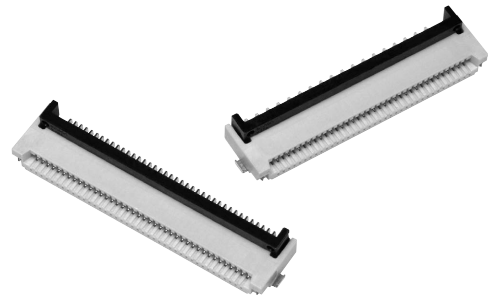


Rotary Backlock Connectors Provide Improved Insertion of FPC/FFC Cables and helps Confirm Proper Connection with Sure Lock Feel.



- Models available with 0.5-mm or 1.0-mm pitch.
- Models available with dual contacts or upper contacts.
(Models with upper contacts come only with a 0.5-mm pitch.)
- Models available with gold or tin plating.
(Tin plating is available only with models with dual contacts.)
- Models with 80 pins (multiple type) available with 0.5-mm pitch.
- Applicable FPC/FFC thickness of 0.3 mm.
- Halogen Free (*)

* OMRON uses the following standard to determine halogen-free construction: 900 ppm max. for Br, 900 ppm max. for Cl, and 1,500 ppm max. for Br+Cl.

RoHS compliant

■ Ratings and Specifications

| | |
|-------------------------------|--|
| Rated current | 0.5 A AC/DC |
| Rated voltage | 50 V AC/DC |
| Contact resistance | 50 mΩ max. (at 20 mV DC max., 100 mA max.) |
| Insulation resistance | 100 MΩ min. (at 250 V DC) |
| Dielectric strength | 250 V AC for 1 min. (leakage current: 1 mA max.) |
| Insertion durability | Gold plating: 20 times Tin plating: 10 times |
| Ambient operating temperature | -30 to 85 °C (With no icing or condensation) |

■ Materials and Finish

| Model | Dual Contact Models | | Upper-contact Models |
|-----------|---|----------------------------|------------------------------|
| | Gold plating | Tin plating | Gold plating |
| Housing | LCP resin (UL94 V-0)/natural | | LCP resin (UL94 V-0)/gray |
| Slider | LCP resin (UL94 V-0)/black | | |
| Contacts | Spring copper alloy/nickel substrate (1.5 μm) | | |
| | Gold-plated contacts (flash) | Tin-plated contacts (1 μm) | Gold-plated contacts (flash) |
| Hold-down | Copper alloy/tin plating (1 μm) | | |

■ Model Number Legend (Refer to Models on pages 16 and 17 for the product lineup.)

XF3M□-□□□5-1□□-□
(1) (2) (3)(4) (5)(6)(7) (8)

(1) Classification in Series

3M : 0.5 mm pitch
3M(1) : 1.0 mm pitch

(3) Signal Contact Arrangement

1 : Dual Contact
2 : Upper Contact

(5) Applicable FPC/FFC thickness

1 : 0.3mm

(7) Slider

Blank : Standard
E : Easy-operation connector

(2) Number of Signal Contact Pins

(4) Terminal Shape

5 : SMT terminals (side entry)

(6) Plating

B : Au flash
D : Sn

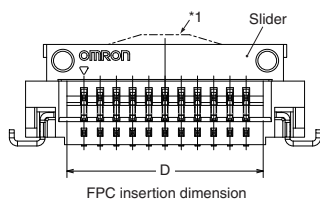
(8) Packing unit

R100 : 100pcs

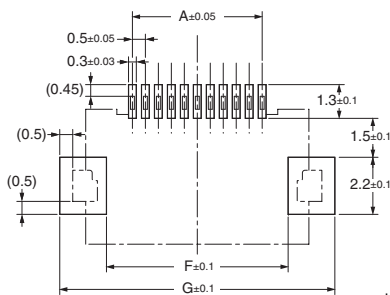
XF3M 0.5-mm pitch model

■ Dimensions

XF3M-□□15-1B
 XF3M-□□15-1BE
 XF3M-□□15-1D
 XF3M-□□25-1B



PCB Dimensions (TOP VIEW)



Recommended FPC/FFC Dimensions

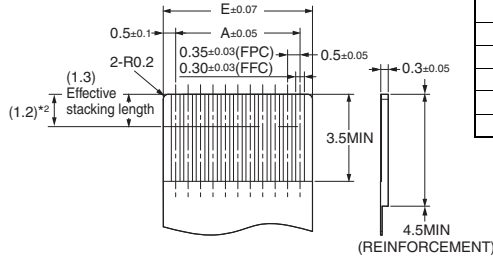


Table of Dimension

| Pins*1 | A | B | C | D | E | F | G |
|--------|------|------|------|-------|------|------|------|
| 6 | 2.5 | 6.1 | 7.1 | 3.55 | 3.5 | 4.5 | 8.1 |
| 7 | 3.0 | 6.6 | 7.6 | 4.05 | 4.0 | 5.0 | 8.6 |
| 8 | 3.5 | 7.1 | 8.1 | 4.55 | 4.5 | 5.5 | 9.1 |
| 9 | 4.0 | 7.6 | 8.6 | 5.05 | 5.0 | 6.0 | 9.6 |
| 10 | 4.5 | 8.1 | 9.1 | 5.55 | 5.5 | 6.5 | 10.1 |
| 11 | 5.0 | 8.6 | 9.6 | 6.05 | 6.0 | 7.0 | 10.6 |
| 12 | 5.5 | 9.1 | 10.1 | 6.55 | 6.5 | 7.5 | 11.1 |
| 13 | 6.0 | 9.6 | 10.6 | 7.05 | 7.0 | 8.0 | 11.6 |
| 14 | 6.5 | 10.1 | 11.1 | 7.55 | 7.5 | 8.5 | 12.1 |
| 15 | 7.0 | 10.6 | 11.6 | 8.05 | 8.0 | 9.0 | 12.6 |
| 16 | 7.5 | 11.1 | 12.1 | 8.55 | 8.5 | 9.5 | 13.1 |
| 17 | 8.0 | 11.6 | 12.6 | 9.05 | 9.0 | 10.0 | 13.6 |
| 18 | 8.5 | 12.1 | 13.1 | 9.55 | 9.5 | 10.5 | 14.1 |
| 19 | 9.0 | 12.6 | 13.6 | 10.05 | 10.0 | 11.0 | 14.6 |
| 20 | 9.5 | 13.1 | 14.1 | 10.55 | 10.5 | 11.5 | 15.1 |
| 21 | 10.0 | 13.6 | 14.6 | 11.05 | 11.0 | 12.0 | 15.6 |
| 22 | 10.5 | 14.1 | 15.1 | 11.55 | 11.5 | 12.5 | 16.1 |
| 23 | 11.0 | 14.6 | 15.6 | 12.05 | 12.0 | 13.0 | 16.6 |
| 24 | 11.5 | 15.1 | 16.1 | 12.55 | 12.5 | 13.5 | 17.1 |
| 25 | 12.0 | 15.6 | 16.6 | 13.05 | 13.0 | 14.0 | 17.6 |
| 26 | 12.5 | 16.1 | 17.1 | 13.55 | 13.5 | 14.5 | 18.1 |
| 28 | 13.5 | 17.1 | 18.1 | 14.55 | 14.5 | 15.5 | 19.1 |
| 30 | 14.5 | 18.1 | 19.1 | 15.55 | 15.5 | 16.5 | 20.1 |
| 31 | 15.0 | 18.6 | 19.6 | 16.05 | 16.0 | 17.0 | 20.6 |
| 32 | 15.5 | 19.1 | 20.1 | 16.55 | 16.5 | 17.5 | 21.1 |
| 33 | 16.0 | 19.6 | 20.6 | 17.05 | 17.0 | 18.0 | 21.6 |
| 34 | 16.5 | 20.1 | 21.1 | 17.55 | 17.5 | 18.5 | 22.1 |
| 35 | 17.0 | 20.6 | 21.6 | 18.05 | 18.0 | 19.0 | 22.6 |
| 36 | 17.5 | 21.1 | 22.1 | 18.55 | 18.5 | 19.5 | 23.1 |
| 37 | 18.0 | 21.6 | 22.6 | 19.05 | 19.0 | 20.0 | 23.6 |
| 40 | 19.5 | 23.1 | 24.1 | 20.55 | 20.5 | 21.5 | 25.1 |
| 41 | 20.0 | 23.6 | 24.6 | 21.05 | 21.0 | 22.0 | 25.6 |
| 45 | 22.0 | 25.6 | 26.6 | 23.05 | 23.0 | 24.0 | 27.6 |
| 50 | 24.5 | 28.1 | 29.1 | 25.55 | 25.5 | 26.5 | 30.1 |
| 53 | 26.0 | 29.6 | 30.6 | 27.05 | 27.0 | 28.0 | 31.6 |
| 60 | 29.5 | 33.1 | 34.1 | 30.55 | 30.5 | 31.5 | 35.1 |
| 80 | 39.5 | 43.1 | 44.1 | 40.55 | 40.5 | 41.5 | 45.1 |

*1. Dotted lines indicate the shape and dimensions of the XF3M-8015-1BE Connectors.
 *2. For the XF3M-□□25-1B Connectors.

Ordering Information

● Dual Contact Models - Gold plating

1500pcs per reel

| Pins ^{*1} | Model | Pins ^{*1} | Model | Pins ^{*1} | Model | Pins ^{*1} | Model | Quantity per reel (unit) ^{*2} |
|--------------------|--------------|--------------------|--------------|--------------------|--------------|--------------------|--------------|--|
| 6 | XF3M-0615-1B | 16 | XF3M-1615-1B | 26 | XF3M-2615-1B | 37 | XF3M-3715-1B | 1,500 |
| 7 | XF3M-0715-1B | 17 | XF3M-1715-1B | (28) | XF3M-2815-1B | 40 | XF3M-4015-1B | |
| 8 | XF3M-0815-1B | 18 | XF3M-1815-1B | 29 | XF3M-2915-1B | 41 | XF3M-4115-1B | |
| 9 | XF3M-0915-1B | 19 | XF3M-1915-1B | 30 | XF3M-3015-1B | 45 | XF3M-4515-1B | |
| 10 | XF3M-1015-1B | 20 | XF3M-2015-1B | 31 | XF3M-3115-1B | 50 | XF3M-5015-1B | |
| 11 | XF3M-1115-1B | 21 | XF3M-2115-1B | (32) | XF3M-3215-1B | (53) | XF3M-5315-1B | |
| 12 | XF3M-1215-1B | 22 | XF3M-2215-1B | 33 | XF3M-3315-1B | 60 | XF3M-6015-1B | |
| 13 | XF3M-1315-1B | 23 | XF3M-2315-1B | 34 | XF3M-3415-1B | | | |
| 14 | XF3M-1415-1B | 24 | XF3M-2415-1B | (35) | XF3M-3515-1B | | | |
| 15 | XF3M-1515-1B | 25 | XF3M-2515-1B | 36 | XF3M-3615-1B | | | |

1000pcs per reel

| Pins ^{*1} | Model |
|--------------------|---------------|
| 80 | XF3M-8015-1BE |

100pcs per reel

| Pins ^{*1} | Model | Pins ^{*1} | Model | Pins ^{*1} | Model | Pins ^{*1} | Model | Quantity per reel (unit) ^{*2} |
|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|--------------------|--|
| 6 | XF3M-0615-1B-R100 | 16 | XF3M-1615-1B-R100 | 26 | XF3M-2615-1B-R100 | 37 | XF3M-3715-1B-R100 | 100 |
| 7 | XF3M-0715-1B-R100 | 17 | XF3M-1715-1B-R100 | (28) | XF3M-2815-1B-R100 | 40 | XF3M-4015-1B-R100 | |
| 8 | XF3M-0815-1B-R100 | 18 | XF3M-1815-1B-R100 | 29 | XF3M-2915-1B-R100 | 41 | XF3M-4115-1B-R100 | |
| 9 | XF3M-0915-1B-R100 | 19 | XF3M-1915-1B-R100 | 30 | XF3M-3015-1B-R100 | 45 | XF3M-4515-1B-R100 | |
| 10 | XF3M-1015-1B-R100 | 20 | XF3M-2015-1B-R100 | 31 | XF3M-3115-1B-R100 | 50 | XF3M-5015-1B-R100 | |
| 11 | XF3M-1115-1B-R100 | 21 | XF3M-2115-1B-R100 | (32) | XF3M-3215-1B-R100 | (53) | XF3M-5315-1B-R100 | |
| 12 | XF3M-1215-1B-R100 | 22 | XF3M-2215-1B-R100 | 33 | XF3M-3315-1B-R100 | 60 | XF3M-6015-1B-R100 | |
| 13 | XF3M-1315-1B-R100 | 23 | XF3M-2315-1B-R100 | 34 | XF3M-3415-1B-R100 | 80 | XF3M-8015-1BE-R100 | |
| 14 | XF3M-1415-1B-R100 | 24 | XF3M-2415-1B-R100 | (35) | XF3M-3515-1B-R100 | | | |
| 15 | XF3M-1515-1B-R100 | 25 | XF3M-2515-1B-R100 | 36 | XF3M-3615-1B-R100 | | | |

● Dual Contact Models - Tin plating

1500pcs per reel

| Pins ^{*1} | Model | Pins ^{*1} | Model | Pins ^{*1} | Model | Quantity per reel (unit) ^{*2} |
|--------------------|--------------|--------------------|--------------|--------------------|--------------|--|
| (6) | XF3M-0615-1D | (11) | XF3M-1115-1D | (16) | XF3M-1615-1D | 1,500 |
| (7) | XF3M-0715-1D | (12) | XF3M-1215-1D | (17) | XF3M-1715-1D | |
| (8) | XF3M-0815-1D | (13) | XF3M-1315-1D | (18) | XF3M-1815-1D | |
| (9) | XF3M-0915-1D | (14) | XF3M-1415-1D | (19) | XF3M-1915-1D | |
| (10) | XF3M-1015-1D | (15) | XF3M-1515-1D | (20) | XF3M-2015-1D | |

100pcs per reel

| Pins ^{*1} | Model | Pins ^{*1} | Model | Pins ^{*1} | Model | Quantity per reel (unit) ^{*2} |
|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--|
| (6) | XF3M-0615-1D-R100 | (11) | XF3M-1115-1D-R100 | (16) | XF3M-1615-1D-R100 | 100 |
| (7) | XF3M-0715-1D-R100 | (12) | XF3M-1215-1D-R100 | (17) | XF3M-1715-1D-R100 | |
| (8) | XF3M-0815-1D-R100 | (13) | XF3M-1315-1D-R100 | (18) | XF3M-1815-1D-R100 | |
| (9) | XF3M-0915-1D-R100 | (14) | XF3M-1415-1D-R100 | (19) | XF3M-1915-1D-R100 | |
| (10) | XF3M-1015-1D-R100 | (15) | XF3M-1515-1D-R100 | (20) | XF3M-2015-1D-R100 | |

● Upper-contact Models - Gold plating

1500pcs per reel

| Pins ^{*1} | Model | Pins ^{*1} | Model | Pins ^{*1} | Model | Quantity per reel (unit) ^{*2} |
|--------------------|--------------|--------------------|--------------|--------------------|--------------|--|
| (6) | XF3M-0625-1B | 12 | XF3M-1225-1B | 18 | XF3M-1825-1B | 1,500 |
| 7 | XF3M-0725-1B | (13) | XF3M-1325-1B | (19) | XF3M-1925-1B | |
| 8 | XF3M-0825-1B | 14 | XF3M-1425-1B | (20) | XF3M-2025-1B | |
| 9 | XF3M-0925-1B | (15) | XF3M-1525-1B | 22 | XF3M-2225-1B | |
| (10) | XF3M-1025-1B | 16 | XF3M-1625-1B | 24 | XF3M-2425-1B | |
| (11) | XF3M-1125-1B | (17) | XF3M-1725-1B | 40 | XF3M-4025-1B | |

100pcs per reel

| Pins ^{*1} | Model | Pins ^{*1} | Model | Pins ^{*1} | Model | Quantity per reel (unit) ^{*2} |
|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--|
| (6) | XF3M-0625-1B-R100 | (12) | XF3M-1225-1B-R100 | (18) | XF3M-1825-1B-R100 | 100 |
| (7) | XF3M-0725-1B-R100 | (13) | XF3M-1325-1B-R100 | (19) | XF3M-1925-1B-R100 | |
| (8) | XF3M-0825-1B-R100 | (14) | XF3M-1425-1B-R100 | (20) | XF3M-2025-1B-R100 | |
| (9) | XF3M-0925-1B-R100 | (15) | XF3M-1525-1B-R100 | (22) | XF3M-2225-1B-R100 | |
| (10) | XF3M-1025-1B-R100 | (16) | XF3M-1625-1B-R100 | (24) | XF3M-2425-1B-R100 | |
| (11) | XF3M-1125-1B-R100 | (17) | XF3M-1725-1B-R100 | (40) | XF3M-4025-1B-R100 | |

*1. Please consult your OMRON representative for available pin count.

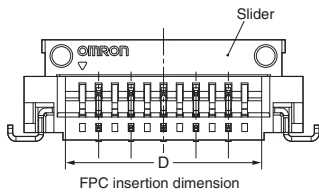
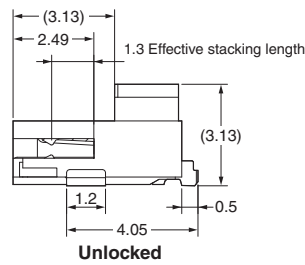
Please consult your OMRON representative for the marketing dates for pin counts in parentheses.

*2. Please order by integer multiple of the quantity per reel.

XF3M(1) 1.0-mm pitch model

■ Dimensions

XF3M(1)-□□15-1B
XF3M(1)-□□15-1D



PCB Dimensions (TOP VIEW)



Recommended FPC/FFC Dimensions



Table of Dimensions

| Pins*1 | A | B | C | D | E | F | G |
|--------|------|------|------|-------|------|------|------|
| 4 | 3.0 | 7.6 | 8.6 | 5.05 | 5.0 | 6.0 | 9.6 |
| 5 | 4.0 | 8.6 | 9.6 | 6.05 | 6.0 | 7.0 | 10.6 |
| 6 | 5.0 | 9.6 | 10.6 | 7.05 | 7.0 | 8.0 | 11.6 |
| 7 | 6.0 | 10.6 | 11.6 | 8.05 | 8.0 | 9.0 | 12.6 |
| 8 | 7.0 | 11.6 | 12.6 | 9.05 | 9.0 | 10.0 | 13.6 |
| 9 | 8.0 | 12.6 | 13.6 | 10.05 | 10.0 | 11.0 | 14.6 |
| 10 | 9.0 | 13.6 | 14.6 | 11.05 | 11.0 | 12.0 | 15.6 |
| 11 | 10.0 | 14.6 | 15.6 | 12.05 | 12.0 | 13.0 | 16.6 |
| 12 | 11.0 | 15.6 | 16.6 | 13.05 | 13.0 | 14.0 | 17.6 |
| 15 | 14.0 | 18.6 | 19.6 | 16.05 | 16.0 | 17.0 | 20.6 |
| 16 | 15.0 | 19.6 | 20.6 | 17.05 | 17.0 | 18.0 | 21.6 |
| 17 | 16.0 | 20.6 | 21.6 | 18.05 | 18.0 | 19.0 | 22.6 |
| 18 | 17.0 | 21.6 | 22.6 | 19.05 | 19.0 | 20.0 | 23.6 |
| 20 | 19.0 | 23.6 | 24.6 | 21.05 | 21.0 | 22.0 | 25.6 |
| 22 | 21.0 | 25.6 | 26.6 | 23.05 | 23.0 | 24.0 | 27.6 |
| 26 | 25.0 | 29.6 | 30.6 | 27.05 | 27.0 | 28.0 | 31.6 |
| 30 | 29.0 | 33.6 | 34.6 | 31.05 | 31.0 | 32.0 | 35.6 |

■ Ordering Information

● Dual Contact Models - Gold plating

1500pcs per reel

| Pins*1 | Model | Pins*1 | Model | Pins*1 | Model | Pins*1 | Model | Quantity per reel (unit) *2 |
|--------|-----------------|--------|-----------------|--------|-----------------|--------|-----------------|-----------------------------|
| 4 | XF3M(1)-0415-1B | 9 | XF3M(1)-0915-1B | 15 | XF3M(1)-1515-1B | 22 | XF3M(1)-2215-1B | 1,500 |
| 5 | XF3M(1)-0515-1B | 10 | XF3M(1)-1015-1B | 16 | XF3M(1)-1615-1B | 26 | XF3M(1)-2615-1B | |
| 6 | XF3M(1)-0615-1B | 11 | XF3M(1)-1115-1B | (17) | XF3M(1)-1715-1B | 30 | XF3M(1)-3015-1B | |
| 7 | XF3M(1)-0715-1B | 12 | XF3M(1)-1215-1B | 18 | XF3M(1)-1815-1B | | | |
| 8 | XF3M(1)-0815-1B | 14 | XF3M(1)-1415-1B | 20 | XF3M(1)-2015-1B | | | |

100pcs per reel

| Pins*1 | Model | Pins*1 | Model | Pins*1 | Model | Pins*1 | Model | Quantity per reel (unit) *2 |
|--------|----------------------|--------|----------------------|--------|----------------------|--------|----------------------|-----------------------------|
| 4 | XF3M(1)-0415-1B-R100 | 9 | XF3M(1)-0915-1B-R100 | 15 | XF3M(1)-1515-1B-R100 | 22 | XF3M(1)-2215-1B-R100 | 100 |
| 5 | XF3M(1)-0515-1B-R100 | 10 | XF3M(1)-1015-1B-R100 | 16 | XF3M(1)-1615-1B-R100 | 26 | XF3M(1)-2615-1B-R100 | |
| 6 | XF3M(1)-0615-1B-R100 | 11 | XF3M(1)-1115-1B-R100 | (17) | XF3M(1)-1715-1B-R100 | 30 | XF3M(1)-3015-1B-R100 | |
| 7 | XF3M(1)-0715-1B-R100 | 12 | XF3M(1)-1215-1B-R100 | 18 | XF3M(1)-1815-1B-R100 | | | |
| 8 | XF3M(1)-0815-1B-R100 | 14 | XF3M(1)-1415-1B-R100 | 20 | XF3M(1)-2015-1B-R100 | | | |

● Dual Contact Models - Tin plating

1500pcs per reel

| Pins*1 | Model | Pins*1 | Model | Pins*1 | Model | Quantity per reel (unit) *2 |
|--------|-----------------|--------|-----------------|--------|-----------------|-----------------------------|
| (4) | XF3M(1)-0415-1D | (9) | XF3M(1)-0915-1D | (16) | XF3M(1)-1615-1D | 1,500 |
| (5) | XF3M(1)-0515-1D | 10 | XF3M(1)-1015-1D | (17) | XF3M(1)-1715-1D | |
| (6) | XF3M(1)-0615-1D | (11) | XF3M(1)-1115-1D | (18) | XF3M(1)-1815-1D | |
| (7) | XF3M(1)-0715-1D | (12) | XF3M(1)-1215-1D | (20) | XF3M(1)-2015-1D | |
| (8) | XF3M(1)-0815-1D | (15) | XF3M(1)-1515-1D | | | |

100pcs per reel

| Pins*1 | Model | Pins*1 | Model | Pins*1 | Model | Quantity per reel (unit) *2 |
|--------|----------------------|--------|----------------------|--------|----------------------|-----------------------------|
| (4) | XF3M(1)-0415-1D-R100 | (9) | XF3M(1)-0915-1D-R100 | (16) | XF3M(1)-1615-1D-R100 | 100 |
| (5) | XF3M(1)-0515-1D-R100 | 10 | XF3M(1)-1015-1D-R100 | (17) | XF3M(1)-1715-1D-R100 | |
| (6) | XF3M(1)-0615-1D-R100 | (11) | XF3M(1)-1115-1D-R100 | (18) | XF3M(1)-1815-1D-R100 | |
| (7) | XF3M(1)-0715-1D-R100 | (12) | XF3M(1)-1215-1D-R100 | (20) | XF3M(1)-2015-1D-R100 | |
| (8) | XF3M(1)-0815-1D-R100 | (15) | XF3M(1)-1515-1D-R100 | | | |

*1. Please consult your OMRON representative for available pin count.
Please consult your OMRON representative for the marketing dates for pin counts in parentheses.
*2. Please order by integer multiple of the quantity per reel.

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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