

QUICKSWITCH[®] PRODUCTS 2.5V / 3.3V 24-BIT BUS EXCHANGE HIGH BANDWIDTH BUS SWITCH

IDTQS3VH16212

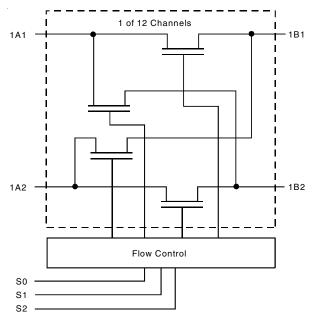
FEATURES:

- 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 500 MHz
- · LVTTL-compatible control Inputs
- · Undershoot Clamp Diodes on all switch and control Inputs
- Low I/O capacitance, 4pF typical
- Available in TSSOP package

APPLICATIONS:

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

FUNCTIONAL BLOCK DIAGRAM



 ${\sf The}\,{\sf IDT}\,{\sf logo}\,{\sf is}\,{\sf a}\,{\sf registered}\,{\sf trademark}\,{\sf of}\,{\sf Integrated}\,{\sf Device}\,{\sf Technology},{\sf Inc}$

INDUSTRIAL TEMPERATURE RANGE

DESCRIPTION:

The QS3VH16212 Bus Exchange HotSwitch with 24-bits is a high bandwidth bus switch. The QS3VH16212 has very low ON resistance, resulting in under 250ps propagation delay through the switch. The device operates as a 24-bit bus switch or a 12-bit bus exchanger, which provides data exchanging between the four signal ports through the data-select (So - S2) terminals. In the OFF and ON states, the switches are 5V-tolerant. In the OFF state, the switches offer very high impedence at the terminals.

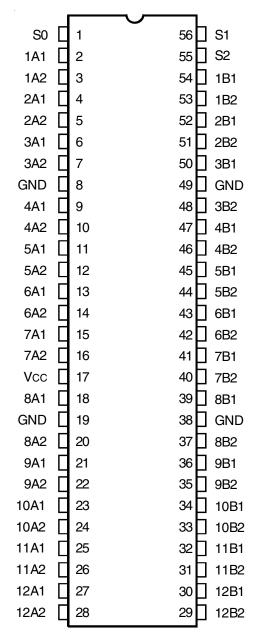
The combination of near-zero propagation delay, high OFF impedance, and over-voltage tolerance makes the QS3VH16212 ideal for high performance communications applications.

The QS3VH16212 is characterized for operation from -40 $^\circ$ C to +85 $^\circ$ C.

IDTQS3VH16212 2.5V/3.3V 24-BIT BUS EXCHANGE HIGH BANDWIDTH BUS SWITCH

INDUSTRIAL TEMPERATURE RANGE

PINCONFIGURATION



TSSOP 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
Ιουτ	DC Output Current (max. current/pin) 120		mA
Tstg	StorageTemperature	-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.

2. Vcc terminals.

3. All terminals except Vcc.

CAPACITANCE ($T_A = +25^{\circ}C$, f = 1MHz, VIN = 0V, VOUT = 0V)

Symbol	Parameter ⁽¹⁾	Тур.	Max.	Unit
CIN	Control Inputs	3	5	pF
Ci/o	Quickswitch Channels (Switch OFF)	6	8	pF
Ci/o	Quickswitch Channels (Switch ON)	12	16	pF
NOTE				

UIE:

1. This parameter is guaranteed but not production tested.

PIN DESCRIPTION

Pin Names	I/O	Description
1Ax - 12Ax	I/O	Bus A
1Bx - 12Bx	I/O	Bus B
S0 - S2	Ι	Data Select

FUNCTION TABLE⁽¹⁾

S2	S 1	S0	xA 1	xA2	Function
L	L	L	Z	Z	Disconnect
L	L	Н	xB1	Z	xA1 to xB1
L	Н	L	xB2	Z	xA1 to xB2
L	Н	Н	Z	xB1	xA2 to xB1
Н	L	L	Z	xB2	xA2 to xB2
Н	L	Н	Z	Z	Disconnect
Н	Н	L	xB1	xB2	xA1 to xB1, xA2 to xB2
Н	Н	Н	xB2	xB1	xA1 to xB2, xA2 to xB1

NOTE:

1. H = HIGH Voltage Level

L = LOW Voltage Level

Z = High-Impedence

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE⁽¹⁾

Following Conditions Apply Unless Otherwise Specified:

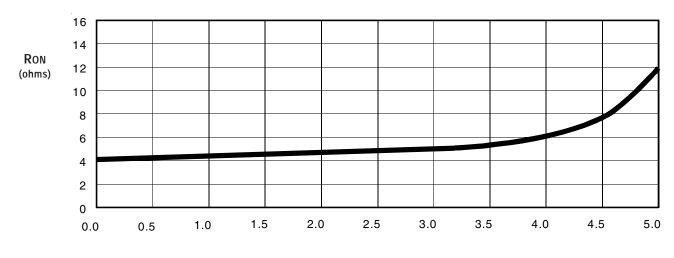
Industrial: TA = -40° C to $+85^{\circ}$ C, VCC = $3.3V \pm 0.3V$

Symbol	Parameter	Test Conditions			Min.	Тур. ⁽¹⁾	Max.	Unit
Vih	Input HIGH Voltage	Guaranteed Logic HI	GH	Vcc = 2.3V to 2.7V	1.7	_	_	V
		for Control Inputs	Γ	Vcc = 2.7V to 3.6V	2	_	—	
Vil	Input LOW Voltage	Guaranteed Logic HI	GH	Vcc = 2.3V to 2.7V	_	_	0.7	V
		for Control Inputs	Γ	Vcc = 2.7V to 3.6V	—	_	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 OV to 5	VIN or VOUT 0V to 5V, Vcc = 0V		_	—	±1	μA
		Vcc = 2.3V	VIN = 0V	ION = 30mA	_	6	8	
Ron	Switch ON Resistance	(Typ. 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°C, unless otherwise noted.

TYPICAL ON RESISTANCE vs VIN AT VCC = 3.3V



VIN (Volts)

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾	Min.	Тур.	Max.	Unit
lcco	Quiescent Power Supply Current	Vcc = Max., VIN = GND or Vcc, f = 0	-	1.5	3	mA
Δlcc	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 B Pins Open, Control Inputs	See Typical	ICCD vs Enable	Frequency gra	ph below
		Toggling @ 50% Duty Cycle				

NOTES:

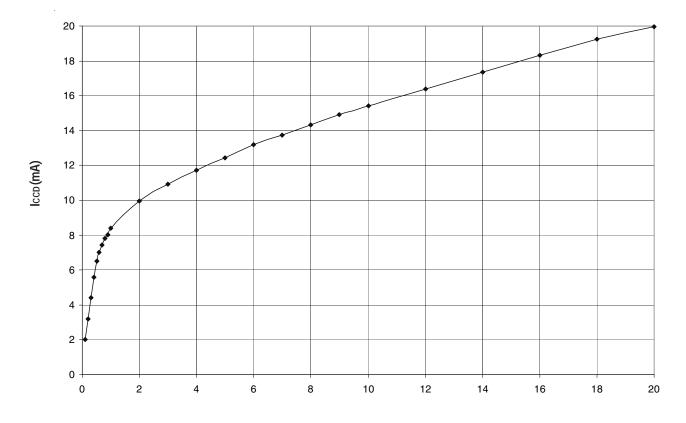
1. For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.

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

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

 $T_A = -40^{\circ}C \text{ to } +85^{\circ}C$

		$Vcc = 2.5 \pm 0.2V^{(1)}$		$Vcc = 3.3 \pm 0.3 V^{(1)}$		
Symbol	Parameter	Min. ⁽⁴⁾	Max.	Min. ⁽⁴⁾	Max.	Unit
t PLH	Data Propagation Delay ^(2,3)		0.2	—	0.2	ns
t PHL	xAx to xBx or xBx to xAx					
tPZH	Switch Turn-On Delay	1.5	11.5	1.5	11	ns
tPZL	Sx to xAx, xBx					
tphz	Switch Turn-Off Delay	1.5	11	1.5	10.5	ns
tPLZ	Sx to xAx, xBx					
tPSX	Propagation Delay	1.5	11	1.5	9	ns
	Sx to xAx, xBx					
fSx	Operating Frequency - Enable ^(2,5)	—	10	—	20	MHz

NOTES:

1. See Test Conditions under TEST CIRCUITS AND WAVEFORMS.

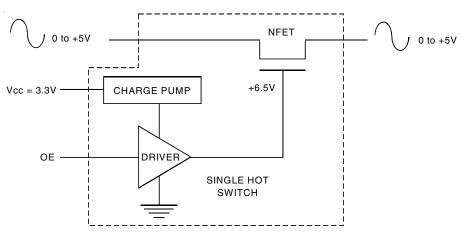
2. This parameter is guaranteed but not production tested.

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.

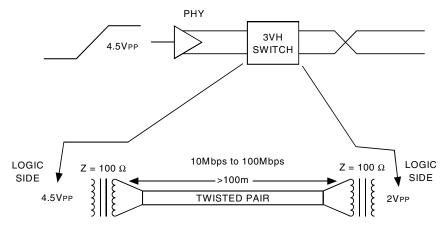
4. Minimums are guaranteed but not production tested.

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

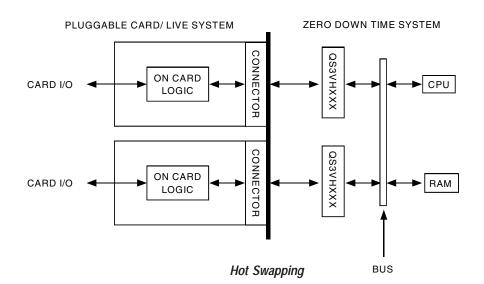
SOME APPLICATIONS FOR HOTSWITCH PRODUCTS



Rail-to-Rail Switching



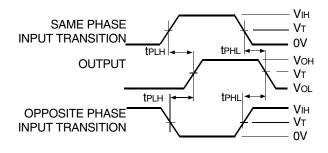
Fast Ethernet Data Switching (LAN Switch)



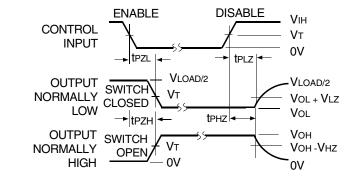
TEST CIRCUITS AND WAVEFORMS

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
Vhz	300	150	mV
CL	50	30	pF



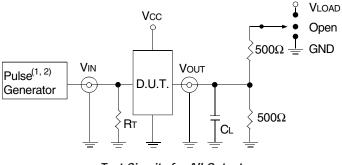
Propagation Delay



NOTE:

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

Enable and Disable Times



Test Circuits for All Outputs

DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.

RT = Termination resistance: should be equal to Zout of the Pulse Generator.

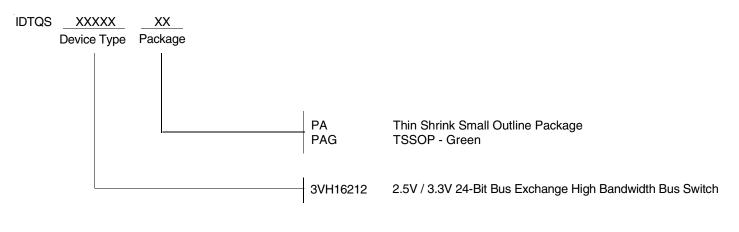
NOTES:

- 1. Pulse Generator for All Pulses: Rate \leq 1.0MHz; tF \leq 2.5ns; tR \leq 2.5ns.
- 2. Pulse Generator for All Pulses: Rate \leq 1.0MHz; tF \leq 2ns; tR \leq 2ns.

SWITCH POSITION

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

ORDERING INFORMATION





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