QuickSwitch® Products
High-Speed Low Power 20-Bit Bus Exchange Switches

QS32XL383
QS32XL2383

FEATURES/BENEFITS

- Enhanced N channel FET with no inherent diode to V_{CC}
- 5Ω bidirectional switches connect inputs to outputs
- Zero propagation delay, zero ground bounce
- Ultra low power with 0.2µA typical I_{CC}
- Undershoot clamp diodes on all switch and control inputs
- Bus exchange allows nibble swap
- Available in 48-pin QVSOP
- QS32XL2383 is 25Ω version for low noise

APPLICATIONS

- Resource sharing
- Crossbar switching
- Bus isolation
- Hot-docking (Application Note AN-13)
- Voltage translation (5V to 3.3V; Application Note AN-11)

DESCRIPTION

The QS32XL383 and QS32XL2383 provide two sets of ten high-speed CMOS TTL-compatible bus switches. The low ON resistance of the QS32XL383 allows inputs to be connected to outputs without adding propagation delay and without generating additional ground bounce noise. The Bus Enable ($\overline{BE}$) signal turns the switches on. The Bus Exchange (BX) signal provides nibble swap 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 10-wide 2-to-1 multiplexer and to create low delay barrel shifters, etc.

The QS32XL2383 add an internal 25Ω series termination resistor to each switch to reduce reflection noise in high speed applications.

Figure 1. Functional Block Diagram

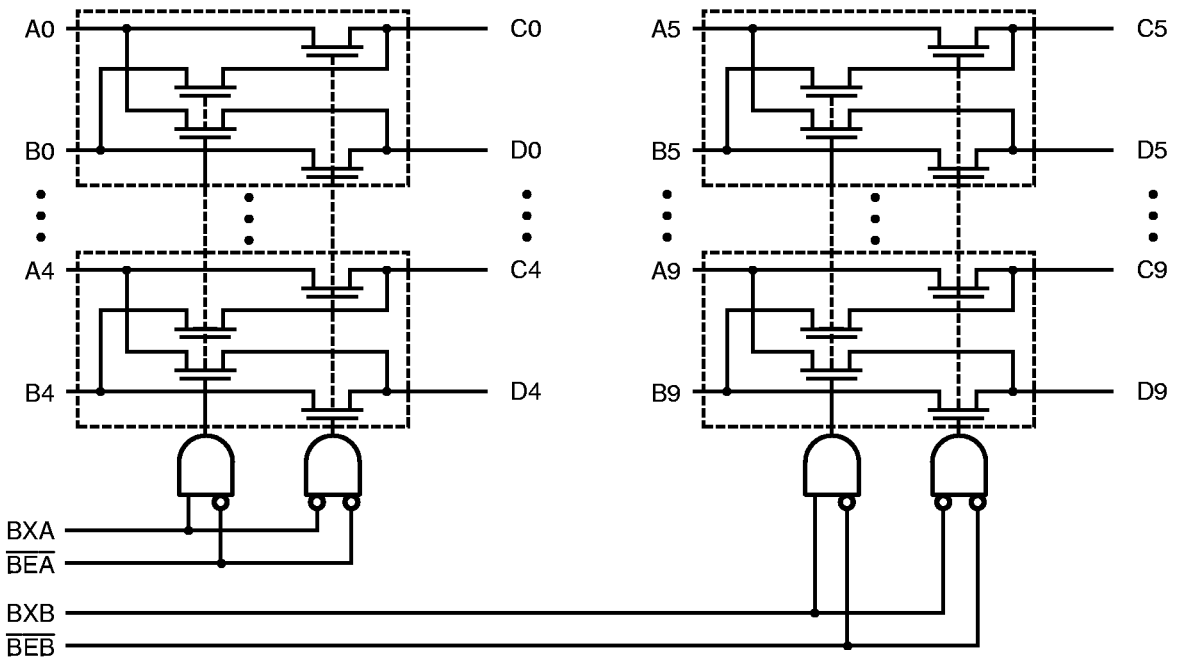


Table 1. Pin Description

Name	I/O	Function
Ai, Bi	I/O	Buses A, B
Ci, Di	I/O	Buses C, D
$\overline{BE}$n	I	Bus Switch Enable
BXn	I	Bus Exchange

Figure 2. Pin Configuration (All Pins Top View)

QVSOP

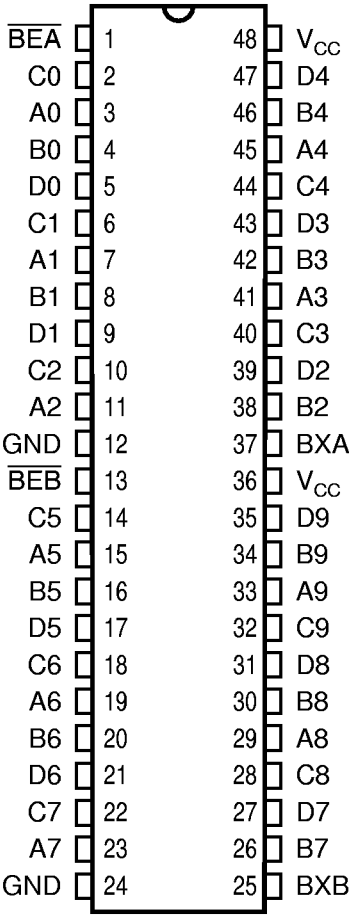


Table 2. Function Table

$\overline{BEA}$	BXA	A0-A4	B0–B4	Function
H	X	Hi-Z	Hi-Z	Disconnect
L	L	C0–C4	D0–D4	Connect
L	H	D0–D4	C0–C4	Exchange
$\overline{BEB}$	**BXB**	**A5–A9**	**B5–B9**	**Function**
H	X	Hi-Z	Hi-Z	Disconnect
L	L	C5–C9	D5–D9	Connect
L	H	D5–D9	C5–C9	Exchange

Table 3. Absolute Maximum Ratings

Supply Voltage to Ground	–0.5V to +7.0V
DC Switch Voltage V_S	–0.5V to +7.0V
DC Input Voltage V_{IN}	–0.5V to +7.0V
AC Input Voltage (for a pulse width ≤ 20ns)	–3.0V
DC Output Current Max. Sink Current/Pin	120mA
Maximum Power Dissipation	0.5 watts
T_{STG} Storage Temperature	–65° to +150°C

Note: ABSOLUTE MAXIMUM CONTINUOUS RATINGS are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum conditions is not implied.

Table 4. Capacitance

T_A = 25°C, f = 1MHz, V_{IN} = 0V, V_{OUT} = 0V

Pins	QVSOP Typ	QVSOP Max	Unit
Control Inputs	3	5	pF
QuickSwitch Channels (Switch OFF)	5	7	pF

Note: Capacitance is guaranteed, but not production tested. For total capacitance while the switch is ON, please see Section 1 under "Input and Switch Capacitance."

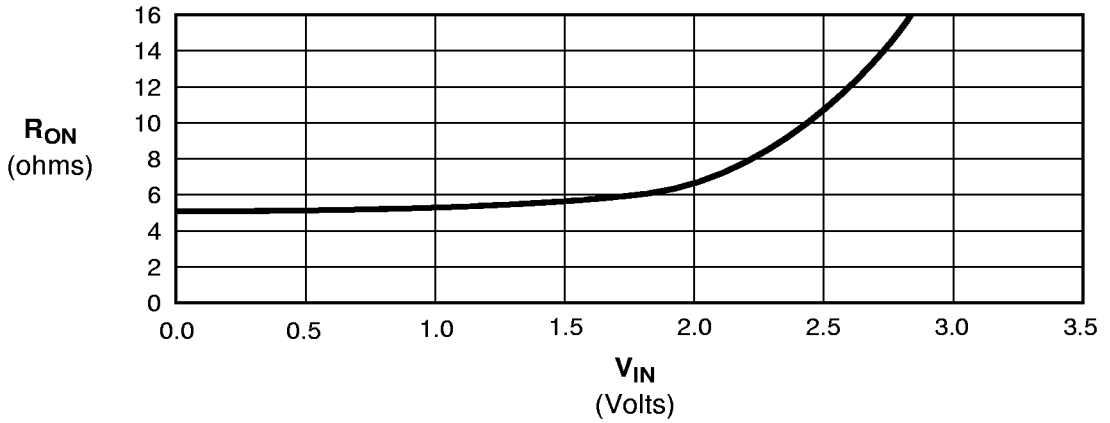
Table 5. DC Electrical Characteristics Over Operating Range

T_A = –40°C to 85°C, V_{CC} = 5.0V ± 5%

Symbol	Parameter	Test Conditions		Min	Typ(1)	Max	Unit
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH for Control Inputs		2.0	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for Control Inputs		—	—	0.8	V
$\lvert I_{IN} \rvert$	Input Leakage Current (Control Inputs)	$0 \le V_{IN} \le V_{CC}$, Control Inputs		—	0.01	1	µA
$\lvert I_{OZ} \rvert$	Off-State Current (Hi-Z)	$0 \le V_{OUT} \le V_{CC}$		—	0.01	1	µA
R_{ON}	Switch ON Resistance(2)	V_{CC} = Min., V_{IN} = 0.0V	QS32XL383	—	5	7	Ω
		I_{ON} = 30mA	QS32XL2383	20	28	40	
R_{ON}	Switch ON Resistance(2)	V_{CC} = Min., V_{IN} = 2.4V	QS32XL383	—	10	15	Ω
		I_{ON} = 15mA	QS32XL2383	20	35	48	
V_P	Pass Voltage(3)	V_{CC} = 5V, I_{OUT} = –5µA		3.7	4.0	4.2	V

Notes:
1. Typical values indicate V_{CC} = 5.0V and T_A = 25°C.
2. For a diagram explaining the procedure for R_{ON} measurement, please see Section 1 under "DC Electrical Characteristics." Max. value of R_{ON} guaranteed, but not production tested.
3. Pass voltage is guaranteed, but not production tested.

Figure 3. Typical ON Resistance vs V_{IN} at V_{CC} = 5.0V (QS32XL383)



Note: For QS32XL2383, add 23Ω to RON shown.

Table 6. Power Supply Characteristics

T_A = –40°C to 85°C, V_{CC} = 5.0V ± 5%

Symbol	Parameter	Test Conditions[1]	Max	Unit
I_{CCQ}	Quiescent Power Supply Current	V_{CC} = Max., V_{IN} = GND or V_{CC}, f = 0	6.0	µA
ΔI_{CC}	Power Supply Current per Input HIGH[2]	V_{CC} = Max., V_{IN} = 3.4V, f = 0 per Control Input	2.5	mA
Q_{CCD}	Dynamic Power Supply Current per MHz[3]	V_{CC} = Max., ABCD Pins Open, Control Inputs Toggling @ 50% Duty Cycle	0.25	mA/ MHz

Notes:
1. For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
2. Per TTL driven input (V_{IN} = 3.4V, control inputs only). A, B, C, D pins do not contribute to ΔI_{CC}.
3. This current applies to the control inputs only and represents the current required to switch internal capacitance at the specified frequency. The A, B, C, D inputs generate no significant AC or DC currents as they transition. This parameter is guaranteed, but not production tested.

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Table 7. Switching Characteristics Over Operating Range

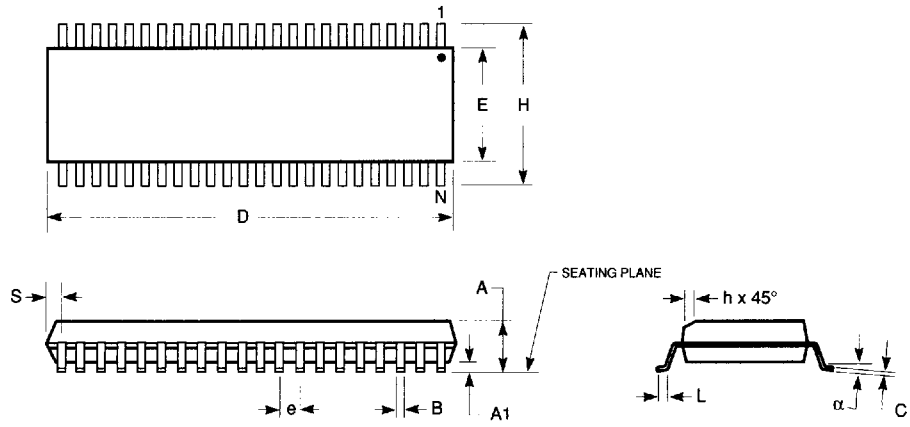
T_A = –40°C to 85°C, V_{CC} = 5.0V ± 5% C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.

Symbol	Description[1]		Min	Typ	Max	Unit
t_{PLH}	Data Propagation Delay[2,4]	QS32XL383	—	—	0.25[3]	ns
t_{PHL}	AiBi to CiDi, CiDi to AiBi	QS32XL2383	—	—	1.5	
t_{PZL}	Switch Turn-on Delay	QS32XL383	1.5	—	6.5	ns
t_{PZH}	$\overline{BE}$ to Ai, Bi, Ci, Di	QS32XL2383	1.5		7.5	
t_{PLZ}	Switch Turn-off Delay[2]	QS32XL383	1.5	—	5.5	ns
t_{PHZ}	$\overline{BE}$ to Ai, Bi, Ci, Di	QS32XL2383	1.5		6.5	
t_{BX}	Switch Multiplex Delay	QS32XL383	1.5	—	6.5	ns
	BX to Ai, Bi, Ci, Di	QS32XL2383	1.5		7.5	

Notes:
1. See Test Circuit and Waveforms. Minimums guaranteed, but not production tested.
2. This parameter is guaranteed, but not production tested.
3. The time constant for the switch alone is of the order of 0.25ns for QS32XL383 and 1.25ns for QS32XL2383.
4. The bus switch contributes no propagation delay other than the RC delay of the ON resistance of the switch and the load capacitance. 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.

150-MIL QVSOP™ - Package Code Q1/Q2

150-Mil Wide Plastic Small Outline Gull-Wing



JEDEC#	MO-154BB			MO-154AB		
DWG#	PSS-40A (Q2)			PSS-48A (Q1)		
Symbol	Min	Nom	Max	Min	Nom	Max
A	0.059	0.065	0.069	0.059	0.065	0.069
A1	0.004	0.006	0.008	0.004	0.006	0.008
B	0.0067	0.008	0.009	0.0051	0.0063	0.008
C	0.0075	0.008	0.0098	0.0075	0.008	0.0098
D	0.386	0.390	0.394	0.386	0.390	0.394
E	0.150	0.154	0.157	0.150	0.154	0.157
e	0.0197 BSC, 0.5mm			0.0157 BSC, 0.4mm		
H	0.228	0.236	0.244	0.228	0.236	0.244
h	0.010	0.013	0.016	0.010	0.013	0.016
L	0.020	0.024	0.030	0.020	0.024	0.030
N	40			48		
α	0°	5°	8°	0°	5°	8°
S	0.006	0.008	0.010	0.012	0.014	0.016

Notes:
1. Refer to applicable symbol list.
2. All dimensions are in inches.
3. N is the number of lead positions.
4. Dimensions D and E are to be measured at maximum material condition but do not include mold flash. Allowable mold flash is 0.006in. per side.
5. Lead coplanarity is 0.003in. maximum.