



# QUICKSWITCH® PRODUCTS

## 3.3V QUAD ACTIVE LOW SWITCH

### FOR HOT SWAP APPLICATIONS

#### (HOTSWITCH™)

**IDTQS3VH125**

### FEATURES:

- N channel FET switches with no parasitic diode to Vcc
  - No DC path to Vcc or GND
  - 5V tolerant in OFF and ON state
- 5V tolerant I/Os
- Low RON - 4Ω typical
- Flat RON characteristics from 0 - 5V
- Rail-to-rail switching 0 - 5V
- Bidirectional dataflow with near-zero delay: no added ground bounce
- Excellent RON matching between channels
- Vcc operation: 2.3V to 3.6V
- Maximum operating frequency for data - 150MHz
- LVTTTL-compatible control Inputs
- Undershoot Clamp Diodes on all switch and control Inputs
- Low I/O capacitance, 4pF typical
- Available in QSOP, TSSOP, and SOIC packages

### APPLICATIONS:

- PCI/Compact PCI hot-swapping
- 10/100 Base-T, Ethernet LAN switch
- Low distortion analog switch
- Replaces mechanical relay
- ATM 25/155 switching

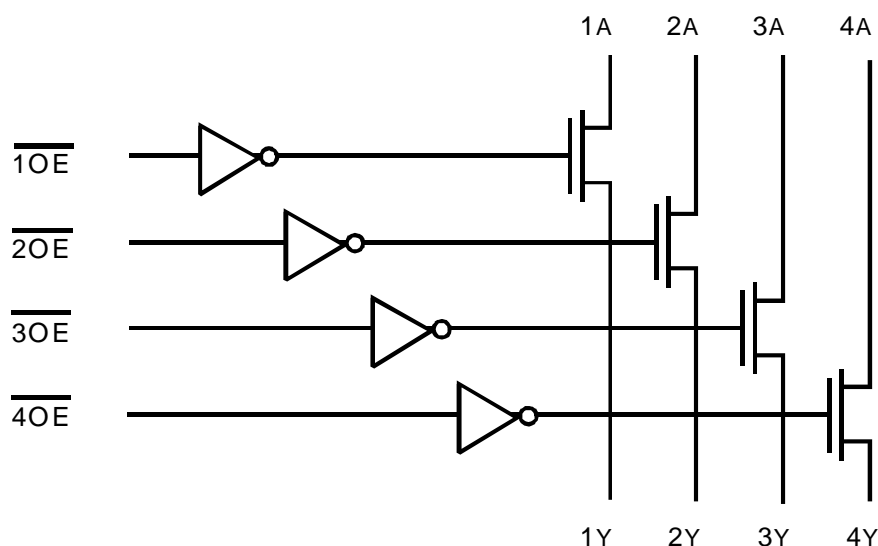
### DESCRIPTION:

The QS3VH125 HotSwitch Quad bus switch is specially designed for a hot-swapping environment. The QS3VH125 has very low ON resistance, resulting in under 250ps propagation delay through the switch. The switches can be turned ON under the control of individual LVTTTL-compatible active low Output Enable signals for bidirectional data flow with no added delay or ground bounce. In the OFF and ON states, the switches are 5V-tolerant. In the OFF state, the switches offer very high impedance at the terminals.

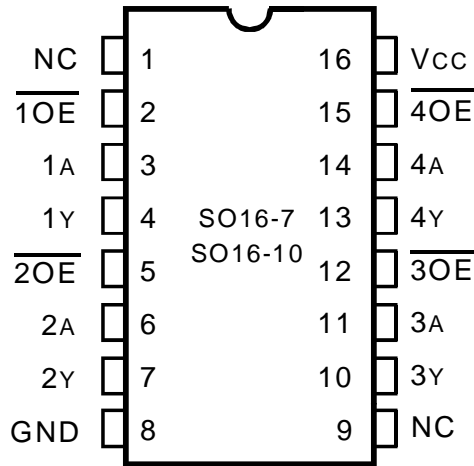
The combination of near-zero propagation delay, high OFF impedance, and over-voltage tolerance makes the QS3VH125 ideal for hot-swapping applications.

The QS3VH125 is characterized for operation from -40°C to +85°C.

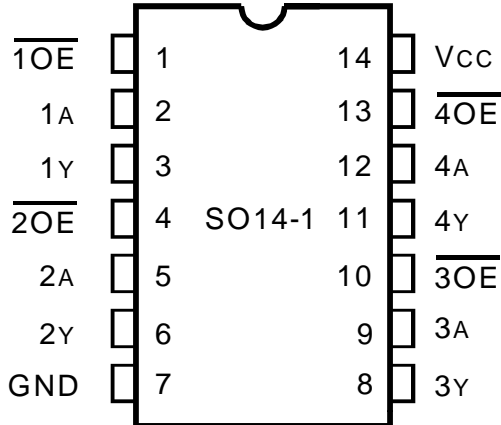
### FUNCTIONAL BLOCK DIAGRAM



## PIN CONFIGURATION



QSOP/TSSOP  
TOP VIEW



SOIC  
TOP VIEW

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

Symbol	Description	Max.	Unit
V <sub>TERM</sub> <sup>(2)</sup>	Supply Voltage to Ground	-0.5 to 4.6	V
V <sub>TERM</sub> <sup>(3)</sup>	DC Switch Voltage V <sub>S</sub>	-0.5 to 5.5	V
V <sub>TERM</sub> <sup>(3)</sup>	DC Input Voltage V <sub>IN</sub>	-0.5 to 5.5	V
V <sub>AC</sub>	AC Input Voltage (pulse width ≤20ns)	-3	V
V <sub>OUT</sub>	DC Output Current	120	mA
P <sub>MAX</sub>	Maximum Power Dissipation	0.5	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 = 1MHz, V<sub>IN</sub> = 0V, V<sub>OUT</sub> = 0V)

Symbol	Parameter <sup>(1)</sup>	Typ.	Max.	Unit
C <sub>IN</sub>	Control Inputs	3	5	pF
C <sub>I/O</sub>	Quickswitch Channels (Switch OFF)	4	6	pF

### NOTE:

- This parameter is guaranteed but not production tested.

## PIN DESCRIPTION

Pin Names	I/O	Description
1A - 4A	I/O	Bus A
1Y - 4Y	I/O	Bus B
1OE - 4OE	I	Output Enable

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

OE	A	Y	Function
L	H	H	Connect
L	L	L	Connect
H	X	X	Disconnect

### 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:

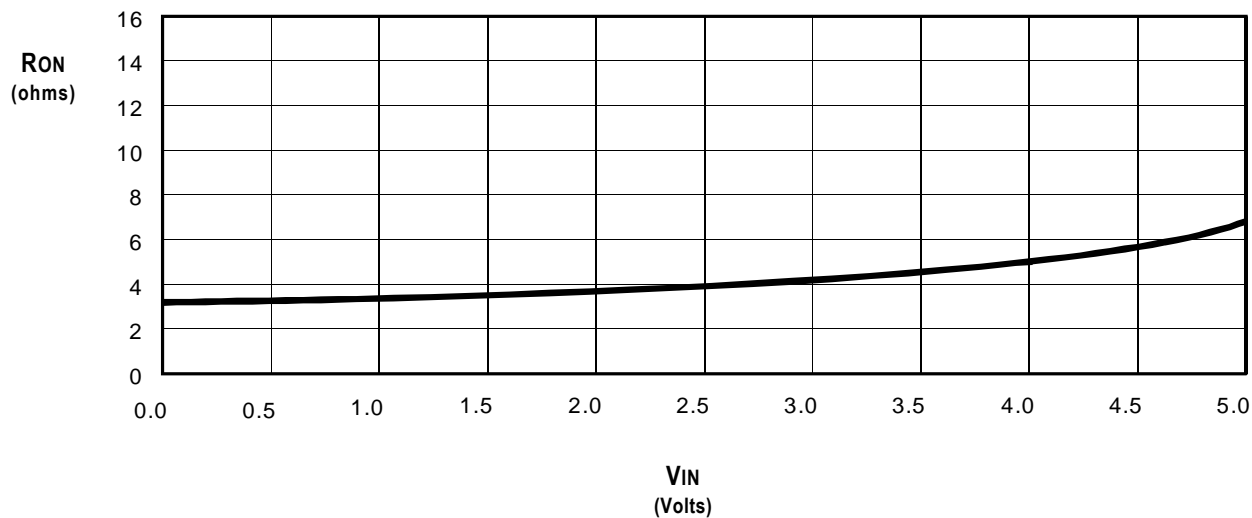
Industrial:  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ,  $V_{CC} = 3.3\text{V} \pm 0.3\text{V}$

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)	$0\text{V} \leq V_{OUT} \leq V_{CC}$ , Switches OFF	—	—	$\pm 1$	$\mu\text{A}$
$R_{ON}$	Switch ON Resistance	$V_{CC} = \text{Min.}$ , $V_{IN} = 0\text{V}$ , $I_{ON} = 30\text{mA}$	—	4	6	$\Omega$
		$V_{CC} = \text{Min.}$ , $V_{IN} = 2.4\text{V}$ , $I_{ON} = 15\text{mA}$	—	5	8	

**NOTE:**

1. Typical values are at  $V_{CC} = 3.3\text{V}$  and  $T_A = 25^{\circ}\text{C}$ .

### TYPICAL ON RESISTANCE vs $V_{IN}$ AT $V_{CC} = 3.3\text{V}$



## 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	mA
ΔI <sub>CC</sub>	Power Supply Current <sup>(2,3)</sup> per Input HIGH	V <sub>CC</sub> = Max., V <sub>IN</sub> = 3V, f = 0 per Control Input	30	μA
I <sub>CCD</sub>	Dynamic Power Supply Current per MHz <sup>(4)</sup>	V <sub>CC</sub> = Max., A and Y 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 LVTTLL driven input. A and Y pins do not contribute to ΔI<sub>CC</sub>.
- This parameter is guaranteed but not tested.
- This parameter represents the current required to switch internal capacitance at the specified frequency. The A and Y inputs do not contribute to the Dynamic Power Supply Current. 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> = 3.3V ± 0.3V

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

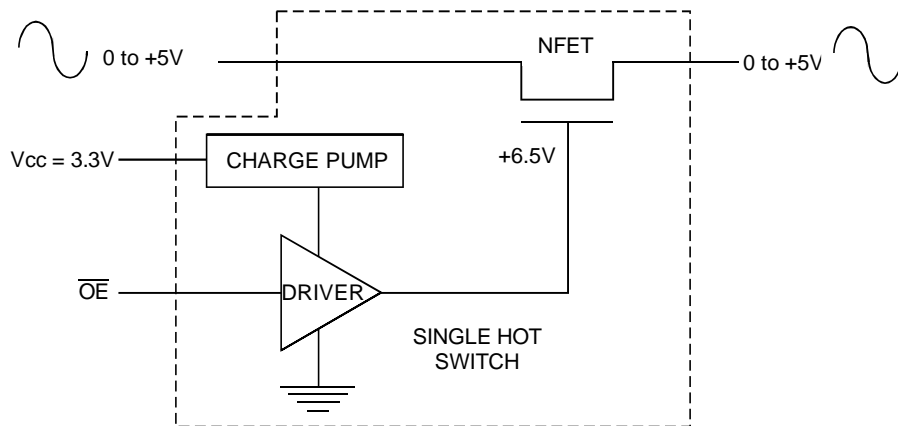
Symbol	Parameter	Min. <sup>(3)</sup>	Typ.	Max.	Unit
t <sub>PLH</sub> t <sub>PHL</sub>	Data Propagation Delay <sup>(1,2)</sup> A to Y	—	—	0.25	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Switch Turn-On Delay OE to nA/nY	1.5	—	9	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Switch Turn-Off Delay <sup>(1)</sup> OE to nA/nY	1.5	—	8	ns
f <sub>s</sub>	Operating Frequency - Data <sup>(1,4)</sup> OE = LOW	—	—	150 <sup>(6)</sup>	MHz
f <sub>OE</sub>	Operating Frequency - Enable <sup>(1,5)</sup>	—	—	1	MHz

### NOTES:

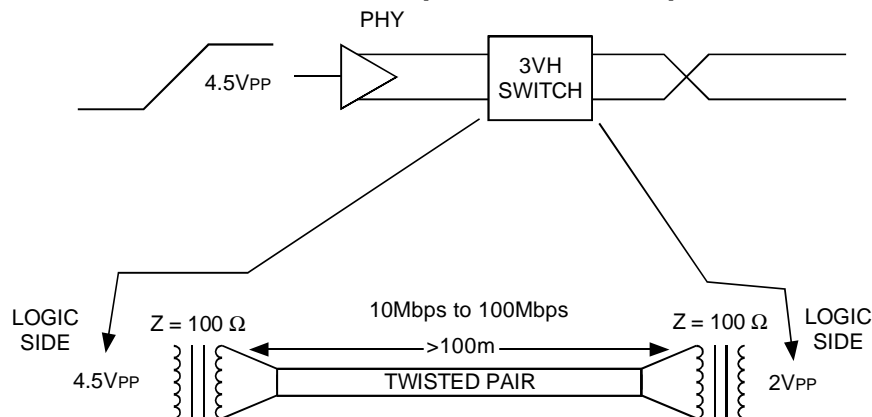
- This parameter is guaranteed but not production tested.
- The bus switch contributes no propagation delay other than the RC delay of the ON resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 0.25ns at C<sub>L</sub> = 50pF. Since this time constant 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.
- Minimums are guaranteed but not production tested.
- Maximum frequency for bidirectional data flow.
- Maximum toggle frequency for OE control input.
- Measured at C<sub>LOAD</sub> = 30pF.

## SOME APPLICATIONS FOR HOTSWITCH PRODUCTS

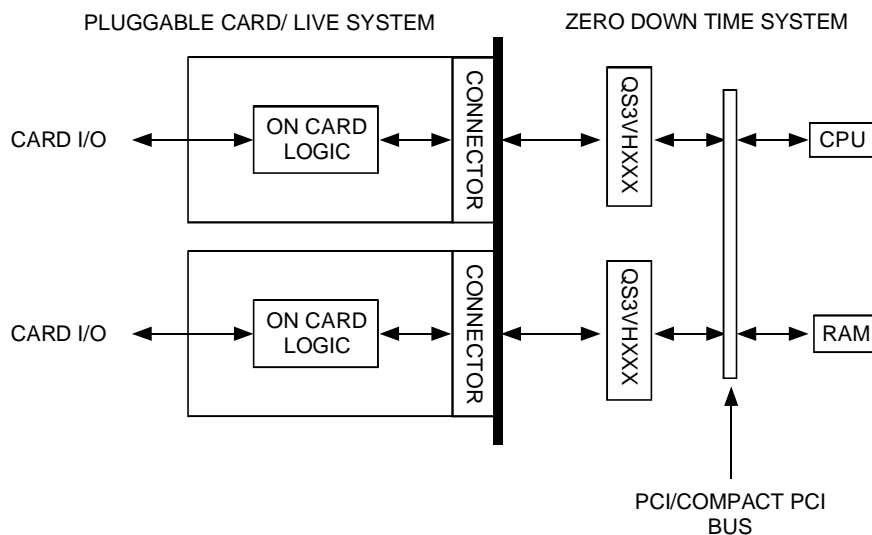
### RAIL-TO-RAIL SWITCHING



### FAST ETHERNET DATA SWITCHING (LAN SWITCH)



### HOT SWAPPING: PCI/COMPACT PCI



## ORDERING INFORMATION

IDTQS	XXXXX	XX	X		
	Device Type	Package	Process		
				Blank	Industrial (-40°C to +85°C)
				Q	Quarter Size Outline Package (SO16-7)
				PG	Thin Shrink Small Outline Package (SO16-10)
				S1	Small Outline IC (SO14-1)
				3VH125	3.3V Quad Active Low Switch for Hot Swap Applications



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