



**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 pins
- Available in 56-pin SSOP and TSSOP Packages

**APPLICATIONS**

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

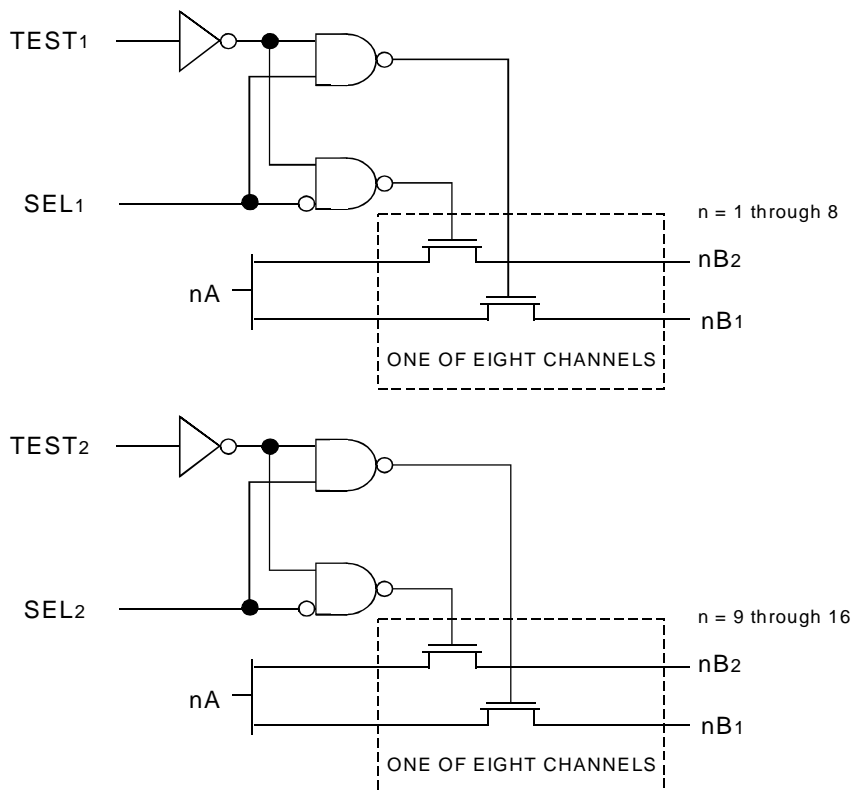
**DESCRIPTION:**

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.

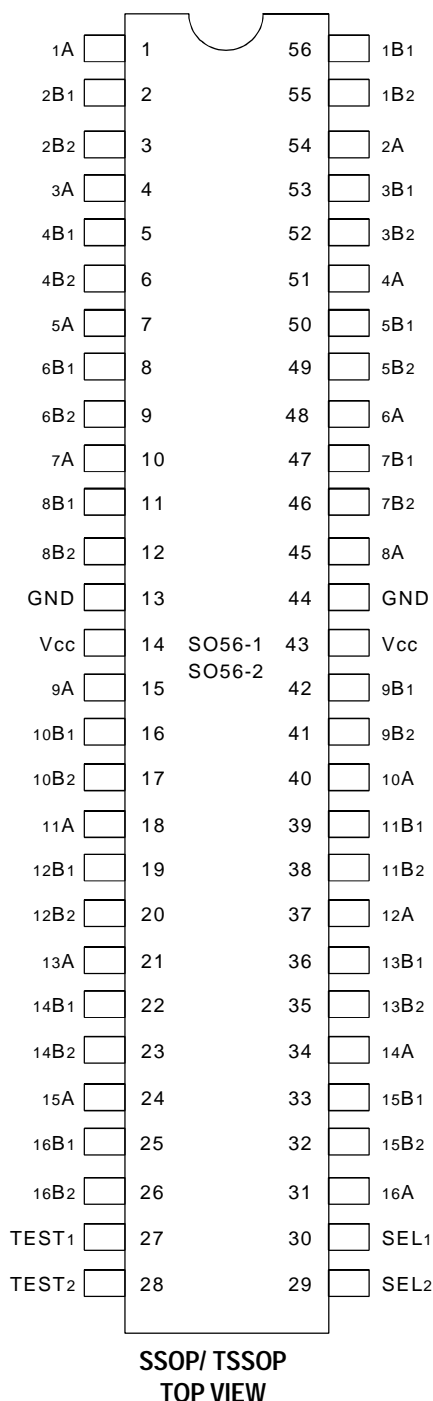
Mux/Demux devices provide an order of magnitude faster speed than equivalent logic devices.

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

**FUNCTIONAL BLOCK DIAGRAM**



## PIN CONFIGURATION



## 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	SSOP	.93	W
	Dissipation (T <sub>A</sub> = 85°C)	TSSOP	.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 = 1.0MHz, 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	pF

### NOTE:

- This parameter is guaranteed but not production tested.

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

n = 1 through 8

SEL <sub>1</sub>	TEST <sub>1</sub>	nA	Function
L	L	nB <sub>1</sub>	nA to nB <sub>1</sub>
H	L	nB <sub>2</sub>	nA to nB <sub>2</sub>
X	H	nB <sub>1</sub> , nB <sub>2</sub>	nA to nB <sub>1</sub> and nB <sub>2</sub>

n = 9 through 16

SEL <sub>2</sub>	TEST <sub>2</sub>	nA	Function
L	L	nB <sub>1</sub>	nA to nB <sub>1</sub>
H	L	nB <sub>2</sub>	nA to nB <sub>2</sub>
X	H	nB <sub>1</sub> , nB <sub>2</sub>	nA to nB <sub>1</sub> and nB <sub>2</sub>

### NOTE:

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

## PIN DESCRIPTION

Pin Names	I/O	Description
nA	I/O	Bus A
nB <sub>1</sub> , nB <sub>2</sub>	I/O	Bus B
SEL <sub>1</sub> , SEL <sub>2</sub>	I	Data Select
TEST <sub>1</sub> , TEST <sub>2</sub>	I	Port Select

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

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

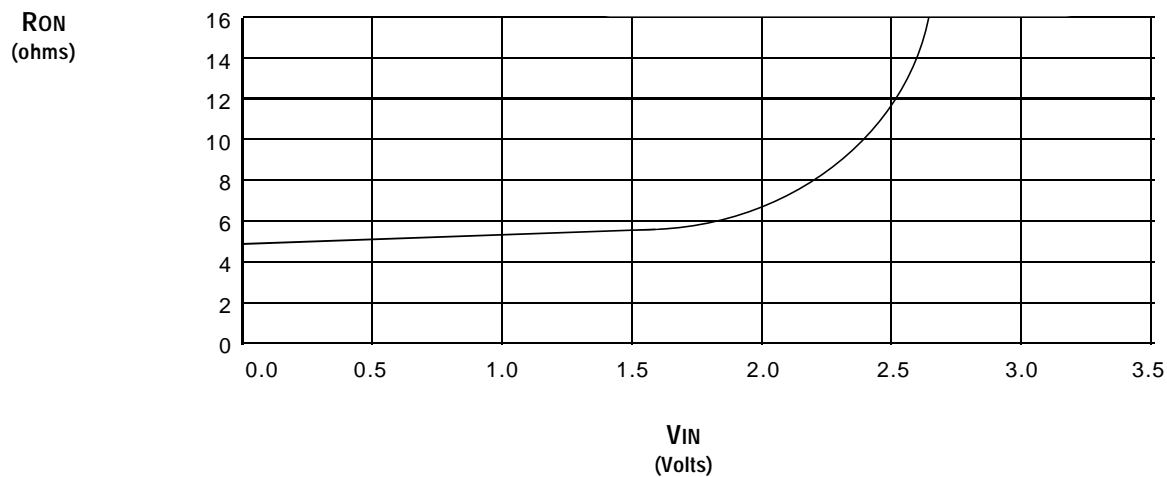
Symbol	Parameter	Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit
$V_{IH}$	Input HIGH Voltage	Guaranteed Logic HIGH for Control Pins	2	—	—	V
$V_{IL}$	Input LOW Voltage	Guaranteed Logic LOW for Control Pins	—	—	0.8	V
$I_{IN}$	Input Leakage Current (Control Inputs)	$0\text{V} \leq V_{IN} \leq V_{CC}$	—	—	$\pm 1$	$\mu\text{A}$
$I_{OZ}$	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	$\Omega$
$R_{ON}$	Switch ON Resistance	$V_{CC} = \text{Min.}, V_{IN} = 2.4\text{V}, I_{ON} = 15\text{mA}$	—	10	12	$\Omega$
$V_P$	Pass Voltage <sup>(2)</sup>	$V_{IN} = V_{CC} = 5\text{V}, I_{OUT} = -5\mu\text{A}$	3.7	4	4.2	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.

## 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 Input 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). 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> = 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>(2,4)</sup> nA to nBx, nBx to nA	—	—	0.25 <sup>(3)</sup>	ns
t <sub>BX</sub>	Switch Multiplex Delay SEL to nA	1.5	—	5.3	ns
t <sub>PZL</sub> t <sub>PZH</sub>	Switch Turn-on Delay SEL, TEST to nBx	1.5	—	5.2	ns
t <sub>PLZ</sub> t <sub>PHZ</sub>	Switch Turn-off Delay <sup>(2)</sup> SEL, TEST to nBx	1.5	—	5.3	ns

### 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 0.25ns 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

IDTQS	XXXXX	XX	X		
	Device Type	Package	Process		
				Blank	Industrial (-40°C to +85°C)
				PV	Shrink Small Outline Package (SO56-1)
				PA	Thin Shrink Small Outline Package (SO56-2)
				316233	High Speed CMOS QuickSwitch 32:16 Mux/Demux



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