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Messrs. Digi-Key

Issue No. : PC-02-053

Date of issue : November 15, 2002

Classification : New Change Renewal

Delivery Specification

Product Description : Dual Band Directional Coupler

Product Part Number : EHFFD1812D

Classification of Spec : Individual Product Specification

Applications : Cellular phone

For other applications, contact the undersigned in advance.

Term of Validity : November 14, 2007 from the date of issue.

| | |
|---|------------------|
| CUSTOMER USE ONLY | Receipt Record#: |
| This was certainly received by us. 1(one) copy is being returned to you. | Date of receipt: |
| | Received by: |
| | Title: |
| | Dept.: |

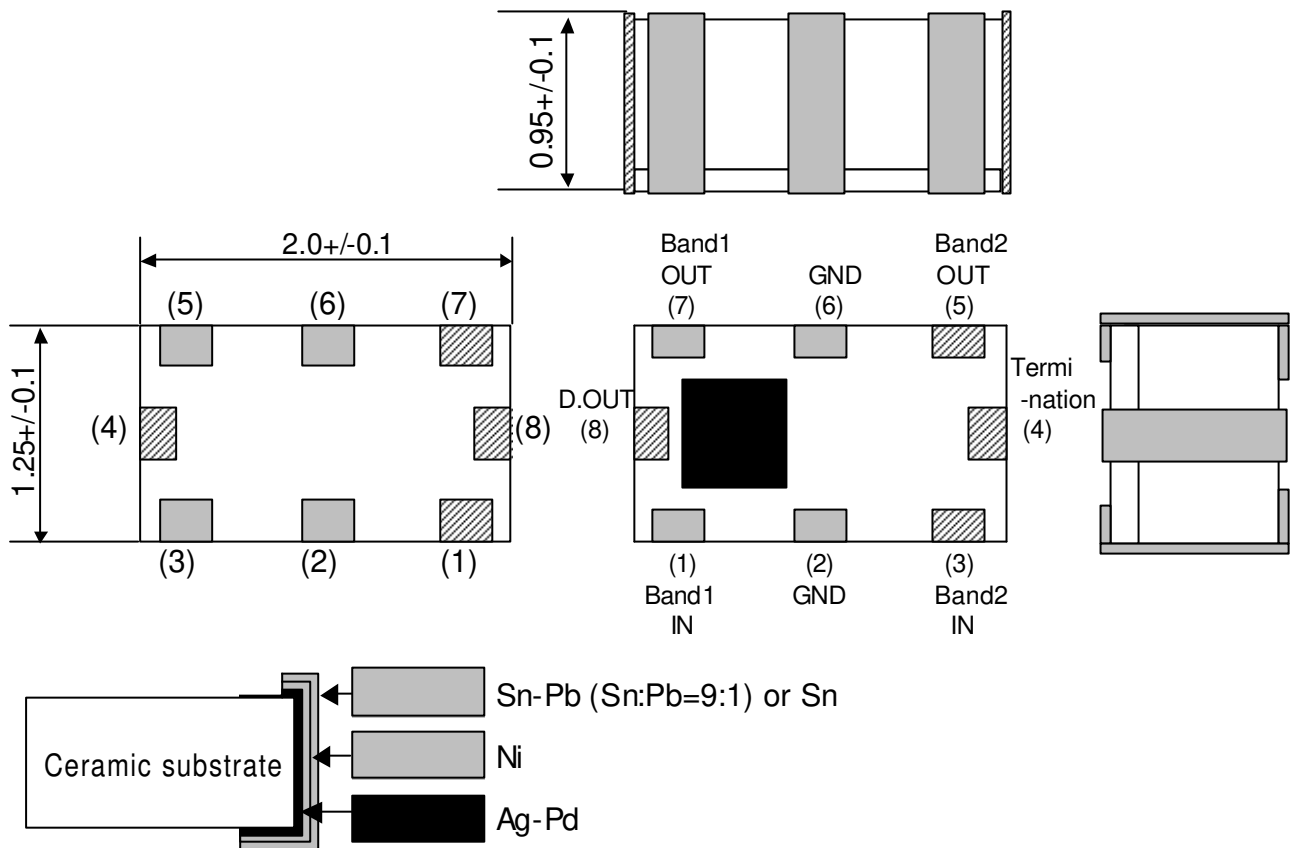
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| | |
|---------------|--------------------------|
| Prepared by | : S.Endo |
| Checked by | : M. Mizuno |
| Authorized by | : M. Mizuno |
| Title | : Manager of Engineering |

[Shape, appearance, dimension] Unit: mm

<Back View>

<Front & Side View>



Note 1) "typ" is used where no dimensional tolerance applies.

| Item | Description |
|-----------------------------|--|
| Appearance/ construction | Product surface shall be covered with a protective film, which does not easily separate nor present noticeable unevenness, scratches, pinholes, color changes etc. |
| | Terminals shall ensure practically acceptable quality. |
| | Substrate shall be as shown in the drawing with no excessive chippings, scratches, burrs, or cracks. |
| Marking | Shall be legible in black (with printing paste). |
| Remarks | ■ marked side for pin 1. |

| | | | | | |
|-------------------------------|-------|------------------------|-----------|--------|-------------------------------------|
| Dual Directional Coupler | | Delivery Specification | | | EHF FD1812D Appearance |
| Enact. Date November 15, 2002 | P.S.M | Approval | Check | Plan | |
| Enfo. Date November 15, 2002 | ----- | M. Mizuno | M. Mizuno | S.Endo | Drawing No. 151-EHF- FD1812D 9-1 |

[Absolute maximum ratings]

| No. | Item | Symbol | Rating | Unit | Remark |
|-----|-----------------------|--------|------------------|------|------------------|
| 1 | Maximum Input Power | Pmax | 3.2/1.5(Band1/2) | W | DC bias is zero. |
| 2 | Operating Temperature | Topr | -30~+85 | degC | |
| 3 | Storage Temperature | Tstg | -40~+85 | degC | |

Note: This component cannot apply a DC Bias.

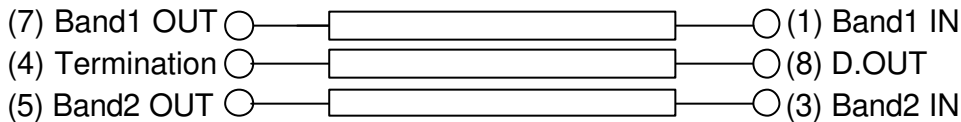
[Characteristics]

T = 25 +/- 5 degC

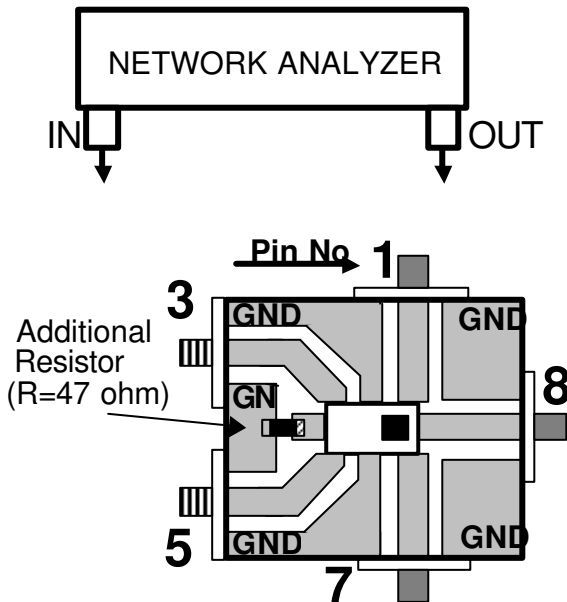
| No. | Item | Test Circuit | Specification | | | Unit |
|-----|------------------------------|--------------|---------------|------|------|------|
| | | | min. | typ. | max. | |
| 1 | Frequency range Band1 | Fig.1 | 880 | - | 915 | MHz |
| 2 | Frequency range Band2 | Fig.1 | 1710 | - | 1785 | MHz |
| 3 | Insertion loss *1 Band1 | Fig.1 | - | - | 0.35 | dB |
| 4 | Insertion loss *1 Band2 | Fig.1 | - | - | 0.45 | dB |
| 5 | Coupling Band1 | Fig.1 | 18.0 | 19.0 | 20.0 | dB |
| 6 | Coupling Band2 | Fig.1 | 12.5 | 14.0 | 15.5 | dB |
| 7 | Isolation Band1 | Fig.1 | 24.0 | - | - | dB |
| 8 | Isolation Band2 | Fig.1 | 17.0 | - | - | dB |
| 9 | Input V.S.W.R. in both Bands | Fig.1 | | - | 1.5 | - |
| | | | | | | |
| | | | | | | |

*1 not include Test Board Loss
 Band1 : 0.10 dB
 Band2 : 0.15 dB

[Circuit]



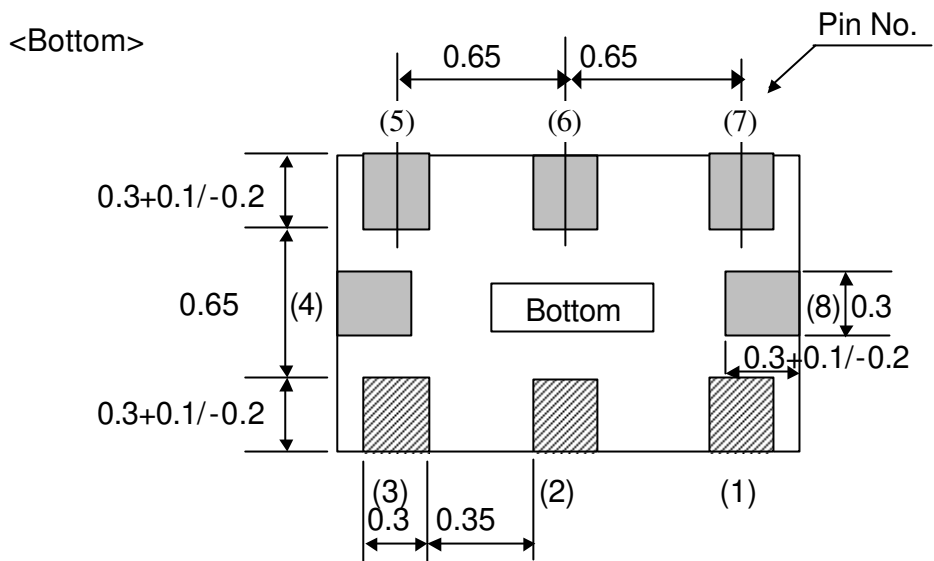
[Test Circuit Diagram] Fig. 1



- <3. Insertion loss in Band1>
(1) to (7) , others=Termination(50 ohm)
- <4. Insertion loss in Band2>
(3) to (5) , others =Termination(50 ohm)
- <5. Coupling in Band1>
(1) to (8) , others =Termination(50 ohm)
- <6. Coupling in Band2>
(3) to (8) , others =Termination(50 ohm)
- <7. Isolation in Band1>
(7) to (8) , others =Termination(50 ohm)
- <8. Isolation in Band2>
(5) to (8) , others =Termination(50 ohm)
- <9. Isolation in Band1 In to Band2 Out>
(1) to (5) , others =Termination(50 ohm)
- <10. Isolation in Band1 In to Band2 In >
(1) to (3) , others =Termination(50 ohm)

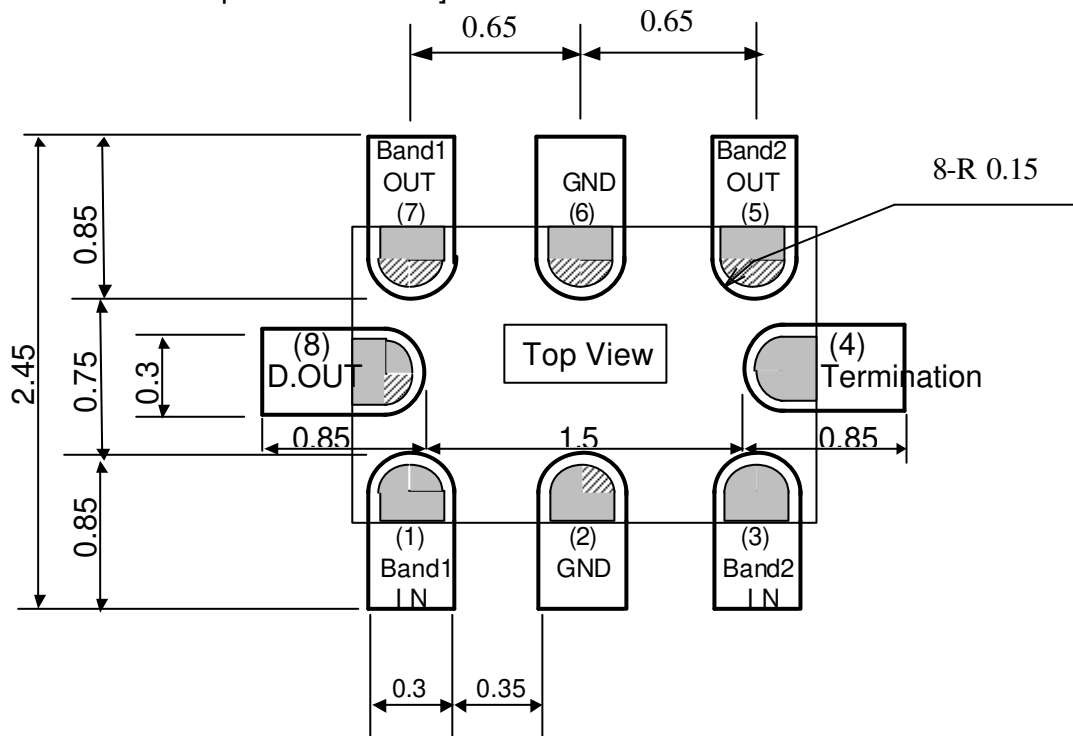
| Dual Directional Coupler | | Delivery Specification | | | EHF FD1812D Specification and measurement |
|--------------------------|-------------------|------------------------|-----------|-----------|--|
| Enact. Date | November 15, 2002 | P.S.M | Approval | Check | |
| Enfo. Date | November 15, 2002 | ----- | M. Mizuno | M. Mizuno | S.Endo |
| | | | | | Drawing No. 151-EHF- FD1812D 9-2 |

[Terminal dimensions] Unit: mm



Tolerance
Pin land : +/-0.1

[Recommended PCB pad dimensions] Unit: mm



Dual Directional Coupler

Delivery Specification

EHF FD1812D

Enact. Date November 15, 2002

P.S.M

Approval

Check

Plan

Terminals/Recommended lands

Enfo. Date November 15, 2002

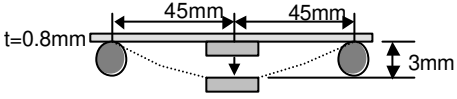
M. Mizuno

M. Mizuno

S.Endo

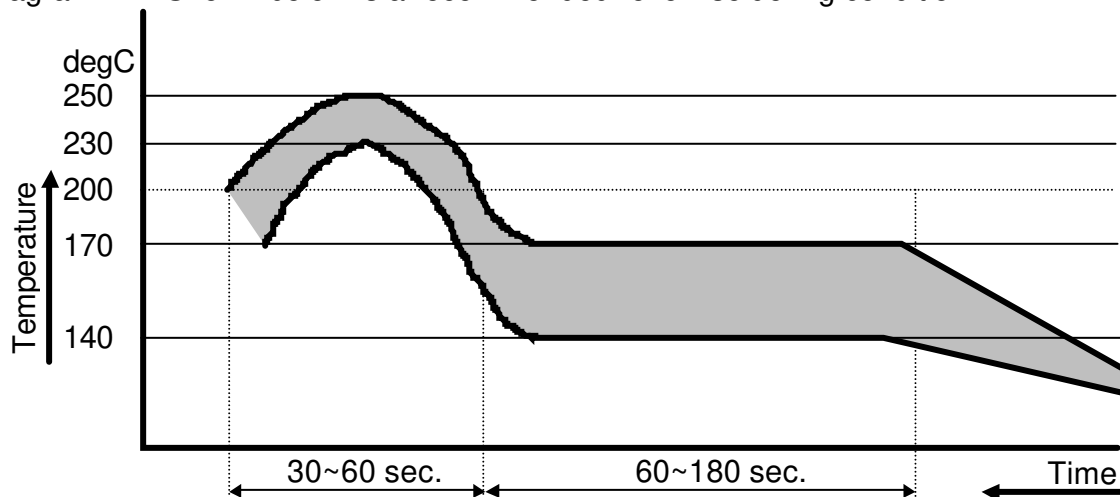
Drawing No.
151-EHF- FD1812D 9-3

[Quality characteristics]

| Test item | Test condition | Judgment criteria |
|--|--|---|
| High temperature | +85degC, 1000h | No abnormality shall be observed in appearance or electrical characteristics. |
| Low temperature | -40degC, 1000h | |
| High-temperature high-humidity storage | +60degC, 90%RH, 1000h | |
| Pressure Pot | +121degC, 99%RH, 2.026x10 ⁵ Pa, 100h | |
| Temperature cycling | -40...+85degC, Each 30 min., 200cy | |
| Vibration | 10...500Hz, 10G, in each direction of XYZ, 2h30min. | |
| Impact | 100G, 6mS, Half sinusoidal wave, in each direction of XYZ, 3 times | |
| Shock (Drop) | 1.8m, 6 facesx6cy(36 times with 100g Dummy Load) | |
| Electro static discharge | 200pF, 0 ohm, +/-200V, Each 5 times | |
| Soldering heat resistance | Manual hot gas: 260+/-10degC, 30 sec., 2 times | Over 90% of the terminal surface shall be covered with solder. |
| | Soldering iron: 260+/-10degC, 3 sec., 2 times | |
| | Reflow: 260degC peak, 2 times | |
| Solder ability | Solder bath: 235+/-5degC, 2 sec. | Over 95% of the terminal surface shall be covered with solder. |
| | Reflow: 230degC | |
| Board warping | Assemble this component on a PC board with 0.8mm thickness using the recommended soldering condition shown below, and apply a bending force of 3mm warping at a rate of 1mm/sec. 5 seconds and 5 times.  | There should not be any cracks in the component or solder joints, no abnormality in electrical characteristics. |
| Terminal removal | Solder a component on a PC board using the recommended condition shown below and then press the component sideways at 1mm/sec. Destruction limit 9.8N or greater. | |
| Seating plane co-planarity | Within 0.1mm | |

< Recommended soldering condition >

Diagram1 Shown below is a recommended reflow soldering condition.



| | | | | | |
|-------------------------------|-------|------------------------|-----------|--------|--|
| Dual Directional Coupler | | Delivery Specification | | | EHF FD1812D Quality Characteristics |
| Enact. Date November 15, 2002 | P.S.M | Approval | Check | Plan | |
| Enfo. Date November 15, 2002 | ---- | M. Mizuno | M. Mizuno | S.Endo | Drawing No. 151-EHF- FD1812D 9-4 |

[Cautions for use]

- (1) Operating a product over the maximum rating for even a moment may result in a product failure or breakage. Never use a product in such a condition that it may cause a safety problem.
- (2) Opening or short-circuiting the product terminals or inserting a product in the reverse orientation while power is being supplied may cause a breakage. Always avoid such circumstances.
- (3) Operations in a corrosive gas atmosphere or improper environments such as high-temperature, high-humidity or dewy conditions may lead to product performance deterioration, a breakage, a change in appearance etc. Please avoid such conditions, as they are unsafe.
- (4) Always ground the soldering iron or soldering bath used for assembly operation to avoid any excessive voltage applied to a product.
- (5) After soldering with solder bridges, incomplete soldering or in the reverse orientation, supplying power may result in a product breakage. Please confirm the soldered condition before supplying power to the product.
- (6) Excessive stress on the terminals may cause a contact failure or performance deterioration. Please use caution.
- (7) Please provide a fail-safe provision in the product you design by taking any failure of our product into consideration.
- (8) This product does not include a DC-cutting device. Application of a DC Current may cause product deterioration or breakage.

* If any question arises about the safety of this product, please contact us immediately with a request for an engineering examination.

[Remarks]

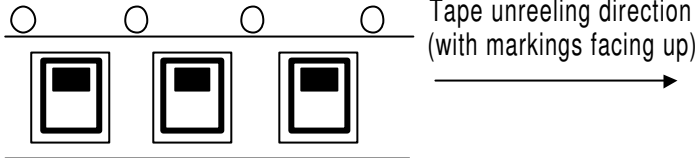
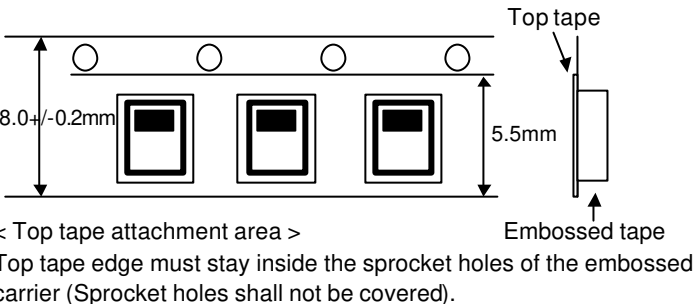

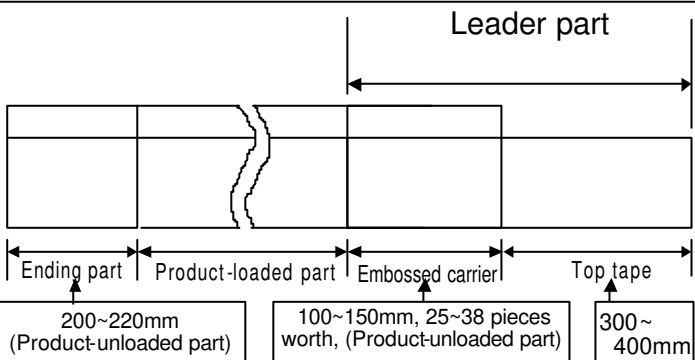
- *1: All of the materials used in this product are those listed as the existing chemical substances based on the "Law for examination and regulation of manufacture of chemical substances".
- *2: The production process of this product does not use any ozone-depleting chemicals (OZC) regulated by the Montreal Protocol.
- *3: Validity of this specification is 5 years from the date of issue, but the validity is considered on going unless any changes are made.

| | | | | | |
|-------------------------------|-------|------------------------|-----------|--------|-------------------------------------|
| Dual Directional Coupler | | Delivery Specification | | | EHF FD1812D Cautions |
| Enact. Date November 15, 2002 | P.S.M | Approval | Check | Plan | |
| Enfo. Date November 15, 2002 | ----- | M. Mizuno | M. Mizuno | S.Endo | Drawing No. 151-EHF- FD1812D 9-5 |

[Packaging materials]

1. Materials
- 1) Embossed carrier tape (Refer to the attachment)
 - 2) Top tape: Anti-static
 - 3) Packaging box (Refer to the attachment)
 - 4) Packaging tape, carrier-securing adhesive tape

2. Specification

| No. | Item | Condition | Remarks |
|-----|---------------------------------------|--|--|
| 1 | Reel outer diameter | Refer to the attachment. | |
| 2 | Reel inner diameter | Refer to the attachment. | |
| 3 | Reel inner width | Refer to the attachment. | |
| 4 | Quantity in a reel | 4000 pieces/reel | |
| 5 | Taping direction |  | |
| 6 | Top tape attachment position |  | Tape breaks force. Min. 10N Top cover tape strength. Min. 10N Tape peel force. 0.1...1.0N Tape peel angle. 165...180degree Reel weight. Max 1500g |
| 7 | Label attachment position |  | Indicated Item Pat No., Lot No. Quantity, Maker Country of Origin |
| 8 | Tape leader part and tape ending part |  | |
| 9 | Missing products | No missing products shall be allowed. | |
| 10 | Packaged quantity in a box | 21 reels/box (Max) | 84000 pieces/box(Max) |

Dual Directional Coupler

Delivery Specification

EHF FD1812D

Packaging specification 1

Enact. Date November 15, 2002

P.S.M

Approval

Check

Plan

Enfo. Date November 15, 2002

M. Mizuno

M. Mizuno

S.Endo

Drawing No.
151-EHF- FD1812D 9-6

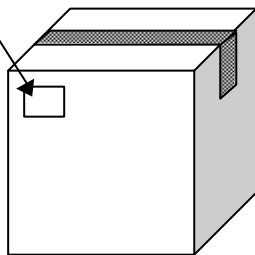
1. Method

- 1) Load products in each cavity of an embossed carrier tape, in the correct orientation, by leaving the product-unloaded part shown in Item No. 8(P9-6) of the packaging specification.
- 2) Heat-seal a top tape in good alignment on the carrier tape.
- 3) After 4000 pieces are loaded and reeled, provide a product-unloaded part at the tape-leader portion. Secure the tip of the carrier tape with a piece of adhesive tape.
- 4) Stack the reels (21 reels max.) and enclose them in a packaging box. Close the flaps with a piece of adhesive tape.
- 5) Provide markings on the packaging box.

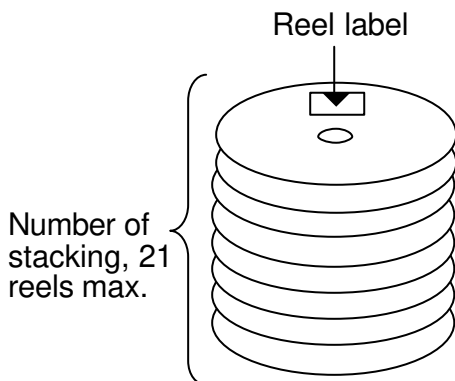
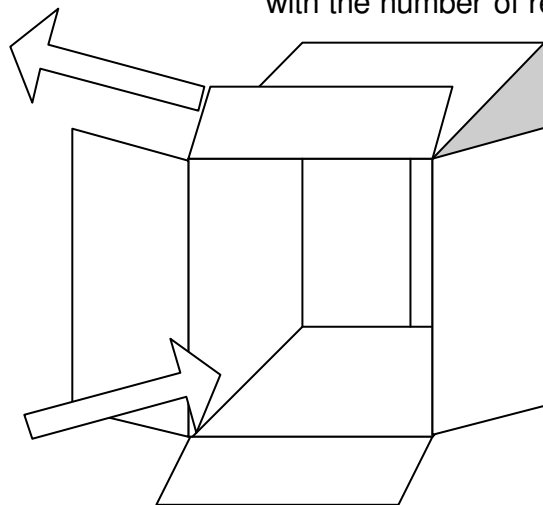
< Items to be indicated >

1. Part No.
2. Quantity
3. Lot No.
4. Manufacturer name
5. Country of origin

Marking on the packaging box



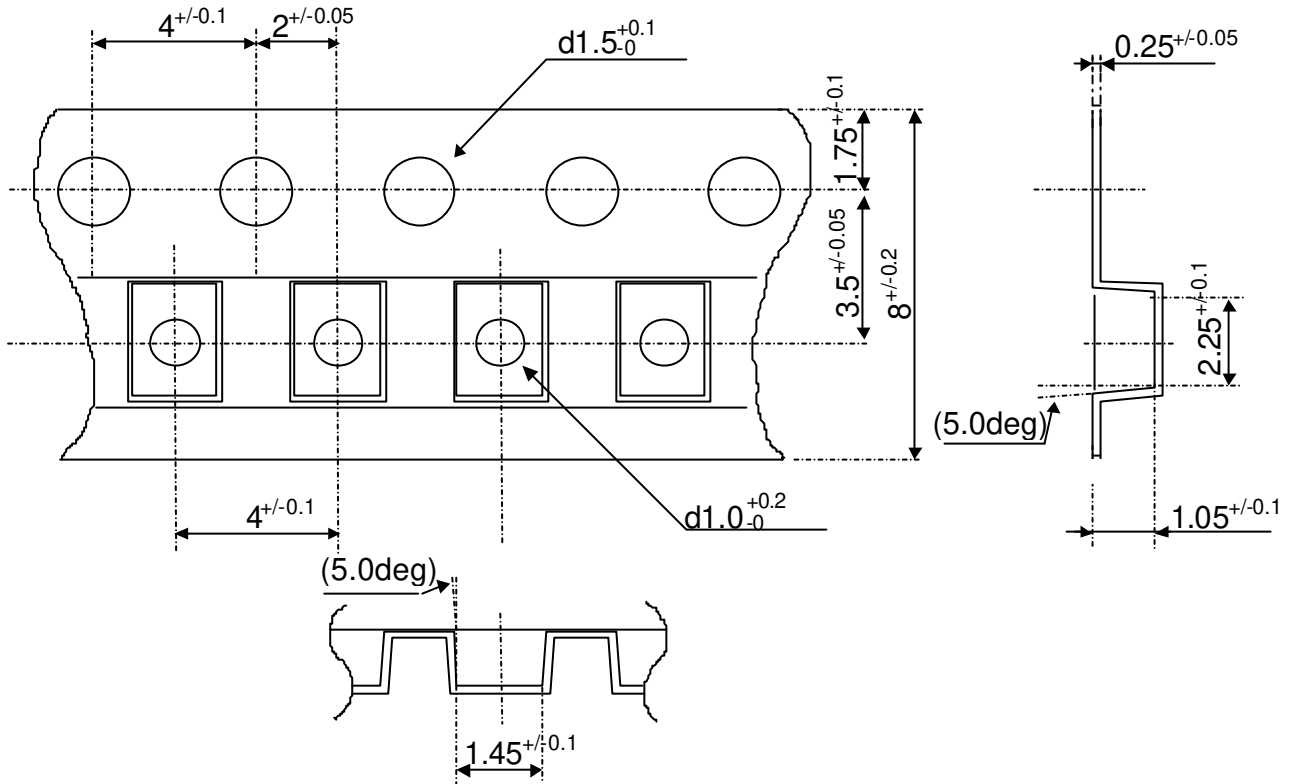
Packaging box shape varies with the number of reels enclosed.



* Insert cushion material in the empty spaces to secure reels.

| | | | | | |
|-------------------------------|-------|------------------------|-----------|--------|--|
| Dual Directional Coupler | | Delivery Specification | | | EHF FD1812D Packaging specification 2 |
| Enact. Date November 15, 2002 | P.S.M | Approval | Check | Plan | |
| Enfo. Date November 15, 2002 | ----- | M. Mizuno | M. Mizuno | S.Endo | Drawing No. 151-EHF- FD1812D 9-7 |

[Embossed tape dimensions] Unit: mm



<Remarks>

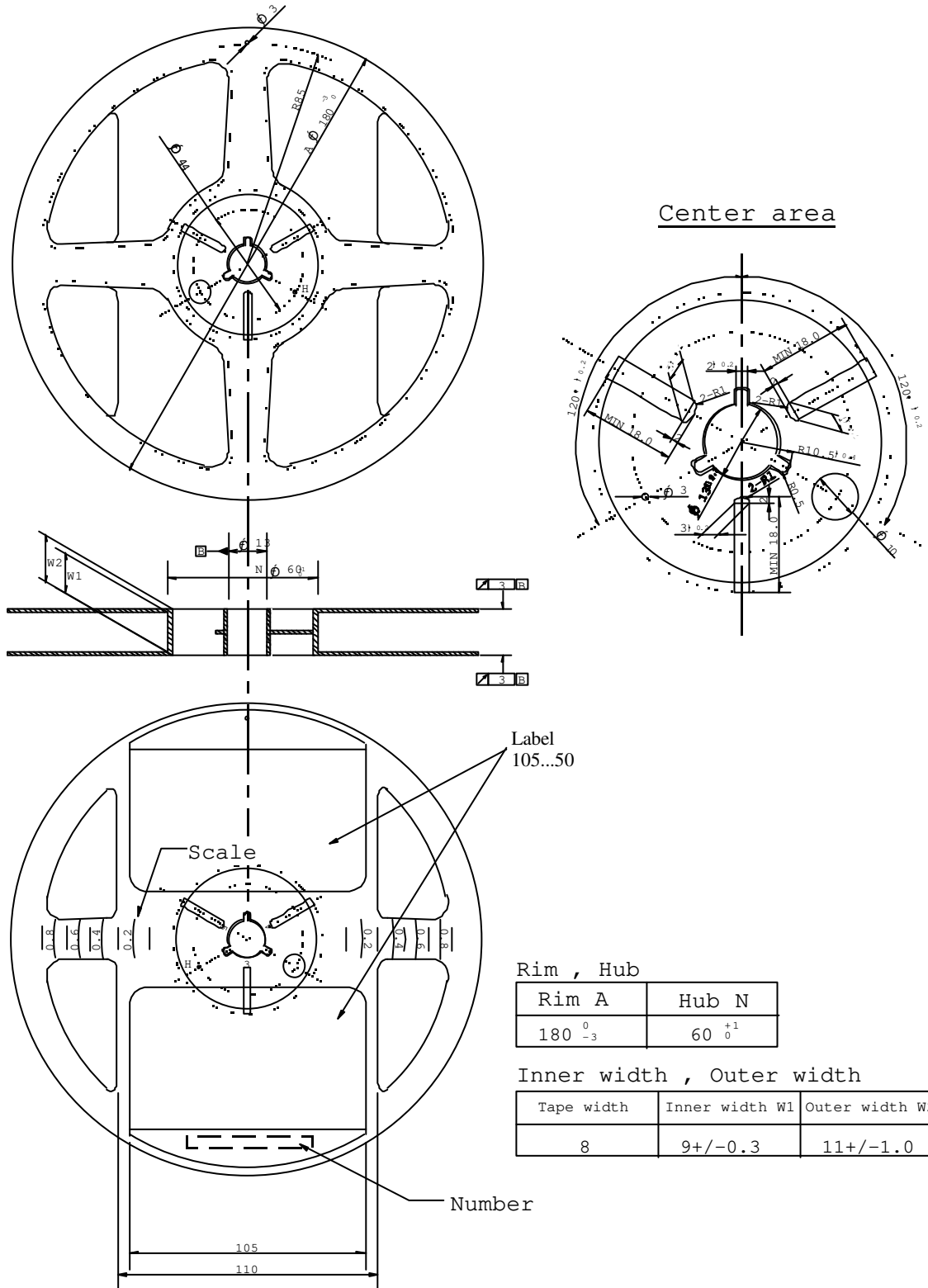
- (1) Unspecified corner radius shall be 0.3mm max.
- (2) Cumulative pitch error of sprocket holes shall be $+/-0.2$ mm for 10 pitches.

| | | | | | |
|-------------------------------|-------|------------------------|-----------|--------|--|
| Dual Directional Coupler | | Delivery Specification | | | EHF FD1812D Packaging specification 3 |
| Enact. Date November 15, 2002 | P.S.M | Approval | Check | Plan | |
| Enfo. Date November 15, 2002 | ---- | M. Mizuno | M. Mizuno | S.Endo | Drawing No. 151-EHF- FD1812D 9-8 |

[Reel dimensions] Unit: mm

(1) This reel conforms to EIAJ-RRM-08B based on EIAJ standard.

(2) Material: PS (Polystyrene)



Rim , Hub

| Rim A | Hub N |
|---|--|
| $180 \begin{smallmatrix} 0 \\ -3 \end{smallmatrix}$ | $60 \begin{smallmatrix} +1 \\ 0 \end{smallmatrix}$ |

Inner width , Outer width

| Tape width | Inner width W1 | Outer width W2 |
|------------|----------------|----------------|
| 8 | $9+/-0.3$ | $11+/-1.0$ |

| Dual Directional Coupler | | Delivery Specification | | | EHFFD1812D Packaging specification 4 |
|-------------------------------|-------|------------------------|-----------|--------|---|
| Enact. Date November 15, 2002 | P.S.M | Approval | Check | Plan | |
| Enfo. Date November 15, 2002 | ---- | M. Mizuno | M. Mizuno | S.Endo | Drawing No. 151-EHF-FD1812D 9-9 |