



# QUICKSWITCH® PRODUCTS HIGH-SPEED CMOS QUICKSWITCH 16:8 MULTIPLEXER

IDTQS32390

## FEATURES:

- Enhanced N channel FET with no inherent diode to Vcc
- 16:8 multiplexer function with zero delay
- 5Ω bidirectional switches connect inputs to outputs
- Zero propagation delay, zero ground bounce
- Undershoot clamp diodes on all switch and control inputs
- Direct bidirectional connection for mux, demux
- 25Ω resistors for low noise
- Available in QSOP package

## APPLICATIONS:

- Video, audio, graphics switching, muxing
- Hot-swapping, hot-docking
- Voltage translation (5V to 3.3V)

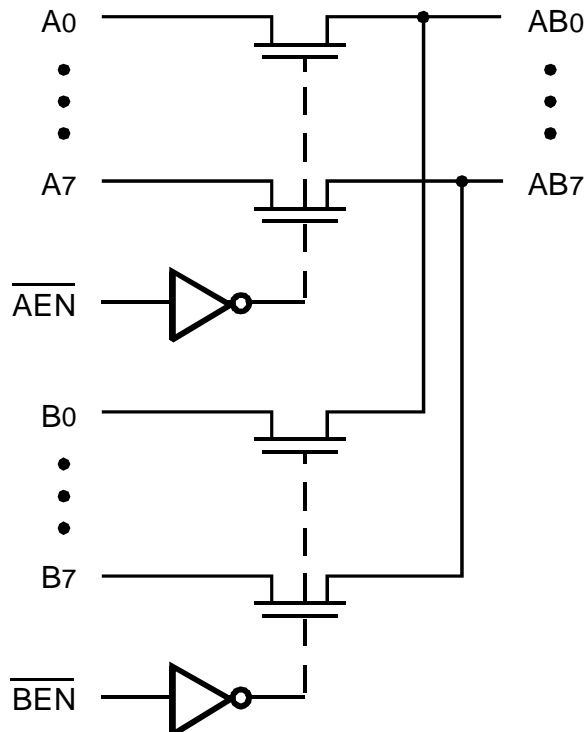
## DESCRIPTION:

The QS32390 provides a 16:8 multiplexer logic switch. The QS32390 has an internal 25Ω resistor to reduce reflection noise in high-speed applications. The enable inputs connect one of two inputs to the common I/O pin, respectively. The multiplexer function can be used to select and route logic signals for zero delay, isolate bus capacitance, form crossbar switches, etc.

Mux/Demux devices provide an order of magnitude faster speed than equivalent logic devices.

The QS32390 is characterized for operation at -40°C to +85°C.

## FUNCTIONAL BLOCK DIAGRAM

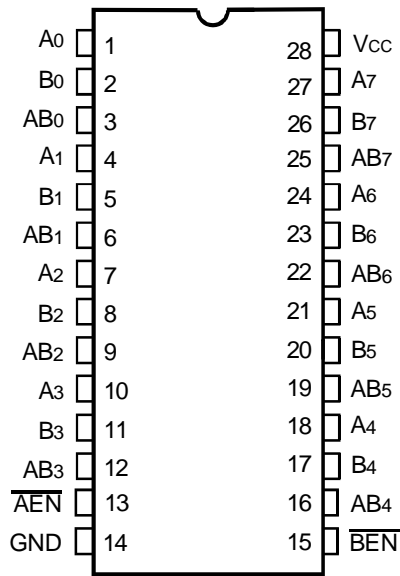


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**INDUSTRIAL TEMPERATURE RANGE**

**MARCH 2002**

## PIN CONFIGURATION



QSOP  
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

### NOTE:

- 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 = 1.0MHz, VIN = 0V, VOUT = 0V)

Pins		Typ.	Max. <sup>(1)</sup>	Unit
Control Pins		4	5	pF
Quickswitch Channels (Switch OFF)	Demux	5	7	pF
	Mux	9	10	

### NOTE:

- This parameter is measured at characterization but not tested.

## PIN DESCRIPTION

Pin Names	I/O	Description
A0 - A9	I/O	Bus A
B0 - B9	I/O	Bus B
AEN, BEN	I	Bus Switch Enable

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

AEN	BEN	A0 - A9	B0 - B9	Function
H	H	Off	Off	Disconnect
L	H	On	Off	A to AB
H	L	Off	On	B to AB
L	L	On	On	A, B to AB

### NOTE:

- H = HIGH Voltage Level  
L = LOW Voltage Level

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

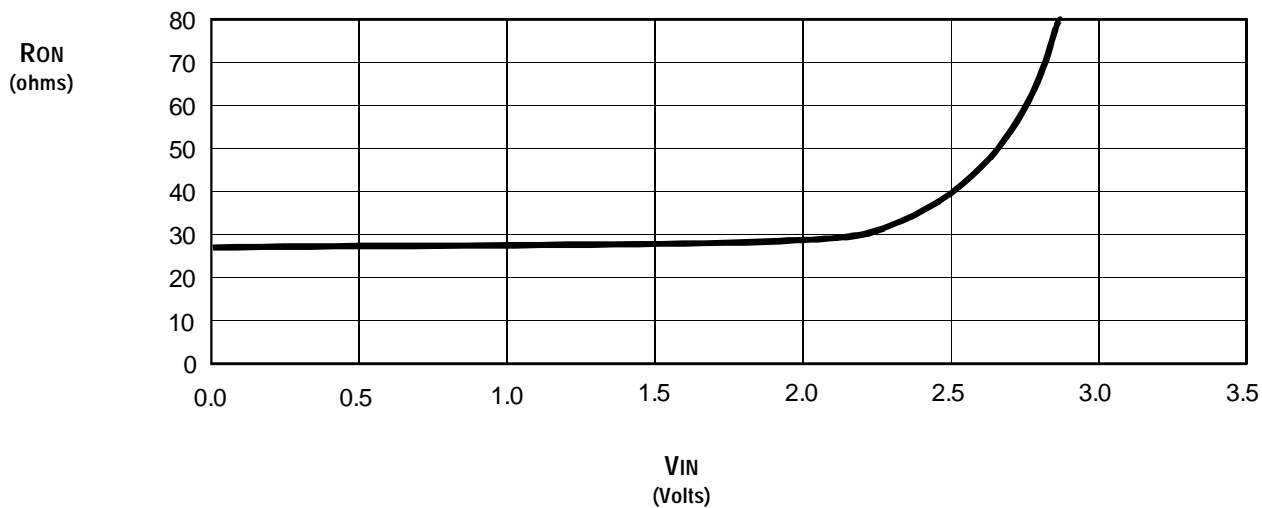
Industrial:  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 5\%$

Symbol	Parameter	Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit
$V_{IH}$	Input HIGH Level	Guaranteed Logic HIGH for Control Pins	2	—	—	V
$V_{IL}$	Input LOW Level	Guaranteed Logic LOW for Control Pins	—	—	0.8	V
$I_{IN}$	Input Leakage Current (Control Inputs) <sup>(2)</sup>	$0\text{V} \leq V_{IN} \leq V_{CC}$	—	—	$\pm 1$	$\mu\text{A}$
$I_{OZ}$	Off-State Output Current (Hi-Z)	$0\text{V} \leq V_{OUT} \leq V_{CC}$ , Switches OFF	—	—	$\pm 1$	$\mu\text{A}$
$R_{ON}^{(3)}$	Switch ON Resistance	$V_{CC} = \text{Min.}, V_{IN} = 0\text{V}, I_{ON} = 30\text{mA}$	15	20	35	$\Omega$
		$V_{CC} = \text{Min.}, V_{IN} = 2.4\text{V}, I_{ON} = 15\text{mA}$	15	19	40	
$V_P$	Pass Voltage <sup>(2)</sup>	$V_{IN} = V_{CC} = 5\text{V}, I_{OUT} = -5\mu\text{A}$	3.7	4	4.2	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.
3.  $R_{OUT}$  changed on March 8, 2002. See rear page for more information.

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



## 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	μA
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	1.5	mA
I <sub>CCD</sub>	Dynamic Power Supply Current per MHz <sup>(3)</sup>	V <sub>CC</sub> = Max., A, B, and AB 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.
- Per TLL driven input (V<sub>IN</sub> = 3.4V, control inputs only). A, B, and AB 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, B, and AB I/Os 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%;

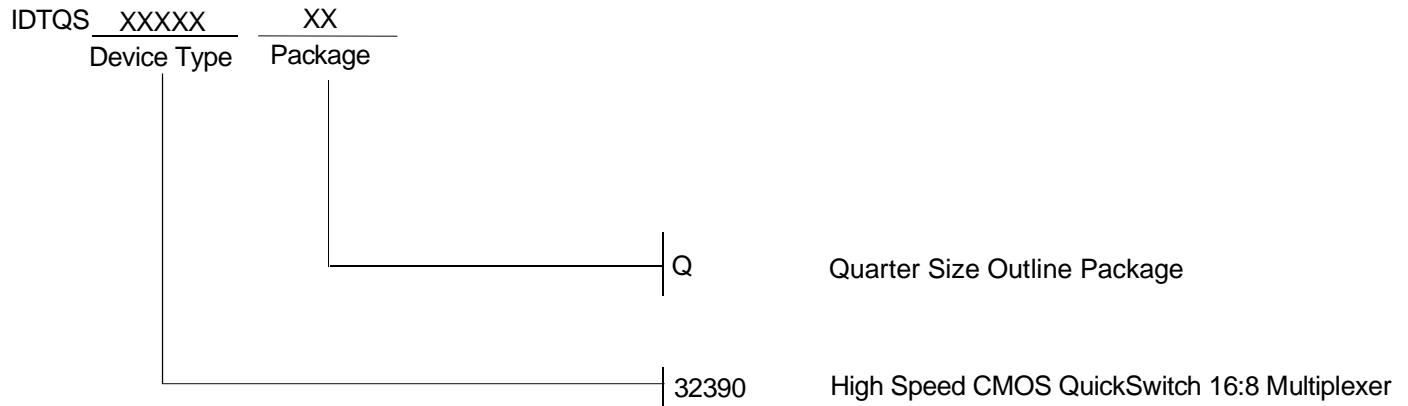
C<sub>LOAD</sub> = 50pF, R<sub>LOAD</sub> = 500Ω unless otherwise noted.

Symbol	Parameter	Min. <sup>(1)</sup>	Typ.	Max.	Unit
t <sub>PLH</sub>	Data Propagation Delay <sup>(2,4)</sup>	—	—	1.25 <sup>(3)</sup>	ns
t <sub>PHL</sub>	AxBx to CxDx, CxDx to AxBx	—	—	—	—
t <sub>PZH</sub>	Switch Turn-on Delay	1.5	—	7.5	ns
t <sub>PZL</sub>	$\overline{BE}$ to Ax, Bx, Cx, Dx	—	—	—	—
t <sub>PHZ</sub>	Switch Turn-off Delay <sup>(2)</sup>	—	—	5.5	ns
t <sub>PLZ</sub>	$\overline{BE}$ to Ax, Bx, Cx, Dx	—	—	—	—

### NOTES:

- Minimums are guaranteed but not production tested.
- This parameter is guaranteed but not production tested.
- The time constant for the switch alone is of the order of 1.25ns for C<sub>L</sub> = 50pF.
- 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



As per PCN L0201-02, the Output Resistance (R<sub>ON</sub>) specifications have changed as of March 8, 2002. The original specifications were:

Parameter	Description	Min.	Typ.	Max.	Unit
RON	V <sub>CC</sub> = Min, V <sub>IN</sub> = 0V, I <sub>ON</sub> = 30mA	20	28	40	Ω
	V <sub>CC</sub> = Min, V <sub>IN</sub> = 2.4V, I <sub>ON</sub> = 15mA	24	35	48	



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