CD29FCT52T

December 1996

Fast CMOS Registered Transceiver

Features

- **Advanced 0.8 micron CMOS Technology**
- **These Devices are Pin Compatible With Bipolar FAST™ Series at a Higher Speed and Lower Power Consumption**
- **TTL Input and Output Levels**
- **Extremely Low Static Power**
- **Hysteresis on All Inputs**

Description

The CD29FCT52T is an 8-bit registered transceiver designed with two 8-bit back-to-back registers to store data flowing in both directions between two bidirectional buses. Separate clock enable and three-state output enable signals are provided for each register.

Ordering Information

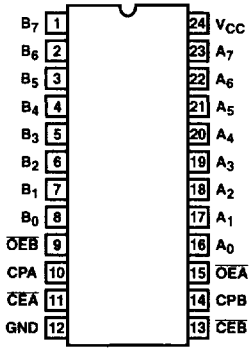
PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
CD29FCT52ATM	-40 to 85	24 Ld SOIC	M24.3-P
CD29FCT52ATQM	-40 to 85	24 Ld QSOP	M24.15-P
CD29FCT52BTM	-40 to 85	24 Ld SOIC	M24.3-P
CD29FCT52BTQM	-40 to 85	24 Ld QSOP	M24.15-P

NOTE: QSOP is commonly known as SSOP.

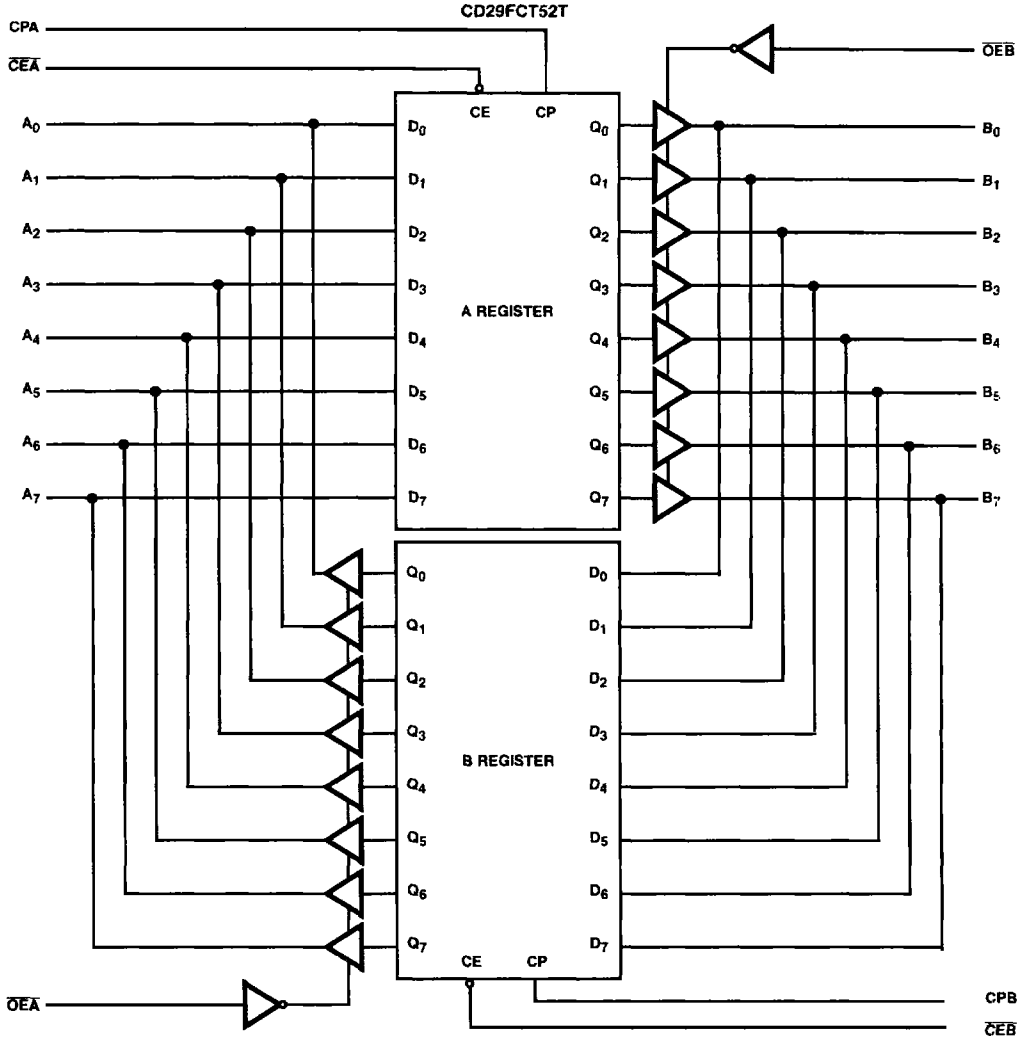
When ordering, use the entire part number. Add the suffix 96 to obtain the variant in the tape and reel.

Pinout

CD29FCT52T
(QSOP, SOIC)
TOP VIEW



Functional Block Diagram



TRUTH TABLE (NOTE 1)

FUNCTION	INPUTS			INTERNAL
	D_N	CP	$\overline{CE}$	Q_N
Hold Data	X	X	H	NC
Load Data	L	↑	L	L
	H	↑	L	H

NOTE:

1. H = HIGH Voltage Level
   L = LOW Voltage Level
   X = Don't Care
   Z = High Impedance
   NC = No Change
   ↑ = LOW-to-HIGH Transition

OUTPUT CONTROL TABLE

FUNCTION	$\overline{OE}$	INTERNAL	Y-OUTPUTS
		Q_N	CD29FCT52T
Disable Outputs	H	X	Z
Enable Outputs	L	L	L
	L	H	H

Pin Descriptions

PIN NAME	DESCRIPTION
A_0-A_7	A Register Inputs or B Register Outputs
B_0-B_7	B Register Inputs or A Register Outputs
CPA	Clock for A Register
CPB	Clock for B Register
$\overline{OEA}$	Output Enable for B Register
$\overline{OEB}$	Output Enable for A Register
$\overline{CEA}$	Clock Enable for A Register
$\overline{CEB}$	Clock Enable for B Register
GND	Ground
V_{CC}	Power

Absolute Maximum Ratings

DC Input Voltage ..... -0.5V to 7.0V
DC Output Current 120mA

Operating Conditions

Operating Temperature Range ..... -40°C to 85°C
Supply Voltage to Ground Potential
Inputs and V_{CC} Only ..... -0.5V to 7.0V
Supply Voltage to Ground Potential
Outputs and D/O Only ..... -0.5V to 7.0V

Thermal Information

Thermal Resistance (Typical, Note 2)	θ_{JA} (°C/W)
SOIC Package	75
QSOP Package	100

Maximum Junction Temperature ..... 150°C
Maximum Storage Temperature Range ..... -65°C to 150°C
Maximum Lead Temperature (Soldering 10s) ..... 300°C
(Lead Tips Only)

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

2. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

Electrical Specifications

PARAMETER	SYMBOL	(NOTE 3) TEST CONDITIONS		MIN	(NOTE 4) TYP	MAX	UNITS
DC ELECTRICAL SPECIFICATIONS Over the Operating Range, T_A = -40°C to 85°C, V_{CC} = 5.0V ±5%							
Output HIGH Voltage	V_{OH}	V_{CC} = Min, V_{IN} = V_{IH} or V_{IL}	I_{OH} = -15.0mA	2.4	3.0	-	V
Output LOW Voltage	V_{OL}	V_{CC} = Min, V_{IN} = V_{IH} or V_{IL}	I_{OL} = 64mA	-	0.3	0.50	V
Input HIGH Voltage	V_{IH}	Guaranteed Logic HIGH Level		2.0	-	-	V
Input LOW Voltage	V_{IL}	Guaranteed Logic LOW Level		-	-	0.8	V
Input HIGH Current	I_{IH}	V_{CC} = Max	V_{IN} = V_{CC}	-	-	1	µA
Input LOW Current	I_{IL}	V_{CC} = Max	V_{IN} = GND	-	-	-1	µA
High Impedance Output Current	I_{OZH}	V_{CC} = Max	V_{OUT} = 2.7V	-	-	1	µA
	I_{OZL}		V_{OUT} = 0.5V	-	-	-1	µA
Clamp Diode Voltage	V_{IK}	V_{CC} = Min, I_{IN} = -18mA		-	-0.7	-1.2	V
Short Circuit Current	I_{OS}	V_{CC} = Max (Note 5), V_{OUT} = GND		-60	-120	-	mA
Power Down Disable	I_{OFF}	V_{CC} = GND, V_{OUT} = 4.5V		-	-	100	µA
Input Hysteresis	V_H			-	200	-	mV
CAPACITANCE T_A = 25°C, f = 1MHz							
Input Capacitance (Note 6)	C_{IN}	V_{IN} = 0V		-	6	10	pF
Output Capacitance (Note 6)	C_{OUT}	V_{OUT} = 0V		-	8	12	pF
POWER SUPPLY SPECIFICATIONS							
Quiescent Power Supply Current	I_{CC}	V_{CC} = Max	V_{IN} = GND or V_{CC}	-	0.1	500	µ A
Supply Current per Input at TTL HIGH	ΔI_{CC}	V_{CC} = Max	V_{IN} = 3.4V (Note 7)	-	0.5	2	mA
Supply Current per Input per MHz (Note 8)	I_{CCD}	V_{CC} = Max, Outputs Open $\overline{OEA}$ or $\overline{OEB}$ = GND One Input Toggling 50% Duty Cycle	V_{IN} = V_{CC} V_{IN} = GND	-	0.15	0.25	mA/ MHz
Total Power Supply Current (Note 10)	I_C	V_{CC} = Max, Outputs Open f_{CP} = 10MHz, 50% Duty Cycle $\overline{OEA}$ or $\overline{OEB}$ = GND f_i = 5MHz One Bit toggling	V_{IN} = V_{CC} V_{IN} = GND	-	1.5	3.5 (Note 9)	mA
			V_{IN} = 3.4V V_{IN} = GND	-	2	5.5 (Note 9)	mA
		V_{CC} = Max, Outputs Open f_{CP} = 10MHz, 50% Duty Cycle $\overline{OEA}$ or $\overline{OEB}$ = GND Eight Bits Toggling f_i = 2.5MHz 50% Duty Cycle	V_{IN} = V_{CC} V_{IN} = GND	-	3.8	7.3 (Note 9)	mA
			V_{IN} = 3.4V V_{IN} = GND	-	6	16.3 (Note 9)	mA

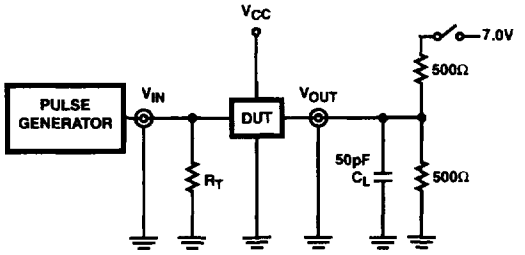
Switching Specifications Over Operating Range

PARAMETER	SYMBOL	(NOTE 11) TEST CONDITIONS	AT (NOTE 12) MIN	AT MAX	BT (NOTE 12) MIN	BT MAX	UNITS
Propagation Delay CPA, CPB, to A_N, B_N	t_{PLH}, t_{PHL}	C_L = 50 pF, R_L = 500Ω	2.0	10.0	2.0	7.5	ns
Output Enable Time $\overline{OEA}$, $\overline{OEB}$, to A_N, B_N	t_{PZH}, t_{PZL}		1.5	10.5	1.5	8.0	ns
Output Disable Time $\overline{OEA}$, $\overline{OEB}$, to A_N, B_N (Note 13)	t_{PHZ}, t_{PLZ}		1.5	10.0	1.5	7.5	ns
Set-up Time HIGH or LOW, A_N, B_N to CPA, CPB	t_{SU}		2.5	-	2.5	-	ns
Hold Time HIGH or LOW, A_N, B_N to CPA, CPB	t_H		2.0	-	1.5	-	ns
Set-up Time HIGH or LOW, $\overline{CEA}$, $\overline{CEB}$ to CPA, CPB	t_{SU}		3.0	-	3.0	-	ns
Hold Time HIGH or LOW, $\overline{CEA}$, $\overline{CEB}$ to CPA, CPB	t_H		2.0	-	2.0	-	ns
Pulse Width HIGH or LOW, CPA or CPB (Note 13)	t_W		3.0	-	3.0	-	ns

NOTES:

3. For conditions shown as Max or Min, use appropriate value specified under Electrical Specifications for the applicable device type.
4. Typical values are at V_{CC} = 5.0V, 25°C ambient and maximum loading
5. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
6. This parameter is determined by device characterization but is not production tested.
7. Per TTL driven input (V_{IN} = 3.4V); all other inputs at V_{CC} or GND.
8. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
9. Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.
10. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
    $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_i)$
    I_{CC} = Quiescent Current
    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_{CP} = Clock Frequency for Register Devices (Zero for Non-Register Devices)
    f_i = Input Frequency
    N_i = Number of Inputs at f_i
    All currents are in milliamps and all frequencies are in megahertz.
11. See test circuit and wave forms.
12. Minimum limits are guaranteed but not tested on Propagation Delays.
13. This parameter is guaranteed but not production tested.

Test Circuits and Waveforms



SWITCH POSITION

TEST	SWITCH
t_{PLZ}, t_{PZL}	Closed
t_{PHZ}, t_{PZH}, t_{PLH}, t_{PHL}	Open

DEFINITIONS:

C_L = Load capacitance, includes jig and probe capacitance.

R_T = Termination resistance, should be equal to Z_{OUT} of the Pulse Generator.

NOTE:

14. Pulse Generator for All Pulses: Rate ≤ 1.0MHz; $Z_{OUT} \leq 50\Omega$; t_f, $t_r \leq 2.5$ns.

FIGURE 1. TEST CIRCUIT

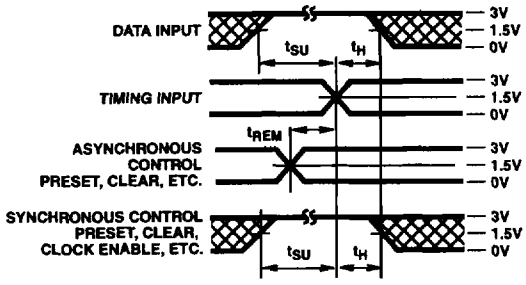


FIGURE 2. SETUP, HOLD, AND RELEASE TIMING

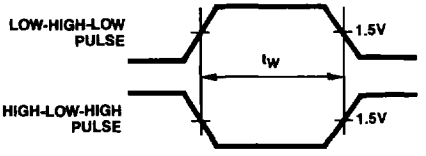


FIGURE 3. PULSE WIDTH

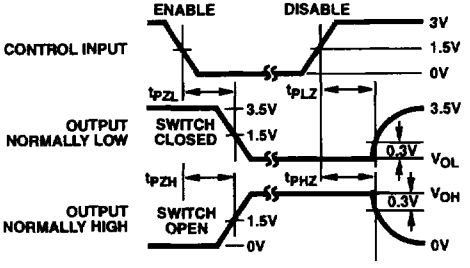


FIGURE 4. ENABLE AND DISABLE TIMING

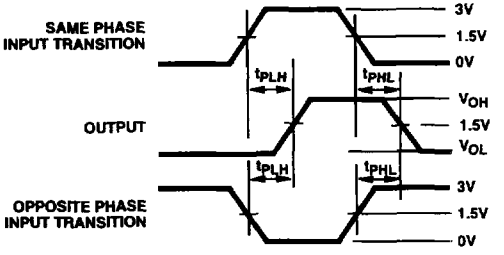


FIGURE 5. PROPAGATION DELAY