FAIRCHILD SEMICONDUCTOR™

November 2001
Revised November 2001

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

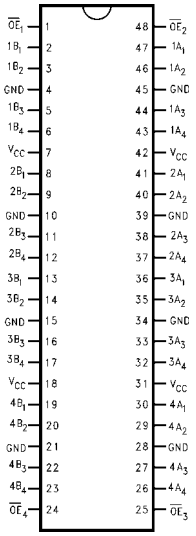
Ordering Code:

Order Number	Package Number	Package Description
FSTD16244MTD	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

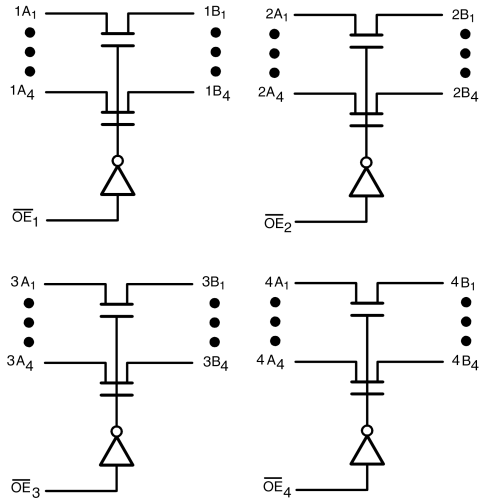
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

TruTranslation™ is trademark of Fairchild Semiconductor Corporation.

Connection Diagram



Logic Diagram



Pin Descriptions

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

Truth Table

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})	±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°C to +85°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			±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	4.5		4	7	Ω	V_{IN} = 0V, I_{IN} = 64mA
	(Note 6)	4.5		4	7	Ω	V_{IN} = 0V, I_{IN} = 30mA
		4.5		35	50	Ω	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	µA	OE_n = 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 5: Typical values are at V_{CC} = 5.0V and T_A = +25°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	$T_A = -40\ °C$ to $+85\ °C$, $C_L = 50pF$, $RU = RD = 500\Omega$, $V_{CC} = 4.5 - 5.5V$		Units	Conditions	Figure Number
		Min	Max			
t_{PHL}, t_{PLH}	Propagation Delay Bus-to-Bus (Note 7)		0.25	ns	V_I = OPEN	Figures 1, 2
t_{PZH}, t_{PZL}	Output Enable Time	1.0	5.1	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	5.4	ns	V_I = 7V for t_{PLZ} V_I = OPEN for t_{PHZ}	Figures 1, 2

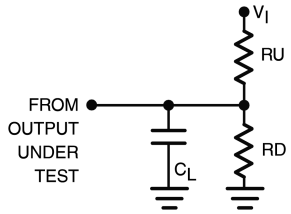
Note 7: This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical On Resistance of the switch and the 50pF load capacitance, when driven by an ideal voltage source (zero output impedance).

Capacitance (Note 8)

Symbol	Parameter	Typ	Max	Units	Conditions
C_{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 8: $T_A = +25°C$, 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

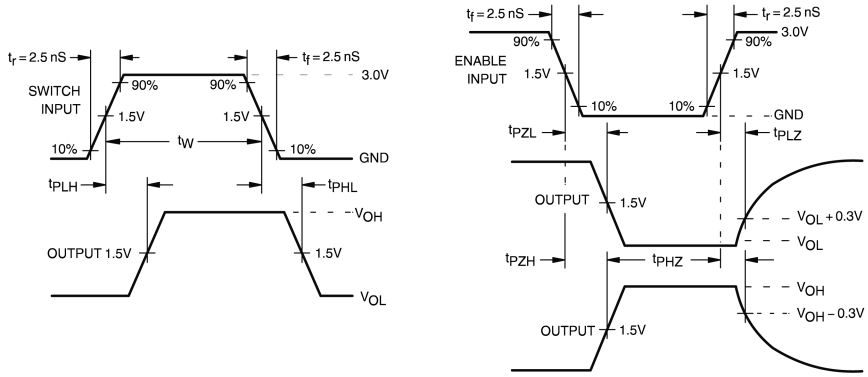
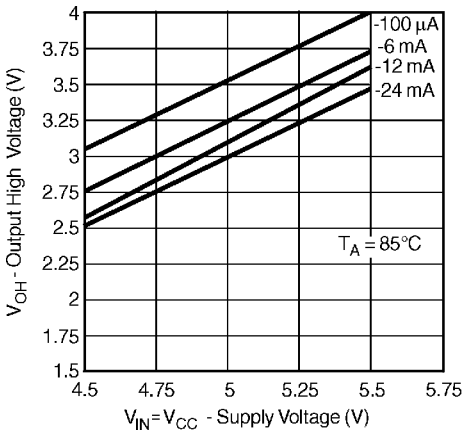
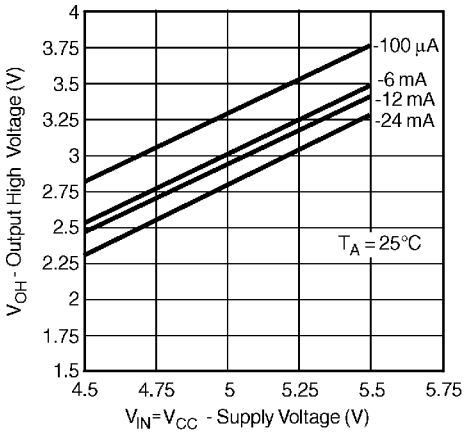


FIGURE 2. AC Waveforms

Output Voltage HIGH vs. Supply Voltage





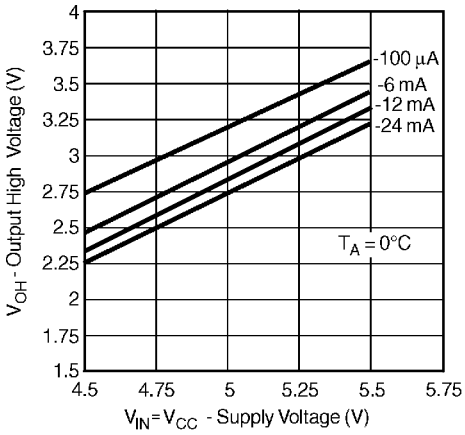
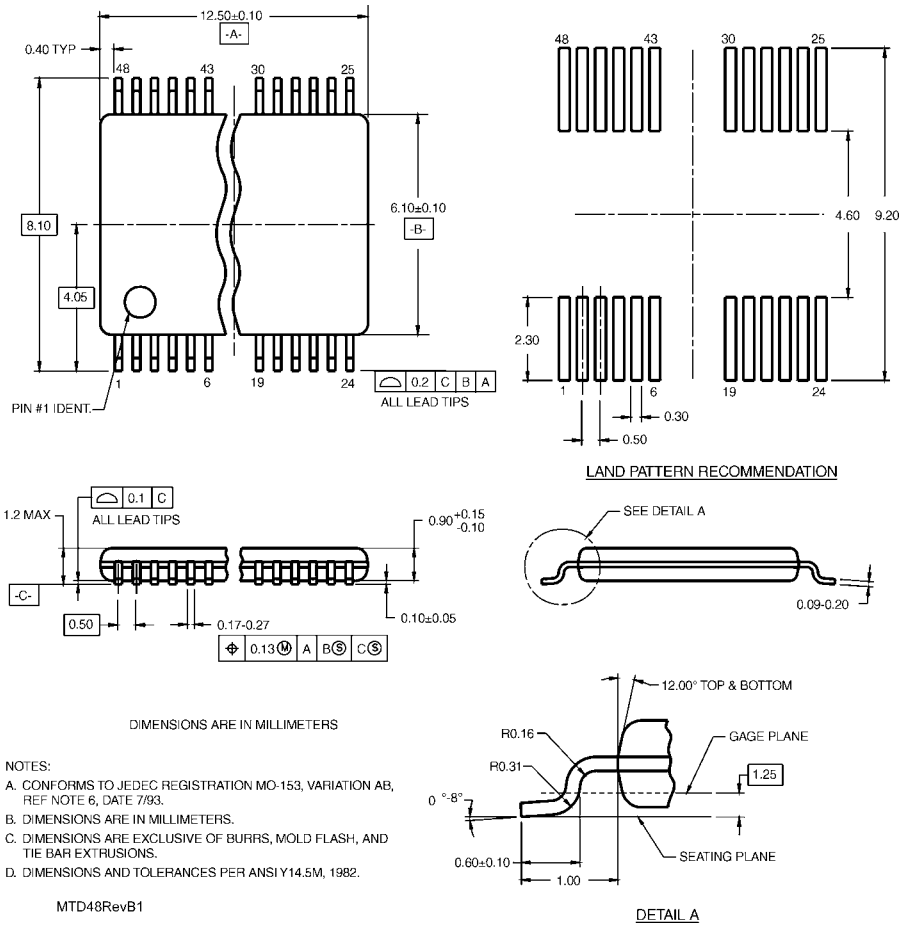


FIGURE 3.

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.

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

www.fairchildsemi.com