

## FST16232

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

#### General Description

The Fairchild Switch FST16232 is a 16-bit to 32-bit high-speed CMOS TTL-compatible synchronous 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 allows two separate datapaths to be multiplexed onto, or demultiplexed from, a single path. Two con-

trol select pins ( $S_1$ ,  $S_0$ ) are synchronous and clocked on the rising edge of CLK when  $\overline{\text{CLKEN}}$  is LOW.

#### Features

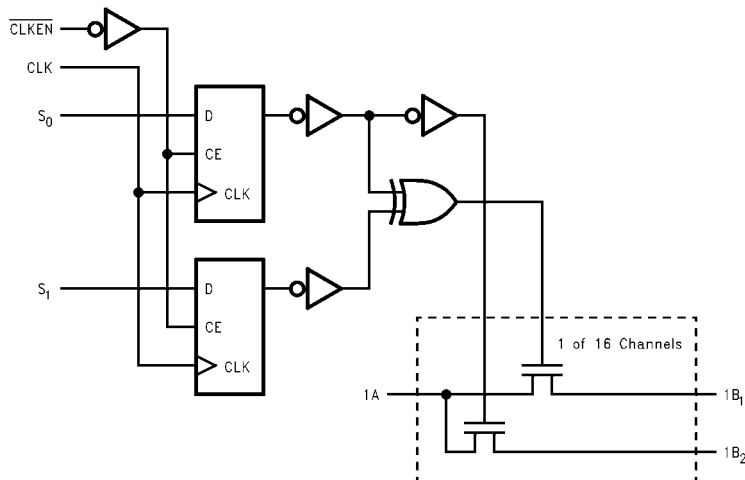
- $4\Omega$  switch connection between two ports.
- Minimal propagation delay through the switch.
- Low  $I_{CC}$ .
- Zero bounce in flow-through mode.
- Control inputs compatible with TTL level.

#### Ordering Code:

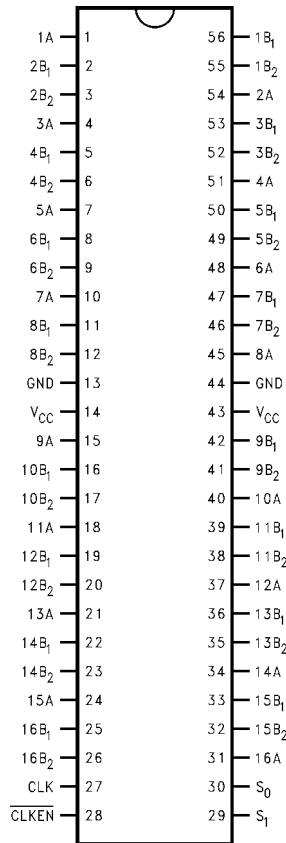
Order Number	Package Number	Package Description
FST16232MEA	MS56A	56-Lead Shrink Small Outline Package (SSOP), JEDEC MO-118, 0.300 Wide
FST16232MTD	MTD56	56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

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 <sub>1</sub> , S <sub>0</sub>	Control Pins
CLK	Clock Input
CLKEN	Clock Enable Input
1A, 2A	Bus A
1B, 2B	Bus B

### Truth Table

Inputs				Function
S <sub>1</sub>	S <sub>0</sub>	CLK	CLKEN	
X	X	X	H	Last State
L	L	↑	L	Disconnect
L	H	↑	L	A = B <sub>1</sub> and A = B <sub>2</sub>
H	L	↑	L	A = B <sub>1</sub>
H	H	↑	L	A = B <sub>2</sub>

**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)	$T_A = -40\text{ °C to }+85\text{ °C}$			Units	Conditions
			Min	Typ (Note 4)	Max		
$V_{IK}$	Clamp Diode Voltage	4.5			-1.2	V	$I_{IN} = -18\text{mA}$
$V_{IH}$	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			$\pm 1.0$	$\mu\text{A}$	$0 \leq V_{IN} \leq 5.5\text{V}$
		0			10	$\mu\text{A}$	$V_{IN} = 5.5\text{V}$
$I_{OFF}$	OFF-STATE Leakage Current	5.5			$\pm 1.0$	$\mu\text{A}$	$0 \leq A, B \leq V_{CC}$
$R_{ON}$	Switch On Resistance (Note 5)	4.5		4	7	$\Omega$	$V_{IN} = 0\text{V}, I_{IN} = 64\text{mA}$
		4.5		4	7	$\Omega$	$V_{IN} = 0\text{V}, I_{IN} = 30\text{mA}$
		4.5		8	12	$\Omega$	$V_{IN} = 2.4\text{V}, I_{IN} = 15\text{mA}$
		4.0		11	20	$\Omega$	$V_{IN} = 2.4\text{V}, I_{IN} = 15\text{mA}$
$I_{CC}$	Quiescent Supply Current	5.5			3	$\mu\text{A}$	$V_{IN} = V_{CC}$ 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 4:** Typical values are at  $V_{CC} = 5.0\text{V}$  and  $T_A = +25\text{ °C}$

**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	$T_A = -40\text{ }^\circ\text{C to } +85\text{ }^\circ\text{C}$ , $C_L = 50\text{pF}$ , $R_U = R_D = 500\Omega$				Units	Conditions	Figure No.
		$V_{CC} = 4.5 - 5.5\text{V}$		$V_{CC} = 4.0\text{V}$				
		Min	Max	Min	Max			
$f_{MAX}$	Maximum Clock Frequency	150		150		MHz	$V_I = \text{open}$	Figure 1, Figure 2
$t_{PHL}, t_{PLH}$	Prop Delay Bus to Bus (Note 6)		0.25		0.25	ns	$V_I = \text{open}$	Figure 1, Figure 2
$t_{PHL}, t_{PLH}$	Prop Delay CLK to B or A	2.0	6.3		6.0	ns	$V_I = \text{open}$	Figure 1, Figure 2
$t_{PZH}, t_{PZL}$	Output Enable Time CLK to A = B <sub>1</sub> = B <sub>2</sub>	1.7	8.5		9.0	ns	$V_I = 7\text{V}$ for $t_{PZL}$ , $V_I = \text{open}$ for $t_{PZH}$	Figure 1, Figure 2
	Output Enable Time CLK to A or B <sub>1</sub> or B <sub>2</sub>	2.0	6.5		6.5	ns	$V_I = 7\text{V}$ for $t_{PZL}$ , $V_I = \text{open}$ for $t_{PZH}$	Figure 1, Figure 2
$t_{PHZ}, t_{PLZ}$	Output Disable Time CLK to A or B	1.0	8.5		9.0	ns	$V_I = 7\text{V}$ for $t_{PLZ}$ , $V_I = \text{open}$ for $t_{PHZ}$	Figure 1, Figure 2
$t_S$	Setup Time S <sub>1</sub> , S <sub>0</sub> before CLK $\uparrow$	2.5		2.8		ns		Figure 1, Figure 2
	Setup Time $\overline{\text{CLKEN}}$ before CLK $\uparrow$	1.8		2.0				
$t_H$	Hold Time S <sub>1</sub> , S <sub>0</sub> after CLK $\uparrow$	1.0		1.0		ns		Figure 1, Figure 2
	Hold Time $\overline{\text{CLKEN}}$ after CLK $\uparrow$	1.5		1.5				
$t_W$	Pulse Width	3.1		3.1		ns	Clock HIGH or LOW	Figure 1, Figure 2

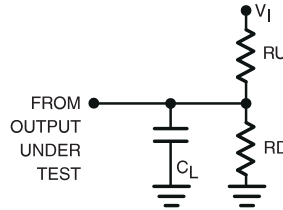
**Note 6:** This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical On resistance of the switch and the 50pF load capacitance, when driven by an ideal voltage source (zero output impedance).

## Capacitance (Note 7)

Symbol	Parameter	Typ	Max	Units	Conditions
$C_{IN}$	Control pin Input Capacitance	4		pF	$V_{CC} = 5.0\text{V}$
$C_{IO}$	Input/Output Capacitance	7		pF	$V_{CC} = 5.0\text{V}$ , $S_0, S_1 = 0\text{V}$

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

## AC Loading and Waveforms

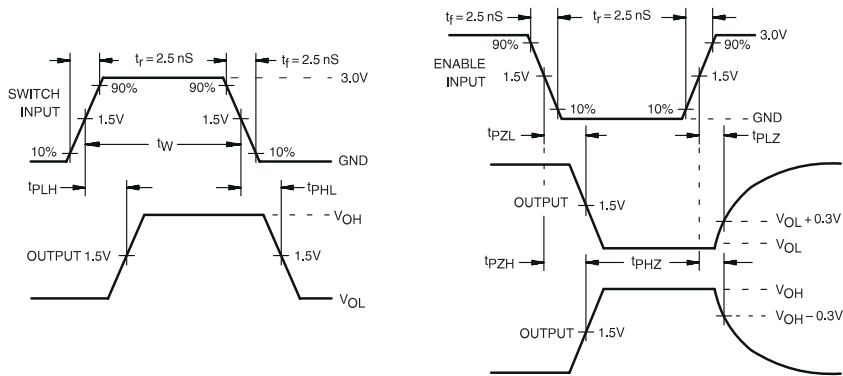


**Note:** Input driven by 50 Ohms source terminated in 50 Ohms

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

**Note:** Input PRR = 1.0 MHz,  $t_W = 500\text{ ns}$

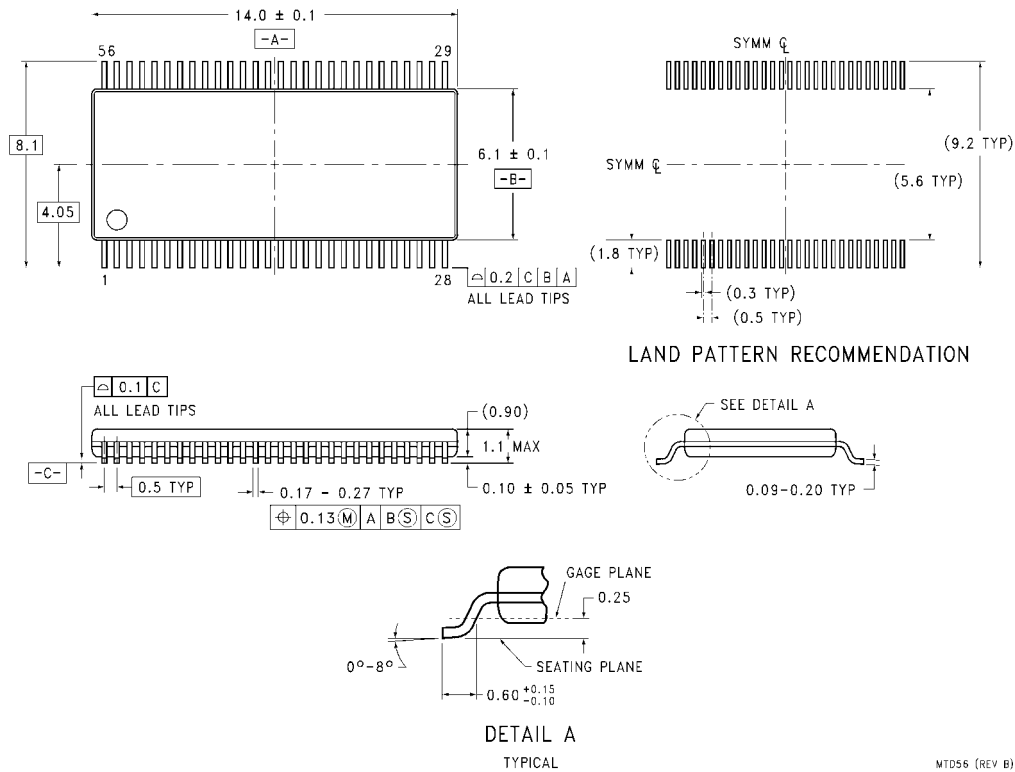
**FIGURE 1. AC Test Circuit**



**FIGURE 2. AC Waveforms**



## 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.

### 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](http://www.fairchildsemi.com)