QUICKSWITCH® PRODUCTS 3.3V HIGH SPEED 32-BIT MULTIWIDTH™ BUS SWITCH

IDTQS34XV245

FEATURES:

– 5Ω bi-directional switches connect inputs to outputs
– Pin Compatibility with QS3245
– 250ps Propagation Delay
– Undershoot Clamp Diodes on all Switch and Control Inputs
– LVTTL-Compatible Control Inputs
– Available in 80-pin MillipaQ Package (Q3)

APPLICATIONS:

– 3.3V to 2.5V Voltage translation
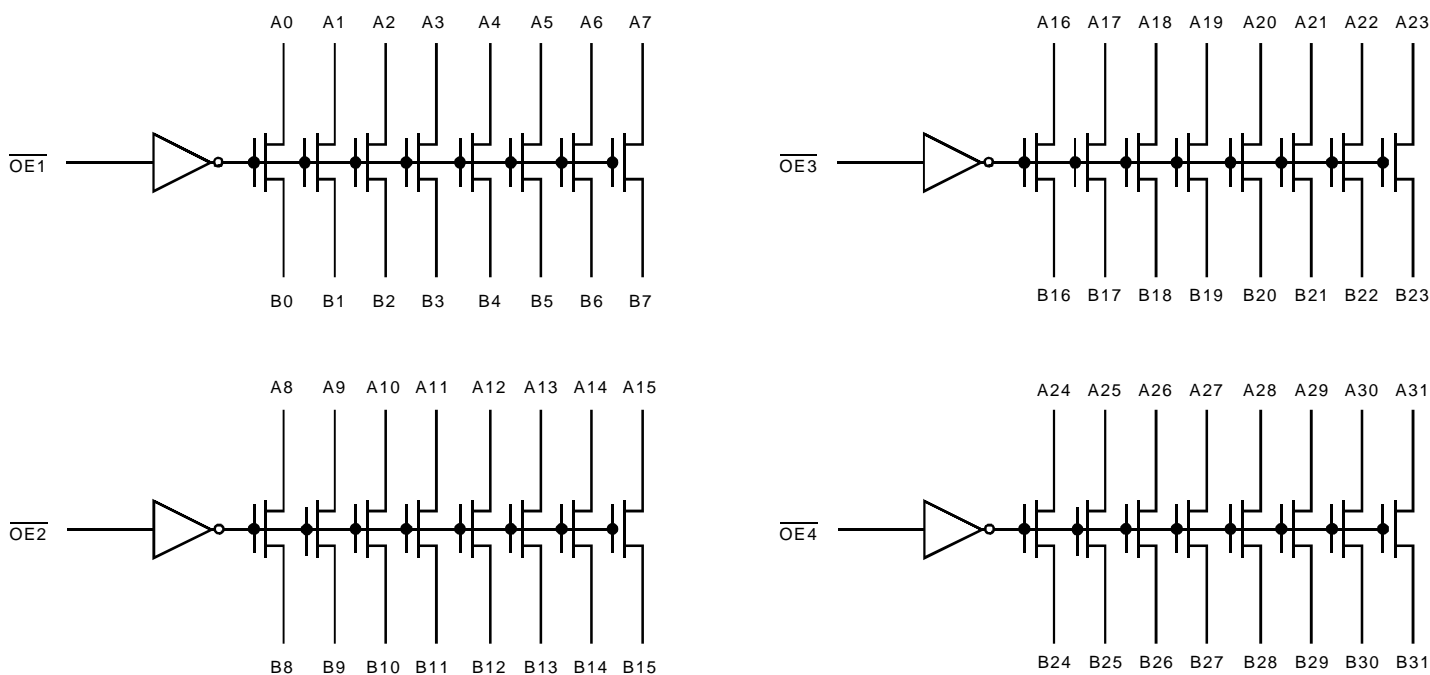– 2.5V to 1.8V Voltage translation
– PCI Bus isolation hot swap

DESCRIPTION:

The QS34XV245 is a set of 32-bit high speed bus switches controlled by LVTTL-compatible active low enable signal. When closed, the switches exhibit near zero propagation delay without generating additional ground bounce or switching noise.
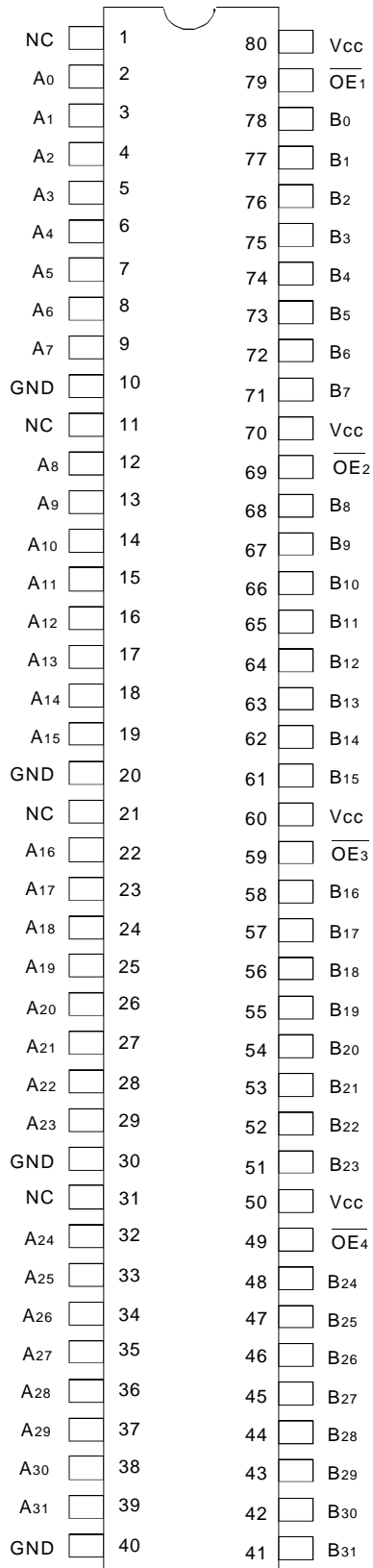
The QS34XV245 is specially designed for direct interface betweeen 3.3V and 2.5V devices without any external components. When operating from a 3.3V supply, the logic high level at the switch output is clamped to 2.5V when the switch input signal exceeds 2.5V. This device can be used for switching 2.5V buses without signal attenuation. The ON resistance at 3.3V V_{CC} is less than 5Ω typical, providing near zero propagation delay through the switch. Absence of DC path from switch I/O pins to V_{CC} or ground makes QS34XV245 an ideal device for hot swapping applications.

The QS34XV245 is characterized for operation from -40°C to +85°C.

FUNCTIONAL BLOCK DIAGRAM

INDUSTRIAL TEMPERATURE RANGE

NOVEMBER 1999

PIN CONFIGURATION

NC	1	80	Vcc
A_0	2	79	$\overline{OE}_1$
A_1	3	78	B_0
A_2	4	77	B_1
A_3	5	76	B_2
A_4	6	75	B_3
A_5	7	74	B_4
A_6	8	73	B_5
A_7	9	72	B_6
GND	10	71	B_7
NC	11	70	Vcc
A_8	12	69	$\overline{OE}_2$
A_9	13	68	B_8
A_{10}	14	67	B_9
A_{11}	15	66	B_{10}
A_{12}	16	65	B_{11}
A_{13}	17	64	B_{12}
A_{14}	18	63	B_{13}
A_{15}	19	62	B_{14}
GND	20	61	B_{15}
NC	21	60	Vcc
A_{16}	22	59	$\overline{OE}_3$
A_{17}	23	58	B_{16}
A_{18}	24	57	B_{17}
A_{19}	25	56	B_{18}
A_{20}	26	55	B_{19}
A_{21}	27	54	B_{20}
A_{22}	28	53	B_{21}
A_{23}	29	52	B_{22}
GND	30	51	B_{23}
NC	31	50	Vcc
A_{24}	32	49	$\overline{OE}_4$
A_{25}	33	48	B_{24}
A_{26}	34	47	B_{25}
A_{27}	35	46	B_{26}
A_{28}	36	45	B_{27}
A_{29}	37	44	B_{28}
A_{30}	38	43	B_{29}
A_{31}	39	42	B_{30}
GND	40	41	B_{31}

MILLIPAQ
TOP VIEW

ABSOLUTE MAXIMUM RATING[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 4.6	V
V_{TERM}[3]	DC Input Voltage V_{IN}	– 0.5 to 4.6	V
V_{AC}	AC Input Voltage (pulse width ≤20ns)	– 3	V
V_{OUT}	DC Output Current	120	mA
P_{MAX}	Maximum Power Dissipation	0.92	W
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 $(T_A = +25^oC, f = 1MHz, V_{IN} = 0V, V_{OUT} = 0V)$

Symbol	Parameter[1]	Conditions	Typ.	Max.	Unit
C_{IN}	Control Inputs		4	6	pF
CI/O	Quickswitch Channels	Switch OFF	5	7	pF

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

PIN DESCRIPTION

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

FUNCTION TABLE [1]

$\overline{OEn}$	Function
H	Disconnected
L	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 Level	Guaranteed Logic HIGH for Control Inputs	2	—	—	V
V_{IL}	Input LOW Voltage Level	Guaranteed Logic LOW for Control Inputs	—	—	0.8	V
I_{IN}	Input Leakage Current (Control Inputs)	$0V \leq V_{IN} \leq V_{CC}$	—	—	1	µA
I_{OZ}	Off-State Current (Hi-Z)	$0V \leq V_{OUT} \leq V_{CC}$, Switches OFF	—	0.001	1	µA
R_{ON}	Switch ON Resistance	V_{CC} = Min., V_{IN} = 0V, I_{ON} = 8mA	—	5	7	Ω
		V_{CC} = Min., V_{IN} = 1.7V, I_{ON} = 8mA	—	15	20	Ω
		V_{CC} = 2.3V, V_{IN} = 0V, I_{ON} = 8mA	—	7	—	Ω
		V_{CC} = 2.3V, V_{IN} = 1.3V, I_{ON} = 8mA	—	25	—	Ω
V_P	Pass Voltage[2]	V_{IN} = V_{CC} = 3.3V, I_{OUT} = -5µA	2.5	2.7	2.9	V
		V_{IN} = V_{CC} = 2.5V, I_{OUT} = -5µA	—	1.8	—	V

NOTES:
1. Typical values are at V_{CC} = 3.3V, +25°C ambient.
2. Pass voltage is guaranteed, but not production tested.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions[1]	Min.	Max.	Unit
I_{CCQ}	Quiescent Power Supply Current	V_{CC} = Max., V_{IN} = GND or V_{CC}, f = 0	—	12	µA
ΔI_{CC}	Power Supply Current[2] per Input HIGH	V_{CC} = Max., V_{IN} = 3V or V_{CC}, f = 0 per Control Input	—	50	µA
I_{CCD}	Dynamic Power Supply Current per MHz [3]	V_{CC} = Max., A and B Pins Open, Control Input Toggling @ 50% Duty Cycle	—	0.15	mA/MHz

NOTES:
1. For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.
2. Per TLL driven input (V_{IN} = 3.4V). A and B pins do not contribute to ΔI_{CC}.
3. This current applies to the control inputs only and represents the current required to switch internal capacitance at the specified frequency. The A and B inputs generate no significant AC or DC currents as they transition. 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

Symbol	Parameter	Min. [1]	Typ.	Max.	Unit
t_{PLH}	Data Propagation Delay[2, 3]	—	—	0.25	ns
t_{PHL}	An to/from Bn				
t_{PZL}	Switch Turn-On Delay	0.5	—	6.5	ns
t_{PZH}	$\overline{OEn}$ to An/Bn				
t_{PLZ}	Switch Turn-Off Delay[2]	0.5	—	4	ns
t_{PHZ}	$\overline{OEn}$ to An/Bn				

NOTES:

1. Minimums are guaranteed but not production tested.
2. This parameter is guaranteed but not production tested.
3. The time constant for the switch alone is of the order of 0.25ns at C_L = 30pF. The bus switch contributes no propagation delay other than the RC delay of the ON resistance of the switch and the load capacitance. 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.
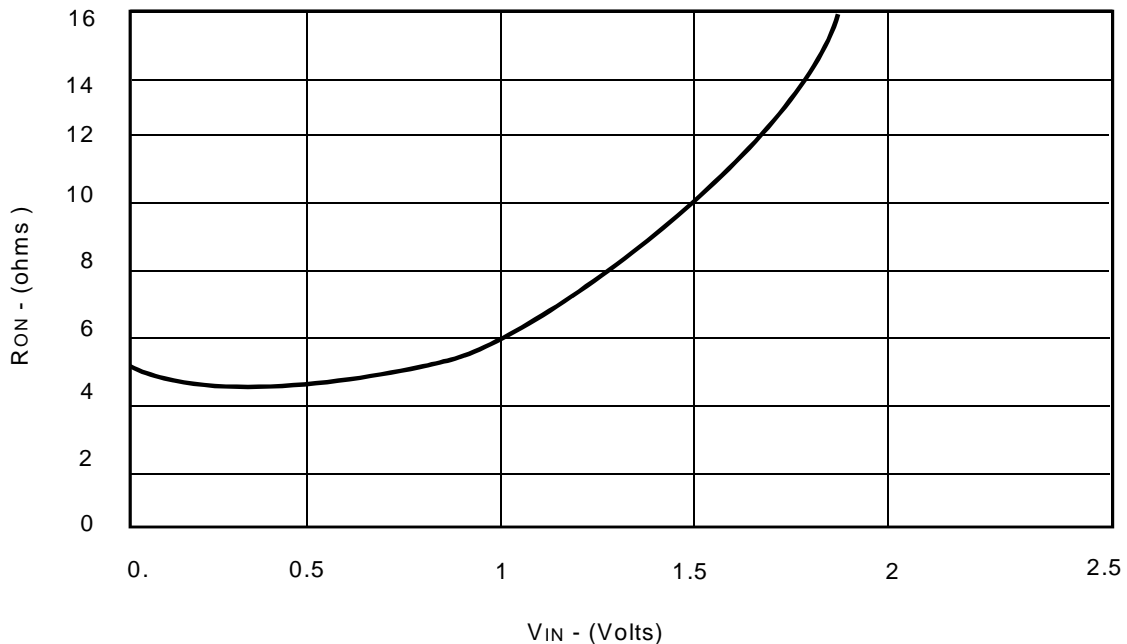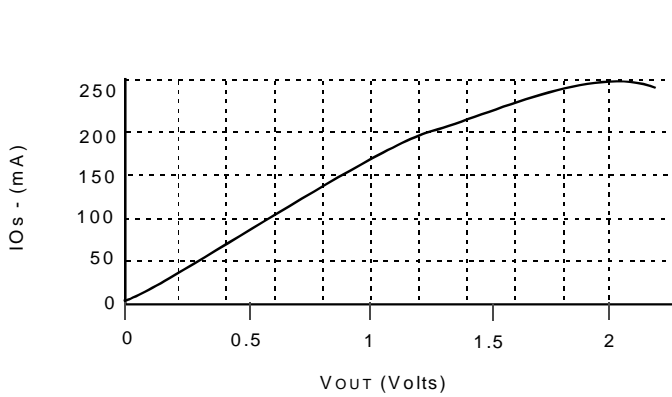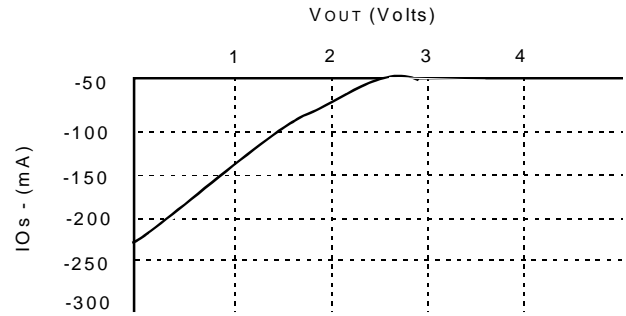
TYPICAL ON RESISTANCE vs V_{IN} AT V_{CC} = 3.3V

Figure. 1

OUTPUT VI CHARACTERISTICS

Outputs Low Characteristic

Figure. 2

Outputs High Characteristic

Figure. 3

PASS VOLTAGE vs Vcc

V_{OUT} = 2.5V @ V_{CC} = 3.3V
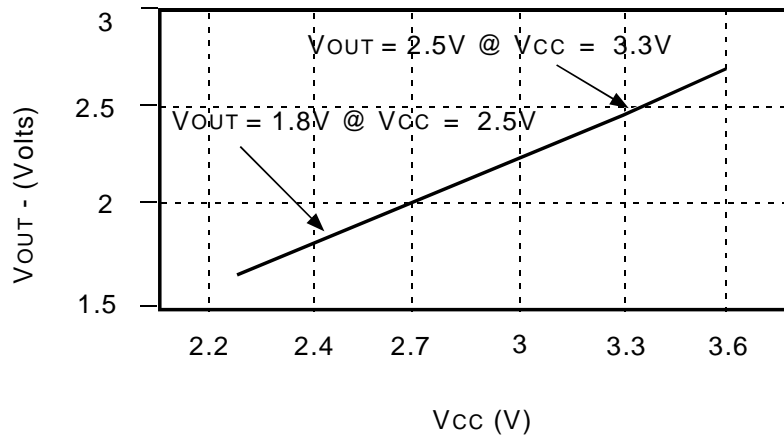
V_{OUT} = 1.8V @ V_{CC} = 2.5V

Figure. 4

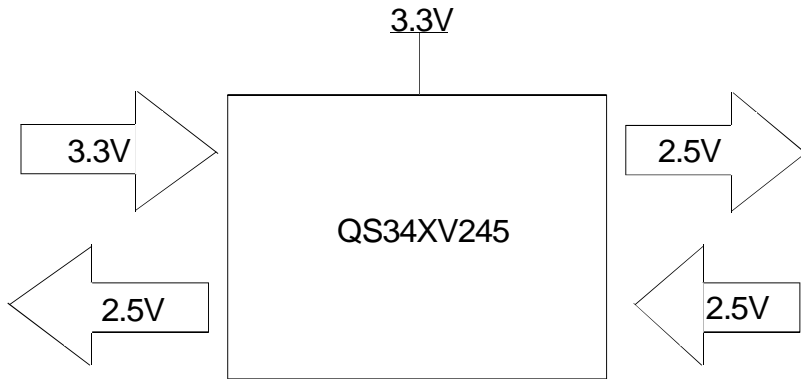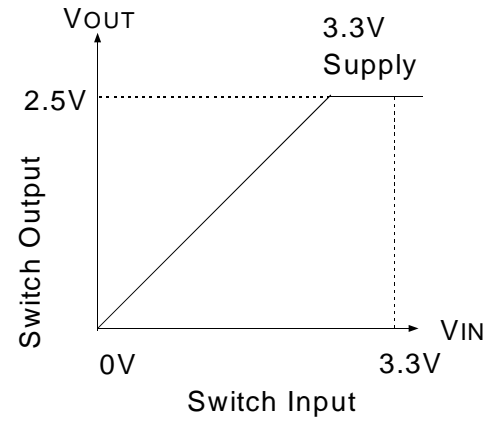## 3.3V TO 2.5V VOLTAGE TRANSLATION

Figure. 5

Figure. 6

2.5V TO 1.8V VOLTAGE TRANSLATION
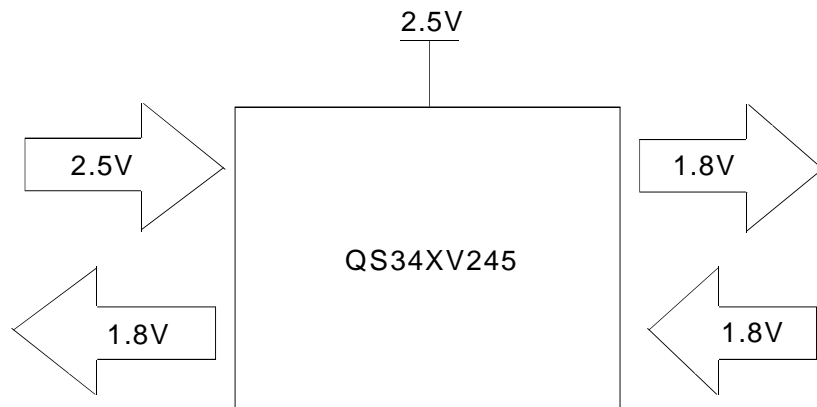
Figure. 7

Figure. 8

ORDERING INFORMATION

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IDTQS    XXXXX        XX      X
        Device Type  Package Process
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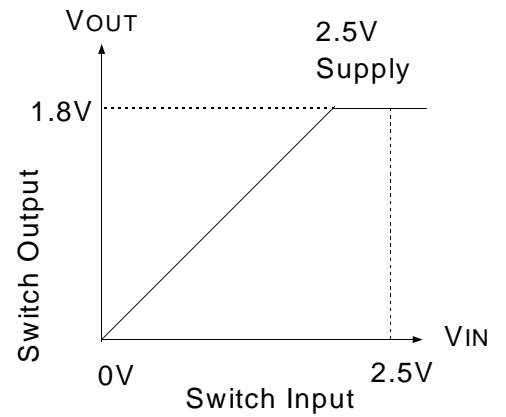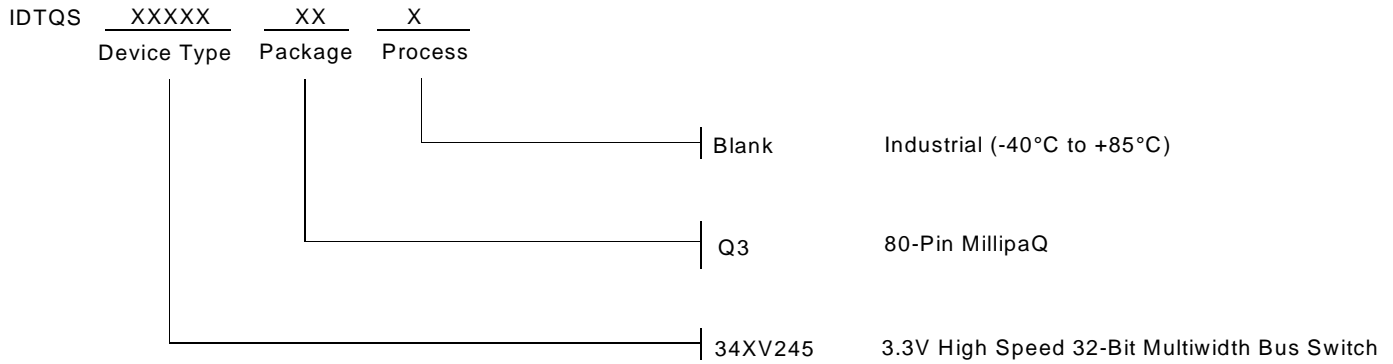|	
Blank	Industrial (-40°C to +85°C)
Q3	80-Pin MillipaQ
34XV245	3.3V High Speed 32-Bit Multiwidth Bus Switch

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