FAIRCHILD

SEMICONDUCTOR™

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.

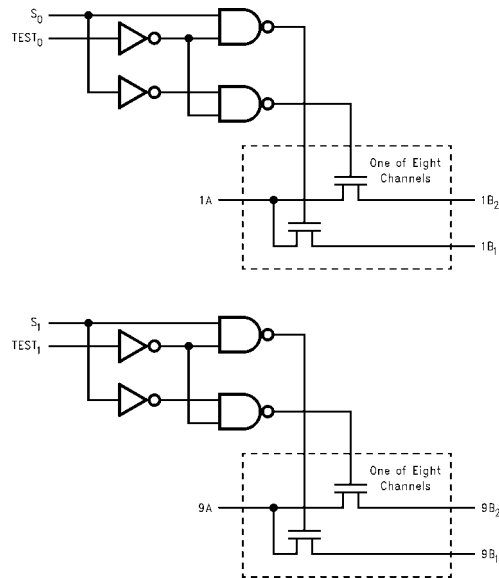The FST16233 is designed to prevent through-current when switching buses.

Features

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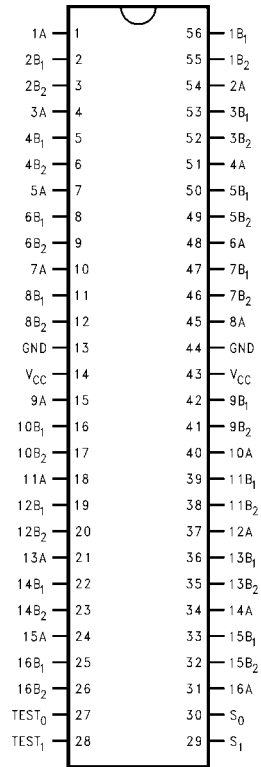■ Control inputs compatible with TTL level.

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

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FST16233

Connection Diagram

1A	1	56	1B$_1$
2B$_1$	2	55	1B$_2$
2B$_2$	3	54	2A
3A	4	53	3B$_1$
4B$_1$	5	52	3B$_2$
4B$_2$	6	51	4A
5A	7	50	5B$_1$
6B$_1$	8	49	5B$_2$
6B$_2$	9	48	6A
7A	10	47	7B$_1$
8B$_1$	11	46	7B$_2$
8B$_2$	12	45	8A
GND	13	44	GND
V$_{CC}$	14	43	V$_{CC}$
9A	15	42	9B$_1$
10B$_1$	16	41	9B$_2$
10B$_2$	17	40	10A
11A	18	39	11B$_1$
12B$_1$	19	38	11B$_2$
12B$_2$	20	37	12A
13A	21	36	13B$_1$
14B$_1$	22	35	13B$_2$
14B$_2$	23	34	14A
15A	24	33	15B$_1$
16B$_1$	25	32	15B$_2$
16B$_2$	26	31	16A
TEST$_0$	27	30	S$_0$
TEST$_1$	28	29	S$_1$

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	$0 \leq V_{IN} \leq 5.5V$
		0			10	μA	$V_{IN} = 5.5V$
I_{OFF}	OFF-STATE Leakage Current	5.5			±1.0	μA	$0 \leq A, B \leq V_{CC}$
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, $I_{OUT} = 0$
ΔI_{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 $V_{CC} = 5.0V$ 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.

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AC Electrical Characteristics

| Symbol	Parameter	$T_A = -40\,°C$ to $+85\,°C$, $C_L = 50pF$, $RU = RD = 500\Omega$				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°C, f = 1 MHz, Capacitance is characterized but not tested.

AC Loading and Waveforms
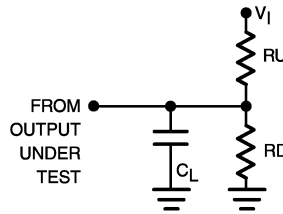
Note: Input driven by 50 Ω source terminated in 50 Ω

Note: C_L includes load and stray capacitance

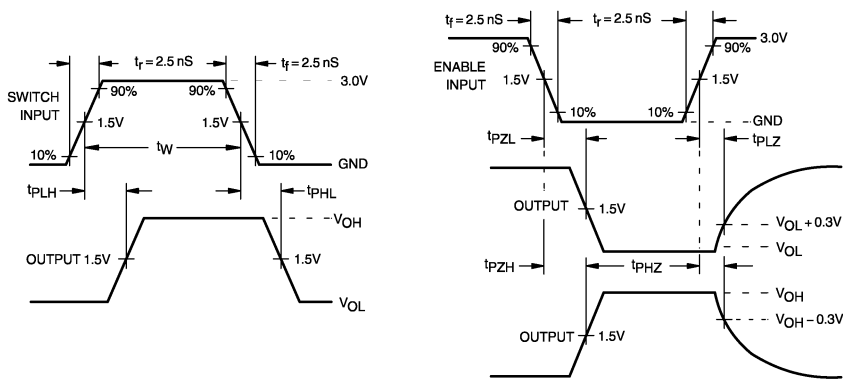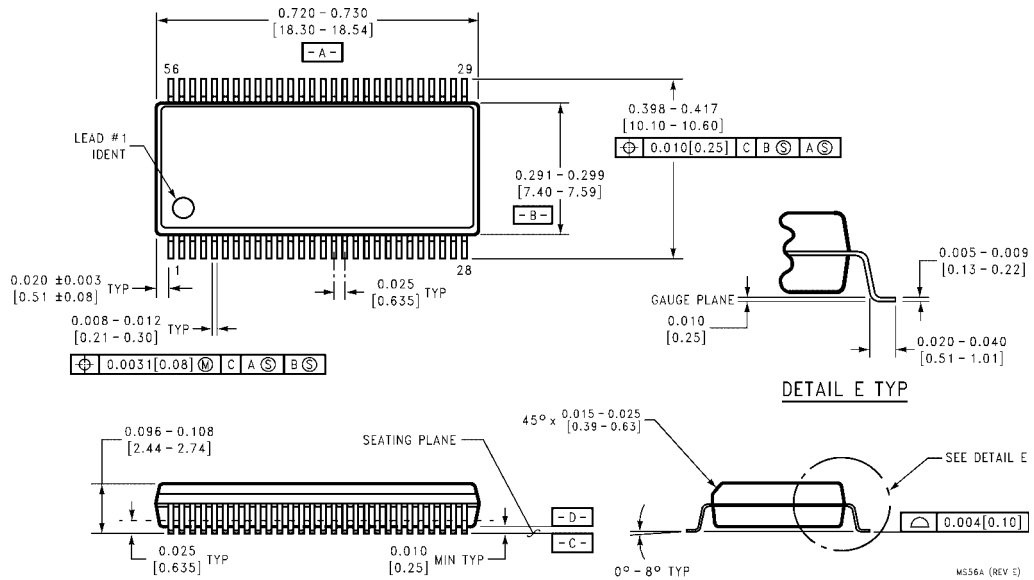**Note:** Input PRR = 1.0 MHz, t_W = 500 ns

FIGURE 1. AC Test Circuit

FIGURE 2. AC Waveforms

Physical Dimensions inches (millimeters) unless otherwise noted

0.720 – 0.730
[18.30 – 18.54]

– A –

56   29

LEAD #1
IDENT

0.398 – 0.417
[10.10 – 10.60]

⊕ 0.010[0.25] C B Ⓢ A Ⓢ

0.291 – 0.299
[7.40 – 7.59]

– B –

1   28

0.020 ±0.003 TYP
[0.51 ±0.08]

0.025 TYP
[0.635]

0.008 – 0.012 TYP
[0.21 – 0.30]

⊕ 0.0031[0.08] Ⓜ C A Ⓢ B Ⓢ

0.005 – 0.009
[0.13 – 0.22]

GAUGE PLANE

0.010
[0.25]

0.020 – 0.040
[0.51 – 1.01]

DETAIL E TYP

0.096 – 0.108
[2.44 – 2.74]

SEATING PLANE

45° x 0.015 – 0.025
[0.39 – 0.63]

SEE DETAIL E

– D –
– C –

0.025 TYP
[0.635]

0.010 MIN TYP
[0.25]

0° – 8° TYP

△ 0.004[0.10]

MS56A (REV E)

**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
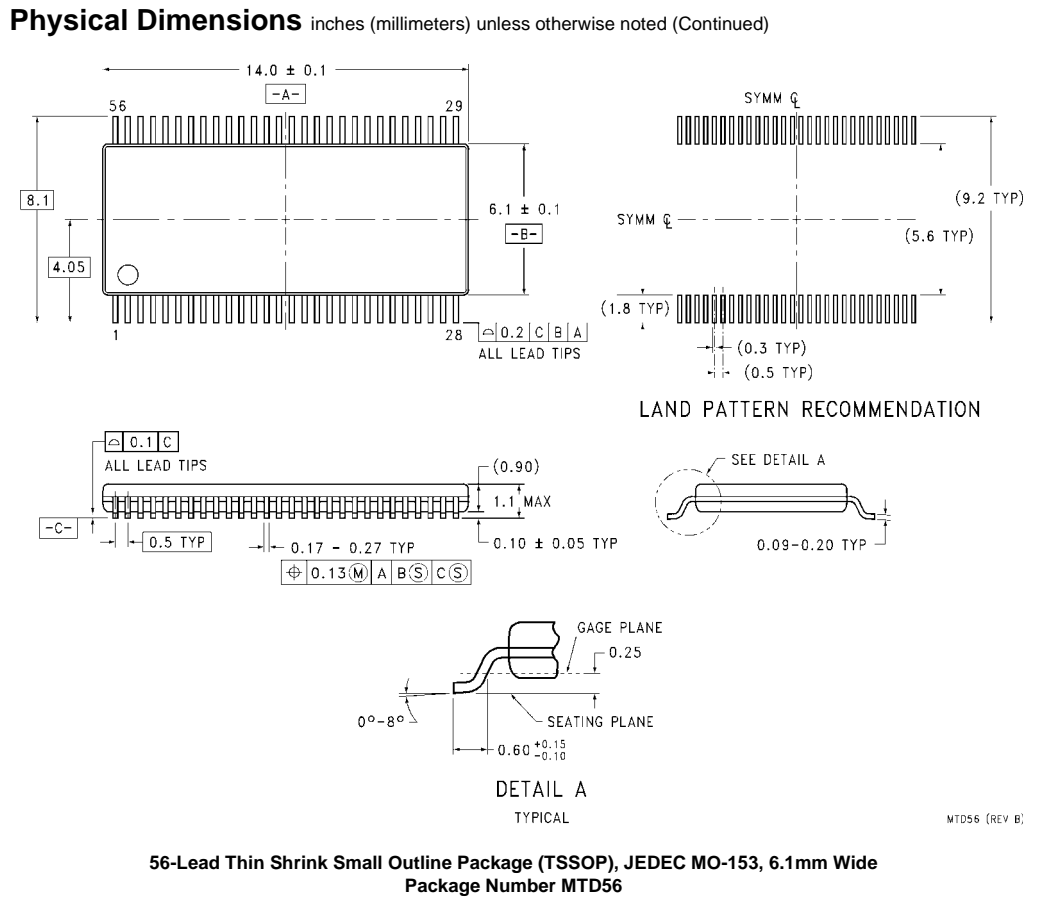
Technology Description

The Fairchild Switch family derives from and embodies Fairchild's proven switch technology used for several years in its 74LVX3L384 (FST3384) bus switch product.

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