

FEATURES

- Function, Pinout and Drive Compatible with the FCT, F Logic and AM29520
- FCT-C speed at 6.0ns max. (Com'I)
FCT-B speed at 7.5ns max. (Com'I)
- 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
- Fully Compatible with TTL Input and Output Logic Levels
- 64 mA Sink Current (Com'I), 32 mA (Mil)
15 mA Source Current (Com'I), 12 mA (Mil)
- Single and Dual Pipeline Operation Modes
- Multiplexed Data Inputs and Outputs

DESCRIPTION

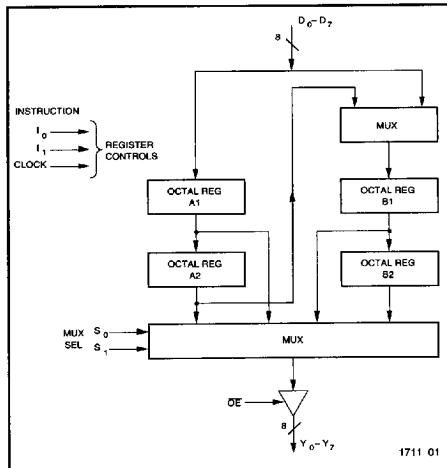
The 'FCT520T is a multi-level 8-bit wide pipeline register. The device consists of 4 registers A1, A2, B1 and B2 which are configured by the instruction inputs I_0 , I_1 as a single 4-level pipeline or as two 2-level pipelines. The contents of any register may be read at the multiplexed output at any time by using the mux-selection controls S_0 and S_1 .

The pipeline register is positive edge triggered and data is shifted by the rising edge of the clock input. Instruction

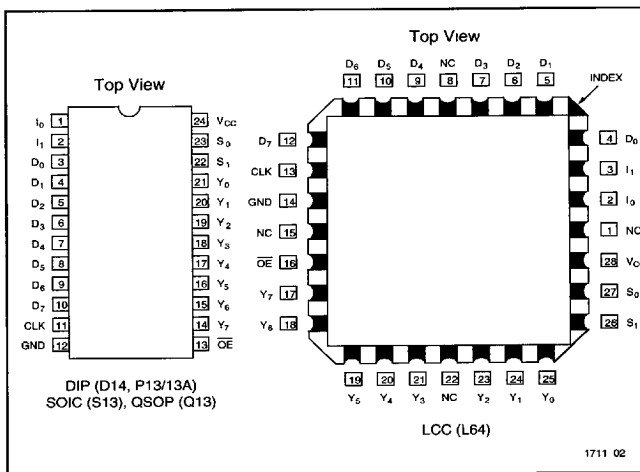
$I = 0$ selects the 4-level pipeline mode. Instruction $I = 1$ selects the 2-level B pipeline while $I = 2$ selects the 2-level A pipeline. $I = 3$ is the HOLD instruction; no shifting is performed by the clock in this mode.

In the 2-level operation mode, the 'FCT520T data is shifted from level 1 to level 2 and new data is loaded into level 1.

LOGIC BLOCK DIAGRAM



PIN CONFIGURATIONS



ABSOLUTE MAXIMUM RATINGS^{1,2}

Symbol	Parameter	Value	Unit
T_{STG}	Storage Temperature	-65 to +150	°C
T_A	Ambient Temperature Under Bias	-65 to +135	°C
V_{CC}	V_{CC} Potential to Ground	-0.5 to +7.0	V
P_T	Power Dissipation	0.5	W

1711 Tbl 01

Symbol	Parameter	Value	Unit
I_{OUTPUT}	Current Applied to Output	120	mA
V_{IN}	Input Voltage	-0.5 to +7.0	V
V_{OUT}	Voltage Applied to Output	-0.5 to +7.0	V

1711 Tbl 02

Notes:

1. Operation beyond the limits set forth in the above table may impair the useful life of the device. Unless otherwise noted, these limits are over the operating free-air temperature range.

2. Unused inputs must always be connected to an appropriate logic voltage level, preferably either V_{CC} or ground.

RECOMMENDED OPERATING CONDITIONS

Free Air Ambient Temperature	Min	Max
Military	-55°C	+125°C
Commercial	0°C	+70°C

1711 Tbl 03

Supply Voltage (V_{CC})	Min	Max
Military	+4.5V	+5.5V
Commercial	+4.75V	+5.25V

1711 Tbl 04

DC ELECTRICAL CHARACTERISTICS (Over recommended operating conditions)

Symbol	Parameter		Min	Typ ¹	Max	Units	V _{CC}	Conditions
V _{IH}	Input HIGH Voltage		2.0			V		
V _{IL}	Input LOW Voltage				0.8	V		
V _H	Hysteresis			0.2		V		All inputs
V _{IK}	Input Clamp Diode Voltage			−0.7	−1.2	V	MIN	I _{IN} = −18mA
V _{OH}	Output HIGH Voltage	Military	2.4	3.3		V	MIN	I _{OH} = −12mA
		Commercial	2.4	3.3		V	MIN	I _{OH} = −15mA
V _{OL}	Output LOW Voltage	Military Commercial Commercial		0.3	0.5	V	MIN	I _{OL} = 32mA
				0.3	0.5	V	MIN	I _{OL} = 48mA
				0.3	0.5	V	MIN	I _{OL} = 64mA
I _I	Input HIGH Current				20	μA	MAX	V _{IN} = V _{CC}
I _{IH}	Input HIGH Current				5	μA	MAX	V _{IN} = 2.7V
I _{IL}	Input LOW Current				−5	μA	MAX	V _{IN} = 0.5V
I _{OZH}	Off State I _{OUT} HIGH-Level Output Current				10	μA	MAX	V _{OUT} = 2.7V
I _{OZL}	Off State I _{OUT} LOW-Level Output Current				−10	μA	MAX	V _{OUT} = 0.5V
I _{OS}	Output Short Circuit Current ²		−60	−120	−225	mA	MAX	V _{OUT} = 0.0V
I _{OFF}	Power-off Disable				100	μA	0V	V _{OUT} = 4.5V
C _{IN}	Input Capacitance ³			5	10	pF	MAX	All inputs
C _{OUT}	Output Capacitance ³			9	12	pF	MAX	All outputs
I _{CC}	Quiescent Power Supply Current			0.2	1.5	mA	MAX	V _{IN} ≤ 0.2V, V _{IN} ≥ V _{CC} − 0.2V

1711 Tbl 05

Notes:

- Typical values are at $V_{CC} = 5.0V$, $T_A = +25^\circ C$ ambient.
- 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 parameter tests. In any sequence of parameter tests, I_{OS} tests should be performed last.

- This parameter is guaranteed but not tested.

DC CHARACTERISTICS (Over recommended operating conditions unless otherwise specified.)

Symbol	Parameter	Typ ¹	Max	Units	Conditions
ΔI_{CC}	Quiescent Power Supply Current (TTL inputs) ²	0.5	2.0	mA	$V_{CC} = \text{MAX}$, Outputs Open, $f_1 = 0$, $V_{IN} = 3.4V^2$
I_{CCD}	Dynamic Power Supply Current ³	0.15	0.25	mA/ MHz	$V_{CC} = \text{MAX}$, One Input Toggling, 50% Duty Cycle, Outputs Open, $\overline{OE} = \text{GND}$, $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
I_C	Total Power Supply Current ⁵	1.7	4.0	mA	$V_{CC} = \text{MAX}$, $f_0 = 10\text{MHz}$, 50% Duty Cycle, Outputs Open, One Bit Toggling at $f_1 = 5\text{MHz}$, $\overline{OE} = \text{GND}$, $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
		2.2	6.0	mA	$V_{CC} = \text{MAX}$, $f_0 = 10\text{MHz}$, 50% Duty Cycle, Outputs Open, One Bit Toggling at $f_1 = 5\text{MHz}$, $\overline{OE} = \text{GND}$, $V_{IN} = 3.4V$ or $V_{IN} = \text{GND}$
		7.0	12.8 ⁴	mA	$V_{CC} = \text{MAX}$, $f_0 = 10\text{MHz}$, 50% Duty Cycle, Outputs Open, Eight Bits Toggling, $f_1 = 5\text{MHz}$, $\overline{OE} = \text{GND}$, $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
		9.2	21.8 ⁴	mA	$V_{CC} = \text{MAX}$, $f_0 = 10\text{MHz}$, 50% Duty Cycle, Outputs Open, Eight Bits Toggling, $f_1 = 5\text{MHz}$, $\overline{OE} = \text{GND}$, $V_{IN} = 3.4V$ or $V_{IN} = \text{GND}$

1711 Tbl 06

Notes:

- Typical values are at $V_{CC} = 5.0V$, $+25^\circ\text{C}$ ambient.
- Per TTL driven input ($V_{IN} = 3.4V$); all other inputs at V_{CC} or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
- Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.
- $$I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$$

$$I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_0/2 + f_1 N_I)$$

$$I_{CC} = \text{Quiescent Current with CMOS input levels}$$

$$\Delta I_{CC} = \text{Power Supply Current for a TTL High Input}$$

$$(V_{IN} = 3.4V)$$

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 Register Devices (Zero for Non-Register Devices)

f_1 = Input Frequency

N_I = Number of Inputs at f_1

All currents are in milliamps and all frequencies are in megahertz.

OUTPUT SELECTION MUX TABLE

S_1	S_0	Output
1	1	A1
1	0	A2
0	1	B1
0	0	B2

1711 Tbl 07

AC CHARACTERISTICS

Symbol	Parameter	'FCT520AT				Units	Fig. No.*
		MIL		COM'L			
		Min.¹	Max.	Min.¹	Max.		
t _{PLH} t _{PHL}	Clock to Data Output	2.0	16.0	2.0	14.0	ns	5
t _{PLH} t _{PHL}	S0, S1 To Data Output	2.0	15.0	2.0	13.0	ns	5
t _S	Setup Time Input Data to Clock	6.0	—	5.0	—	ns	5
t _H	Hold Time Input Data to Clock	2.0	—	2.0	—	ns	5
t _S	Setup Time Instruction (Reg. Enable) to Clock	6.0	—	5.0	—	ns	5
t _H	Hold Time Instruction (Reg. Enable) to Clock	2.0	—	2.0	—	ns	5
t _{PHZ} t _{PLZ}	Output Disable Time	1.5	13.0	1.5	12.0	ns	8, 7
t _{PZH} t _{PZL}	Output Enable Time	1.5	16.0	1.5	15.0	ns	8, 7
t _W (H) t _W (L)	Clock Pulse Width, High or Low	8.0	—	7.0	—	ns	5

Notes:

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

1711 Tbl 09

AC CHARACTERISTICS

Symbol	Parameter	'FCT520BT				'FCT520CT				Units	Fig. No.*
		MIL		COM'L		MIL		COM'L			
		Min. ¹	Max.	Min. ¹	Max.	Min. ¹	Max.	Min. ¹	Max.		
t_{PLH} t_{PHL}	Clock to Data Output	2.0	8.0	2.0	7.5	2.0	7.0	2.0	6.0	ns	5
t_{PLH} t_{PHL}	S0, S1 To Data Output	2.0	8.0	2.0	7.5	2.0	7.0	2.0	6.0	ns	5
t_S	Setup Time Input Data to Clock	2.8	—	2.5	—	2.8	—	2.5	—	ns	5
t_H	Hold Time Input Data to Clock	2.0	—	2.0	—	2.0	—	2.0	—	ns	
t_S	Setup Time Instruction (Reg. Enable) to Clock	4.5	—	4.0	—	4.5	—	4.0	—	ns	
t_H	Hold Time Instruction (Reg. Enable) to Clock	2.0	—	2.0	—	2.0	—	2.0	—	ns	
t_{PHZ} t_{PLZ}	Output Disable Time	1.5	7.5	1.5	7.0	1.5	6.0	1.5	6.0	ns	8, 7
t_{PZH} t_{PZL}	Output Enable Time	1.5	8.0	1.5	7.5	1.5	7.0	1.5	6.0	ns	8, 7
$t_W(H)$ $t_W(L)$	Clock Pulse Width, High or Low	6.0	—	5.5	—	6.0	—	5.5	—	ns	5

Notes:

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

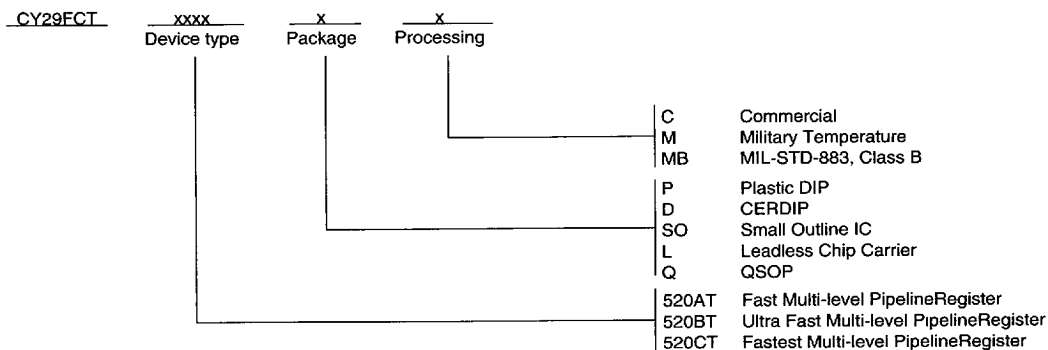
AC Characteristics guaranteed with $C_i = 50\text{pF}$ as shown in Figure 1

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

1711 Tbl 10

$I = 0$	$I = 1$	$I = 2$	$I = 3$
$I_1 = 0, \quad I_0 = 0$	$I_1 = 0 \quad I_0 = 1$	$I_1 = 1 \quad I_0 = 0$	$I_1 = 1 \quad I_0 = 1$
Single 4-level	Dual 2-level		Hold

ORDERING INFORMATION



1711 03