



# QUICKSWITCH® PRODUCTS

## HIGH-SPEED CMOS 20-BIT LOW RESISTANCE, ACTIVE HIGH BUS SWITCH WITH FLOW-THROUGH PINOUT

**IDTQS32XR862**

### FEATURES:

- Enhanced N channel FET with no inherent diode to Vcc
- $2.5\Omega$  bidirectional switches connect inputs to outputs
- Zero propagation delay, zero ground bounce
- Undershoot clamp diodes on all switch and control pins
- Active Low and High enable controls
- Available in 48-pin QVSOP Package

### DESCRIPTION:

The QS32XR862 provides two sets of ten high-speed CMOS, TTL-compatible, active high, low resistance bus switches. The very low ON resistance ( $2.5\Omega$ ) of the QS32XR862 allows inputs to be connected to outputs without adding propagation delay and without generating additional ground bounce noise. The switches are controlled by independent active Low Enable ( $\overline{BE}$ ) and active High Enable (BE) controls for each set.

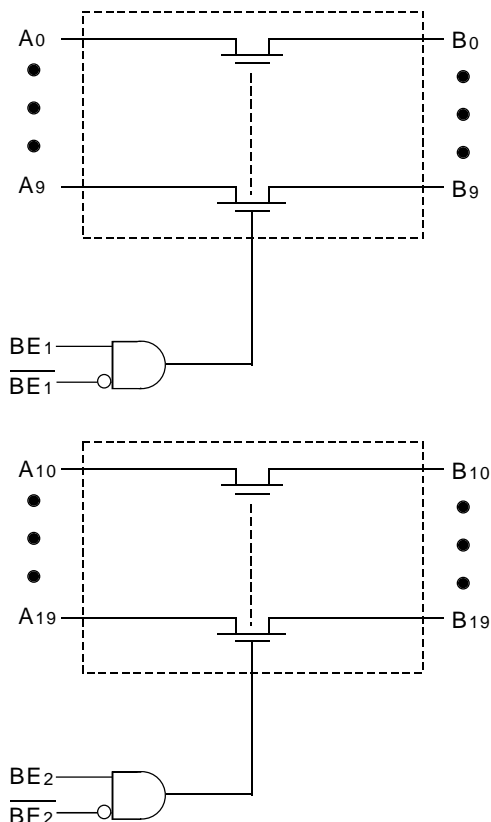
The QS32XR862 is ideal for switching digital buses as well as for hot plug buffering and 5V to 3.3V conversion. The low ON resistance of the QS32XR862 makes it ideal for PCI hot-docking applications.

The QS32XR862 is characterized for operation at  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

### APPLICATIONS

- Hot-swapping and hot-docking (low RON resistance for PCI and Compact PCI applications)
- Voltage translation (5V to 3.3V)
- Power conservation
- Capacitance reduction and isolation
- Applications requiring Low resistance and active High enabling
- Bus isolation
- Clock gating

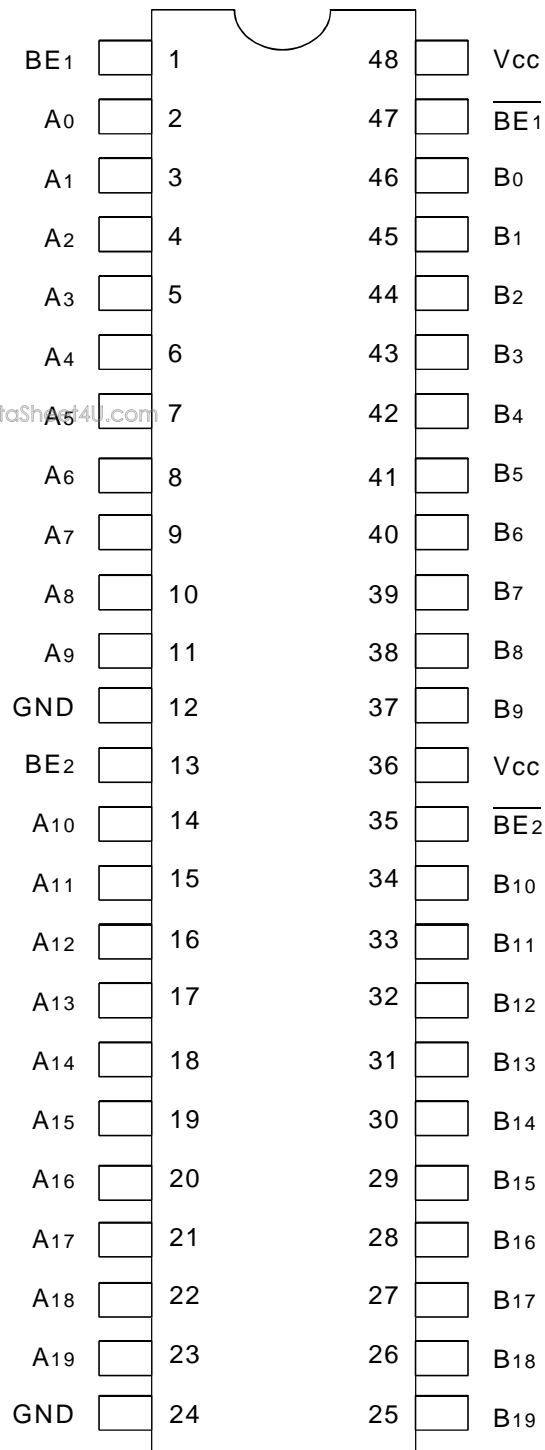
### FUNCTIONAL BLOCK DIAGRAM



**INDUSTRIAL TEMPERATURE RANGE**

**NOVEMBER 1999**  
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## PIN CONFIGURATION



QVSOP  
TOP VIEW

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

Symbol	Description	Max.	Unit
V <sub>TERM</sub> <sup>(2)</sup>	Supply Voltage to Ground	- 0.5 to +7	V
V <sub>TERM</sub> <sup>(3)</sup>	DC Switch Voltage V <sub>s</sub>	- 0.5 to +7	V
V <sub>TERM</sub> <sup>(3)</sup>	DC Input Voltage V <sub>IN</sub>	- 0.5 to +7	V
V <sub>AC</sub>	AC Input Voltage (pulse width ≤20ns)	-3	V
I <sub>OUT</sub>	DC Output Current	120	mA
P <sub>MAX</sub>	Maximum Power Dissipation	.5	W
T <sub>STG</sub>	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.
- V<sub>cc</sub> Terminals.
- All terminals except V<sub>cc</sub>.

## CAPACITANCE

(T<sub>A</sub> = +25°C, f = 1.0MHz, V<sub>IN</sub> = 0V, V<sub>OUT</sub> = 0V)

Pins	Typ.	Max. <sup>(1)</sup>	Unit
Control Inputs	3	4	pF
Quickswitch Channels (Switch OFF)	5	6	pF

### NOTE:

- This parameter is guaranteed but not production tested.

## PIN DESCRIPTION

Pin Names	I/O	Description
BE	I	Active LOW Bus Enable
BE	I	Active HIGH Bus Enable
A <sub>0</sub> - A <sub>19</sub>	I/O	Bus A
B <sub>0</sub> - B <sub>19</sub>	I/O	Bus B

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

BE <sub>1</sub>	BE <sub>1</sub>	A <sub>0</sub> - A <sub>9</sub>	Function
L	L	Hi-Z	Disconnect
L	H	Hi-Z	Disconnect
H	L	B <sub>0</sub> - B <sub>9</sub>	Connect
H	H	Hi-Z	Disconnect

BE <sub>2</sub>	BE <sub>2</sub>	A <sub>10</sub> - A <sub>19</sub>	Function
L	L	Hi-Z	Disconnect
L	H	Hi-Z	Disconnect
H	L	B <sub>10</sub> - B <sub>19</sub>	Connect
H	H	Hi-Z	Disconnect

### NOTE:

- H = HIGH Voltage Level  
L = LOW Voltage Level  
Z = High-Impedence

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial:  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$

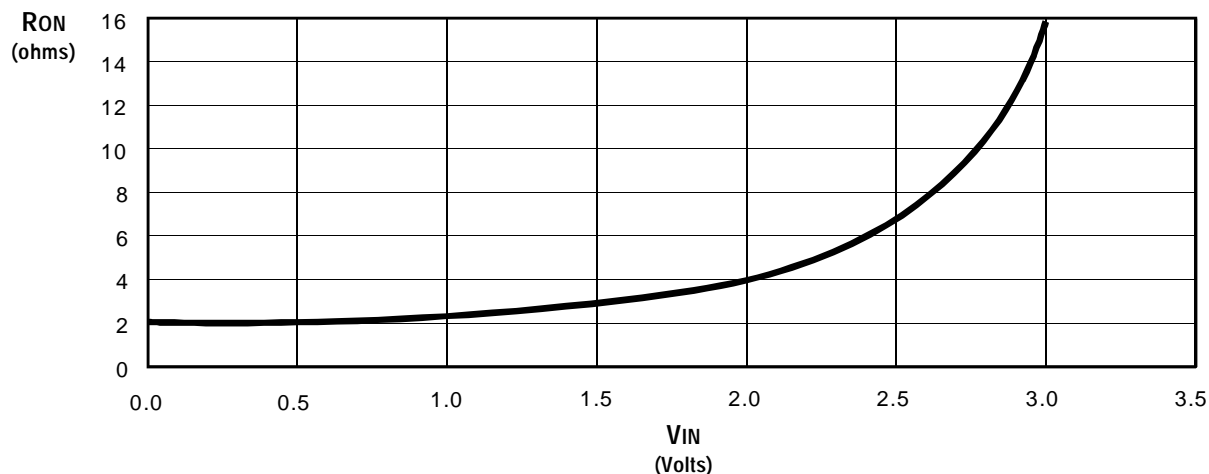
Symbol	Parameter	Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit
$V_{IH}$	Input HIGH Voltage	Guaranteed Logic HIGH for Control Pins	2	—	—	V
$V_{IL}$	Input LOW Voltage	Guaranteed Logic LOW for Control Pins	—	—	0.8	V
$I_{IN}$	Input Leakage Current (Control Inputs)	$0\text{V} \leq B_{En}, \overline{B}_{En} \leq V_{CC}$	—	$\pm 0.01$	$\pm 1$	$\mu\text{A}$
$I_{OZ}$	Off-State Current (Hi-Z)	$0\text{V} \leq V_{OUT} \leq V_{CC}$ , Switches OFF	—	$\pm 0.01$	$\pm 1$	$\mu\text{A}$
$R_{ON}$	Switch ON Resistance	$V_{CC} = \text{Min.}$ , $V_{IN} = 0\text{V}$ , $I_{ON} = 30\text{mA}$	—	2.5	5	$\Omega$
$R_{ON}$	Switch ON Resistance	$V_{CC} = \text{Min.}$ , $V_{IN} = 2.4\text{V}$ , $I_{ON} = 15\text{mA}$	—	4	8.5	$\Omega$
$V_P$	Pass Voltage <sup>(2)</sup>	$V_{IN} = V_{CC} = 5\text{V}$ , $I_{OUT} = -5\mu\text{A}$	3.7	4	4.3	V

### NOTES:

1. Typical values are at  $V_{CC} = 5.0\text{V}$ ,  $T_A = 25^{\circ}\text{C}$ .

2. Pass voltage is guaranteed but not production tested.

## TYPICAL ON RESISTANCE vs $V_{IN}$ AT $V_{CC} = 5\text{V}$



## POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Typ. <sup>(2)</sup>	Max.	Unit
I <sub>ccQ</sub>	Quiescent Power Supply Current	V <sub>CC</sub> = Max., BEn = GND or V <sub>CC</sub> , f = 0	0.2	6	μA
ΔI <sub>cc</sub>	Power Supply Current per Control Input HIGH <sup>(3)</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>(4)</sup>	V <sub>CC</sub> = Max., A and B pins open Control Inputs Toggling at 50% Duty Cycle	—	0.25	mA/MHz

### NOTES:

- For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.
- Typical values are at V<sub>CC</sub> = 5.0V, T<sub>A</sub> = 25°C.
- Per TLL driven input (V<sub>IN</sub> = 3.4V, control inputs only). A and B pins do not contribute to ΔI<sub>cc</sub>.
- 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.

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## SWITCHING CHARACTERISTICS OVER OPERATING RANGE

T<sub>A</sub> = -40°C to +85°C, V<sub>CC</sub> = 5.0V ± 10%

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> t <sub>PHL</sub>	Data Propagation Delay <sup>(2,3)</sup> A <sub>n</sub> to/from B <sub>n</sub>	—	—	0.12	ns
t <sub>PZL</sub> t <sub>PZH</sub>	Switch Turn-on Delay BEn or BEn to A <sub>n</sub> /B <sub>n</sub>	1.5	—	5.6	ns
t <sub>PLZ</sub> t <sub>PHZ</sub>	Switch Turn-off Delay <sup>(2)</sup> BEn to A <sub>n</sub> /B <sub>n</sub>	1.5	—	4.5	ns

### NOTES:

- Minimums are guaranteed but not production tested.
- This parameter is guaranteed but not production 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 alone is of the order of 0.12ns for C<sub>L</sub> = 50pF. 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

IDTQS	XXXXX	XX	X		
Device Type	Package	Process			
			Blank	Industrial (-40°C to +85°C)	
			Q1	QVSOP	
			32XR862	High Speed CMOS 20-Bit Low Resistance, Active High Bus Switch with Flow-Through Pinout	

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