
**Is Now Part of**


**ON Semiconductor®**

**To learn more about ON Semiconductor, please visit our website at**
**www.onsemi.com**

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD SEMICONDUCTOR™

September 1997
Revised November 2000

# FST16233
# 16-Bit to 32-Bit Multiplexer/Demultiplexer Bus Switch

## General Description

The Fairchild Switch FST16233 is a 16-bit to 32-bit high-speed CMOS TTL-compatible multiplexer/demultiplexer 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 FST16233 can be used as two 8-bit to 16-bit multiplexers or as one 16-bit to 32-bit multiplexer.

Two select ($S_1$, $S_0$) and two test ($TEST_0$, $TEST_1$) inputs provide switch enable and multiplexer select control.

The FST16233 is designed to prevent through-current when switching buses.

## Features

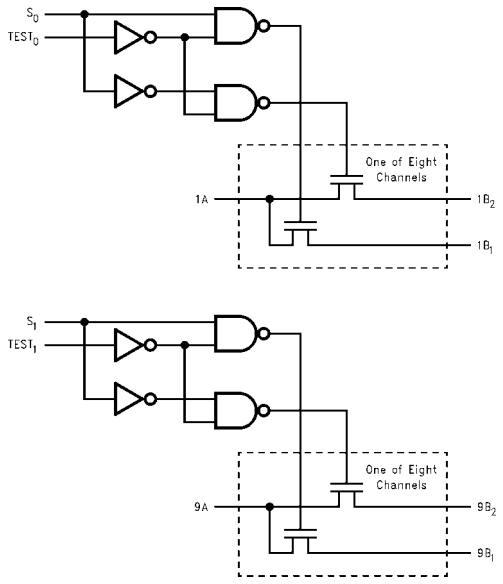
- 4Ω switch connection between two ports.
- Minimal propagation delay through the switch.
- Low $I_{CC}$.
- Zero bounce in flow-through mode.
- Control inputs compatible with TTL level.

## Ordering Code:

| Order Number | Package Number | Package Description |
|---|---|---|
| FST16233MEA | MS56A | 56-Lead Shrink Small Outline Package (SSOP), JEDEC MO-118, 0.300 Wide |
| FST16233MTD | MTD56 | 56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide |

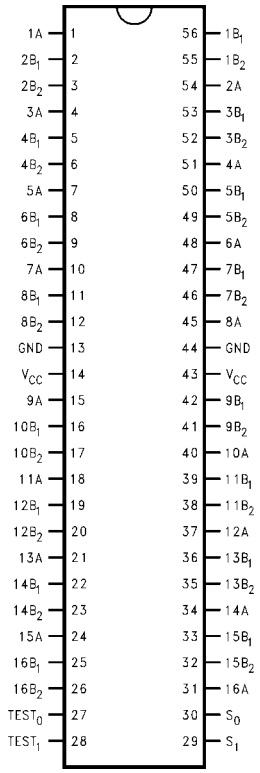
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

## Logic Diagram



## Connection Diagram




## Pin Descriptions

| Pin Name | Description |
|---|---|
| $S_0$, $S_1$ | Select Inputs |
| $TEST_0$, $TEST_1$ | Test Inputs |
| A | Bus A |
| $B_1$, $B_2$ | Bus B |

## Truth Table

| Inputs | | Function |
|---|---|---|
| S | TEST | |
| L | L | $A = B_1$ |
| H | L | $A = B_2$ |
| X | H | $A = B_1$ and $A = B_2$ |

## Absolute Maximum Ratings (Note 1)

| | |
|---|---|
| Supply Voltage ($V_{CC}$) | −0.5V to +7.0V |
| DC Switch Voltage ($V_S$) | −0.5V to +7.0V |
| DC Input Voltage ($V_{IN}$) (Note 2) | −0.5V to +7.0V |
| DC Input Diode Current ($I_{IK}$) $V_{IN}$ < 0V | −50mA |
| DC Output ($I_{OUT}$) Sink 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 3)

| | |
|---|---|
| Power Supply Operating ($V_{CC}$) | 4.0V 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 | 0nS/V to 5nS/V |
| Switch I/O | 0nS/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:** The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

**Note 3:** 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 4) | Max | | |
| $V_{IK}$ | Clamp Diode Voltage | 4.5 | | | −1.2 | V | $I_{IN}$ = −18mA |
| $V_{IH}$ | HIGH Level Input Voltage | 4.0–5.5 | 2.0 | | | V | |
| $V_{IL}$ | LOW Level Input Voltage | 4.0–5.5 | | | 0.8 | V | |
| $I_I$ | Input Leakage Current | 5.5 | | | ±1.0 | µA | 0≤ $V_{IN}$ ≤5.5V |
| | | 0 | | | 10 | µA | $V_{IN}$ = 5.5V |
| $I_{OFF}$ | 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 5) | 4.5 | | 4 | 7 | Ω | $V_{IN}$ = 0V, $I_{IN}$ = 30mA |
| | | 4.5 | | 8 | 12 | Ω | $V_{IN}$ = 2.4V, $I_{IN}$ = 15mA |
| | | 4.0 | | 11 | 20 | Ω | $V_{IN}$ = 2.4V, $I_{IN}$ = 15mA |
| $I_{CC}$ | Quiescent Supply Current | 5.5 | | | 3 | µA | $V_{IN}$ = $V_{CC}$ or GND, $I_{OUT}$ = 0 |
| Δ $I_{CC}$ | Increase in $I_{CC}$ per Input | 5.5 | | | 2.5 | mA | One input at 3.4V<br>Other inputs at $V_{CC}$ or GND |

**Note 4:** Typical values are at $V_{CC}$ = 5.0V and $T_A$ = +25°C

**Note 5:** 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 No. |
|---|---|---|---|---|---|---|---|---|
| | | $V_{CC} = 4.5 - 5.5V$ | | $V_{CC} = 4.0V$ | | | | |
| | | Min | Max | Min | Max | | | |
| $t_{PHL}$, $t_{PLH}$ | A or B, to B or A (Note 6) | | 0.25 | | 0.25 | ns | $V_I$ = OPEN | Figures 1, 2 |
| $t_{PHL}$,$t_{PLH}$ | S to A | 1.5 | 6.1 | | 6.8 | ns | $V_I$ = OPEN | Figures 1, 2 |
| $t_{PZH}$, $t_{PZL}$ | Output Enable Time, S or TEST to B | 1.0 | 6.5 | | 7.2 | ns | $V_I$ = 7V for $t_{PZL}$, $V_I$ = OPEN for $t_{PZH}$ | Figures 1, 2 |
| $t_{PHZ}$, $t_{PLZ}$ | Output Disable Time, S or TEST to B | 1.5 | 7.8 | | 8.5 | ns | $V_I$ = 7V for $t_{PLZ}$, $V_I$ = OPEN for $t_{PHZ}$ | Figures 1, 2 |

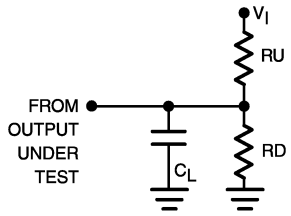
**Note 6:** This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical On resistance of the switch and the 50pF load capacitance, when driven by an ideal voltage source (zero output impedance).

## Capacitance (Note 7)

| Symbol | Parameter | Typ | Max | Units | Conditions |
|---|---|---|---|---|---|
| $C_{IN}$ | Control pin Input Capacitance | 4 | | pF | $V_{CC}$ = 5.0V |
| $C_{I/O}$ | Input/Output Capacitance | 6 | | pF | $V_{CC}$ = 5.0V, Switch OFF |

**Note 7:** $T_A = +25^{\circ}C$, f = 1 MHz, Capacitance is characterized but not tested.

## AC Loading and Waveforms




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

**Note:** $C_L$ includes load and stray capacitance

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

**FIGURE 1. AC Test Circuit**

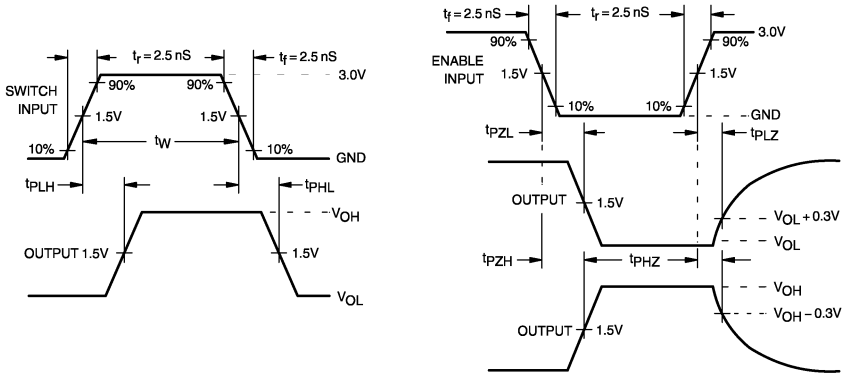
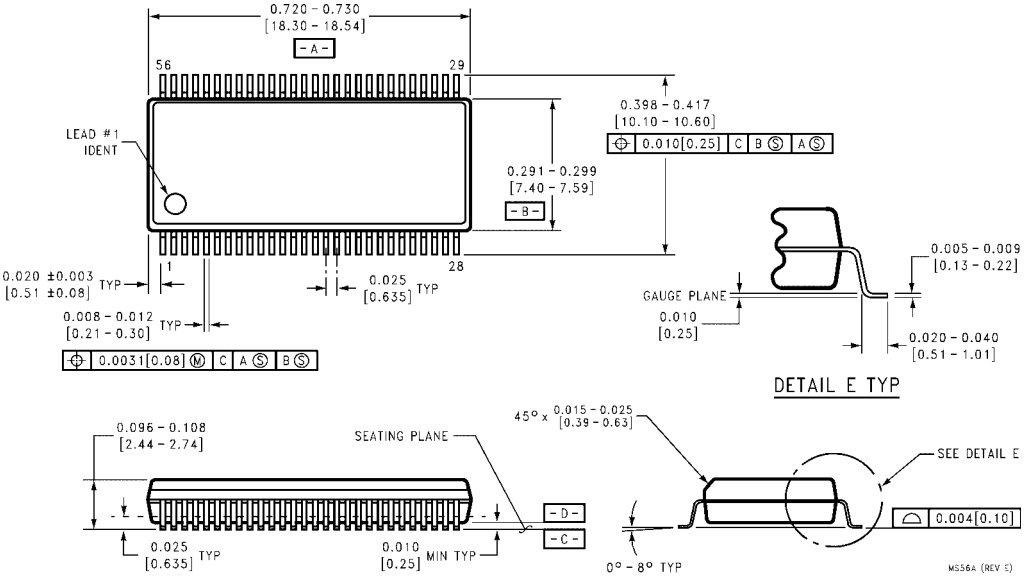


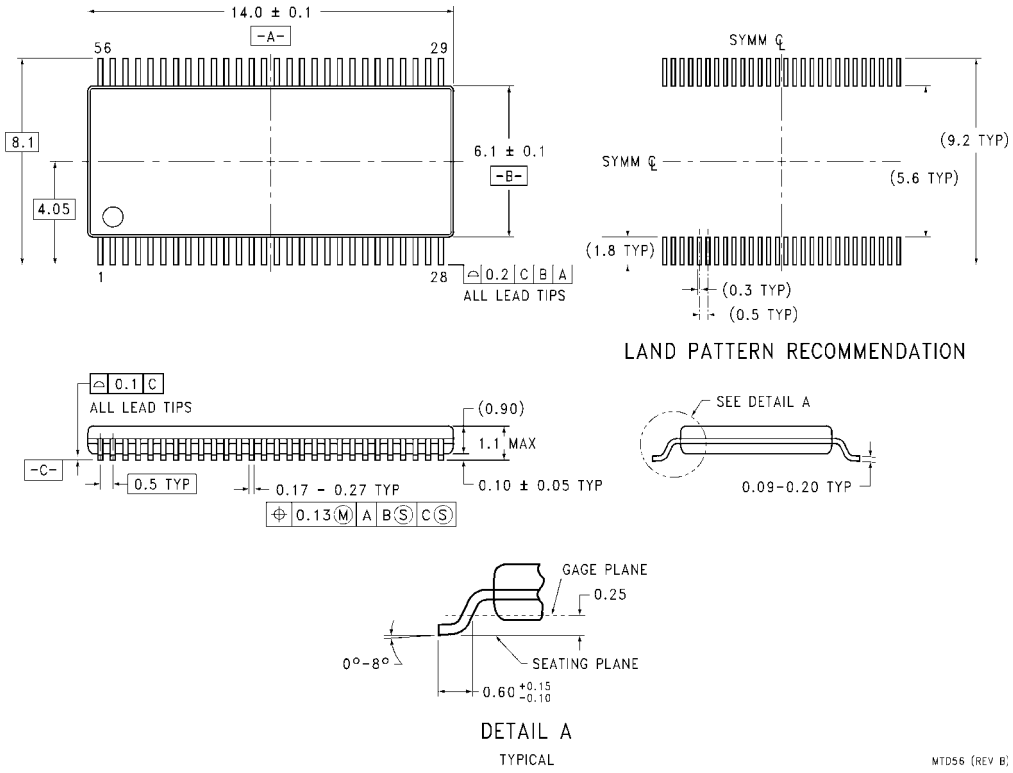

**FIGURE 2. AC Waveforms**

## Physical Dimensions inches (millimeters) unless otherwise noted




**56-Lead Shrink Small Outline Package (SSOP), JEDEC MO-118, 0.300 Wide**
**Package Number MS56A**

## Physical Dimensions inches (millimeters) unless otherwise noted (Continued)




**56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide**
**Package Number MTD56**

## 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.

## PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT**:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
**Phone**: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
**Fax**: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
**Email**: orderlit@onsemi.com

**N. American Technical Support**: 800−282−9855 Toll Free USA/Canada
**Europe, Middle East and Africa Technical Support:**
Phone: 421 33 790 2910
**Japan Customer Focus Center**
Phone: 81−3−5817−1050

**ON Semiconductor Website**: **www.onsemi.com**

**Order Literature**: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative