

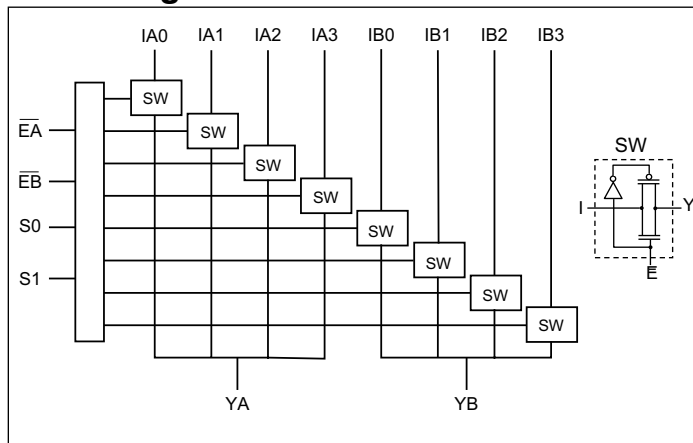
**PI3B3253**

**3.3V, Dual 4:1 Mux/DeMux NanoSwitch™**

## Features

- Near-Zero propagation delay
- 5Ω switches connect inputs to outputs
- Fast Switching Speed: 5.2ns max.
- Ultra Low Quiescent Power (0.2μA typical)
  - Ideally suited for notebook applications
- Pin compatible with 74 series 253 logic devices
- Packaging (Pb-free & Green available):
  - 16-pin, QSOP (Q)
  - 16-pin, TSSOP (L)
  - 16-pin, UQFN (ZHD)

## Block Diagram



## Truth Table<sup>(1)</sup>

| Enable           |                  | Select         |                | Y <sub>A</sub>  | Y <sub>B</sub>  | Function  |
|------------------|------------------|----------------|----------------|-----------------|-----------------|-----------|
| $\overline{E_A}$ | $\overline{E_B}$ | S <sub>1</sub> | S <sub>0</sub> |                 |                 |           |
| H                | X                | X              | X              | Hi-Z            | X               | Disable A |
| X                | H                | X              | X              | X               | Hi-Z            | Disable B |
| L                | L                | L              | L              | I <sub>A0</sub> | I <sub>B0</sub> | S1-0 = 0  |
| L                | L                | L              | H              | I <sub>A1</sub> | I <sub>B1</sub> | S1-0 = 1  |
| L                | L                | H              | L              | I <sub>A2</sub> | I <sub>B2</sub> | S1-0 = 2  |
| L                | L                | H              | H              | I <sub>A3</sub> | I <sub>B3</sub> | S1-0 = 3  |

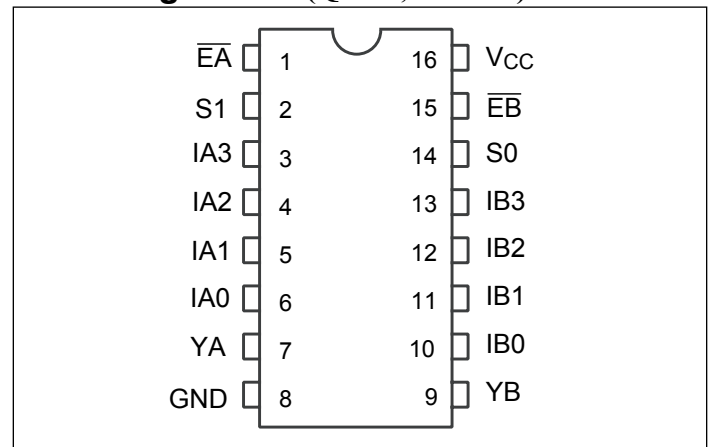
**Note:**

1. H = High Voltage Level, L = Low Voltage Level

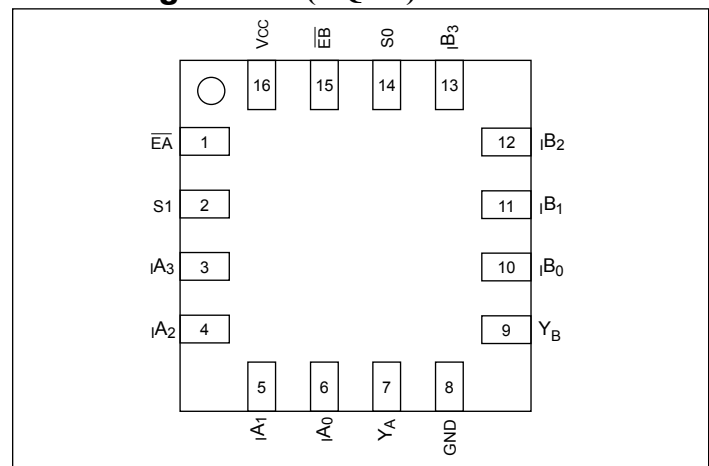
## Description

The PI3B3253 is a 3.3V, Dual4:1 Multi-plexer/ Demultiplexer with Hi-Z outputs that is pinout compatible with the PI74FCT253T, 74F253, and 74ALS/AS/LS 253. Inputs can be connected to outputs with low On-Resistance (5Ω) with no additional ground bounce noise or propagation delay.

## Pin Configuration (QSOP, TSSOP)



## Pin Configuration (UQFN)



## Pin Description

| Pin Name                            | Description   |
|-------------------------------------|---------------|
| I <sub>AN</sub> , I <sub>BN</sub>   | Data Inputs   |
| S <sub>0-1</sub>                    | Select Inputs |
| $\overline{E_A}$ , $\overline{E_B}$ | Enable        |
| Y <sub>A</sub> , Y <sub>B</sub>     | Data Outputs  |
| GND                                 | Ground        |
| V <sub>CC</sub>                     | 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 .....     | -0.5V to +4.6V  |
| DC Input Voltage .....                       | -0.5V to +4.6V  |
| DC Output Current.....                       | 120mA           |
| 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, $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ , $V_{CC} = 3.3\text{V} \pm 10\%$ )

| Parameters | Description                         | Test Conditions <sup>(1)</sup>                                                      | Min. | Typ. <sup>(2)</sup> | 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                  | $V_{CC} = \text{Max.}, V_{IN} = V_{CC}$                                             |      |                     | $\pm 1$ | $\mu\text{A}$ |
| $I_{IL}$   | Input LOW Current                   | $V_{CC} = \text{Max.}, V_{IN} = \text{GND}$                                         |      |                     | $\pm 1$ |               |
| $I_{OZH}$  | High Impedance Output Current       | $0 \leq I_N, Y_N \leq V_{CC}$                                                       |      |                     | $\pm 1$ |               |
| $V_{IK}$   | Clamp Diode Voltage                 | $V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}$                                       |      |                     | -1.2    | V             |
| $R_{ON}$   | Switch On-Resistance <sup>(3)</sup> | $V_{CC} = \text{Min.}, V_{IN} = 0.0\text{V}, I_{ON} = 48\text{mA}$ or $64\text{mA}$ |      | 5                   | 8       | $\Omega$      |
|            |                                     | $V_{CC} = \text{Min.}, V_{IN} = 2.4\text{V}, I_{ON} = 15\text{mA}$                  |      | 10                  | 17      |               |

### Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 3.3\text{V}$ ,  $T_A = 25^{\circ}\text{C}$  ambient and maximum loading.
- 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.

## Capacitance ( $T_A = 25^{\circ}\text{C}$ , $f = 1\text{ MHz}$ )

| Parameters <sup>(1)</sup> | Description                       | Test Conditions      | Typ. | Units |
|---------------------------|-----------------------------------|----------------------|------|-------|
| $C_{IN}$                  | Input Capacitance                 | $V_{IN} = 0\text{V}$ | 3.0  | pF    |
| $C_{OFF}$                 | $I_A/I_B$ Capacitance, Switch Off |                      | 8.0  |       |
| $C_{ON}$                  | $I_A/I_B$ Capacitance, Switch On  |                      | 36.0 |       |

### Notes:

- This parameter is determined by device characterization but is not production tested.

## Power Supply Characteristics

| Parameters       | Description                         | Test Conditions <sup>(1)</sup> |                                          | Min. | Typ. <sup>(2)</sup> | Max. | Units |
|------------------|-------------------------------------|--------------------------------|------------------------------------------|------|---------------------|------|-------|
| I <sub>CC</sub>  | Quiescent Power Supply Current      | V <sub>CC</sub> = Max.         | V <sub>IN</sub> = GND or V <sub>CC</sub> |      | 0.1                 | 3.0  | μA    |
| ΔI <sub>CC</sub> | Supply Current per Input @ TTL HIGH | V <sub>CC</sub> = Max.         | V <sub>IN</sub> = 3.0V <sup>(3)</sup>    |      |                     | 750  |       |

### Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at V<sub>CC</sub> = 3.3V, +25°C ambient.
- Per TTL driven input (control inputs only); I and Y pins do not contribute to I<sub>CC</sub>.

## Switching Characteristics over Operating Range

| Parameters                           | Description                                       | Test Conditions                                | Com. |      | Units |
|--------------------------------------|---------------------------------------------------|------------------------------------------------|------|------|-------|
|                                      |                                                   |                                                | Min. | Max. |       |
| t <sub>IY</sub>                      | Propagation Delay <sup>(1,2)</sup> In to Yn       | C <sub>L</sub> = 50pF<br>R <sub>L</sub> = 500Ω |      | 0.25 | ns    |
| t <sub>SY</sub>                      | Bus Select Time, S <sub>n</sub> to Y <sub>n</sub> |                                                | 1    | 4.0  |       |
| t <sub>PZH</sub>                     | Bus Enable Time, E to Y <sub>n</sub>              |                                                | 1    | 3.8  |       |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Bus Disable Time, E <sub>n</sub> to Y             |                                                | 1    | 5.2  |       |

### Notes:

- This parameter is guaranteed but not tested on Propagation Delays.
- 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 0.25ns for 50pF 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.

## Applications Information

### Logic Inputs

The logic control inputs can be driven up to +3.6V regardless of the supply voltage. For example, given a +3.3V supply, IN may be driven low to 0V and high to 3.6V. Driving IN Rail-to-Rail<sup>®</sup> minimizes power consumption.

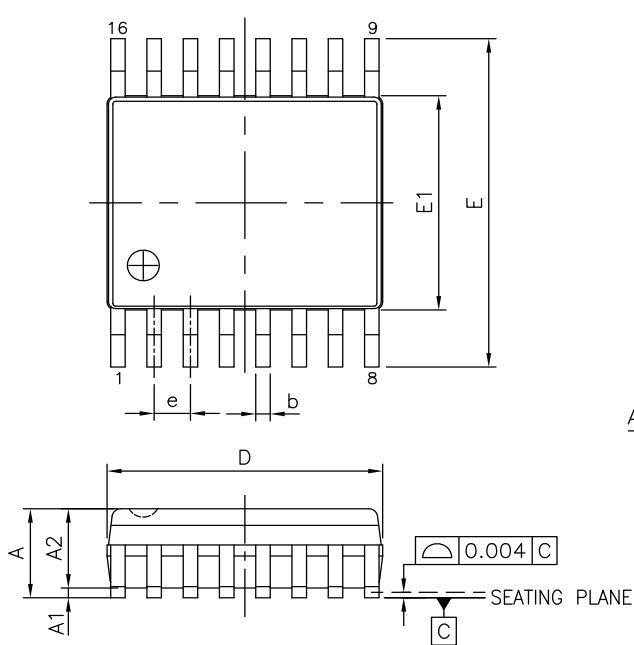
### Power-Supply Sequencing and Hot Plug Information

Proper power-supply sequencing is recommended for all CMOS devices. Always apply V<sub>CC</sub> and GND before applying signals to input/output or control pins.

*Rail-to-Rail is a registered trademark of Nippon Motorola, Ltd.*

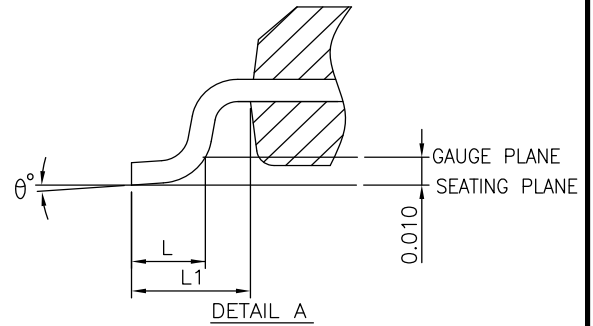
**PI3B3253**

**Packaging Mechanical: 16-Pin QSOP (Q)**



| SYMBOLS | MIN.       | NOM.  | MAX.   |
|---------|------------|-------|--------|
| A       | —          | —     | 0.069  |
| A1      | 0.004      | —     | 0.0098 |
| A2      | 0.049      | —     | —      |
| b       | 0.008      | —     | 0.012  |
| c       | 0.004      | —     | 0.010  |
| D       | 0.189      | 0.193 | 0.197  |
| E1      | 0.150      | 0.154 | 0.158  |
| E       | 0.228      | 0.236 | 0.244  |
| L       | 0.016      | —     | 0.050  |
| L1      | 0.041 REF. |       |        |
| e       | 0.025 BSC. |       |        |
| θ°      | 0          | —     | 8      |

UNIT : INCH



NOTES:  
1. ALL DIMENSIONS IN INCH. ANGLES IN DEGREES.  
2. JEDEC MO-137E  
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.



DATE: 04/08/16

DESCRIPTION: 16-Pin, 150mil Wide QSOP

PACKAGE CODE: Q (Q16)

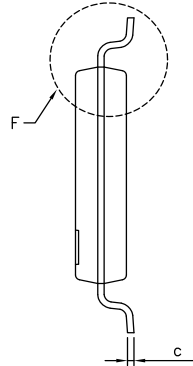
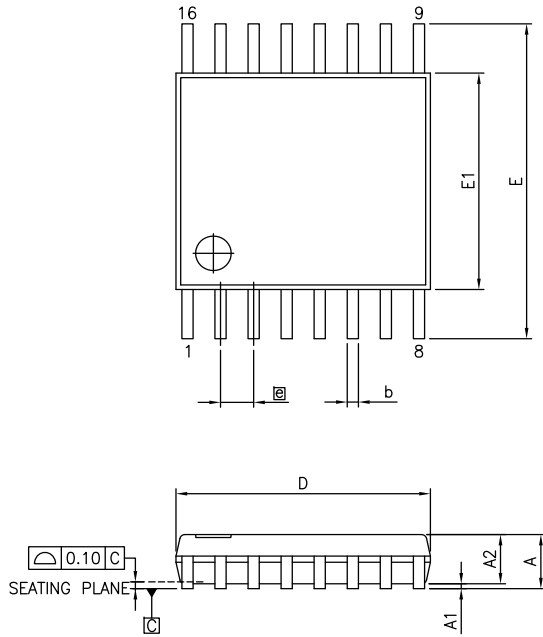
DOCUMENT CONTROL #: PD-1201

REVISION: H

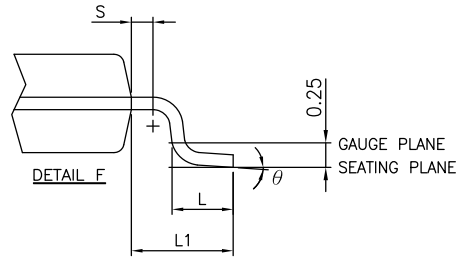
16-0056

**PI3B3253**

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



| SYMBOLS | MIN.     | NOM. | MAX. |
|---------|----------|------|------|
| A       | —        | —    | 1.20 |
| A1      | 0.05     | —    | 0.15 |
| A2      | 0.80     | 1.00 | 1.05 |
| b       | 0.19     | —    | 0.30 |
| c       | 0.09     | —    | 0.20 |
| D       | 4.90     | 5.00 | 5.10 |
| E1      | 4.30     | 4.40 | 4.50 |
| E       | 6.20     | 6.40 | 6.60 |
| e       | 0.65 BSC |      |      |
| L1      | 1.00 REF |      |      |
| L       | 0.45     | 0.60 | 0.75 |
| S       | 0.20     | —    | —    |
| θ       | 0°       | —    | 8°   |



NOTES:  
1. ALL DIMENSIONS IN MILLIMETERS. ANGLES IN DEGREES.  
2. JEDEC MO-153F  
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.



DATE: 03/24/16

DESCRIPTION: 16-Pin, 173mil Wide TSSOP

PACKAGE CODE: L (L16)

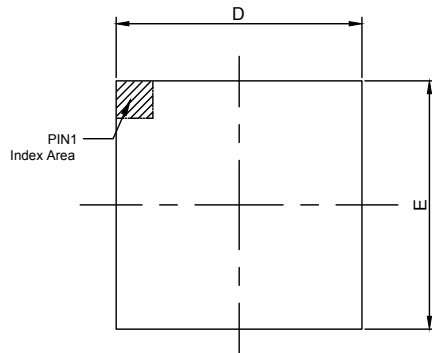
DOCUMENT CONTROL #: PD-1310

REVISION: G

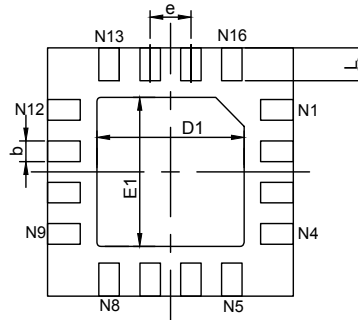
16-0061

**PI3B3253**

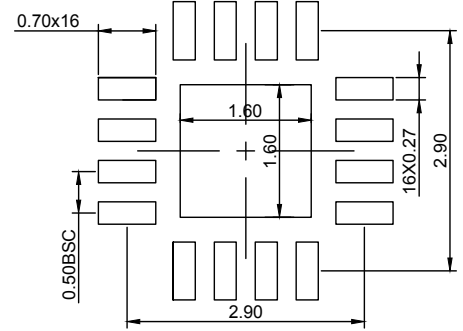
## Packaging Mechanical: 16-Pin UQFN (ZHD)



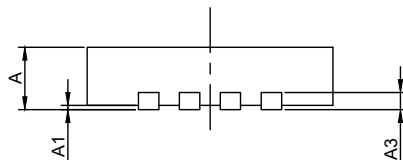
Top View



Bottom View



RECOMMENDED LAND PATTERN(unit:mm)



Side View

| PKG. DIMENSIONS(MM) |          |      |
|---------------------|----------|------|
| SYMBOL              | Min      | Max  |
| A                   | 0.50     | 0.65 |
| A1                  | 0.00     | 0.05 |
| A3                  | 0.15 REF |      |
| D                   | 2.90     | 3.10 |
| E                   | 2.90     | 3.10 |
| D1                  | 1.60     | 1.90 |
| E1                  | 1.60     | 1.90 |
| b                   | 0.18     | 0.30 |
| e                   | 0.50 BSC |      |
| L                   | 0.25     | 0.55 |

### Note:

1. Comply with MO-248E, except 'L' MIN and 'L' 'D1' 'E1' MAX



DATE: 07/27/16

DESCRIPTION: 16-Pin, UQFN, 3X3

PACKAGE CODE: ZHD(ZHD16)

DOCUMENT CONTROL#: PD-2209

REVISION: --

16-0092

### For latest package info.

please check: <http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/>

## Ordering Information

| Ordering Code | Package Code | Package Description         |
|---------------|--------------|-----------------------------|
| PI3B3253QEX   | Q            | 16-pin, 150mil Wide (QSOP)  |
| PI3B3253LEX   | L            | 16-pin, 173mil Wide (TSSOP) |
| PI3B3253ZHDEX | ZHD          | 16-pin, 3x3 (UQFN)          |

### Notes:

- Thermal characteristics can be found on the company web site at [www.diodes.com/design/support/packaging/](http://www.diodes.com/design/support/packaging/)
- E = Pb-free and Green
- X suffix = Tape/Reel

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