May 2001
Revised June 2005

FSTD16861
20-Bit Bus Switch with Level Shifting

General Description

The Fairchild Switch FSTD16861 provides 20-bits of high-speed CMOS TTL-compatible bus switching. The low On Resistance of the switch allows inputs to be connected to outputs without adding propagation delay or generating additional ground bounce noise. A diode to V_{CC} has been integrated into the circuit to allow for level shifting between 5V inputs and 3.3V outputs.

The device is organized as a 10-bit or 20-bit bus switch. When $\overline{OE}_1$ is LOW, the switch is ON and Port 1A is connected to Port 1B. When $\overline{OE}_2$ is LOW, Port 2A is connected to Port 2B. When $\overline{OE}_X$ is HIGH, a high impedance state exists between the A and B Ports.

Features

- 4Ω switch connection between two ports.
- Minimal propagation delay through the switch.
- Low I_{CC}.
- Zero bounce in flow-through mode.
- Control inputs compatible with TTL level.
- TruTranslation™ voltage translation from 5.0V inputs to 3.3V outputs
- Power-off high impedance inputs and outputs
- Supports live insertion/withdrawal (Note 1)

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
FSTD16861MTD	MTD48	48-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 letter "X" to the ordering code.

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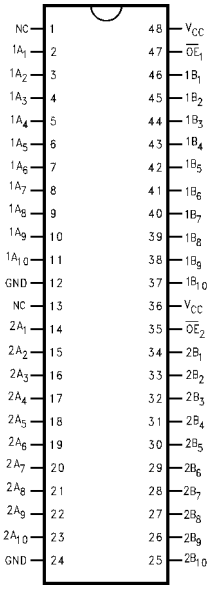
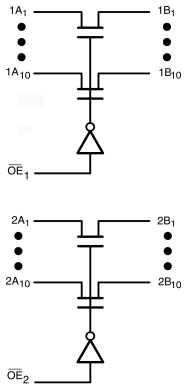
Connection Diagram



Logic Diagram



Pin Descriptions

Pin Name	Description
$\overline{OE}_1$, $\overline{OE}_2$	Bus Switch Enables
$1A_n$, $2A_n$	Bus A
$1B_n$, $2B_n$	Bus B

Truth Table

Inputs		Inputs/Outputs	
$\overline{OE}_1$	$\overline{OE}_2$	1A, 1B	2A, 2B
L	L	1A = 1B	2A = 2B
L	H	1A = 1B	Z
H	L	Z	2A = 2B
H	H	Z	Z

H = HIGH Voltage Level
L = LOW Voltage Level
Z = High Impedance

Absolute Maximum Ratings (Note 2)

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Switch Voltage (V_S) (Note 3)	−0.5V to +7.0V
DC Input Voltage (V_{IN}) (Note 4)	−0.5V to +7.0V
DC Input Diode Current (I_{IK}) V_{IN} < 0V	−50 mA
DC Output Current (I_{OUT})	128 mA
DC V_{CC}/GND Current (I_{CC}/I_{GND})	±100 mA
Storage Temperature Range (T_{STG})	−65°C to +150 °C

Recommended Operating Conditions (Note 5)

Power Supply Operating (V_{CC})	4.5V to 5.5V
Input Voltage (V_{IN})	0V to 5.5V
Output Voltage (V_{OUT})	0V to 5.5V
Input Rise and Fall Time (t_r, t_f)	
Switch Control Input	0 ns/V to 5 ns/V
Switch I/O	0 ns/V to DC
Free Air Operating Temperature (T_A)	-40 °C to +85 °C

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 rating. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 3: V_S is the voltage observed/applied at either the A or B Ports across the switch.

Note 4: The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

Note 5: Unused control inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	T_A = −40 °C to +85 °C			Units	Conditions
			Min	Typ (Note 6)	Max		
V_{IK}	Clamp Diode Voltage	4.5			−1.2	V	I_{IN} = −18 mA
V_{IH}	HIGH Level Input Voltage	4.5-5.5	2.0			V	
V_{IL}	LOW Level Input Voltage	4.5-5.5			0.8	V	
V_{OH}	HIGH Level	4.5-5.5	See Figure 3			V	
I_I	Input Leakage Current	5.5			±1.0	μA	0 ≤ V_{IN} ≤ 5.5V
		0			10	μA	V_{IN} = 5.5V
I_{OZ}	OFF-STATE Leakage Current	5.5			±1.0	μA	0 ≤ A, B ≤ V_{CC}
R_{ON}	Switch On Resistance (Note 7)	4.5		4	7	Ω	V_{IN} = 0V, I_{IN} = 64 mA
		4.5		4	7	Ω	V_{IN} = 0V, I_{IN} = 30 mA
		4.5		35	50	Ω	V_{IN} = 2.4V, I_{IN} = 15 mA
I_{CC}	Quiescent Supply Current	5.5			1.5	mA	OE_1 = OE_2 = GND V_{IN} = V_{CC} or GND, I_{OUT} = 0
					10	μA	OE_1 = OE_2 = V_{CC} V_{IN} = V_{CC} or GND, I_{OUT} = 0
ΔI_{CC}	Increase in I_{CC} per Input	5.5			2.5	mA	One Input at 3.4V Other Inputs at V_{CC} or GND

Note 6: Typical values are at V_{CC} = 5.0V and T_A = +25°C

Note 7: Measured by the voltage drop between A and B pins at the indicated current through the switch. On Resistance is determined by the lower of the voltages on the two (A or B) pins.

AC Electrical Characteristics

Symbol	Parameter	$T_A = -40\ ^\circ C$ to $+85\ ^\circ C$, $C_L = 50pF$, $RU = RD = 500\Omega$		Units	Conditions	Figure Number
		$V_{CC} = 4.5 - 5.5V$				
		Min	Max			
t_{PHL}, t_{PLH}	Propagation Delay Bus-to-Bus (Note 8)		0.25	ns	V_I = OPEN	Figures 1, 2
t_{PZH}, t_{PZL}	Output Enable Time	1.0	6.0	ns	V_I = 7V for t_{PZL} V_I = OPEN for t_{PZH}	Figures 1, 2
t_{PHZ}, t_{PLZ}	Output Disable Time	1.0	7.0	ns	V_I = 7V for t_{PLZ} V_I = OPEN for t_{PHZ}	Figures 1, 2

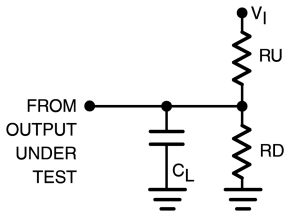
Note 8: This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical On Resistance of the switch and the 50pF load capacitance, when driven by an ideal voltage source (zero output impedance).

Capacitance (Note 9)

Symbol	Parameter	Typ	Max	Units	Conditions
C_{IN}	Control Pin Input Capacitance	3		pF	V_{CC} = 5.0V, V_{IN} = 0V
$C_{I/O}$	Input/Output Capacitance "OFF State"	6		pF	V_{CC}, $\overline{OE}$ = 5.0V, V_{IN} = 0V

Note 9: $T_A = +25°C$, f = 1 Mhz, Capacitance is characterized but not tested.

AC Loading and Waveforms



Note: Input driven by 50Ω source terminated in 50Ω

Note: C_L includes load and stray capacitance

Note: Input PRR = 1.0 MHz, t_W = 500 ns

FIGURE 1. AC Test Circuit

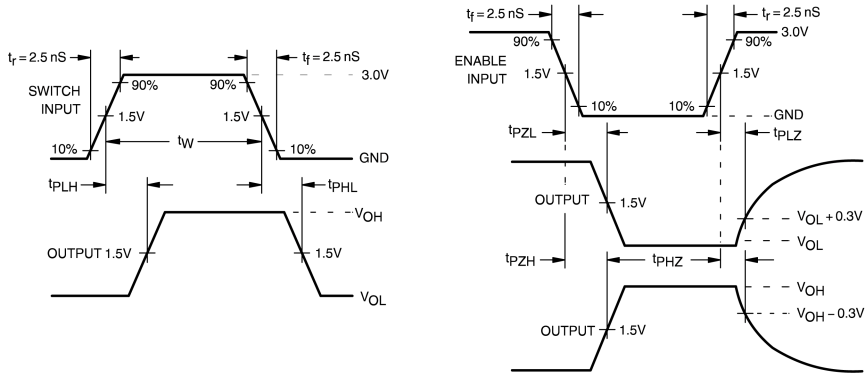
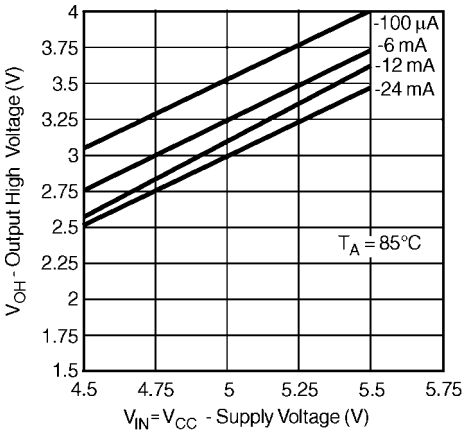
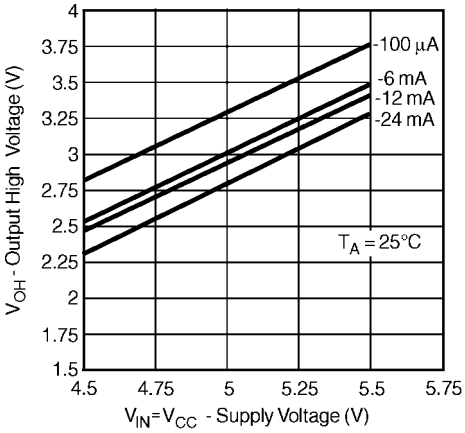


FIGURE 2. AC Waveforms

Output Voltage HIGH vs. Supply Voltage





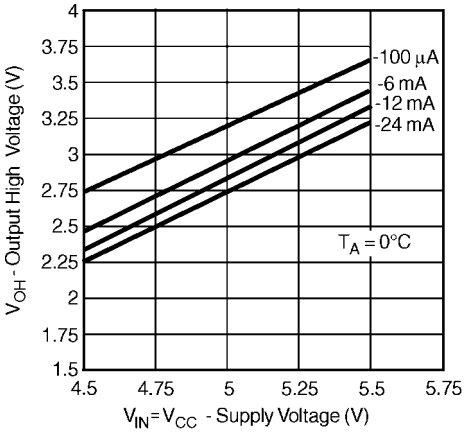
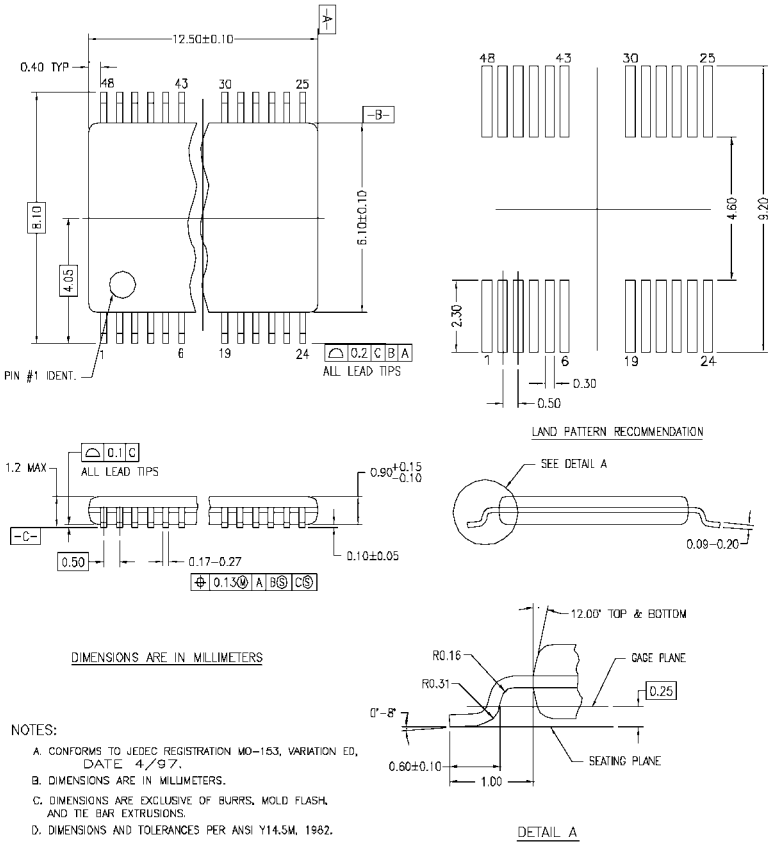


FIGURE 3.

Physical Dimensions inches (millimeters) unless otherwise noted



48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide
Package Number MTD48

Technology Description

The Fairchild Switch family derives from and embodies Fairchild's proven switch technology used for several years in its 74LVX3L384(FST3384) bus switch product.

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