

**3.3V, PCI Express® 3.0, 1-Lane, 2-Channel, 8Gbps, 2:1 Mux/DeMux Switch w/ Single Enable**

**Features**

- 2 Differential Channel, 2:1 Mux/DeMux
- PCI Express® 3.0 performance, 8.0Gbps
- Bi-directional operation
- 3dB Bandwidth: 8.1GHz
- Low Bit-to-Bit Skew, 10ps max
- Low channel-to-channel skew: 20ps max
- Low insertion loss: -1.7dB @4GHz (8.0Gbps)
- Low return loss: -13.5dB @4GHz (8.0Gbps)
- Low Crosstalk: -32dB@4GHz (8.0Gbps)
- Low Off Isolation: -21dB@4GHz (8.0Gbps)
- Supply Voltage: 3.3V ± 10%
- Industrial Temperature Range: -40°C to 85°C
- Low Current: 0.2mA typ.
- Packaging (Pb-free & Green):
  - - 20-contact TQFN (2.5 × 4.5mm)
  - - 18 contact, X2QFN(XUA18), 2x2mm

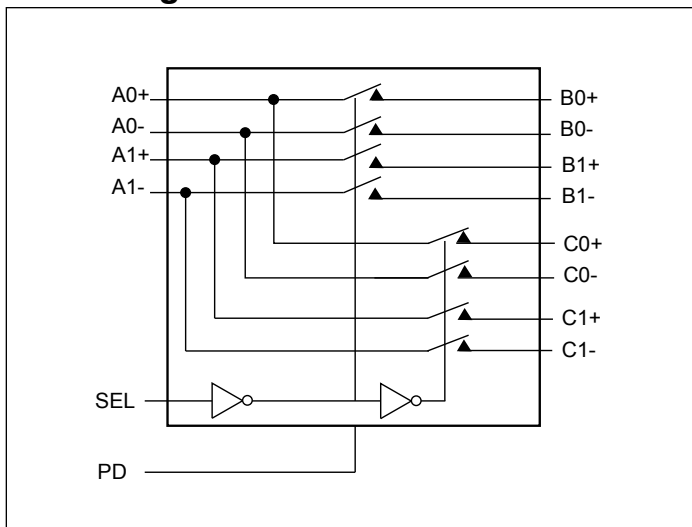
**Description**

The PI3PCIE3212 is a PCIe Gen3.0, 8Gbps, 4 to 2 differential, bi-directional channel multiplexer/demultiplexer switch. Due to its low bit-to-bit skew, high channel-to-channel noise isolation and bandwidth, this product is ideal for PCI Express® 3.0 signal switching at 8.0Gbps.

**Applications**

Switch a PCI Express 3.0 lane output between two PCI Express lane inputs. Applications include NBs, PCs, servers, and other embedded devices. Routing of PCI Express 3.0, DP1.2, USB3.0, SAS2.0, SATA3.0, XAUI, RXAUI signals with low signal attenuation.

**Block Diagram**

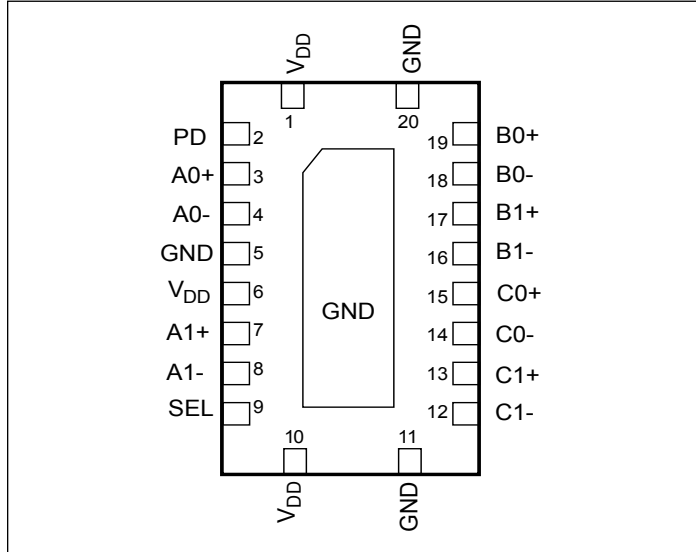


**Truth Table**

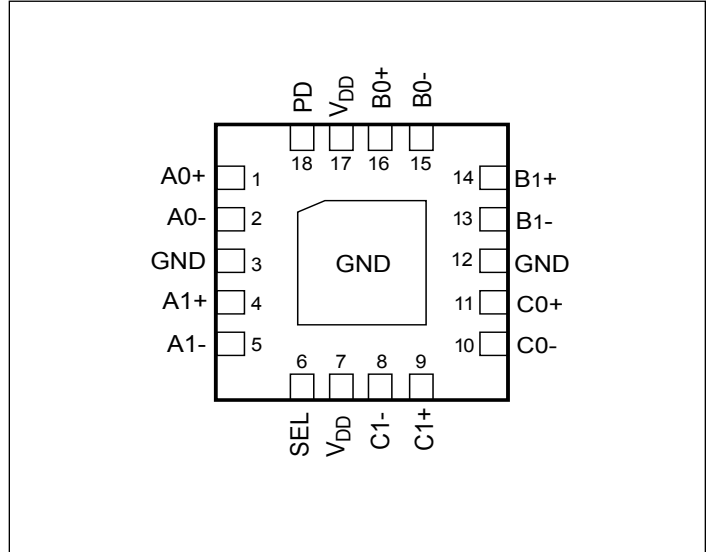
| Function                      | SEL | PD |
|-------------------------------|-----|----|
| A to B                        | L   | L  |
| A to C                        | H   | L  |
| All ports Hi-Z, IC Power Down | X   | H  |

### Pin Configuration (Top-side view)

20-contact TQFN



18-contact X2QFN



### Pin Description

| 20-TQFN Pin # | 18-X2QFN Pin #    | Pin Name        | I/O | Description   |
|---------------|-------------------|-----------------|-----|---|
| 3             | 1                 | A0+             | I/O | Signal I/O, Channel 0, Port A                               |
| 4             | 2                 | A0-             |     |   |
| 7             | 4                 | A1+             | I/O | Signal I/O, Channel 1, Port A                               |
| 8             | 5                 | A1-             |     |   |
| 19            | 16                | B0+             | I/O | Signal I/O, Channel 0, Port B                               |
| 18            | 15                | B0-             |     |   |
| 17            | 14                | B1+             | I/O | Signal I/O, Channel 1, Port B                               |
| 16            | 13                | B1-             |     |   |
| 15            | 11                | C0+             | I/O | Signal I/O, Channel 0, Port C                               |
| 14            | 10                | C0-             |     |   |
| 13            | 9                 | C1+             | I/O | Signal I/O, Channel 1, Port C                               |
| 12            | 8                 | C1-             |     |   |
| 9             | 6                 | SEL             | I   | Operation mode Select<br>(when SEL=0: A→B, when SEL=1: A→C) |
| 2             | 18                | PD              | I   | PD = 1, Power down is enabled. Please see Truth Table.      |
| 1, 6, 10      | 7, 17             | V <sub>DD</sub> | Pwr | 3.3V ±10% Positive Supply Voltage                           |
| 5, 11, 20     | 3, 12, Center Pad | GND             | Pwr | Power ground  |

### Maximum Ratings

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

|  |                 |
|--|-----------------|
| Storage Temperature .....                | -65°C to +150°C |
| Supply Voltage to Ground Potential ..... | -0.5V to +4.6V  |
| Channel DC Input Voltage .....           | -0.5V to 1.5V   |
| DC Output Current .....                  | 120mA           |
| Power Dissipation .....                  | 0.5W            |
| SEL/PD DC Input Voltage .....            | -0.5V to 4.6V   |
| Junction Temperature .....               | 125°C           |

**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.

### Electrical Characteristics

#### Recommended Operating Conditions

| Symbol               | Parameter                                      | Conditions                  | Min. | Typ. | Max. | Units            |
|----------------------|--|-----------------------------|------|------|------|------------------|
| V <sub>DD</sub>      | 3.3V Power Supply                              |                             | 3.0  | 3.3  | 3.6  | V                |
| I <sub>DD</sub>      | Total current from V <sub>DD</sub> 3.3V supply | SEL = OV or V <sub>DD</sub> |      | 0.2  | 1    | mA               |
| I <sub>DD_PD</sub>   | Power down current                             | PD = 1                      |      | 20   | 40   | μA               |
| V <sub>I/O-DIF</sub> | Differential Voltage (differential pins)       |                             |      |      | 1.6  | V <sub>ppd</sub> |
| V <sub>I/O-CM</sub>  | Common Mode Voltage (differential pins)        |                             | 0    |      | 0.8  | v                |
| T <sub>A</sub>       | Operating temperature range                    |                             | -40  |      | 85   | °C               |

#### DC Electrical Characteristics for Switching over Operating Range

| Parameters                | Description  | Test Conditions <sup>(1)</sup>                            | Min. | Typ. <sup>(1)</sup> | Max. | Units |
|---------------------------|--|---|------|---------------------|------|-------|
| V <sub>IH</sub> - SEL, PD | Input HIGH Voltage, SEL, PD Input                                    |   | 2    |                     | 3.6  | V     |
| V <sub>IL</sub> - SEL, PD | Input LOW Voltage, SEL, PD Input                                     |   | 0    |                     | 0.8  |       |
| V <sub>IK</sub>           | Clamp Diode Voltage  | V <sub>DD</sub> = Max., I <sub>IN</sub> = -18mA           |      | -0.7                | -1.2 |       |
| I <sub>IH</sub>           | Input HIGH Current, SEL, PD  | V <sub>DD</sub> = Max., V <sub>IN</sub> = V <sub>DD</sub> |      |                     | ±5   | μA    |
| I <sub>IL</sub>           | Input LOW Current, SEL, PD   | V <sub>DD</sub> = Max., V <sub>IN</sub> = 0V              |      |                     | ±5   |       |
| I <sub>IH</sub>           | Input HIGH Current, A <sub>X</sub> , B <sub>X</sub> , C <sub>X</sub> | V <sub>DD</sub> = Max., V <sub>IN</sub> = 1.5V            | -10  |                     | +10  | μA    |
| I <sub>IL</sub>           | Input LOW Current, A <sub>X</sub> , B <sub>X</sub> , C <sub>X</sub>  | V <sub>DD</sub> = Max., V <sub>IN</sub> = 0V              | -10  |                     | +10  |       |
| I <sub>OZH</sub>          | HighZ HIGH Current, B <sub>X</sub> , C <sub>X</sub>                  | V <sub>DD</sub> = Max., V <sub>IN</sub> = 1.5V            | -10  |                     | +10  | μA    |
| I <sub>OZL</sub>          | HighZ LOW Current, B <sub>X</sub> , C <sub>X</sub>                   | V <sub>DD</sub> = Max., V <sub>IN</sub> = 0V              | -10  |                     | +10  | μA    |

**Note:**

1. Typical values are at V<sub>DD</sub> = 3.3V, T<sub>A</sub> = 25°C ambient and maximum loading.

### Switching Characteristics

| Parameters         | Description   | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------|---|-----------------|------|------|------|-------|
| tPZH, tPZL         | Line Enable Time - SEL to A <sub>N</sub> , B <sub>N</sub> , C <sub>N</sub>  |                 |      | 25   | 30   | ns    |
| tPHZ, tPLZ         | Line Disable Time - SEL to A <sub>N</sub> , B <sub>N</sub> , C <sub>N</sub> |                 |      | 5    | 25   |       |
| tPLH               | Propagation Delay, LOW to HIGH  |                 | 17   |      | 36   | ps    |
| tPLL               | Propagation Delay, HIGH to LOW  |                 | 21   |      | 39   | ps    |
| t <sub>b-b</sub>   | Bit-to-bit skew within the same differential pair                           |                 |      | 5    | 10   | ps    |
| t <sub>ch-ch</sub> | Channel-to-channel skew   |                 |      |      | 20   | ps    |

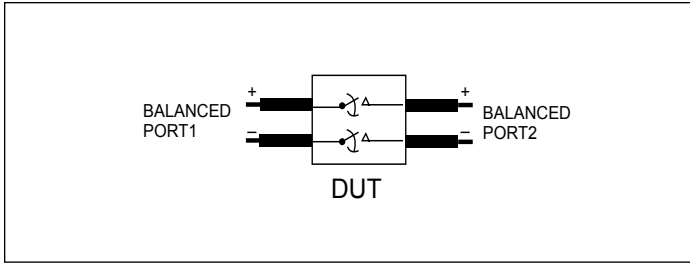
### Dynamic Electrical Characteristics

| Parameter                          | Description  | Test Conditions   | Min. | Typ. <sup>1</sup>                    | Max. | Units |
|------------------------------------|--|---|------|--------------------------------------|------|-------|
| DDIL <sup>2,3</sup>                | Differential Insertion Loss<br>(V <sub>IN</sub> = -10dBm, DC = 0V) | f = 100MHz<br>f = 100MHz-1.25GHz<br>f = 1.25GHz-2.5GHz<br>f = 2.5GHz-4GHz<br>f = 5GHz |      | -0.4<br>-0.6<br>-1.0<br>-1.7<br>-2.1 |      | dB    |
| DDIL <sub>OFF</sub> <sup>2,3</sup> | Differential Off Isolation   | f = 100MHz<br>f = 100MHz-1.25GHz<br>f = 1.25GHz-2.5GHz<br>f = 2.5GHz-4GHz             |      | -59<br>-37<br>-27<br>-21             |      | dB    |
| DDRL <sup>2</sup>                  | Differential Return Loss   | f = 100MHz<br>f = 100MHz-1.25GHz<br>f = 1.25GHz-2.5GHz<br>f = 2.5GHz-4GHz             |      | -27<br>-23.3<br>-23.3<br>-13.5       |      | dB    |
| DDNEXT <sup>2,3</sup>              | Near End Crosstalk   | f = 100MHz<br>f = 100MHz-1.25GHz<br>f = 1.25GHz-2.5GHz<br>f = 2.5GHz-4GHz             |      | -57<br>-38<br>-33<br>-32             |      | dB    |
| BW                                 | -3dB Bandwidth   |   |      | 8.1                                  |      | GHz   |

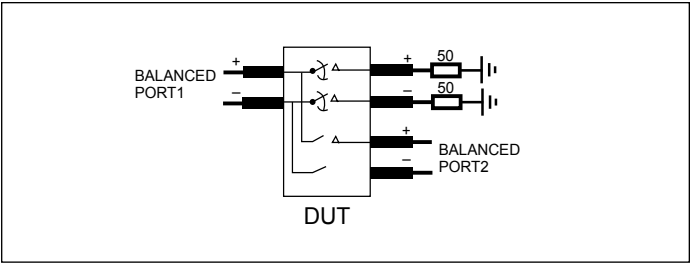
#### Notes:

- Guaranteed by design. Typical values are at V<sub>DD</sub> = 3.3V, T<sub>A</sub> = 25°C ambient and maximum loading.
- S parameters are measured with our evaluation board made with Rogers (R04350) material. Trace width is 30 mil, length 540 mil, trace impedance is 50 Ohm (+/-5%) and total insertion loss of the trace is 0.5dB@4GHz.
- Measurement done with fixture deembedding.

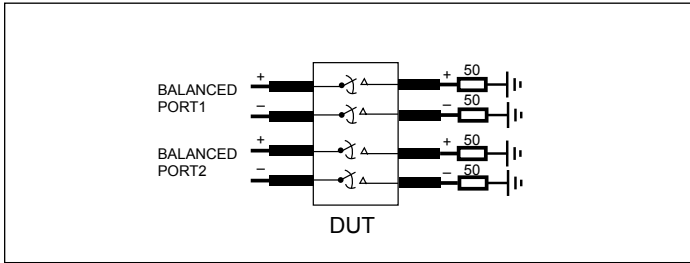
**PI3PCIE3212**



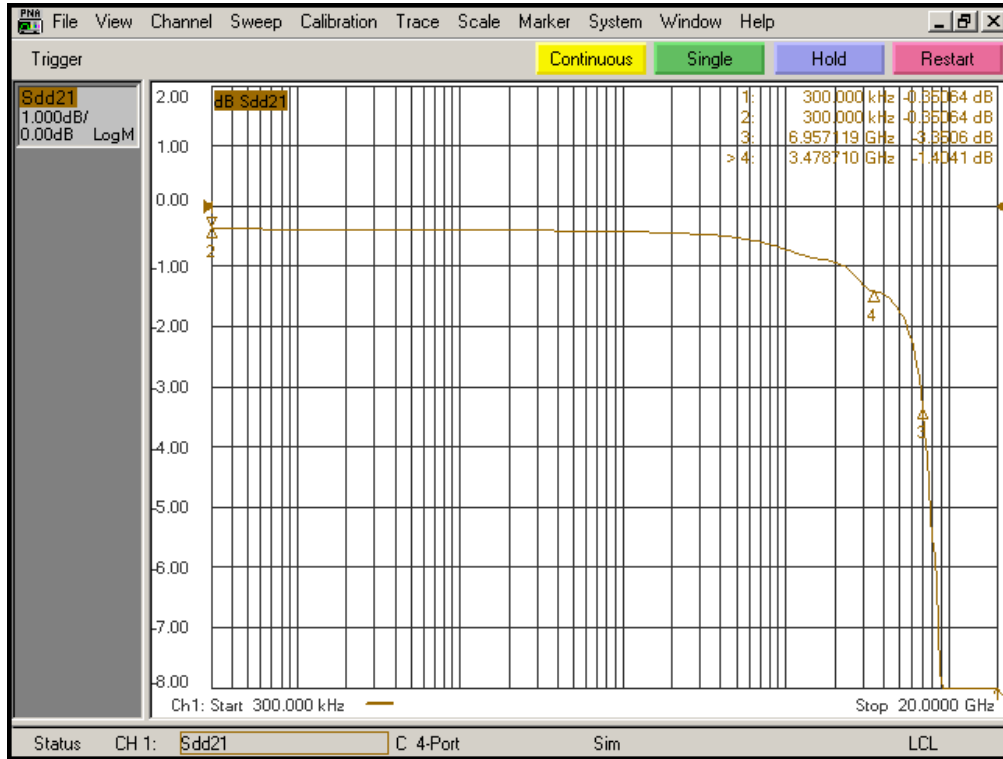
**Diff. Insertion Loss and Return Test Circuit**



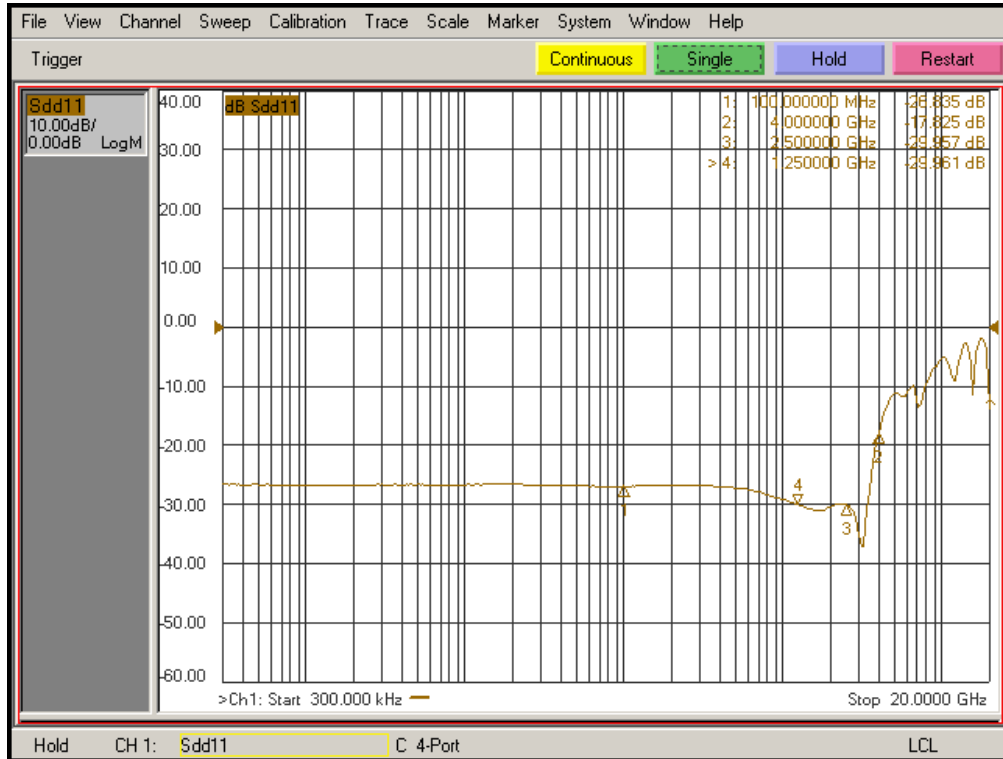
**Diff. Off Isolation Test Circuit**



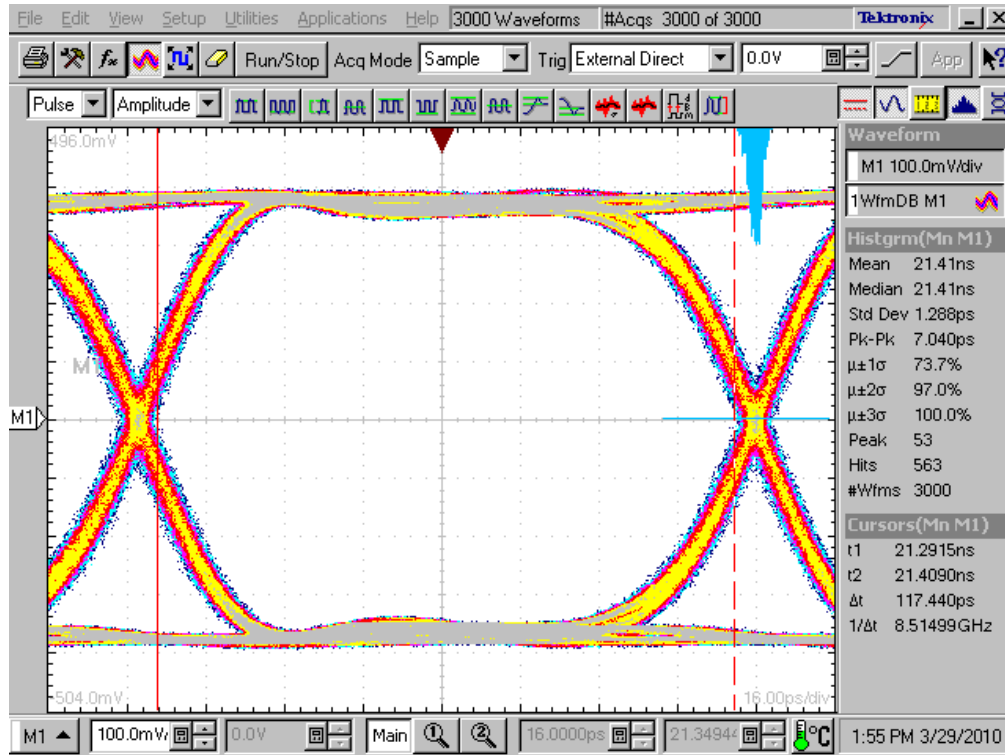
**Diff. Near End Xtalk Test Circuit**



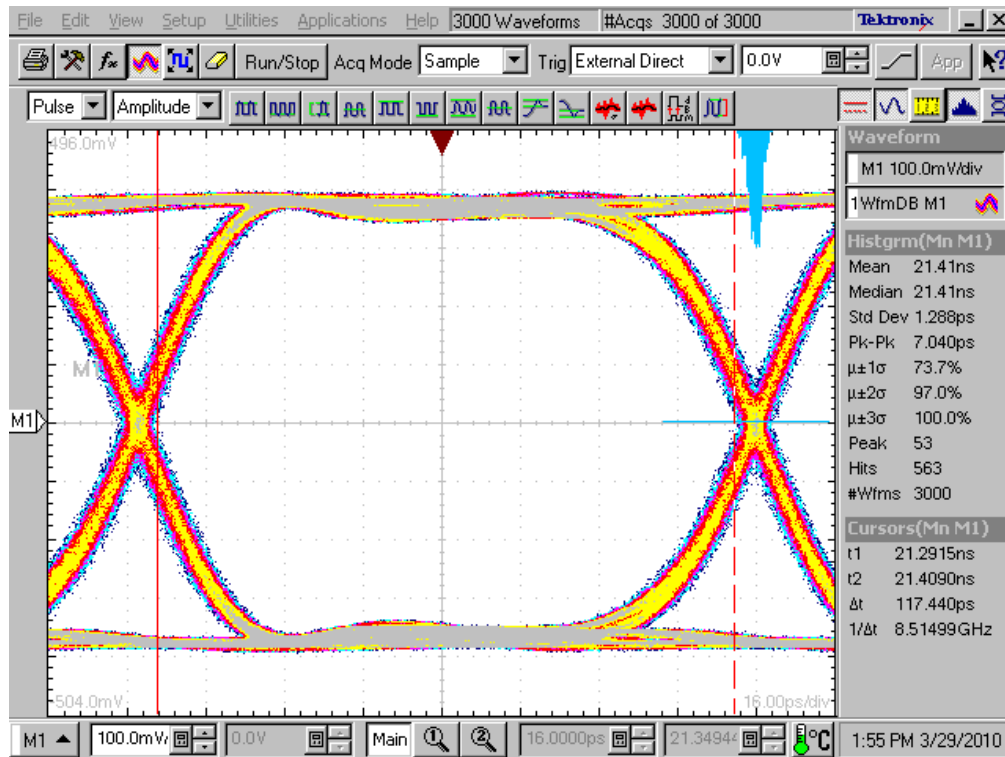
**Differential Insertion Loss**



**Differential Return Loss**

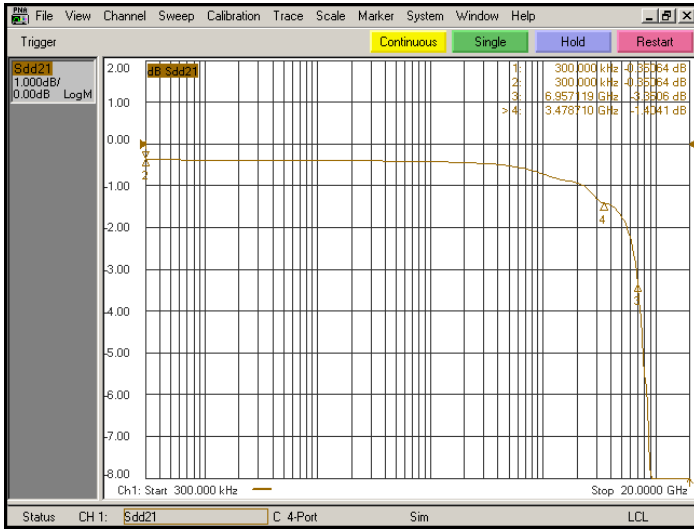


**Differential Off Isolation**

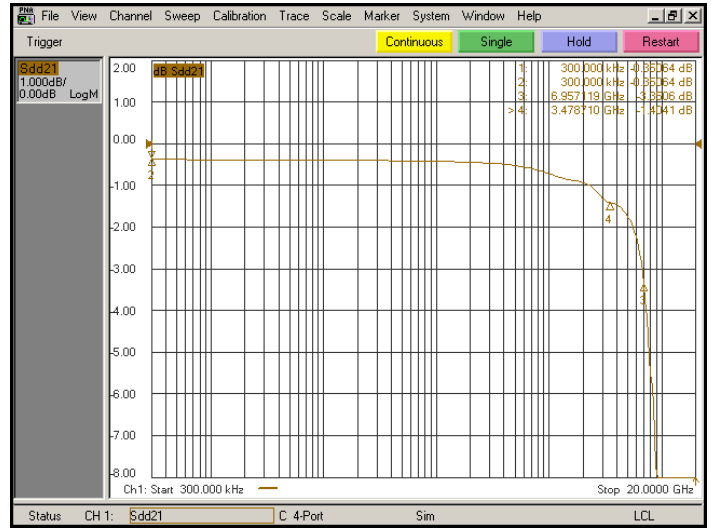


**Differential Crosstalk**

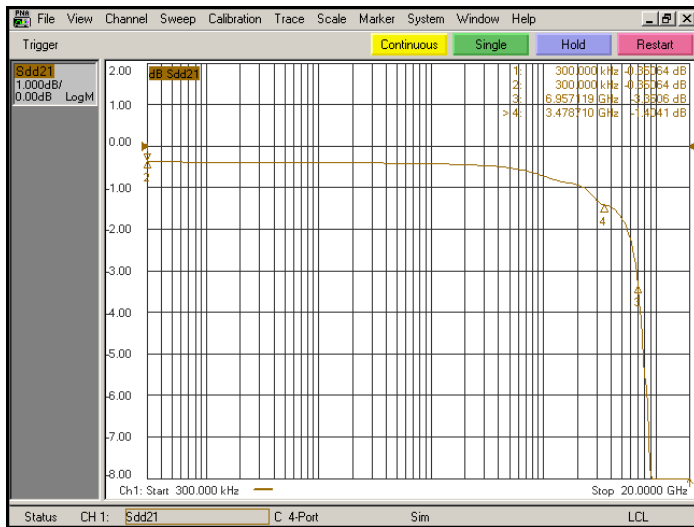
**PI3PCIE3212**



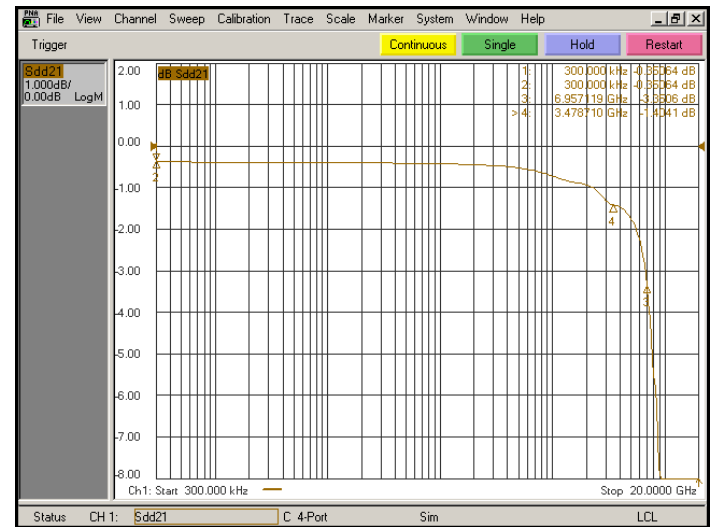
**5.0 Gbps RX signal eye without PI3PCIE3212**



**5.0 Gbps RX signal eye with PI3PCIE3212**



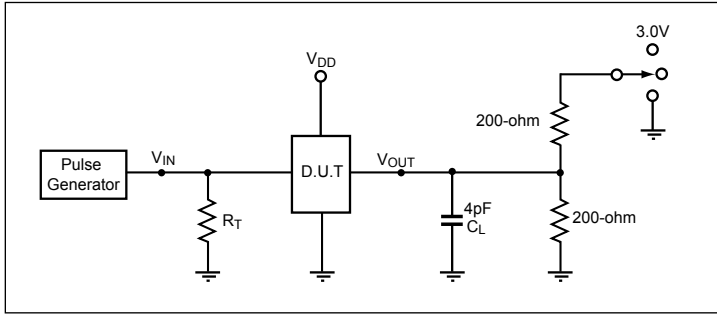
**8.0 Gbps RX signal eye without PI3PCIE3212**



**8.0 Gbps RX signal eye with PI3PCIE3212**



**Test Circuit for Electrical Characteristics<sup>(1-5)</sup>**



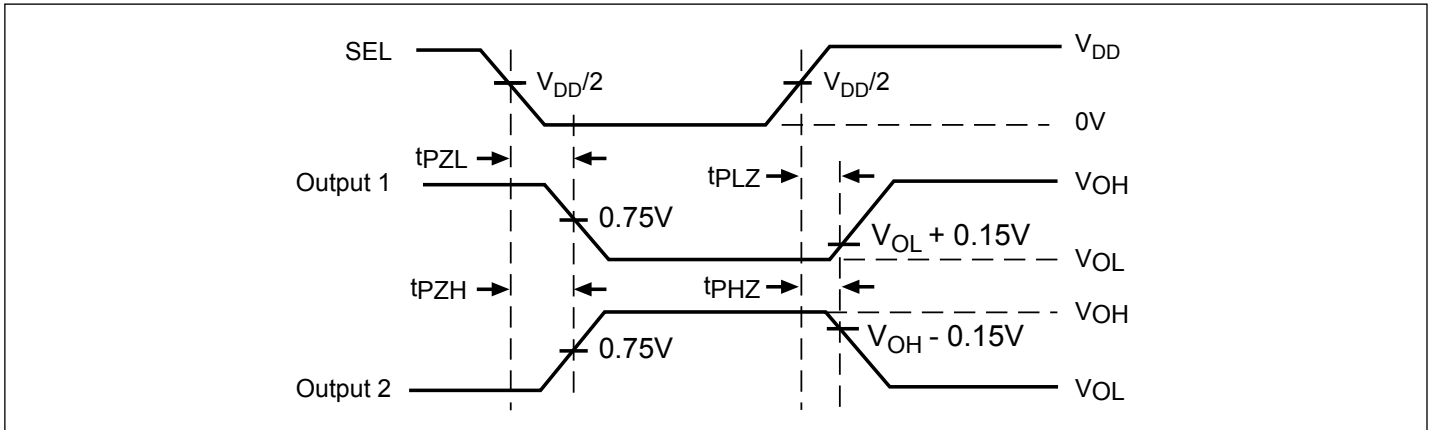
**Notes:**

1.  $C_L$  = Load capacitance: includes jig and probe capacitance.
2.  $R_T$  = Termination resistance: should be equal to  $Z_{OUT}$  of the Pulse Generator
3. Output 1 is for an output with internal conditions such that the output is low except when disabled by the output control.  
output 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
4. All input impulses are supplied by generators having the following characteristics:  $PRR \leq \text{MHz}$ ,  $Z_O = 50\Omega$ ,  $t_R \leq 2.5\text{ns}$ ,  $t_F \leq 2.5\text{ns}$ .
5. The outputs are measured one at a time with one transition per measurement.

**Switch Positions**

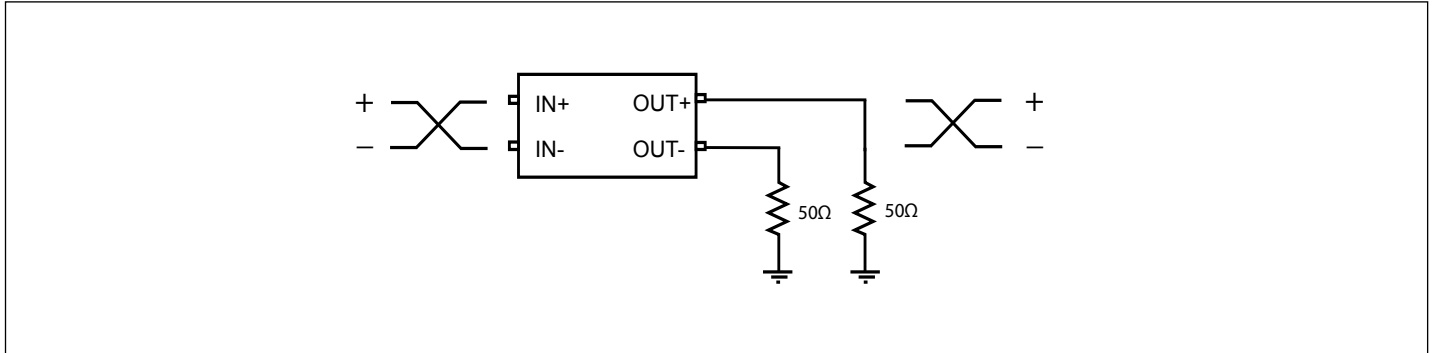
| Test                  | Switch |
|-----------------------|--------|
| $t_{PLZ}$ , $t_{PZL}$ | 3.0V   |
| $t_{PHZ}$ , $t_{PZH}$ | GND    |

**Switching Waveforms**

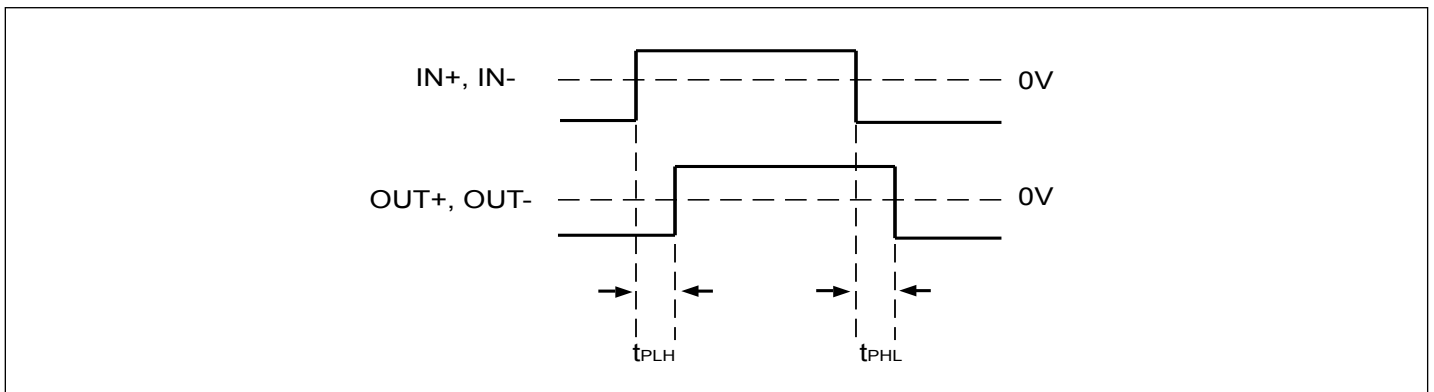


**Voltage Waveforms Enable and Disable Times**

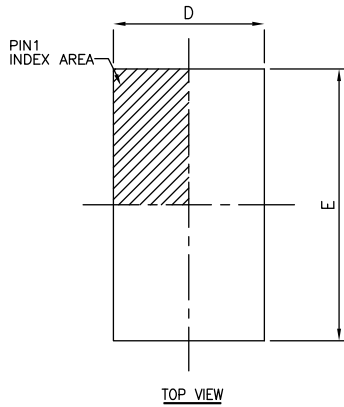
**Test Circuit for Propagation Delay**



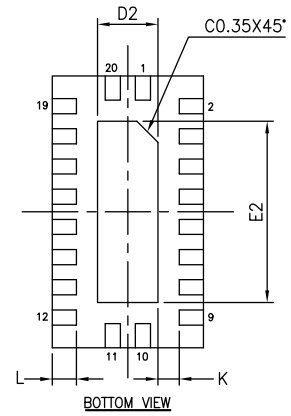
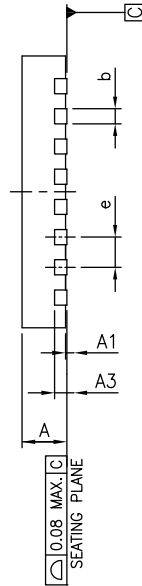
**Differential Input/Output Signal Waveform**



**Packaging Mechanical: 20-Contact TQFN (ZB)**

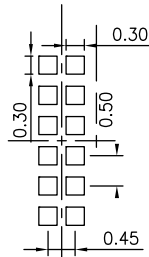


TOP VIEW

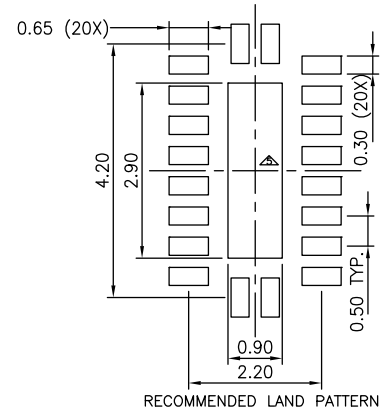


BOTTOM VIEW

| SYMBOLS | MIN.      | NOM. | MAX. |
|---------|-----------|------|------|
| A       | --        | --   | 1.00 |
| A1      | 0.00      | 0.02 | 0.05 |
| A3      | 0.20 REF. |      |      |
| b       | 0.18      | 0.25 | 0.30 |
| D       | 2.40      | 2.50 | 2.60 |
| E       | 4.40      | 4.50 | 4.60 |
| e       | 0.50 BSC  |      |      |
| L       | 0.30      | 0.40 | 0.50 |
| K       | 0.20      | --   | --   |
| D2      | 0.90      | 1.00 | 1.10 |
| E2      | 2.90      | 3.00 | 3.10 |



RECOMMENDED STENCIL DESIGN for EPAD  
(0.125mm THICK STENCIL)



RECOMMENDED LAND PATTERN

NOTE :

1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES.
2. COPLANARITY APPLIES TO THE EXPOSED THERMAL PAD AS WELL AS THE TERMINALS.
3. REFER JEDEC MO-241
4. RECOMMENDED LAND PATTERN IS FOR REFERENCE ONLY.
5. THERMAL PAD SOLDERING AREA (MESH STENCIL DESIGN IS RECOMMENDED).

14-0265

**Packaging Mechanical: 18-Contact XUA (X2QFN)**

| SYMBOLS | MIN.       | NOM. | MAX. |
|---------|------------|------|------|
| A       | 0.30       | 0.35 | 0.40 |
| A1      | 0.00       | 0.02 | 0.05 |
| A3      | 0.127 REF. |      |      |
| b       | 0.15       | 0.20 | 0.25 |
| D       | 1.95       | 2.00 | 2.05 |
| E       | 1.95       | 2.00 | 2.05 |
| e       | 0.40 BSC   |      |      |
| L       | 0.15       | 0.25 | 0.35 |
| D2      | 0.95       | 1.00 | 1.05 |
| E2      | 0.95       | 1.00 | 1.05 |

**NOTE :**  
 1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES.  
 2. REFER JEDEC MO-288  
 3. RECOMMENDED LAND PATTERN IS FOR REFERENCE ONLY.  
 MESH STENCIL DESIGN IS RECOMMENDED.

**PERICOM**  
Enabling Serial Connectivity

DATE: 03/31/14

DESCRIPTION: 18-Pin, X2QFN 2X2mm

PACKAGE CODE: XUA (XUA18)

DOCUMENT CONTROL #: PD-2184

REVISION: --

14-0039

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 Type  |
|------------------|--------------|---|
| PI3PCIE3212ZBEX  | ZB           | 20-contact, Very Thin Quad Flat No-Lead (TQFN), Tape & Reel |
| PI3PCIE3212XUAEX | XUA          | 18-Pin, 2x2mm (X2QFN), Tape & Reel                          |

**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
- Adding an X suffix = Tape/Reel

**IMPORTANT NOTICE**

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and definitive format released by Diodes Incorporated.

**LIFE SUPPORT**

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2016, Diodes Incorporated

[www.diodes.com](http://www.diodes.com)

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Diodes Incorporated:](#)

[PI3PCIE3212ZBEX](#) [PI3PCIE3212ZBE+DAX](#)

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А