



SCCS020 - March 1995 - Revised February 2000

CY54/74FCT273T

8-Bit Register

Features

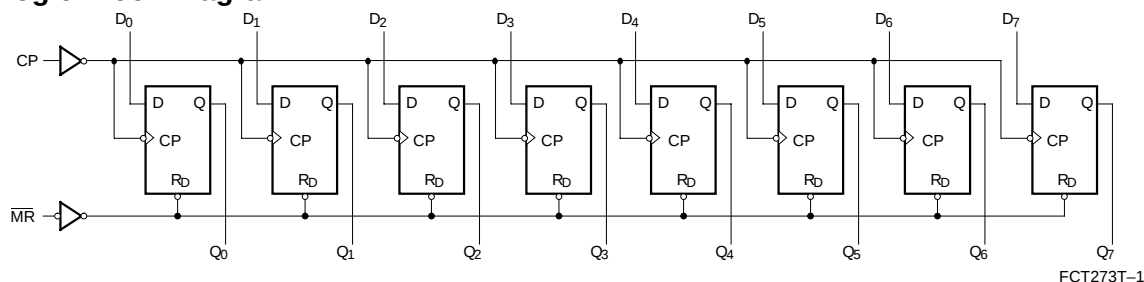
- Function, pinout, and drive compatible with FCT and F logic
- FCT-C speed at 5.8 ns max. (Com'l)
FCT-A speed at 7.2 ns max. (Com'l)
- Reduced V_{OH} (typically = 3.3V) versions of equivalent FCT functions
- Edge-rate control circuitry for significantly improved noise characteristics
- Power-off disable feature
- Matched rise and fall times
- ESD > 2000V
- Fully compatible with TTL input and output logic levels
- Extended commercial range of -40°C to $+85^{\circ}\text{C}$
- Sink current **64 mA (Com'l), 32 mA (Mil)**
Source current **32 mA (Com'l), 12 mA (Mil)**

Functional Description

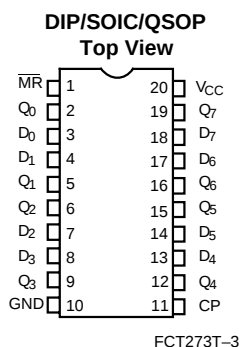
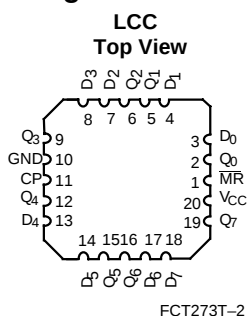
The FCT273T consists of eight edge-triggered D-type flip-flops with individual D inputs and Q outputs. The common buffered clock (CP) and master reset (MR) load and reset all flip-flops simultaneously. The FCT273T is an edge-triggered register. The state of each D input (one set-up time before the LOW-to-HIGH clock transition) is transferred to the corresponding flip-flop's Q output. All outputs will be forced LOW by a low voltage level on the $\overline{\text{MR}}$ input.

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

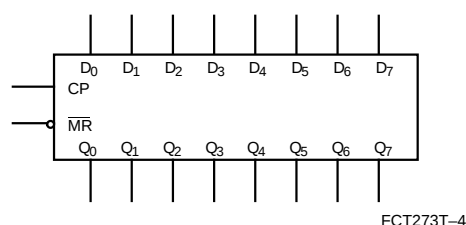
Logic Block Diagram



Pin Configurations



Logic Symbol



Function Table^[1]

Operating Mode	Inputs			Output
	$\overline{\text{MR}}$	CP	D	Q
Reset (clear)	L	X	X	L
Load '1'	H	$\uparrow$	h	H
Load '0'	H	$\uparrow$	l	L

Note:

1. H = HIGH Voltage Level steady state
h = HIGH Voltage Level one set-up time prior to LOW-to-HIGH clock transition
L = LOW Voltage Level steady state
l = LOW Voltage Level one set-up time prior to the LOW-to-HIGH transition
X = Don't Care
 $\uparrow$ = LOW-to-HIGH clock transition

Maximum Ratings^[2, 3]

(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 _{CC}
Commercial	All	-40°C to +85°C	5V ± 5%
Military ^[4]	All	-55°C to +125°C	5V ± 10%

Electrical Characteristics Over the Operating Range

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

Capacitance^[6]

Parameter	Description	Typ. ^[5]	Max.	Unit
C _{IN}	Input Capacitance	5	10	pF
C _{OUT}	Output Capacitance	9	12	pF

Notes:

- 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_{CC} or ground.
- T_A is the "instant on" case temperature
- Typical values are at V_{CC}=5.0V, T_A=+25°C ambient.
- This parameter is specified 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_{OS} tests should be performed last.

Power Supply Characteristics

Parameter	Description	Test Conditions	Typ. ^[5]	Max.	Unit
I_{CC}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}, V_{IN} \leq 0.2V, V_{IN} \geq V_{CC} - 0.2V$	0.1	0.2	mA
ΔI_{CC}	Quiescent Power Supply Current (TTL inputs HIGH)	$V_{CC} = \text{Max.}, V_{IN} = 3.4V, f_1 = 0, \text{Outputs Open}^{[8]}$	0.5	2.0	mA
I_{CCD}	Dynamic Power Supply Current ^[9]	$V_{CC} = \text{Max.}, \text{One Bit Toggling, 50\% Duty Cycle, Outputs Open, } MR = V_{CC}, V_{IN} \leq 0.2V \text{ or } V_{IN} \geq V_{CC} - 0.2V$	0.06	0.12	mA/MHz
I_C	Total Power Supply Current ^[10]	$V_{CC} = \text{Max.}, f_0 = 10 \text{ MHz, 50\% Duty Cycle, Outputs Open, One Bit Toggling at } f_1 = 5 \text{ MHz, } MR = V_{CC}, V_{IN} \leq 0.2V \text{ or } V_{IN} \geq V_{CC} - 0.2V$	0.7	1.4	mA
		$V_{CC} = \text{Max.}, f_0 = 10 \text{ MHz, 50\% Duty Cycle, Outputs Open, One Bit Toggling at } f_1 = 5 \text{ MHz, } MR = V_{CC}, V_{IN} = 3.4V \text{ or } V_{IN} = \text{GND}$	1.2	3.4	mA
		$V_{CC} = \text{Max.}, f_0 = 10 \text{ MHz, 50\% Duty Cycle, Outputs Open, Eight Bits Toggling at } f_1 = 2.5 \text{ MHz, } MR = V_{CC}, V_{IN} \leq 0.2V \text{ or } V_{IN} \geq V_{CC} - 0.2V$	1.6	3.2 ^[11]	mA
		$V_{CC} = \text{Max.}, f_0 = 10 \text{ MHz, 50\% Duty Cycle, Outputs Open, Eight Bits Toggling at } f_1 = 2.5 \text{ MHz, } MR = V_{CC}, V_{IN} = 3.4V \text{ or } V_{IN} = \text{GND}$	3.9	12.2 ^[11]	mA

Notes:

8. Per TTL driven input ($V_{IN} = 3.4V$); all other inputs at V_{CC} or GND.
9. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
10. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_0/2 + f_1 N_1)$
 I_{CC} = Quiescent Current with CMOS input levels
 ΔI_{CC} = Power Supply Current for a TTL HIGH input ($V_{IN} = 3.4V$)
 D_H = Duty Cycle for TTL inputs HIGH
 N_T = Number of TTL inputs at D_H
 I_{CCD} = Dynamic Current caused by an input transition pair (HLH or LHL)
 f_0 = Clock frequency for registered devices, otherwise zero
 f_1 = Input signal frequency
 N_1 = Number of inputs changing at f_1
All currents are in milliamps and all frequencies are in megahertz.
11. Values for these conditions are examples of the I_{CC} formula. These limits are specified but not tested.

Switching Characteristics Over the Operating Range^[12]

Parameter	Description	FCT273T		FCT273AT				Unit	Fig. No. ^[13]
		Commercial		Military		Commercial			
		Min.	Max.	Min.	Max.	Min.	Max.		
t _{PLH} t _{PHL}	Propagation Delay Clock to Output	2.0	13.0	2.0	8.3	2.0	7.2	ns	1, 5
t _{PLH} t _{PHL}	Propagation Delay MR to Output	2.0	13.0	2.0	8.3	2.0	7.2	ns	1, 6
t _S	Set-Up Time HIGH or LOW D to Clock	2.0		2.0		2.0		ns	4
t _H	Hold Time HIGH or LOW D to Clock	1.5		1.5		1.5		ns	4
t _W	Clock Pulse Width HIGH or LOW	6.0		6.0		6.0		ns	5
t _W	MR Pulse Width LOW	6.0		6.0		6.0		ns	6
t _{REC}	Recovery Time MR to Clock	2.0		2.5		2.0		ns	6

Parameter	Description	FCT273CT		Unit	Fig. No. ^[13]
		Commercial			
		Min.	Max.		
t _{PLH} t _{PHL}	Propagation Delay Clock to Output	2.0	5.8	ns	1, 5
t _{PLH} t _{PHL}	Propagation Delay MR to Output	2.0	6.1	ns	1, 6
t _S	Set-Up Time HIGH or LOW D to Clock	2.0		ns	4
t _H	Hold Time HIGH or LOW D to Clock	1.5		ns	4
t _W	Clock Pulse Width HIGH or LOW	6.0		ns	5
t _W	$\overline{\text{MR}}$ Pulse Width LOW	6.0		ns	6
t _{REC}	Recovery Time $\overline{\text{MR}}$ to Clock	2.0		ns	6

Ordering Information

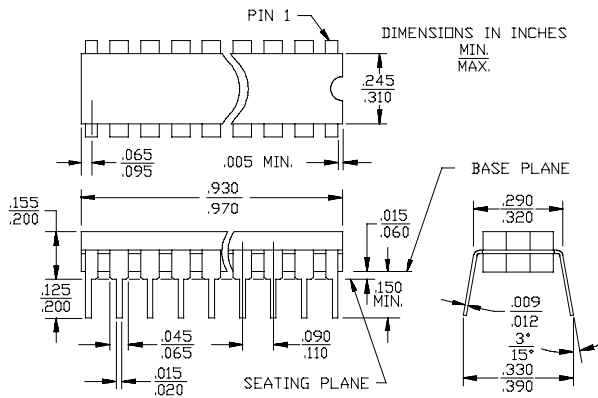
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
5.8	CY74FCT273CTQCT	Q5	20-Lead (150-Mil) QSOP	Commercial
	CY74FCT273CTSOC/SOCT	S5	20-Lead (300-Mil) Molded SOIC	
7.2	CY74FCT273ATQCT	Q5	20-Lead (150-Mil) QSOP	Commercial
	CY74FCT273ATSOC/SOCT	S5	20-Lead (300-Mil) Molded SOIC	
8.3	CY54FCT273ATLMB	L61	20-Square Leadless Chip Carrier	Military
	CY54FCT273ATDMB	D6	20-Lead (300-Mil) CerDIP	
13.0	CY74FCT273TQCT	Q5	20-Lead (150-Mil) QSOP	Commercial
	CY74FCT273TSOC/SOCT	S5	20-Lead (300-Mil) Molded SOIC	

Notes:

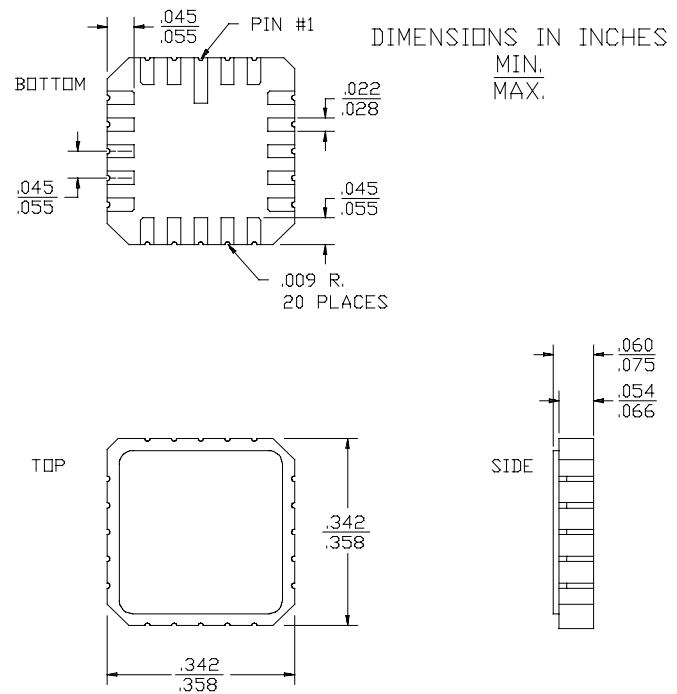
12. Minimum limits are specified but not tested on Propagation Delays.
 13. See "Parameter Measurement Information" in the General Information section.

Package Diagrams

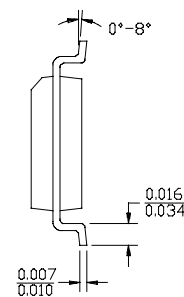
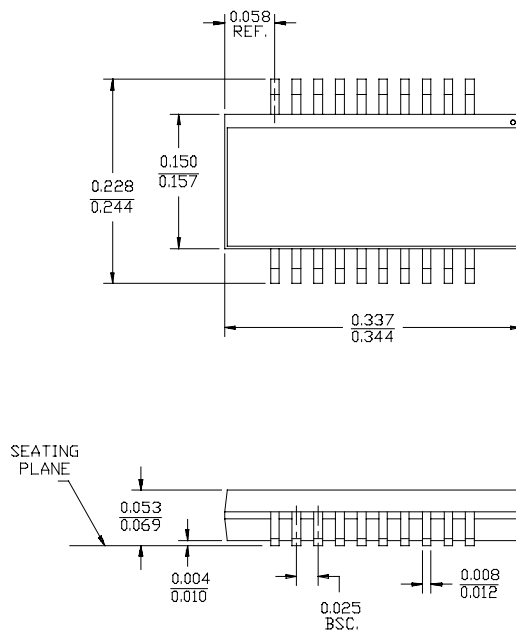
20-Lead (300-Mil) CerDIP D6
MIL-STD-1835 D- 8 Config.A



20-Pin Square Leadless Chip Carrier L61
MIL-STD-1835 C-2A



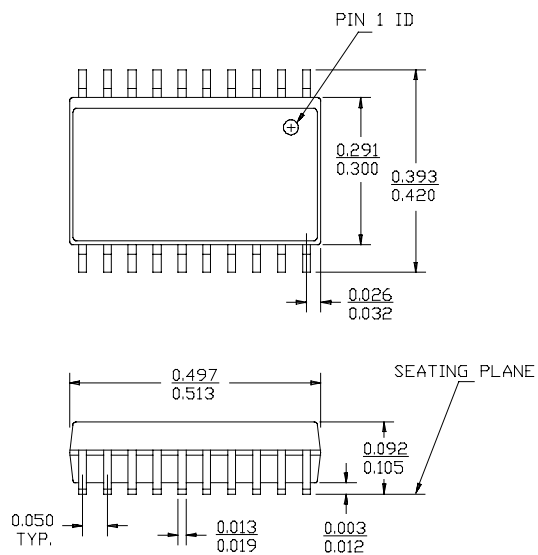
20-Lead Quarter Size Outline Q5



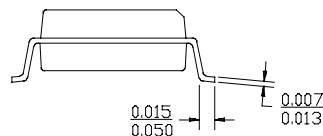
DIMENSIONS IN INCHES MIN.
MAX.
LEAD COPLANARITY 0.004 MAX.

Package Diagrams (continued)

20-Lead (300-Mil) Molded SOIC S5



DIMENSIONS IN INCHES MIN.
MAX.
LEAD COPLANARITY 0.004 MAX.



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