

## FST33X257 24:12 Multiplexer/Demultiplexer Bus Switch

### General Description

The Fairchild Switch FST33X257 is a 24:12 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.

When  $\overline{OE}_x$  is LOW, the select pin connects the A Port to the selected B Port output. When  $\overline{OE}_x$  is HIGH, the switch is OPEN and a high-impedance state exists between the two 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

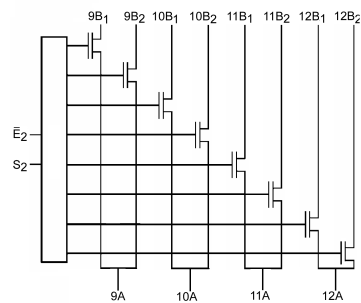
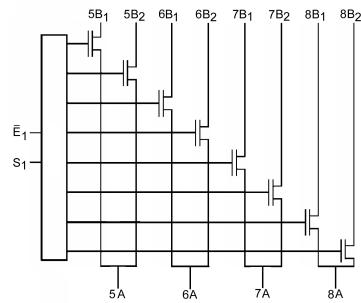
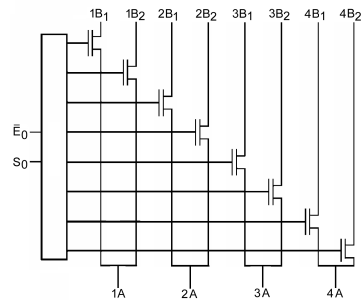
### Ordering Code:

Order Number	Package Number	Package Description
FST33X257QSP	MQA48A	48-Lead Quarter Size Very Small Outline Package (QVSOP), JEDEC MO-154, 0.150" Wide

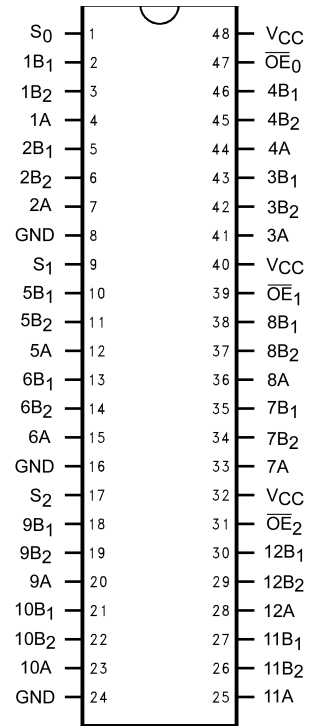
Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.

FST33X257 24:12 Multiplexer/Demultiplexer Bus Switch

**Logic Diagram**



**Connection Diagram**



**Pin Descriptions**

Pin Name	Description
$\overline{OE}_x$	Bus Switch Enable
$S_x$	Select Input
A	Bus A
$B_1-B_2$	Bus B

**Truth Table**

$S_x$	$\overline{OE}_x$	Function
X	H	Disconnect
L	L	$A = B_1$
H	L	$A = B_2$

**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 ( $I_{IK}$ ) $V_{IN} < 0V$	-50 mA
DC Output ( $I_{OUT}$ ) Sink Current	128 mA
DC $V_{CC}$ /GND Current ( $I_{CC}/I_{GND}$ )	+/- 100 mA
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	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 tables 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			$\pm 1.0$	$\mu\text{A}$	$0 \leq V_{IN} \leq 5.5V$
		0			10		$V_{IN} = 5.5V$
$I_{OZ}$	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	$\Omega$	$V_{IN} = 0V, I_{IN} = 64\text{ mA}$
		4.5		4	7	$\Omega$	$V_{IN} = 0V, I_{IN} = 30\text{ mA}$
		4.5		8	15	$\Omega$	$V_{IN} = 2.4V, I_{IN} = 15\text{ mA}$
		4.0		11	20	$\Omega$	$V_{IN} = 2.4V, I_{IN} = 15\text{ mA}$
$I_{CC}$	Quiescent Supply Current (Note 6)	5.5			3	$\mu\text{A}$	$V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$
$\Delta I_{CC}$	Increase in $I_{CC}$ per Input (Note 7)	5.5			2.5	mA	One Input at 3.4V Other Inputs at $V_{CC}$ or GND

**Note 4:** Typical values are at  $V_{CC} = 5.0V$  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.

**Note 6:** Per  $V_{CC}$  pin.

**Note 7:** Per TTL driven input, control pins only.

## AC Electrical Characteristics

Symbol	Parameter	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$ $C_L = 50\text{ pF, } R_U = R_D = 500\Omega$				Units	Conditions	Figure Number
		$V_{CC} = 4.5 - 5.5\text{V}$		$V_{CC} = 4.0\text{V}$				
		Min	Max	Min	Max			
$t_{PHL}, t_{PLH}$	Propagation Delay Bus to Bus (Note 8)		0.25		0.25	ns	$V_I = \text{OPEN}$	Figures 1, 2
	Propagation Delay, Select to Bus A	1.0	4.7		5.2			
$t_{PZH}, t_{PZL}$	Output Enable Time, Select to Bus B	1.0	5.2		5.7	ns	$V_I = 7\text{V}$ for $t_{PZL}$ $V_I = \text{OPEN}$ for $t_{PZH}$	Figures 1, 2
	Output Enable Time, $\overline{\text{OE}}$ to Bus A, B	1.0	5.1		5.6			
$t_{PHZ}, t_{PLZ}$	Output Disable Time, Select to Bus B	1.0	5.2		5.5	ns	$V_I = 7\text{V}$ for $t_{PLZ}$ $V_I = \text{OPEN}$ for $t_{PHZ}$	Figures 1, 2
	Output Disable Time, Output Enable Time, $\overline{\text{OE}}$ to Bus A, B	1.5	5.5		5.5			

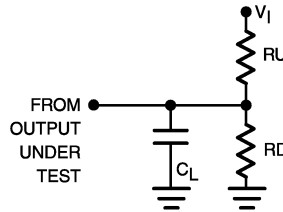
**Note 8:** This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical On Resistance of the switch and the 50pF load capacitance, when driven by an ideal voltage the source (zero output impedance).

## Capacitance (Note 9)

Symbol	Parameter	Typ	Max	Units	Conditions
$C_{IN}$	Control Pin Input Capacitance	3		pF	$V_{CC} = 5.0\text{V}$
$C_{I/O}$	A Port	7		pF	$V_{CC}, \overline{\text{OE}} = 5.0\text{V}$
	B Port	5		pF	

**Note 9:**  $T_A = +25^\circ\text{C}$ ,  $f = 1\text{ MHz}$ , Capacitance is characterized but not tested.

## AC Loading and Waveforms



**Note:** Input driven by 50  $\Omega$  source terminated in 50  $\Omega$

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

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

FIGURE 1. AC Test Circuit

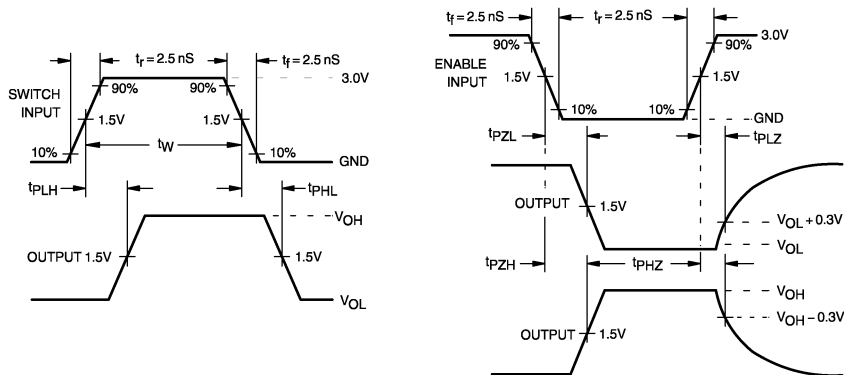
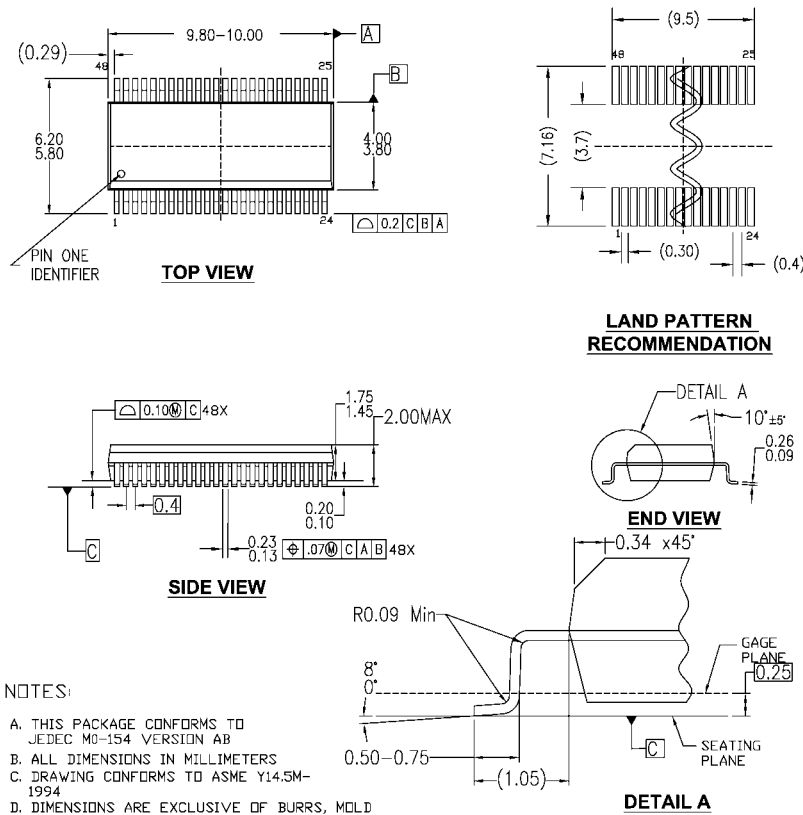


FIGURE 2. AC Waveforms



**NOTES:**

- A. THIS PACKAGE CONFORMS TO JEDEC MO-154 VERSION AB
- B. ALL DIMENSIONS IN MILLIMETERS
- C. DRAWING CONFORMS TO ASME Y14.5M-1994
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

MQA48AREVA

**48-Lead Quarter Size Very Small Outline Package (QVSOP), JEDEC MO-154, 0.150" Wide Package Number MQA48A**

**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.

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