

# QUICKSWITCH<sup>®</sup> PRODUCTS HIGH-SPEED CMOS 20-BIT BUS SWITCH

# 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 (Q1)

# APPLICATIONS

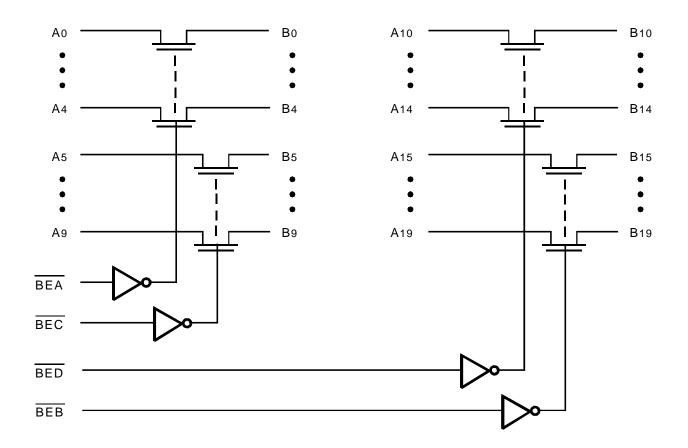
- Hot-swapping, hot-docking
- Voltage translation (5V to 3.3V)
- Power Conservation
- Capacitance reduction and isolation
- Bus isolation
- Clock gating

# FUNCTIONAL BLOCK DIAGRAM

# DESCRIPTION

The QS32X384 provides a set of twenty high-speed CMOS TTLcompatible 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°C to +85°C.



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### INDUSTRIAL TEMPERATURE RANGE

# JANUARY 2000

### **PIN CONFIGURATION**

	г		~ ~	_	1	
BEA		1	Ŭ	48	Ь	Vcc
B0	Ц	2		47	þ	B19
A0	Ц	3		46	þ	A19
A1	П	4		45	þ	A18
B1	Ц	5		44	þ	B18
B2	Ц	6		43	þ	B17
A2	П	7		42	þ	A17
А3	П	8		41		A16
В3	П	9		40	þ	B16
B4	П	10		39	Þ	B15
A4	П	11		38		A15
GND	Ц	12		37	þ	BEB
BEC		13		36	þ	Vcc
<b>B</b> 5		14		35		A14
A5		15		34		B14
A6		16		33	þ	A13
B6		17		32	þ	B13
B7		18		31		B12
A7		19		30	þ	A12
A8		20		29	þ	A11
B8	Γ	21		28	þ	B11
B9	Ц	22		27	Þ	B10
A9	П	23		26	þ	A10
GND	q	24		25	þ	BED

QVSOP TOP VIEW

### **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		Enable, 10 - 14

### INDUSTRIALTEMPERATURERANGE

# ABSOLUTE MAXIMUM RATINGS (1)

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
Ιουτ	DC Output Current	120	mA
Рмах	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.
- 2. Vcc Terminals.
- 3. All terminals except Vcc.

## CAPACITANCE

 $(T_A = +25^{\circ}C, f = 1.0MHz, V_{IN} = 0V, V_{OUT} = 0V)$ 

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

#### NOTE:

1. This parameter is guaranteed but not production tested.

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

BEA	BEB	B0 - B4	B15 - B19	Function
Н	Н	Hi-Z	Hi-Z	Disconnect
L	Н	A0 - A4	Hi-Z	Connect
Н	L	Hi-Z	A15 - A19	Connect
L	L	A0 - A4	A15 - A19	Connect
BEC	BED	B5 - B9	B10 - B14	Function
Н	Н	Hi-Z	Hi-Z	Disconnect
L	Н	A5 - A9	Hi-Z	Connect
Н	L	Hi-Z	A10 - A14	Connect
L	L	A5 - A9	A10 - A14	Connect

#### NOTE:

1. H = HIGH Voltage Level

- L = LOW Voltage Level
- X = Don't care
- Z = High-Impedence

# DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified: Industrial: TA = -40°C to +85°C, Vcc =  $5.0V \pm 5\%$ 

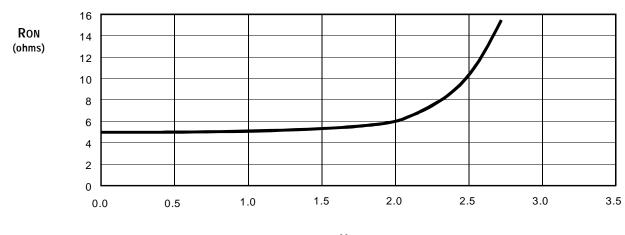
Symbol	Parameter	Test Conditions	Min.	Тур. <sup>(1)</sup>	Мах.	Unit
Vih	Input HIGH Voltage	Guaranteed Logic HIGH for Control Pins	2	_	—	V
VIL	Input LOW Voltage	Guaranteed Logic LOW for Control Pins	-	—	0.8	V
lin	Input Leakage Current (Control Inputs)	$0V \le VIN \le Vcc$	—	±0.01	±1	μA
loz	Off-State Current (Hi-Z)	$0V \le VOUT \le Vcc$ , Switches OFF	—	±0.01	±1	μA
Ron	Switch ON Resistance	Vcc = Min., VIN = 0V, ION = 30mA	-	5	7	Ω
Ron	Switch ON Resistance	Vcc = Min., VIN = 2.4V, ION = 15mA	-	10	15	Ω
Vp	Pass Voltage <sup>(2)</sup>	Vcc = 5V, Iout = -5µA	3.7	4	4.2	V

NOTES:

1. Typical values are at Vcc = 5.0V, TA =  $25^{\circ}C$ .

2. Pass voltage is guaranteed but not production tested.

## TYPICAL ON RESISTANCE vs Vin AT Vcc = 5V



VIN (Volts)

# **POWER SUPPLY CHARACTERISTICS**

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Max.	Unit
lcco	Quiescent Power Supply Current	Vcc = Max., VIN = GND or Vcc, f = 0	3	mA
ΔΙcc	Power Supply Current per Control Input HIGH (2)	Vcc = Max., VIN = 3.4V, f = 0	2.5	mA
Ісср	Dynamic Power Supply Current per MHz <sup>(3)</sup>	Vcc = Max., A and B pins open	0.25	mA/MHz
		Control Input Toggling at 50% Duty Cycle		

#### NOTES:

1. For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.

2. Per TLL driven input (VIN = 3.4V, control inputs only). A and B pins do not contribute to ∆Icc.

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

#### $T_A = -40^{\circ}C \text{ to } +85^{\circ}C, V_{CC} = 5.0V \pm 5\%$

CLOAD = 50pF, RLOAD =  $500\Omega$  unless otherwise noted.

Symbol	Parameter	Min. <sup>(1)</sup>	Тур.	Max.	Unit
<b>t</b> PLH	Data Propagation Delay <sup>(2,4)</sup>			0.25 <sup>(3)</sup>	
<b>t</b> PHL	Ax to Bx, Bx to Ax	—		0.23	ns
tPZL	Switch Turn-on Delay	1 5		4 F	
<b>t</b> PZH	BEn to Ax, Bx	1.5		6.5	ns
tPLZ	Switch Turn-off Delay <sup>(2)</sup>	1 5		EE	
tphz	BEn to Ax, Bx	1.5	_	5.5	ns

NOTES:

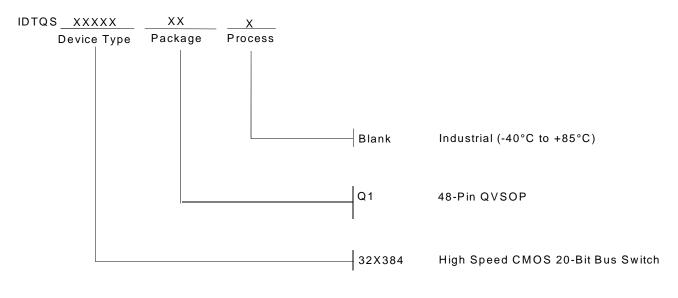
1. Minimums are guaranteed but not production tested.

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 CL = 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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