# QuickSwitch® Products
# High-Speed CMOS QuickSwitch
# 32-Bit MultiWidth™ Bus Switches



## FEATURES/BENEFITS

- Enhanced N channel FET with no inherent diode to $V_{CC}$
- Bidirectional switches connect inputs to outputs
- Zero propagation delay, zero ground bounce
- QS34X245 is 32-bit version of QS3245
- QS34X2245 has 25Ω resistors for low noise
- Flow-through pinout for easy layout
- Undershoot clamp diodes on all switch and control inputs
- TTL-compatible control inputs
- Available in 80-pin MillipaQ™ package (Q3)

## APPLICATIONS

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

## DESCRIPTION

The QS34X245 is a member of the MultiWidth™ family of QuickSwitch devices and provides a set of 32 high-speed CMOS compatible bus switches in a flow-thru pinout. This device is available in the MillipaQ package, the worlds first small outline 32-bit solution. The low on-resistance of the QS34X245 allows inputs to be connected outputs without adding propagation delay and without generating additional ground bounce noise. The QS34X2245 includes internal 25Ω resistors to reduce reflection noise in high speed applications. When Output Enable ($\overline{OEn}$) is low, the switches are turned on, connecting bus A to bus B. When $\overline{OEn}$ is high, the switches are turned off. This device is ideally suited for 32/64 bit applications where board space is at a premium.

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

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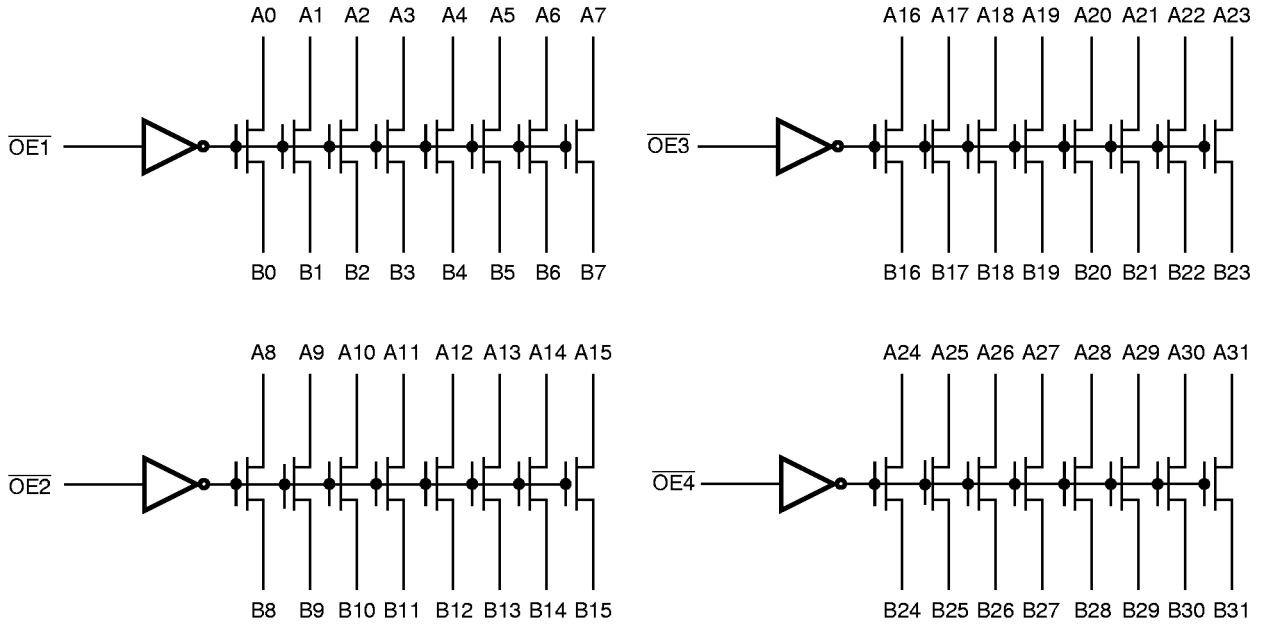
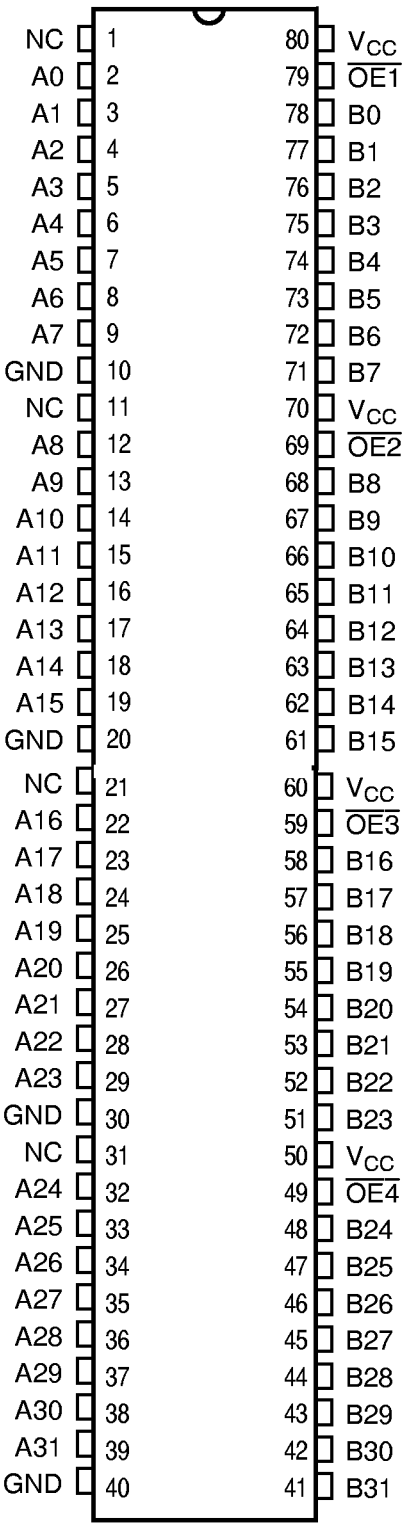
## Figure 1. Functional Block Diagram



## Figure 2. Pin Configuration

(All pins top view)




## Table 1. Pin Description

| Name | Description |
|---|---|
| $\overline{OEn}$ | Output Enable |
| An | Data I/Os |
| Bn | Data I/Os |

## Table 2. Function Table

| $\overline{OEn}$ | Function |
|---|---|
| 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 At $T_A$ =70°C | 1.4 watts |
| $T_{STG}$ Storage Temperature | –65°C 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 | MillipaQ Typ | MillipaQ Max | Unit |
|---|---|---|---|
| Control Inputs | 3 | 4 | pF |
| QuickSwitch Channels (Switch OFF) | 7 | 8 | pF |

**Note:** Capacitance is characterized but not production tested.

## Table 5. DC Electrical Characteristics Over Operating Range

$T_A$ = –40°C to 85°C, $V_{CC}$ = 5.0V ± 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 (Control Inputs) | $0V \le V_{IN} \le V_{CC}$ | — | — | 1 | µA |
| $\| I_{OZ} \|$ | Off-State Current (Hi-Z) | $0V \le V_{OUT} \le V_{CC}$, Switches OFF | — | — | 1 | µA |
| $R_{ON}$ | Switch ON Resistance(2) | $V_{CC}$ = Min., $V_{IN}$ = 0.0V QS34X245<br>$I_{ON}$ = 30mA QS34X2245 | —<br>20 | 5<br>28 | 7<br>40 | Ω |
| $R_{ON}$ | Switch ON Resistance(2) | $V_{CC}$ = Min., $V_{IN}$ = 2.4V QS34X245<br>$I_{ON}$ = 15mA QS34X2245 | —<br>20 | 10<br>35 | 15<br>48 | Ω |
| $V_P$ | Pass Voltage(3) | $V_{IN} = V_{CC}$ = 5V, $I_{OUT}$ = –5µA | 3.7 | 4 | 4.2 | V |

**Notes**:
1. Typical values indicate $V_{CC}$ = 5.0V and $T_A$ = 25°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.

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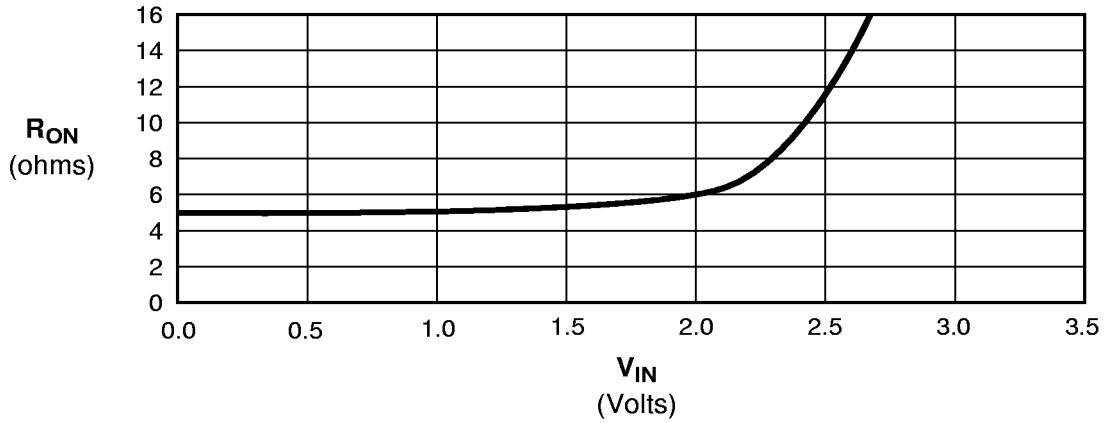
## Figure 3. Typical ON Resistance vs $V_{IN}$ at $V_{CC}$ = 5.0V (QS34X245)




**Note:** For QS34X2245, add 23Ω to $R_{ON}$ shown.

## Table 6. Power Supply Characteristics Over Operating Range

$T_A$ = –40°C to 85°C, $V_{CC}$ = 5.0V ± 5%

| Symbol | Parameter | Test Conditions[1] | Max | Unit |
|---|---|---|---|---|
| $I_{CCQ}$ | Quiescent Power Supply Current | $V_{CC}$ = Max., $V_{IN}$ = GND or $V_{CC}$, f = 0 | 12 | µA |
| $\Delta I_{CC}$ | Power Supply Current[2] Per Control Input HIGH | $V_{CC}$ = Max., $V_{IN}$ = 3.4V, f = 0 | 1.5 | mA |
| $Q_{CCD}$ | Dynamic Power Supply Current per MHz[3] | $V_{CC}$ = Max., A and B Pins Open, Control 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 $\Delta I_{CC}$.
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.

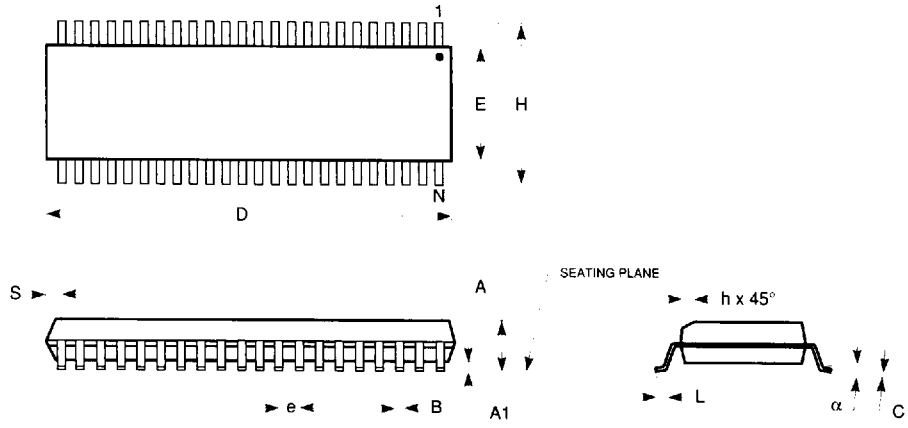
## Table 7. Switching Characteristics Over Operating Range

$T_A$ = –40°C to 85°C, $V_{CC}$ = 5.0V ± 5%
$C_{LOAD}$ = 50pF, $R_{LOAD}$ = 500Ω unless otherwise noted.

| Symbol | Description[1] | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $t_{PLH}$ | Data Propagation Delay[2,3] | QS34X245 | — | — | 0.25[3] | ns |
| $t_{PHL}$ | An to Bn, Bn to An | QS34X2245 | — | — | 1.25[3] | |
| $t_{PZH}$ | Switch Turn-on Delay | QS34X245 | 0.5 | — | 5.6 | ns |
| $t_{PZL}$ | $\overline{OE}$ to An,Bn | QS34X2245 | 0.5 | — | 6.6 | |
| $t_{PHZ}$ | Switch Turn-off Delay[2] | QS34X245 | 0.5 | — | 5.2 | ns |
| $t_{PLZ}$ | $\overline{OE}$ to An,Bn | QS34X2245 | 0.5 | — | 5.2 | |

**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 QS34X245 and 1.25ns for QS34X2245 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.

# 150-MIL MilliPaQ - Package Code Q3
## Plastic Small Outline Gull-Wing




| JEDEC# | MO-154BC | | |
|---|---|---|---|
| DWG# | PSS-80A | | |
| Symbol | Min | Nom | Max |
| A | 0.059 | 0.065 | 0.069 |
| A1 | 0.004 | 0.006 | 0.008 |
| B | 0.0067 | 0.008 | 0.009 |
| C | 0.0075 | 0.008 | 0.0098 |
| D | 0.803 | 0.807 | 0.811 |
| E | 0.150 | 0.154 | 0.157 |
| e | 0.0197 BSC, 0.5mm | | |
| H | 0.228 | 0.236 | 0.244 |
| h | 0.010 | 0.013 | 0.016 |
| L | 0.020 | 0.024 | 0.030 |
| N | 80 | | |
| α | 0° | 5° | 8° |
| S | 0.016 | 0.020 | 0.024 |

**Notes:**
1. Refer to applicable symbol list.
2. All dimensions are in inches.
3. N is the maximum number of lead positions.
4. Dimensions D and E are to be measured at maximum material condition but do not include mold flash. Allowable mold flash is 0.006in. per side.
5. Lead coplanarity is 0.003in. maximum.