



# 8-Bit Register

## Features

- Function, pinout and drive compatible with FCT and F logic
- FCT-C speed at 5.2 ns max. (Com'l)  
FCT-A speed at 7.2 ns max. (Com'l)
- Reduced  $V_{OH}$  (typically = 3.3V) versions of equivalent FCT functions
- Edge-rate control circuitry for significantly improved noise characteristics
- Power-off disable feature
- Matched rise and fall times
- ESD > 2000V

- Fully compatible with TTL input and output logic levels
- Sink current 64 mA (Com'l),  
32 mA (Mil)
- Source current 32 mA (Com'l),  
12 mA (Mil)
- Clock Enable for address and data synchronization application
- Eight edge-triggered D flip-flops

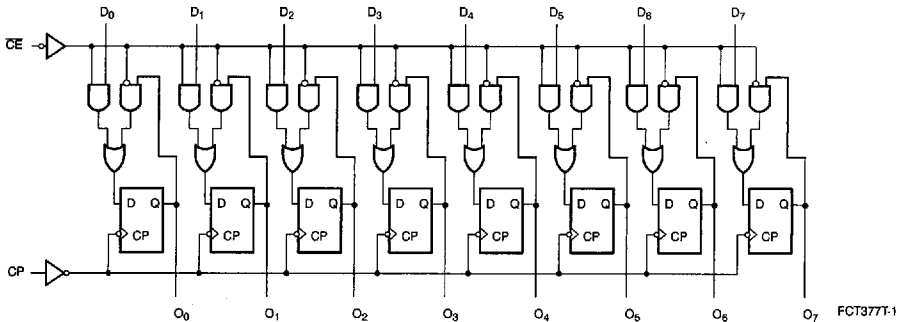
## Functional Description

The FCT377T has eight triggered D-type flip-flops with individual D inputs. The common buffered clock inputs (CP) loads

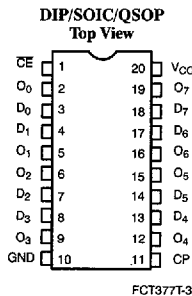
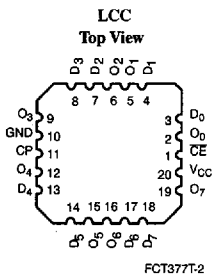
all flip-flops simultaneously when the Clock Enable ( $\overline{CE}$ ) is LOW. The register is fully edge-triggered. The state of each D input, one set-up time before the LOW-to-HIGH clock transition, is transferred to the corresponding flip-flop's O output. The  $\overline{CE}$  input must be stable only one set-up time prior to the LOW-to-HIGH clock transition for predictable operation.

The outputs are designed with a power-off disable feature to allow for live insertion of boards.

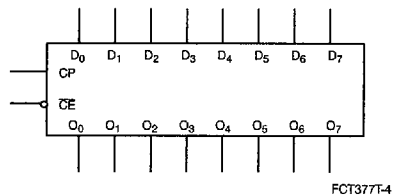
## Logic Block Diagram



## Pin Configurations



## Logic Symbol



**Function Table<sup>[1]</sup>**

Operating Mode	Inputs			Outputs
	CP	$\overline{CE}$	D	O
Load "1"	┐	l	h	H
Load "0"	┐	l	l	L
Hold	┐ X	h H	X X	No Change No Change

**Maximum Ratings<sup>[2,3]</sup>**

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature	-65°C to +150°C
Ambient Temperature with Power Applied	-65°C to +135°C
Supply Voltage to Ground Potential	-0.5V to +7.0V
DC Input Voltage	-0.5V to +7.0V
DC Output Voltage	-0.5V to +7.0V
DC Output Current (Maximum Sink Current/Pin)	120 mA
Power Dissipation	0.5W

Static Discharge Voltage ..... >2001V  
(per MIL-STD-883, Method 3015)

**Operating Range**

Range	Range	Ambient Temperature	V <sub>CC</sub>
Commercial	CT	0°C to +70°C	5V ± 5%
Commercial	T, AT	-40°C to +85°C	5V ± 5%
Military <sup>[4]</sup>	All	-55°C to +125°C	5V ± 10%

**Electrical Characteristics Over the Operating Range**

Parameter	Description	Test Conditions		Min.	Typ. <sup>[5]</sup>	Max.	Unit
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> =Min., I <sub>OH</sub> =-32 mA	Com'l	2.0			V
		V <sub>CC</sub> =Min., I <sub>OH</sub> =-15 mA	Com'l	2.4	3.3		V
		V <sub>CC</sub> =Min., I <sub>OH</sub> =-12 mA	Mil	2.4	3.3		V
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> =Min., I <sub>OL</sub> =64 mA	Com'l		0.3	0.55	V
		V <sub>CC</sub> =Min., I <sub>OL</sub> =32 mA	Mil		0.3	0.55	V
V <sub>IH</sub>	Input HIGH Voltage			2.0			V
V <sub>IL</sub>	Input LOW Voltage					0.8	V
V <sub>H</sub>	Hysteresis <sup>[6]</sup>	All inputs			0.2		V
V <sub>IK</sub>	Input Clamp Diode Voltage	V <sub>CC</sub> =Min., I <sub>IN</sub> =-18 mA			-0.7	-1.2	V
I <sub>I</sub>	Input HIGH Current	V <sub>CC</sub> =Max., V <sub>IN</sub> =V <sub>CC</sub>				5	μA
I <sub>IH</sub>	Input HIGH Current	V <sub>CC</sub> =Max., V <sub>IN</sub> =2.7V				±1	μA
I <sub>IL</sub>	Input LOW Current	V <sub>CC</sub> =Max., V <sub>IN</sub> =0.5V				±1	μA
I <sub>OS</sub>	Output Short Circuit Current <sup>[7]</sup>	V <sub>CC</sub> =Max., V <sub>OUT</sub> =0.0V		-60	-120	-225	mA
I <sub>OFF</sub>	Power-Off Disable	V <sub>CC</sub> =0V, V <sub>OUT</sub> =4.5V				±1	μA

**Notes:**

- H = HIGH Voltage Level  
h = HIGH Voltage Level one set-up time prior to the LOW-to-HIGH Clock Transition  
L = LOW Voltage Level  
l = LOW Voltage Level one set-up time prior to the LOW-to-HIGH Clock Transition  
X = Don't Care  
Z = HIGH Impedance  
┐ = LOW-to-HIGH clock transition
- Unless otherwise noted, these limits are over the operating free-air temperature range.
- Unused inputs must always be connected to an appropriate logic voltage level, preferably either V<sub>CC</sub> or ground.

- T<sub>A</sub> is the "instant on" case temperature.
- Typical values are at V<sub>CC</sub>=5.0V, T<sub>A</sub>=+25°C ambient.
- This parameter is guaranteed but not tested.
- Not more than one output should be shorted at a time. Duration of short should not exceed one second. The use of high-speed test apparatus and/or sample and hold techniques are preferable in order to minimize internal chip heating and more accurately reflect operational values. Otherwise prolonged shorting of a high output may raise the chip temperature well above normal and thereby cause invalid readings in other parametric tests. In any sequence of parameter tests, I<sub>OS</sub> tests should be performed last.

**Capacitance<sup>[6]</sup>**

Parameter	Description	Typ. <sup>[5]</sup>	Max.	Unit
C <sub>IN</sub>	Input Capacitance	5	10	pF
C <sub>OUT</sub>	Output Capacitance	9	12	pF

**Power Supply Characteristics**

Parameter	Description	Test Conditions	Typ. <sup>[5]</sup>	Max.	Unit
I <sub>CC</sub>	Quiescent Power Supply Current	V <sub>CC</sub> =Max., V <sub>IN</sub> ≤0.2V, V <sub>IN</sub> ≥V <sub>CC</sub> -0.2V	0.1	0.2	mA
ΔI <sub>CC</sub>	Quiescent Power Supply Current (TTL inputs HIGH)	V <sub>CC</sub> =Max., V <sub>IN</sub> =3.4V <sup>[8]</sup> f <sub>1</sub> =0, Outputs Open	0.5	2.0	mA
I <sub>CCD</sub>	Dynamic Power Supply Current <sup>[9]</sup>	V <sub>CC</sub> =Max., One Bit Toggling, 50% Duty Cycle, Outputs Open, CE=GND, V <sub>IN</sub> ≤0.2V or V <sub>IN</sub> ≥V <sub>CC</sub> -0.2V	0.06	0.12	mA/ MHz
I <sub>C</sub>	Total Power Supply Current <sup>[10]</sup>	V <sub>CC</sub> =Max., f <sub>0</sub> =10 MHz, 50% Duty Cycle, Outputs Open, One Bit Toggling at f <sub>1</sub> =5 MHz, CE=GND, V <sub>IN</sub> ≤0.2V or V <sub>IN</sub> ≥V <sub>CC</sub> -0.2V	0.7	1.4	mA
		V <sub>CC</sub> =Max., f <sub>0</sub> =10 MHz, 50% Duty Cycle, Outputs Open, One Bit Toggling at f <sub>1</sub> =5 MHz, CE=GND, V <sub>IN</sub> =3.4V or V <sub>IN</sub> =GND	1.2	3.4	mA
		V <sub>CC</sub> =Max., f <sub>0</sub> =10 MHz, 50% Duty Cycle, Outputs Open, Eight Bits Toggling at f <sub>1</sub> =2.5 MHz, CE=GND, V <sub>IN</sub> ≤0.2V or V <sub>IN</sub> ≥V <sub>CC</sub> -0.2V	1.6	3.2 <sup>[11]</sup>	mA
		V <sub>CC</sub> =Max., f <sub>0</sub> =10 MHz, 50% Duty Cycle, Outputs Open, Eight Bits Toggling at f <sub>1</sub> =2.5 MHz, CE=GND, V <sub>IN</sub> =3.4V or V <sub>IN</sub> =GND	3.9	12.2 <sup>[11]</sup>	mA

**Notes:**

8. Per TTL driven input (V<sub>IN</sub>=3.4V); all other inputs at V<sub>CC</sub> or GND.
9. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
  - 10. I<sub>C</sub> = I<sub>QUIESCENT</sub> + I<sub>INPUTS</sub> + I<sub>DYNAMIC</sub>
  - I<sub>C</sub> = I<sub>CC</sub> + ΔI<sub>CC</sub>D<sub>H</sub>N<sub>T</sub> + I<sub>CCD</sub>(f<sub>0</sub>/2 + f<sub>1</sub>N<sub>1</sub>)
  - I<sub>CC</sub> = Quiescent Current with CMOS input levels
  - ΔI<sub>CC</sub> = Power Supply Current for a TTL HIGH input (V<sub>IN</sub>=3.4V)
  - D<sub>H</sub> = Duty Cycle for TTL inputs HIGH
  - N<sub>T</sub> = Number of TTL inputs at D<sub>H</sub>
  - I<sub>CCD</sub> = Dynamic Current caused by an input transition pair (HLH or LHL)
  - f<sub>0</sub> = Clock frequency for registered devices, otherwise zero
  - f<sub>1</sub> = Input signal frequency
  - N<sub>1</sub> = Number of inputs changing at f<sub>1</sub>
11. All currents are in milliamps and all frequencies are in megahertz. Values for these conditions are examples of the I<sub>CC</sub> formula. These limits are guaranteed but not tested.

**Switching Characteristics** Over the Operating Range<sup>[12]</sup>

Parameter	Description	FCT377T				FCT377AT				Unit	Fig. No. <sup>[14]</sup>
		Military		Commercial		Military		Commercial			
		Min. <sup>[13]</sup>	Max.	Min. <sup>[13]</sup>	Max.	Min. <sup>[13]</sup>	Max.	Min. <sup>[13]</sup>	Max.		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Clock to Output	2.0	15.0	2.0	13.0	2.0	8.3	2.0	7.2	ns	1, 5
t <sub>S</sub>	Set-Up Time HIGH or LOW Data to CP	3.0		2.0		2.0		2.0		ns	4
t <sub>H</sub>	Hold Time HIGH or LOW Data to CP	2.5		1.5		1.5		1.5		ns	4
t <sub>W</sub>	Set-Up Time HIGH or LOW CE to CP	4.0		3.5		3.5		3.5		ns	4
t <sub>W</sub>	Set-Up Time HIGH or LOW CE to CP	1.5		1.5		1.5		1.5		ns	4
t <sub>W</sub>	Clock Pulse Width <sup>[15]</sup> HIGH or LOW	7.0		6.0		7.0		6.0		ns	6

Parameter	Description	FCT377CT				Unit	Fig. No. <sup>[14]</sup>
		Military		Commercial			
		Min. <sup>[13]</sup>	Max.	Min. <sup>[13]</sup>	Max.		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Clock to Output	2.0	5.5	2.0	5.2	ns	1, 5
t <sub>S</sub>	Set-Up Time, HIGH or LOW, Data to CP	2.0		2.0		ns	4
t <sub>H</sub>	Hold Time, HIGH or LOW, Data to CP	1.5		1.5		ns	4
t <sub>W</sub>	Set-Up Time, HIGH or LOW, CE to CP	3.5		3.5		ns	4
t <sub>W</sub>	Set-Up Time HIGH or LOW, CE to CP	1.5		1.5		ns	4
t <sub>W</sub>	Clock Pulse Width <sup>[15]</sup> HIGH or LOW	7.0		6.0		ns	6

**Notes:**

12. AC Characteristics guaranteed with C<sub>L</sub> = 50 pF as shown in Figure 1 of the "Parameter Measurement Information" in the General Information Section.

13. Minimum limits are guaranteed but not tested on Propagation Delays.

14. See "Parameter Measurement Information" in the General Information Section.

15. With one data channel toggling, t<sub>W(L)</sub> = t<sub>W(H)</sub> = 4.0 ns and t<sub>r</sub> = t<sub>f</sub> = 1.0 ns.

**Ordering Information—FCT377T**

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
5.2	CY74FCT377CTPC	P5	20-Lead (300-Mil) Molded DIP	Commercial
	CY74FCT377CTQC	Q5	20-Lead (150-Mil) QSOP	
	CY74FCT377CTSOC	S5	20-Lead (300-Mil) Molded SOIC	
5.5	CY54FCT377CTDMB	D6	20-Lead (300-Mil) CerDIP	Military
	CY54FCT377CTLMB	L61	20-Pin Square Leadless Chip Carrier	
7.2	CY74FCT377ATPC	P5	20-Lead (300-Mil) Molded DIP	Commercial
	CY74FCT377ATQC	Q5	20-Lead (150-Mil) QSOP	
	CY74FCT377ATSOC	S5	20-Lead (300-Mil) Molded SOIC	
8.3	CY54FCT377ATDMB	D6	20-Lead (300-Mil) CerDIP	Military
	CY54FCT377ATLMB	L61	20-Pin Square Leadless Chip Carrier	
13.0	CY74FCT377TPC	P5	20-Lead (300-Mil) Molded DIP	Commercial
	CY74FCT377TQC	Q5	20-Lead (150-Mil) QSOP	
	CY74FCT377TSOC	S5	20-Lead (300-Mil) Molded SOIC	
15.0	CY54FCT377TDMB	D6	20-Lead (300-Mil) CerDIP	Military
	CY54FCT377TLMB	L61	20-Pin Square Leadless Chip Carrier	

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