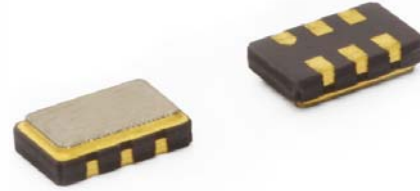


# Model 315

## HFF HCMOS VCXO

### Features

- Ceramic Surface Mount Package
- Ultra-Low Phase Jitter Performance
- High Frequency Fundamental Crystal Design
- Frequency Range 100 – 170MHz \*
- +3.3V Operation
- Output Enable Standard
- Tape and Reel Packaging, EIA-418



Part Dimensions:  
5.0 × 3.2 × 1.2mm • 62.28mg

### Applications

- Small Cells
- Wireless Communication
- Broadband Access
- SONET/SDH/DWDM
- Base Stations
- Ethernet/GbE/SyncE
- Digital Video
- Test and Measurement

| Standard Frequencies |             |
|----------------------|-------------|
| - 100.00MHz          | - 155.52MHz |
| - 122.88MHz          | - 156.25MHz |
| - 125.00MHz          | - 166.00MHz |
| - 153.60MHz          |             |

\* Check with factory for availability.

### Description

CTS Model 315 is a low cost, small size, high performance VCXO. Employing the latest IC technology, coupled with a high frequency fundamental crystal, M315 has excellent stability and low jitter/phase noise performance.

### Ordering Information

| Model                               | Supply Voltage   | Absolute Pull Range   | Frequency Stability | Temperature Range | Frequency Code [MHz] | Packaging |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
|-------------------------------------|--|---|---------------------|-------------------|----------------------|-----------|---|---|-----------|-------------|--------|----------------|--------|----------------|---|------|--|------|--------------|-------------------------------------|--|--|
| 315                                 | L  | B   | 3                   | I                 | XXX or XXXX          | T         |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
|                                     | <table border="1"> <thead> <tr> <th>Code</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>+3.3V ±5%</td> </tr> </tbody> </table> | Code  | Voltage             | L                 | +3.3V ±5%            |           | <table border="1"> <thead> <tr> <th>Code</th> <th>Stability</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>±50ppm</td> </tr> <tr> <td>5</td> <td>±25ppm</td> </tr> <tr> <td>6</td> <td>±20ppm<sup>1</sup></td> </tr> </tbody> </table> | Code  | Stability | 3           | ±50ppm | 5              | ±25ppm | 6              | ±20ppm <sup>1</sup>   |      | <table border="1"> <thead> <tr> <th>Code</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td colspan="2">Product Frequency Code<sup>2</sup></td> </tr> </tbody> </table> | Code | Frequency    | Product Frequency Code <sup>2</sup> |  |  |
| Code                                | Voltage  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| L                                   | +3.3V ±5%  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| Code                                | Stability  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| 3                                   | ±50ppm   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| 5                                   | ±25ppm   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| 6                                   | ±20ppm <sup>1</sup>  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| Code                                | Frequency  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| Product Frequency Code <sup>2</sup> |  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
|                                     |  | <table border="1"> <thead> <tr> <th>Code</th> <th>APR</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>±50ppm</td> </tr> </tbody> </table> | Code                | APR               | B                    | ±50ppm    |   | <table border="1"> <thead> <tr> <th>Code</th> <th>Temp. Range</th> </tr> </thead> <tbody> <tr> <td>C</td> <td>-20°C to +70°C</td> </tr> <tr> <td>I</td> <td>-40°C to +85°C</td> </tr> </tbody> </table> | Code      | Temp. Range | C      | -20°C to +70°C | I      | -40°C to +85°C | <table border="1"> <thead> <tr> <th>Code</th> <th>Packing</th> </tr> </thead> <tbody> <tr> <td>T</td> <td>1k pcs./reel</td> </tr> </tbody> </table> | Code | Packing  | T    | 1k pcs./reel |                                     |  |  |
| Code                                | APR  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| B                                   | ±50ppm   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| Code                                | Temp. Range  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| C                                   | -20°C to +70°C   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| I                                   | -40°C to +85°C   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| Code                                | Packing  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| T                                   | 1k pcs./reel   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |

Notes:

- 1] Only available with "C" temperature range.
- 2] Refer to document 016-1454-0, Frequency Code Tables.  
3-digits for frequencies <100MHz, 4-digits for frequencies 100MHz or greater.

**Not all performance combinations and frequencies may be available.  
Contact your local CTS Representative or CTS Customer Service for availability.**



## Electrical Specifications

### Operating Conditions

| PARAMETER               | SYMBOL    | CONDITIONS   | MIN        | TYP | MAX        | UNIT             |
|-------------------------|-----------|--|------------|-----|------------|------------------|
| Maximum Supply Voltage  | $V_{CC}$  | -  | -0.5       | -   | 5.0        | V                |
| Maximum Control Voltage | $V_C$     | -  | -0.5       | -   | $V_{CC}$   | V                |
| Supply Voltage          | $V_{CC}$  | ±5%  | 3.14       | 3.3 | 3.47       | V                |
| Supply Current          | $I_{CC}$  | Typical @ $C_L = 15$ pF, $T_A = +25^\circ\text{C}$ | -          | 20  | 30         | mA               |
| Output Load             | $C_L$     | -  | -          | -   | 15         | pF               |
| Operating Temperature   | $T_A$     | -  | -20<br>-40 | +25 | +70<br>+85 | $^\circ\text{C}$ |
| Storage Temperature     | $T_{STG}$ | -  | -40        | -   | +100       | $^\circ\text{C}$ |

### Frequency Stability

| PARAMETER                       | SYMBOL            | CONDITIONS  | MIN | TYP          | MAX | UNIT |
|---------------------------------|-------------------|---|-----|--------------|-----|------|
| Frequency Range                 | $f_o$             | -   |     | 100 - 170    |     | MHz  |
| Frequency Stability<br>[Note 1] | $\Delta f/f_o$    | ±20ppm stability, -20 $^\circ\text{C}$ to +70 $^\circ\text{C}$ only |     | 20, 25 or 50 |     | ±ppm |
| Absolute Pull Range<br>[Note 2] | APR               | -   | 50  | -            | -   | ±ppm |
| Aging                           | $\Delta f/f_{25}$ | First Year @ +25 $^\circ\text{C}$ , nominal $V_{CC}$ and $V_C$      | -3  | -            | 3   | ppm  |

1.] Inclusive of initial tolerance at time of shipment, changes in supply voltage, load, temperature and 1st year aging.

2.] Minimum guaranteed frequency shift from  $f_o$  over variations in temperature, aging, power supply and load.

### Output Parameters

| PARAMETER              | SYMBOL               | CONDITIONS   | MIN               | TYP    | MAX               | UNIT          |
|------------------------|----------------------|--|-------------------|--------|-------------------|---------------|
| Output Type            | -                    | -  |                   | HCMOS  |                   | -             |
| Output Voltage Levels  | $V_{OH}$<br>$V_{OL}$ | Logic '1' Level, CMOS Load<br>Logic '0' Level, CMOS Load | 0.9 $V_{CC}$<br>- | -<br>- | -<br>0.1 $V_{CC}$ | V             |
| Output Duty Cycle      | SYM                  | @ 50% Level  | 45                | -      | 55                | %             |
| Rise and Fall Time     | $T_R, T_F$           | @ 20%/80% Levels   | -                 | 1.5    | 3.0               | ns            |
| Start Up Time          | $T_S$                | Application of $V_{CC}$                                  | -                 | -      | 5                 | ms            |
| <b>Enable Function</b> |                      |  |                   |        |                   |               |
| Enable Input Voltage   | $V_{IH}$             | Pin 2 Logic '1', Output Enabled                          | 0.7 $V_{CC}$      | -      | -                 | V             |
| Disable Input Voltage  | $V_{IL}$             | Pin 2 Logic '0', Output Standby                          | -                 | -      | 0.3 $V_{CC}$      | V             |
| Standby Current        | $I_{STB}$            | Pin 2 Logic '0', Output Standby                          | -                 | -      | 10                | $\mu\text{A}$ |
| Enable Time            | $T_{PLZ}$            | Pin 2 Logic '1'  | -                 | -      | 2                 | ms            |
| Phase Jitter, RMS      | $t_{jrms}$           | Bandwidth 12 kHz - 20 MHz                                | -                 | 50     | 500               | fs            |
| Phase Noise            | -                    | See Typical Plots  | -                 | -      | -                 | -             |

### Enable Truth Table

| Pin 2     | Pin 4     |
|-----------|-----------|
| Logic '1' | Output    |
| Open      | Output    |
| Logic '0' | High Imp. |

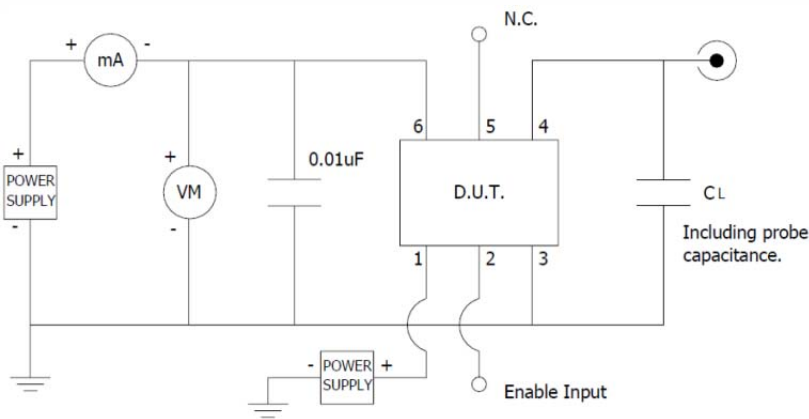
## Electrical Specifications

### Control Voltage

| PARAMETER           | SYMBOL         | CONDITIONS                        | MIN  | TYP         | MAX  | UNIT  |
|---------------------|----------------|-----------------------------------|------|-------------|------|-------|
| Control Voltage     | $V_C$          | -                                 | 0.30 | 1.65        | 3.00 | V     |
| Frequency Deviation | $\Delta f/f_0$ | $V_C = 0.0V$                      |      | -155 to -75 |      | ppm   |
|                     |                | $V_C = 3.3V$                      |      | 75 to 155   |      |       |
| Linearity           | L              | Best Straight Line Fit            | -    | 5           | 10   | %     |
| Gain Transfer       | $K_V$          | Pull Sensitivity; @ +1.65V, +25°C | -    | 65          | -    | ppm/V |
| Input Impedance     | $Z_{V_C}$      | -                                 | 100  | -           | -    | kOhms |
| Modulation Roll-off | -              | @ -3dB                            | 20   | -           | -    | kHz   |
| Transfer Function   | -              | -                                 |      | Positive    |      | -     |

### Test Circuit

HCMOS



### Output Waveform

HCMOS

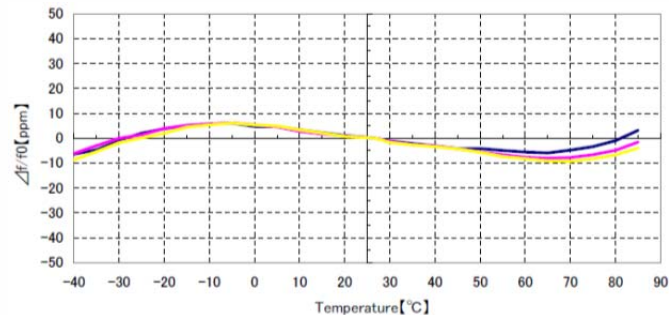


## Electrical Specifications

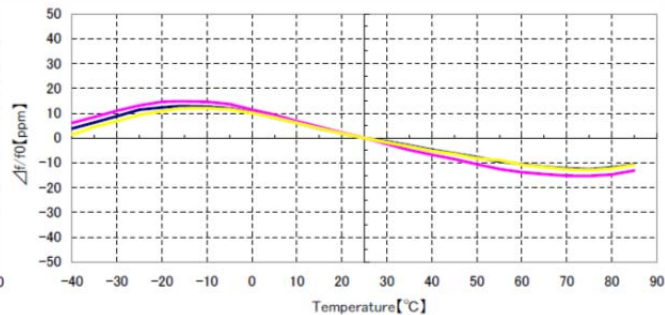
### Performance Data

#### Frequency Deviation – Over Temperature [typical]

122.88MHz,  $V_{CC} = 3.3V$ ,  $V_C = 1.65V$

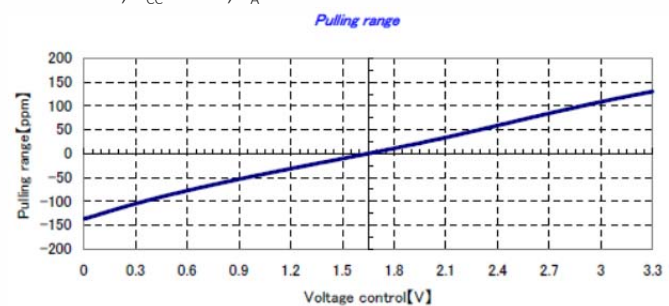


156.25MHz,  $V_{CC} = 3.3V$ ,  $V_C = 1.65V$

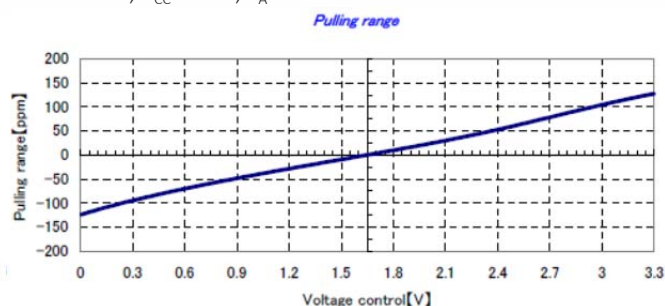


#### Frequency Deviation – Pulling Range [typical]

122.88MHz,  $V_{CC} = 3.3V$ ,  $T_A = +25^\circ V$

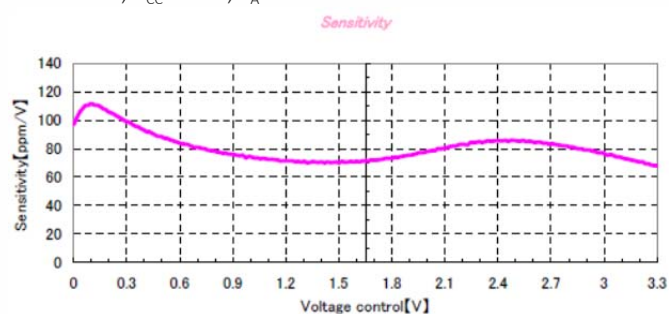


156.25MHz,  $V_{CC} = 3.3V$ ,  $T_A = +25^\circ V$

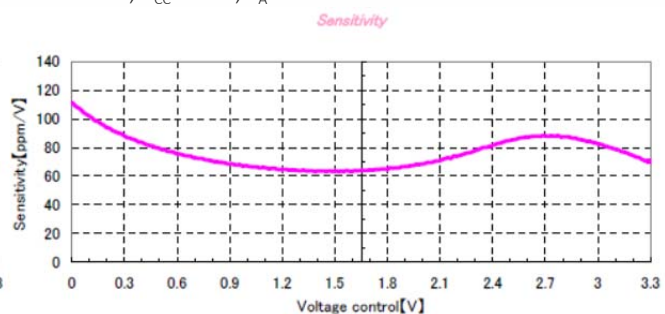


#### Frequency Deviation – Gain Transfer [typical]

122.88MHz,  $V_{CC} = 3.3V$ ,  $T_A = +25^\circ V$



156.25MHz,  $V_{CC} = 3.3V$ ,  $T_A = +25^\circ V$



### Electrical Specifications

#### Performance Data

##### Phase Noise [typical]

122.88MHz,  $V_{CC} = 3.3V$ ,  $V_C = 1.65V$ ,  $T_A = +25^\circ C$

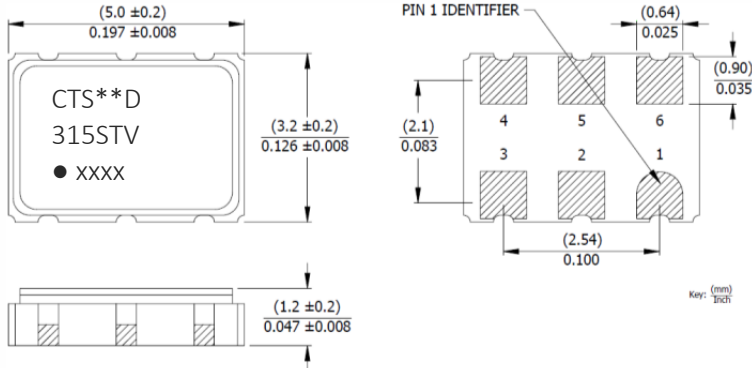


156.25MHz,  $V_{CC} = 3.3V$ ,  $V_C = 1.65V$ ,  $T_A = +25^\circ C$



## Mechanical Specifications

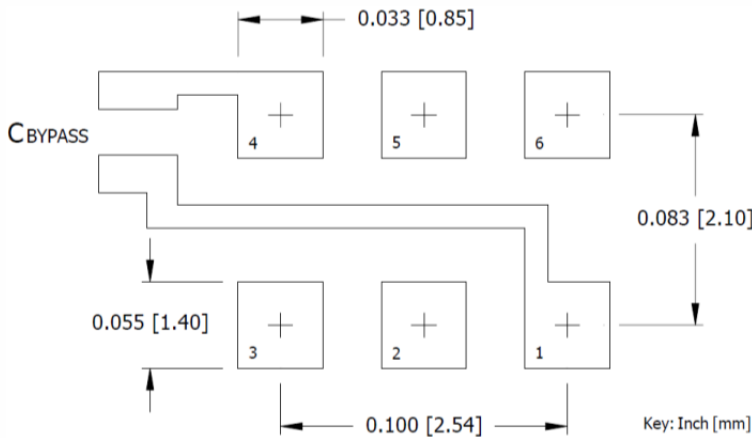
### Package Drawing



### Marking Information

- \*\* - Manufacturing Site Code.
- D – Date Code. See Table I for codes.
- ST – Frequency Stability/Temperature Code. [Refer to Ordering Information]
- V – Voltage Code. L = 3.3V
- xxxx – Frequency Code. 4-digits required for frequencies 100MHz and above. [See document 016-1454-0, Frequency Code Tables.]

### Recommended Pad Layout



### Notes

- Termination pads (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
- Reflow conditions per JEDEC J-STD-020; +260°C maximum, 20 seconds.
- MSL = 1.

### Pin Assignments

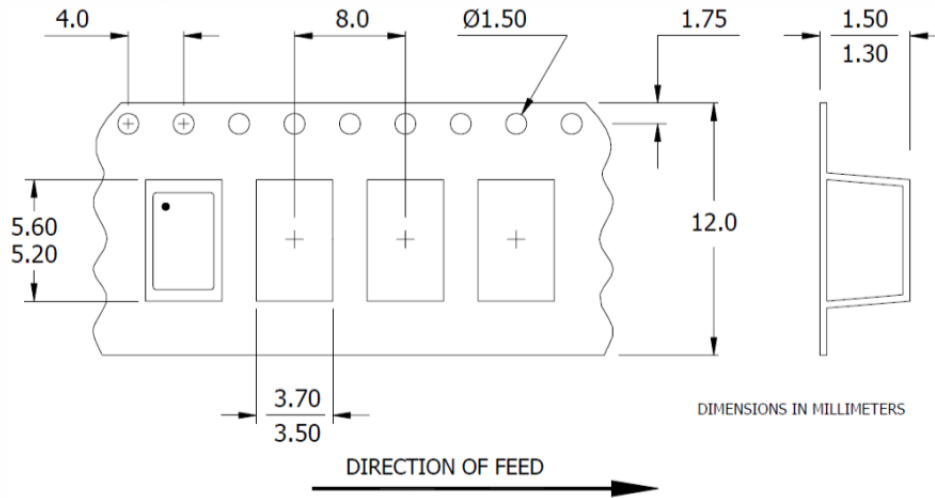
| Pin | Symbol          | Function          |
|-----|-----------------|-------------------|
| 1   | V <sub>C</sub>  | Control Voltage   |
| 2   | EOH             | Enable            |
| 3   | GND             | Circuit & Package |
| 4   | Output          | RF Output         |
| 5   | N.C.            | No Connect        |
| 6   | V <sub>CC</sub> | Supply Voltage    |

Table I - Date Code

| YEAR |      | MONTH |      |      |  |   | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|------|------|-------|------|------|--|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2001 | 2005 | 2009  | 2013 | 2017 |  | A | B   | C   | D   | E   | F   | G   | H   | J   | K   | L   | M   |     |
| 2002 | 2006 | 2010  | 2014 | 2018 |  | N | P   | Q   | R   | S   | T   | U   | V   | W   | X   | Y   | Z   |     |
| 2003 | 2007 | 2011  | 2015 | 2019 |  | a | b   | c   | d   | e   | f   | g   | h   | j   | k   | l   | m   |     |
| 2004 | 2008 | 2012  | 2016 | 2020 |  | n | p   | q   | r   | s   | t   | u   | v   | w   | x   | y   | z   |     |

### Packaging - Tape and Reel

#### Tape Drawing



#### Reel Drawing



#### Notes

1. Device quantity is 1k pieces maximum per 180mm reel.
2. Complete CTS part number, frequency value and date code information must appear on reel and carton labels.

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).



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