# QUICKSWITCH® PRODUCTS 3.3V QUAD ACTIVE HIGH SWITCH FOR HOT SWAP APPLICATIONS (HOTSWITCH™)

**IDTQS3VH126**

## FEATURES:

- **N channel FET switches with no parasitic diode to $V_{CC}$**
  - *No DC path to $V_{CC}$ or GND*
  - *5V tolerant in OFF and ON state*
- **5V tolerant I/Os**
- **Low $R_{ON}$ - 4Ω typical**
- **Flat $R_{ON}$ characteristics from 0 - 5V**
- **Rail-to-rail switching 0 - 5V**
- **Bidirectional dataflow with near-zero delay: no added ground bounce**
- **Excellent $R_{ON}$ matching between channels**
- **$V_{CC}$ operation: 2.3V to 3.6V**
- **High bandwidth - up to 500MHz**
- **LVTTL-compatible control Inputs**
- **Undershoot Clamp Diodes on all switch and control Inputs**
- **Low I/O capacitance, 4pF typical**
- **Available in QSOP 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**

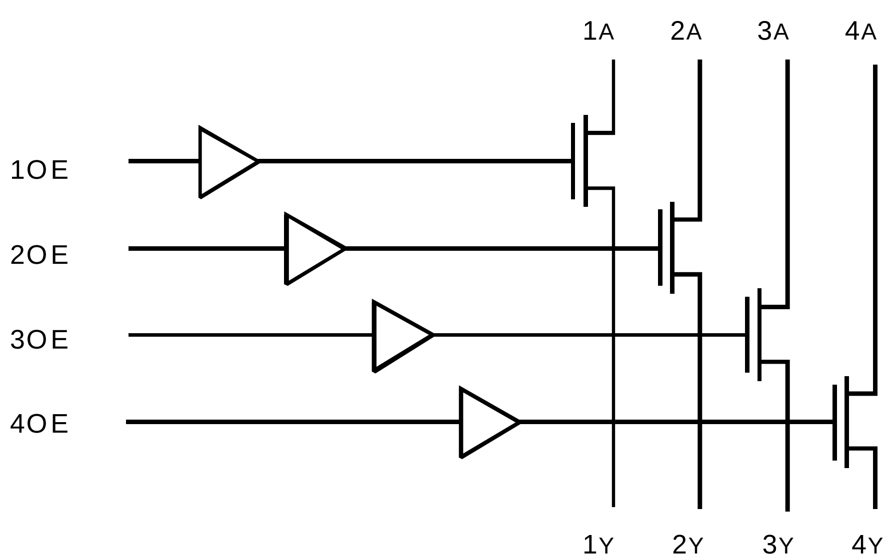
## DESCRIPTION:

The QS3VH126 bus switch is specially designed for a hot-swapping environment. The QS3VH126 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 LVTTL-compatible active high Output Enable signals for bidirectional data flow with no added delay or ground bounce. In the ON state, the switches can pass signals up to 5V. In the OFF state, the switches offer very high impedence at the terminals.

The combination of near-zero propagation delay, high OFF impedance, and over-voltage tolerance makes the QS3VH126 ideal for hot-swapping applications.

The QS3VH126 is characterized for operation from -40°C to +85°C.

## FUNCTIONAL BLOCK DIAGRAM

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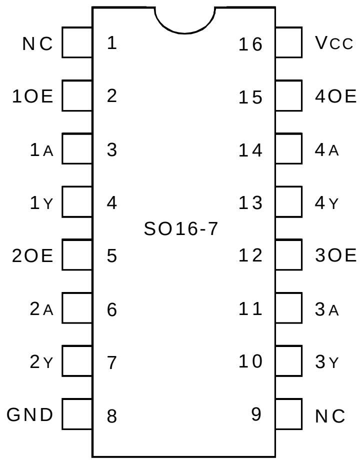
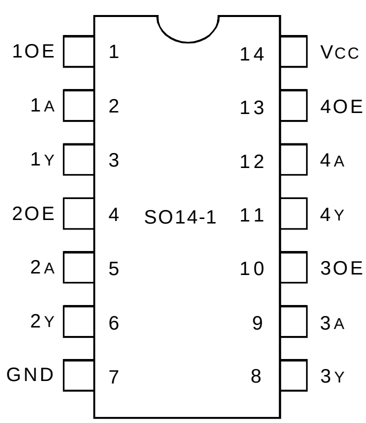
## PIN CONFIGURATION




QSOP
TOP VIEW




SOIC
TOP VIEW

## ABSOLUTE MAXIMUM RATINGS(1)

| Symbol | Description | Max | Unit |
|---|---|---|---|
| VTERM(2) | Supply Voltage to Ground | –0.5 to +4.6 | V |
| VTERM(3) | DC Switch Voltage VS | –0.5 to +5.5 | V |
| VTERM(3) | DC Input Voltage VIN | –0.5 to +5.5 | V |
| VAC | AC Input Voltage (pulse width ≤20ns) | –3 | V |
| VOUT | DC Output Current | 120 | mA |
| PMAX | Maximum Power Dissipation | 0.5 | W |
| TSTG | 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 (TA = +25°C, F = 1MHz, VIN = 0V, VOUT = 0V)

| Symbol | Parameter(1) | Typ. | Max. | Unit |
|---|---|---|---|---|
| CIN | Control Inputs | 3 | 5 | pF |
| CI/O | Quickswitch Channels (Switch OFF) | 4 | 6 | pF |

NOTE:
1. 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 Y |
| 1OE - 4OE | I | Output Enable |

## FUNCTION TABLE(1)

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

NOTE:
1. H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care

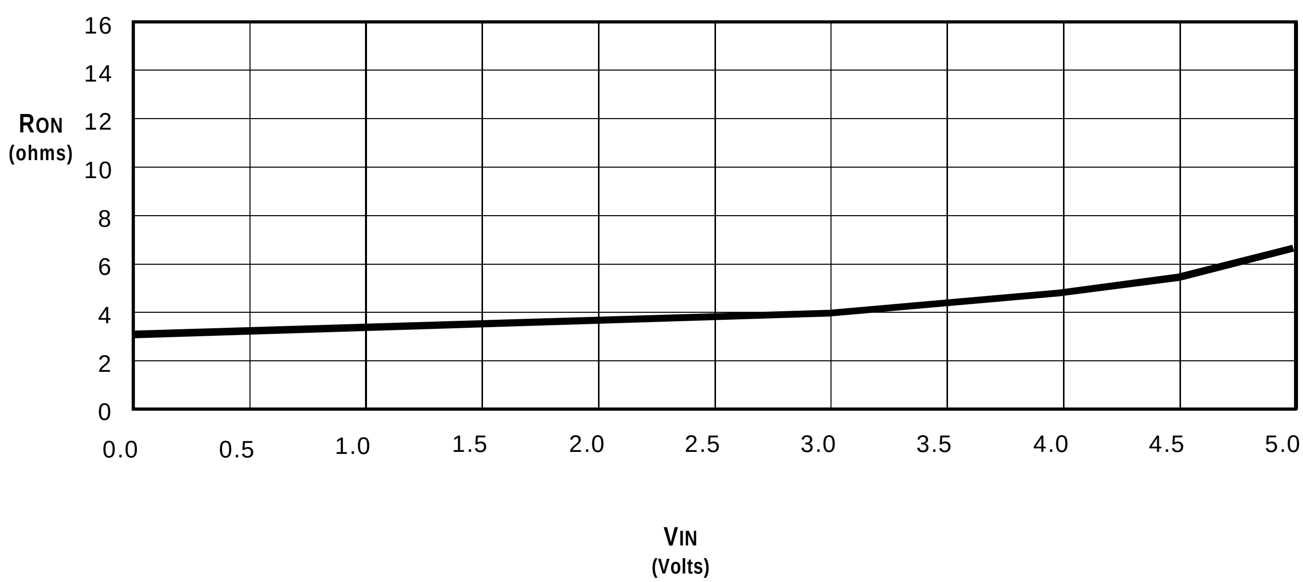
## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:
Industrial: $T_A$ = –40°C to +85°C, $V_{CC}$ = 3.3V ±0.3V

| Symbol | Parameter | Test Conditions | Min. | Typ.(1) | 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) | $0V \le V_{IN} \le V_{CC}$ | — | — | ±1 | μA |
| $I_{OZ}$ | Off-State Current (Hi-Z) | $0V \le V_{OUT} \le V_{CC}$, Switches OFF | — | — | ±1 | μA |
| $R_{ON}$ | Switch ON Resistance | $V_{CC}$ = Min, $V_{IN}$ = 0V, $I_{ON}$ = 30mA | — | 4 | 6 | Ω |
| | | $V_{CC}$ = Min, $V_{IN}$ = 2.4V, $I_{ON}$ = 15mA | — | 5 | 8 | |

**NOTE:**
1. Typical values are at $V_{CC}$ = 3.3V and $T_A$ = 25°C.

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



## 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 | mA |
| $\Delta I_{CC}$ | Power Supply Current [2,3] per Input HIGH | $V_{CC}$ = 3.6V, $V_{IN}$ = 3V, f = 0 per Control Input | 30 | µA |
| $I_{CCD}$ | Dynamic Power Supply Current per MHz[4] | $V_{CC}$ = 3.6V, A and Y Pins Open, per Control Input Toggling @ 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 LVTTL-driven-control-input. A and Y pins do not contribute to $\Delta$Icc.
3. This parameter is guaranteed but not tested.
4. 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

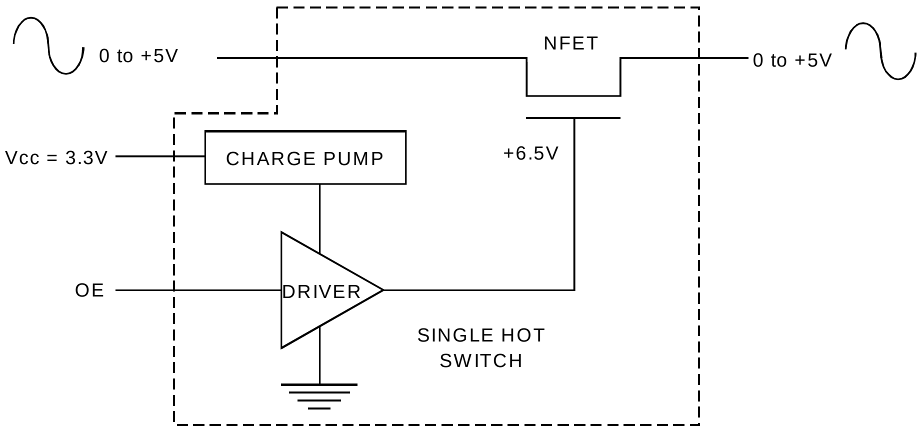
$T_A$ = -40°C to +85°C, $V_{CC}$ = 3.3V ± 0.3V

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

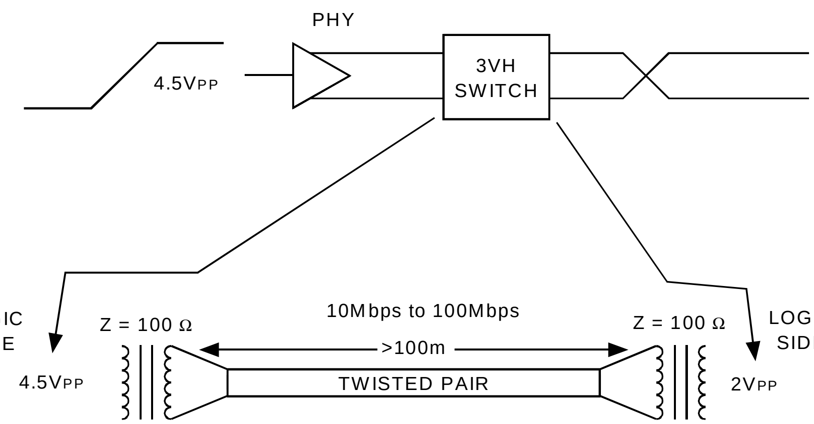
| Symbol | Parameter | Min.[3] | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| $t_{PLH}$<br>$t_{PHL}$ | Data Propagation Delay[1,2]<br>A to Y | — | — | 0.2 | ns |
| $t_{PZL}$<br>$t_{PZH}$ | Switch Turn-On Delay<br>OE to xA/xY | 1.5 | — | 9 | ns |
| $t_{PLZ}$<br>$t_{PHZ}$ | Switch Turn-Off Delay[1]<br>OE to xA/xY | 1.5 | — | 8 | ns |
| $f_{OE}$ | Operating Frequency - Enable[1,4] | — | — | 1 | MHz |

**NOTES:**
1. This parameter is guaranteed but not production tested.
2. 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 0.2ns at $C_L$ = 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.
3. Minimums are guaranteed but not production tested.
4. Maximum toggle frequency for OE control input.

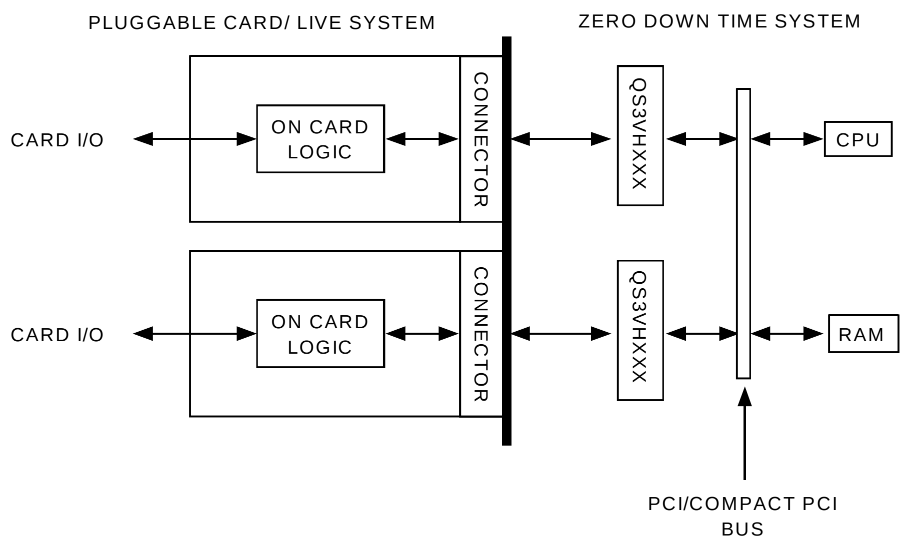
## SOME APPLICATIONS FOR HOTSWITCH PRODUCTS




*Rail-to-Rail Switching*




*Fast Ethernet Data Switching (LAN Switch)*




*Hot-Swapping: PCI / Compact PCI*

## ORDERING INFORMATION

IDTQS XXXXX XX
Device Type Package

| | |
|---|---|
| Q | Quarter Size Outline Package (SO16-7) |
| S1 | Small Outline IC (SO14-1) |

| | |
|---|---|
| 3VH126 | 3.3V Quad Active High Switch for Hot Swap Applications |

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