

# QuickSwitch<sup>®</sup> Products

## High-Speed CMOS

### QuickSwitch<sup>®</sup>

## 8-Bit Bus Switches

QS3245  
QS32245

### FEATURES/BENEFITS

- Enhanced N channel FET with no inherent diode to  $V_{CC}$
- $5\Omega$  bidirectional switches connect inputs to outputs
- Pin compatible with the 74F245, 74FCT245, and 74FCT245T
- Low power CMOS proprietary technology
- Zero propagation delay, zero ground bounce
- Undershoot clamp diodes on all switch and control inputs
- QS32245 is  $25\Omega$  version for low noise
- TTL-compatible control inputs
- Available in TSSOP, SOIC, QSOP and HQSOP

### APPLICATIONS

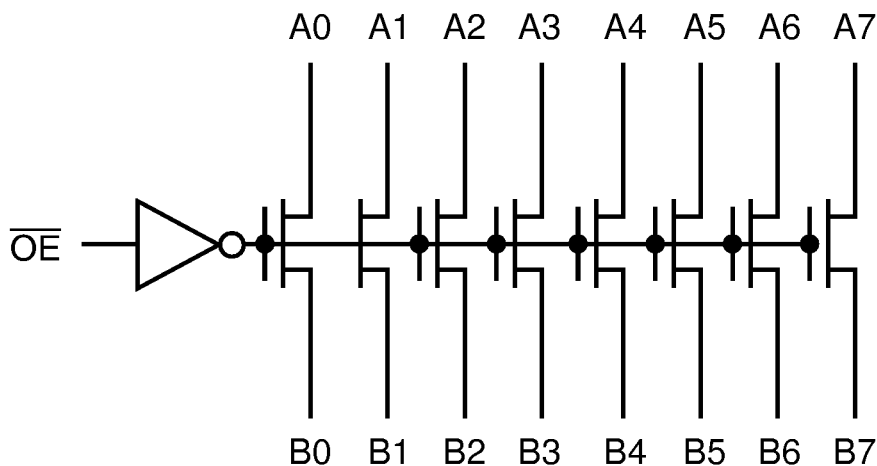
- Hot-docking, hot-swapping (Application Note AN-13)
- Voltage translation (5V to 3.3V; Application Note AN-11)
- Logic replacement (data processing)
- Power conservation
- Capacitance reduction, and isolation
- Bus isolation
- Clock gating

### DESCRIPTION

The QS3245 and QS32245 provide a set of eight high-speed CMOS TTL-compatible bus switches in a pinout compatible with 74FCT245, 74F245, 74ALS/AS/LS245 8-bit transceivers. The low ON resistance of the 3245 allows inputs to be connected to outputs without adding propagation delay and without generating additional ground bounce noise. The Output Enable ( $\overline{OE}$ ) signal turns the switches on similar to the  $\overline{OE}$  signal of the 74'245. The QS32245 has  $25\Omega$  series resistors to reduce ground bounce noise.

QuickSwitch devices provide an order of magnitude faster speed than conventional logic devices.

Figure 1. Functional Block Diagram



**Table 1. Pin Description**

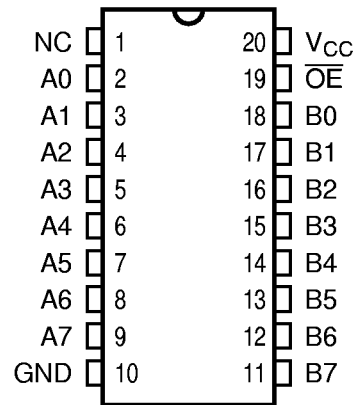
Name	Description
$\overline{OE}$	Output Enable
A <sub>n</sub>	Data I/Os
B <sub>n</sub>	Data I/Os

**Table 2. Function Table**

$\overline{OE}$	Outputs
H	Disconnected
L	A <sub>n</sub> = B <sub>n</sub>

**Figure 2. Pin Configuration**  
(All Pins Top View)

TSSOP, SOIC, QSOP, HQSOP



**Table 3. Absolute Maximum Ratings**

Supply Voltage to Ground .....	-0.5V to 7.0V
DC Switch Voltage V <sub>S</sub> .....	-0.5V to 7.0V
DC Input Voltage V <sub>IN</sub> .....	-0.5V to 7.0V
AC Input Voltage (for a pulse width ≤ 20ns) .....	-3.0V
DC Output Current Max. Sink Current/Pin .....	120mA
Maximum Power Dissipation .....	0.5 watts
T <sub>STG</sub> Storage Temperature .....	-65° to 150°C

**Note:** ABSOLUTE MAXIMUM CONTINUOUS RATINGS are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum conditions is not implied.

**Table 4. Capacitance**

T<sub>A</sub> = 25°C, f = 1MHz, V<sub>IN</sub> = 0V, V<sub>OUT</sub> = 0V

Pins	QSOP, SOIC		Unit
	Typ	Max	
Control Inputs	3	5	pF
QuickSwitch Channels (Switch OFF)	5	7	pF

**Note:** Capacitance is guaranteed but not production tested. For total capacitance while the switch is ON, please see Section 1 under "Input and Switch Capacitance".

**Table 5. DC Electrical Characteristics Over Operating Range**

Commerical:  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 5\%$

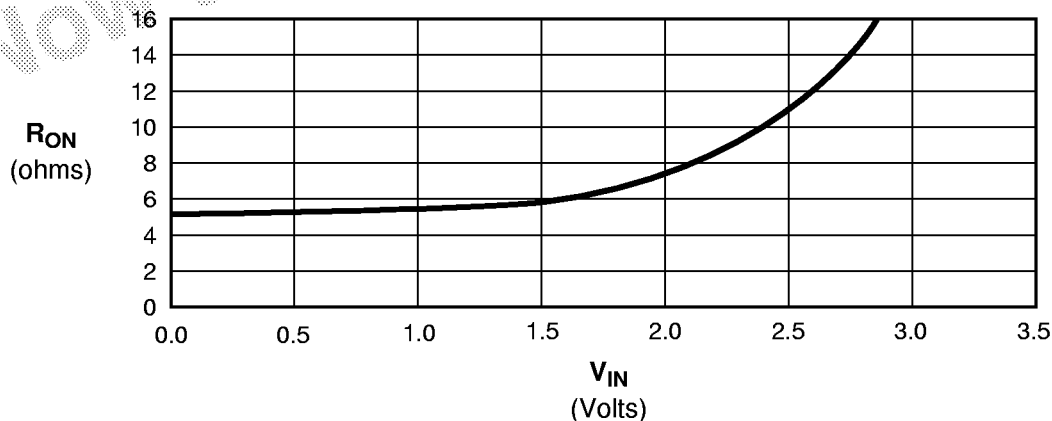
Military:  $T_A = -55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$

Symbol	Parameter	Test Conditions	Min	Typ <sup>(1)</sup>	Max	Unit
$V_{IH}$	Input HIGH Voltage	Guaranteed Logic HIGH for Control Inputs	2.0	—	—	V
$V_{IL}$	Input LOW Voltage	Guaranteed Logic LOW for Control Inputs	—	—	0.8	V
$ I_{IN} $	Input Leakage Current (Control Inputs)	$0\text{V} \leq V_{IN} \leq V_{CC}$	—	—	1	$\mu\text{A}$
$ I_{OZ} $	Off-State Current (Hi-Z)	$0\text{V} \leq V_{OUT} \leq V_{CC}$ , Switches OFF	—	0.001	1	$\mu\text{A}$
$R_{ON}$	Switch ON Resistance <sup>(2)</sup>	$V_{CC} = \text{Min.}, V_{IN} = 0.0\text{V}$ 3245	—	5	7	$\Omega$
		$I_{ON} = 30\text{mA}$ 32245	20	28	40	
$R_{ON}$	Switch ON Resistance <sup>(2)</sup>	$V_{CC} = \text{Min.}, V_{IN} = 2.4\text{V}$ 3245	—	10	15	$\Omega$
		$I_{ON} = 15\text{mA}$ 32245	20	35	48	
$V_P$	Pass Voltage <sup>(3)</sup>	$V_{IN} = V_{CC} = 5\text{V}, I_{OUT} = -5\mu\text{A}$	3.7	4	4.2	V

**Notes:**

1. Typical values indicate  $V_{CC} = 5.0\text{V}$  and  $T_A = 25^{\circ}\text{C}$ .
2. For a diagram explaining the procedure for  $R_{ON}$  measurement, please see Section 1 under "DC Electrical Characteristics." Max value of  $R_{ON}$  guaranteed, but not production tested.
3. Pass voltage is guaranteed, but not production tested.

**Figure 3. Typical ON Resistance vs  $V_{IN}$  at  $V_{CC} = 5.0\text{V}$  (QS3245)**



**Note:** For QS32245, and  $23\Omega$  to  $R_{ON}$  shown.

**Table 6. Power Supply Characteristics**

Commercial:  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 5\%$

Military:  $T_A = -55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Max	Unit
$I_{CCQ}$	Quiescent Power Supply Current	$V_{CC} = \text{Max.}, V_{IN} = \text{GND or } V_{CC}, f = 0$	3.0	$\mu\text{A}$
$\Delta I_{CC}$	Power Supply Current <sup>(2)</sup> per Input HIGH	$V_{CC} = \text{Max.}, V_{IN} = 3.4\text{V}, f = 0$ per Control Input	1.5	mA
$Q_{CCD}$	Dynamic Power Supply Current per MHz <sup>(3)</sup>	$V_{CC} = \text{Max.}, A$ and B Pins Open, Controls Inputs Toggling @ 50% Duty Cycle	0.25	mA/MHz

**Notes:**

1. For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
2. Per TTL driven input ( $V_{IN} = 3.4\text{V}$ , control inputs only). A and B pins do not contribute to  $I_{CC}$ .
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.

**Table 7. Switching Characteristics Over Operating Range**

Commercial:  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 5\%$

Military:  $T_A = -55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$

$C_{LOAD} = 50\text{pF}$ ,  $R_{LOAD} = 500\Omega$  unless otherwise noted.

Symbol	Description <sup>(1)</sup>	QS3245			QS32245			Unit
		Min	Typ	Max	Min	Typ	Max	
$t_{PLH}$	Data Propagation Delay <sup>(2,3)</sup>	—	—	0.25	—	—	1.25	ns
$t_{PHL}$	An to/from Bn MIL	—	—	0.75	—	—	—	
$t_{PZL}$	Switch Turn-on Delay	0.5	—	5.6	0.5	—	6.6	ns
$t_{PZH}$	$\overline{\text{OE}}$ to An/Bn MIL	—	—	6.6	—	—	—	
$t_{PLZ}$	Switch Turn-off Delay <sup>(2)</sup>	0.5	—	4.5	0.5	—	4.5	ns
$t_{PHZ}$	$\overline{\text{OE}}$ to An/Bn MIL	—	—	5.5	—	—	—	

**Notes:**

1. See Test Circuit and Waveforms. Minimums guaranteed, but not production tested.
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 0.25ns for QS3245 and 1.25ns for QS32245 for  $C_L = 50\text{pF}$ . Since this time constant is much smaller than the rise/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.