CY74FCT16543T
CY74FCT162543T

16-Bit Latched Transceivers

Features

- **Low power, pin-compatible replacement for ABT functions**
- **FCT-C speed at 5.1 ns**
- **Power-off disable outputs permits live insertion**
- **Edge-rate control circuitry for significantly improved noise characteristics**
- **Typical output skew < 250 ps**
- **ESD > 2000 V**
- **TSSOP (19.6-mil pitch) and SSOP (25-mil pitch) packages**
- **Extended commercial range of −40°C to +85°C**
- **V_{CC} = 5V ± 10%**

CY74FCT16543T Features:

- **64 mA sink current (Com'l), 32 mA source current (Com'l)**
- **Typical V_{OLP} (ground bounce) <1.0V at V_{CC} = 5V, T_A = 25°C**

CY74FCT162543T Features:

- **Balanced output drivers: 24 mA**
- **Reduced system switching noise**
- **Typical V_{OLP} (ground bounce) <0.6V at V_{CC} = 5V, T_A = 25°C**

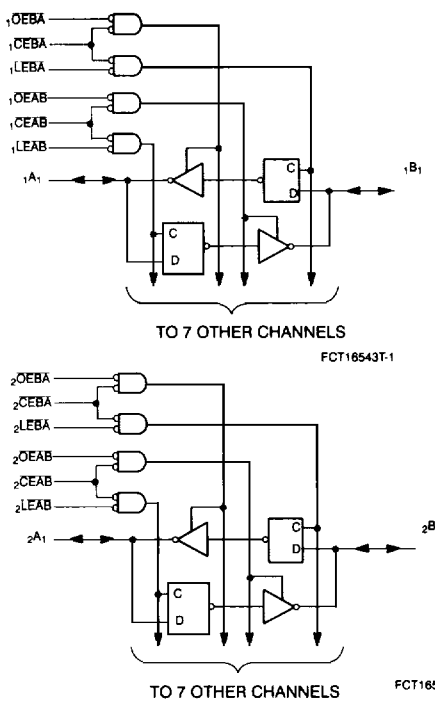
Functional Description

The CY74FCT16543T and CY74FCT162543T are 16-bit, high-speed, low power latched transceivers that are organized as two independent 8-bit D-type latched transceivers containing twosets of eight D-type latches with separate Latch Enable ($\overline{LEAB}$, $\overline{LEAB}$) and Output Enabe ($\overline{OEAB}$, $\overline{OEAB}$) controls for each set to permit independent control of inputting and outputting in either direction of data flow. For data flow from A to B, for example, the A-to-B input Enable ($\overline{CEAB}$) must be LOW in order to enter data from A or to take data from B as indicated in the truth table. With $\overline{CAEB}$ LOW, a LOW signal on the A-to-B Latch Enable ($\overline{LEAB}$) makes the A-to-B latch-estransparent; a subsequent LOW-to-HIGH transition of the $\overline{LEAB}$ signal puts the A latches in the storage mode and their outputs no longer change with the A inputs. With $\overline{CEAB}$ and $\overline{OEAB}$ both LOW, the three-state B output buffers are active and reflect the data present at the output of the A latches. Control of data from B to A is similar, but uses $\overline{CEAB}$, $\overline{LEAB}$, and $\overline{OEAB}$ inputs flow-through pinout and small shrink packaging and in simplifying board design. The output buffers are designed with a power-off disable feature to allow live insertion of boards.

The CY74FCT16543T is ideally suited for driving high-capacitance loads and low-impedance backplanes.

The CY74FCT162543T has 24-mA balanced output drivers with current limiting resistors in the outputs. This reduces the need for external terminating resistors and provides for minimal undershoot and reduced ground bounce. The CY74FCT162543T is ideal for driving transmission lines.

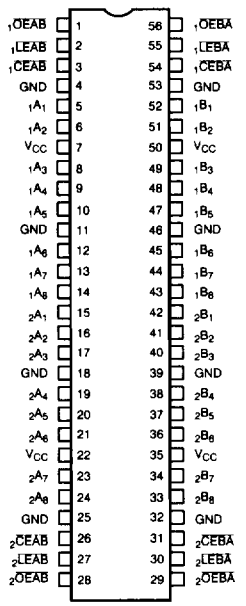
Logic Block Diagrams



Pin Configuration

Top View

SSOP/TSSOP



FCT16543T-3

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Pin Description

Name	Description
$\overline{OEAB}$	A-to-B Output Enable Input (Active LOW)
$\overline{OEBA}$	B-to-A Output Enable Input (Active LOW)
$\overline{CEAB}$	A-to-B Enable Input (Active LOW)
$\overline{CEBA}$	B-to-A Enable Input (Active LOW)
$\overline{LEAB}$	A-to-B Latch Enable Input (Active LOW)
$\overline{LEBA}$	B-to-A Latch Enable Input (Active LOW)
A	A-to-B Data Inputs or B-to-A Three-State Outputs
B	B-to-A Data Inputs or A-to-B Three-State Outputs

Function Table[1]

Inputs			Latch Status	Output Buffers
$\overline{CEAB}$	$\overline{LEAB}$	$\overline{OEAB}$	A to B	B
H	X	X	Storing	High Z
X	H	X	Storing	X
X	X	H	X	High Z
L	L	L	Transparent	Current A Inputs
L	H	L	Storing	Previous A Inputs[2]

Maximum Ratings[3, 4]

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

Storage Temperature ..... Com'l −55°C to +125°C

DC Output Voltage ..... −0.5V to +7.0V

DC Output Current
(Maximum Sink Current/Pin) ..... −60 to +120 mA

Power Dissipation 1.0W

Ambient Temperature with
Power Applied ..... Com'l −55°C to +125°C

DC Input Voltage ..... −0.5V to +7.0V

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

Notes:

1. A-to-B data flow shown; B-to-A flow control is the same, except using $\overline{CEBA}$, LEBA, and $\overline{OEBA}$.
2. Data prior to $\overline{LEAB}$ LOW-to-HIGH Transition.
   H = HIGH Voltage Level. L = LOW Voltage Level.
   X = Don't Care. Z = High Impedance.
3. Operation beyond the limits set forth may impair the useful life of the device. Unless otherwise noted, these limits are over the operating free-air temperature range.
4. Unused inputs must always be connected to an appropriate logic voltage level, preferably either V_{CC} or ground.

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	Min.	Typ.[8]	Max.	Unit
V_{IH}	Input HIGH Voltage		2.0			V
V_{IL}	Input LOW Voltage				0.8	V
V_H	Input Hysteresis[5]			100		mV
V_{IK}	Input Clamp Diode Voltage	V_{CC}=Min., I_{IN}=−18 mA		−0.7	−1.2	V
I_{IH}	Input HIGH Current	V_{CC}=Max., V_I=V_{CC}			±1	µA
I_{IL}	Input LOW Current	V_{CC}=Max., V_I=GND			±1	µA
I_{OZH}	High Impedance Output Current (Three-State Output pins)	V_{CC}=Max., V_{OUT}=2.7V			±1	µA
I_{OZL}	High Impedance Output Current (Three-State Output pins)	V_{CC}=Max., V_{OUT}=0.5V			±1	µA
I_{OS}	Short Circuit Current[6]	V_{CC}=Max., V_{OUT}=GND	−80	−140	−200	mA
I_O	Output Drive Current[6]	V_{CC}=Max., V_{OUT}=2.5V	−50		−180	mA
I_{OFF}	Power-Off Disable	V_{CC}=0V, V_{OUT}≤4.5V			±1	µA

Output Drive Characteristics for CY74FCT16543T

Parameter	Description	Test Conditions	Min.	Typ.[8]	Max.	Unit
V_{OH}	Output HIGH Voltage	V_{CC}=Min., I_{OH}=−3 mA	2.5	3.5		V
		V_{CC}=Min., I_{OH}=−15 mA	2.4	3.5		V
		V_{CC}=Min., I_{OH}=−32 mA	2.0	3.0		V
V_{OL}	Output LOW Voltage	V_{CC}=Min., I_{OL}=64 mA		0.2	0.55	V

Output Drive Characteristics for CY74FCT162543T

Parameter	Description	Test Conditions	Min.	Typ.[8]	Max.	Unit
I_{ODL}	Output LOW Current[6]	V_{CC}=5V, V_{IN}=V_{IH} or V_{IL}, V_{OUT}=1.5V	60	115	150	mA
I_{ODH}	Output HIGH Current[6]	V_{CC}=5V, V_{IN}=V_{IH} or V_{IL}, V_{OUT}=1.5V	−60	−115	−150	mA
V_{OH}	Output HIGH Voltage	V_{CC}=Min., I_{OH}=−24 mA	2.4	3.3		V
V_{OL}	Output LOW Voltage	V_{CC}=Min., I_{OL}=24 mA		0.3	0.55	V

Capacitance[7] (T_A = +25°C, f = 1.0 MHz)

Parameter	Description	Test Conditions	Typ.[8]	Max.	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	4.5	6.0	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V	5.5	8.0	pF

Notes:
5. This parameter is guaranteed but not tested.
6. 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.
7. This parameter is guaranteed but not tested.
8. Typical values are at V_{CC}=5.0V, T_A=+25°C ambient.

Power Supply Characteristics

Parameter	Description	Test Conditions		Typ.[8]	Max.	Unit
I_{CC}	Quiescent Power Supply Current	V_{CC}=Max.	$V_{IN} \le 0.2V$, $V_{IN} \ge V_{CC}-0.2V$	5	500	µA
ΔI_{CC}	Quiescent Power Supply Current (TTL inputs HIGH)	V_{CC}=Max.	V_{IN}=3.4V[9]	0.5	1.5	mA
I_{CCD}	Dynamic Power Supply Current[10]	V_{CC}=Max., One Input Toggling, 50% Duty Cycle, Outputs Open, $\overline{OE}$=GND	$V_{IN}=V_{CC}$ or V_{IN}=GND	60	100	µA/ MHz
I_C	Total Power Supply Current[11]	V_{CC}=Max., f_1=10 MHz, 50% Duty Cycle, Outputs Open, One Bit Toggling, $\overline{OE}$=GND	$V_{IN}=V_{CC}$ or V_{IN}=GND	0.6	1.5	mA
			V_{IN}=3.4V or V_{IN}=GND	0.9	2.3	mA
		V_{CC}=Max., f_1=2.5 MHz, 50% Duty Cycle, Outputs Open, Sixteen Bits Toggling, $\overline{OE}$=GND	$V_{IN}=V_{CC}$ or V_{IN}=GND	2.4	4.5[12]	mA
			V_{IN}=3.4V or V_{IN}=GND	6.4	16.5[12]	mA

Notes:

9. Per TTL driven input (V_{IN}=3.4V); all other inputs at V_{CC} or GND.
10. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
11. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
    $I_C = I_{CC}+\Delta I_{CC}D_HN_T+I_{CCD}(f_0/2 + f_1N_1)$
    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.
12. Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.

Switching Characteristics Over the Operating Range

Parameter	Description	Conditions[13]	74FCT16543T 74FCT162543T		74FCT16543AT 74FCT162543AT		74FCT16543CT 74FCT162543CT		Unit	Fig. No.[15]
			Min.[14]	Max.	Min.[14]	Max.	Min.[14]	Max.		
t_{PLH} t_{PHL}	Propagation Delay Transparent Mode A to B or B to A	C_L=50pF R_L=500Ω	1.5	8.5	1.5	6.5	1.5	5.1	ns	1, 3
t_{PLH} t_{PHL}	Propagation Delay $\overline{LEBA}$ to A, $\overline{LEAB}$ to B		1.5	12.5	1.5	8.0	1.5	5.6	ns	1, 5
t_{PZH} t_{PZL}	Output Enable Time $\overline{OEBA}$ or $\overline{OEAB}$ to A or B $\overline{CEBA}$ or $\overline{CEAB}$ to A or B		1.5	12.0	1.5	9.0	1.5	7.8	ns	1, 7, 8
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OEBA}$ or $\overline{OEAB}$ to A or B $\overline{CEBA}$ or $\overline{CEAB}$ to A or B		1.5	9.0	1.5	7.5	1.5	6.5	ns	1, 7, 8
t_{SU}	Set-up Time HIGH or LOW A or B to $\overline{LEAB}$ or $\overline{LEBA}$		2.0	—	2.0	—	2.0	—	ns	4
t_H	Hold Time HIGH or LOW A or B to $\overline{LEAB}$ or $\overline{LEBA}$		2.0	—	2.0	—	2.0	—	ns	4
t_W	$\overline{LEBA}$ or $\overline{LEAB}$ Pulse Width LOW		4.0	—	4.0	—	4.0	—	ns	5
$t_{SK(O)}$	Output Skew[16]		—	0.5	—	0.5	—	0.5	ns	—

Notes:

13. See test circuits and waveforms.
14. Minimum limits are guaranteed but not tested on Propagation Delays.
15. See "Parameter Measurement Information" in the General Information Section.
16. Skew between any two outputs of the same package switching in the same directional. This parameter is guaranteed by design.

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Ordering Information CY74FCT16543

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
5.1	CY74FCT16543CTPAC	Z56	56-Lead (240-Mil) TSSOP	Commercial
	CY74FCT16543CTPVC	O56	56-Lead (300-Mil) SSOP	
6.5	CY74FCT16543ATPAC	Z56	56-Lead (240-Mil) TSSOP	Commercial
	CY74FCT16543ATPVC	O56	56-Lead (300-Mil) SSOP	
8.5	CY74FCT16543TPAC	Z56	56-Lead (240-Mil) TSSOP	Commercial
	CY74FCT16543TPVC	O56	56-Lead (300-Mil) SSOP	

Ordering Information CY74FCT162543

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
5.1	CY74FCT162543CTPAC	Z56	56-Lead (240-Mil) TSSOP	Commercial
	CY74FCT162543CTPVC	O56	56-Lead (300-Mil) SSOP	
6.5	CY74FCT162543ATPAC	Z56	56-Lead (240-Mil) TSSOP	Commercial
	CY74FCT162543ATPVC	O56	56-Lead (300-Mil) SSOP	
8.5	CY74FCT162543TPAC	Z56	56-Lead (240-Mil) TSSOP	Commercial
	CY74FCT162543TPVC	O56	56-Lead (300-Mil) SSOP	

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