QUICKSWITCH® PRODUCTS 2.5V / 3.3V 32-BIT HIGH BANDWIDTH BUS SWITCH

IDTQS34XVH2245

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**
- **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**
- **LVTTL-compatible control Inputs**
- **Undershoot Clamp Diodes on all switch and control Inputs**
- **Low I/O capacitance, 4pF typical**
- **25Ω resistors for low noise and line matching**
- **Available in 80-pin QVSOP package**

APPLICATIONS:

- **Hot-swapping**
- **Low distortion analog switch**
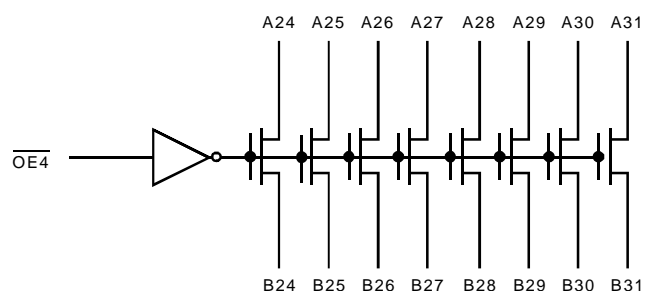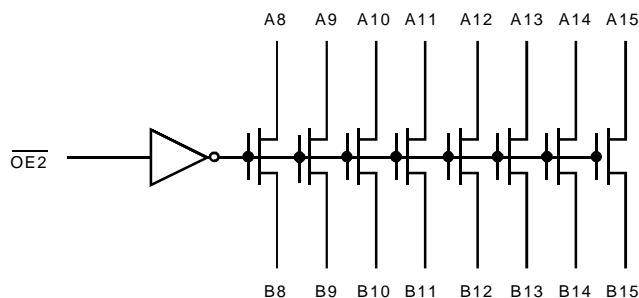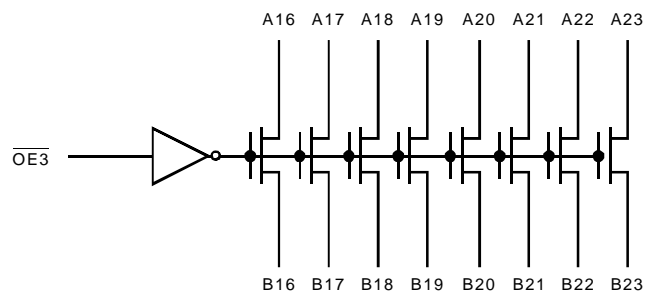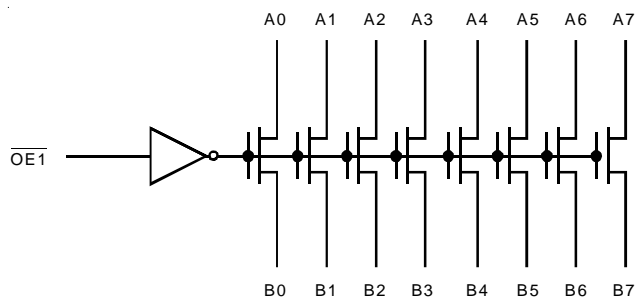- **Replaces mechanical relay**
- **ATM 25/155 switching**

DESCRIPTION:

The QS34XVH2245 is a high bandwidth, 32-bit bus switch. The QS34XVH2245 with 25Ω resistance and 1.35ns propagation delay is ideal for line matching and low noise environments. The switches can be turned ON under the control of individual LVTTL-compatible Output Enable ($\overline{OEx}$) 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 small propagation delay, high OFF impedance, and over-voltage tolerance makes the QS34XVH2245 ideal for high performance communications applications.

The QS34XVH2245 is characterized for operation from -40°C to +85°C.
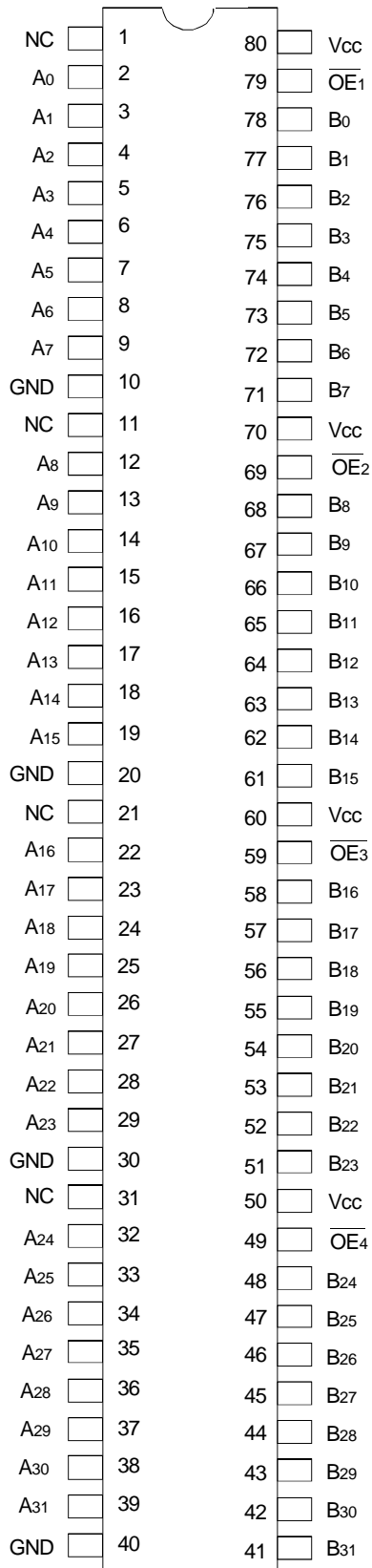
FUNCTIONAL BLOCK DIAGRAM

INDUSTRIAL TEMPERATURE RANGE

MARCH 2003

DSC-5592/11

PIN CONFIGURATION

NC	1		80	Vcc
A0	2		79	$\overline{OE}_1$
A1	3		78	B0
A2	4		77	B1
A3	5		76	B2
A4	6		75	B3
A5	7		74	B4
A6	8		73	B5
A7	9		72	B6
GND	10		71	B7
NC	11		70	Vcc
A8	12		69	$\overline{OE}_2$
A9	13		68	B8
A10	14		67	B9
A11	15		66	B10
A12	16		65	B11
A13	17		64	B12
A14	18		63	B13
A15	19		62	B14
GND	20		61	B15
NC	21		60	Vcc
A16	22		59	$\overline{OE}_3$
A17	23		58	B16
A18	24		57	B17
A19	25		56	B18
A20	26		55	B19
A21	27		54	B20
A22	28		53	B21
A23	29		52	B22
GND	30		51	B23
NC	31		50	Vcc
A24	32		49	$\overline{OE}_4$
A25	33		48	B24
A26	34		47	B25
A27	35		46	B26
A28	36		45	B27
A29	37		44	B28
A30	38		43	B29
A31	39		42	B30
GND	40		41	B31

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 Vs	–0.5 to +5.5	V
V_{TERM}[3]	DC Input Voltage VIN	–0.5 to +5.5	V
V_{AC}	AC Input Voltage (pulse width ≤20ns)	–3	V
I_{OUT}	DC Output Current (max. sink current/pin)	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. Vcc terminals.
3. All terminals except Vcc.

CAPACITANCE (TA = +25°C, F = 1MHz, VIN = 0V, VOUT = 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	I/O	Description
$\overline{OE}$x	I	Output Enable
A x	I/O	Bus A
B x	I/O	Bus B

FUNCTION TABLE[1]

$\overline{OE}$x	Function
H	Disconnected
L	Connect (Ax = Bx)

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 Control Inputs	V_{CC} = 2.3V to 2.7V		1.7	—	—	V
			V_{CC} = 2.7V to 3.6V		2	—	—	
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for Control Inputs	V_{CC} = 2.3V to 2.7V		—	—	0.7	V
			V_{CC} = 2.7V to 3.6V		—	—	0.8	
I_{IN}	Input Leakage Current (Control Inputs)	$0V \le V_{IN} \le V_{CC}$			—	—	±1	µA
I_{OZ}	Off-State Current (Hi-Z)	$0V \le V_{OUT} \le 5V$, Switches OFF			—	—	±1	µA
I_{OFF}	Data Input/Output Power Off Leakage	V_{IN} or V_{OUT} 0V to 5V, V_{CC} = 0V			—	—	±1	µA
R_{ON}	Switch ON Resistance	V_{CC} = 2.3V Typical at V_{CC} = 2.5V	V_{IN} = 0V	I_{ON} = 30mA	18	27	39	Ω
			V_{IN} = 1.7V	I_{ON} = 15mA	18	28	41	
		V_{CC} = 3V	V_{IN} = 0V	I_{ON} = 30mA	18	25	38	
			V_{IN} = 2.4V	I_{ON} = 15mA	18	26	40	

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


R_{ON}
(ohms)

V_{IN}
(Volts)
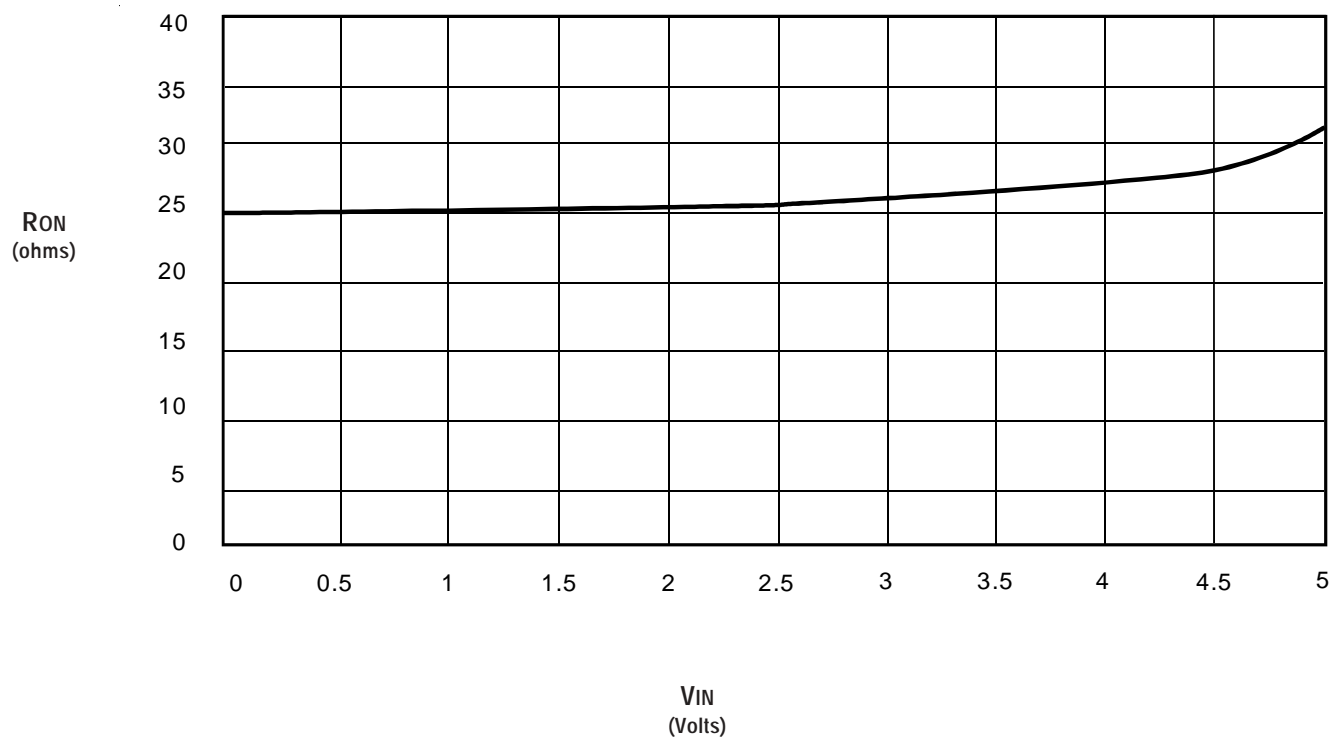
POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions[1]	Min.	Typ.	Max.	Unit
I_{CCQ}	Quiescent Power Supply Current	V_{CC} = Max., V_{IN} = GND or V_{CC}, f = 0	—	4	12	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 Output Enable Control Input[4]	V_{CC} = 3.3V, A and B Pins Open, Control Inputs Toggling @ 50% Duty Cycle	See Typical I_{CCD} vs Enable Frequency graph below			

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 ΔI_{CC}.
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 I_{CCD} vs ENABLE FREQUENCY CURVE AT V_{CC} = 3.3V

ENABLE FREQUENCY (MHz)
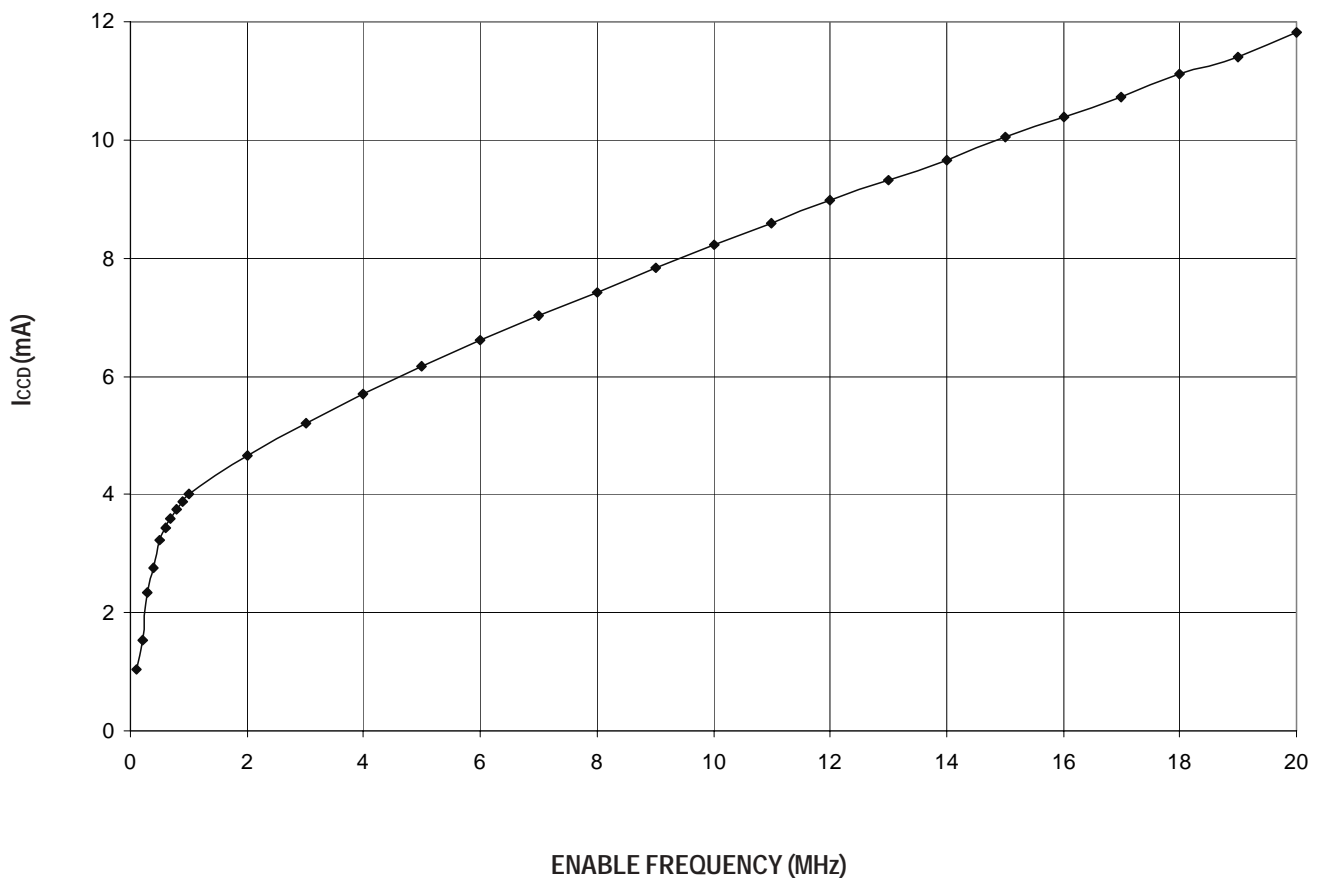
# SWITCHING CHARACTERISTICS OVER OPERATING RANGE

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}	Data Propagation Delay[2,3]	——	0.9	——	1.35	ns
t_{PHL}	Ax to/from Bx					
t_{PZL}	Switch Turn-On Delay	1.5	9	1.5	8	ns
t_{PZH}	$\overline{OEx}$ to Ax/Bx					
t_{PLZ}	Switch Turn-Off Delay	1.5	7.5	1.5	7.5	ns
t_{PHZ}	$\overline{OEx}$ to Ax/Bx					
$f_{\overline{OEx}}$	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 1.35ns 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 $\overline{OEx}$ control input (pass voltage > V_{CC}, V_{IN} = 5V, $R_{LOAD} \geq 1M\Omega$, no C_{LOAD}).

SOME APPLICATIONS FOR HOT SWITCH PRODUCTS
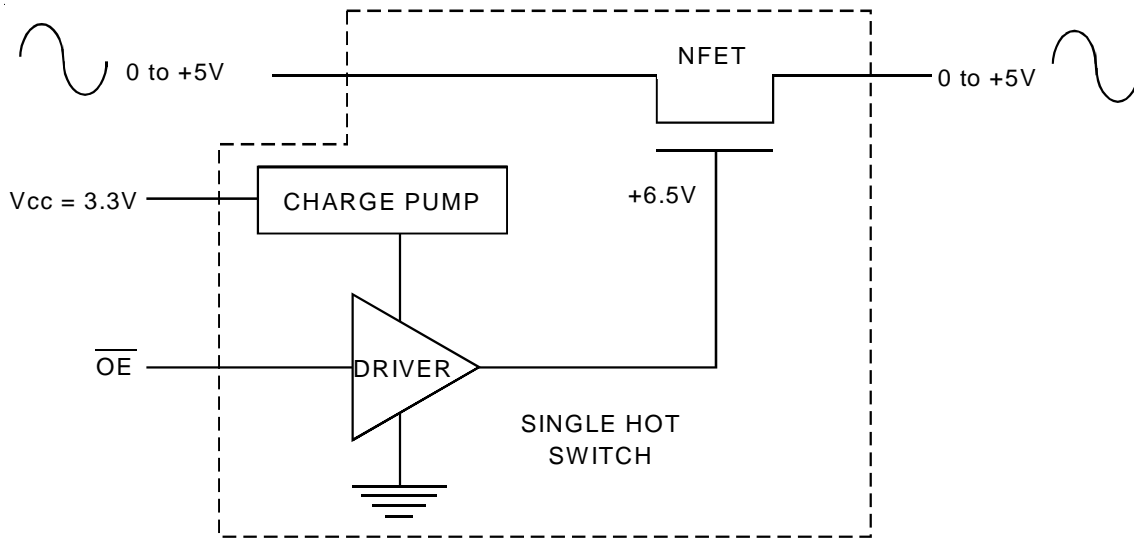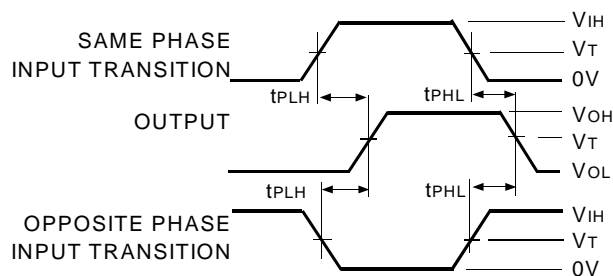
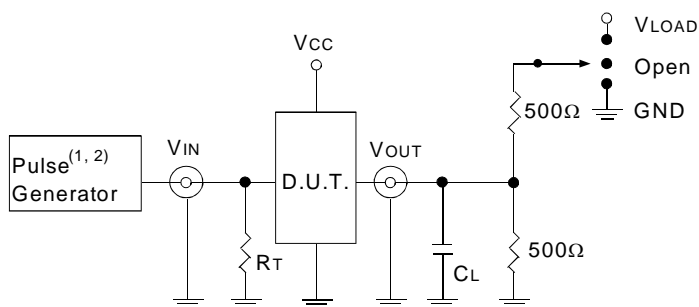*Rail-to-Rail Switching*
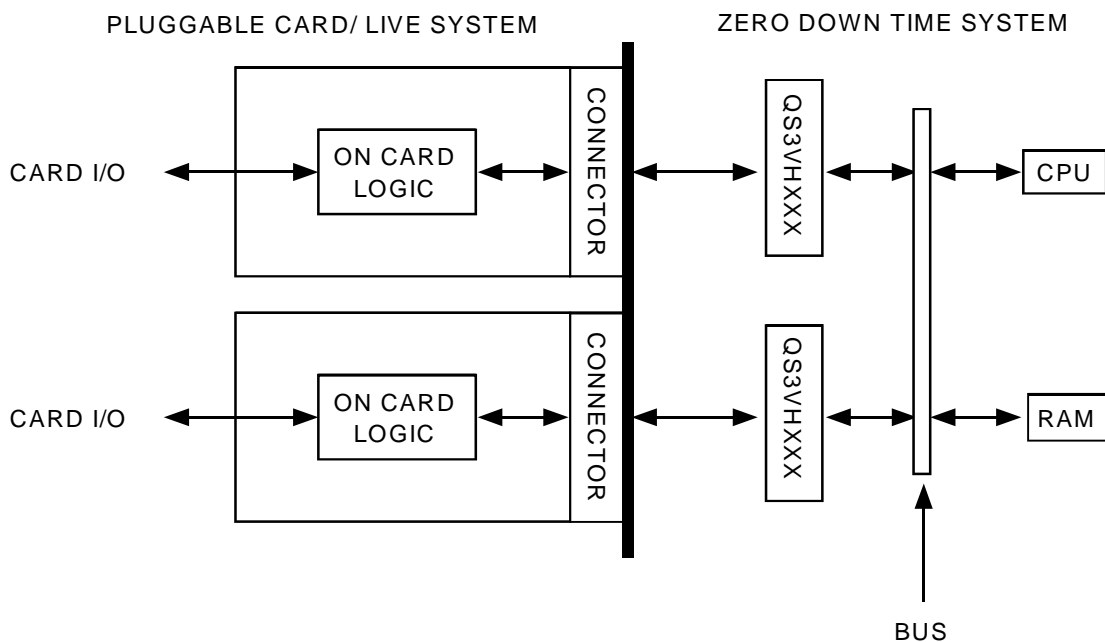
Hot-Swapping
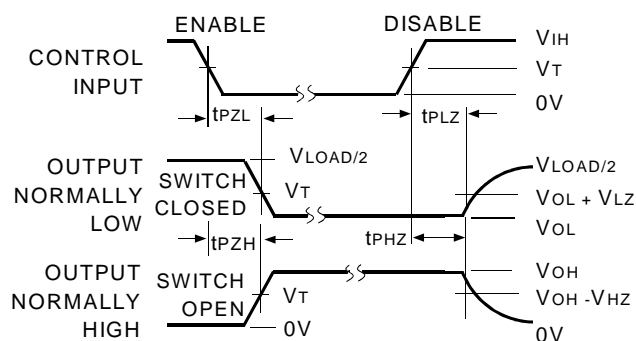
TEST CIRCUITS AND WAVEFORMS

TEST CONDITIONS

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

Propagation Delay

Test Circuits for All Outputs

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

Enable and Disable Times

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 ≤ 2.5ns; t_R ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2ns; t_R ≤ 2ns.

SWITCH POSITION

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

ORDERING INFORMATION

IDTQS <u>XXXXX</u> <u>XX</u>
　　　Device Type　Package

Q3　　　　80-Pin QVSOP

34XVH2245　　2.5V / 3.3V 32-Bit High Bandwidth Bus Switch

DATA SHEET DOCUMENT HISTORY

8/6/2002　Updated according to PCN Logic-0206-11
3/3/2003　Changed Icc limits