National Semiconductor

PRELIMINARY

74LVX3L383
10-Bit Low Power Bus-Exchange Switch

General Description

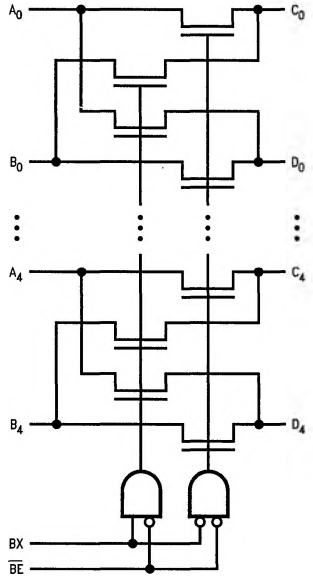
The LVX3L383 provides two sets of high-speed CMOS TTL-compatible bus switches. The low on resistance of the switch allows inputs to be connected to outputs without adding propagation delay or generating additional ground bounce noise. The device operates as a 10-bit bus switch or a 5-bit bus exchanger. 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
- Available in SOIC and QSOP (SSOP, 0.15" body width) packages

Ordering Code: See Section 11

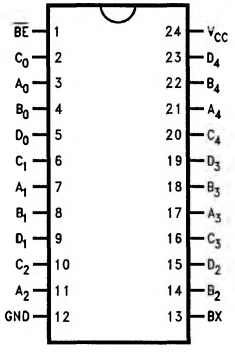
Logic Diagram



TL/F/11652–1

Connection Diagram

Pin Assignment for SOIC and QSOP



TL/F/11652–2

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

	SOIC JEDEC	SSOP JEDEC
Order Number	74LVX3L383WM 74LVX3L383WMX	74LVX3L383QSC 74LVX3L383QSCX
See NS Package Number	M24B	MQA24

Preliminary Data: National Semiconductor reserves the right to make changes at any time without notice.

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

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

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" table 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.*

Recommended Operating Conditions

Supply Voltage (V_{CC})	4.0V to 5.5V
Free Air Operating Temperature (T_A)	−40°C to +85°C

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	74LVX3L383 $T_A = -40°C$ to $+85°C$			Units	Conditions
			Min	Typ (Note 3)	Max		
V_{IK}	Maximum Clamp Diode Voltage	4.5			−1.2	V	$I_{IN} = -18$ mA
V_{IH}	Minimum High Level Input Voltage	4.0–5.5	2.0			V	
V_{IL}	Maximum Low Level Input Voltage	4.0–5.5			0.8	V	
I_{IN}	Maximum Input Leakage Current	0			10	μA	$0 \le V_{IN} \le 5.5V$
		5.5			±1	μA	
I_{OZ}	Maximum TRI-STATE® I/O Leakage	5.5			±1	μA	$0 \le A, B \le V_{CC}$
I_{OS}	Short Circuit Current	4.5	100			mA	$V_I(A), V_I(B) = 0V$, $V_I(B), V_I(A) = 4.5V$
R_{ON}	Switch On Resistance (Note 1)	4.5		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	5.5		0.2	3.0	μA	$V_I = V_{CC}$, GND $I_O = 0$
ΔI_{CC}	Increase in I_{CC} per Input (Note 2)	5.5			2.5	mA	$V_{IN} = 3.4V$, $I_O = 0$ Per Control Input

Note 1: 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 2: Per TTL driven input ($V_{IN} = 3.4V$, control inputs only). A and B pins do not contribute to I_{CC}.

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

AC Electrical Characteristics: See Section 2 for Test Methodology

Symbol	Parameter	V_{CC} (V)	74LVX3L383 $T_A = -40°C$ to $+85°C$ $C_L = 50$ pF			Units
			Min	Typ (Note 2)	Max	
t_{PLH} t_{PHL}	Data Propagation Delay A_n to B_n or B_n to A_n (Note 1)	4.5			0.25	ns
t_{PLH} t_{PHL}	Switch Exchange Time BX to A_n or B_n	4.5	1.5		6.5	ns
t_{PZL} t_{PZH}	Switch Enable Time $\overline{BE}$ to A_n, B_n	4.5	1.5		6.5	ns
t_{PLZ} t_{PHZ}	Switch Disenable Time $\overline{BE}$ to A_n, B_n	4.5	1.5		5.5	ns

Note 1: 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.

Note 2: All typical values are at $V_{CC} = 5.0V$, $T_A = 25°C$.

Capacitance (Note)

Symbol	Parameter	Typ	Max	Units	Conditions
C_{IN}	Control Input Capacitance	4		pF	$V_{CC} = 5.0V$
$C_{I/O}$ (ON)	Input/Output Capacitance	8		pF	$V_{CC} = 5.0V$
$C_{I/O}$ (OFF)	Input/Output Capacitance	6		pF	$V_{CC} = 5.0V$

Note: Capacitance is characterized but not tested.