

QUICKSWITCH[®] PRODUCTS 2.5V / 3.3V QUAD ACTIVE HIGH, HIGH BANDWIDTH SWITCH

DESCRIPTION:

The QS3VH126 is a high bandwidth bus switch. 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

The combination of near-zero propagation delay, high OFF imped-

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

ance, and over-voltage tolerance makes the QS3VH126 ideal for high

switches offer very high impedence at the terminals.

performance communications applications.

FEATURES:

- N channel FET switches with no parasitic diode to Vcc
 - Isolation under power-off conditions
 - 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 over operating range
- 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
- · 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:

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

FUNCTIONAL BLOCK DIAGRAM

$10E \qquad 10E \qquad 10E$

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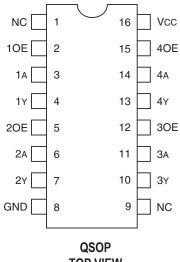
INDUSTRIAL TEMPERATURE RANGE

JANUARY 2013

IDTQS3VH126 2.5V / 3.3V QUAD ACTIVE HIGH, HIGH BANDWIDTH SWITCH

INDUSTRIAL TEMPERATURE RANGE

PIN CONFIGURATION



TOP VIEW

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Description	Max	Unit
VTERM ⁽²⁾	SupplyVoltage 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
Ιουτ	DC Output Current (max. sink current/pin)	120	mA
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 =					
0 Symbo l	Parameter ⁽¹⁾	Тур.	Max.	Unit	
CIN	Control Inputs	3	5	рF	
CI/O	Quickswitch Channels (Switch OFF)	4	6	рF	
CI/O	Quickswitch Channels (Switch ON)	8	12	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
10E - 40E	I	Output Enable

FUNCTION TABLE(1)

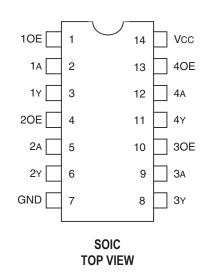
OE	А	Y	Function
Н	Н	Н	Connect
Н	L	L	Connect
L	Х	Х	Disconnect

NOTE:

1. H = HIGH Voltage Level

L = LOW Voltage Level

X = Don't Care



DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

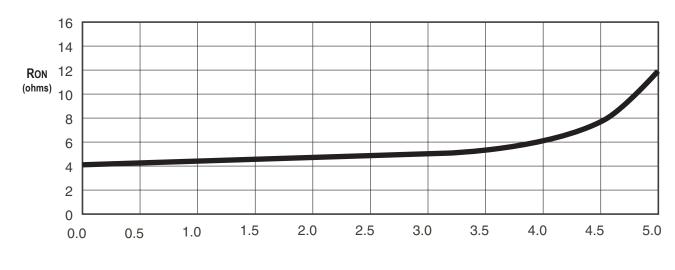
Following Conditions Apply Unless Otherwise Specified: Industrial: TA = -40° C to $+85^{\circ}$ C, Vcc = $3.3V \pm 0.3V$

Symbol	Parameter	Test C	Conditions		Min.	Typ. ⁽¹⁾	Max.	Unit
Vih	Input HIGH Voltage	Guaranteed Logic HIGH	Vcc = 2.3V to 2.7	ΥV	1.7	—	_	V
		for Control Inputs	Vcc = 2.7V to 3.6	νV	2	_	—	
VIL	Input LOW Voltage	Guaranteed Logic LOW	Vcc = 2.3V to 2.7	ΥV	—	—	0.7	V
		for Control Inputs	Vcc = 2.7V to 3.6	νV	—	—	0.8	
lin	Input Leakage Current (Control Inputs)	$0V \le VIN \le VCC$		—	_	±1	μA	
loz	Off-State Current (Hi-Z)	$0V \le VOUT \le 5V$, Switches OFF		—	_	±1	μA	
IOFF	Data Input/Output Power Off Leakage	VIN or VOUT 0V to 5V, Vcc = 0V		—	_	±1	μA	
		Vcc = 2.3V	VIN = 0V	Ion = 30mA	—	6	8	
Ron	Switch ON Resistance	Typical at Vcc = 2.5V	VIN = 1.7V	Ion = 15mA	—	7	9	Ω
		Vcc = 3V	VIN = 0V	Ion = 30mA	_	4	6	
			VIN = 2.4V	Ion = 15mA	—	5	8	

NOTE:

1. Typical values are at Vcc = 3.3V and TA = $25^{\circ}C$.

TYPICAL ON RESISTANCE vs VIN AT Vcc = 3.3V



VIN (Volts)

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾	Min.	Тур.	Max.	Unit
Iccq	Quiescent Power Supply Current	Vcc = Max., VIN = GND or Vcc, f = 0	—	2	4	mA
Δ lcc	Power Supply Current (2,3) per Input HIGH	Vcc = Max., VIN = 3V, f = 0 per Control Input	—	—	30	μA
ICCD	Dynamic Power Supply Current (4)	Vcc = 3.3V, A and Y Pins Open, Control Inputs	See Typical	ICCD vs Enabl	e Frequency	graph below
		Toggling @ 50% Duty Cycle				

NOTES:

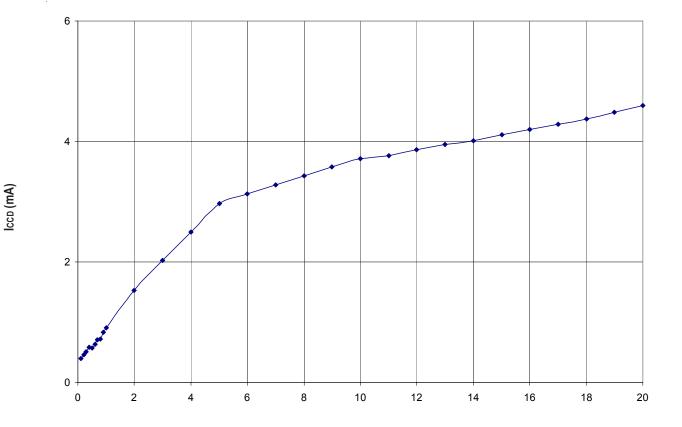
1. For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.

2. Per input driven at the specified level. A and Y pins do not contribute to Δ lcc.

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.

TYPICAL ICCD vs ENABLE FREQUENCY CURVE AT VCC = 3.3V



ENABLE FREQUENCY (MHz)

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SWITCHING CHARACTERISTICS OVER OPERATING RANGE

TA = -40°C to +85°C

		$Vcc = 2.5 \pm 0.2 V^{(1)}$		$Vcc = 3.3 \pm 0.3 V^{(1)}$		
Symbol	Parameter	Min. ⁽⁴⁾	Max.	Min. ⁽⁴⁾	Max.	Unit
t PLH	Data Propagation Delay ^(2,3)		0.2		0.2	ns
t PHL	A to Y					
tPZL	Switch Turn-On Delay	1.5	8	1.5	6.5	ns
t PZH	xOE to xA/xY					
tPLZ	Switch Turn-Off Delay	1.5	7	1.5	7	ns
t PHZ	xOE to xA/xY					
fxOE	Operating Frequency -Enable ^(2,5)		10		20	MHz

NOTES:

1. See Test Conditions under TEST CIRCUITS AND WAVEFORMS.

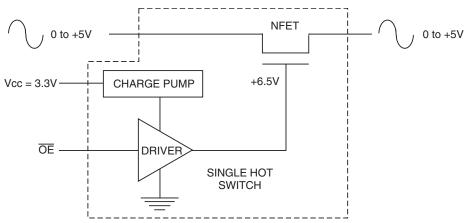
2. This parameter is guaranteed but not production tested.

3. 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.

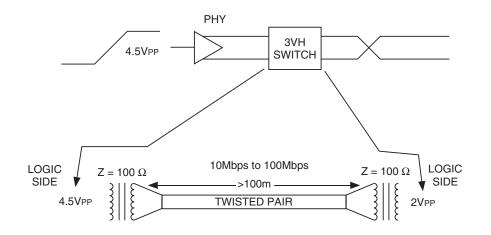
4. Minimums are guaranteed but not production tested.

5. Maximum toggle frequency for xOE control input (pass voltage > Vcc, VIN = 5V, RLOAD \ge 1M Ω , no CLOAD).

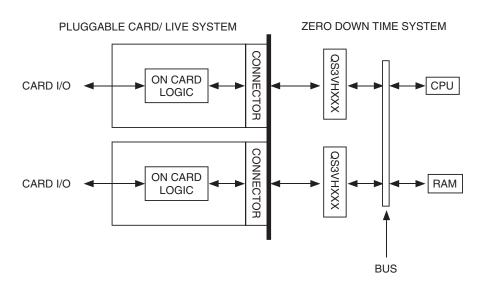
SOME APPLICATIONS FOR HOTSWITCH PRODUCTS



Rail-to-Rail Switching



Fast Ethernet Data Switching (LAN Switch)

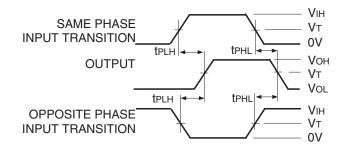


Hot-Swapping

TEST CIRCUITS AND WAVEFORMS

TEST CONDITIONS

Symbol	$Vcc^{(1)}= 3.3V \pm 0.3V$	$Vcc^{(2)} = 2.5V \pm 0.2V$	Unit
Vload	6	2 x Vcc	V
Vih	3	Vcc	V
Vt	1.5	Vcc/2	V
Vlz	300	150	mV
Vнz	300	150	mV
CL	50	30	pF



Propagation Delay

ENABLE

tPZL

tPZH

OPEN,

-

VLOAD/2

tPHZ

Vт

Vт

0V

CONTROL

NORMALLY

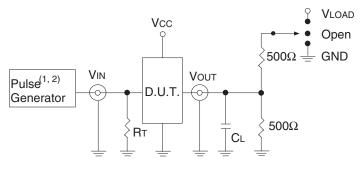
HIGH

INPUT

OUTPUT SWITCH

OUTPUT SWITCH

NORMALLY CLOSED



Test Circuits for All Outputs

NOTE:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

Enable and Disable Times

DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.

 $\mathsf{R} \mathsf{T} = \mathsf{Termination}$ resistance: should be equal to $\mathsf{Z} \mathsf{O} \mathsf{U} \mathsf{T}$ of the Pulse Generator.

NOTES:

1. Pulse Generator for All Pulses: Rate \leq 10MHz; tF \leq 2.5ns; tR \leq 2.5ns.

2. Pulse Generator for All Pulses: Rate \leq 10MHz; tF \leq 2ns; tR \leq 2ns.

SWITCH POSITION

Test	Switch
tplz/tpzl	Vload
tphz/tpzh	GND
tPD	Open

DISABLE

tPLZ

Vін

Vт

0V

Vol

Vон

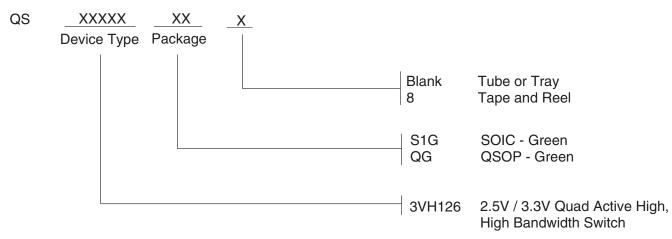
0V

VLOAD/2

VOL + VLZ

VOH - VHZ

ORDERING INFORMATION



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