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FAIRCHILD SEMICONDUCTOR®

May 2012

FSTD3125 — 4-Bit Bus Switch with Level Shifting

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

Description

Fairchild switch FSTD3125 provides four high-speed CMOS TTL-compatible bus switches. 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 four one-bit switches with separate /OE inputs. When /OE is LOW, the switch is ON and port A is connected to port B. When /OE is HIGH, the switch is OPEN and a high-impedance state exists between the two ports.

Ordering Information

Part Number	Operating Temperature Range	Package	Packing Method
FSTD3125MTCX	-40 to 85°C	14-Lead, Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4mm Wide	Tape and Reel

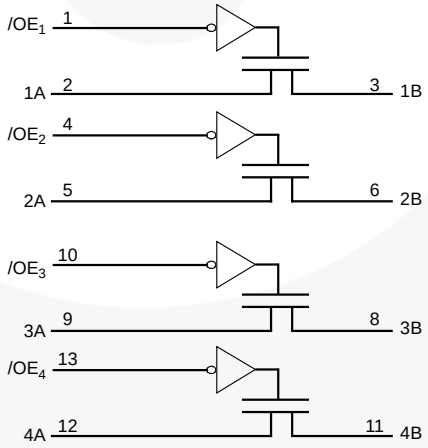


Figure 1. Logic Diagram

Pin Configuration

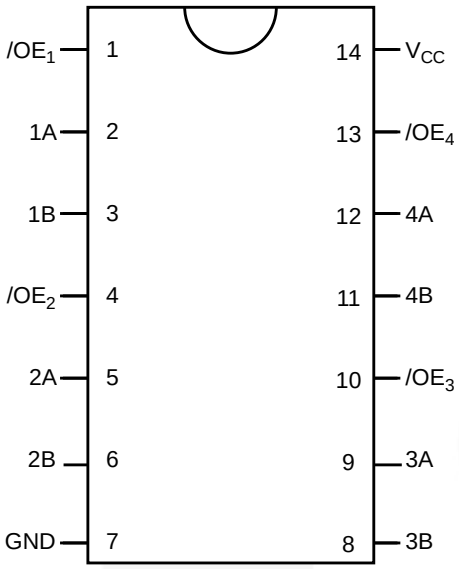


Figure 2. Pin Assignments

Pin Descriptions

Pin #	Pin Names	Description
1, 4, 10, 13	$/OE_1$, $/OE_2$, $/OE_3$, $/OE_4$	Bus Switch Enables
2, 5, 9, 12	1A, 2A, 3A, 4A	Bus A
3, 6, 8, 11	1B, 2B, 3B, 4B	Bus B
14	V_{CC}	Supply Voltage
7	GND	Ground

Truth Table

Inputs	Inputs/Outputs
/OE	A, B
LOW	A = B
HIGH	High Impedance

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply Voltage	-0.5	7.0	V
V_S	DC Switch Voltage	-0.5	7.0	V
V_{IN}	DC Input Voltage[1]	-0.5	7.0	V
I_{IK}	DC Input Diode Current, V_{IN}<0V		-50	mA
I_{OUT}	DC Output Sink Current		128	mA
I_{CC} / I_{GND}	DC V_{CC} / GND Current		±100	mA
T_{STG}	Storage Temperature Range	-65	+150	°C

Note:

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

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter		Min.	Max.	Unit
V_{CC}	Power Supply Operating		4.5	5.5	V
V_{IN}	Input Voltage		0	5.5	V
V_{OUT}	Output Voltage		0	5.5	V
t_r, t_f	Input Rise and Fall Time	Switch Control Input[2]	0	5	ns/V
		Switch I/O	0	DC	
T_A	Operating Temperature, Free Air		-40	+85	°C

Note:

2. Unused control inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Typical values are at V_{CC} = 5.0V and T_A = 25°C.

Symbol	Parameter	Condition	V_{CC} (V)	T_A=-40 to +85°C			Unit
				Min.	Typ.	Max.	
V_{IK}	Clamp Diode Voltage	I_{IN} = -18mA	4.5			-1.2	V
V_{IH}	High-Level Input Voltage		4.5 to 5.5	2.0			V
V_{OH}	High-Level	Figure 5, Figure 6, and Figure 7	4.0 to 5.5				V
V_{IL}	Low-Level Input Voltage		4.5 to 5.5			0.8	V
I_{IN}	Input Leakage Current	$0 \le V_{IN} \le 5.5V$	5.5			±1.0	µA
		V_{IN} = 5.5V	0			10	µA
I_{OZ}	Off-state Leakage Current	$0 \le A, B \le V_{CC}$	5.5			±1.0	µA
R_{ON}	Switch On Resistance(3)	V_{IN} = 0V, I_{IN} = 64mA	4.5		4	7	Ω
		V_{IN} = 0V, I_{IN} = 30mA	4.5		4	7	
		V_{IN} = 2.4V, I_{IN} = 15mA	4.5		35	50	
I_{CC}	Quiescent Supply Current	$/OE_1$ = $/OE_2$ = GND V_{IN} = V_{CC} or GND, I_{OUT} = 0	5.5			1.5	µA
		$/OE_1$ = $/OE_2$ = V_{CC} V_{IN} = V_{CC} or GND, I_{OUT} = 0				10	
ΔI_{CC}	Increase in I_{CC} per Input	One Input at 3.4V, Other Inputs at V_{CC} or GND	5.5			2.5	mA

Note:

3. Measured by the voltage drop between the A and B pins at the indicated current through the switch. On resistance is determined by the lower of the voltages on the A or B pins.

AC Electrical Characteristics

T_A = -40 to +85°C, C_L = 50pF, and R_U = R_D = 500Ω.

Symbol	Parameter	Condition	V_{CC} = 4.5 – 5.5V		Unit	Figure
			Min.	Max.		
t_{PHL}, t_{PLH}	Propagation Delay, Bus-to-Bus(4)	V_{IN} = Open		0.25	ns	Figure 3 Figure 4
t_{PZH} ,t_{PZL}	Output Enable Time	V_{IN} = 7V for t_{PZL} V_{IN} = Open for t_{PZH}	1.0	6.1	ns	Figure 3 Figure 4
t_{PHZ}, t_{PLZ}	Output Disable Time	V_{IN} = 7V for t_{PLZ} V_{IN} = Open for t_{PHZ}	1.5	6.4	ns	Figure 3 Figure 4

Note:

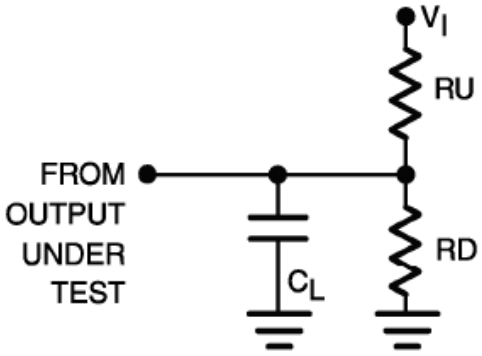
4. This parameter is guaranteed by design, but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical on resistance of the switch and the 50pF load capacitance when driven by an ideal voltage source (zero output impedance).

Capacitance

T_A = +25°C, f = 1MHz. Capacitance is characterized, but not tested.

Symbol	Parameter	Condition	Typ.	Unit
C_{IN}	Control Pin Input Capacitance	V_{CC} = 5.0V	3	pF
$C_{I/O}$	Input/Output Capacitance	V_{CC}, /OE = 5.0V	6	pF

AC Loadings and Waveforms



Notes: Input driven by 50Ω source terminated in 50Ω.
C_L includes load and stray capacitance.
Input PRR = 1.0MHz, t_w = 500ns.

Figure 3. AC Test Circuit

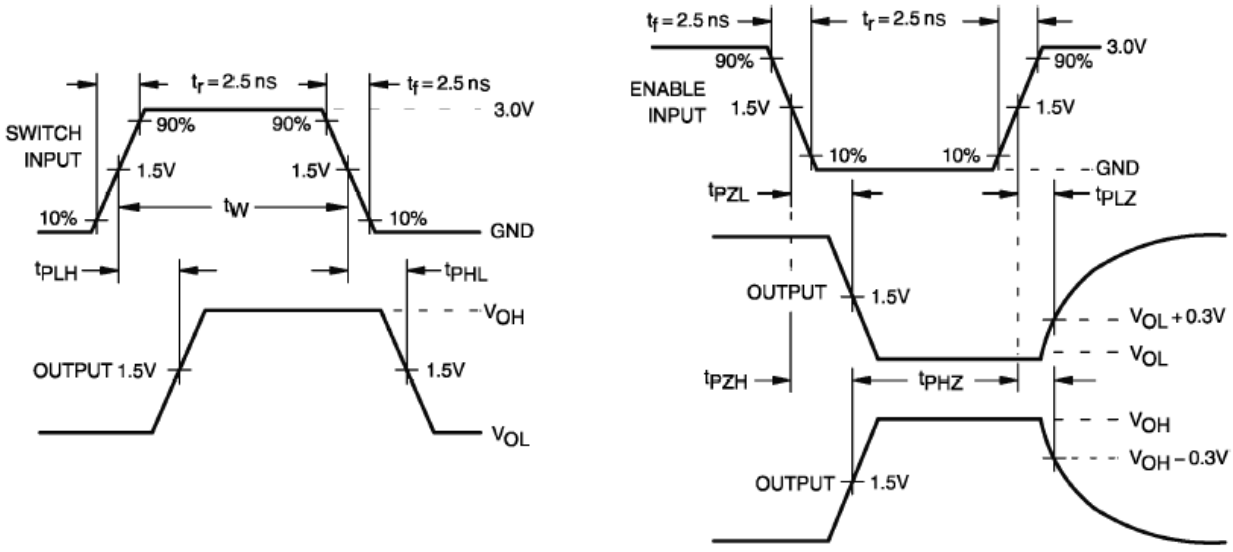


Figure 4. AC Waveforms

Performance Characteristics

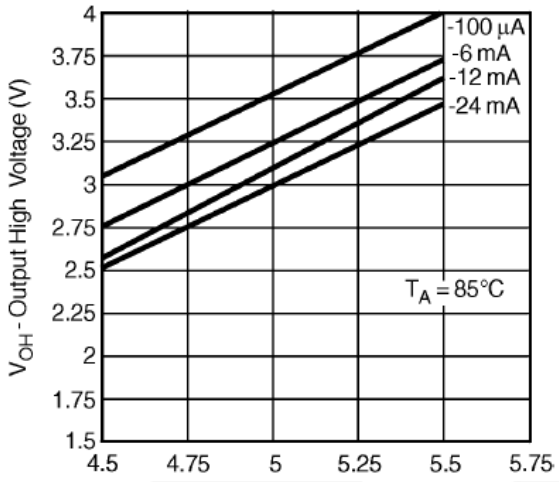


Figure 5. Output Voltage vs. Supply Voltage, $V_{IN} = V_{CC}$, T_A = 85°C

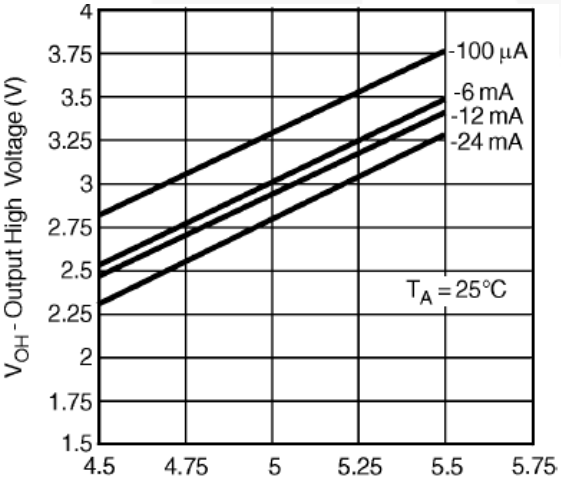


Figure 6. Output Voltage vs. Supply Voltage, $V_{IN} = V_{CC}$, T_A = 25°C

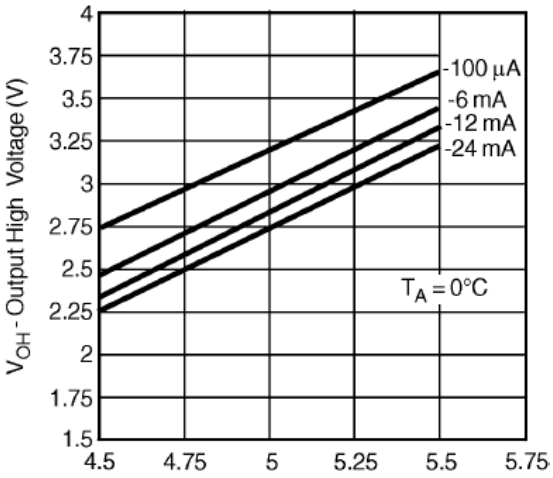
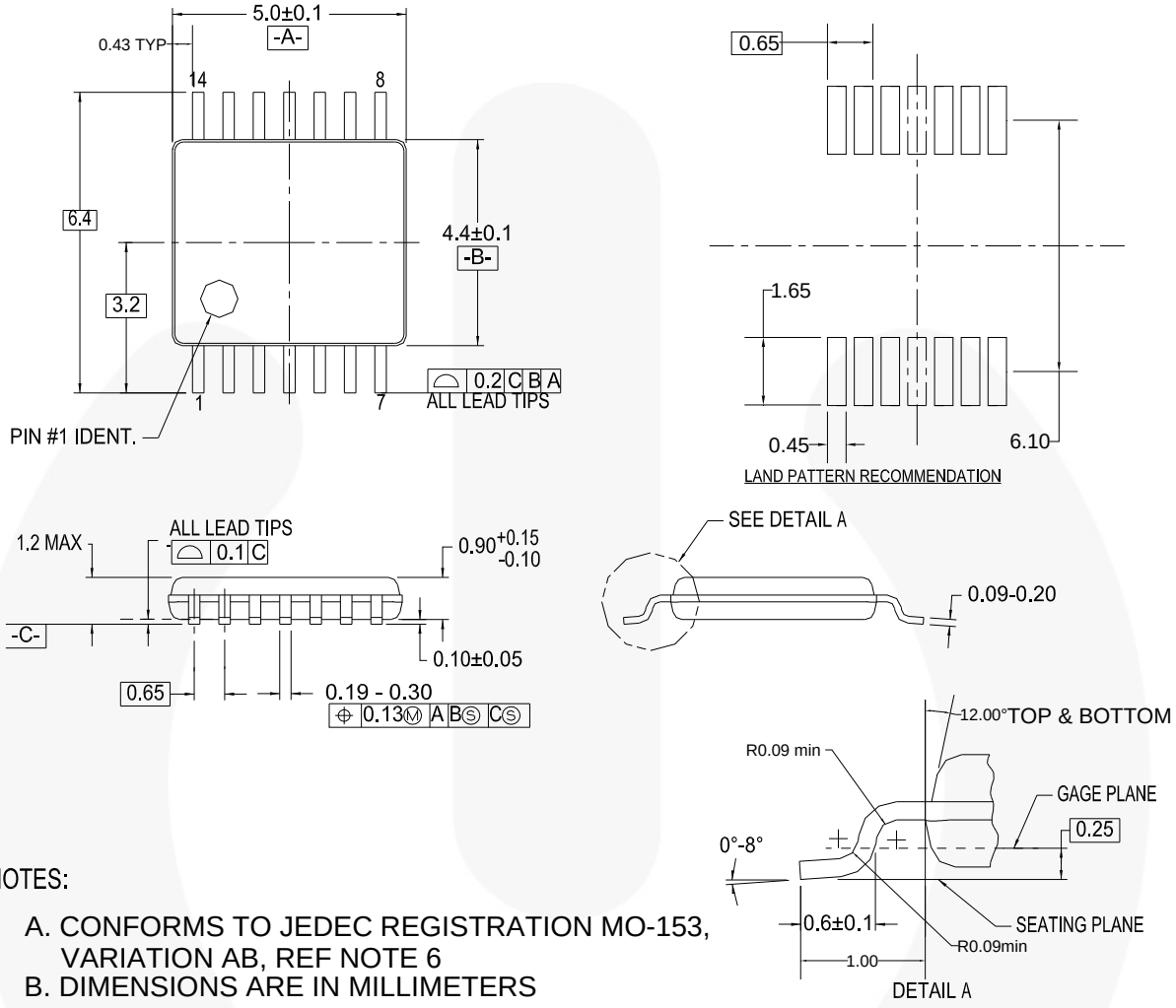


Figure 7. Output Voltage vs. Supply Voltage, $V_{IN} = V_{CC}$, T_A = 0°C

Physical Dimensions



NOTES:

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B. DIMENSIONS ARE IN MILLIMETERS

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS

D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 1982

E. LANDPATTERN STANDARD: SOP65P640X110-14M

F. DRAWING FILE NAME: MTC14REV6

Figure 8. 14-Lead, Thin Shrink Small Outline Package (TSSOP) MO-153, 4mm Wide

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