CY74FCT16240T
CY74FCT162240T

16-Bit Buffers/Line Drivers

Features

- **Low power, pin compatible replacement for ABT functions**
- **FCT-E speed at 3.2 ns**
- **Power-off disable outputs permits live insertion**
- **Edge-rate control circuitry for significantly improved noise characteristics**
- **Typical output skew < 250 ps**
- **ESD > 2000V**
- **TSSOP (19.6-mil pitch) and SSOP (25-mil pitch) packages**
- **Industrial temperature range of –40°C to +85°C**
- **$V_{CC} = 5V \pm 10\%$**

CY74FCT16240T Features:

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

CY74FCT162240T Features:

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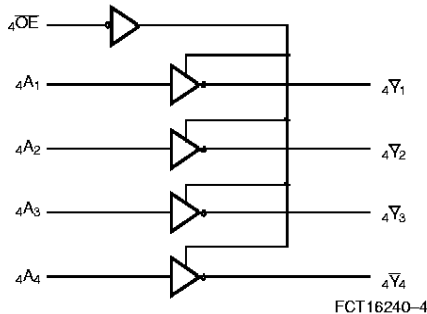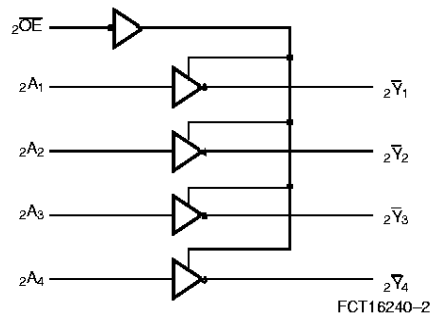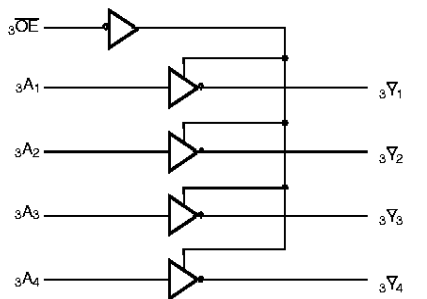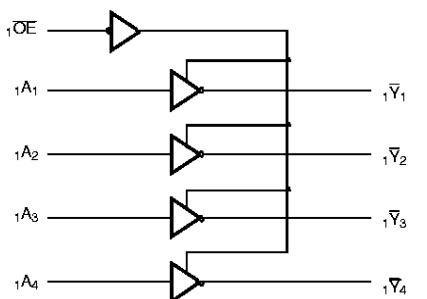 **<0.6V at $V_{CC} = 5V$, $T_A = 25°C$**

Functional Description

These 16-bit buffer/line drivers are used in memory driver, clock driver, or other bus interface applications, where high speed and low power are required. With flow-through pinout and small shrink packaging, board layout is simplified. The three-state controls are designed to allow 4-, 8-, or 16-bit operation. The outputs are designed with a power-off disable feature to allow for live insertion of boards.

The CY74FCT16240T is ideally suited for driving high-capacitance loads and low-impedance backplanes.
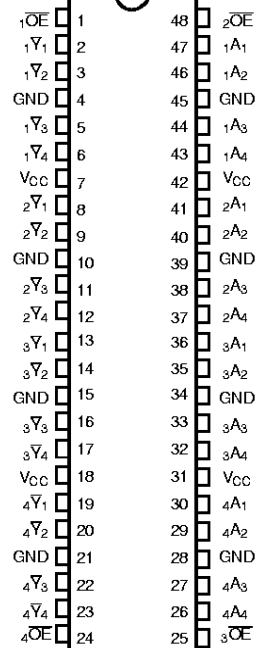
The CY74FCT162240T has 24-mA balanced output drivers with current limiting resistors in the outputs. This reduces the need for external terminating resistors and provides for minimal undershoot and reduced ground bounce. The CY74FCT162240T is ideal for driving transmission lines.

Logic Block Diagrams

FCT16240–1

FCT16240–3

FCT16240–2

FCT16240–4

Pin Configuration

SSOP/TSSOP
Top View

Pin	Signal		Signal	Pin
1	$1\overline{OE}$		$2\overline{OE}$	48
2	$1Y_1$		$1A_1$	47
3	$1Y_2$		$1A_2$	46
4	GND		GND	45
5	$1Y_3$		$1A_3$	44
6	$1Y_4$		$1A_4$	43
7	V_{CC}		V_{CC}	42
8	$2Y_1$		$2A_1$	41
9	$2Y_2$		$2A_2$	40
10	GND		GND	39
11	$2Y_3$		$2A_3$	38
12	$2Y_4$		$2A_4$	37
13	$3Y_1$		$3A_1$	36
14	$3Y_2$		$3A_2$	35
15	GND		GND	34
16	$3Y_3$		$3A_3$	33
17	$3Y_4$		$3A_4$	32
18	V_{CC}		V_{CC}	31
19	$4Y_1$		$4A_1$	30
20	$4Y_2$		$4A_2$	29
21	GND		GND	28
22	$4Y_3$		$4A_3$	27
23	$4Y_4$		$4A_4$	26
24	$4\overline{OE}$		$3\overline{OE}$	25

FCT16240–5

Pin Summary

Name	Description
$\overline{OE}$	Three-State Output Enable Inputs (Active LOW)
A	Data Inputs
$\overline{Y}$	Three-State Outputs

Function Table[1]

Inputs		Outputs
$\overline{OE}$	A	$\overline{Y}$
L	L	H
L	H	L
H	X	Z

Maximum Ratings[2, 3]

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

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

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

DC Input Voltage .... −0.5V to +7.0V

DC Output Voltage.. −0.5V to +7.0V

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

Power Dissipation... 1.0W

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

Operating Range

Range	Ambient Temperature	V_{CC}
Industrial	−40°C to +85°C	5V ± 10%

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	Min.	Typ.[4]	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_{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_{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, $V_{OUT} \leq 4.5V$[7]			±1	µA

Output Drive Characteristics for CY74FCT16240T

Parameter	Description	Test Conditions	Min.	Typ.[4]	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

Note:
1. H = HIGH Voltage Level. L = LOW Voltage Level. X = Don't Care. Z = High Impedance.
2. Operation beyond the limits set forth may impair the useful life of the device. Unless noted, these limits are over the operating free-air temperature range.
3. Unused inputs must always be connected to an appropriate logic voltage level, preferably either V_{CC} or ground.
4. Typical values are at V_{CC}=5.0V, T_A= +25°C ambient.
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. Tested at +25°C.

Output Drive Characteristics for CY74FCT162240T

Parameter	Description	Test Conditions	Min.	Typ.[4]	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[5] (T_A = +25°C, f = 1.0 MHz)

Parameter	Description	Test Conditions	Typ.[4]	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

Power Supply Characteristics

Parameter	Description	Test Conditions		Typ.[]	Max.	Unit
I_{CC}	Quiescent Power Supply Current	V_{CC}=Max.	V_{IN}≤0.2V, V_{IN}≥V_{CC}−0.2V	5	500	μA
ΔI_{CC}	Quiescent Power Supply Current (TTL inputs HIGH)	V_{CC}=Max.	V_{IN}=3.4V[8]	0.5	1.5	mA
I_{CCD}	Dynamic Power Supply Current[9]	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[10]	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[11]	mA
			V_{IN}=3.4V or V_{IN}=GND	6.4	16.5[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 guaranteed but not tested.

Switching Characteristics Over the Operating Range[12]

Parameter	Description	CY74FCT16240T CY74FCT162240T		CY74FCT16240AT CY74FCT162240AT		Unit	Fig. No.[13]
		Min.	Max.	Min.	Max.		
t_{PLH} t_{PHL}	Propagation Delay Data to Output	1.5	8.0	1.5	4.8	ns	1, 2
t_{PZH} t_{PZL}	Output Enable Time	1.5	10.0	1.5	6.2	ns	1, 7, 8
t_{PHZ} t_{PLZ}	Output Disable Time	1.5	9.5	1.5	5.6	ns	1, 7, 8
$t_{SK(O)}$	Output Skew[14]		0.5		0.5	ns	—

Parameter	Description	CY74FCT16240CT CY74FCT162240CT		CY74FCT16240ET CY74FCT162240ET		Unit	Fig. No.[13]
		Min.	Max.	Min.	Max.		
t_{PLH} t_{PHL}	Propagation Delay Data to Output	1.5	4.3	1.5	3.2	ns	1, 2
t_{PZH} t_{PZL}	Output Enable Time	1.5	5.8	1.5	4.4	ns	1, 7, 8
t_{PHZ} t_{PLZ}	Output Disable Time	1.5	5.2	1.5	3.6	ns	1, 7, 8
$t_{SK(O)}$	Output Skew[14]		0.5		0.5	ns	—

Note:
12. Minimum limits are guaranteed but not tested on Propagation Delays.
13. See "Parameter Measurement Information" in the General Information section.
14. Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.
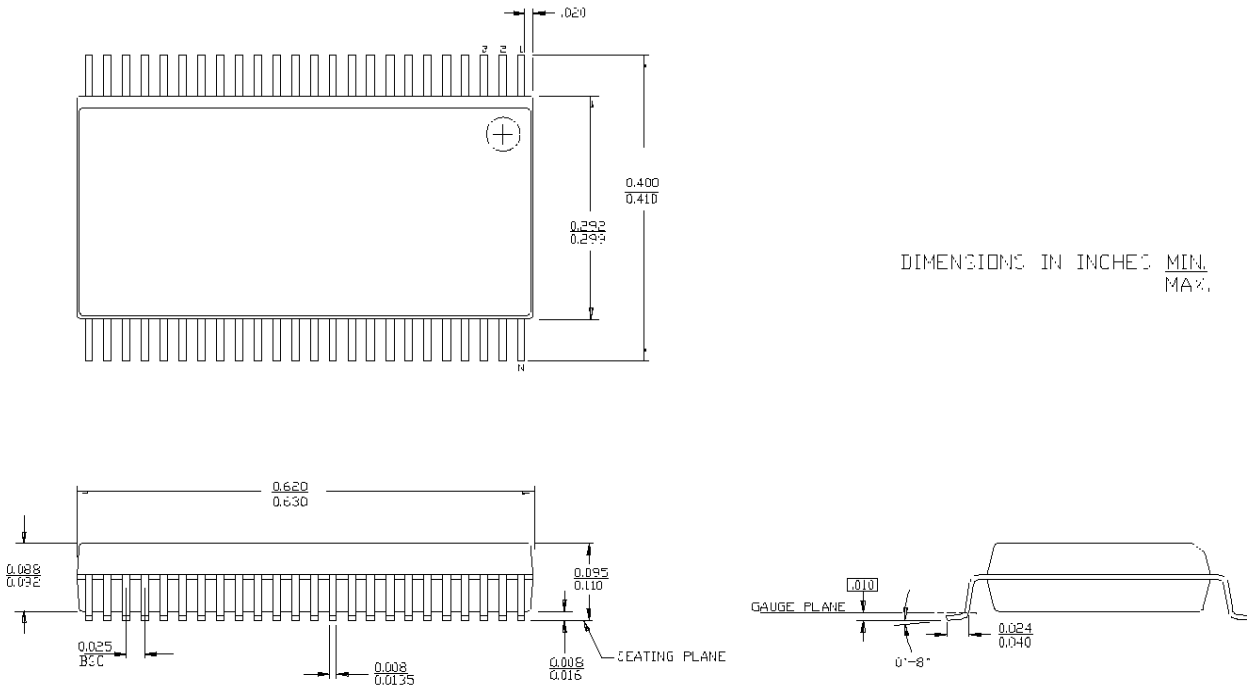
Ordering Information CY74FCT16240

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
3.2	CY74FCT16240ETPAC	Z48	48-Lead (240-Mil) TSSOP	Industrial
	CY74FCT16240ETPVC	O48	48-Lead (300-Mil) SSOP	
4.3	CY74FCT16240CTPAC	Z48	48-Lead (240-Mil) TSSOP	Industrial
	CY74FCT16240CTPVC	O48	48-Lead (300-Mil) SSOP	
4.8	CY74FCT16240ATPAC	Z48	48-Lead (240-Mil) TSSOP	Industrial
	CY74FCT16240ATPVC	O48	48-Lead (300-Mil) SSOP	
8.0	CY74FCT16240TPAC	Z48	48-Lead (240-Mil) TSSOP	Industrial
	CY74FCT16240TPVC	O48	48-Lead (300-Mil) SSOP	

Ordering Information CY74FCT162240

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
3.2	CY74FCT162240ETPAC	Z48	48-Lead (240-Mil) TSSOP	Industrial
	CY74FCT162240ETPVC	O48	48-Lead (300-Mil) SSOP	
4.3	CY74FCT162240CTPAC	Z48	48-Lead (240-Mil) TSSOP	Industrial
	CY74FCT162240CTPVC	O48	48-Lead (300-Mil) SSOP	
4.8	CY74FCT162240ATPAC	Z48	48-Lead (240-Mil) TSSOP	Industrial
	CY74FCT162240ATPVC	O48	48-Lead (300-Mil) SSOP	
8.0	CY74FCT162240TPAC	Z48	48-Lead (240-Mil) TSSOP	Industrial
	CY74FCT162240TPVC	O48	48-Lead (300-Mil) SSOP	

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Package Diagrams

48-Lead Shrunk Small Outline Package O48

DIMENSIONS IN INCHES MIN.
MAX.

48-Lead Thin Shrunk Small Outline Package

DIMENSIONS IN INCHES MIN.
MAX.