

Fast CMOS 20-Bit Buffers

Product Features:

Common Features:

- PI74FCT16827T, PI74FCT162827T, and PI74FCT2H827T are high-speed, low power devices with high current drive
- $V_{CC} = 5V \pm 10\%$
- Hysteresis on all inputs
- Packages available:
 - 56-pin 240 mil wide plastic TSSOP (A56)
 - 56-pin 300 mil wide plastic SSOP (V56)

PI74FCT16827T Features:

- High output drive: $I_{OH} = -32\text{ mA}$; $I_{OL} = 64\text{ mA}$
- Power off disable outputs permit "live insertion"
- Typical VOLP (Output Ground Bounce) $< 1.0V$ at $V_{CC} = 5V$, $T_A = 25^\circ C$

PI74FCT162827T Features:

- Balanced output drivers: $\pm 24\text{ mA}$
- Reduced system switching noise
- Typical VOLP (Output Ground Bounce) $< 0.6V$ at $V_{CC} = 5V$, $T_A = 25^\circ C$

PI74FCT162H827T Features:

- Bus Hold retains last active bus state during 3-state
- Eliminates the need for external pull-up resistors

Product Description:

Pericom Semiconductor's PI74FCT series of logic circuits are produced in the Company's advanced 0.6 micron CMOS technology, achieving industry leading speed grades.

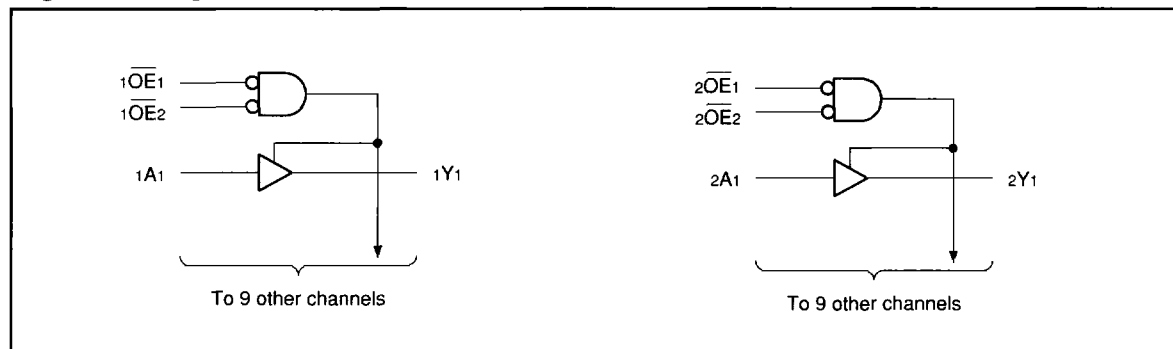
The PI74FCT16827T, PI74FCT162827T, and PI74FCT162H827T are 20-bit wide bus drivers designed to provide buffering and high-performance bus interfacing for wide data/address paths or buses with parity. Two pair of nanded output enable controls allow the devices to be operated as two 10-bit buffers or as one 20-bit buffer. Signal pins are arranged in a flow-through organization for ease of layout and hysteresis is designed into all inputs to improve noise margin.

The PI74FCT16827T output buffers are designed with a Power-Off disable function allowing "live insertion" of boards when the devices are used as backplane drives.

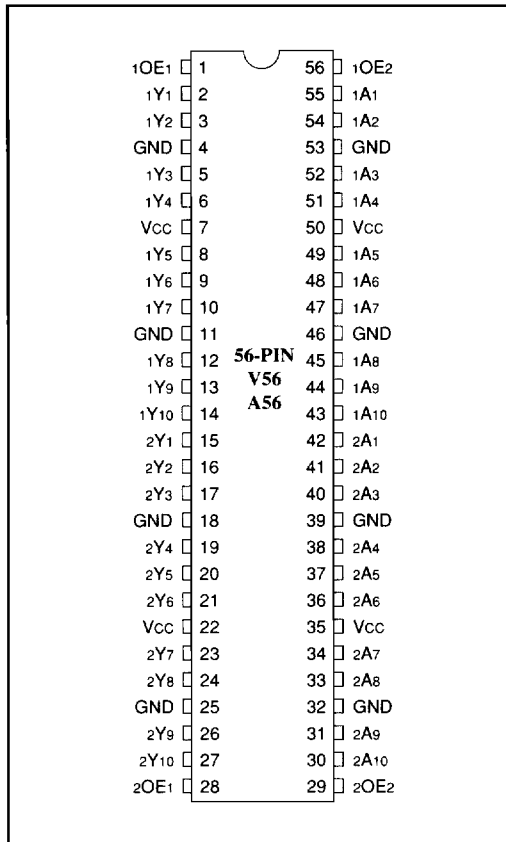
The PI74FCT162827T has $\pm 24\text{ mA}$ balanced output drivers. It is designed with current limiting resistors at its outputs to control the output edge rate resulting in lower ground bounce and undershoot. This eliminates the need for external terminating resistors for most interface applications.

The PI74FCT162H827T has "Bus Hold" which retains the input's last state whenever the input goes to high-impedance preventing "floating" inputs and eliminating the need for pull-up/down resistors.

Logic Block Diagram



Product Pin Configuration



Product Pin Description

Pin Name	Description
$\overline{xOE}x$	Output Enable Inputs (Active LOW)
$xAx^{(1)}$	Data Inputs
xYx	3-State Outputs

Note: 1. For the PI74FCT162H827T, these pins have "Bus Hold." All other pins are standard, outputs, or I/Os.

Truth Table(1)

Inputs			Outputs
$\overline{xOE}1$	$\overline{xOE}2$	xAx	xYx
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

1. H = High Voltage Level
 L = Low Voltage Level
 X = Don't Care
 Z = High Impedance

Maximum Ratings

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

Storage Temperature	-65°C to +150°C
Ambient Temperature with Power Applied	-40°C to +85°C
Supply Voltage to Ground Potential (Inputs & V _{CC} Only)	-0.5V to +7.0V
Supply Voltage to Ground Potential (Outputs & D/O Only)	-0.5V to +7.0V
DC Input Voltage	-0.5V to +7.0V
DC Output Current	120mA
Power Dissipation	1.0W

Note:

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

DC Electrical Characteristics (Over the Operating Range, T_A = -40°C to +85°C, V_{CC} = 5.0V ± 10%)

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ ⁽²⁾	Max.	Units
V _{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level		2.0			V
V _{IL}	Input LOW Voltage	Guaranteed Logic LOW Level				0.8	V
I _{IH}	Input HIGH Current	Standard Input, V _{CC} = Max.	V _{IN} = V _{CC}			1	μA
I _{IH}	Input HIGH Current	Standard I/O, V _{CC} = Max.	V _{IN} = V _{CC}			1	μA
I _{IH}	Input HIGH Current	Bus Hold Input ⁽⁴⁾ , V _{CC} = Max.	V _{IN} = V _{CC}			±100	μA
I _{IH}	Input HIGH Current	Bus Hold I/O ⁽⁴⁾ , V _{CC} = Max.	V _{IN} = V _{CC}			±100	μA
I _{IL}	Input LOW Current	Standard Input, V _{CC} = Min.	V _{IN} = GND			-1	μA
I _{IL}	Input LOW Current	Standard I/O, V _{CC} = Min.	V _{IN} = GND			-1	μA
I _{IL}	Input LOW Current	Bus Hold Input ⁽⁴⁾ , V _{CC} = Min.	V _{IN} = GND			±100	μA
I _{IL}	Input LOW Current	Bus Hold I/O ⁽⁴⁾ , V _{CC} = Min.	V _{IN} = GND			±100	μA
I _{BHH}	Bus Hold	Bus Hold Input ⁽⁴⁾ , V _{CC} = Min.	V _{IN} = 2.0V	-50			μA
I _{BHL}	Sustain Current		V _{IN} = 0.8V	+50			μA
I _{OZH} ⁽⁵⁾	High-Impedance	V _{CC} = Max.	V _{OUT} = 2.7V			1	μA
I _{OZL} ⁽⁵⁾	Output Current (3-STATE OUTPUTS)	V _{CC} = Max.	V _{OUT} = 0.5V			-1	μA
V _{IK}	Clamp Diode Voltage	V _{CC} = Min., I _{IN} = -18 mA			-0.7	-1.2	V
I _{OS}	Short Circuit Current	V _{CC} = Max. ⁽³⁾ , V _{OUT} = GND		-80	-140	-200	mA
I _O	Output Drive Current	V _{CC} = Max. ⁽³⁾ , V _{OUT} = 2.5V		-50		-180	mA
V _H	Input Hysteresis				100		mV

Notes:

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 5.0V, +25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. Pins with Bus Hold are identified in the pin description.
5. This specification does not apply to bi-directional functionalities with Bus Hold.

PI74FCT16827T Output Drive Characteristics (Over the Operating Range)

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ ⁽²⁾	Max.	Units
VOH	Output HIGH Voltage	VCC = Min., VIN = VIH or VIL	IOH = -3.0 mA	2.5	3.5		V
			IOH = -15.0 mA	2.4	3.5		
			IOH = -32.0 mA	2.0	3.0		
VOL	Output LOW Voltage	VCC = Min., VIN = VIH or VIL	IOL = 64 mA		0.2	0.55	V
IOFF	Power Down Disable	VCC = 0V, VIN or VOUT ≤ 4.5V		—	—	±100	μA

PI74FCT162827T/162H827T Output Drive Characteristics (Over the Operating Range)

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ ⁽²⁾	Max.	Units
VOH	Output HIGH Voltage	VCC = Min., VIN = VIH or VIL	IOH = -24.0 mA	2.4	3.3		V
VOL	Output LOW Voltage	VCC = Min., VIN = VIH or VIL	IOL = 24 mA		0.3	0.55	V
IODL	Output LOW Current	VCC = 5V, VIN = VIH OR VIL, VOUT = 1.5V ⁽³⁾		60	115	150	mA
IODH	Output HIGH Current	VCC = 5V, VIN = VIH OR VIL, VOUT = 1.5V ⁽³⁾		-60	-115	-150	mA

Capacitance (TA = 25°C, f = 1 MHz)

Parameters ⁽⁴⁾	Description	Test Conditions	Typ	Max.	Units
CIN	Input Capacitance	VIN = 0V	4.5	6	pF
COUT	Output Capacitance	VOUT = 0V	5.5	8	pF

Notes:

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at VCC = 5.0V, +25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. This parameter is determined by device characterization but is not production tested.

Power Supply Characteristics

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ ⁽²⁾	Max.	Units
I _{CC}	Quiescent Power Supply Current	V _{CC} = Max.	V _{IN} = GND or V _{CC}		0.1	500	μA
ΔI _{CC}	Supply Current per Input @ TTL HIGH	V _{CC} = Max.	V _{IN} = 3.4V ⁽³⁾		0.5	2.5	mA
I _{CCD}	Supply Current per Input per MHz ⁽⁴⁾	V _{CC} = Max., Outputs Open OE1 = OE2 = GND One Input Toggling 50% Duty Cycle	V _{IN} = V _{CC} V _{IN} = GND		60	100	μA/ MHz
I _C	Total Power Supply Current ⁽⁶⁾	V _{CC} = Max., Outputs Open f _{CP} = 10 MHz 50% Duty Cycle OE1 = OE2 = GND fi = 5 MHz One Bit Toggling	V _{IN} = V _{CC} V _{IN} = GND		0.6	1.5 ⁽⁵⁾	mA
			V _{IN} = 3.4V V _{IN} = GND		0.9	2.3 ⁽⁵⁾	
		V _{CC} = Max., Outputs Open f _{CP} = 10 MHz 50% Duty Cycle OE1 = OE2 = GND Eight Bits Toggling fi = 2.5 MHz 50% Duty Cycle	V _{IN} = V _{CC} V _{IN} = GND		3.0	5.5 ⁽⁵⁾	
			V _{IN} = 3.4 V _{IN} = GND		8.0	20.5 ⁽⁵⁾	

Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at V_{CC} = 5.0V, +25°C ambient.
- Per TTL driven input (V_{IN} = 3.4V); all other inputs at V_{CC} or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.
- I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}
I_C = I_{CC} + ΔI_{CC} D_HN_T + I_{CCD} (f_{CP}/2 + fiN_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).
fi = Input Frequency
N_I = Number of Inputs at fi
All currents are in milliamps and all frequencies are in megahertz.

PI74FCT16827T Switching Characteristics over Operating Range

Parameters	Description	Conditions ⁽¹⁾	16827AT		16827BT		16827CT		16827DT		16827ET		Unit
			Com.		Com.		Com.		Com.		Com.		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
tPLH tPHL	Propagation Delay xAX to xYx	CL = 50 pF RL = 500Ω	1.5	8.0	1.5	5.0	1.5	4.4	1.5	3.8	1.5	3.2	ns
		CL = 300 pF ⁽³⁾ RL = 500Ω	1.5	15.0	1.5	13.0	1.5	10.0	1.5	7.5	1.5	7.0	ns
tPZH tPZL	Output Enable Time xOEx to xYx	CL = 50 pF RL = 500Ω	1.5	12.0	1.5	8.0	1.5	7.0	1.5	5.0	1.5	4.8	ns
		CL = 300 pF ⁽³⁾ RL = 500Ω	1.5	23.0	1.5	15.0	1.5	14.0	1.5	9.0	1.5	9.0	ns
tPHZ tPLZ	Output Disable Time ⁽³⁾ OEN to YN	CL = 5 pF ⁽³⁾ RL = 500Ω	1.5	9.0	1.5	6.0	1.5	5.7	1.5	4.3	1.5	4.0	ns
		CL = 50 pF RL = 500Ω	1.5	10.0	1.5	7.0	1.5	6.0	1.5	4.3	1.5	4.0	ns
tsk(O)	Output Skew ⁽⁴⁾		—	0.5	—	0.5	—	0.5	—	0.5	—	0.5	ns

PI74FCT162827T Switching Characteristics over Operating Range

Parameters	Description	Conditions ⁽¹⁾	162827AT		162827BT		162827CT		162827DT		162827ET		Unit
			Com.		Com.		Com.		Com.		Com.		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
tPLH tPHL	Propagation Delay xAX to xYx	CL = 50 pF RL = 500Ω	1.5	8.0	1.5	5.0	1.5	4.4	1.5	3.8	1.5	3.2	ns
		CL = 300 pF ⁽³⁾ RL = 500Ω	1.5	15.0	1.5	13.0	1.5	10.0	1.5	7.5	1.5	7.0	ns
tPZH tPZL	Output Enable Time xOEx to xYx	CL = 50 pF RL = 500Ω	1.5	12.0	1.5	8.0	1.5	7.0	1.5	5.0	1.5	4.8	ns
		CL = 300 pF ⁽³⁾ RL = 500Ω	1.5	23.0	1.5	15.0	1.5	14.0	1.5	9.0	1.5	9.0	ns
tPHZ tPLZ	Output Disable Time ⁽³⁾ OEN to YN	CL = 5 pF ⁽³⁾ RL = 500Ω	1.5	9.0	1.5	6.0	1.5	5.7	1.5	4.3	1.5	4.0	ns
		CL = 50 pF RL = 500Ω	1.5	10.0	1.5	7.0	1.5	6.0	1.5	4.3	1.5	4.0	ns
tsk(O)	Output Skew ⁽⁴⁾		—	0.5	—	0.5	—	0.5	—	0.5	—	0.5	ns

Notes:

1. See test circuit and wave forms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not production tested.
4. Skew between any two outputs, of the same package, switching in the same direction. This parameter is guaranteed by design.

PI74FCT162H827T Switching Characteristics over Operating Range

Parameters	Description	Conditions ¹⁾	162H827AT		162H827BT		162H827CT		162H827DT		162H827ET		Unit
			Com.		Com.		Com.		Com.		Com.		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
IPLH IPL	Propagation Delay xAX to xYx	CL = 50 pF RL = 500Ω	1.5	8.0	1.5	5.0	1.5	4.4	1.5	3.8	1.5	3.2	ns
		CL = 300 pF ³⁾ RL = 500Ω	1.5	15.0	1.5	13.0	1.5	10.0	1.5	7.5	1.5	7.0	ns
IPZH IPZL	Output Enable Time xOEx to xYx	CL = 50 pF RL = 500Ω	1.5	12.0	1.5	8.0	1.5	7.0	1.5	5.0	1.5	4.8	ns
		CL = 300 pF ³⁾ RL = 500Ω	1.5	23.0	1.5	15.0	1.5	14.0	1.5	9.0	1.5	9.0	ns
IPHZ IPLZ	Output Disable Time ³⁾ OEN to YN	CL = 5 pF ³⁾ RL = 500Ω	1.5	9.0	1.5	6.0	1.5	5.7	1.5	4.3	1.5	4.0	ns
		CL = 50 pF RL = 500Ω	1.5	10.0	1.5	7.0	1.5	6.0	1.5	4.3	1.5	4.0	ns
ISK(o)	Output Skew ⁴⁾		—	0.5	—	0.5	—	0.5	—	0.5	—	0.5	ns

Notes:

1. See test circuit and wave forms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not production tested.
4. Skew between any two outputs, of the same package, switching in the same direction. This parameter is guaranteed by design.