

# ESD-R-B Toroidal Cores for Round Cables for Low & High Frequency (with snail-shaped case)

## Overview

The KEMET ESD-R-B series solid toroidal cores are designed to use on round cables. The wide range of Manganese Zinc (MnZn) and Nickel Zinc (NiZn) options allows for targeting of specific frequency ranges. The snail-shaped case allows fixing the core in the application to avoid contact with other components.

EMI cores are part of a family of passive components which address the issues of noise or electromagnetic interference (EMI) in circuits or systems.

## Applications

- Consumer electronics
- Air conditioners
- Power conditioners
- Refrigerators
- Washing machines
- Industrial equipment
- Medical equipment

## Benefits

- MnZn  $\leq$  10 MHz (AM band range) and NiZn  $\leq$  300 MHz (FM band range) options available
- Solid construction
- Easy to install with one M4 screw
- UL94 V-2 flame retardant rated case



## Part Number System

| ESD-   | R-         | 19                                     | B                        |
|--------|------------|----------------------------------------|--------------------------|
| Series | Shape Type | Core Size<br>Outer Dimension Code (mm) | Core Material            |
| ESD-   | Ring       | See Table 1                            | B = Mn-Zn<br>D-B = Ni-Zn |

## Turns and Impedance Characteristics

When the desired performance of an EMI core cannot be obtained with a single pass through the core, the impedance characteristics can be changed with multiple turns.

A turn is counted by the number of lead-wire windings which pass through the inner hole of the core. Windings on the outside of the core do not count.

See Figure 1 for examples of one, two, and three turns.

Adding turns will result in higher impedance while also lowering the effective frequency range.

See Figure 2 for an example.

## Core Material and Effective Frequency Range

There are two ferrite material options for KEMET EMI Cores: Nickel Zinc (Ni-Zn) and Manganese Zinc (Mn-Zn). Each core material has a different resistance and effective frequency range. The MnZn core material has a lower resistance compared to the Ni-Zn; therefore, adequate insulation is required before use.

The Ni-Zn core material is typically effective for frequencies in the MHz band range such as the FM-band, while the Mn-Zn core material is typically effective for the kHz band range such as the AM-band. See Figure 3.

It is recommended to measure the actual frequency range effectiveness in the target application.

Figure 1 – How to count turns

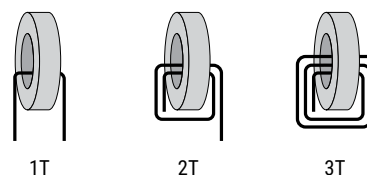


Figure 2 – Relationship between impedance and turn count. (Representative example: ESD-R-16C)

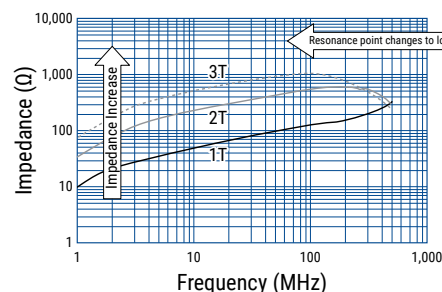
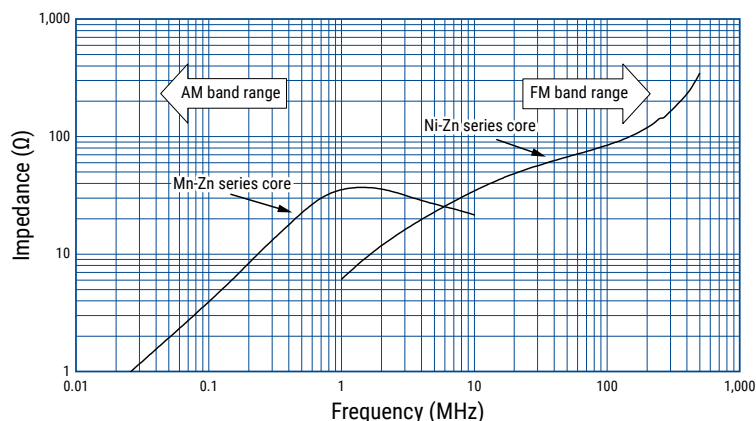


Figure 3 – Effective band range of Mn-Zn and Ni-Zn ferrite core material. (Representative example, measured with same-dimension ring core)



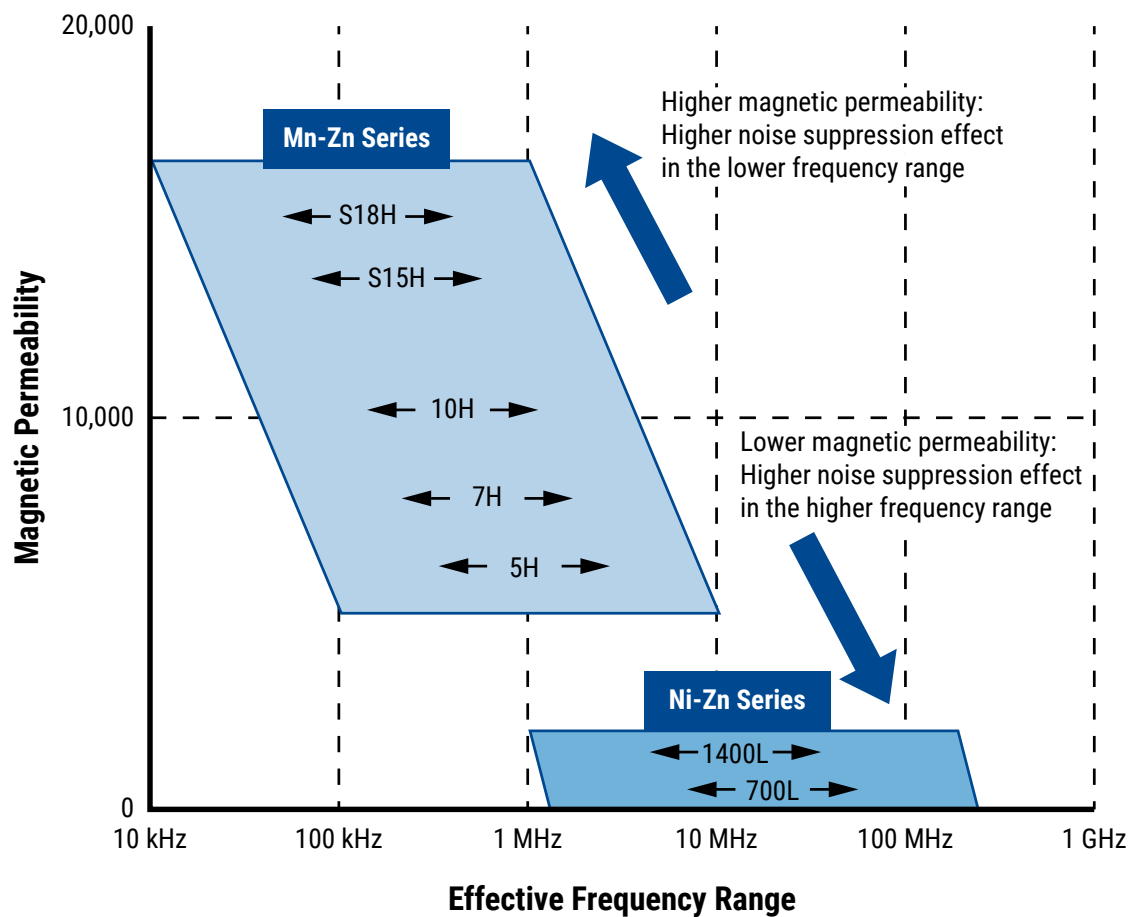
## Magnetic Permeability of Ferrite Material

In order to achieve most efficient noise reduction, it is important to select the material according to the target frequency band. Depending on its magnetic permeability, a particular ferrite material will be effective in a certain frequency band. A schematic representation of the relationship between the magnetic permeability of each material and the corresponding effective band range is shown in Figure 1. Materials with higher magnetic permeability are effective in the lower frequency range, while those with lower magnetic permeability are effective in the higher frequency range. Thus, Mn-Zn products are mainly used for reducing conduction noise, while Ni-Zn products are commonly used for radiation noise countermeasures.

The effective frequency range varies depending on core shape, size and number of windings. This frequency dependence of the magnetic permeability as shown in the figure serves for reference purposes only and it should be tested on the actual device to determine its effectiveness.

S18H, S15H, 10H, 7H, 5H, 1400L and 700L are KEMET's proprietary ferrite material names. Other materials can also be available on request.

Figure 4 - Relationship between the magnetic permeability of each material and its effective frequency range

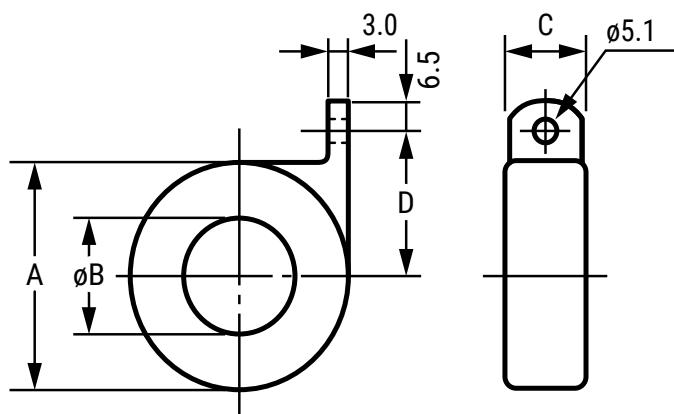


## Environmental Compliance

All KEMET EMI cores are RoHS compliant.

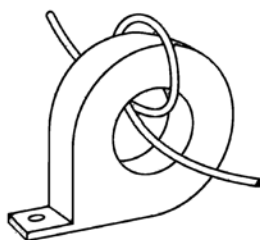


## Dimensions – Millimeters



See Table 1 for dimensions

## Installation Example



## Performance Characteristics

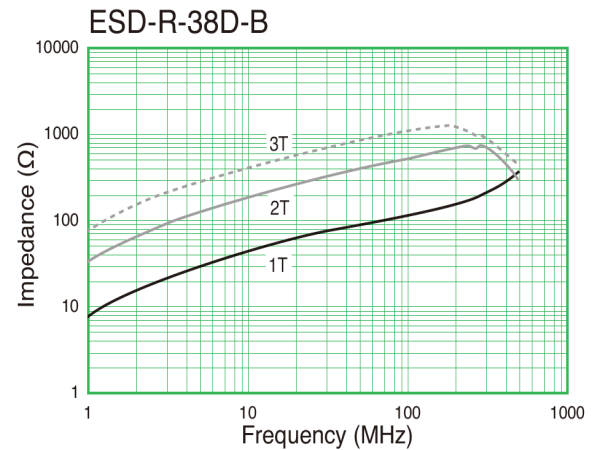
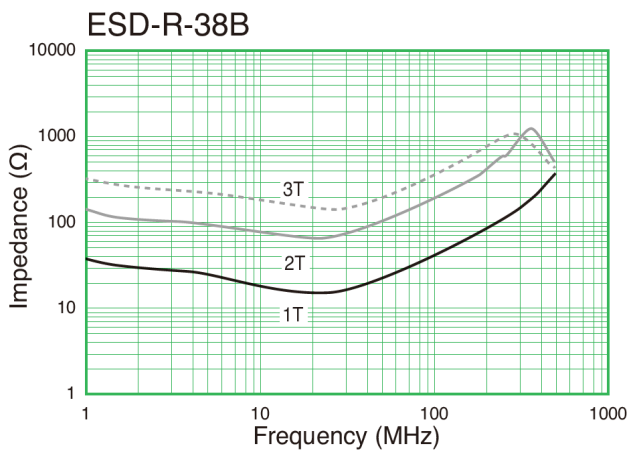
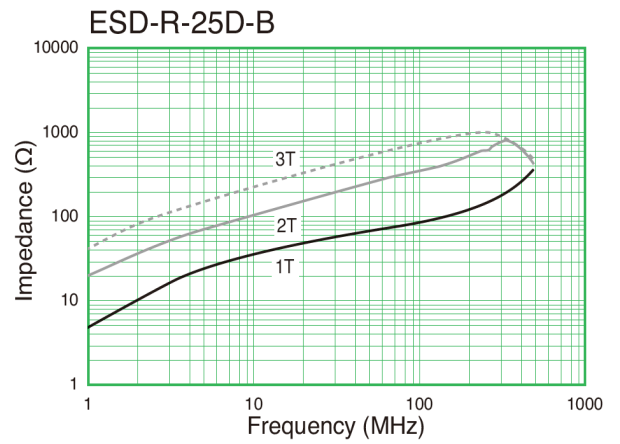
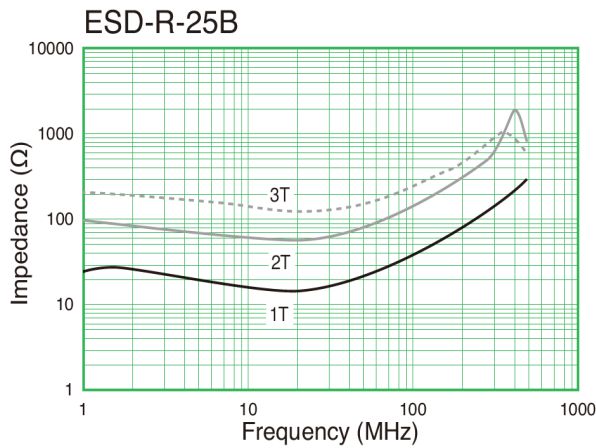
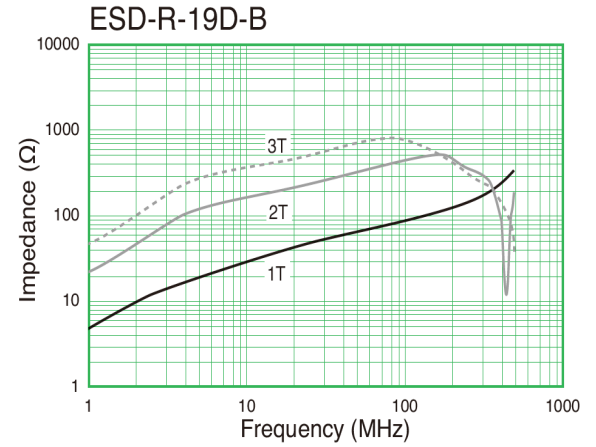
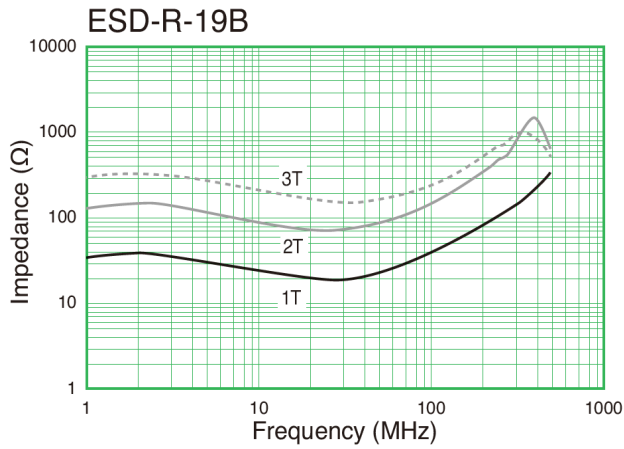
| Item                        | Performance Characteristics      |
|-----------------------------|----------------------------------|
| Operating temperature       | -25°C to +60°C                   |
| Frequency range             | Low frequency and high frequency |
| Outer diameter              | 21.5 – 51.5 mm                   |
| Inner diameter              | 8.8 – 21.5 mm                    |
| Thickness                   | 13.0 – 17.5 mm                   |
| Type                        | Snail-shaped case                |
| Case flame resistant rating | UL94 V-2                         |
| Material                    | MnZn 5H and NiZn 700L            |

**Table 1 – Ratings & Part Number Reference**

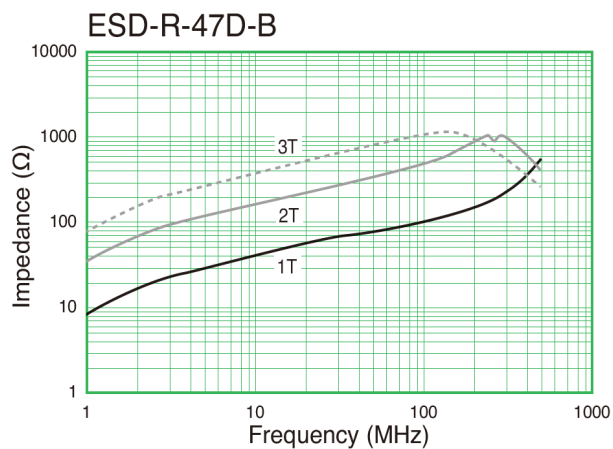
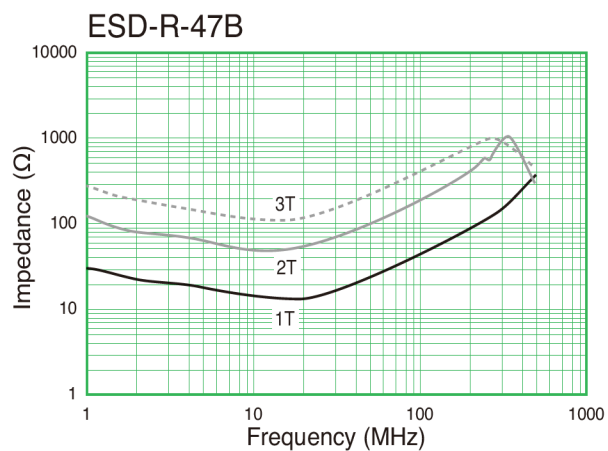
| Part Number | Dimensions (mm) |           |           |           | Weight (g) | Case Color | Compatible Toroid Core (Bare Type) | Frequency Range <sup>1</sup> |                           | Material |      |
|-------------|-----------------|-----------|-----------|-----------|------------|------------|------------------------------------|------------------------------|---------------------------|----------|------|
|             | A               | B         | C Maximum | D         |            |            |                                    | ≤ 10 MHz (AM band range)     | ≤ 300 MHz (FM band range) | MnZn     | NiZn |
| ESD-R-19B   | 21.5 ±1.0       | 8.8 ±1.0  | 13.0      | 18.5 ±1.0 | 12.1       | White      | ESD-R-19S                          | X                            |                           | 5H       | —    |
| ESD-R-19D-B | 21.5 ±1.0       | 8.8 ±1.0  | 13.0      | 18.5 ±1.0 | 11.7       | Black      | ESD-R-19SD                         |                              | X                         | —        | 700L |
| ESD-R-25B   | 29.3 ±1.0       | 13.9 ±1.0 | 15.0      | 23.0 ±1.0 | 21.8       | White      | ESD-R-25S                          | X                            |                           | 5H       | —    |
| ESD-R-25D-B | 29.3 ±1.0       | 13.9 ±1.0 | 15.0      | 23.0 ±1.0 | 12.9       | Black      | ESD-R-25SD                         |                              | X                         | —        | 700L |
| ESD-R-38B   | 42.4 ±0.8       | 17.9 ±0.8 | 16.0      | 28.0 ±0.8 | 58.6       | White      | ESD-R-38D                          | X                            |                           | 5H       | —    |
| ESD-R-38D-B | 42.4 ±0.8       | 17.9 ±0.8 | 16.0      | 28.0 ±0.8 | 58.6       | Black      | —                                  |                              | X                         | —        | 700L |
| ESD-R-47B   | 51.5 ±0.7       | 25.5 ±0.7 | 17.5      | 34.0 ±0.7 | 89.0       | White      | —                                  | X                            |                           | 5H       | —    |
| ESD-R-47D-B | 51.5 ±0.7       | 25.5 ±0.7 | 17.5      | 34.0 ±0.7 | 89.0       | Black      | —                                  |                              | X                         | —        | 700L |
| Part Number | A               | B         | C Maximum | D         | (g)        | Color      | Compatible Toroid Core (Bare Type) | ≤ 10 MHz (AM band range)     | ≤ 300 MHz (FM band range) | MnZn     | NiZn |
|             | Dimensions      |           |           |           | Weight     |            |                                    | Frequency Range <sup>1</sup> |                           | Material |      |

<sup>1</sup> Frequency range is for reference only. Please test with actual device before use.

## Impedance vs. Frequency



## Impedance vs. Frequency cont.



## Packaging

| Part Number | Packaging Type | Pieces per Box |
|-------------|----------------|----------------|
| ESD-R-19B   | Tray           | 640            |
| ESD-R-19D-B |                |                |
| ESD-R-25B   |                | 300            |
| ESD-R-25D-B |                |                |
| ESD-R-38B   |                | 240            |
| ESD-R-38D-B |                |                |
| ESD-R-47B   |                | 90             |
| ESD-R-47D-B |                |                |

## Handling Precautions

EMI Cores should be stored in normal working environments. While the EMI Cores themselves are quite robust in other environments, avoid exposure to high temperatures, high humidity, corrosive atmospheres and long term storage for case, snap-on and split types.

KEMET recommends that maximum storage temperature not exceed 40°C and maximum storage humidity not exceed 75% relative humidity. Atmospheres should be free of chlorine, sulfur and alkali bearing compounds. Avoid also storage near strong magnetic fields as this might magnetize the product.

Temperature fluctuations should be minimized to avoid condensation or cracks on the parts. Mechanical shocks can bring to cracks as well.

---

## Export Control

### For customers in Japan

For products that are controlled items subject to the “Foreign Exchange and Foreign Trade Law” of Japan, the export license specified by the law is required for export.

### For customers outside Japan

EMI Core products should not be used or sold for use in the development, production, stockpiling or utilization of any conventional weapons or mass-destructive weapons (nuclear weapons, chemical or biological weapons, or missiles), or any other weapons.

## KEMET Electronics Corporation Sales Offices

For a complete list of our global sales offices, please visit [www.kemet.com/sales](http://www.kemet.com/sales).

---

## Disclaimer

All product specifications, statements, information and data (collectively, the "Information") in this datasheet are subject to change. The customer is responsible for checking and verifying the extent to which the Information contained in this publication is applicable to an order at the time the order is placed. All Information given herein is believed to be accurate and reliable, but it is presented without guarantee, warranty, or responsibility of any kind, expressed or implied.

Statements of suitability for certain applications are based on KEMET Electronics Corporation's ("KEMET") knowledge of typical operating conditions for such applications, but are not intended to constitute – and KEMET specifically disclaims – any warranty concerning suitability for a specific customer application or use. The Information is intended for use only by customers who have the requisite experience and capability to determine the correct products for their application. Any technical advice inferred from this Information or otherwise provided by KEMET with reference to the use of KEMET's products is given gratis, and KEMET assumes no obligation or liability for the advice given or results obtained.

Although KEMET designs and manufactures its products to the most stringent quality and safety standards, given the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage.

Although all product-related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicated or that other measures may not be required.

When providing KEMET products and technologies contained herein to other countries, the customer must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the International Traffic in Arms Regulations (ITAR), the US Export Administration Regulations (EAR) and the Japan Foreign Exchange and Foreign Trade Act.

*KEMET is a registered trademark of KEMET Electronics Corporation.*

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