



November 2001  
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## FSTD16244

### 16-Bit Bus Switch with Level Shifting (Preliminary)

#### General Description

The Fairchild Switch FSTD16244 provides 16-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 16-bit switch. There are four 4-bit switches with separate output enable inputs. When  $\overline{OE}$  is LOW, the switch in ON and Port A is connected to Port B. When  $\overline{OE}$  is HIGH, the switch OFF and 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

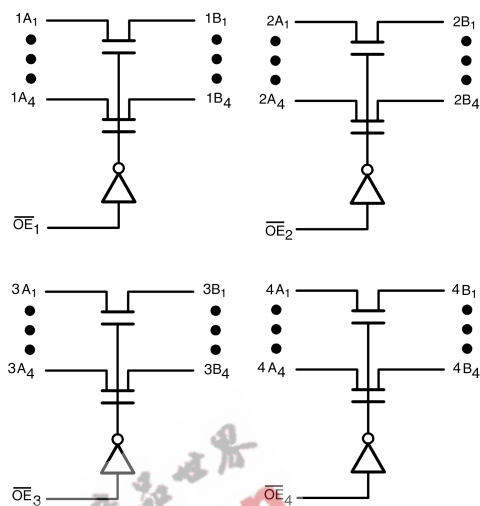
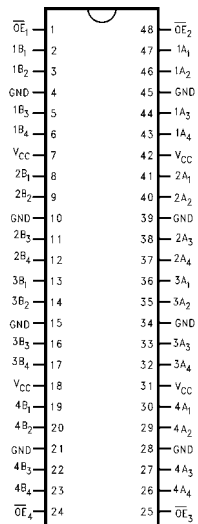
#### Ordering Code:

Order Number	Package Number	Package Description
FSTD16244MTD	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.

TruTranslation™ is trademark of Fairchild Semiconductor Corporation.

### Logic Diagram



## Truth Table

Pin Name	Description
$\overline{OE}_n$	Output Enable Input (Active LOW)
$1A_n, 2A_n, 3A_n, 4A_n$	Bus A
$1B_n, 2B_n, 3B_n, 4B_n$	Bus B

Inputs	Outputs
$\overline{OE}_x$	A, B
L	A Port = B Port
H	Z

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

**Absolute Maximum Ratings**(Note 1)

Supply Voltage ( $V_{CC}$ )	-0.5V to +7.0V
DC Switch Voltage ( $V_S$ ) (Note 2)	-0.5V to +7.0V
DC Input Voltage ( $V_{IN}$ ) (Note 3)	-0.5V to +7.0V
DC Input Diode Current ( $I_{IK}$ ) $V_{IN} < 0V$	-50mA
DC Output ( $I_{OUT}$ ) Current	128mA
DC $V_{CC}/GND$ Current ( $I_{CC}/I_{GND}$ )	$\pm 100mA$
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150 °C

**Recommended Operating Conditions** (Note 4)

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 1:** 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 2:**  $V_S$  is the voltage observed/applied at either the A or B Ports across the switch.

**Note 3:** The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

**Note 4:** Unused control inputs must be held HIGH or LOW. They may not float.

**DC Electrical Characteristics**

Symbol	Parameter	$V_{CC}$ (V)	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$			Units	Conditions
			Min	Typ (Note 5)	Max		
$V_{IK}$	Clamp Diode Voltage	4.5			-1.2	V	$I_{IN} = -18mA$
$V_{IH}$	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			$\pm 1.0$	$\mu A$	$0 \leq V_{IN} \leq 5.5V$
		0			$\pm 10$	$\mu A$	$V_{IN} = 5.5V$
$I_{OZ}$	OFF-STATE Leakage Current	5.5			$\pm 1.0$	$\mu A$	$0 \leq A, B \leq V_{CC}$
$R_{ON}$	Switch On Resistance (Note 6)	4.5		4	7	$\Omega$	$V_{IN} = 0V, I_{IN} = 64mA$
		4.5		4	7	$\Omega$	$V_{IN} = 0V, I_{IN} = 30mA$
		4.5		35	50	$\Omega$	$V_{IN} = 2.4V, I_{IN} = 15mA$
$I_{CC}$	Quiescent Supply Current	5.5			1.5	mA	$OE_n = GND$ $V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$
					10	$\mu A$	$OE_n = V_{CC}$ $V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$
$\Delta I_{CC}$	Increase in $I_{CC}$ per Input	5.5			2.5	mA	One Input at 3.4V Other Inputs at $V_{CC}$ or GND

**Note 5:** Typical values are at  $V_{CC} = 5.0V$  and  $T_A = +25^\circ\text{C}$

**Note 6:** 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 <sub>A</sub> = -40 °C to +85 °C, C <sub>L</sub> = 50pF, R <sub>U</sub> = R <sub>D</sub> = 500Ω		Units	Conditions	Figure Number
		V <sub>CC</sub> = 4.5 – 5.5V				
		Min	Max			
t <sub>PHL</sub> , t <sub>PLH</sub>	Propagation Delay Bus-to-Bus (Note 7)		0.25	ns	V <sub>I</sub> = OPEN	Figures 1, 2
t <sub>PZH</sub> , t <sub>PZL</sub>	Output Enable Time	1.0	5.1	ns	V <sub>I</sub> = 7V for t <sub>PZL</sub> V <sub>I</sub> = OPEN for t <sub>PZH</sub>	Figures 1, 2
t <sub>PHZ</sub> , t <sub>PLZ</sub>	Output Disable Time	1.0	5.4	ns	V <sub>I</sub> = 7V for t <sub>PLZ</sub> V <sub>I</sub> = OPEN for t <sub>PHZ</sub>	Figures 1, 2

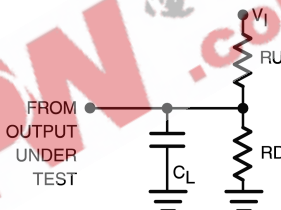
**Note 7:** This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical On Resistance of the switch and the 50pF load capacitance, when driven by an ideal voltage source (zero output impedance).

## Capacitance (Note 8)

Symbol	Parameter	Typ	Max	Units	Conditions
C <sub>IN</sub>	Control Pin Input Capacitance	3		pF	V <sub>CC</sub> = 5.0V, V <sub>IN</sub> = 0V
C <sub>I/O</sub>	Input/Output Capacitance "OFF State"	6		pF	V <sub>CC</sub> , OE = 5.0V, V <sub>IN</sub> = 0V

**Note 8:** T<sub>A</sub> = +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<sub>L</sub> includes load and stray capacitance

**Note:** Input PRR = 1.0 MHz, t<sub>W</sub> = 500 ns

FIGURE 1. AC Test Circuit

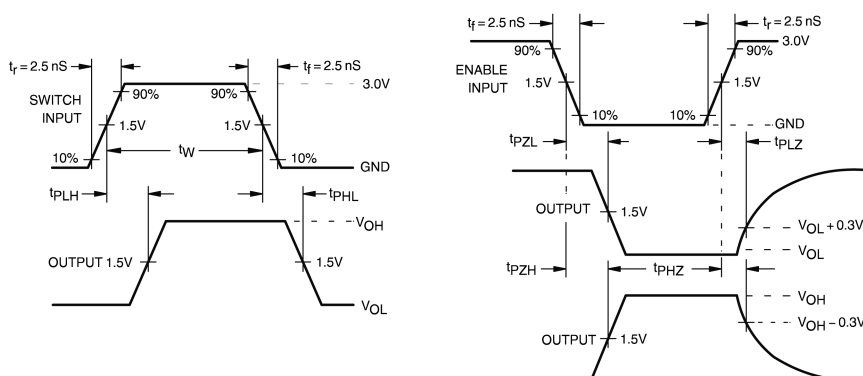


FIGURE 2. AC Waveforms

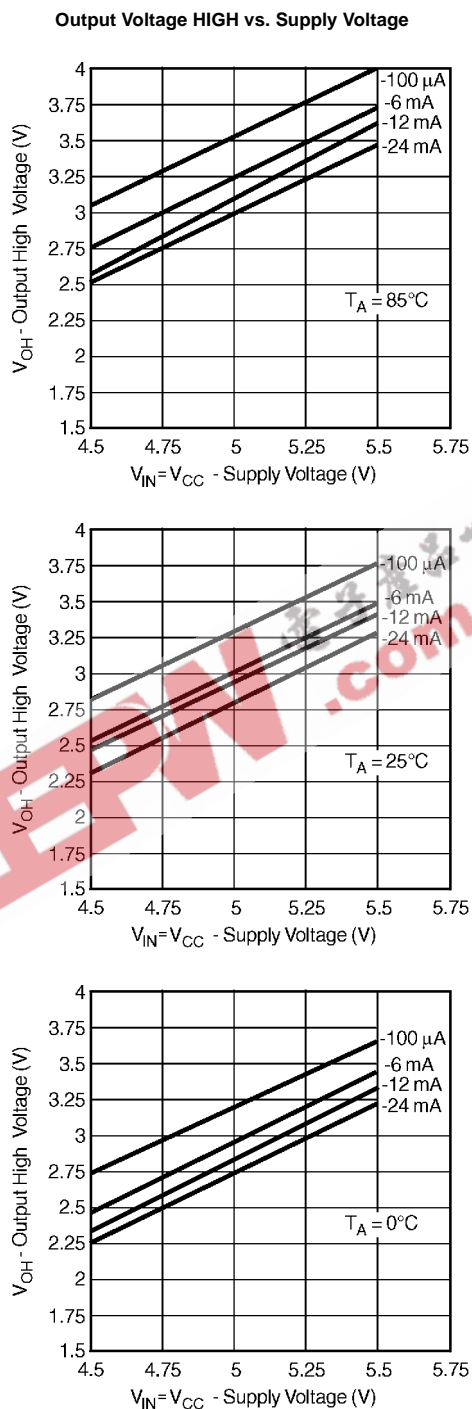
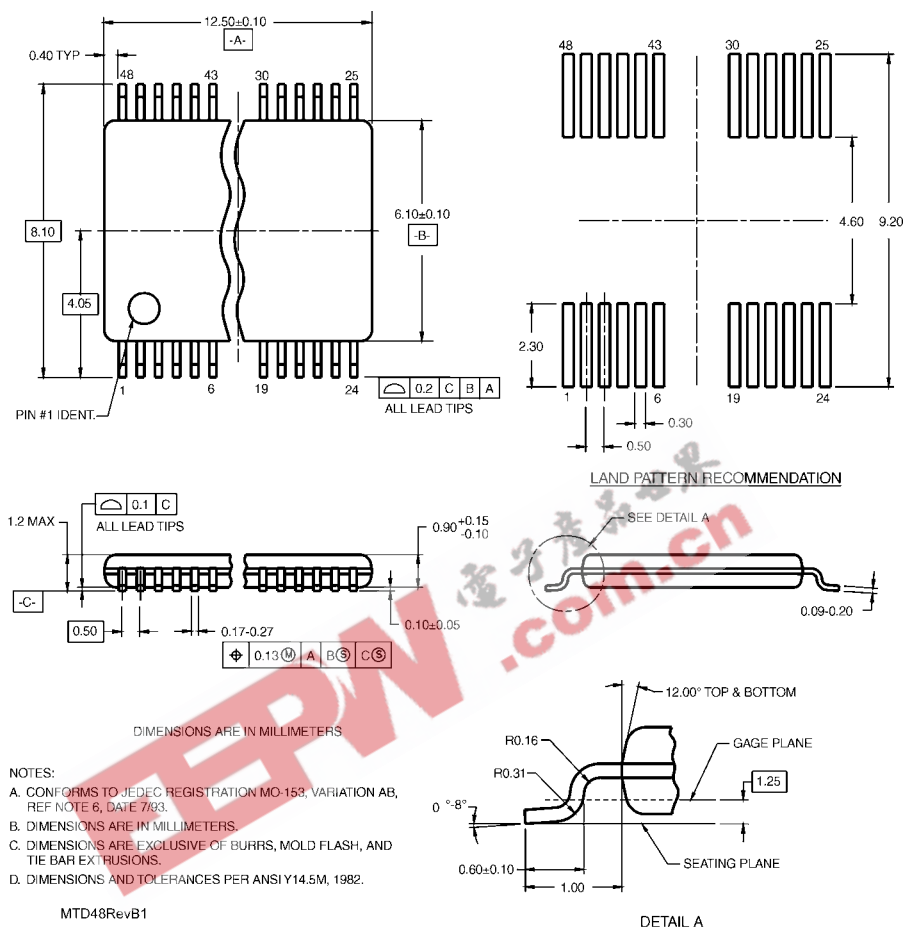


FIGURE 3.

Preliminary

**Physical Dimensions** inches (millimeters) unless otherwise noted**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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