FAIRCHILD SEMICONDUCTOR®

April 2008

FST34170 — 17-Bit to 34-Bit Multiplexer / De-multiplexer Bus Switch

Features

- Slower Output Enable Times Prevent Signal Disruption
- 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

Related Resources

- *AN-5008 - FSTU - Undershoot Protected Fairchild Switch Family*

Description

The FST34170 Fairchild switch is a 17-bit to 34-bit, high-speed, CMOS TTL-compatible multiplexer / de-multiplexer bus switch. The low on resistance of the switch allows inputs to be connected to outputs without adding propagation delay or generating additional ground bounce noise.

The device can be used in applications where two buses need to be addressed simultaneously. The FST34170 is designed so that the A port de-multiplexes into B1 or B2 or both. Two select (SEL_1, SEL_2) inputs provide switch enable control.

Ordering Information

Part Number	Operating Temperature Range	Package	Packing Method
FST34170MTC	-40 to 85°C	56-Lead, Thin Shrink Small Outline Package (TSSOP) JEDEC MO-153, 6.1mm Wide	Tube
FST34170MTCX	-40 to 85°C	56-Lead, Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide	Tape and Reel

All packages are lead free per JEDEC: J-STD-020B standard.

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.

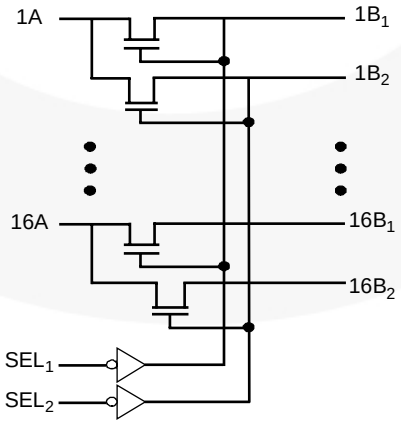


Figure 1. Logic Diagram

Pin Configurations

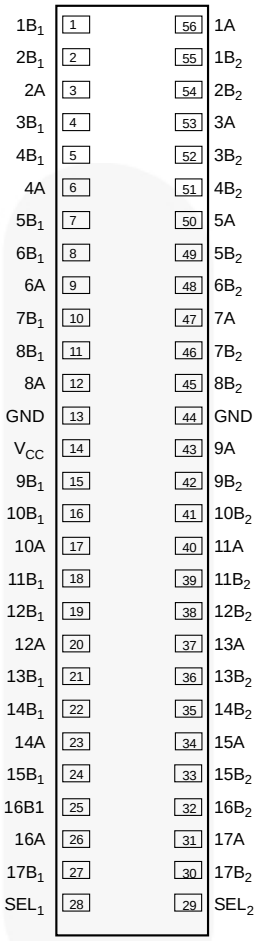


Figure 2. TSSOP Pin Assignments

Pin Descriptions

Pin #	Pin Names	Description
1,2,4,5,7,8,10,11,15,16,18,19,21,22,24,25,27,30,32,33,35,36,38,39,41,4245,46,48,49,51,52,54,55	$1B_1$,$2B_1$,$3B_1$,4B,$5B_1$,6B,$7B_1$,8B,9B,$10B_1$,$11B_1$, $12B_1$,$13B_1$,$14B_1$,$15B_1$,$16B_1$,$17B_1$,$17B_2$,$16B_2$, $15B_2$,$14B_2$,$13B_2$,$12B_2$,$11B_2$,$10B_2$,$9B_2$,$8B_2$, $7B_2$,$6B_2$,$5B_2$,$4B_2$,$3B_2$,$2B_2$,$1B_2$	Bus B
3,6,9,12,17,20,23,26,31,34,37,40, 43,47,50,53,56	2A,4A,6A,8A,10A,12A,14A,16A,17A,15A,13A, 11A,9A,7A,5A,3A,1A	Bus A
13,44	GND	Ground
14	V_{CC}	Supply Voltage
28,29	SEL_1, SEL_2	Select Inputs

Truth Table

Inputs		Function
SEL_1	SEL_2	
LOW	HIGH	$xA = xB_1$
HIGH	LOW	$xA = xB_2$
LOW	LOW	$xA = xB_1$ and xB_2
HIGH	HIGH	Switch Open

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[1]	-0.5	7.0	V
V_{IN}	DC Input Control Pin Voltage[2]	-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. V_S is the voltage observed/applied at either the A or B ports across the switch.
2. 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		4.0	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[3]	0	5	ns/V
		Switch I/O	0	DC	
T_A	Operating Temperature, Free Air		-40	+85	°C

Note:
3. 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	Conditions	V_{CC} (V)	T_A=-40 to +85°C			Units
				Min.	Typ.	Max.	
V_{IK}	Clamp Diode Voltage	I_{IN} = -18mA	4.5			-1.2	V
V_{IH}	High-Level Input Voltage		4.0 to 5.5	2.0			V
V_{IL}	Low-Level Input Voltage		4.0 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	$0 \le A, \le V_{CC}$, V, $0 \le B, \le V_{CC}$, V	5.5			±1.0	µA
R_{ON}	Switch On Resistance(4)	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		8	14	
		V_{IN} = 2.4V, I_{IN} = 15mA	4.0		11	20	
I_{CC}	Quiescent Supply Current	V_{IN} = V_{CC} or GND, I_{OUT} = 0	5.5			3	µA
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:

4. 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	Conditions	V_{CC} = 4.5 -5.5V		V_{CC} = 4.0V		Units	Figure
			Min.	Max.	Min.	Max.		
t_{PHL}, t_{PLH}	Propagation Delay A or B, to B or A(5)	V_{IN} = Open		0.25		0.25	ns	Figure 3 Figure 4
t_{PZH} ,t_{PZL}	Output Enable Time, SEL to A, B	V_{IN} = Open for t_{PZH}, V_{IN} = 7V for t_{PZL}	7	30		35	ns	Figure 3 Figure 4
t_{PHZ}, t_{PLZ}	Output Disable Time, SEL to A, B	V_{IN} = Open for t_{PHZ},	1.0	6.9		7.3	ns	Figure 3 Figure 4
		V_{IN} = 7V for t_{PLZ}	1.0	7.7		7.7		

Note:

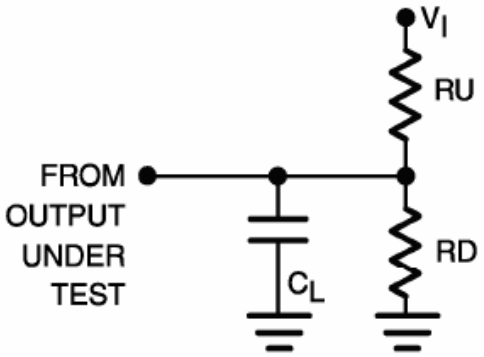
5. This parameter is guaranteed by design, but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical on resistance of the switch and the 50pF load capacitance when driven by an ideal voltage source (zero output impedance).

Capacitance

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

Symbol	Parameter	Conditions	Typ.	Units
C_{IN}	Control Pin Input Capacitance	V_{CC} = 5.0V	4	pF
$C_{I/O\ OFF}$	Input/Output Capacitance, Off State	V_{CC} = 5.0V, Switched Off	8	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

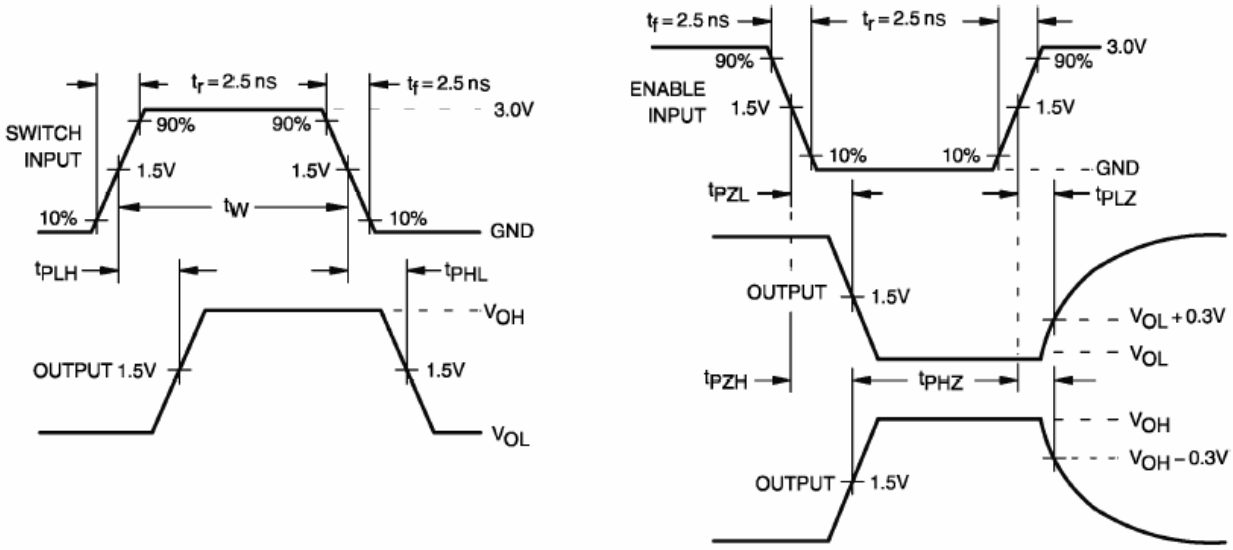


Figure 4. AC Waveforms

Physical Dimensions

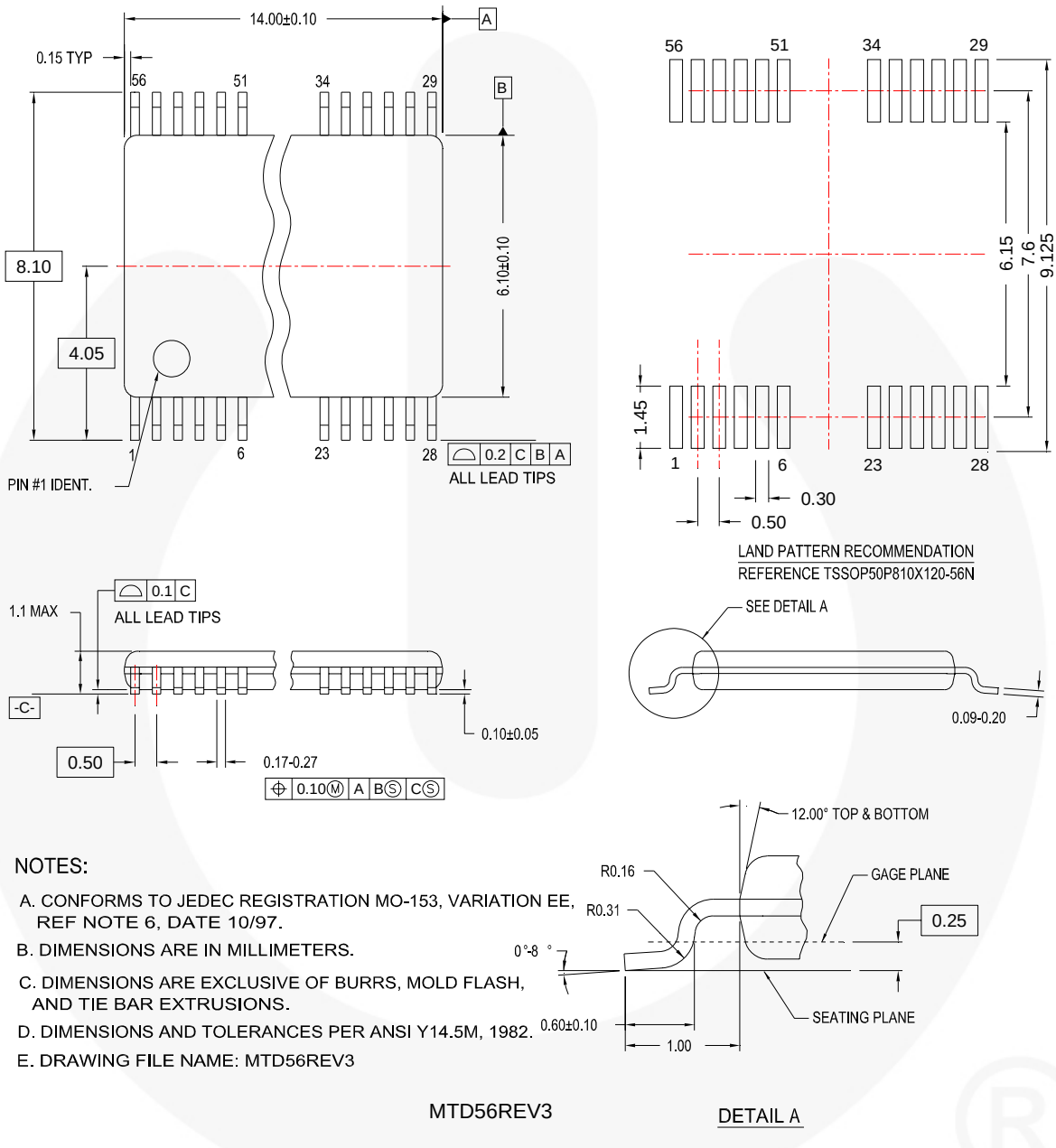


Figure 5. 56-Lead, Thin Shrink Small Outline Package (TSSOP) MO-153, 6.1mm Wide

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