:**  $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (min.)
- **Symmetrical Output Impedance:**  $I_{OH} = I_{OL} = 24\text{mA}$  (min.). Capability of driving  $50\Omega$  transmission lines.
- **Balanced Propagation Delays:**  $t_{pLH} = t_{pHL}$
- **Wide Operating Voltage Range:**  $V_{CC}$  (opr.) =  $2\text{V} \sim 5.5\text{V}$
- **Pin and Function Compatible with 74F377**
- **Available in DIP, SOIC and SOP Packages**

### Pin Assignment



The TC74AC377 is an advanced high speed CMOS OCTAL D-TYPE FLIP-FLOP fabricated with silicon gate and double-layer metal wiring  $C^2\text{MOS}$  technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL, while maintaining the CMOS low power dissipation.

These 8-bit D-type flip-flops are controlled by a clock input (CK) and a output enable input ( $\overline{G}$ ).

The signal level applied to the D inputs are transferred to Q outputs during the positive going transition of CK.

When the  $\overline{G}$  is high, the eight outputs are in a high impedance state.

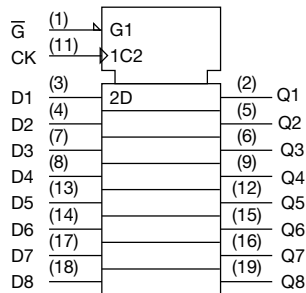
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

### Truth Table

INPUTS			OUTPUT
$\overline{G}$	CLOCK	DATA	Q
H	X	X	NO CHANGE
L		L	L
L		H	H
X		X	NO CHANGE

X: Don't care

### IEC Logic Symbol



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## Absolute Maximum Ratings

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7.0	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	$I_{IK}$	$\pm 20$	mA
Output Diode Current	$I_{OK}$	$\pm 50$	mA
DC Output Current	$I_{OUT}$	$\pm 50$	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	$\pm 200$	mA
Power Dissipation	$P_D$	500 (DIP) */180 (SOP)	mW
Storage Temperature	$T_{stg}$	-65~150	°C
Lead Temperature 10sec	$T_L$	300	°C

\* 500mW in the range of  $T_a = -40^{\circ}\text{C} \sim 65^{\circ}\text{C}$ .  
From  $T_a = 65^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  a derating factor of  
-10mW/°C should be applied up to 300mW.

## Recommended Operating Conditions

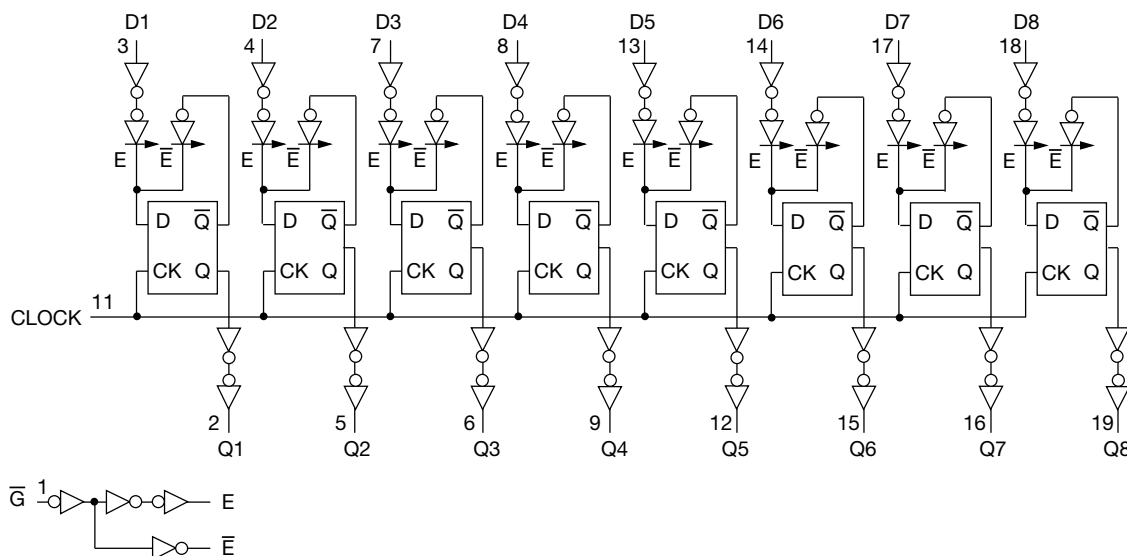
PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	$V_{CC}$	2.0~5.5	V
Input Voltage	$V_{IN}$	0~ $V_{CC}$	V
Output Voltage	$V_{OUT}$	0~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40~85	°C
Input Rise and Fall Time	dt/dv	0~100 ( $V_{CC} = 3.3 \pm 0.3\text{V}$ ) 0~20 ( $V_{CC} = 5 \pm 0.5\text{V}$ )	ns/v

## DC Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C				Ta = -40~85°C		UNIT
				VCC	Min.	Typ.	Max.	Min.	Max.	
High-Level Input Voltage	VIH	—		2.0	1.50	—	—	1.50	—	V
				3.0	2.10	—	—	2.10	—	
				5.5	3.85	—	—	3.85	—	
Low-Level Input Voltage	VIL	—		2.0	—	—	0.50	—	0.50	V
				3.0	—	—	0.90	—	0.90	
				5.5	—	—	1.65	—	1.65	
High-Level Output Voltage	VOH	VIN = VIH or VIL	IOH = -50μA	2.0	1.9	2.0	—	1.9	—	V
				3.0	2.9	3.0	—	2.9	—	
				4.5	4.4	4.5	—	4.4	—	
			IOH = -4mA	3.0	2.58	—	—	2.48	—	
			IOH = -24mA	4.5	3.94	—	—	3.80	—	
			IOH = -75mA*	5.5	—	—	—	3.85	—	
Low-Level Output Voltage	VOL	VIN = VIH or VIL	IOL = 50μA	2.0	—	0.0	0.1	—	0.1	V
				3.0	—	0.0	0.1	—	0.1	
				4.5	—	0.0	0.1	—	0.1	
			IOL =12mA	3.0	—	—	0.36	—	0.44	
			IOL = 24mA	4.5	—	—	0.36	—	0.44	
			IOL = 75mA*	5.5	—	—	—	—	1.65	
Input Leakage Current	IIN	VIN = VCC or GND		5.5	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	ICC	VIN = VCC or GND		5.5	—	—	8.0	—	80.0	

\* This spec indicates the capability of driving  $50\Omega$  transmission lines.  
One output should be tested at a time for a 10ms maximum duration.

## System Diagram

Timing Requirements (Input  $t_r = t_f = 3n$ )

PARAMETER	SYMBOL	TEST CONDITION	Ta=25° C			Ta= -40~85°	UNIT
			V <sub>CC</sub>	Typ.	Max.	Max.	
Minimum Pulse Width (CK)	t <sub>W(L)</sub>	—	3.3±0.3	—	8.0	8.0	ns
	t <sub>W(H)</sub>		5.0±0.5	—	5.0	5.0	
Minimum Set-up Time (D—CK)	t <sub>W(L)</sub>	—	3.3±0.3	—	8.0	8.0	
			5.0±0.5	—	4.0	4.0	
Minimum Set-up Time ( $\overline{G}$ —CK)	t <sub>s</sub>	—	3.3±0.3	—	9.0	9.0	
			5.0±0.5	—	4.0	4.0	
Minimum Hold Time	t <sub>h</sub>	—	3.3±0.3	—	1.0	1.0	
			5.0±0.5	—	1.0	1.0	

AC Electrical Characteristics (C<sub>L</sub> = 50pF, R<sub>L</sub> = 500Ω, Input  $t_r = t_f = 3ns$ )

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C			Ta = -40~85°C		UNIT
			V <sub>CC</sub>	Min.	Typ.	Max.	Min.	Max.
Propagation Delay Time (CK-Q)	$t_{PLH}$	—	3.0±0.3	—	10.6	17.6	1.0	20.0
	$t_{PHL}$		5.0±0.5	—	7.4	10.6	1.0	12.0
Maximum Clock Frequency	$f_{MAX}$	—	3.0±0.3	50	95	—	50	—
	$f_{MAX}$		5.0±0.5	80	140	—	80	—
Input Capacitance	C <sub>IN</sub>	—	—	—	5	10	—	10
Power Dissipation Capacitance	C <sub>PD</sub> <sup>1</sup>	—	—	—	30	—	—	—

Note (1): C<sub>PD</sub> 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 F/F).

And the total C<sub>PD</sub> when n pcs. of Flip-Flop operate can be gained by the following equation:  $C_{PD}(total) = 20 + 10 \cdot n$ .