

**FEATURES:**

- Enhanced N channel FET with no inherent diode to Vcc
- $5\Omega$  bidirectional switches connect inputs to outputs
- Zero propagation delay
- Zero ground bounce
- Undershoot clamp diodes on all switch and control pins
- Four enables control five bits each
- TTL-compatible input and output levels
- Available in 48-pin QVSOP package

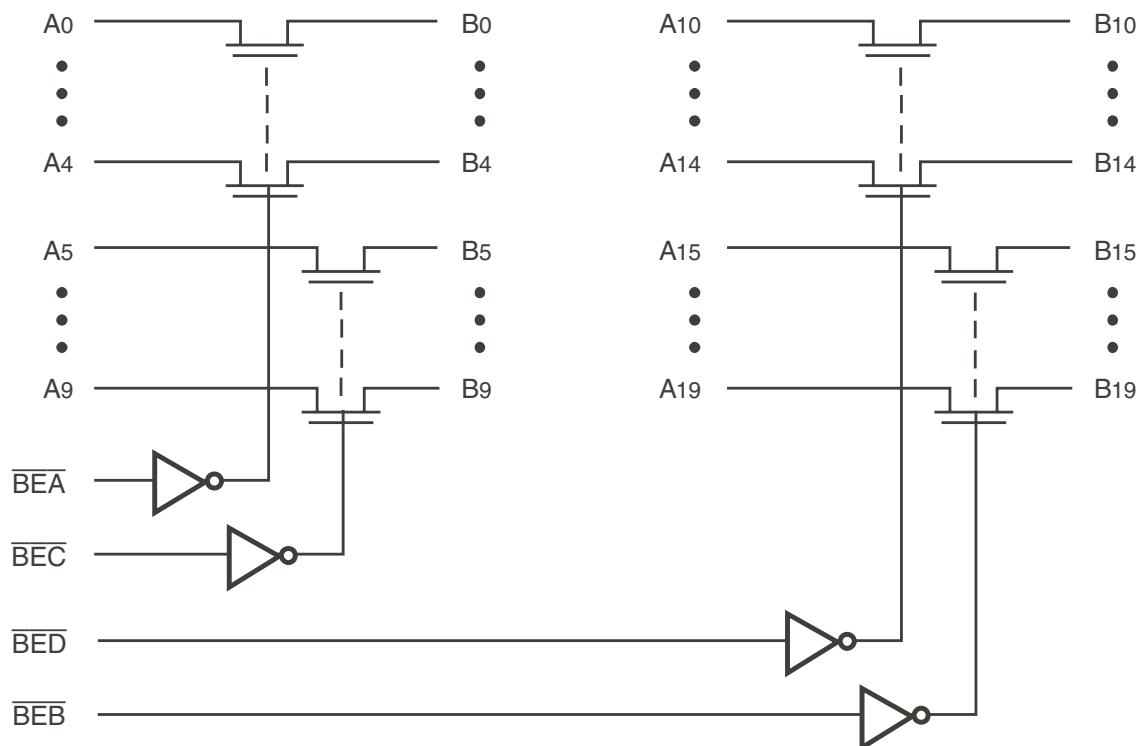
**APPLICATIONS:**

- Hot-swapping, hot-docking
- Voltage translation (5V to 3.3V)
- Power conservation
- Capacitance reduction and isolation
- Bus isolation
- Clock gating

**DESCRIPTION:**

The QS32X384 provides a set of twenty high-speed CMOS TTL-compatible bus switches. The low ON resistance of the QS32X384 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 hotplug buffering, and 5V to 3V conversion.

The QS32X384 is characterized for operation at  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

**FUNCTIONAL BLOCK DIAGRAM**


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**INDUSTRIAL TEMPERATURE RANGE**

**JUNE 2011**

## PIN CONFIGURATION

BEA	1	48	Vcc
B0	2	47	B19
A0	3	46	A19
A1	4	45	A18
B1	5	44	B18
B2	6	43	B17
A2	7	42	A17
A3	8	41	A16
B3	9	40	B16
B4	10	39	B15
A4	11	38	A15
GND	12	37	BEB
BEC	13	36	Vcc
B5	14	35	B14
A5	15	34	A14
A6	16	33	A13
B6	17	32	B13
B7	18	31	B12
A7	19	30	A12
A8	20	29	A11
B8	21	28	B11
B9	22	27	B10
A9	23	26	A10
GND	24	25	BED

QVSOP  
TOP VIEW

## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

Symbol	Description	Max	Unit
VTERM <sup>(2)</sup>	Supply Voltage to Ground	-0.5 to +7	V
VTERM <sup>(3)</sup>	DC Switch Voltage Vs	-0.5 to +7	V
VTERM <sup>(3)</sup>	DC Input Voltage VIN	-0.5 to +7	V
VAC	AC Input Voltage (pulse width ≤20ns)	-3	V
IOUT	DC Output Current	120	mA
PMAX	Maximum Power Dissipation (TA = 85°C)	0.5	W
TSTG	Storage Temperature	-65 to +150	°C

### NOTES:

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
- Vcc terminals.
- All terminals except Vcc .

## CAPACITANCE (TA = +25°C, F = 1MHz, VIN = 0V, VOUT = 0V)

Pins	Typ.	Max. <sup>(1)</sup>	Unit
Control Inputs	3	5	pF
Quickswitch Channels (Switch OFF)	5	7	pF

### NOTE:

- This parameter is guaranteed but not production tested.

## FUNCTION TABLE<sup>(1)</sup>

BEA	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
BEC	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

### NOTE:

- H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Don't care  
Z = High-Impedance

## PIN DESCRIPTION

Pin Names	I/O	Description
A0 - A19	I/O	Bus A
B0 - B19	I/O	Bus B
BEA	I	Enable, 0-4
BEB	I	Enable, 15-19
BEC	I	Enable, 5-9
BED	I	Enable, 10-14

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

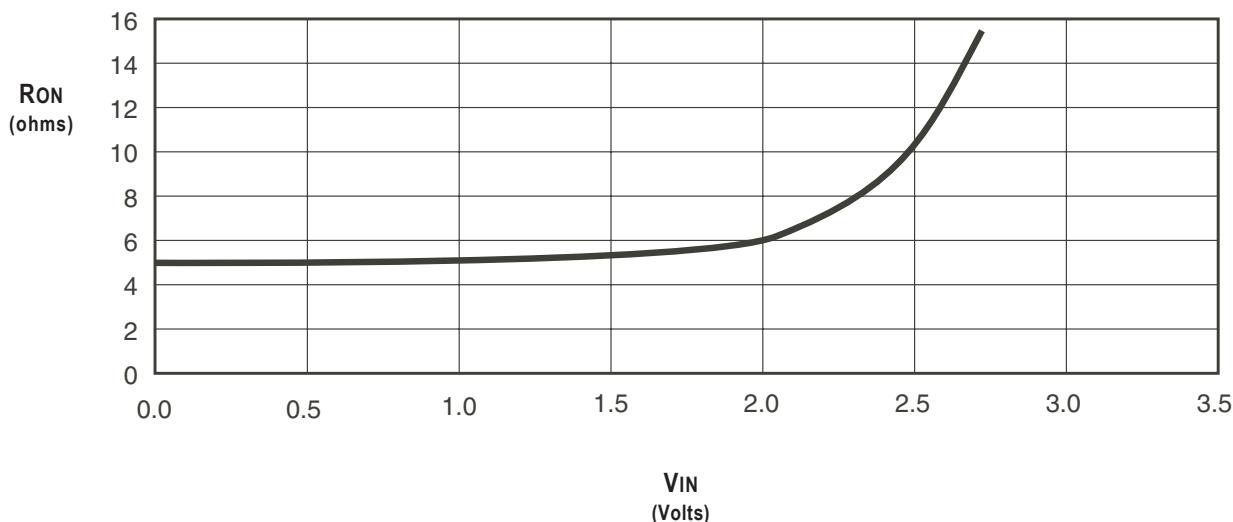
Industrial: TA = -40°C to +85°C, VCC = 5V ± 5%

Symbol	Parameter	Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit
V <sub>IH</sub>	Input HIGH Voltage	Guaranteed Logic HIGH for Control Inputs	2	—	—	V
V <sub>IL</sub>	Input LOW Voltage	Guaranteed Logic LOW for Control Inputs	—	—	0.8	V
I <sub>IN</sub>	Input Leakage Current (Control Inputs)	0V ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>	—	±0.01	±1	µA
I <sub>OZ</sub>	Off-State Current(Hi-Z)	0V ≤ V <sub>OUT</sub> ≤ V <sub>CC</sub> , Switches OFF	—	±0.01	±1	µA
R <sub>ON</sub>	Switch ON Resistance	V <sub>CC</sub> = Min, V <sub>IN</sub> = 0V, I <sub>ON</sub> = 30mA	—	5	7	Ω
		V <sub>CC</sub> = Min, V <sub>IN</sub> = 2.4V, I <sub>ON</sub> = 15mA	—	10	15	
V <sub>P</sub>	Pass Voltage <sup>(2)</sup>	V <sub>CC</sub> = 5V, I <sub>OUT</sub> = -5µA	3.7	4	4.2	V

NOTES:

1. Typical values are at V<sub>CC</sub> = 5V and T<sub>A</sub> = 25°C.
2. Pass voltage is guaranteed but not production tested.

## TYPICAL ON RESISTANCE vs V<sub>IN</sub> AT V<sub>CC</sub> = 5V



## POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Max.	Unit
I <sub>CCQ</sub>	Quiescent Power Supply Current	V <sub>CC</sub> = Max., V <sub>IN</sub> = GND or V <sub>CC</sub> , f = 0	3	mA
ΔI <sub>CC</sub>	Power Supply Current per Control Input HIGH <sup>(2)</sup>	V <sub>CC</sub> = Max., V <sub>IN</sub> = 3.4V, f = 0	2.5	mA
I <sub>CCD</sub>	Dynamic Power Supply Current per MHz <sup>(3)</sup>	V <sub>CC</sub> = Max., A and B Pins Open, Control Input Toggling at 50% Duty Cycle	0.25	mA/MHz

NOTES:

1. For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.
2. Per TTL driven input (V<sub>IN</sub> = 3.4V, control inputs only). A and B pins do not contribute to ΔI<sub>CC</sub>.
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.

## SWITCHING CHARACTERISTICS OVER OPERATING RANGE

T<sub>A</sub> = -40°C to +85°C, V<sub>CC</sub> = 5.0V ± 5%

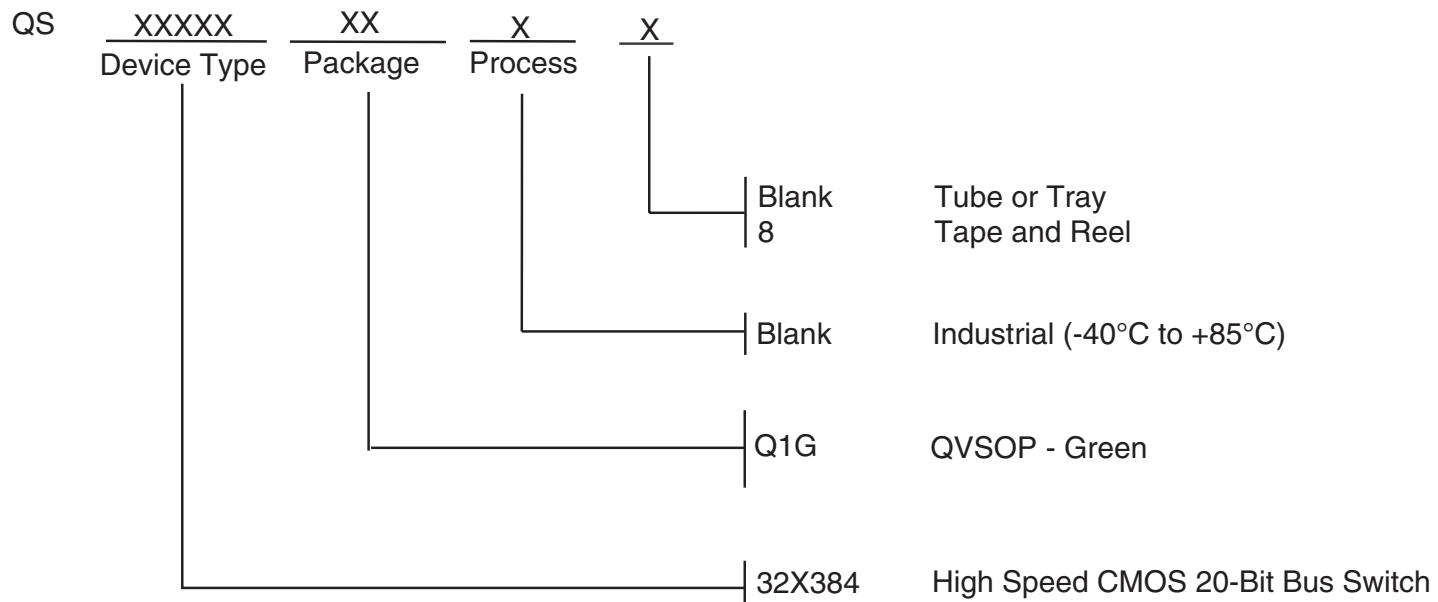
C<sub>LOAD</sub> = 50pF, R<sub>LOAD</sub> = 500Ω unless otherwise noted.

Symbol	Parameter	Min. <sup>(1)</sup>	Typ.	Max.	Unit
t <sub>PLH</sub>	Data Propagation Delay <sup>(2,4)</sup> Ax to Bx, Bx to Ax	—	—	0.25 <sup>(3)</sup>	ns
t <sub>PHL</sub>	Switch Turn-on Delay B̄En to Ax, Bx	1.5	—	6.5	ns
t <sub>PZL</sub>	Switch Turn-off Delay <sup>(2)</sup> B̄En to Ax, Bx	1.5	—	5.5	ns

NOTES:

1. Minimums are 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 C<sub>L</sub> = 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 and 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.

## ORDERING INFORMATION



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