

# CY74FCT16827T CY74FCT162827T

## 20-Bit Buffer

### 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<sub>CC</sub> = 5V ± 10%

### CY74FCT16827T Features:

- 64 mA sink current, 32 mA source current
- Typical V<sub>OLP</sub> (ground bounce) < 1.0V at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C

### CY74FCT162827T Features:

- Balanced 24 mA output drivers
- Reduced system switching noise
- Typical V<sub>OLP</sub> (ground bounce) < 0.6V at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C

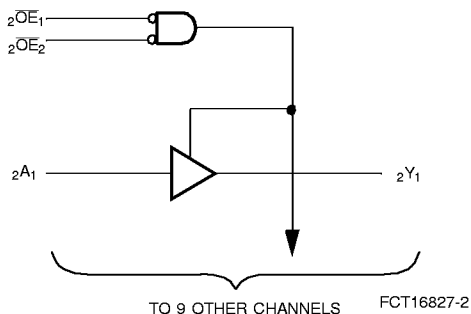
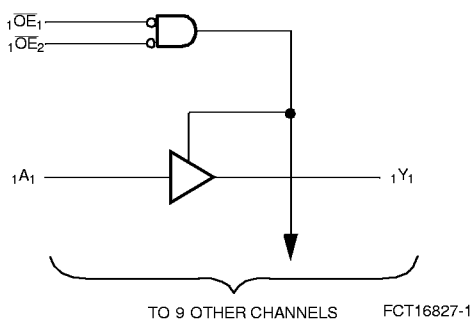
### Functional Description

The CY74FCT16827T 20-bit buffer/line driver and the CY74FCT162827T 20-bit buffer/line driver provide high-performance bus interface buffering for wide data/address paths or buses carrying parity. These parts can be used as a single 20-bit buffer or two 10-bit buffers. Each 10-bit buffer has a pair of NANDed OE for increased flexibility. The outputs are designed with a power-off disable feature to allow for live insertion of boards.

The CY74FCT16827T is ideally suited for driving high-capacitance loads and low-impedance backplanes.

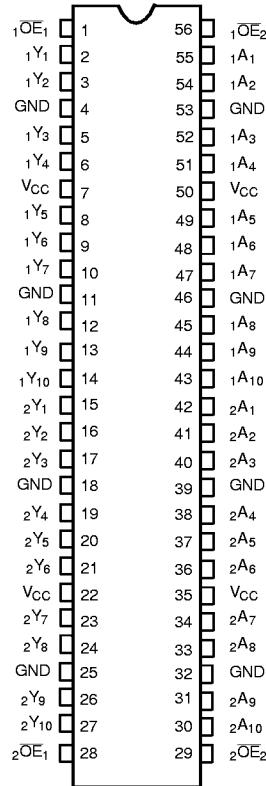
The CY74FCT162827T has 24-mA balanced output drivers with current-limiting resistors in the outputs. This reduces the need for external terminating resistors and provides for minimal undershoot and reduced ground bounce. The CY74FCT162827T is ideal for driving transmission lines.

### Logic Block Diagrams



### Pin Configuration

#### SSOP/TSSOP Top View



FCT16827-3



### Pin Description

Name	Description
OE	Output Enable Inputs (Active LOW)
A	Data Inputs
Y	Three-State Outputs

### Function Table<sup>[1]</sup>

Inputs			Outputs
OE <sub>1</sub>	OE <sub>2</sub>	A	Y
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

### Maximum Ratings<sup>[2, 3]</sup>

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

Storage Temperature.....	-55°C to +125°C
Ambient Temperature with Power Applied.....	-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 .....	>2001V (per MIL-STD-883, Method 3015)

### Operating Range

Range	Ambient Temperature	V <sub>CC</sub>
Industrial	-40°C to +85°C	5V ± 10%

### Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	Min.	Typ. <sup>[4]</sup>	Max.	Unit
V <sub>IH</sub>	Input HIGH Voltage		2.0			V
V <sub>IL</sub>	Input LOW Voltage				0.8	V
V <sub>H</sub>	Input Hysteresis <sup>[5]</sup>			100		mV
V <sub>IK</sub>	Input Clamp Diode Voltage	V <sub>CC</sub> =Min., I <sub>IN</sub> =-18 mA		-0.7	-1.2	V
I <sub>IH</sub>	Input HIGH Current	V <sub>CC</sub> =Max., V <sub>I</sub> =V <sub>CC</sub>			±1	µA
I <sub>IL</sub>	Input LOW Current	V <sub>CC</sub> =Max., V <sub>I</sub> =GND			±1	µA
I <sub>OZH</sub>	High Impedance Output Current (Three-State Output pins)	V <sub>CC</sub> =Max., V <sub>OUT</sub> =2.7V			±1	µA
I <sub>OZL</sub>	High Impedance Output Current (Three-State Output pins)	V <sub>CC</sub> =Max., V <sub>OUT</sub> =0.5V			±1	µA
I <sub>OS</sub>	Short Circuit Current <sup>[6]</sup>	V <sub>CC</sub> =Max., V <sub>OUT</sub> =GND	-80	-140	-200	mA
I <sub>O</sub>	Output Drive Current <sup>[6]</sup>	V <sub>CC</sub> =Max., V <sub>OUT</sub> =2.5V	-50		-180	mA
I <sub>OFF</sub>	Power-Off Disable	V <sub>CC</sub> =0V, V <sub>OUT</sub> ≤4.5V <sup>[7]</sup>			±1	µA

### Output Drive Characteristics for CY74FCT16827T

Parameter	Description	Test Conditions	Min.	Typ. <sup>[4]</sup>	Max.	Unit
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> =Min., I <sub>OH</sub> =-3 mA	2.5	3.5		V
		V <sub>CC</sub> =Min., I <sub>OH</sub> =-15 mA	2.4	3.5		
		V <sub>CC</sub> =Min., I <sub>OH</sub> =-32 mA	2.0	3.0		
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> =Min., I <sub>OL</sub> =64 mA		0.2	0.55	V

- H = HIGH Voltage Level. L = LOW Voltage Level. X = Don't Care. Z = HIGH Impedance.
- 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.
- Unused inputs must always be connected to an appropriate logic voltage level, preferably either V<sub>CC</sub> or ground.
- Typical values are at V<sub>CC</sub>= 5.0V, T<sub>A</sub>= +25°C ambient.
- This parameter is guaranteed but not tested.
- 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<sub>OS</sub> tests should be performed last.
- Tested at +25°C.



### Output Drive Characteristics for CY74FCT162827T

Parameter	Description	Test Conditions	Min.	Typ. <sup>[4]</sup>	Max.	Unit
I <sub>ODL</sub>	Output LOW Current <sup>[6]</sup>	V <sub>CC</sub> =5V, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>OUT</sub> =1.5V	60	115	150	mA
I <sub>ODH</sub>	Output HIGH Current <sup>[6]</sup>	V <sub>CC</sub> =5V, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>OUT</sub> =1.5V	-60	-115	-150	mA
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> =Min., I <sub>OH</sub> =-24 mA	2.4	3.3		V
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> =Min., I <sub>OL</sub> =24 mA		0.3	0.55	V

### Capacitance<sup>[5]</sup> (T<sub>A</sub> = +25 °C, f = 1.0 MHz)

Parameter	Description	Test Conditions	Typ. <sup>[4]</sup>	Max.	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = 0V	4.5	6.0	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>OUT</sub> = 0V	5.5	8.0	pF

### Power Supply Characteristics

Parameter	Description	Test Conditions	Min.	Typ. <sup>[4]</sup>	Max.	Unit	
I <sub>CC</sub>	Quiescent Power Supply Current	V <sub>CC</sub> =Max., V <sub>IN</sub> ≤0.2V, V <sub>IN</sub> ≥V <sub>CC</sub> -0.2V	—	5	500	μA	
ΔI <sub>CC</sub>	Quiescent Power Supply Current (TTL inputs HIGH)	V <sub>CC</sub> =Max., V <sub>IN</sub> =3.4V <sup>[8]</sup>	—	0.5	1.5	mA	
I <sub>CCD</sub>	Dynamic Power Supply Current <sup>[9]</sup>	V <sub>CC</sub> =Max., One Input Toggling, 50% Duty Cycle, Outputs Open, OE <sub>1</sub> =OE <sub>2</sub> =GND,	—	60	100	μA/MHz	
I <sub>C</sub>	Total Power Supply Current <sup>[10]</sup>	V <sub>CC</sub> =Max., f <sub>1</sub> =10 MHz, 50% Duty Cycle, Outputs Open, One Bit Toggling, OE <sub>1</sub> =OE <sub>2</sub> =GND	V <sub>IN</sub> =V <sub>CC</sub> or V <sub>IN</sub> =GND	—	0.6	1.5	mA
			V <sub>IN</sub> =3.4V or V <sub>IN</sub> =GND	—	0.9	2.3	
			V <sub>IN</sub> =V <sub>CC</sub> or V <sub>IN</sub> =GND	—	3.0	5.5 <sup>[11]</sup>	
			V <sub>IN</sub> =3.4V or V <sub>IN</sub> =GND	—	8.0	20.5 <sup>[11]</sup>	

**Notes:**

8. Per TTL driven input (V<sub>IN</sub>=3.4V); all other inputs at V<sub>CC</sub> or GND.
9. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
10. I<sub>C</sub> = I<sub>QUIESCENT</sub> + I<sub>INPUTS</sub> + I<sub>DYNAMIC</sub>  
 I<sub>C</sub> = I<sub>CC</sub> + ΔI<sub>CC</sub>D<sub>H</sub>N<sub>T</sub> + I<sub>CCD</sub>(f<sub>0</sub>/2 + f<sub>1</sub>N<sub>1</sub>)  
 I<sub>CC</sub> = Quiescent Current with CMOS input levels  
 ΔI<sub>CC</sub> = Power Supply Current for a TTL HIGH input (V<sub>IN</sub>=3.4V)  
 D<sub>H</sub> = Duty Cycle for TTL inputs HIGH  
 N<sub>T</sub> = Number of TTL inputs at D<sub>H</sub>  
 I<sub>CCD</sub> = Dynamic Current caused by an input transition pair (HLH or LHL)  
 f<sub>0</sub> = Clock frequency for registered devices, otherwise zero  
 f<sub>1</sub> = Input signal frequency  
 N<sub>1</sub> = Number of inputs changing at f<sub>1</sub>  
 All currents are in milliamps and all frequencies are in megahertz.
11. Values for these conditions are examples of the I<sub>CC</sub> formula. These limits are guaranteed but not tested.



**Switching Characteristics** Over the Operating Range<sup>[12]</sup>

Parameter	Description	Condition <sup>[13]</sup>	CY74FCT16827AT CY74FCT162827AT		CY74FCT16827BT CY74FCT162827BT		Unit	Fig. No. <sup>[13]</sup>
			Min.	Max.	Min.	Max.		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A to Y	C <sub>L</sub> =50 pF R <sub>L</sub> =500Ω	1.5	8.0	1.5	5.0	ns	1, 3
		C <sub>L</sub> =300 pF R <sub>L</sub> =500Ω	1.5	15.0	1.5	13.0		
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time OE to Y	C <sub>L</sub> =50 pF R <sub>L</sub> =500Ω	1.5	12.0	1.5	8.0	ns	1, 7, 8
		C <sub>L</sub> =300 pF R <sub>L</sub> =500Ω	1.5	23.0	1.5	15.0		
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time OE to Y	C <sub>L</sub> =5 pF R <sub>L</sub> =500Ω	1.5	9.0	1.5	6.0	ns	1, 7, 8
		C <sub>L</sub> =50 pF R <sub>L</sub> =500Ω	1.5	10.0	1.5	7.0		
t <sub>SK(O)</sub>	Output Skew <sup>[14]</sup>		—	0.5	—	0.5	ns	—

Parameter	Description	Condition <sup>[12]</sup>	CY74FCT16827CT CY74FCT162827CT		CY74FCT16827ET CY74FCT162827ET		Unit	Fig. No. <sup>[13]</sup>
			Min.	Max.	Min.	Max.		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A to Y	C <sub>L</sub> =50 pF R <sub>L</sub> =500Ω	1.5	4.2	1.5	3.2	ns	1, 3
		C <sub>L</sub> =300 pF R <sub>L</sub> =500Ω	1.5	10.0	1.5	7.0		
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time OE to Y	C <sub>L</sub> =50 pF R <sub>L</sub> =500Ω	1.5	5.6	1.5	4.8	ns	1, 7, 8
		C <sub>L</sub> =300 pF R <sub>L</sub> =500Ω	1.5	14.0	1.5	9.0		
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time OE to Y	C <sub>L</sub> =5 pF R <sub>L</sub> =500Ω	1.5	5.7	1.5	4.0	ns	1, 7, 8
		C <sub>L</sub> =50 pF R <sub>L</sub> =500Ω	1.5	6.0	1.5	4.0		
t <sub>SK(O)</sub>	Output Skew <sup>[14]</sup>		—	0.5	—	0.5	ns	—

**Notes:**

- 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 CY74FCT16827**

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
3.2	CY74FCT16827ETPAC	Z56	56-Lead (240-Mil) TSSOP	Industrial
	CY74FCT16827ETPVC	O56	56-Lead (300-Mil) SSOP	
4.2	CY74FCT16827CTPAC	Z56	56-Lead (240-Mil) TSSOP	Industrial
	CY74FCT16827CTPVC	O56	56-Lead (300-Mil) SSOP	
5.0	CY74FCT16827BTPAC	Z56	56-Lead (240-Mil) TSSOP	Industrial
	CY74FCT16827BTPVC	O56	56-Lead (300-Mil) SSOP	
8.0	CY74FCT16827ATPAC	Z56	56-Lead (240-Mil) TSSOP	Industrial
	CY74FCT16827ATPVC	O56	56-Lead (300-Mil) SSOP	

**Ordering Information CY74FCT162827**

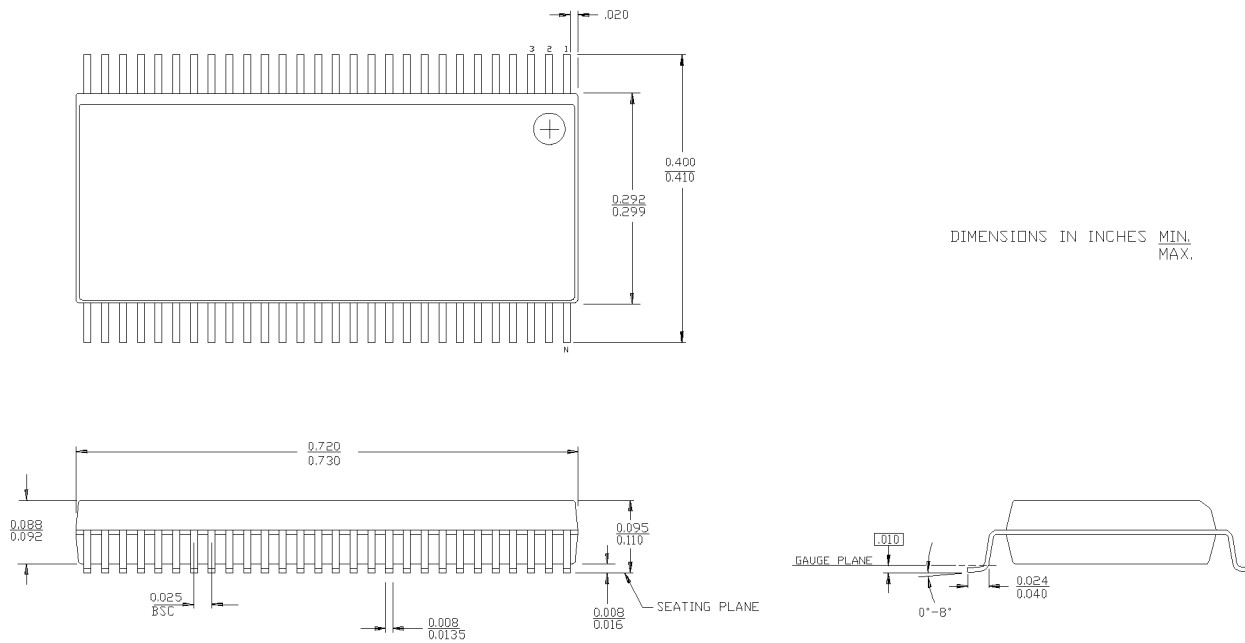
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
3.2	CY74FCT162827ETPAC	Z56	56-Lead (240-Mil) TSSOP	Industrial
	CY74FCT162827ETPVC	O56	56-Lead (300-Mil) SSOP	
4.2	CY74FCT162827CTPAC	Z56	56-Lead (240-Mil) TSSOP	Industrial
	CY74FCT162827CTPVC	O56	56-Lead (300-Mil) SSOP	
5.0	CY74FCT162827BTPAC	Z56	56-Lead (240-Mil) TSSOP	Industrial
	CY74FCT162827BTPVC	O56	56-Lead (300-Mil) SSOP	
8.0	CY74FCT162827ATPAC	Z56	56-Lead (240-Mil) TSSOP	Industrial
	CY74FCT162827ATPVC	O56	56-Lead (300-Mil) SSOP	

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### Package Diagrams

#### 56-Lead Shrunk Small Outline Package Q56



#### 56-Lead Thin Shrunk Small Outline Package Z56

