



QUALITY
SEMICONDUCTOR, INC.

QuickSwitch® Products

High-Speed CMOS

QuickSwitch®

8-Bit Bus Switches

QS3244
QS32244

FEATURES/BENEFITS

- Enhanced N channel FET with no inherent diode to V_{CC}
- 5Ω bidirectional switches connect inputs to outputs
- Pin compatible with the 74F244, 74FCT244, and 74FCT244T
- Zero propagation delay, zero ground bounce
- Undershoot clamp diodes on all switch and control inputs
- Available in SOIC (SO), & QSOP
- QS32244 is 25Ω version for low noise

APPLICATIONS

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

DESCRIPTION

The QS3244 and QS32244 provide a set of eight high-speed CMOS TTL-compatible bus switches in a pinout compatible with 74FCT244, 74F244, 74ALS/AS/LS244 8-bit drivers. The low ON resistance (5Ω) of the 3244 allows inputs to be connected to outputs without adding propagation delay and without generating additional ground bounce noise. The two enable (\overline{nG}) signals turn the switches on similar to the \overline{nG} signals of the 74'244. The QS32244 device includes 25Ω series termination resistors.

The QS32244 adds an internal 25Ω resistor to reduce reflection noise in high speed applications. When the switch is closed, it acts as the source termination for the driver connected to it.

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

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Figure 1. Functional Block Diagram

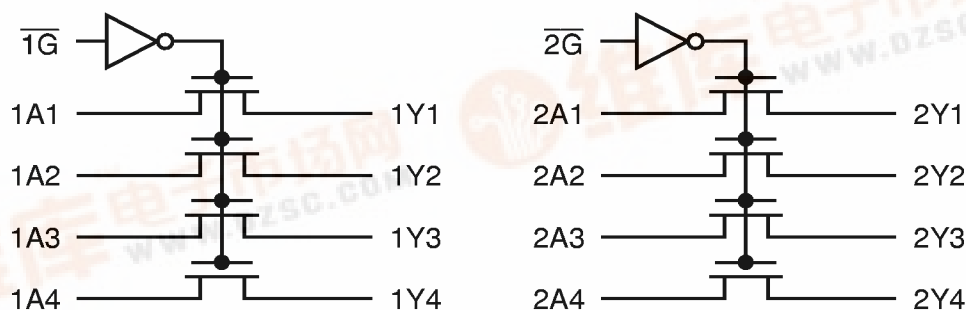


Table 1. Pin Description

Name	Description
$\overline{1G}/\overline{2G}$	Output Enable
An	Data I/Os
Yn	Data I/Os

Pin Configuration
(All Pins Top View)

SOIC (SO), QSOP

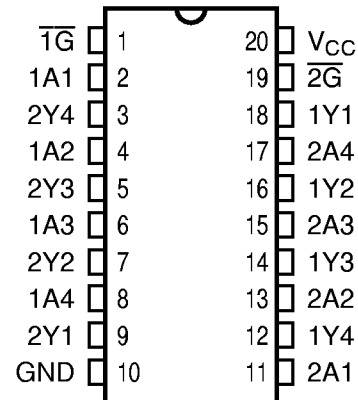


Table 2. Function Table

$\overline{1G}$	$\overline{2G}$	1A, 1Y I/Os	2A, 2Y I/Os
H	H	Disconnected	Disconnected
L	H	1An = 1Yn	Disconnected
H	L	Disconnected	2An = 2Yn
L	L	1An = 1Yn	2An = 2Yn

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 ≤ 20 ns)	–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

$T_A = 25^\circ\text{C}$, $f = 1\text{MHz}$, $V_{IN} = 0\text{V}$, $V_{OUT} = 0\text{V}$

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

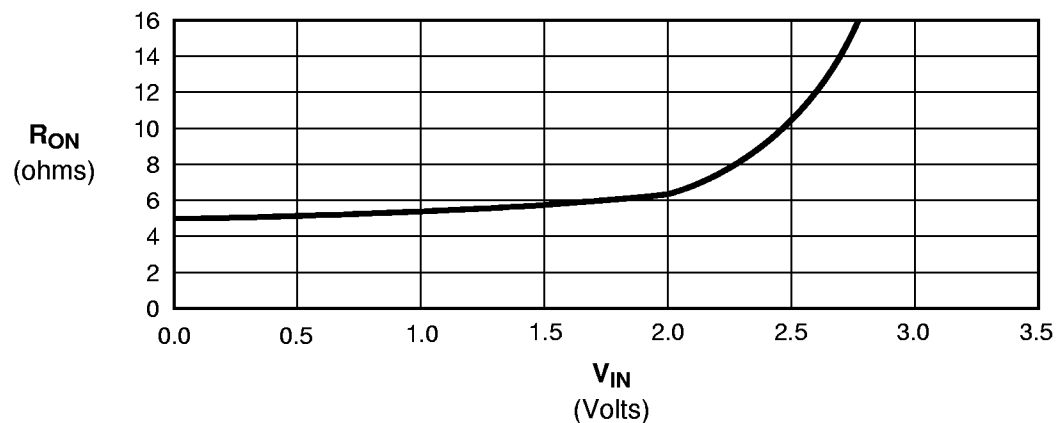
Note: Capacitance is guaranteed, but not production tested and are typical values. For total capacitance while the switch is ON, please see Section 1 under “Input and Switch Capacitance”.

Table 5. DC Electrical Characteristics Over Operating Range $T_A = -40^{\circ}\text{C}$ to 85°C , $V_{CC} = 5.0\text{V} \pm 5\%$

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 ⁽²⁾ (Control Inputs)	$0 \leq V_{IN} \leq V_{CC}$	—	—	1	μA
$ I_{OZ} $	Off-State Current (Hi-Z)	$0 \leq V_{OUT} \leq V_{CC}$, Switches OFF	—	—	1	μA
R_{ON}	Switch ON Resistance ⁽²⁾	$V_{CC} = \text{Min.}$, $V_{IN} = 0.0\text{V}$ QS3244 $I_{ON} = 30\text{mA}$ QS32244	— 20	5 28	7 40	Ω
R_{ON}	Switch ON Resistance ⁽²⁾	$V_{CC} = \text{Min.}$, $V_{IN} = 2.4\text{V}$ QS3244 $I_{ON} = 15\text{mA}$ QS32244	— 20	10 35	15 48	Ω
V_P	Pass Voltage ⁽³⁾	$V_{IN} = V_{CC} = 5\text{V}$, $I_{OUT} = -5\mu\text{A}$	3.7	4	4.2	V

Notes:

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

Figure 3. Typical ON Resistance vs V_{IN} at $V_{CC} = 5.0\text{V}$ (QS3244)

Note: For QS32244, and 23Ω to R_{ON} shown.

Table 7. Power Supply Characteristics Over Operating Range

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

Symbol	Parameter	Test Conditions ⁽¹⁾	Max	Unit
I_{CCQ}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$, $V_{IN} = \text{GND}$ or V_{CC} , $f = 0$	3.0	μA
ΔI_{CC}	Power Supply Current ⁽²⁾ per Input HIGH	$V_{CC} = \text{Max.}$, $V_{IN} = 3.4\text{V}$, $f = 0$ per Control Input	2.5	mA
Q_{CCD}	Dynamic Power Supply Current per MHz ⁽³⁾	$V_{CC} = \text{Max.}$, A and Y 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 Y 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 Y inputs generate no significant AC or DC currents as they transition. This parameter is guaranteed, but not production tested.

Table 8. Switching Characteristics Over Operating Range

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

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

Symbol	Description ⁽¹⁾	QS3244			QS32244			Unit
		Min	Typ	Max	Min	Typ	Max	
t_{PLH} t_{PHL}	Data Propagation Delay ^(2,3) An to Yn	—	—	0.25 ⁽³⁾	—	—	1.25 ⁽³⁾	ns
t_{PZL} t_{PZH}	Switch Turn-on Delay $\overline{1G}$, $\overline{2G}$ to Yn	0.5	—	5.6	0.5	—	6.6	ns
t_{PLZ} t_{PHZ}	Switch Turn-off Delay ⁽²⁾ $\overline{1G}$, $\overline{2G}$ to Yn	0.5	—	5.2	0.5	—	5.2	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 0.25ns for QS3244 and 1.25ns for QS32244 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.