



QUICKSWITCH® PRODUCTS

3.3V QUAD 2:1 MUX/DEMUX FOR HOT SWAP APPLICATIONS (HOTSWITCH™)

IDTQS3VH257

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
- Bidirectional dataflow with near-zero delay: no added ground bounce
- Low RON - 4Ω typical
- Flat RON characteristics over operating range
- Rail-to-rail switching 0 - 5V
- Excellent RON matching between channels
- VCC operation: 2.3V to 3.6V
- High bandwidth - up to 500MHz
- LVTTTL-compatible control Inputs
- Undershoot Clamp Diodes on all switch and control Inputs
- Low demux capacitance, 4pF typical
- Available in QSOP, SOIC, and TSSOP packages

APPLICATIONS:

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

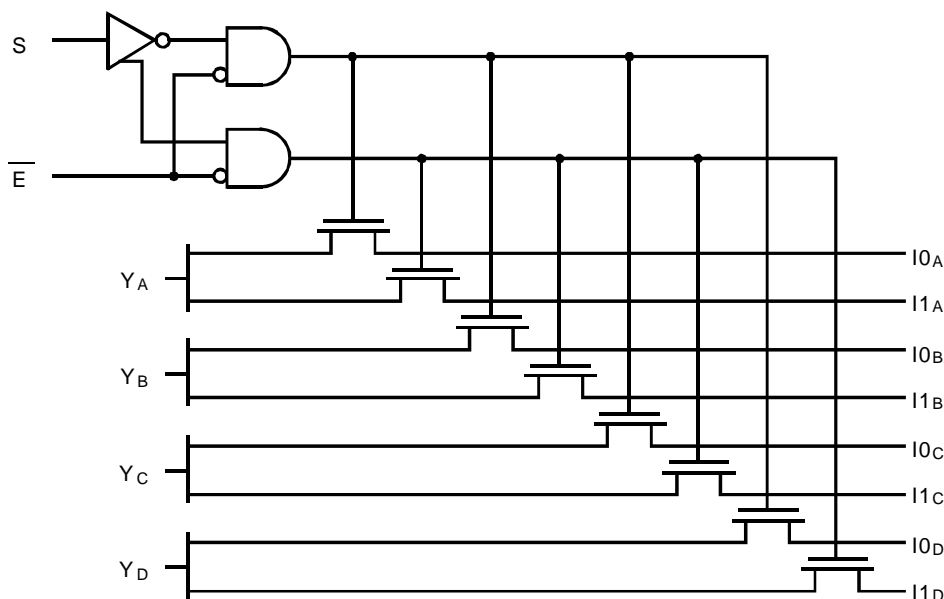
DESCRIPTION:

The QS3VH257 HotSwitch Quad 2:1 multiplexer/demultiplexer is a high bandwidth bus switch. The QS3VH257 has very low ON resistance, resulting in under 250ps propagation delay through the switch. 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 QS3VH257 ideal for high performance communication applications.

The QS3VH257 is characterized for operation from -40°C to +85°C.

FUNCTIONAL BLOCK DIAGRAM

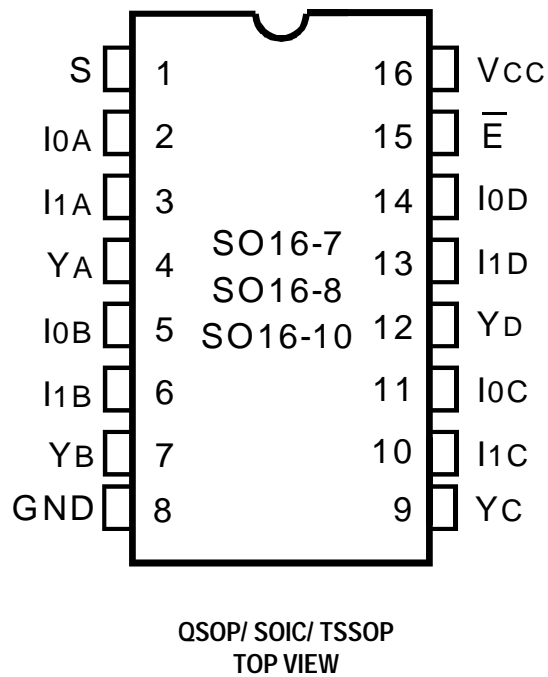


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INDUSTRIAL TEMPERATURE RANGE

NOVEMBER 2001

PIN CONFIGURATION



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 V _S | -0.5 to +5.5 | V |
| VTERM ⁽³⁾ | DC Input Voltage V _{IN} | -0.5 to +5.5 | V |
| V _{AC} | AC Input Voltage (pulse width ≤20ns) | -3 | V |
| V _{OUT} | DC Output Current | 120 | mA |
| P _{MAX} | Maximum Power Dissipation | 0.5 | W |
| T _{STG} | 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_{CC} terminals.
- All terminals except V_{CC}.

CAPACITANCE (T_A = +25°C, F = 1MHz, V_{IN} = 0V, V_{OUT} = 0V)

| Symbol | Parameter ⁽¹⁾ | Typ. | Max. | Unit |
|------------------|--------------------------------------|-------|------|------|
| C _{IN} | Control Inputs | 3 | 5 | pF |
| C _{I/O} | Quickswitch Channels (Switch OFF) | Demux | 4 | pF |
| | | Mux | 7 | |

NOTE:

- This parameter is guaranteed but not production tested.

PIN DESCRIPTION

| Pin Names | I/O | Description |
|---------------------------------|-----|--------------|
| I _{XX} | I | Data Inputs |
| S | I | Select Input |
| \bar{E} | I | Enable Input |
| Y _A - Y _D | O | Data Outputs |

FUNCTION TABLE⁽¹⁾

| Inputs | | Outputs | | | | Function |
|-----------|---|-----------------|-----------------|-----------------|-----------------|----------|
| \bar{E} | S | Y _A | Y _B | Y _C | Y _D | |
| H | X | Z | Z | Z | Z | Disable |
| L | L | I _{0A} | I _{0B} | I _{0C} | I _{0D} | Select 0 |
| L | H | I _{1A} | I _{1B} | I _{1C} | I _{1D} | Select 1 |

NOTE:

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

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

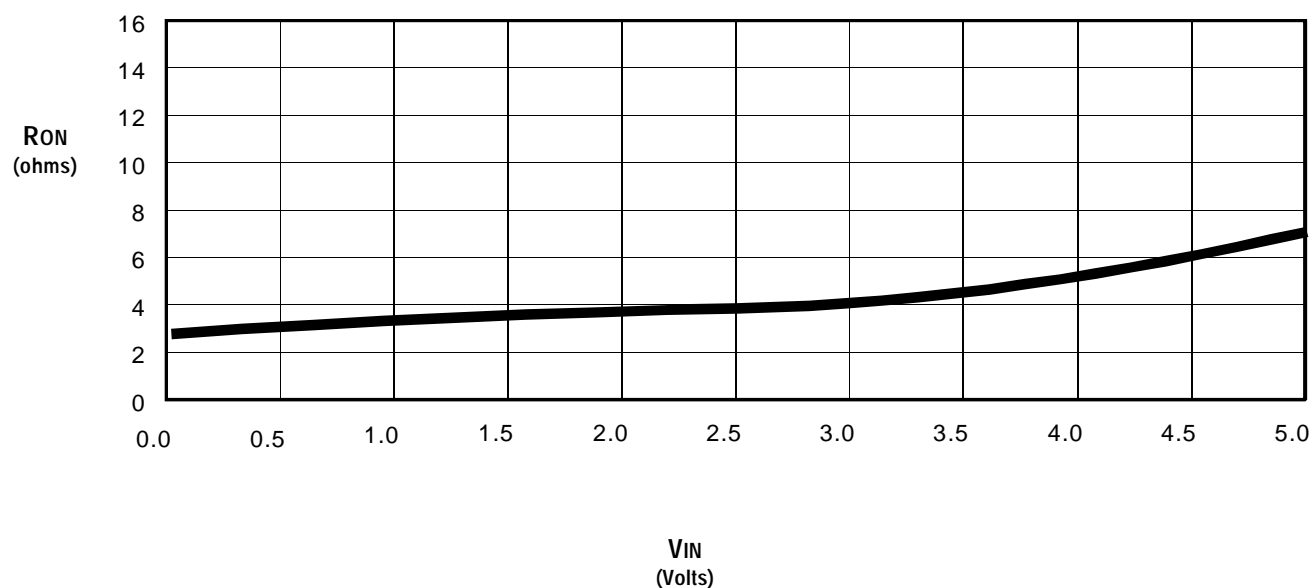
Industrial: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CC} = 3.3\text{V} \pm 0.3\text{V}$

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

NOTES:

1. Typical values are at $V_{CC} = 3.3\text{V}$ and $T_A = 25^{\circ}\text{C}$.
2. R_{ON} guaranteed but not production tested.

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



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 |
| ΔI _{CC} | Power Supply Current ^(2,3) per Input HIGH | V _{CC} = Max., V _{IN} = 3V, f = 0 per Control Input | 30 | μA |
| I _{CCD} | Dynamic Power Supply Current per MHz ⁽³⁾ | V _{CC} = 3.3V, 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 LVTTLL-driven-control input. A and Y pins do not contribute to ΔI_{CC}.
4. This current applies to the control inputs only and represents the current required to switch internal capacitance at the specified frequency. The A and Y inputs generate no significant AC or DC currents as they change states. 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

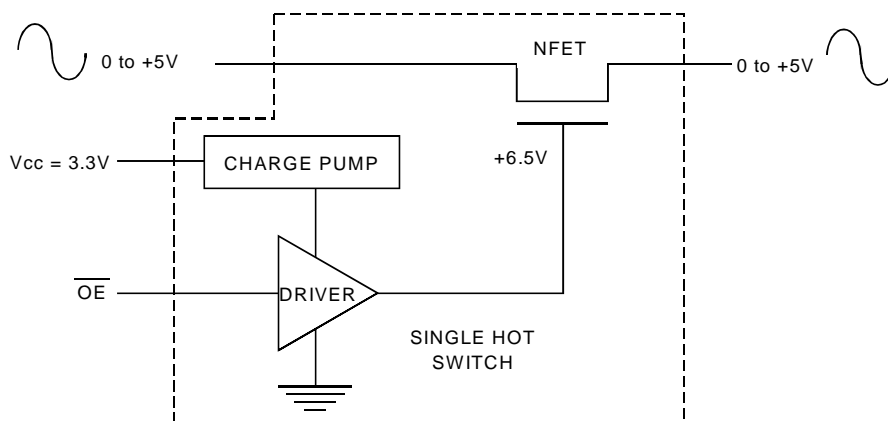
C_{LOAD} = 50pF, R_{LOAD} = 500Ω, unless otherwise noted

| Symbol | Parameter | Min. ⁽³⁾ | Typ. | Max. | Unit |
|--------------------------------------|---|---------------------|------|------|------|
| t _{PLH} t _{PHL} | Data Propagation Delay ^(1,2) A to Y | — | — | 0.25 | ns |
| t _{PZH} t _{PZL} | Switch Turn-On Delay S _x , \bar{E}_x to Y | 1.5 | — | 9 | ns |
| t _{PHZ} t _{PLZ} | Switch Turn-Off Delay ⁽¹⁾ S _x , \bar{E}_x to Y | 1.5 | — | 8 | ns |
| f _{CONTROL} | Operating Frequency - Enable ^(1,4) | — | — | 1 | MHz |

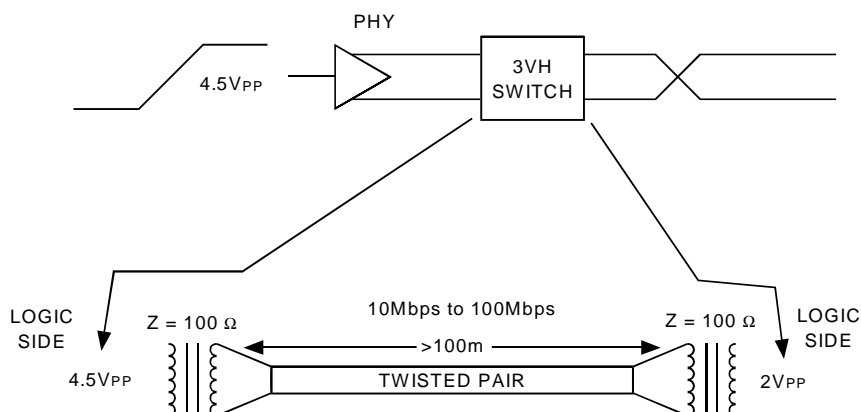
NOTES:

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 \bar{E} and S control input.

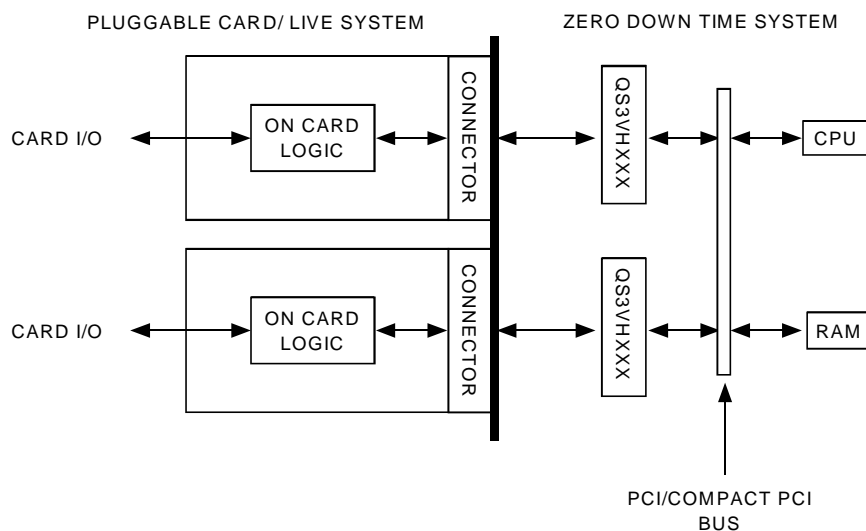
SOME APPLICATIONS FOR HOTSWITCH PRODUCTS



Rail-to-Rail Switching



Fast Ethernet Data Switching (LAN Switch)



Hot-Swapping: PCI / Compact PCI

ORDERING INFORMATION

| | | | | |
|-------|-------------|---------|--------|--|
| IDTQS | XXXXX | XX | | |
| | Device Type | Package | | |
| | | | S1 | Small Outline IC (SO16-8) |
| | | | Q | Quarter Size Outline Package (SO16-7) |
| | | | PA | Thin Shrink Small Outline Package (SO16-10) |
| | | | 3VH257 | 2.5V / 3.3V Quad 2:1 Mux/Demux High Bandwidth Bus Switch |



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