QUALITY SEMICONDUCTOR, INC.

QuickSwitch® Products
High-Speed CMOS
20-Bit Bus Switches

QS32XL384
QS32XL2384

FEATURES/BENEFITS

- Enhanced N channel FET with no inherent diode to V_{CC}
- 5Ω bidirectional switches connect inputs to outputs
- Zero propagation delay and zero ground bounce
- Undershoot clamp diodes on all control and switch pins
- Available in 48-pin QVSOP (Q1)
- Four enables control five bits each
- TTL-compatible input and output levels
- QS32XL2384 is 25Ω version for low noise

FEATURES/BENEFITS

- Hot-docking, hot-swapping (Application Note AN-13)
- Voltage translation (5V to 3.3V; Application Note AN-11)
- Logic replacement (data processing)
- Power conservation
- Capacitance reduction and isolation
- Low power for hand held and mobil applications
- Bus isolation
- Clock gating

DESCRIPTION

The QS32XL384 provides a set of twenty high-speed CMOS TTL-compatible bus switches. The low ON resistance of the QS32XL384 allows inputs to be connected to outputs without adding propagation delay and without generating additional ground bounce noise. The Bus Enable ($\overline{BE}$) signals turn the switches on. Four Bus Enable signals are provided, one for each of five bits of the 20-bit bus. The '384 family of QuickSwitch products is ideal for switching wide digital buses, as well as hot-docking, 5V to 3V conversion and capacitance isolation for power conservation.

The QS32XL2384 adds an internal 25Ω series termination resistor to each switch to reduce reflection noise in high speed applications.

Figure 1. Functional Block Diagram

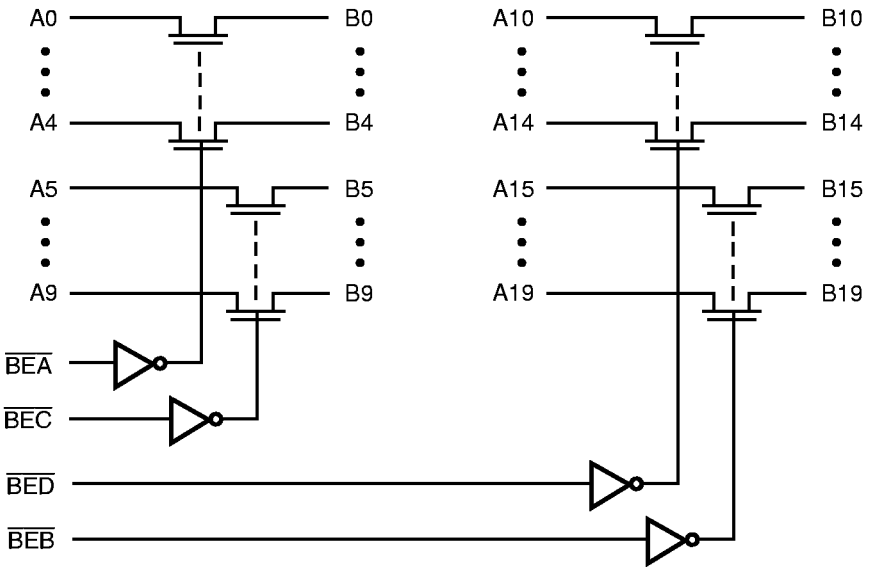


Table 1. Pin Description

Name	I/O	Function
A0-A19	I/O	Bus A
B0-B19	I/O	Bus B
$\overline{BEA}$	I	Enable, 0-4
$\overline{BEB}$	I	Enable, 15-19
$\overline{BEC}$	I	Enable, 5-9
$\overline{BED}$	I	Enable, 10-14

Table 2. Function Table

$\overline{BEA}$	$\overline{BEB}$	B0-B4	B15-B19	Function
H	H	Hi-Z	Hi-Z	Disconnect
L	H	A0-A4	Hi-Z	Connect
H	L	Hi-Z	A15-A19	Connect
L	L	A0-A4	A15-A19	Connect
$\overline{BEC}$	$\overline{BED}$	B5-B9	B10-B14	Function
H	H	Hi-Z	Hi-Z	Disconnect
L	H	A5-A9	Hi-Z	Connect
H	L	Hi-Z	A10-A14	Connect
L	L	A5-A9	A10-A14	Connect

Figure 2. Pin Configuration (All Pins Top View)

QVSOP (Q1)

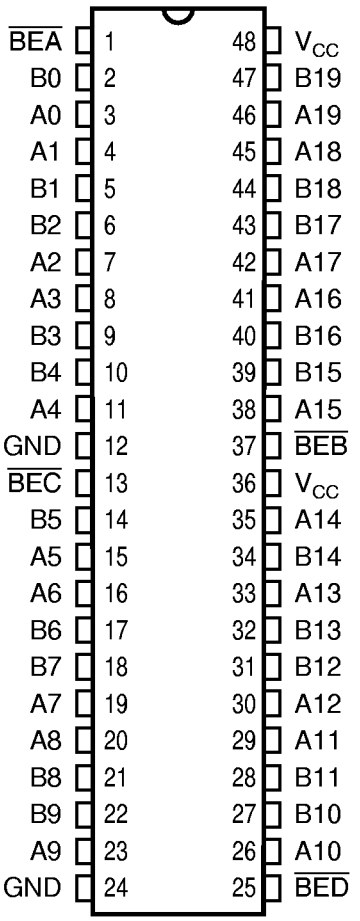


Table 3. Absolute Maximum Ratings

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 characterized but not production tested. For total capacitance while the switch is ON, please see section 1 under "Input and Switch Capacitance."

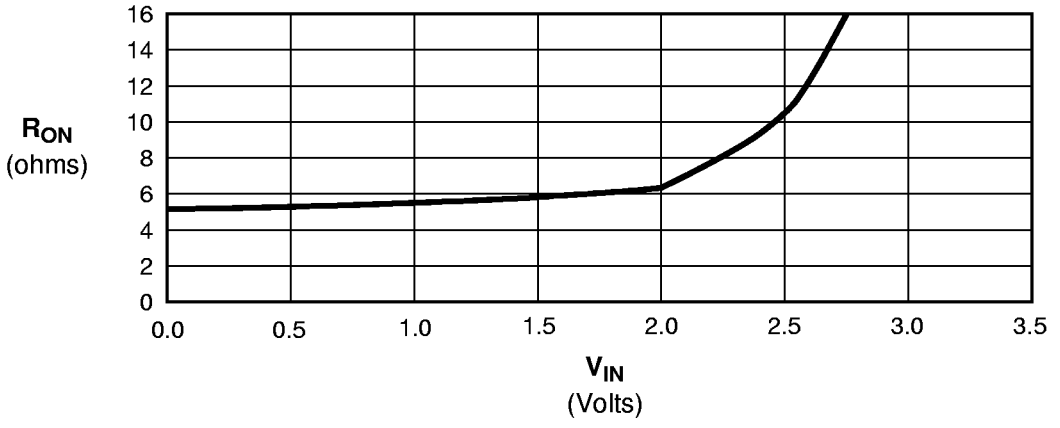
Table 5. DC Electrical Characteristics Over Operating Range

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
$\| I_{IN} \|$	Input Leakage Current (Control Inputs)	$0 \le V_{IN} \le V_{CC}$	—	0.01	1	µA
$\| I_{OZ} \|$	Off-State Current (Hi-Z)	$0 \le V_{OUT} \le V_{CC}$, Switches Off	—	0.01	1	µA
R_{ON}	Switch ON Resistance(2)	V_{CC} = Min., V_{IN} = 0.0V 32XL384 I_{ON} = 30mA 32XL2384	— 20	5 28	7 40	Ω
R_{ON}	Switch ON Resistance(2)	V_{CC} = Min., V_{IN} = 2.4V 32XL384 I_{ON} = 15mA 32XL2384	— 20	10 35	15 48	Ω
V_P	Pass Voltage(3)	$V_{IN} = V_{CC}$ = 5V, I_{OUT} = –5µA	3.7	4	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 (QS32XL384)



Note: For 32XL2384, add 23Ω to R_{ON} shown.

Table 6. Power Supply Characteristics Over Operating Range

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., A and B 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 and B 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 and B inputs generate no significant AC or DC currents as they transition. This parameter is guaranteed, but not production tested.

Table 7. Switching Characteristics Over Operating Range

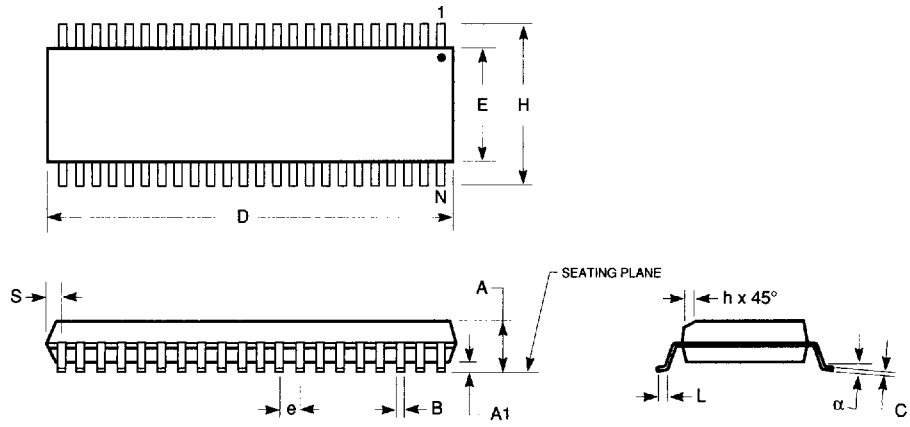
T_A = –40°C to 85°C, V_{CC} = 5.0V ± 5%
C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.

Symbol	Description[1]	QS32XL384 Min	QS32XL384 Typ	QS32XL384 Max	QS32XL2384 Min	QS32XL2384 Typ	QS32XL2384 Max	Unit
t_{PLH} t_{PHL}	Data Propagation Delay[2,4] Ai to Bi, Bi to Ai	—	—	0.25[3]	—	—	1.25[3]	ns
t_{PZL} t_{PZH}	Switch Turn-on Delay $\overline{BE}$ to Ai, Bi	1.5	—	6.5	1.5	—	7.5	ns
t_{PLZ} t_{PHZ}	Switch Turn-off Delay[2] $\overline{BE}$ to Ai, Bi	1.5	—	5.5	1.5	—	5.5	ns

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 QS32XL384 and 1.25ns for QS32XL2384 for C_L = 50pF.
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.
5. Measured at switch turn off, A to B, load = 50pF in parallel with 10 Meg scope probe, V_{IN} at A = 0.0V.
6. Guaranteed parameter. Not production tested.

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.