



# QUICKSWITCH® PRODUCTS HIGH-SPEED CMOS QUICKSWITCH 32:16 MUX/DEMUX

**IDTQS316233**

## FEATURES:

- Enhanced N channel FET with no inherent diode to Vcc
- 5Ω bidirectional switches connect inputs to outputs
- Zero propagation delay, zero ground bounce
- TTL-compatible input and output levels
- Undershoot clamp diodes on all switch and control inputs
- Available in SSOP and TSSOP packages

## APPLICATIONS:

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

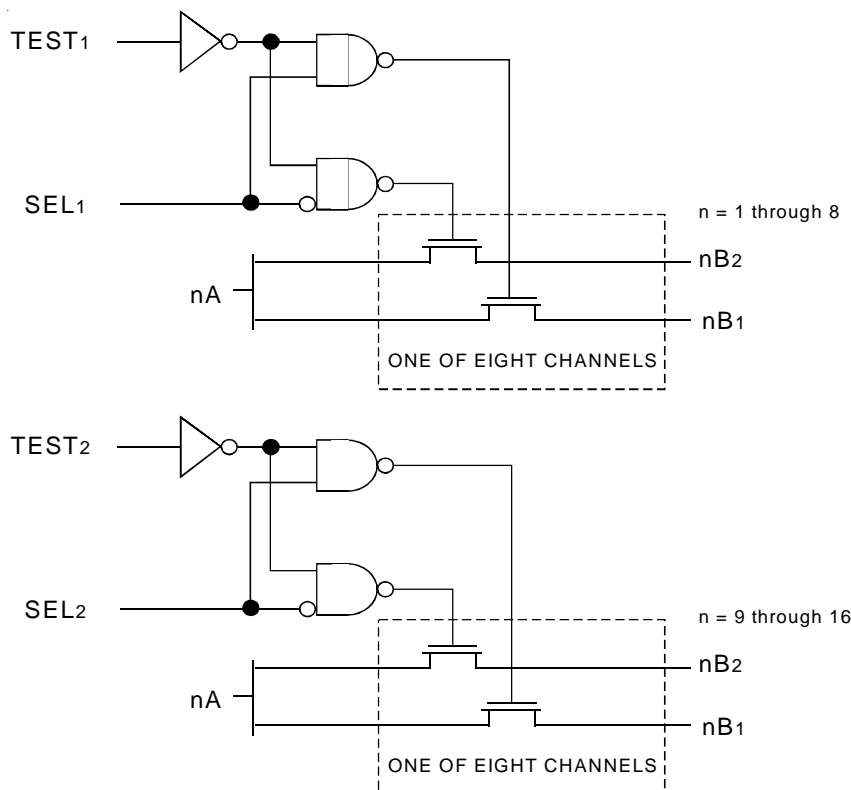
## DESCRIPTION:

The QS316233 is a 32-bit to 16-bit high-speed CMOS, TTL-compatible switch which can multiplex or demultiplex data. It can be used for memory interleaving where two memory banks need to be addressed simultaneously. It can also be used as two 16-bit to 8-bit multiplexers or as one 32-bit to 16-bit multiplexer. SELn inputs control the data flow. TESTn inputs control either one or two ports connection.

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

The QS316233 is characterized for operation at -40°C to +85°C.

## FUNCTIONAL BLOCK DIAGRAM

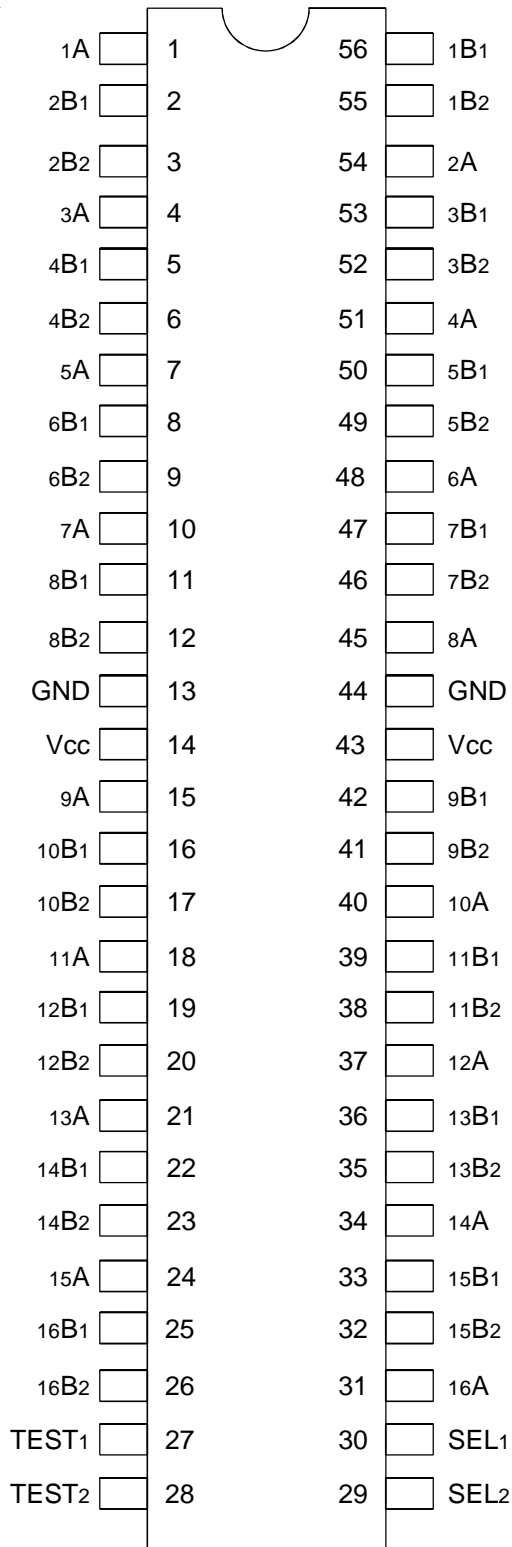


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INDUSTRIAL TEMPERATURE RANGE

NOVEMBER 2001

## PIN CONFIGURATION



SSOP/ TSSOP  
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 (T <sub>A</sub> = 85°C)	SSOP	0.93
		TSSOP	0.77
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 = 1MHz, V<sub>IN</sub> = 0V, V<sub>OUT</sub> = 0V)

Pins		Typ.	Max. <sup>(1)</sup>	Unit
Control Inputs		5	5.5	pF
Quickswitch Channels (Switch OFF)	Mux	8.5	10	pF
	Demux	6	7	

### NOTE:

- This parameter is guaranteed but not production tested.

## PIN DESCRIPTION

Pin Names	I/O	Description
xA	I/O	Bus A
xB1, xB2	I/O	Bus B
SEL1, SEL2	I	Data Select
TEST1, TEST2	I	Port Select

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

### n = 1 through 8

SEL1	TEST1	xA	Function
L	L	xB1	xA to xB1
H	L	xB2	xA to xB2
X	H	xB1, xB2	xA to xB1 and xB2

### n = 9 through 16

SEL2	TEST2	xA	Function
L	L	xB1	xA to xB1
H	L	xB2	xA to xB2
X	H	xB1, xB2	xA to xB1 and xB2

### NOTE:

- H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Don't Care

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

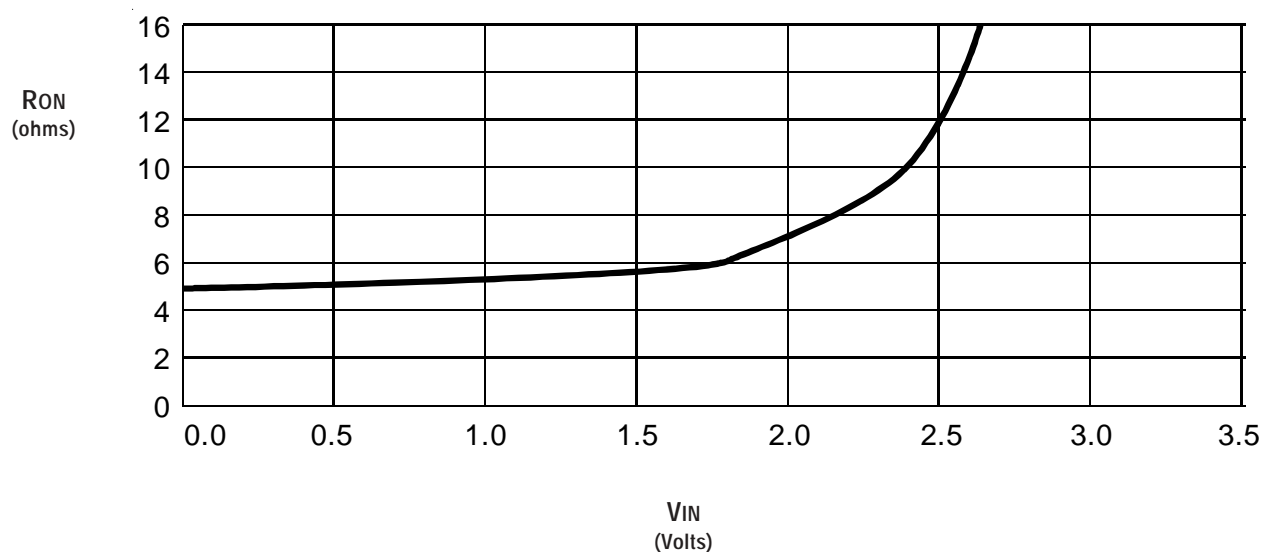
Industrial:  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ,  $V_{CC} = 5\text{V} \pm 10\%$

Symbol	Parameter	Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit
$V_{IH}$	Input HIGH Voltage	Guaranteed Logic HIGH for Control Inputs	2	—	—	V
$V_{IL}$	Input LOW Voltage	Guaranteed Logic LOW for Control Inputs	—	—	0.8	V
$I_{IN}$	Input Leakage Current (Control Inputs)	$0\text{V} \leq V_{IN} \leq V_{CC}$	—	—	$\pm 1$	$\mu\text{A}$
$I_{OZ}$	Off-State Current (Hi-Z)	$0\text{V} \leq V_{OUT} \leq V_{CC}$	—	—	$\pm 1$	$\mu\text{A}$
$R_{ON}$	Switch ON Resistance	$V_{CC} = \text{Min.}, V_{IN} = 0\text{V}, I_{ON} = 30\text{mA}$	—	5	7	$\Omega$
		$V_{CC} = \text{Min.}, V_{IN} = 2.4\text{V}, I_{ON} = 15\text{mA}$	—	10	12	
$V_P$	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:

- Typical values are at  $V_{CC} = 5\text{V}$  and  $T_A = 25^{\circ}\text{C}$ .
- 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>	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	3	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 Inputs Toggling @ 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 TTL-driven input (V<sub>IN</sub> = 3.4V). 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.

## SWITCHING CHARACTERISTICS OVER OPERATING RANGE

T<sub>A</sub> = -40°C to +85°C, V<sub>CC</sub> = 5V ± 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)</sup> xA to xBx, xBx to xA	—	—	0.25 <sup>(3)</sup>	ns
t <sub>BX</sub>	Switch Multiplex Delay SEL to xA	1.5	—	5.3	ns
t <sub>PZL</sub> t <sub>PZH</sub>	Switch Turn-On Delay SEL, TEST to xBx	1.5	—	5.2	ns
t <sub>PLZ</sub> t <sub>PHZ</sub>	Switch Turn-Off Delay <sup>(2)</sup> SEL, TEST to xBx	1.5	—	5.3	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 0.25ns at 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)
				PV PA	Shrink Small Outline Package Thin Shrink Small Outline Package
				316233	High Speed CMOS QuickSwitch 32:16 Mux/Demux



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