FAIRCHILD SEMICONDUCTOR®

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74VCX16827
Low Voltage 20-Bit Buffer/Line Driver with 3.6V Tolerant Inputs and Outputs

General Description

The VCX16827 contains twenty non-inverting buffers with 3-STATE outputs to be employed as a memory and address driver, clock driver, or bus oriented transmitter/receiver carrying parity. The device is byte controlled. Each byte has NOR output enables for maximum control flexibility.

The 74VCX16827 is designed for low voltage (1.2V to 3.6V) V_{CC} applications with I/O capability up to 3.6V.

The 74VCX16827 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining low CMOS power dissipation.

Features

- 1.2V to 3.6V V_{CC} supply operation
- 3.6V tolerant inputs and outputs
- t_{PD}
  2.5 ns max for 3.0V to 3.6V V_{CC}
- Power-off high impedance inputs and outputs
- Supports live insertion and withdrawal (Note 1)
- Static Drive (I_{OH}/I_{OL})
  ±24 mA @ 3.0V V_{CC}
- Uses patented noise/EMI reduction circuitry
- Latch-up performance exceeds 300 mA
- ESD performance:
  Human body model > 2000V
  Machine model > 200V

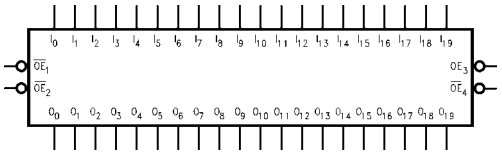
Note 1: To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pull-up resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

Ordering Code:

Order Number	Package Number	Package Description
74VCX16827MTD	MTD56	56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

Devices also available on Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

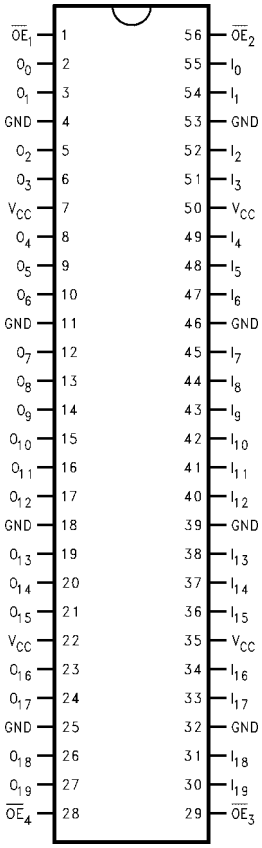
Logic Symbol



Pin Descriptions

Pin Names	Description
$\overline{OE}_n$	Output Enable Input (Active LOW)
I_0–I_{19}	Inputs
O_0–O_{19}	Outputs

Connection Diagram



Truth Tables

Inputs			Outputs
$\overline{OE}_1$	$\overline{OE}_2$	I_0–I_9	O_0–O_9
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

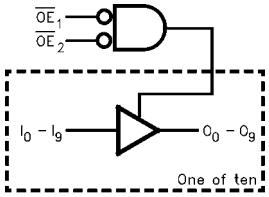
Inputs			Outputs
$\overline{OE}_3$	$\overline{OE}_4$	I_0–I_9	O_{10}–O_{19}
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

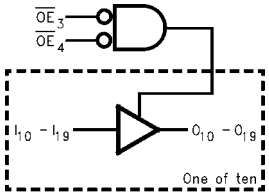
H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial (HIGH or LOW, inputs may not float)
Z = High Impedance

Functional Description

The 74VCX16827 contains twenty non-inverting buffers with 3-STATE outputs. The device is byte controlled with each byte functioning identically, but independent of each other. The control pins may be shorted together to obtain full 16-bit operation. The 3-STATE outputs are controlled by Output Enable ($\overline{OE}_n$) inputs. When $\overline{OE}_1$, and $\overline{OE}_2$ are LOW, O_0—O_{10} are in the 2-state mode. When either $\overline{OE}_1$ or $\overline{OE}_2$ are HIGH, the standard outputs are in the high impedance mode but this does not interfere with entering new data into the inputs. The same applies for byte two with $\overline{OE}_3$ and $\overline{OE}_4$.

Logic Diagrams





Absolute Maximum Ratings (Note 2)

Supply Voltage (V_{CC})	−0.5V to +4.6V
DC Input Voltage (V_I)	−0.5V to +4.6V
Output Voltage (V_O)	
Outputs 3-STATED	−0.5V to +4.6V
Outputs Active (Note 3)	−0.5V to V_{CC} + 0.5V
DC Input Diode Current (I_{IK}) V_I < 0V	−50 mA
DC Output Diode Current (I_{OK})	
V_O < 0V	−50 mA
V_O > V_{CC}	+50 mA
DC Output Source/Sink Current (I_{OH}/I_{OL})	±50 mA
DC V_{CC} or GND Current per Supply Pin (I_{CC} or GND)	±100 mA
Storage Temperature Range (T_{STG})	−65°C to +150°C

Recommended Operating Conditions (Note 4)

Power Supply	
Operating	1.2V to 3.6V
Input Voltage	−0.3V to +3.6V
Output Voltage (V_O)	
Output in Active States	0V to V_{CC}
Output in 3-STATE	0.0V to 3.6V
Output Current in I_{OH}/I_{OL}	
V_{CC} = 3.0V to 3.6V	±24 mA
V_{CC} = 2.3V to 2.7V	±18 mA
V_{CC} = 1.65V to 2.3V	±6 mA
V_{CC} = 1.4V to 1.6V	±2 mA
V_{CC} = 1.2V	± 100 µA
Free Air Operating Temperature (T_A)	−40°C to +85°C
Minimum Input Edge Rate ($\Delta t/\Delta V$)	
V_{IN} = 0.8V to 2.0V, V_{CC} = 3.0V	10 ns/V

Note 2: The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the Absolute Maximum Ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 3: I_O Absolute Maximum Rating must be observed.

Note 4: Floating or unused inputs must be held HIGH or LOW.

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	Min	Max	Units
V_{IH}	HIGH Level Input Voltage		2.7 - 3.6	2.0		
			2.3 - 2.7	1.6		
			1.65 - 2.3	0.65 x V_{CC}		V
			1.4 - 1.6	0.65 x V_{CC}		
			1.2	0.65 x V_{CC}		
V_{IL}	LOW Level Input Voltage		2.7 - 3.6		0.8	
			2.3 - 2.7		0.7	
			1.65 - 2.3		0.35 x V_{CC}	V
			1.4 - 1.6		0.35 x V_{CC}	
			1.2		0.05 x V_{CC}	
V_{OH}	HIGH Level Output Voltage	I_{OH} = −100 µA	2.7 - 3.6	V_{CC} - 0.2		
		I_{OH} = −12 mA	2.7	2.2		
		I_{OH} = −18 mA	3.0	2.4		
		I_{OH} = −24 mA	3.0	2.2		
		I_{OH} = −100 µA	2.3 - 2.7	V_{CC} - 0.2		
		I_{OH} = −6 mA	2.3	2.0		
		I_{OH} = −12 mA	2.3	1.8		V
		I_{OH} = −18 mA	2.3	1.7		
		I_{OH} = −100 µA	1.65 - 2.3	V_{CC} - 0.2		
		I_{OH} = −6 mA	1.65	1.25		
		I_{OH} = −100 µA	1.4 - 1.6	V_{CC} - 0.2		
		I_{OH} = −2 mA	1.4	1.05		
		I_{OH} = −100 µA	1.2	V_{CC} - 0.2		

DC Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	V_{CC} (V)	Min	Max	Units
V_{OL}	LOW Level Output Voltage	I_{OL} = 100 µA	2.7 - 3.6		0.2	V
		I_{OL} = 12 mA	2.7		0.4	
		I_{OL} = 18 mA	3.0		0.4	
		I_{OL} = 24 mA	3.0		0.55	
		I_{OL} = 100 µA	2.3 - 2.7		0.2	
		I_{OL} = 12 mA	2.3		0.4	
		I_{OL} = 18 mA	2.3		0.6	
		I_{OL} = 100 µA	1.65 - 2.3		0.2	
		I_{OL} = 6 mA	1.65		0.3	
		I_{OL} = 100 µA	1.4 - 1.6		0.2	
		I_{OL} = 2 mA	1.4		0.35	
		I_{OL} = 100 µA	1.2		0.05	
I_I	Input Leakage Current	$0 \le V_I \le 3.6V$	1.2 - 3.6		±5.0	µA
I_{OZ}	3-STATE Output Leakage	$0 \le V_O \le 3.6V$ $V_I = V_{IH}$ or V_{IL}	1.2 – 3.6		±10	µA
I_{OFF}	Power-OFF Leakage Current	$0 \le (V_I, V_O) \le 3.6V$	0		10	µA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC}$ or GND	1.2 - 3.6		20	µA
		$V_{CC} \le (V_I, V_O) \le 3.6V$ (Note 5)	1.2 - 3.6		±20	
ΔI_{CC}	Increase in I_{CC} per Input	$V_{IH} = V_{CC} - 0.6V$	2.7 - 3.6		750	µA

Note 5: Outputs disabled or 3-STATE only.

AC Electrical Characteristics (Note 6)

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = -40°C$ to $+85°C$		Units	Figure Number
				Min	Max		
t_{PHL}, t_{PLH}	Propagation Delay	C_L = 30 pF, R_L = 500Ω	3.3 ± 0.3	0.8	2.5	ns	Figures 1, 2
			2.5 ± 0.2	1.0	3.0		
			1.8 ± 0.15	1.5	6.0		
		C_L = 15 pF, R_L = 2kΩ	1.5 ± 0.1	1.0	12.0		Figures 5, 6
			1.2	1.5	30		
t_{PZL}, t_{PZH}	Output Enable Time	C_L = 30 pF, R_L = 500Ω	3.3 ± 0.3	0.8	3.8	ns	Figures 1, 3, 4
			2.5 ± 0.2	1.0	4.9		
			1.8 ± 0.15	1.5	9.8		
		C_L = 15 pF, R_L = 2kΩ	1.5 ± 0.1	1.0	19.6		Figures 5, 7, 8
			1.2		49		
t_{PLZ}, t_{PHZ}	Output Disable Time	C_L = 30 pF, R_L = 500Ω	3.3 ± 0.3	0.8	3.7	ns	Figures 1, 3, 4
			2.5 ± 0.2	1.0	4.2		
			1.8 ± 0.15	1.5	7.6		
		C_L = 15 pF, R_L = 2kΩ	1.5 ± 0.1	1.0	15.2		Figures 5, 7, 8
			1.2		38		
t_{OSHL} t_{OSLH}	Output to Output Skew (Note 7)	C_L = 30 pF, R_L = 500Ω	3.3 ± 0.3		0.5	ns	
			2.5 ± 0.2		0.5		
			1.8 ± 0.15		0.75		
		C_L = 15 pF, R_L = 2kΩ	1.5 ± 0.1		1.5		
			1.2		1.5		

Note 6: For C_L = 50 pF, add approximately 300 ps to the AC maximum specification.

Note 7: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}).

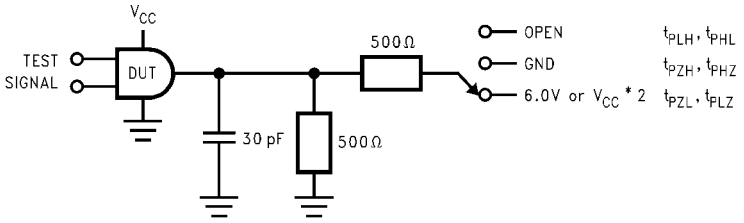
Dynamic Switching Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = +25°C$ Typical	Units
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	C_L = 30 pF, $V_{IH} = V_{CC}$, V_{IL} = 0V	1.8	0.25	V
			2.5	0.6	
			3.3	0.8	
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	C_L = 30 pF, $V_{IH} = V_{CC}$, V_{IL} = 0V	1.8	–0.25	V
			2.5	–0.6	
			3.3	–0.8	
V_{OHV}	Quiet Output Dynamic Valley V_{OH}	C_L = 30 pF, $V_{IH} = V_{CC}$, V_{IL} = 0V	1.8	1.5	V
			2.5	1.9	
			3.3	2.2	

Capacitance

Symbol	Parameter	Conditions	$T_A = +25°C$ Typical	Units
C_{IN}	Input Capacitance	V_{CC} = 1.8, 2.5V or 3.3V, V_I = 0V or V_{CC}	6	pF
C_{OUT}	Output Capacitance	V_I = 0V or V_{CC}, V_{CC} = 1.8V, 2.5V or 3.3V	7	pF
C_{PD}	Power Dissipation Capacitance	V_I = 0V or V_{CC}, f = 10 MHz, V_{CC} = 1.8V, 2.5V or 3.3V	20	pF

AC Loading and Waveforms (V_{CC} 3.3V ± 0.3V to 1.8V ± 0.15V)



TEST	SWITCH
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ}	6V at V_{CC} = 3.3V ± 0.3V; V_{CC} x 2 at V_{CC} = 2.5V ± 0.2V; 1.8V ± 0.15V
t_{PZH}, t_{PHZ}	GND

FIGURE 1. AC Test Circuit

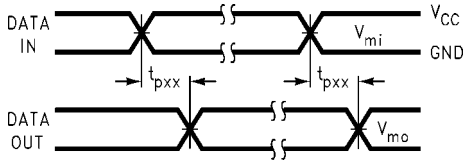


FIGURE 2. Waveform for Inverting and Non-Inverting Functions

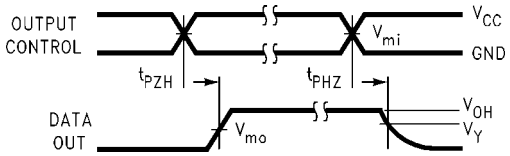


FIGURE 3. 3-STATE Output High Enable and Disable Times for Low Voltage Logic

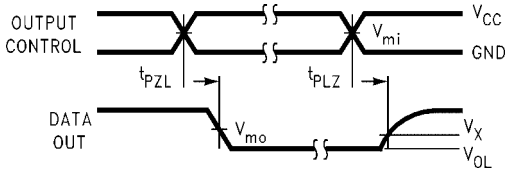
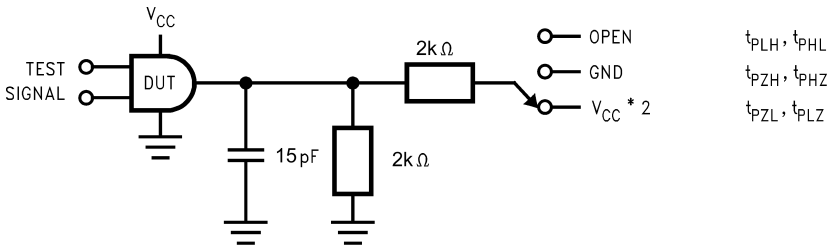


FIGURE 4. 3-STATE Output Low Enable and Disable Times for Low Voltage Logic

Symbol	V_{CC}		
	3.3V ± 0.3V	**2.5V ± 0.2V**	**1.8V ± 0.15V**
V_{mi}	1.5V	V_{CC}/2	V_{CC}/2
V_{mo}	1.5V	V_{CC}/2	V_{CC}/2
V_X	V_{OL} + 0.3V	V_{OL} + 0.15V	V_{OL} + 0.15V
V_Y	V_{OH} − 0.3V	V_{OH} − 0.15V	V_{OH} − 0.15V

AC Loading and Waveforms (V_{CC} 1.5V ± 0.1V to 1.2V)



TEST	SWITCH
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ}	V_{CC} x 2 at V_{CC} = 1.5V ± 0.1V
t_{PZH}, t_{PHZ}	GND

FIGURE 5. AC Test Circuit

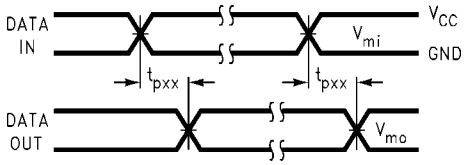


FIGURE 6. Waveform for Inverting and Non-Inverting Functions

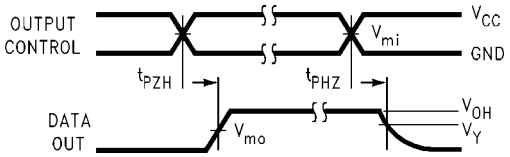


FIGURE 7. 3-STATE Output High Enable and Disable Times for Low Voltage Logic

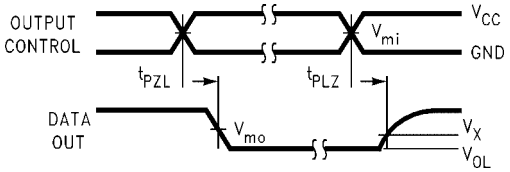
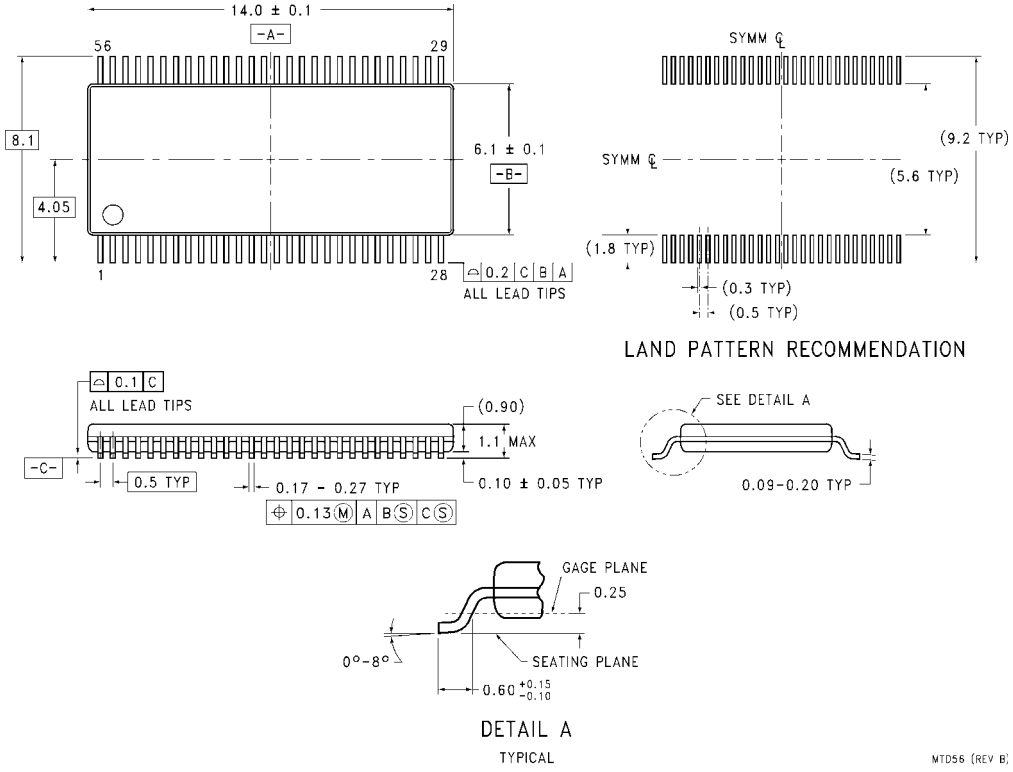


FIGURE 8. 3-STATE Output Low Enable and Disable Times for Low Voltage Logic

Symbol	V_{CC}
	2.5V ± 0.2V
V_{mi}	$V_{CC}/2$
V_{mo}	$V_{CC}/2$
V_X	V_{OL} + 0.15V
V_Y	V_{OH} − 0.15V

Physical Dimensions inches (millimeters) unless otherwise noted



56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide
Package Number MTD56

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