QUALITY SEMICONDUCTOR, INC.

QuickSwitch® Products High-Speed CMOS QuickSwitch® 8-Bit Low Resistance Bus Switches

QS3R245

FEATURES/BENEFITS

- Enhanced N channel FET with no inherent diode to V_{CC}
- 2.5Ω bidirectional switches connect inputs to outputs
- Pin compatible with the 74F245, 74FCT245, and 74FCT245T
- Zero propagation delay, zero ground bounce
- Undershoot clamp diodes on all switch and control inputs
- TTL-compatible control inputs
- Available in SOIC (SO), & QSOP

APPLICATIONS

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

DESCRIPTION

The QS3R245 provides 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 low ON resistance of QS3R245 makes it ideal for PCI hot docking application.

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

Figure 1. Functional Block Diagram

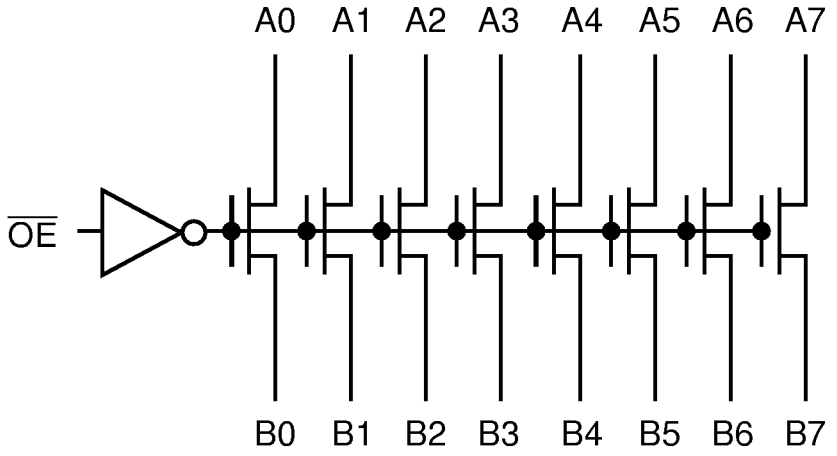

Table 1. Pin Description

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

Figure 2. Pin Configuration
(All Pins Top View)

SOIC (SO), QSOP

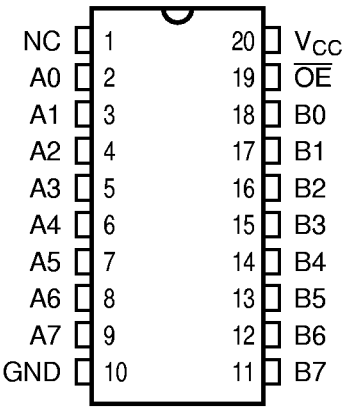

Table 2. Function Table

$\overline{OE}$	Outputs
H	Disconnected
L	An = Bn

Table 3. Absolute Maximum Ratings

Supply Voltage to Ground	–0.5V to 7.0V
DC Switch Voltage V_S	–0.5V to 7.0V
DC Input Voltage V_{IN}	–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_{STG} 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_A = 25°C, f = 1MHz, V_{IN} = 0V, V_{OUT} = 0V

Pins	QSOP, SOIC		Unit
	Typ	Max	
Control Inputs	3	4	pF
QuickSwitch Channels (Switch OFF)	5	6	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°C to 85°C, V_{CC} = 5.0V ±10%

Symbol	Parameter	Test Conditions	Min	Typ(1)	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 Input)	$0V \le V_{IN} \le V_{CC}$	—	—	1	µA
$\| I_{OZ} \|$	Off-State Current (Hi-Z)	$0V \le V_{OUT} \le V_{CC}$, Switches OFF	—	0.001	1	µA
R_{ON}	Switch ON Resistance(2)	V_{CC} = Min., V_{IN} = 0 I_{ON} = 30mA	—	2.5	4	Ω
R_{ON}	Switch ON Resistance(2)	V_{CC} = Min., V_{IN} = 2.4 I_{ON} = 15mA	—	4	5.5	Ω
V_P	Pass Voltage(3)	$V_{IN} = V_{CC}$ = 5V, I_{OUT} = –5µA	3.7	4	4.3	V

Notes:
1. Typical values indicate V_{CC} = 5.0V and T_A = 25°C.
2. For total capacitance while the switch in ON, please see Section 1 under “Input and Switch Capacitance”. 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} = 5.0V

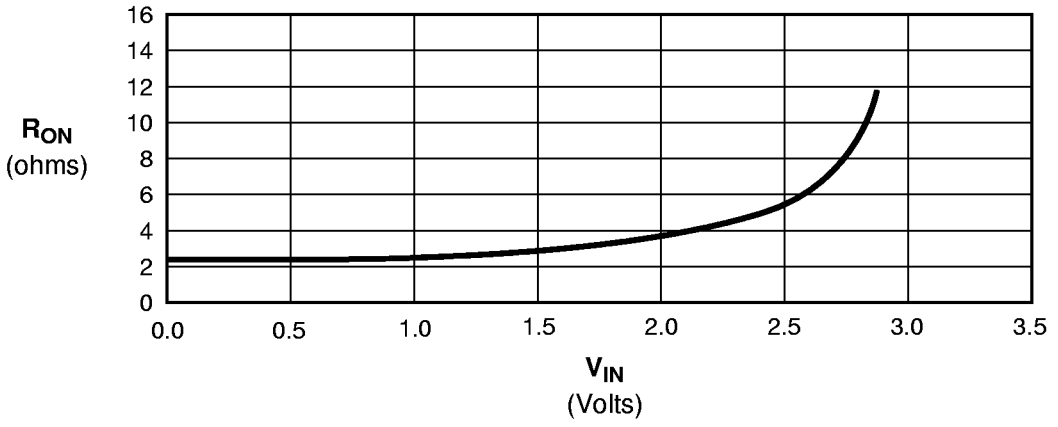

Table 6. Power Supply Characteristics

Commercial: T_A = –40°C to 85°C, V_{CC} = 5.0V ±10%

Symbol	Parameter	Test Conditions[1]	Max	Unit
I_{CCQ}	Quiescent Power Supply Current	V_{CC} = Max., V_{IN} = GND or V_{CC}, f = 0	3	µA
ΔI_{CC}	Power Supply Current[2] per Input HIGH	V_{CC} = Max., V_{IN} = 3.4V, f = 0 per Control Input	2.5	mA
Q_{CCD}	Dynamic Power Supply Current per MHz[3]	V_{CC} = Max., A and B Pins Open, Controls 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 specifications.
2. Per TTL driven input (V_{IN} = 3.4V, 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°C to 85°C, V_{CC} = 5.0V ±10%
C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.

Symbol	Description[1]	Min	Typ	Max	Unit
t_{PLH} t_{PHL}	Data Propagation Delay[2,3] An to/from Bn	—	—	0.12[3]	ns
t_{PZL} t_{PZH}	Switch Turn-on Delay $\overline{OE}$ to An/Bn	0.5	—	5.6	ns
t_{PLZ} t_{PHZ}	Switch Turn-off Delay[2] $\overline{OE}$ to An/Bn	0.5	—	4.5	ns

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 0.12ns for QS3R245 for C_L = 50pF. 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.