FAIRCHILD SEMICONDUCTOR™

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# FST32253
# Dual 4:1 Multiplexer/Demultiplexer Bus Switch with 25Ω Series Resistor in Outputs



## General Description

The Fairchild Switch FST32253 is a dual 4:1 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 $\overline{OE}$ is LOW, $S_0$ and $S_1$ connect the A Port to the selected B Port output. When $\overline{OE}$ is HIGH, the switch is OPEN and a high-impedance state exists between the two ports.

The FST32253 has an equivalent 25Ω series resistor to reduce signal-reflection noise, eliminating the need for external terminating resistors.

## Features

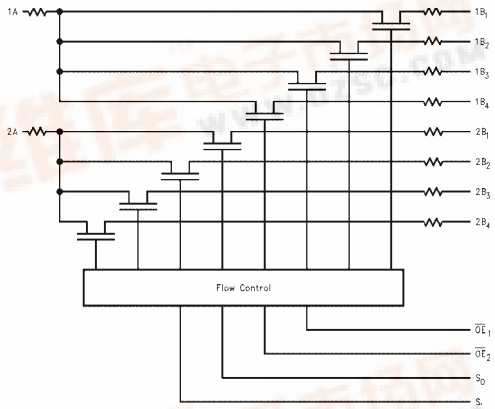
- 25Ω switch connection between two ports
- Minimal propagation delay through the switch
- Low $I_{CC}$
- Zero bounce in flow-through mode
- Control inputs compatible with TTL level

## Ordering Code:

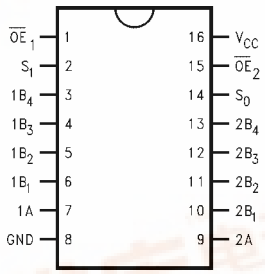
| Order Number | Package Number | Package Description |
|---|---|---|
| FST32253M | M16A | 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow |
| FST32253QSC | MQA16 | 16-Lead Quarter Size Outline Package (QSOP), JEDEC MO-137, 0.150" Wide |
| FST32253MTC | MTC16 | 16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |

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

## Logic Diagram




## Connection Diagram




## Pin Descriptions

| Pin Name | Description |
|---|---|
| $\overline{OE}_1$, $\overline{OE}_2$ | Bus Switch Enables |
| $S_0$, $S_1$ | Select Inputs |
| A | Bus A |
| $B_1$, $B_2$, $B_3$, $B_4$ | Bus B |

## Truth Table

| $S_1$ | $S_0$ | $\overline{OE}_1$ | $\overline{OE}_2$ | Function |
|---|---|---|---|---|
| X | X | H | X | Disconnect 1A |
| X | X | X | H | Disconnect 2A |
| L | L | L | L | A = $B_1$ |
| L | H | L | L | A = $B_2$ |
| H | L | L | L | A = $B_3$ |
| H | H | L | L | A = $B_4$ |

## 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 °C to +85 °C | | | Units | Conditions |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ (Note 4) | Max | | |
| $V_{IK}$ | Clamp Diode Voltage | 4.5 | | | −1.2 | V | $I_{IN}$ = −18 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 | | | ±1.0 | µA | 0 ≤ $V_{IN}$ ≤ 5.5V |
| | | 0 | | | 10 | µA | $V_{IN}$ = 5.5V |
| $I_{OZ}$ | OFF-STATE Leakage Current | 5.5 | | | ±1.0 | µA | 0 ≤ A, B ≤ $V_{CC}$ |
| $R_{ON}$ | Switch On Resistance | 4.5 | 20 | 26 | 38 | Ω | $V_{IN}$ = 0V, $I_{IN}$ = 64 mA |
| | (Note 5) | 4.5 | 20 | 27 | 40 | Ω | $V_{IN}$ = 0V, $I_{IN}$ = 30 mA |
| | | 4.5 | 20 | 28 | 48 | Ω | $V_{IN}$ = 2.4V, $I_{IN}$ = 15 mA |
| | | 4.0 | 20 | 30 | 48 | Ω | $V_{IN}$ = 2.4V, $I_{IN}$ = 15 mA |
| $I_{CC}$ | Quiescent Supply Current | 5.5 | | | 3 | µA | $V_{IN}$ = $V_{CC}$ or GND, $I_{OUT}$ = 0 |
| $\Delta I_{CC}$ | Increase in $I_{CC}$ per Input | 5.5 | | | 2.5 | mA | One Input at 3.4V<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 | $T_A = -40°C$ to $+85°C$, $C_L = 50pF$, RU = RD = 500Ω | | | | Units | Conditions | Figure Number |
|---|---|---|---|---|---|---|---|---|
| | | $V_{CC} = 4.5 – 5.5V$ | | $V_{CC} = 4.0V$ | | | | |
| | | Min | Max | Min | Max | | | |
| $t_{PHL}$, $t_{PLH}$ | Propagation Delay Bus to Bus (Note 6) | | 1.25 | | 1.25 | ns | $V_I$ = OPEN | Figures 1, 2 |
| | Propagation Delay, Select to Bus A | 0.5 | 6.7 | | 7.3 | | | |
| $t_{PZH}$, $t_{PZL}$ | Output Enable Time, Select to Bus B | 0.5 | 6.8 | | 7.3 | ns | $V_I$ = 7V for $t_{PZL}$<br>$V_I$ = OPEN for $t_{PZH}$ | Figures 1, 2 |
| | Output Enable Time, $I_{OE}$ to Bus A, B | 0.5 | 6.0 | | 6.4 | | | |
| $t_{PHZ}$, $t_{PLZ}$ | Output Disable Time., Select to Bus B | 0.5 | 5.7 | | 6.4 | ns | $V_I$ = 7V for $t_{PLZ}$<br>$V_I$ = OPEN for $t_{PHZ}$ | Figures 1, 2 |
| | Output Disable Time, $I_{OE}$ to Bus A, B | 0.5 | 5.7 | | 6.5 | | | |

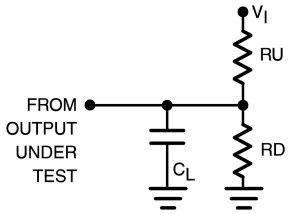
**Note 6:** This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical On Resistance of the switch and the 50pF load capacitance, when driven by an ideal voltage the source (zero output impedance).

## Capacitance (Note 7)

| Symbol | | Parameter | Typ | Max | Units | Conditions |
|---|---|---|---|---|---|---|
| $C_{IN}$ | | Control Pin Input Capacitance | 3 | | pF | $V_{CC}$ = 5.0V |
| $C_{I/O}$ | A Port | Input/Output Capacitance | 13 | | pF | $V_{CC}$, $\overline{OE}$ = 5.0V |
| | B Port | | 5 | | pF | |

**Note 7:** $T_A$ = +25°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**

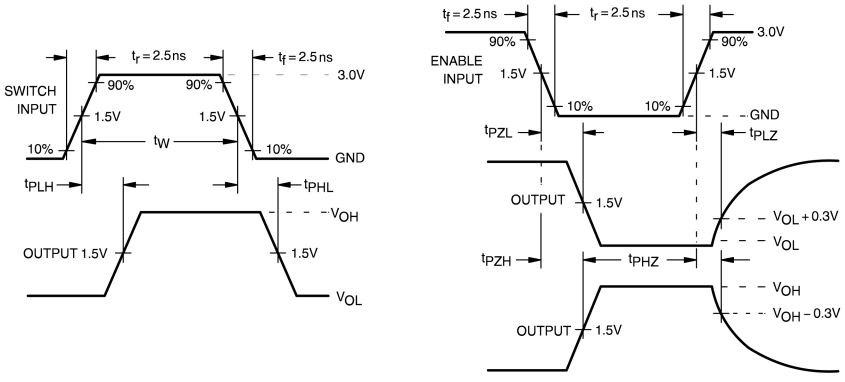
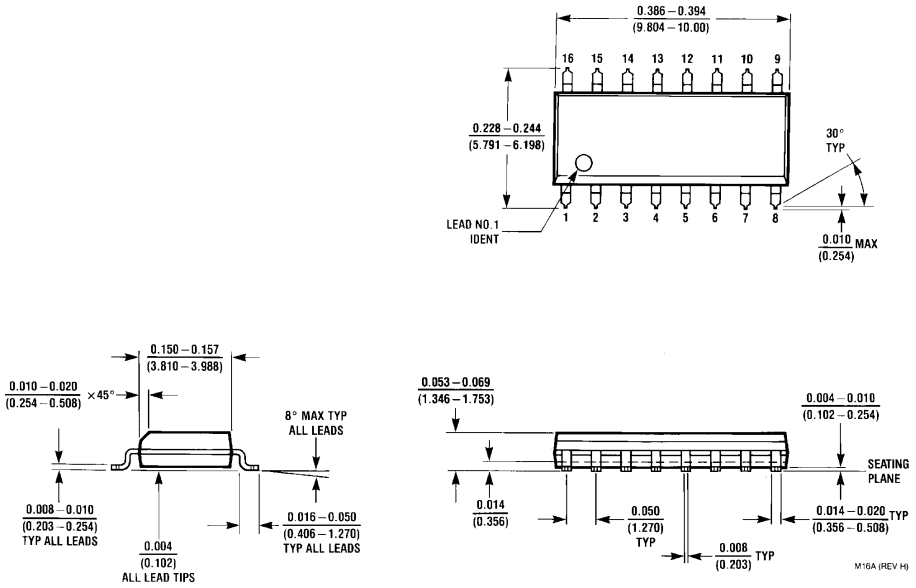
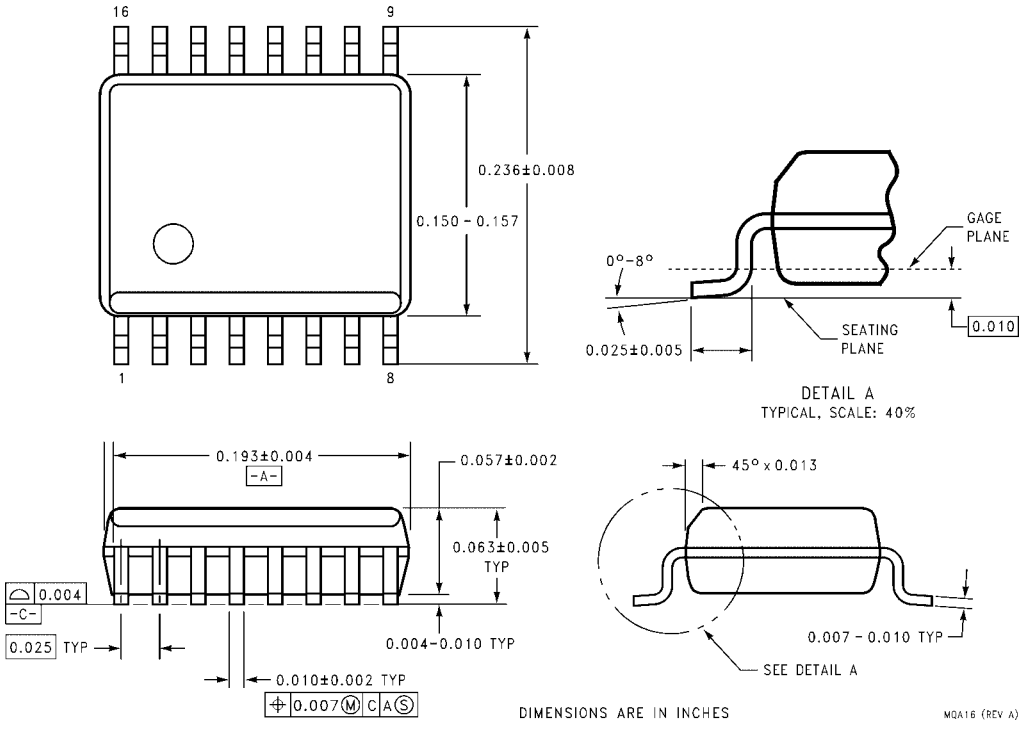



**FIGURE 2. AC Waveforms**

## Physical Dimensions inches (millimeters) unless otherwise noted

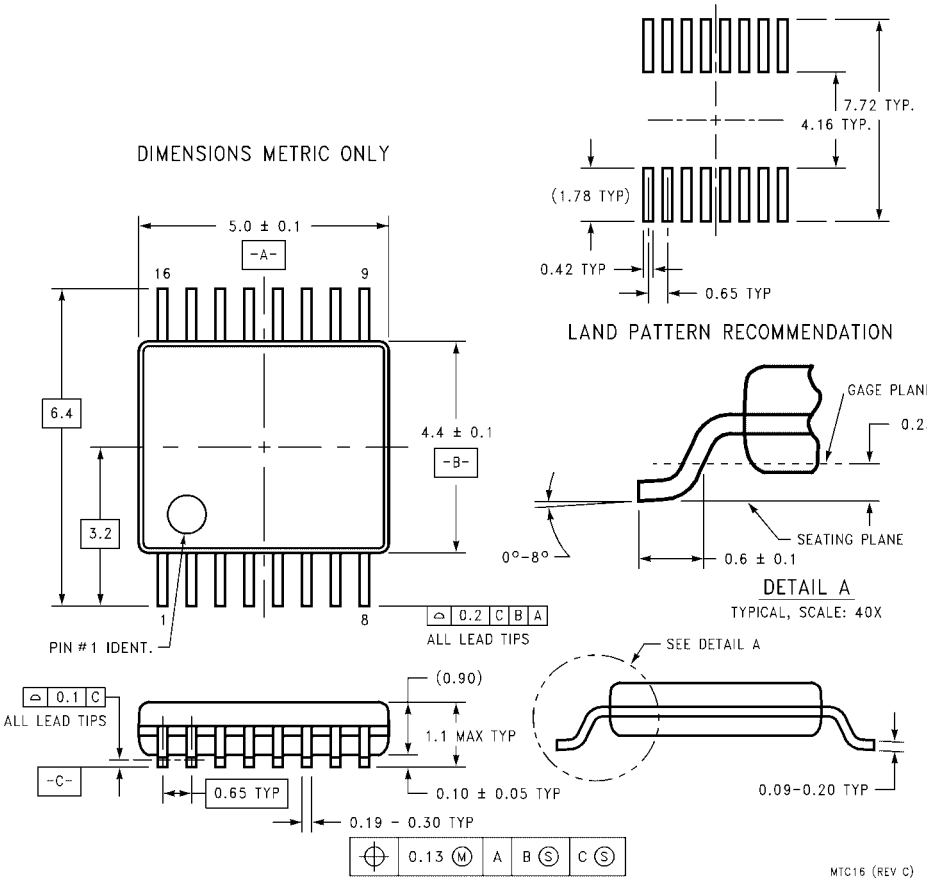



**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow**
**Package Number M16A**




**16-Lead Quarter Size Outline Package (QSOP), JEDEC MO-137, 0.150" Wide**
**Package Number MQA16**

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




**16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide**
**Package Number MTC16**

## 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.