FAIRCHILD SEMICONDUCTOR™

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74VCX162827

Low Voltage 20-Bit Buffer/Line Driver with 3.6V Tolerant Inputs and Outputs and 26Ω Series Resistors in the Outputs

General Description

The VCX162827 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. The device is byte controlled. Each byte has NOR output enables for maximum control flexibility.

The 74VCX162827 is designed for low voltage (1.65V to 3.6V) V_{CC} applications with I/O capability up to 3.6V. The VCX162827 is also designed with 26Ω resistors in the outputs.

The 74VCX162827 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining low CMOS power dissipation.

Features

- 1.65V–3.6V V_{CC} supply operation
- 3.6V tolerant inputs and outputs
- 26Ω series resistors in outputs
- t_{PD}
  - 3.4 ns max for 3.0V to 3.6V V_{CC}
  - 4.1 ns max for 2.3V to 2.7V V_{CC}
  - 8.2 ns max for 1.65V to 1.95V V_{CC}
- Power-off high impedance inputs and outputs
- Supports live insertion and withdrawal (Note 1)
- Static Drive (I_{OH}/I_{OL})
  - ±12 mA @ 3.0V V_{CC}
  - ±8 mA @ 2.3V V_{CC}
  - ±3 mA @ 1.65V V_{CC}
- Uses patented noise/EMI reduction circuitry
- Latch-up performance exceeds 300 mA
- ESD performance:
  - Human body model > 2000V
  - Machine model > 200V

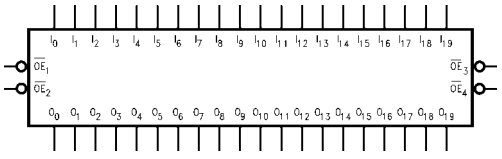
Note 1: To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pull-up resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

Ordering Code:

Order Number	Package Number	Package Description
74VCX162827MTD	MTD56	56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

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

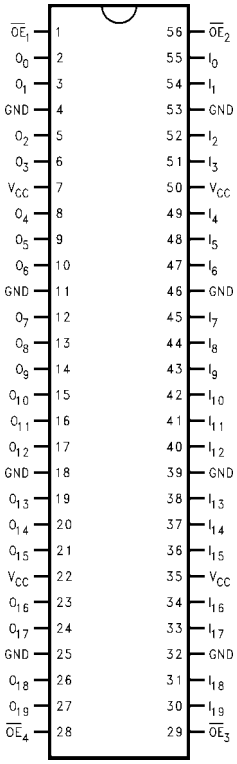
Logic Symbol



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

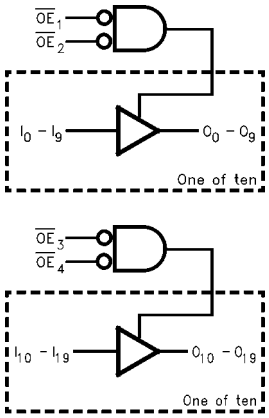
Inputs			Outputs
$\overline{OE}_3$	$\overline{OE}_4$	I_0–I_9	O_{10}–O_{19}
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

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

Functional Description

The 74VCX162827 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 20-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-STATE	−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	1.65V to 3.6V
Data Retention Only	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	±12 mA
V_{CC} = 2.3V to 2.7V	±8 mA
V_{CC} = 1.65V to 2.3V	±3 mA
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 ($2.7V < V_{CC} \leq 3.6V$)

Symbol	Parameter	Conditions	V_{CC} (V)	Min	Max	Units
V_{IH}	HIGH Level Input Voltage		2.7 – 3.6	2.0		V
V_{IL}	LOW Level Input Voltage		2.7 – 3.6		0.8	V
V_{OH}	HIGH Level Output Voltage	I_{OH} = −100 µA	2.7 – 3.6	V_{CC} − 0.2		V
		I_{OH} = −6 mA	2.7	2.2		V
		I_{OH} = −8 mA	3.0	2.4		V
		I_{OH} = −12 mA	3.0	2.2		V
V_{OL}	LOW Level Output Voltage	I_{OL} = 100 µA	2.7 – 3.6		0.2	V
		I_{OL} = 6 mA	2.7		0.4	V
		I_{OL} = 8 mA	3.0		0.55	V
		I_{OL} = 12 mA	3.0		0.8	V
I_I	Input Leakage Current	0 ≤ V_I ≤ 3.6V	2.7 – 3.6		±5.0	µA
I_{OZ}	3-STATE Output Leakage	0 ≤ V_O ≤ 3.6V V_I = V_{IH} or V_{IL}	2.7 – 3.6		±10	µA
I_{OFF}	Power-OFF Leakage Current	0 ≤ (V_I, V_O) ≤ 3.6V	0		10	µA
I_{CC}	Quiescent Supply Current	V_I = V_{CC} or GND	2.7 – 3.6		20	µA
		V_{CC} ≤ (V_I, V_O) ≤ 3.6V (Note 5)	2.7 – 3.6		±20	µA
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.

DC Electrical Characteristics ($2.3V \le V_{CC} \le 2.7V$)

Symbol	Parameter	Conditions	V_{CC} (V)	Min	Max	Units
V_{IH}	HIGH Level Input Voltage		2.3 – 2.7	1.6		V
V_{IL}	LOW Level Input Voltage		2.3 – 2.7		0.7	V
V_{OH}	HIGH Level Output Voltage	I_{OH} = –100 µA	2.3 – 2.7	V_{CC} – 0.2		V
		I_{OH} = –4 mA	2.3	2.0		V
		I_{OH} = –6 mA	2.3	1.8		V
		I_{OH} = –8 mA	2.3	1.7		V
V_{OL}	LOW Level Output Voltage	I_{OL} = 100 µA	2.3 – 2.7		0.2	V
		I_{OL} = 6 mA	2.3		0.4	V
		I_{OL} = 8 mA	2.3		0.6	V
I_I	Input Leakage Current	$0 \le V_I \le 3.6V$	2.3 – 2.7		±5.0	µA
I_{OZ}	3-STATE Output Leakage	$0 \le V_O \le 3.6V$ $V_I = V_{IH}$ or V_{IL}	2.3 – 2.7		±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	2.3 – 2.7		20	µA
		$V_{CC} \le (V_I, V_O) \le 3.6V$ (Note 6)	2.3 – 2.7		±20	µA

Note 6: Outputs disabled or 3-STATE only.

DC Electrical Characteristics ($1.65V \le V_{CC} < 2.3V$)

Symbol	Parameter	Conditions	V_{CC} (V)	Min	Max	Units
V_{IH}	HIGH Level Input Voltage		1.65 - 2.3	$0.65 \times V_{CC}$		V
V_{IL}	LOW Level Input Voltage		1.65 - 2.3		$0.35 \times V_{CC}$	V
V_{OH}	HIGH Level Output Voltage	I_{OH} = –100 µA	1.65 - 2.3	V_{CC} – 0.2		V
		I_{OH} = –3 mA	1.65	1.25		V
V_{OL}	LOW Level Output Voltage	I_{OL} = 100 µA	1.65 - 2.3		0.2	V
		I_{OL} = 3 mA	1.65		0.3	V
I_I	Input Leakage Current	$0 \le V_I \le 3.6V$	1.65 - 2.3		±5.0	µA
I_{OZ}	3-STATE Output Leakage	$0 \le V_O \le 3.6V$ $V_I = V_{IH}$ or V_{IL}	1.65 - 2.3		±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	1.65 - 2.3		20	µA
		$V_{CC} \le (V_I, V_O) \le 3.6V$ (Note 7)	1.65 - 2.3		±20	µA

Note 7: Outputs disabled or 3-STATE only.

AC Electrical Characteristics (Note 8)

Symbol	Parameter	$T_A = -40°C$ to $+85°C$, $C_L = 30$ pF, $R_L = 500\Omega$						Units
		$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 2.5V \pm 0.2V$		$V_{CC} = 1.8V \pm 0.15V$		
		Min	Max	Min	Max	Min	Max	
t_{PHL}, t_{PLH}	Prop Delay	0.8	3.4	1.0	4.1	1.5	8.2	ns
t_{PZL}, t_{PZH}	Output Enable Time	0.8	4.3	1.0	5.9	1.5	9.8	ns
t_{PLZ}, t_{PHZ}	Output Disable Time	0.8	4.3	1.0	4.9	1.5	8.8	ns
t_{OSHL} t_{OSLH}	Output to Output Skew (Note 9)		0.5		0.5		0.75	ns

Note 8: For $C_L = 50$ pF, add approximately 300 ps to the AC maximum specification.

Note 9: 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}).

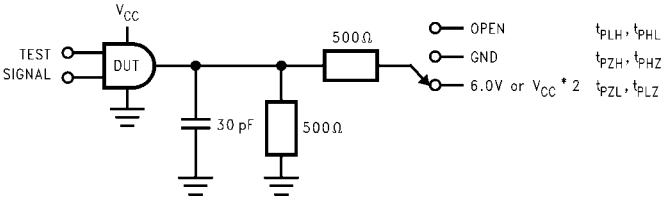
Dynamic Switching Characteristics

Symbol	Parameter	Conditions	V_{CC}	$T_A = +25°C$	Units
			(V)	Typical	
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	$C_L = 30$ pF, $V_{IH} = V_{CC}$, $V_{IL} = 0V$	1.8	0.15	
			2.5	0.25	V
			3.3	0.35	
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	$C_L = 30$ pF, $V_{IH} = V_{CC}$, $V_{IL} = 0V$	1.8	–0.15	
			2.5	–0.25	V
			3.3	–0.35	
V_{OHV}	Quiet Output Dynamic Valley V_{OH}	$C_L = 30$ pF, $V_{IH} = V_{CC}$, $V_{IL} = 0V$	1.8	1.55	
			2.5	2.05	V
			3.3	2.65	

Capacitance

Symbol	Parameter	Conditions	$T_A = +25°C$	Units
			Typical	
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



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

FIGURE 1. AC Test Circuit

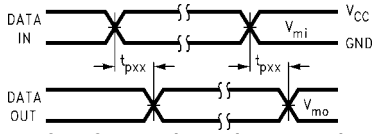


FIGURE 2. Waveform for Inverting and Non-Inverting Functions

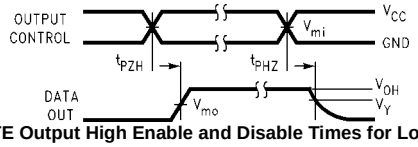


FIGURE 3. 3-STATE Output High Enable and Disable Times for Low Voltage Logic

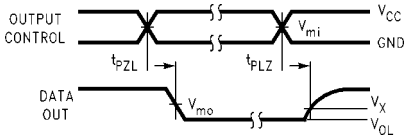
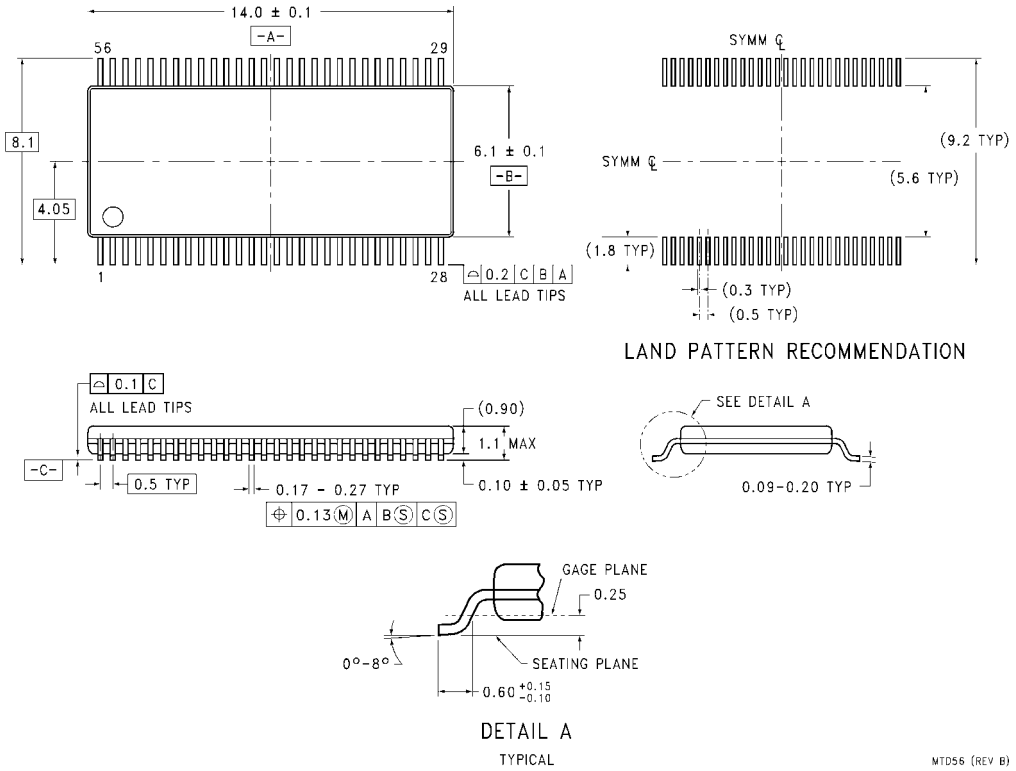


FIGURE 4. 3-STATE Output Low Enable and Disable Times for Low Voltage Logic

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

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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