CY54/74FCT399T
QUAD 2-INPUT REGISTERS

FEATURES

- **Function, Pinout and Drive Compatible with the FCT and F Logic**
- **FCT-C speed at 6.1ns max. (Com'l) FCT-A speed at 7.0ns 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**
- **Fully Compatible with TTL Input and Output Logic Levels**
- **64 mA Sink Current (Com'l), 32 mA (Mil) 15 mA Source Current (Com'l), 12 mA (Mil)**

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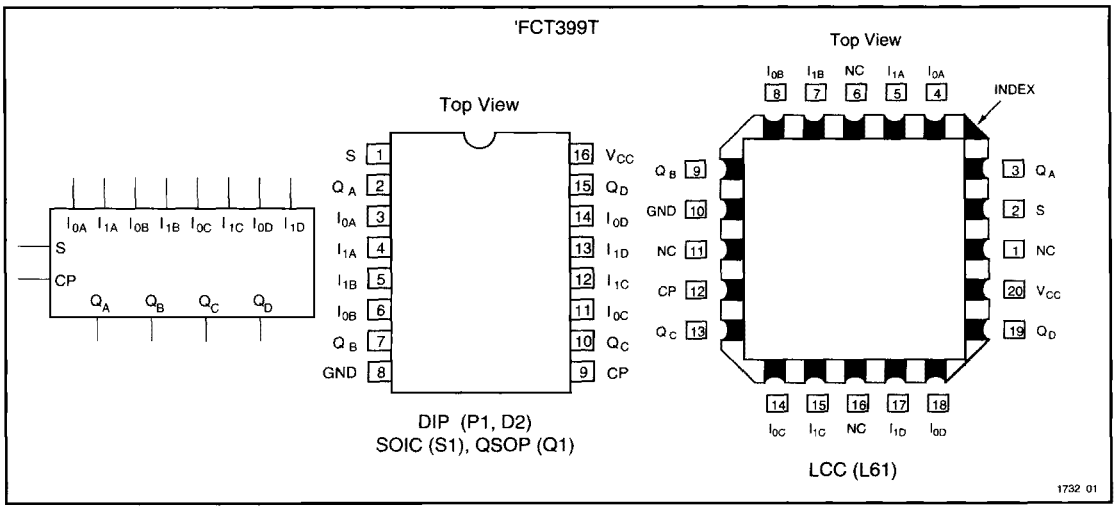
DESCRIPTION

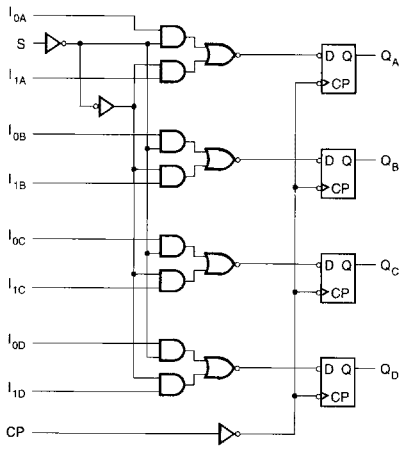
The 'FCT399T is a high-speed quad dual-port registers that select four bits of data from either of two sources (Ports) under control of a common Select input (S). The selected data is transferred to a 4-bit output register synchronous with the LOW-to- HIGH transition of the Clock input (CP). The 4-bit D-type output register is fully edge-triggered. The Data inputs (I_{0X},I_{1X}) and Select input (S) must be stable only one set-up time prior to, and hold time after, the LOW-to HIGH transition of the Clock input for predictable operation. The 'FCT399T offers true outputs.

LOGIC SYMBOL AND PIN CONFIGURATIONS



FUNCTIONAL BLOCK DIAGRAM

'FCT399T



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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
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

Notes:

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

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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		0.3	0.5	V	MIN	I_{OL} = 32mA
		Commercial		0.3	0.5	V	MIN	I_{OL} = 48mA
		Commercial		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_{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	$V_{IN} \leq 0.2V$, $V_{IN} \geq V_{CC}-0.2V$

Notes:

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1. Typical values are at V_{CC} = 5.0V, T_A = +25°C ambient.
2. 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.
3. 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} = MAX, V_{IN} = 3.4V[2], f_1 = 0, Outputs Open
I_{CCD}	Dynamic Power Supply Current[3]	0.15	0.25	mA/ MHz	V_{CC} = MAX, One Input Toggling, 50% Duty Cycle, Outputs Open, $V_{IN} \le 0.2V$ or $V_{IN} \ge V_{CC} - 0.2V$
I_C	Total Power Supply Current[5]	1.7	4.0	mA	V_{CC} = MAX, f_0 = 10MHz, 50% Duty Cycle, Outputs Open, One Input Toggling at f_1 = 5MHz, S = Steady State, $V_{IN} \le 0.2V$ or $V_{IN} \ge V_{CC} - 0.2V$
		2.2	6.0	mA	V_{CC} = MAX, f_0 = 10MHz, 50% Duty Cycle, Outputs Open, One Input Toggling at f_1 = 5MHz, S = Steady State, V_{IN} = 3.4V or V_{IN} = GND
		4.0	7.8[4]	mA	V_{CC} = MAX, f_0 = 10MHz, 50% Duty Cycle, Outputs Open, 4 Inputs Toggling at f_1 = 5MHz, S = Steady State, $V_{IN} \le 0.2V$ or $V_{IN} \ge V_{CC} - 0.2V$
		5.2	12.8[4]	mA	V_{CC} = MAX, f_0 = 10MHz, 50% Duty Cycle, Outputs Open, 4 Inputs Toggling at f_1 = 5MHz, S = Steady State, V_{IN} = 3.4V or V_{IN} = GND

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Notes:

1. Typical values are at V_{CC} = 5.0V, +25°C ambient and maximum loading.
2. Per TTL driven input (V_{IN} = 3.4V); all other inputs at V_{CC} or GND.
3. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
4. Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.
5. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD}(f_0/2 + f_1 N_1)$
   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 Register Devices (Zero for Non-Register Devices)
   f_1 = Input Frequency
   N_1 = Number of Inputs at f_1
   All currents are in milliamps and all frequencies are in megahertz.

FUNCTION TABLE — 'FCT399T

Inputs			Outputs
S	I_0	I_1	Q
l	l	X	L
l	h	X	H
h	X	l	L
h	X	h	H

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H = HIGH Voltage Level
L = LOW Voltage Level
h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition
l = LOW Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition
X = Don't Care

PIN DESCRIPTION

Pin Names	Description
S	Common Select Input
CP	Clock Pulse Input (Active Rising Edge)
$I_{0A} - I_{0D}$	Data Inputs from Source 0
$I_{1A} - I_{1D}$	Data Inputs from Source 1
$Q_A - Q_D$	Register True Outputs

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AC CHARACTERISTICS

Symbol	Parameter	'FCT399T				'FCT399AT				'FCT399CT				Units	Fig. No.*
		MIL		COM'L		MIL		COM'L		MIL		COM'L			
		Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.		
t_{PLH} t_{PHL}	Propagation Delay CP to Q	3.0	11.5	3.0	10.0	2.5	7.5	2.5	7.0	2.5	6.6	2.5	6.1	ns	1, 5

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Note:
1. Minimum limits are guaranteed but not tested on Propagation Delays.
* AC Characteristics guaranteed with C_L = 50pF as shown in Figure 1.
* See 'Parameter Measurement Information' in the General Information Section.

AC OPERATING REQUIREMENTS

Symbol	Parameter	'FCT399T				'FCT399AT				'FCT399CT				Units	Fig. No.*
		MIL		COM'L		MIL		COM'L		MIL		COM'L			
		Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.		
$t_s(H)$ $t_s(L)$	Setup Time, HIGH or LOW I_n to CP	4.5	—	4.0	—	4.0	—	3.5	—	4.0	—	3.5	—	ns	4
$t_h(H)$ $t_h(L)$	Hold Time, HIGH or LOW I_n to CP	1.5	—	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	ns	4
$t_s(H)$ $t_s(L)$	Set-up Time, HIGH or LOW SP to CP	9.5	—	9.0	—	9.0	—	8.5	—	9.0	—	8.5	—	ns	4
$t_h(H)$ $t_h(L)$	Hold Time, HIGH or LOW SP to CP	0	—	0	—	0	—	0	—	0	—	0	—	ns	4
$t_w(H)$ $t_w(L)$	Clock Pulse Width[2], HIGH or LOW	7.0	—	5.0	—	6.0	—	5.0	—	6.0	—	5.0	—	ns	5

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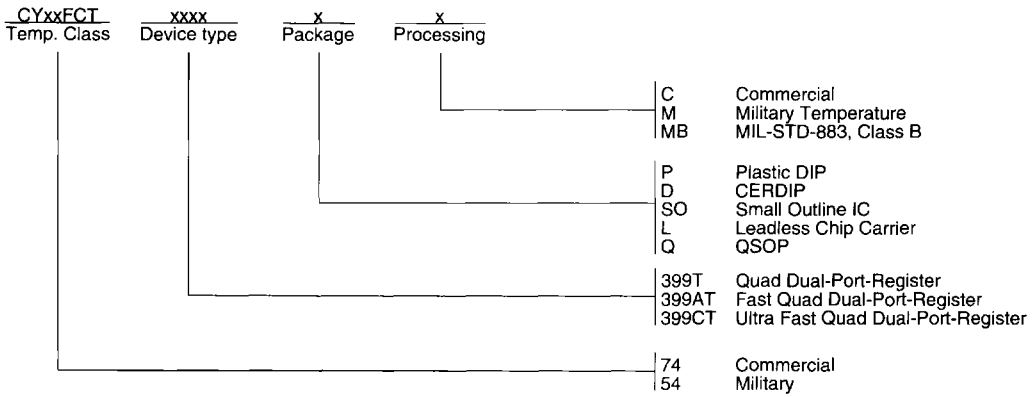
Notes:
1. Minimum limits are guaranteed but not tested on Propagation Delays.
2. This parameter is guaranteed but not tested.
* See "Parameter Measurement Information" in the General Information Section.

ORDERING INFORMATION



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