# PI5C3251

## 8:1 Mux/DeMux BusSwitch

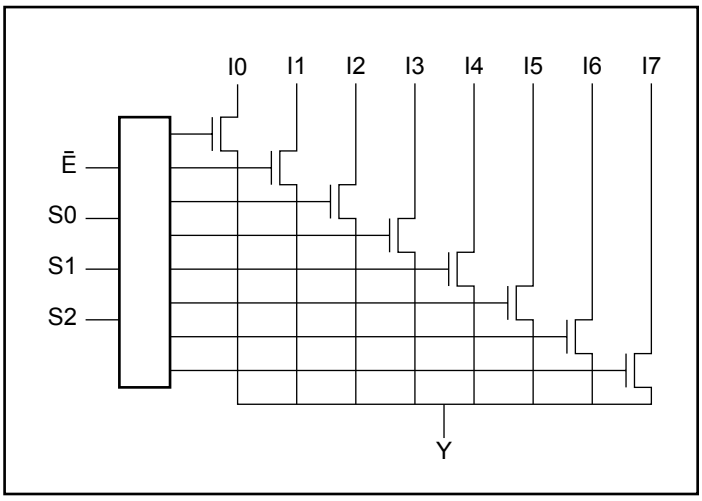
### Features:

- Near-Zero propagation delay
- 5Ω switches connect inputs to outputs
- Direct bus connection when switches are ON
- Ultra Low Quiescent Power (0.2 µA Typical)
  – Ideally suited for notebook applications
- Pin compatible with 74 series 251 logic devices
- Packaging (Pb-free & Green available):
  – 16-pin 150-mil wide plastic QSOP (Q)
  – 16-pin 300-mil wide plastic SOIC (S)
  – 16-pin 150-mil wide plastic SOIC (W)
  – 16-pin 173-mil wide plastic TSSOP (L)

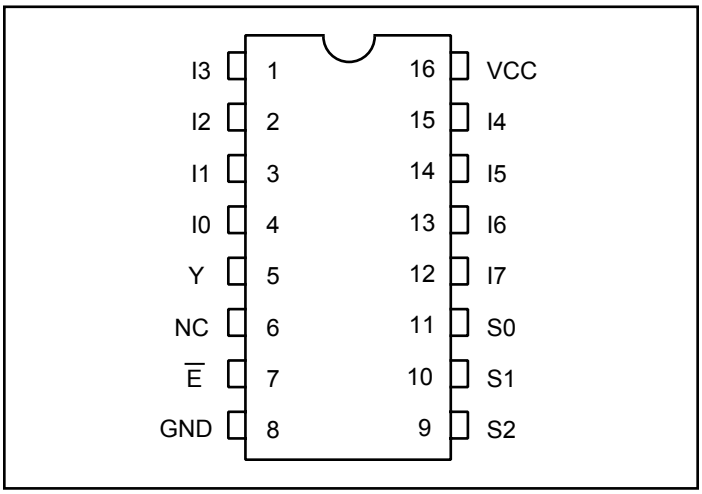
### Description:

Pericom Semiconductor's PI5C3251 is a Dual 8:1 Multiplexer/ demultiplexer with three-state outputs that is pinout compatible with the PI74FCT251T, 74F251, and 74ALS/AS/LS 251. Inputs can be connected to outputs with low on resistance (5Ω) with no additional ground bounce noise or propagation delay.

### Block Diagram




### Pin Configuration




### Truth Table[1]

| Select | | | | | |
|---|---|---|---|---|---|
| **E** | **S2** | **S1** | **S0** | **Y** | **Function** |
| H | X | X | X | Hi-Z | Disable |
| L | L | L | L | I0 | S2-0 = 0 |
| L | L | L | H | I1 | S2-0 = 1 |
| L | L | H | L | I2 | S2-0 = 2 |
| L | L | H | H | I3 | S2-0 = 3 |
| L | H | L | L | I4 | S2-0 = 4 |
| L | H | L | H | I5 | S2-0 = 5 |
| L | H | H | L | I6 | S2-0 = 6 |
| L | H | H | H | I7 | S2-0 = 7 |

**Note:**
1. H = High Voltage Level, L = Low Voltage Level

### Pin Description

| Pin Name | Description |
|---|---|
| I0–7 | Data Inputs |
| S0–2 | Select Inputs |
| $\overline{E}$ | Enable |
| Y | Data Outputs |
| GND | Ground |
| $V_{CC}$ | Power |

## Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

| | |
|---|---|
| Storage Temperature | –65°C to +150°C |
| Ambient Temperature with Power Applied | –40°C to +85°C |
| Supply Voltage to Ground Potential (Inputs & $V_{CC}$ Only) | –0.5V to +7.0V |
| Supply Voltage to Ground Potential (Outputs & D/O Only) | –0.5V to +7.0V |
| DC Input Voltage | –0.5V to +7.0V |
| DC Output Current | 120 mA |
| Power Dissipation | 0.5W |

**Note:**
Stresses greater than those listed under 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.

## DC Electrical Characteristics (Over the Operating Range, $T_A$ = –40°C to +85°C, $V_{CC}$ =5V ±5%)

| Parameters | Description | Test Conditions[1] | Min. | Typ[2] | Max. | Units |
|---|---|---|---|---|---|---|
| $V_{IH}$ | Input HIGH Voltage | Guaranteed Logic HIGH Level | 2.0 | | | V |
| $V_{IL}$ | Input LOW Voltage | Guaranteed Logic LOW Level | –0.5 | | 0.8 | |
| $I_{IH}$ | Input HIGH Current | $V_{CC}$ = Max., $V_{IN}$ = $V_{CC}$ | | | ±1 | µA |
| $I_{IL}$ | Input LOW Current | $V_{CC}$ = Max., $V_{IN}$ = GND | | | ±1 | |
| $I_{OZH}$ | High Impedance Output Current | 0 ≤ I, Y ≤ $V_{CC}$ | | | ±1 | |
| $V_{IK}$ | Clamp Diode Voltage | $V_{CC}$ = Min., $I_{IN}$ = –18 mA | | –0.7 | –1.2 | V |
| $I_{OS}$ | Short Circuit Current[3] | I (Y) = 0V, Y (I) = $V_{CC}$ | 100 | | | mA |
| $V_H$ | Input Hysteresis at Control Pins | | | 150 | | mV |
| $R_{ON}$ | Switch On-Resistance[4] | $V_{CC}$ = Min., $V_{IN}$ = 0.0V, $I_{ON}$ = 48 mA | | 5 | 7 | Ω |
| | | $V_{CC}$ = Min., $V_{IN}$ = 2.4V, $I_{ON}$ = 15 mA | | 10 | 15 | |

## Capacitance ($T_A$ = 25°C, f = 1 MHz)

| Parameters[5] | Description | Test Conditions | Typ. | Max. | Units |
|---|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | $V_{IN}$ = 0V | | 6 | pF |
| $C_{I(OFF)}$ | $I_0$ - $I_7$ Capacitance, Switch Off | | | 6 | |
| $C_{Y(OFF)}$ | Y Capacitance, Switch Off | | | 48 | |
| $C_{I(ON)}$ | $I_0$ - $I_7$ Capacitance, Switch On | | 35 | 54 | |

**Notes:**
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC}$ = 5.0V, $T_A$ = 25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. Measured by the voltage drop between I and Y pin at indicated current through the switch. On-Resistance is determined by the lower of the voltages on the two (I,Y) pins.
5. This parameter is determined by device characterization but is not production tested.

## Power Supply Characteristics

| Parameters | Description | Test Conditions(1) | | Min. | Typ(2) | Max. | Units |
|---|---|---|---|---|---|---|---|
| $I_{CC}$ | Quiescent Power Supply Current | $V_{CC}$ = Max. | $V_{IN}$ = GND or $V_{CC}$ | | 0.1 | 3.0 | µA |
| $\Delta I_{CC}$ | Supply Current per Input @ TTL HIGH | $V_{CC}$ = Max. | $V_{IN}$ = 3.4V(3) | | | 2.5 | mA |
| $I_{CCD}$ | Supply Current per Input per MHz(4) | $V_{CC}$ = Max.,<br>I and Y Pins Open<br>$\overline{E}$ = GND<br>Control Input Toggling<br>50% Duty Cycle | | | | 0.25 | mA/ MHz |

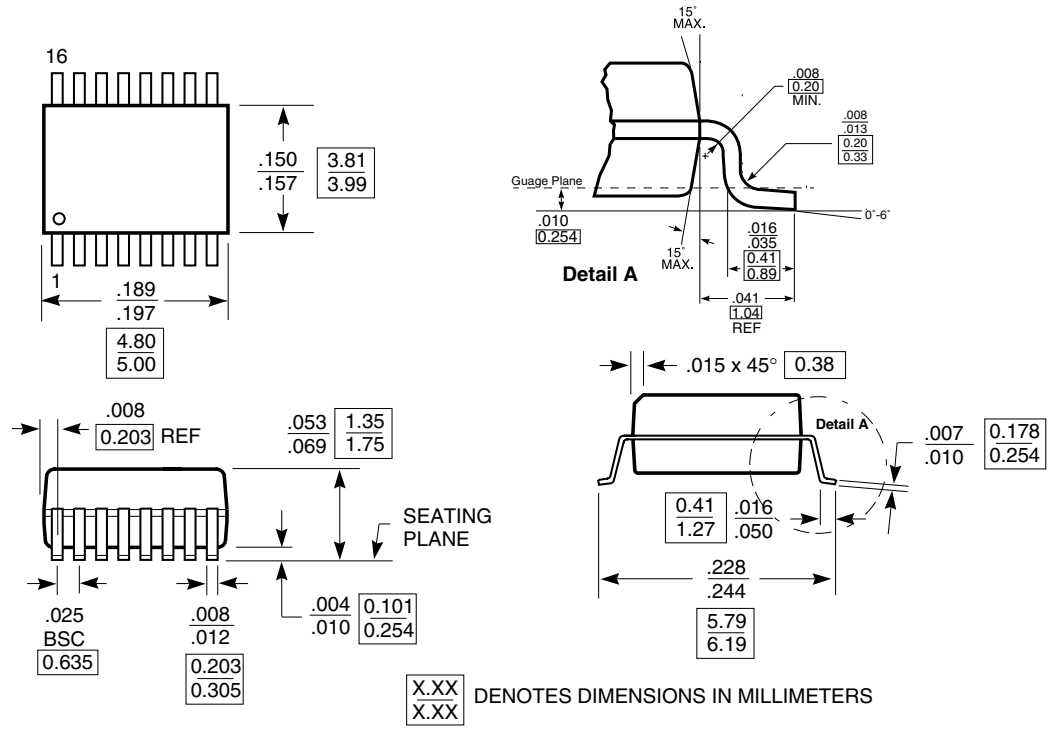
**Notes:**
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at Vcc = 5.0V, +25°C ambient.
3. Per TTL driven input ($V_{IN}$ = 3.4V, control inputs only); I and Y pins do not contribute to Icc.
4. This current applies to the control inputs only and represent the current required to switch internal capacitance at the specified frequency. The I and Y inputs generate no significant AC or DC currents as they transition. This parameter is not tested, but is guaranteed by design.

## Switching Characteristics over Operating Range

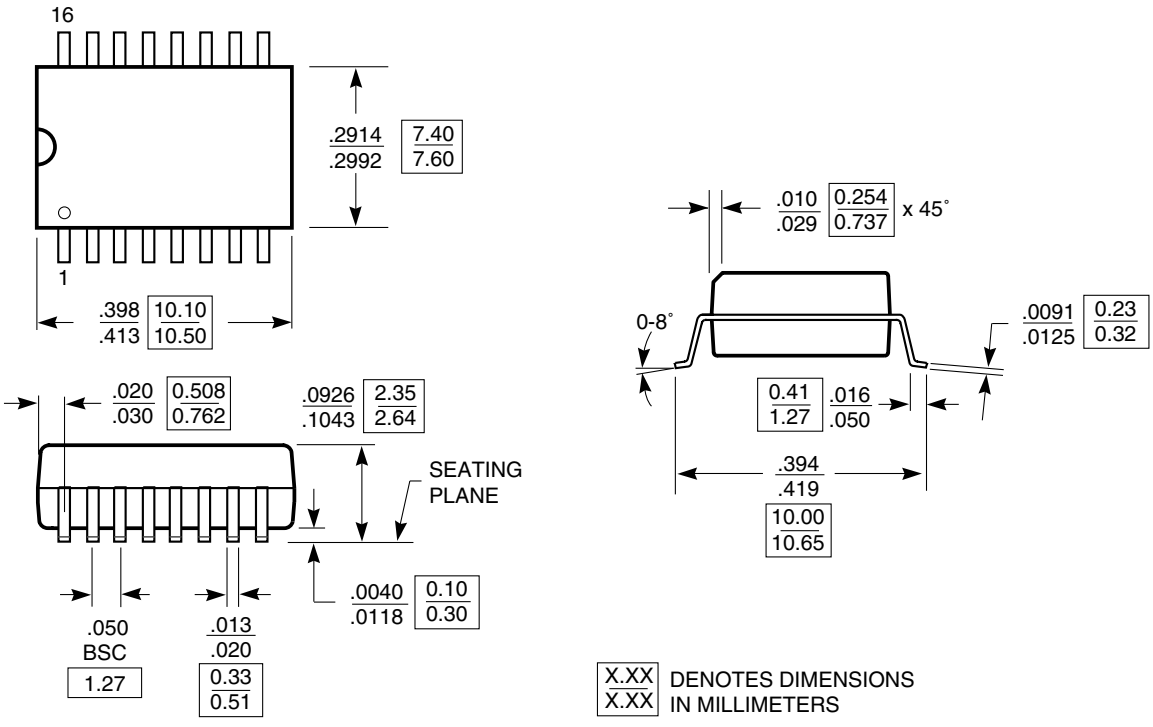
| Parameters | Description | Conditions(1) | Com. | | Unit |
|---|---|---|---|---|---|
| | | | Min. | Max. | |
| $t_{IY}$ | Propagation Delay(2,3)<br>In to Y | $C_L$ = 50 pF<br>$R_L$ = 500Ω | | 0.25 | ns |
| $t_{SY}$ | Bus Select Time<br>Sn to Y | | 0.5 | 6.6 | |
| $t_{PZH}$<br>$t_{PZL}$ | Bus Enable Time<br>$\overline{E}$ to Y | | 0.5 | 6.0 | |
| $t_{PHZ}$<br>$t_{PLZ}$ | Bus Disable Time<br>$\overline{E}$ to Y | | 0.5 | 6.0 | |

**Notes:**
1. See test circuit and wave forms.
2. This parameter is guaranteed but not tested on Propagation Delays.
3. The bus switch contributes no propagational 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 0.25 ns for 50 pF load. Since this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagational delay to the system. Propagational 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.

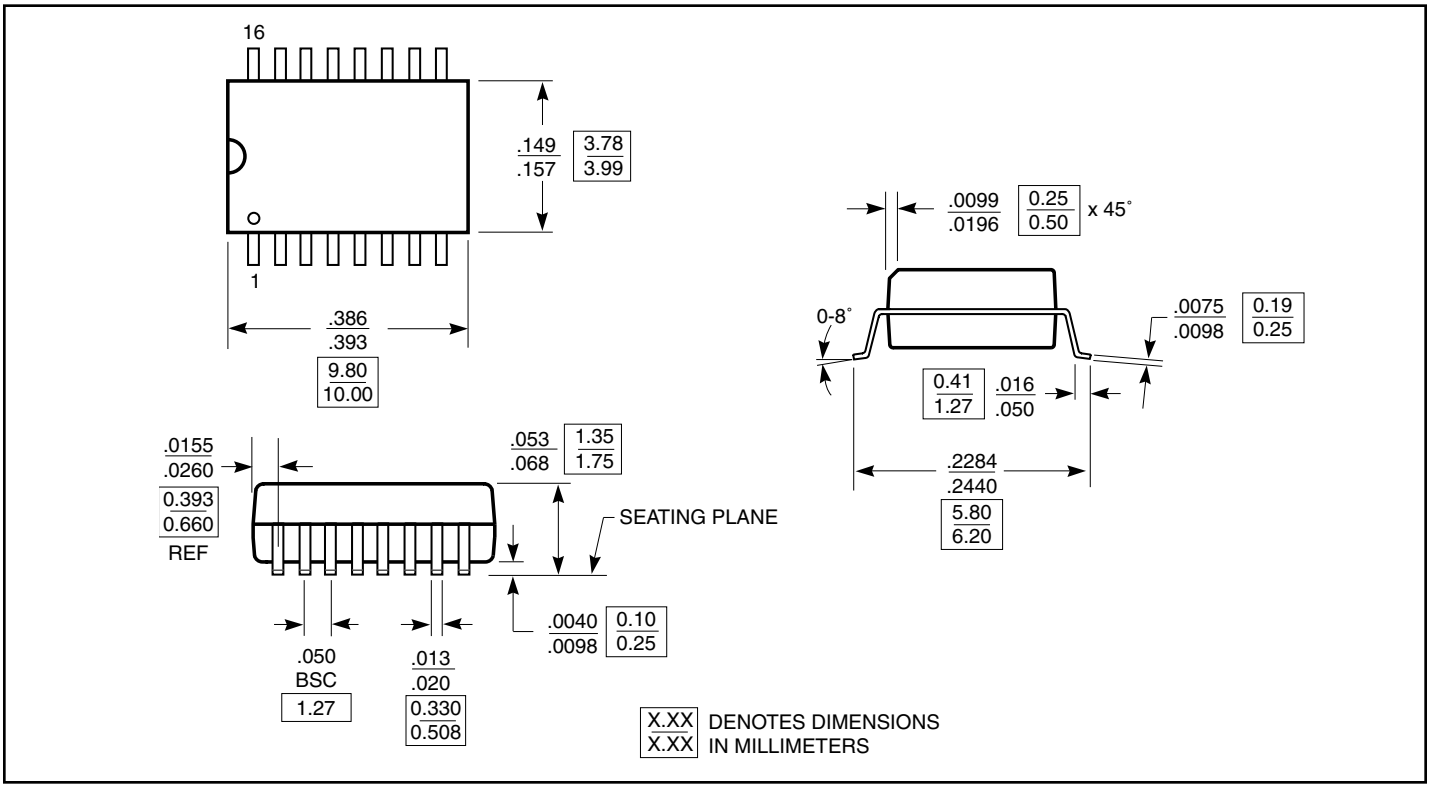
## Packaging Mechanical: 16-pin QSOP (Q)



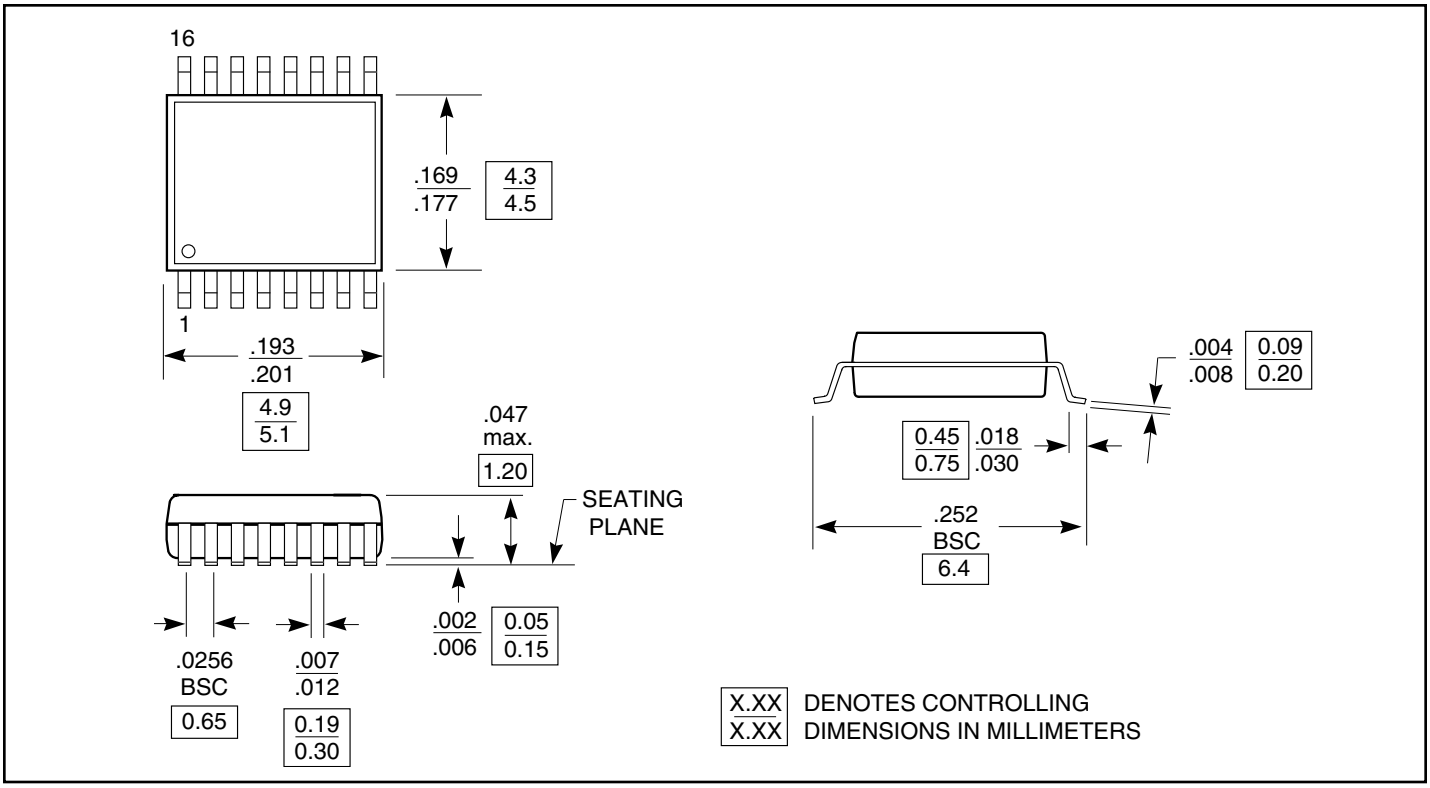

## Packaging Mechanical: 16-pin SOIC (S)



## Packaging Mechanical: 16-pin SOIC (W)




## Packaging Mechanical: 16-pin TSSOP (L)



## Ordering Information

| Ordering Code | Package Code | Package Description |
|---|---|---|
| PI5C3251Q | Q | 16-pin 150-mil wide QSOP |
| PI5C3251QE | Q | Pb-free & Green, 16-pin 150-mil wide QSOP |
| PI5C3251S | S | 16-pin 300-mil wide SOIC |
| PI5C3251SE | S | Pb-free & Green, 16-pin 300-mil wide SOIC |
| PI5C3251W | W | 16-pin 150-mil wide SOIC |
| PI5C3251WE | W | Pb-free & Green, 16-pin 150-mil wide SOIC |
| PI5C3251L | L | 16-pin 173-mil wide TSSOP |
| PI5C3251LE | L | Pb-free & Green, 16-pin 173-mil wide TSSOP |

**Notes:**
1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/