FAIRCHILD SEMICONDUCTOR™

December 1993
Revised May 1999

FST3383
10-Bit Low Power Bus-Exchange Switch

General Description

The FST3383 provides two sets of high-speed CMOS TTL-compatible bus switches. 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 operates as a 10-bit bus switch or a 5-bit bus exchanger. The bus exchange (BX) signal provides nibble swapping of the AB and CD pairs of signals. This exchange configuration allows byte swapping of buses in systems. It can also be used as a quad 2-to-1 multiplexer and to create low delay barrel shifters. The bus enable ($\overline{BE}$) signal turns the switches ON.

Features

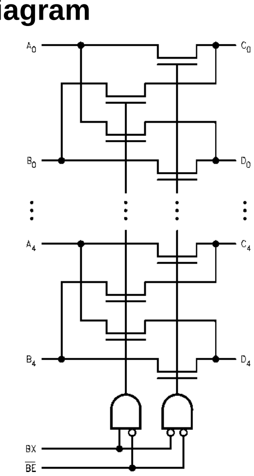
- 5Ω switch connection between two ports
- Zero propagation delay
- Ultra low power with 0.2 µA typical I_{CC}
- Zero ground bounce in flow-through mode
- Control inputs compatible with TTL level

Ordering Code:

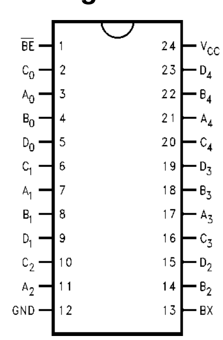
Order Number	Package Number	Package Description
FST3383WM	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
FST3383QSC	MQA24	24-Lead Quarter Size Outline Package (QSOP), JEDEC MO-137, 0.150 Wide
FST3383MTC	MTC24	24-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm 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 Names	Description
$\overline{BE}$	Bus Switch Enable
BX	Bus Exchange
A_0–A_4, B_0–B_4	Buses A, B
C_0–C_4, D_0–D_4	Buses C, D

Truth Table

$\overline{BE}$	BX	A_0–A_4	B_0–B_4	Function
H	X	High-Z State	High-Z State	Disconnect
L	L	C_0–C_4	D_0– D_4	Connect
L	H	D_0–D_4	C_0–C_4	Exchange

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_I) (Note 2)	–0.5V to +7.0V
DC Input Diode Current (I_{IN}) with $V_I < 0$	–20 mA
DC Output (I_O) Sink Current	120 mA
Storage Temperature Range (T_{STG})	–65°C to +150°C
Power Dissipation	0.5W

Recommended Operating Conditions

Supply Voltage (V_{CC})	4.0V to 5.5V
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 ratings. 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.

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	T_A = –40°C to +85°C Min	Typ (Note 3)	Max	Units	Conditions
V_{IK}	Maximum Clamp Diode Voltage	4.75			–1.2	V	I_{IN} = –18 mA
V_{IH}	Minimum High Level Input Voltage	4.75–5.25	2.0			V	
V_{IL}	Maximum Low Level Input Voltage	4.75–5.25			0.8	V	
I_{IN}	Maximum Input	0			10	µA	$0 \le V_{IN} \le 5.25V$
	Leakage Current	5.25			±1		
I_{OZ}	Maximum 3-STATE I/O Leakage	5.25			±10	µA	$0 \le$ A, B $\le V_{CC}$
I_{OS}	Short Circuit Current	4.75	100			mA	V_I(A), V_I(B) = 0V, V_I(B), V_I(A) = 4.75V
R_{ON}	Switch On Resistance (Note 4)	4.75		5	7	Ω	V_I = 0V, I_{ON} = 30 mA
				10	15	Ω	V_I = 2.4V, I_{ON} = 15 mA
I_{CC}	Maximum Quiescent Supply Current	5.25		0.2	10	µA	$V_I = V_{CC}$, GND, I_O = 0
ΔI_{CC}	Increase in I_{CC} per Input (Note 5)	5.25			2.5	mA	V_{IN} = 3.15V, I_O = 0, Per Control Input

Note 3: All typical values are at V_{CC} = 5.0V, T_A = 25°C.

Note 4: Measured by voltage drop between A and B pin at indicated current through the switch. On resistance is determined by the lower of the voltages on the two (A or B) pins.

Note 5: Per TTL driven input (V_{IN} = 3.15V, control inputs only). A and B pins do not contribute to I_{CC}.

AC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	$T_A = -40°C$ to $+85°C$, $C_L = 50$ pF			Units
			Min	Typ (Note 6)	Max	
t_{PLH}, t_{PHL}	Data Propagation Delay A_n to C_n, D_n or B_n to D_n, C_n (Note 7)	4.75			0.25	ns
t_{PLH}, t_{PHL}	Switch Exchange Time BX to A_n, B_n, C_n, D_n	4.75	1.5		6.5	ns
t_{PZL}, t_{PZH}	Switch Enable Time $\overline{BE}$ to A_n, B_n, C_n or D_n	4.75	1.5		6.5	ns
t_{PLZ}, t_{PHZ}	Switch Disable Time $\overline{BE}$ to A_n, B_n, C_n, or D_n	4.75	1.5		5.5	ns

Note 6: All typical values are at $V_{CC} = 5.0V$, $T_A = 25°C$.

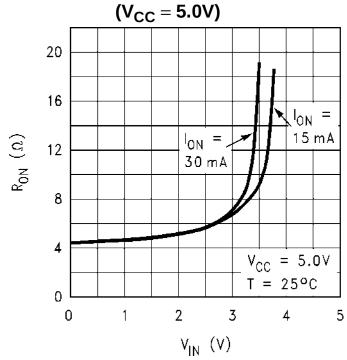
Note 7: This parameter is guaranteed by design but not tested. The bus switch contributes no propagation delay other than the RC delay of the On resistance of the switch and the load capacitance. The time constant for the switch and alone is of the order of 0.25 ns for 50 pF load. Since this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagation delay to the system. Propagation delay of the bus switch when used in a system is determined by the driving circuit on the driving side of the switch and its interaction with the load on the driven side.

Capacitance (Note 8)

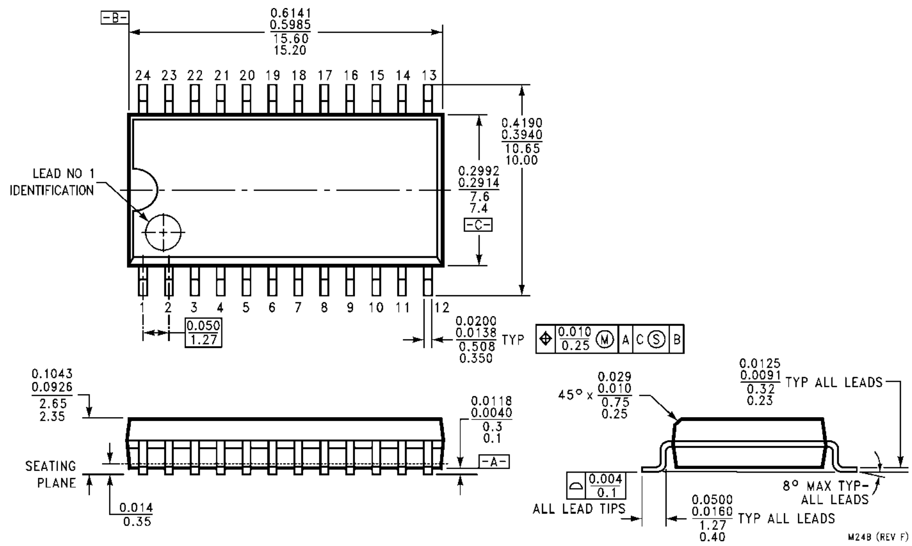
Symbol	Parameter	Typ	Max	Units	Conditions
C_{IN}	Control Input Capacitance	4	6	pF	$V_{CC} = 5.0V$
$C_{I/O}$ (OFF)	Input/Output Capacitance	9	13	pF	$V_{CC} = 5.0V$

Note 8: Capacitance is characterized but not tested.

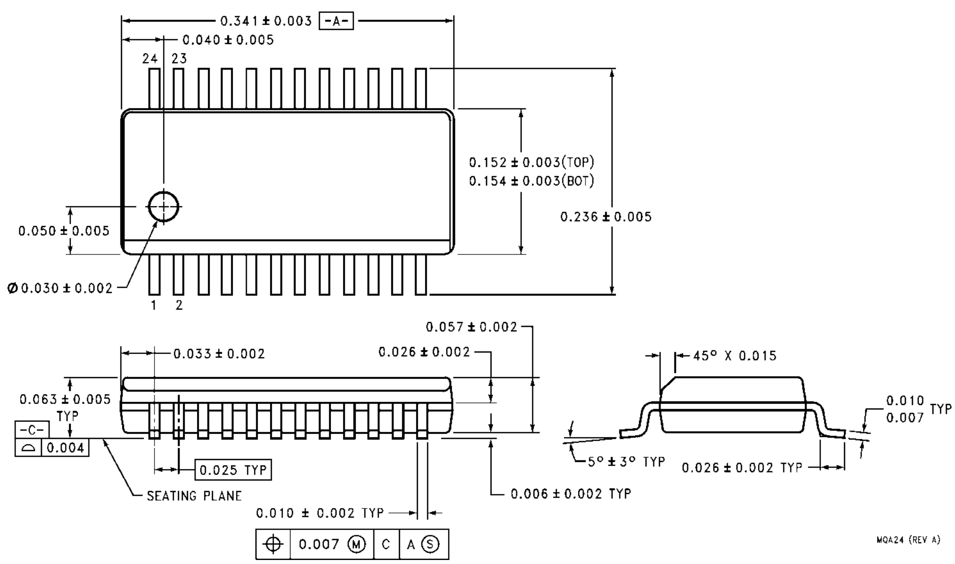
On-Resistance (R_{ON}) vs Input Voltage ($V_{CC} = 5.0V$)



Physical Dimensions inches (millimeters) unless otherwise noted

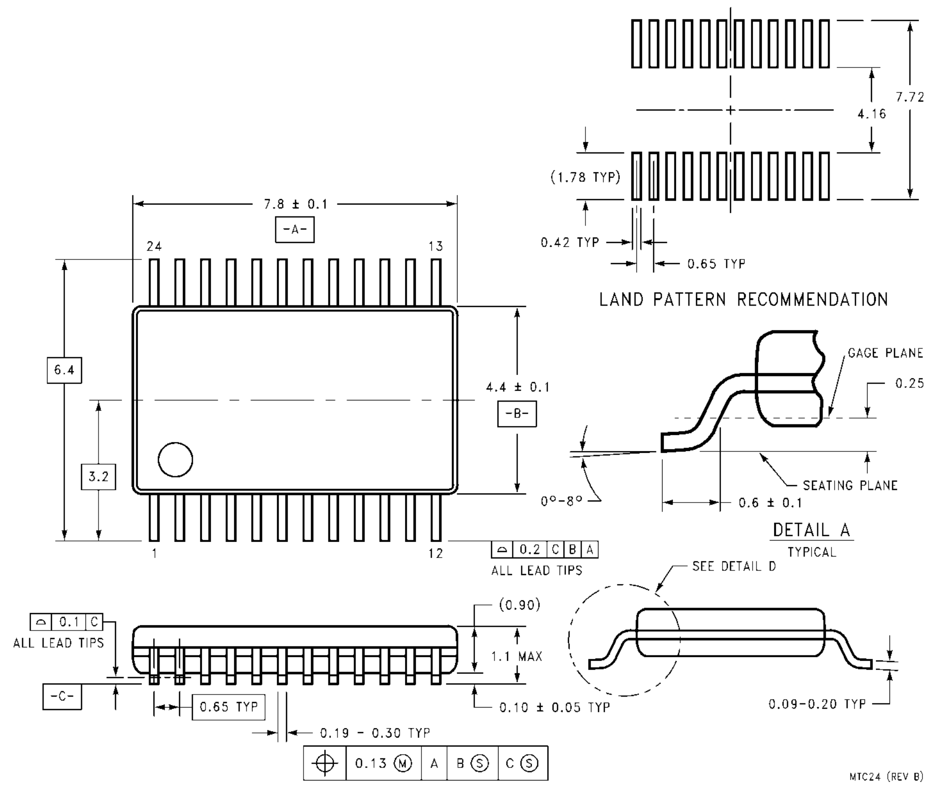


24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
Package Number M24B



24-Lead Quarter Size Outline Package (QSOP), JEDEC MO-137, 0.150 Wide
Package Number MQA24

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



24-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC24

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.

www.fairchildsemi.com