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

IDTQS3390

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
– Low power CMOS proprietary technology
– Undershoot clamp diodes on all switch and control pins
– Direct bidirectional connection for mux, demux
– Available in SOIC and QSOP Packages

APPLICATIONS

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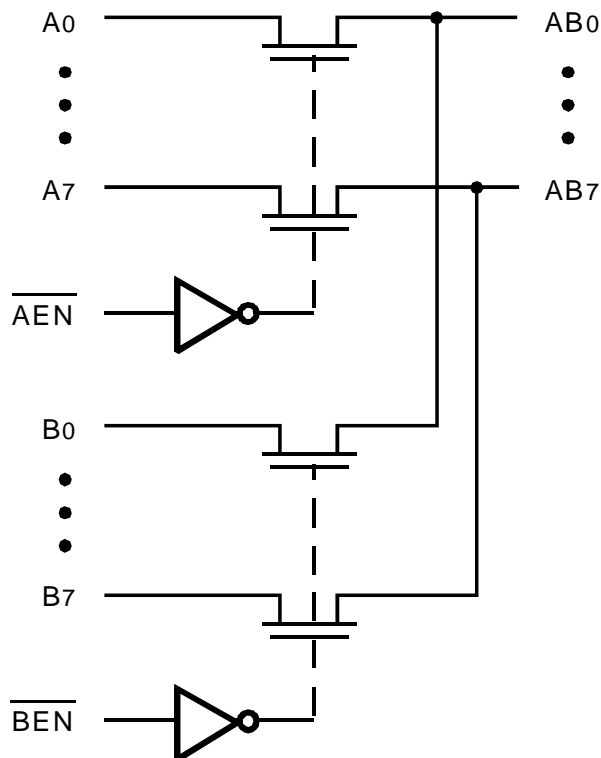– Voltage translation (5V to 3.3V)

DESCRIPTION

The QS3390 provides a 16:8 multiplexer logic switch. The low ON resistance (5Ω) of the QS3390 allows inputs to be connected to the outputs without adding propagation delay and without generating additional ground bounce noise.
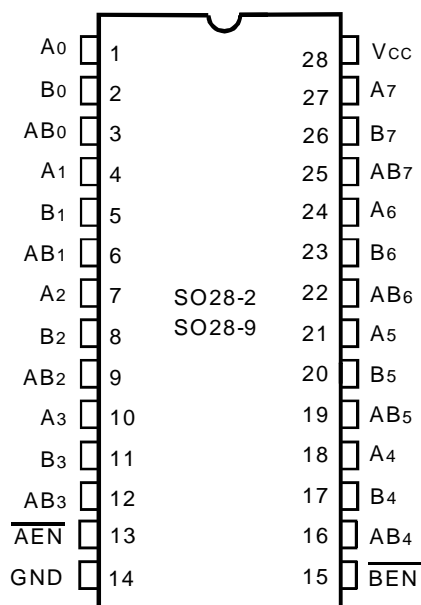
Mux/Demux devices provide an order of magnitude faster speed than equivalent logic devices.

The QS3390 is characterized for operation at -40°C to +85°C.

FUNCTIONAL BLOCK DIAGRAM

INDUSTRIAL TEMPERATURE RANGE

MARCH 2000

PIN CONFIGURATION

A_0	1		28	V_{CC}
B_0	2		27	A_7
AB_0	3		26	B_7
A_1	4		25	AB_7
B_1	5		24	A_6
AB_1	6		23	B_6
A_2	7	SO28-2	22	AB_6
B_2	8	SO28-9	21	A_5
AB_2	9		20	B_5
A_3	10		19	AB_5
B_3	11		18	A_4
AB_3	12		17	B_4
$\overline{AEN}$	13		16	AB_4
GND	14		15	$\overline{BEN}$

SOIC/ QSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS [1]

Symbol	Description	Max.	Unit
V_{TERM}[2]	Supply Voltage to Ground	– 0.5 to +7	V
V_{TERM}[3]	DC Switch Voltage V_S	– 0.5 to +7	V
V_{TERM}[3]	DC Input Voltage V_{IN}	– 0.5 to +7	V
V_{AC}	AC Input Voltage (pulse width ≤20ns)	-3	V
I_{OUT}	DC Output Current	120	mA
P_{MAX}	Maximum Power Dissipation (T_A = 85°C)	0.5	W
T_{STG}	Storage Temperature	– 65 to +150	°C

NOTES:
1. 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

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

Pins		Typ.	Max. [1]	Unit
Control Inputs		4	5	pF
Quickswitch Channels	Demux	5	7	pF
(Switch OFF)	Mux	9	10	pF

NOTE:
1. This parameter is guaranteed but not production tested.

PIN DESCRIPTION

Pin Names	I/O	Description
A_0-A_9	I/O	Bus A
B_0-B_9	I/O	Bus B
$\overline{AEN}$, $\overline{BEN}$	I	Bus Switch Enable

FUNCTION TABLE[1]

$\overline{AEN}$	$\overline{BEN}$	A_0 - A_9	B_0 - B_9	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:
1. H = HIGH Voltage Level
   L = LOW Voltage Level

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

**Following Conditions Apply Unless Otherwise Specified:**
Industrial: 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 Pins	2	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for Control Pins	—	—	0.8	V
I_{IN}	Input Leakage Current (Control Inputs)	0V ≤ V_{IN} ≤ V_{CC}	—	—	±1	µA
I_{OZ}	Off-State Current (Hi-Z)	0V ≤ V_{OUT} ≤ V_{CC}	—	—	±1	µA
R_{ON}	Switch ON Resistance	V_{CC} = Min., V_{IN} = 0V, I_{ON} = 30mA	—	5	7	Ω
R_{ON}	Switch ON Resistance	V_{CC} = Min., V_{IN} = 2.4V, I_{ON} = 15mA	—	10	15	Ω
V_P	Pass Voltage [2]	V_{IN} = V_{CC} = 5V, I_{OUT} = -5µA	3.7	4	4.2	V

NOTES:
1. Typical values are at V_{CC} = 5.0V, T_A = 25°C.
2. Pass voltage is guaranteed but not production tested.

TYPICAL ON RESISTANCE vs V_{IN} AT V_{CC} = 5V
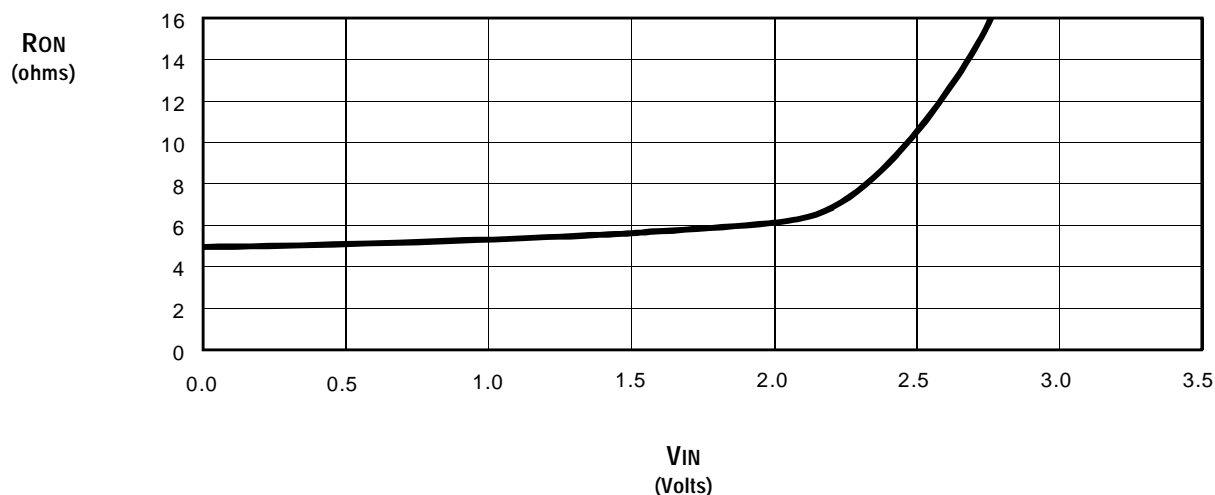
POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions[1]	Max.	Unit
I_{CCQ}	Quiescent Power Supply Current	V_{CC} = Max., V_{IN} = GND or V_{CC}, f = 0	3	µA
ΔI_{CC}	Power Supply Current per Control Input HIGH [2]	V_{CC} = Max., V_{IN} = 3.4V, f = 0	1.5	mA
I_{CCD}	Dynamic Power Supply Current per MHz[3]	V_{CC} = Max., A, B, and AB 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 TLL driven input (V_{IN} = 3.4V, control inputs only). A, B, and AB 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. 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_A = -40°C to +85°C, V_{CC} = 5.0V ± 5%

C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.

Symbol	Parameter	Min. [1]	Typ.	Max.	Unit
t_{PLH} t_{PHL}	Data Propagation Delay [2,4] AxBx to CxDx, CxDx to AxBx	—	—	0.25 [3]	ns
t_{PZL} t_{PZH}	Switch Turn-on Delay $\overline{BE}$ to Ax, Bx, Cx, Dx	1.5	—	6.5	ns
t_{PLZ} t_{PHZ}	Switch Turn-off Delay [2] $\overline{BE}$ to Ax, Bx, Cx, Dx	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_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 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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IDTQS   XXXXX        XX        X
        Device Type  Package   Process
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Blank	Industrial (-40°C to +85°C)
SO	Small Outline IC (SO28-2)
Q	Quarter Size Outline Package (SO28-9)
3390	High Speed CMOS QuickSwitch 16:8 Multiplexer