QUICKSWITCH® PRODUCTS 2.5V / 3.3V 16-BIT HIGH BANDWIDTH BUS SWITCH FOR HOT SWAP APPLICATIONS (HOTSWITCH™)

IDTQS32XVH2245
PRELIMINARY

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
- Flat R_{ON} characteristics from 0 - 5V
- Rail-to-rail switching 0 - 5V
- Bidirectional dataflow with low delay: no added ground bounce
- Excellent R_{ON} matching between channels
- Vcc operation: 2.3V to 3.6V
- Operating frequency for data - up to 400MHz
- LVTTL-compatible control Inputs
- Undershoot Clamp Diodes on all switch and control Inputs
- Low I/O capacitance, 5pF typical
- Available in 40-pin QVSOP (Q2)

APPLICATIONS:

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

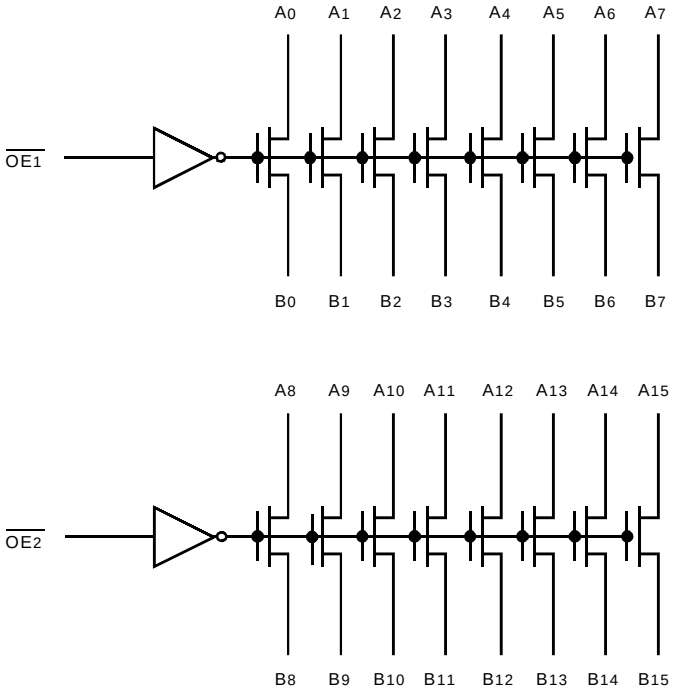
DESCRIPTION:

The QS32XVH2245 HotSwitch 16-bit bus switch is specially designed for hot-swapping environment. The QS32XVH2245, with 25Ω ON resistance and 1.25ns propagation delay, is ideal for line matching and low noise environments. The switches can be turned ON under the control of the LVTTL-compatible Output Enable ($\overline{OEn}$) signal 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 impedence at the terminals.

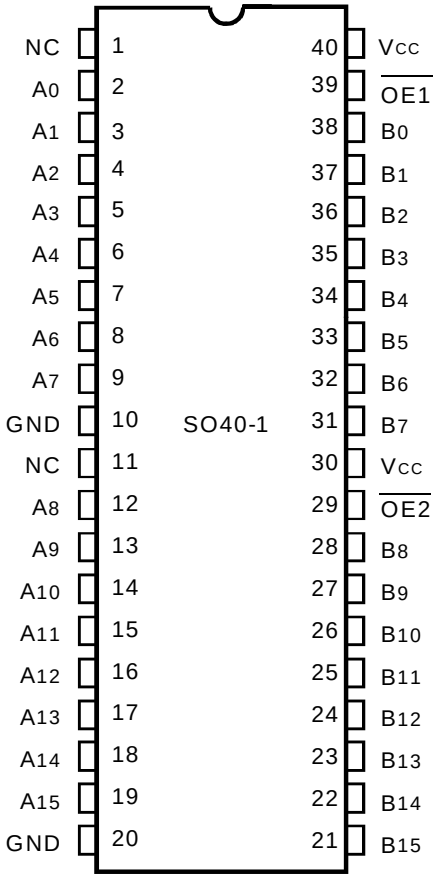
The combination of small propagation delay, high OFF impedance, and over-voltage tolerance makes the QS32XVH2245 ideal for hot-swapping applications.

The QS32XVH2245 is characterized for operation from -40°C to +85°C.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



QVSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Description	Max.	Unit
V_{TERM}(2)	Supply Voltage to Ground	– 0.5 to 4.6	V
V_{TERM}(3)	DC Switch Voltage V_S	– 0.5 to 5.5	V
V_{TERM}(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
T_{STG}	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. V_{CC} terminals.
3. 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)	4	6	pF
$C_{I/O}$	Quickswitch Channels (Switch ON)	8	12	pF

NOTE:
1. This parameter is guaranteed but not production tested.

PIN DESCRIPTION

Pin Names	Description
$\overline{OE}$n	Output Enable
An	Data I/Os
Bn	Data I/Os

FUNCTION TABLE (1)

$\overline{OE}$n	Outputs
H	Disconnected
L	Connect (An = Bn)

NOTE:
1. H = HIGH Voltage Level
   L = LOW Voltage Level

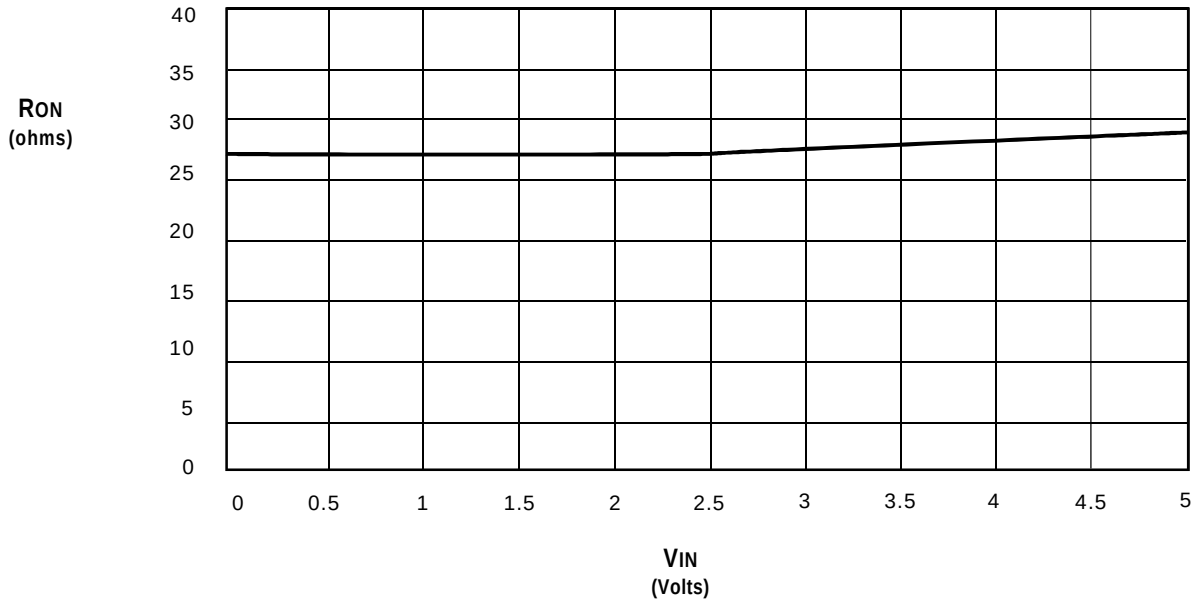
DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

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	V_{CC} = 2.3V to 2.7V		1.7	—	—	V
		Control Inputs	V_{CC} = 2.7V to 3.6V		2	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for	V_{CC} = 2.3V to 2.7V		—	—	0.7	V
		Control Inputs	V_{CC} = 2.7V to 3.6V		—	—	0.8	V
I_{IN}	Input Leakage Current (Control Inputs)	0V ≤ V_{IN} ≤ V_{CC}			—	—	±1	µA
I_{OZ}	Off-State Current (Hi-Z)	0V ≤ V_{OUT} ≤ 5V, Switches OFF			—	—	±1	µA
R_{ON}	Switch ON Resistance	V_{CC} = 2.5V	V_{IN} = 0V	I_{ON} = 30mA	20	29	31	Ω
			V_{IN} = 1.7V	I_{ON} = 15mA	20	30	32	
		V_{CC} = 3V	V_{IN} = 0V	I_{ON} = 30mA	20	27	29	
			V_{IN} = 2.4V	I_{ON} = 15mA	20	28	31	

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

TYPICAL ON RESISTANCE vs V_{IN} AT V_{CC} = 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	0.5	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 [4]	V_{CC} = Max., A and B 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 input driven at the specified level. A and B pins do not contribute to ΔIcc.
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.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

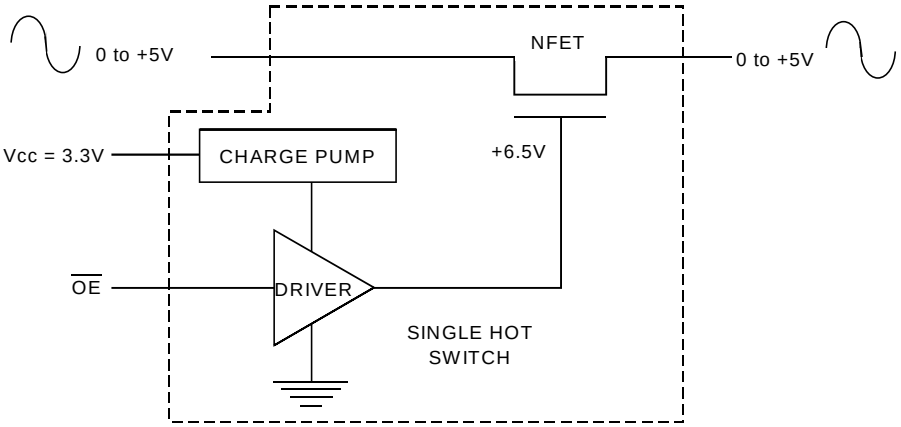
T_A = -40°C to +85°C

Symbol	Parameter	V_{CC} = 2.5 ± 0.2V [1]		V_{CC} = 3.3 ± 0.3V [1]		Unit
		Min. [4]	Max.	Min. [4]	Max.	
t_{PLH} t_{PHL}	Data Propagation Delay[2,3] An to/from Bn	—	0.8	—	1.25	ns
t_{PZL} t_{PZH}	Switch Turn-On Delay $\overline{OE}$n to An/Bn	1.5	10.5	1.5	7.5	ns
t_{PLZ} t_{PHZ}	Switch Turn-Off Delay $\overline{OE}$n to An/Bn	1.5	9	1.5	6.5	ns
f_S	Operating Frequency - Data[2,5] $\overline{OE}$ = LOW	—	400[7]	—	400[7]	MHz
$f_{\overline{OE}}$	Operating Frequency - Enable [2,6]	—	5	—	5	MHz

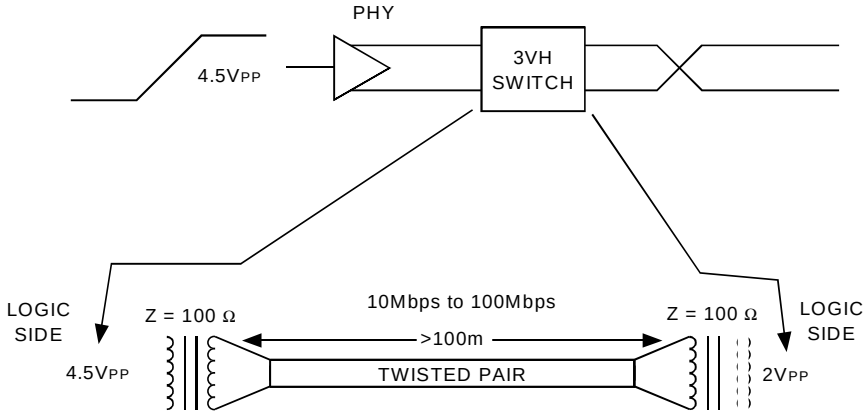
NOTES:
1. See Test Conditions under TEST CIRCUITS AND WAVEFORMS.
2. This parameter is guaranteed but not production tested.
3. The bus switch contributes no propagation delay other than the RC delay of the ON resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 1.25ns 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 frequency for bidirectional data flow.
6. Maximum toggle frequency for $\overline{OE}$ control input.
7. Measured at C_{LOAD} = 30pF.

SOME APPLICATIONS FOR HOTSWITCH PRODUCTS

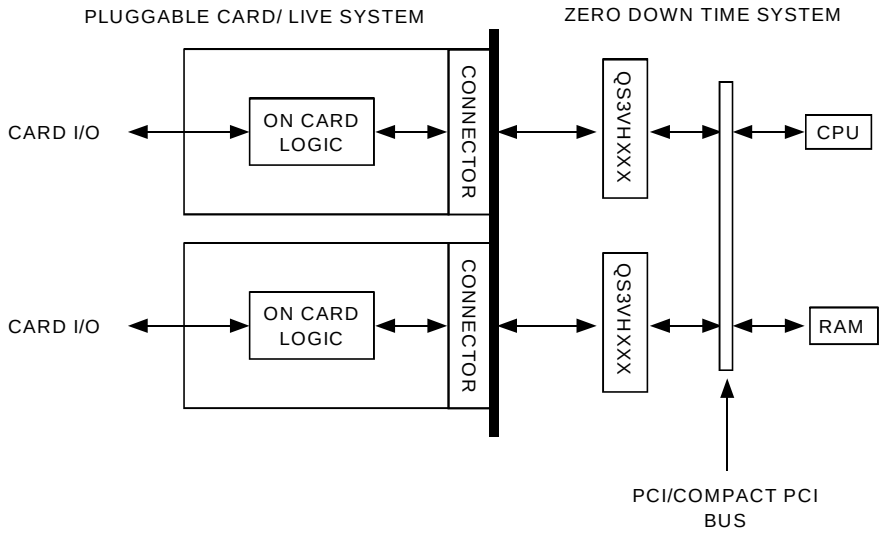
RAIL-TO-RAIL SWITCHING



FAST ETHERNET DATA SWITCHING (LAN SWITCH)



HOT SWAPPING: PCI/COMPACT PCI

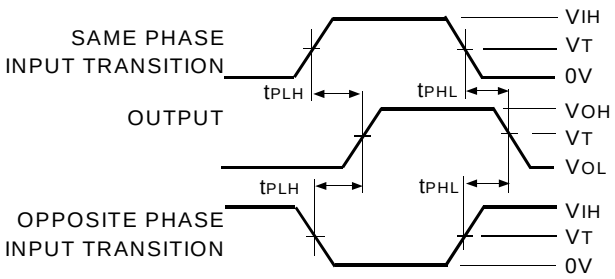


TEST CIRCUITS AND WAVEFORMS

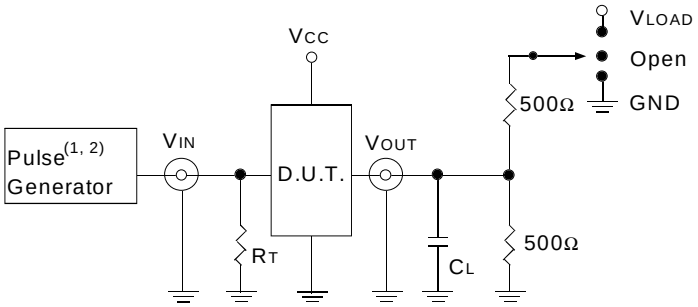
TEST CONDITIONS

Symbol	$V_{CC}^{(1)}$= 3.3V ± 0.3V	$V_{CC}^{(2)}$= 2.5V ± 0.2V	Unit
V_{LOAD}	6	2 x Vcc	V
V_{IH}	3	Vcc	V
V_T	1.5	Vcc/2	V
V_{LZ}	300	150	mV
V_{HZ}	300	150	mV
C_L	50	30	pF

PROPAGATION DELAY



TEST CIRCUITS FOR ALL OUTPUTS



DEFINITIONS:

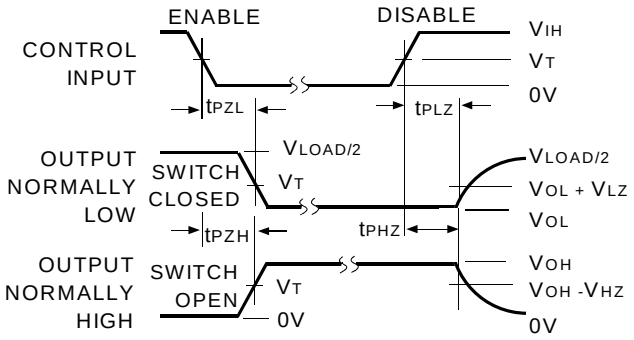
C_L = Load capacitance: includes jig and probe capacitance.

R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

NOTES:

1. Pulse Generator for all pulses: Rate ≤ 10MHz; $t_F \leq$ 2.5ns; $t_R \leq$ 2.5ns.
2. Pulse Generator for all pulses: Rate ≤ 10MHz; $t_F \leq$ 2ns; $t_R \leq$ 2ns.

ENABLE AND DISABLE TIMES



NOTE:

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

SWITCH POSITION

Test	Switch
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND
t_{PD}	Open

ORDERING INFORMATION

IDTQS XXXXX XX

Device Type Package

Q2	40-Pin QVSOP (SO40-1)
32XVH2245	2.5V / 3.3V 16-Bit High Bandwidth Bus Switch for Hot Swap Applications

CORPORATE HEADQUARTERS
2975 Stender Way
Santa Clara, CA 95054

for SALES:
800-345-7015 or 408-727-6116
fax: 408-492-8674
www.idt.com*

**To search for sales office near you, please click the sales button found on our home page or dial the 800# above and press 2.*