

Released

- Specification -

C-band PLL LNB

Internal & External Reference Model

Model No. NJS8496 series

Model No.	RF Frequency	Local Frequency	IF Frequency
NJS8496 series	3.4 to 4.2 GHz	5.15 GHz	950 to 1,750 MHz
NJS8497 series	3.625 to 4.2 GHz	5.15 GHz	950 to 1,525 MHz
NJS8498 series	4.5 to 4.8 GHz	5.76 GHz	960 to 1,260 MHz

Local Reference Type: Internal / External Reference

Local Stability: H-type, +/- 10 ppm (+/- 50 kHz typ.)
S-type, +/- 3 ppm (+/- 15 kHz typ.)
U-type, +/- 1 ppm (+/- 5 kHz typ.)
V-type, +/- 0.3 ppm (+/- 1.5 kHz typ.)
E-type, Same as External Reference Stability

RF Input Interface: Waveguide, CPR-229G

IF Output Interface: N-type / F-type, Female Connector

DC Power Input: IF Output Interface Connector

DC Power Voltage Range: +12 to +24 V

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**Nisshinbo Micro Devices Inc.**

Microwave Business Division

Title:

Datasheet of NJS8496 series

Reference No.:

DS-S8496

Rev.:

02E

Sheet:

1 / 18



Caution

1. While Nisshinbo Micro Devices Inc. (NISD) continually strives to improve the quality and reliability of our products, failures will occur in microwave products over time. For this reason, it is important that customers fulfill their responsibilities to ensure designed-in safety – including failsafe functions, redundancy, and measures to prevent malfunctions and the spread of fire – in order to avoid injuries, accidents, or social repercussions resulting from the failure of any products related to satellite communications on this document (hereinafter, “the product”). Customers must pay careful attention to ensuring the safety of their equipment.
2. The product is designed and tested to function in accordance with its specifications. Do not use under conditions that deviate from the product specifications included in the delivery specifications. NISD assume no responsibility and shall not be liable for any injuries, accidents, or social repercussions resulting from the product being in a poor or damaged state because it was used under conditions that depart from the specifications.
3. The product is covered by a warranty for one year following delivery unless otherwise stipulated in the contract or delivery conditions. In the event of a failure for which NISD are responsible occurring during the warranty period, NISD undertake to repair or replace the product free of charge. Note, however, that the warranty does not cover failures such as those listed here (see bullets below), even if they occur within the warranty period. In addition, in the case of a product being repaired or replaced by us, the starting date for the warranty period is still the original delivery date of the product.
 - Failure due to the product being used in conditions other than those stipulated in the data sheet, specification sheet, etc.
 - Failure due to modifications or repairs carried out by some entity other than our company
 - Failure determined to be the result of unsuitable maintenance or replacement of a consumable item that requires due maintenance
 - Failure due to circumstances that were unforeseeable given the scientific/technological standards at the time of shipment
 - Other failures due to external factors such as fire, earthquake, flood and power supply anomalies for which NISD are not responsible

In addition, the product warranty is limited to the provision of repair services or replacement at no cost. It does not cover secondary damage (to equipment, business opportunities, profits, etc.) or any other damage that may have resulted from failure of the product.

4. The product must be handled appropriately to ensure its continued reliability. Since it can be damaged by the intrusion of water, dust, oil, chemicals, etc., it must be given appropriate protection. Even in the case of a product with an airtight construction, avoid using it in an environment that exceeds the stated levels of waterproofing/dustproofing. Also, be sure to use connectors and waveguides properly.
If replacement parts such as fans are included, proper maintenance is necessary. To maintain product performance and functionality, it is necessary to conduct inspections and maintenance at appropriate intervals and exchange replacement parts when necessary. Improper inspections or maintenance may result in failure.
In addition, the warranty does not cover the use of the product in areas where salt damage can be expected or where there is a substantial presence of corrosive gases such as Cl₂, H₂S, SO₂, and NO₂. If the product is to be used in such areas, at the time of installation you must take appropriate steps to protect the product.
5. If the product is to be used with equipment/systems that must meet special quality and reliability standards (aerospace equipment, medical equipment, power generation control equipment, automotive/railway transportation equipment, safety equipment, disaster prevention and security equipment, etc.), please consult with our sales staff in advance.
6. Some products contain gallium arsenide (GaAs), classified as a harmful substance. To avoid danger, do not incinerate, crush, or chemically treat the product in such a way that gases or dust are released. When disposing of the product, comply with all applicable laws and regulations and do not treat it as general industrial waste or household waste.
7. When exporting a product or technology, observe export laws and regulations such as those governing foreign exchange and foreign trade, and obtain any necessary licenses for export, service transactions, etc.
NISD request that you do not use our products or the technical data published on this document for developing weapons of mass destruction or for any other military purposes or applications.
8. The product specifications in this document are subject to change without notice. If you are considering using a product, delivery specifications must first be settled.

* Above Specifications are subject to change without notice.

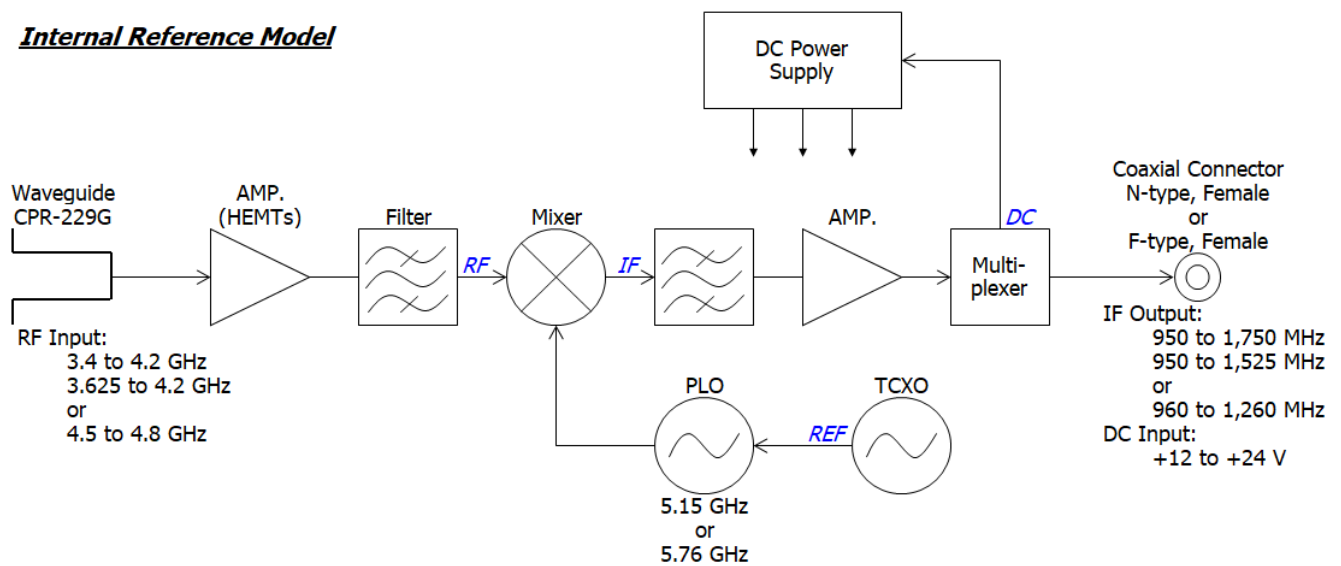
Scope

This LNB is designed for the low noise amplifier and block downconverter intended for the satellite communication data downlink application in C-band. It is combined a 3-stage HEMT amplifier and a block downconverter with a phase locked local oscillator (5.15 GHz or 5.76 GHz) which is synchronized with internal high stability TCXO reference or external 10MHz reference.

The LNB receives an RF signal (C-band: 3.4 to 4.2 GHz, 3.625 to 4.2 GHz, or 4.5 to 4.8 GHz) as input, downconverts from the RF signal to an IF signal (L-band: 950 to 1,750 MHz, 950 to 1,525 MHz, or 960 to 1,260 MHz), and outputs the IF signal. It is operated by +24 V DC power (range: +12 to +24 V) input.

The LNB comes in a single, weatherized housing rated for outdoor use, and has a CPR-229G waveguide flange as RF input and an either an N-type or F-type female connector as IF output.

Internal Reference Model



External Reference Model

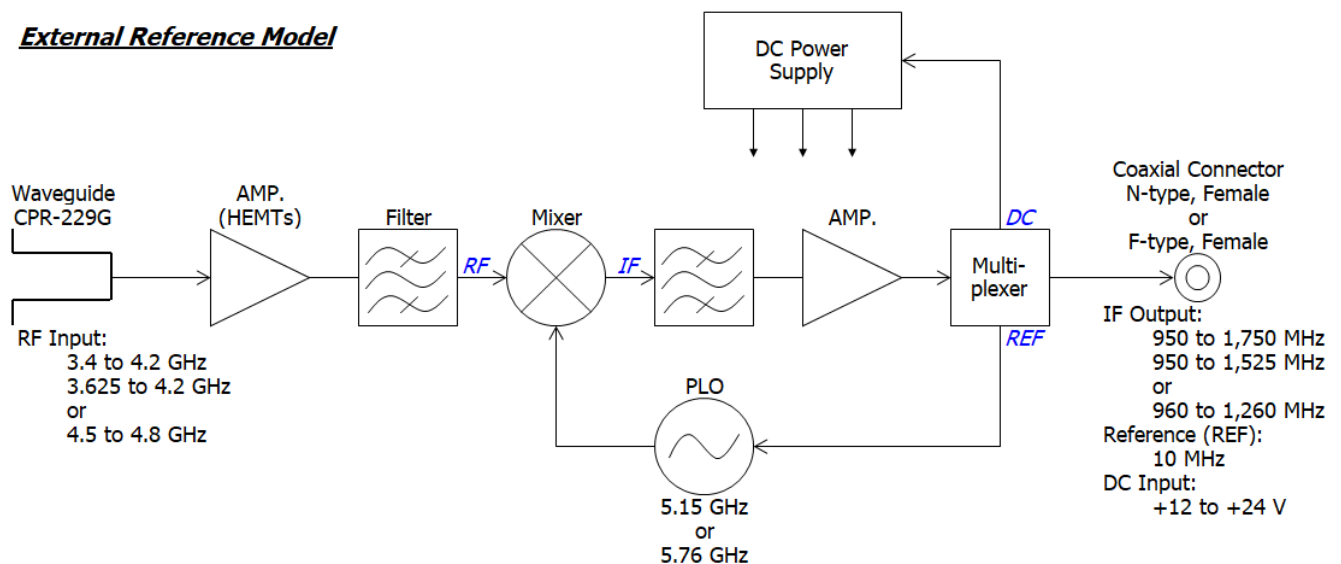
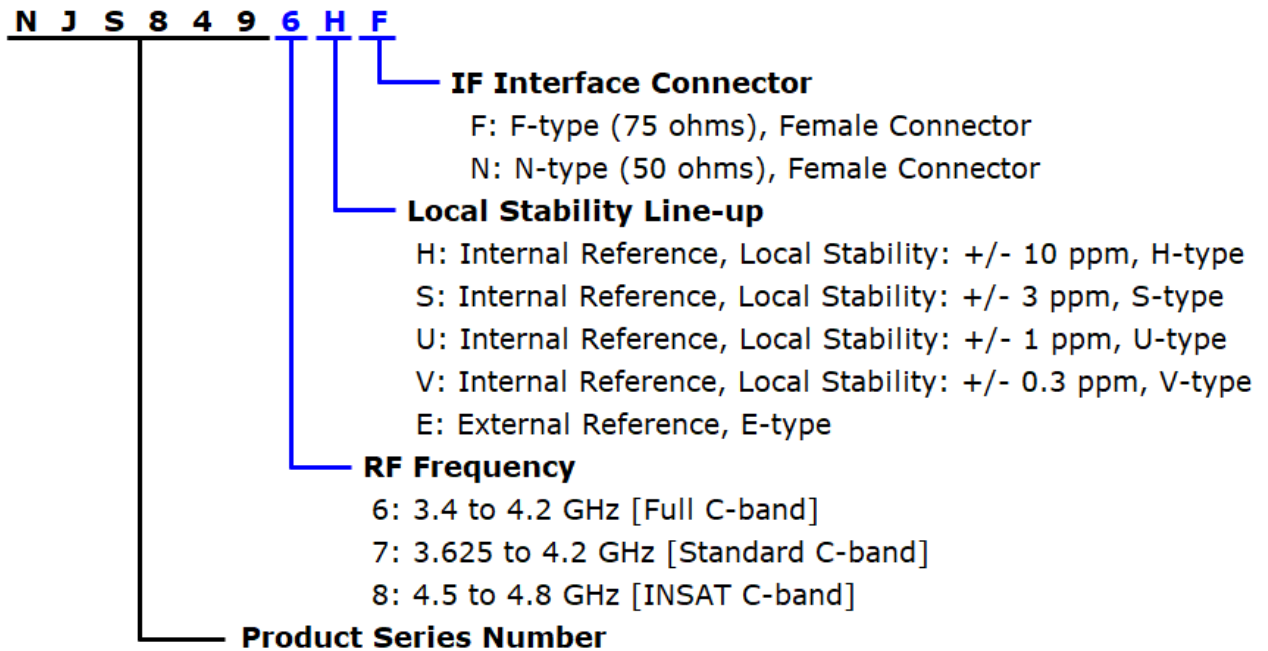


Fig.1 Functional Block Diagram

* Above Specifications are subject to change without notice.

Series Model Number

- Numbering System



Reference & Local Stability Line-up

- (H-type Model) Internal Reference, +/- 10 ppm Local Stability
- (S-type Model) Internal Reference, +/- 3 ppm Local Stability
- (U-type Model) Internal Reference, +/- 1 ppm Local Stability
- (V-type Model) Internal Reference, +/- 0.3 ppm Local Stability
- (E-type Model) External Reference

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- Line-up

Model No.	RF Frequency	Local Frequency	IF Frequency	Local Stability [-40 to +60 °C]	IF Connector
NJS8496EF	3.400 to 4.200 GHz (Full C-band)	5.15 GHz	950 to 1,750 MHz	Same as External Reference	F-type
NJS8496EN					N-type
NJS8496HF				+/- 10 ppm (+/- 50kHz typ.)	F-type
NJS8496HN					N-type
NJS8496SF				+/- 3 ppm (+/- 15kHz typ.)	F-type
NJS8496SN					N-type
NJS8496UF				+/- 1 ppm (+/- 5kHz typ.)	F-type
NJS8496UN					N-type
NJS8496VF				+/- 0.3 ppm (+/- 1.5kHz typ.)	F-type
NJS8496VN					N-type
NJS8497EF	3.625 to 4.200 GHz (Standard C-band)	5.15 GHz	950 to 1,525 MHz	Same as External Reference	F-type
NJS8497EN					N-type
NJS8497HF				+/- 10 ppm (+/- 50kHz typ.)	F-type
NJS8497HN					N-type
NJS8497SF				+/- 3 ppm (+/- 15kHz typ.)	F-type
NJS8497SN					N-type
NJS8497UF				+/- 1 ppm (+/- 5kHz typ.)	F-type
NJS8497UN					N-type
NJS8497VF				+/- 0.3 ppm (+/- 1.5kHz typ.)	F-type
NJS8497VN					N-type
NJS8498EF	4.500 to 4.800 GHz (Insat C-band)	5.76 GHz	960 to 1,260 MHz	Same as External Reference	F-type
NJS8498EN					N-type
NJS8498HF				+/- 10 ppm (+/- 50kHz typ.)	F-type
NJS8498HN					N-type
NJS8498SF				+/- 3 ppm (+/- 15kHz typ.)	F-type
NJS8498SN					N-type
NJS8498UF				+/- 1 ppm (+/- 5kHz typ.)	F-type
NJS8498UN					N-type
NJS8498VF				+/- 0.3 ppm (+/- 1.5kHz typ.)	F-type
NJS8498VN					N-type

* Above Specifications are subject to change without notice.

1. Electrical Specifications

#	Items	Specifications
1.1.	Absolute Maximum Rating [RF Input Power] [Supply Voltage]	-10 dBm for CW Signal +10 dBm for Peak of Pulse Signal +28 V DC
1.2.	Input RF Frequency Range <Model No. NJS8496> <Model No. NJS8497> <Model No. NJS8498>	 3.4 to 4.2 GHz 3.625 to 4.2 GHz 4.5 to 4.8 GHz
1.3.	Noise Temperature @ +25 °C	15 K typ., 30 K max.
1.4.	Output IF Frequency Range <Model No. NJS8496> <Model No. NJS8497> <Model No. NJS8498>	 950 to 1,750 MHz 950 to 1,525 MHz 960 to 1,260 MHz
1.5.	Conversion Gain @ +25 °C	59 dB min., 67 dB max.
1.6.	Conversion Gain Ripple @ +25 °C	2 dBp-p max. at any 50 MHz segments.
1.7.	Conversion Gain Flatness over Frequency <Model No. NJS8496> <Model No. NJS8497> <Model No. NJS8498>	 5 dBp-p max. at 800 MHz BW 5 dBp-p max. at 575 MHz BW 4 dBp-p max. at 300 MHz BW
1.8.	Conversion Gain Stability over Temperature	5 dB max.
1.9.	Output Power @ 1dB G.C.P. (P1dB)	+3 dBm min.
1.10.	IM3 for two dBm input carriers < Condition > Input Level: -75 dBm for each carriers Separation Frequency: 10 MHz	-45 dBc max.
1.11.	Output Intercept Point	+13 dBm min.
1.12.	Local Oscillator Frequency <Model No. NJS8496> <Model No. NJS8497> <Model No. NJS8498>	 5.15 GHz nom. 5.15 GHz nom. 5.76 GHz nom.

* Above Specifications are subject to change without notice.

#	Items	Specifications
1.13.	Local Oscillator Stability including Temperature Stability of -40 to +60 °C, Initial Setting Error and Aging Error	
	<H-type Model>	+/- 10 ppm max.
	<S-type Model>	+/- 3 ppm max.
	<U-type Model>	+/- 1 ppm max.
	<V-type Model>	+/- 0.3 ppm max.
	<E-type Model>	Depend on External Reference
1.14.	L.O. Phase Noise (SSB)	-70 dBc/Hz typ., -59 dBc/Hz max. @ 100 Hz -80 dBc/Hz typ., -75 dBc/Hz max. @ 1 kHz -90 dBc/Hz typ., -85 dBc/Hz max. @ 10 kHz -100 dBc/Hz typ., -95 dBc/Hz max. @ 100 kHz -110 dBc/Hz typ., -105 dBc/Hz max. @ 1 MHz
1.15.	Requirement for External Reference (Only E-type Model Specified)	
	[Input Port]	IF Output Interface *Combine reference with IF Signal and DC Power
	[Frequency]	10 MHz (sine-wave)
	[Input Power]	-10 to 0 dBm @IF Output connector
	[Phase Noise]	-135 dBc/Hz max. at 100 Hz -143 dBc/Hz max. at 1 kHz -145 dBc/Hz max. at 10 kHz
1.16.	Spurious	a) -140 dBm max. at input, Fixed frequency spur, unrelated to test CW signal. (Measured at specified IF band: 950 to 1,750 MHz, 950 to 1,525 MHz, or 960 to 1,260 MHz) b) -55 dBc max. with test CW signal -10 dBm IF output (Measured at specified IF band: 950 to 1,750 MHz, 950 to 1,525 MHz, or 960 to 1,260 MHz)
1.17.	Image Rejection	60 dB min.
1.18.	Input V.S.W.R.	2.5 : 1 typ.
1.19.	Output V.S.W.R.	2.0 : 1 max.
1.20.	DC Power Requirement	
	[Input Port]	IF Output Interface
	[Input Voltage]	+12 to +24 VDC
	[Current Drain]	350 mA

* Above Specifications are subject to change without notice.

2. Mechanical Specifications

#	Items	Specifications
2.1.	RF Input Interface	Waveguide, CPR-229G (with Grooved) and equivalent Waveguide Flange: Type of Through hole ($\phi 6.5$ nom.)
2.2.	IF Output Interface Connector	
	<F-type Model>	F-type female connector, 75 ohms
	<N-type Model>	N-type female connector, 50 ohms
2.3.	Dimension & Housing	144.5 (L) × 98.4 (W) × 69.9 (H) mm without interface connectors and screws
2.4.	Weight	670 g

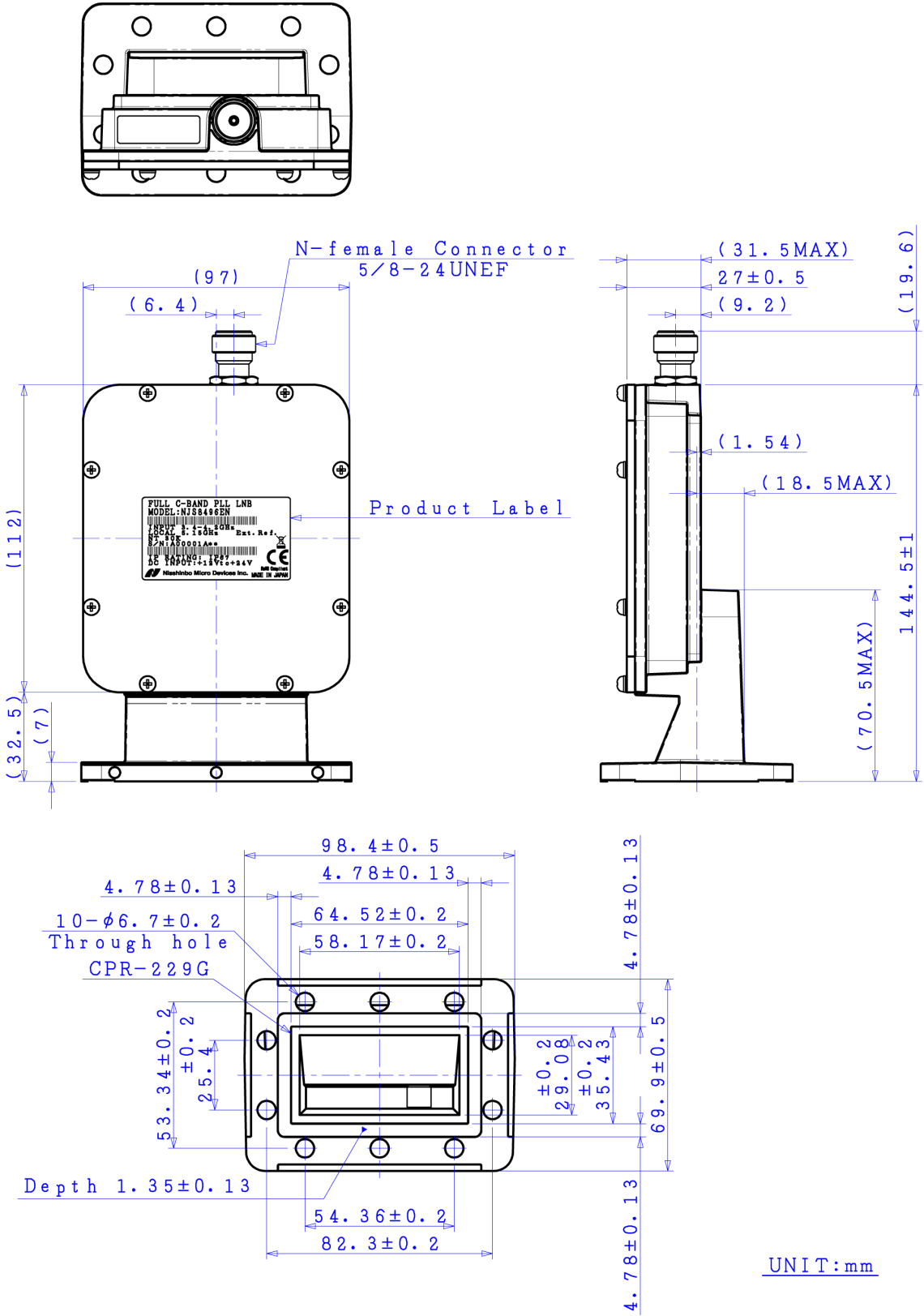
3. Environmental Specifications

#	Items	Specifications
3.1.	Temperature Range (ambient)	
	[Operating]	-40 to +60 °C
	[Storage]	-40 to +80 °C
3.2.	Humidity	0 to 100 % RH
3.3.	Altitude	15,000 feet (4,572 m)
3.4.	Vibration	5 G [49.03 m/s ²] (3 axis, 50 Hz to 2 kHz) 1 mm p-p (3 axis, 5 to 50 Hz)
3.5.	Shock	30 G [294.20 m/s ²] (3 axis)
3.6.	Waterproof / Dustproof (IP Code)	IP 67
3.7.	Regulations	EU Directive (CE Marking) RE - 2014/53/EU EMC - 2014/30/EU RoHS - 2011/65/EU + (EU)2015/863 Safety: EN62368-1, EN60950-22

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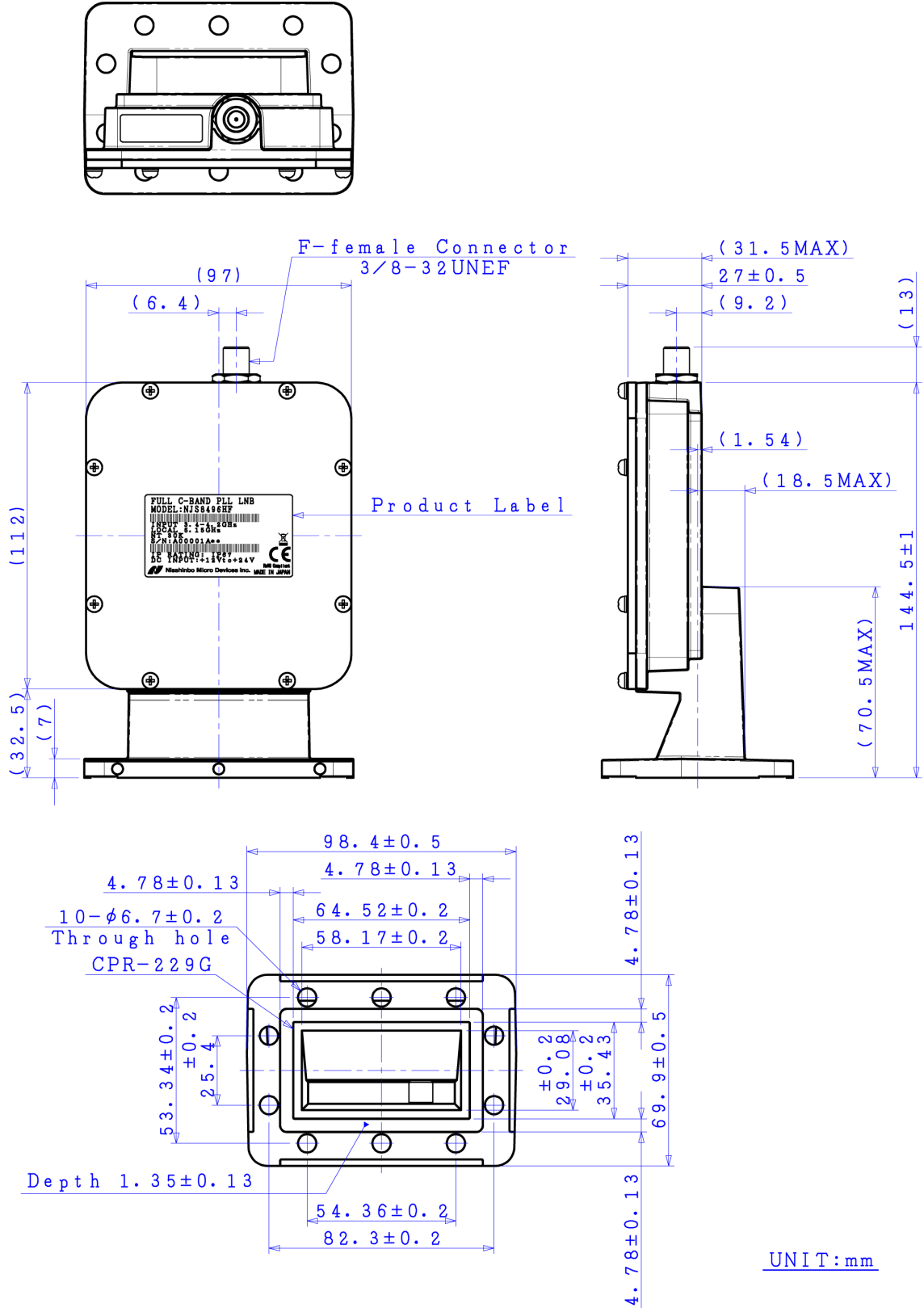
4. Outline Drawing

4.1. N-type Model (e.g. NJS8496EN)



* Above Specifications are subject to change without notice.

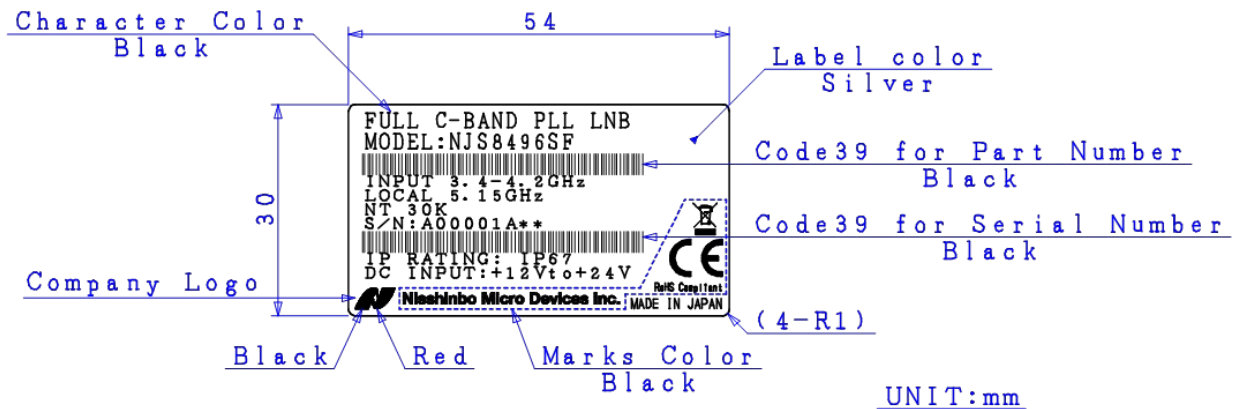
4.2. F-type Model (e.g. NJS8496HF)



* Above Specifications are subject to change without notice.

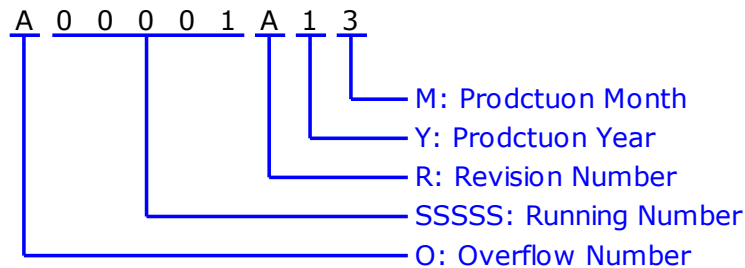
5. Label

5.1. Label Outline (e.g. NJS8496SF)



5.2. Definitions

Serial Number (OSSSSSRYM) - ALPHANUMERIC (9 characters)



O: Overflow Number - ALPHABET (1 character)

"A" to "T" except "I" and "O", e.g.: A99999 ⇒ B00001

"V" to "Z": Specified Numbers

SSSSS: Running Number - NUMBER (5 digits)

"00001" to "99999"

R: Revision Number - ALPHABET (1 character)

"A" to "Z" except "I", "O", and "U"

Y: Production Year - NUMBER (1 digit)

"0" to "9", Last Digit of Calendar Number

e.g.: 2021:"1", 2022:"2", 2023:"3".....

M: Production Month - ALPHANUMERIC (1 character)

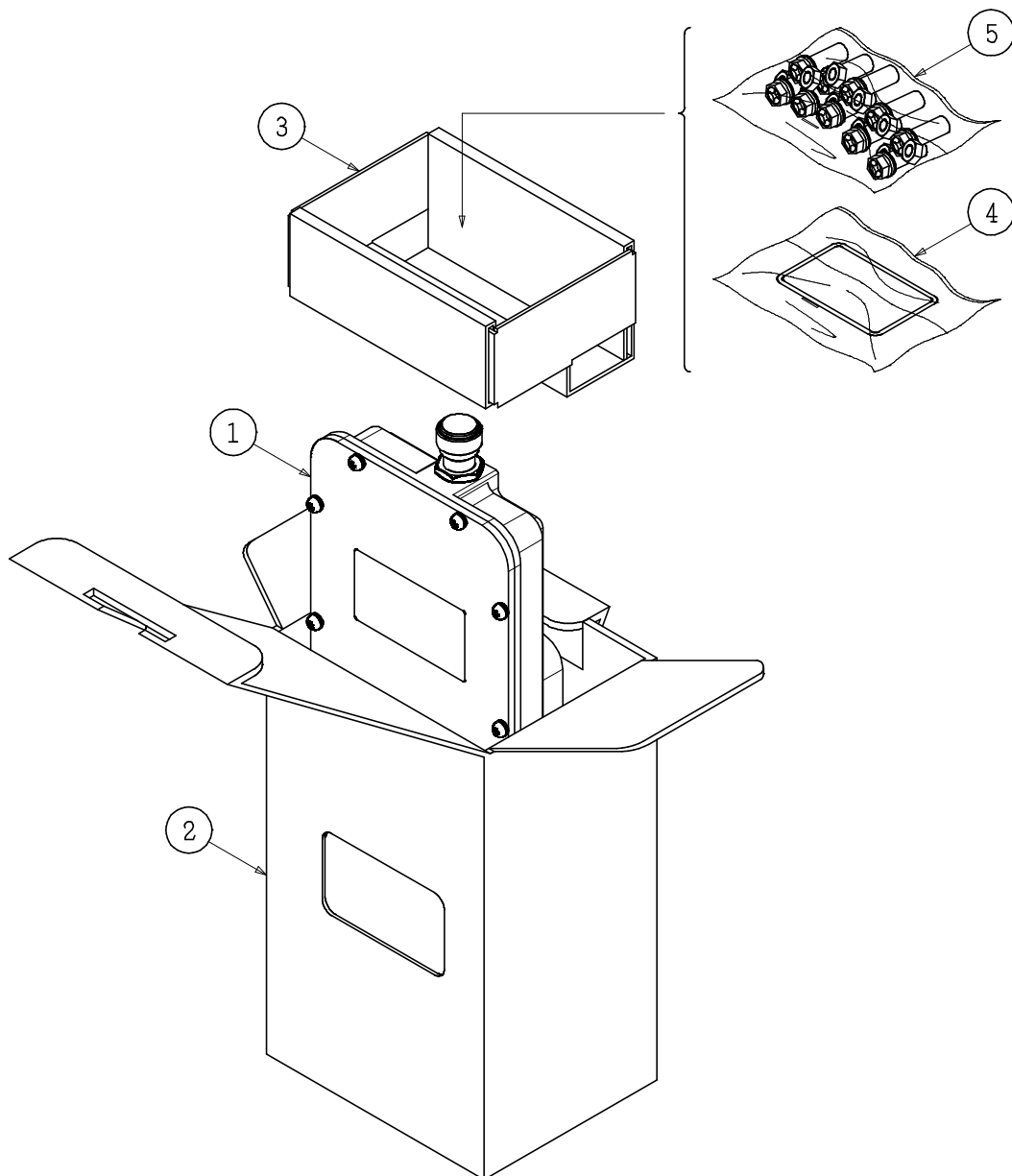
"1" to "9", "X" as October, "Y" as November, "Z" as December

* Above Specifications are subject to change without notice.

6. Package

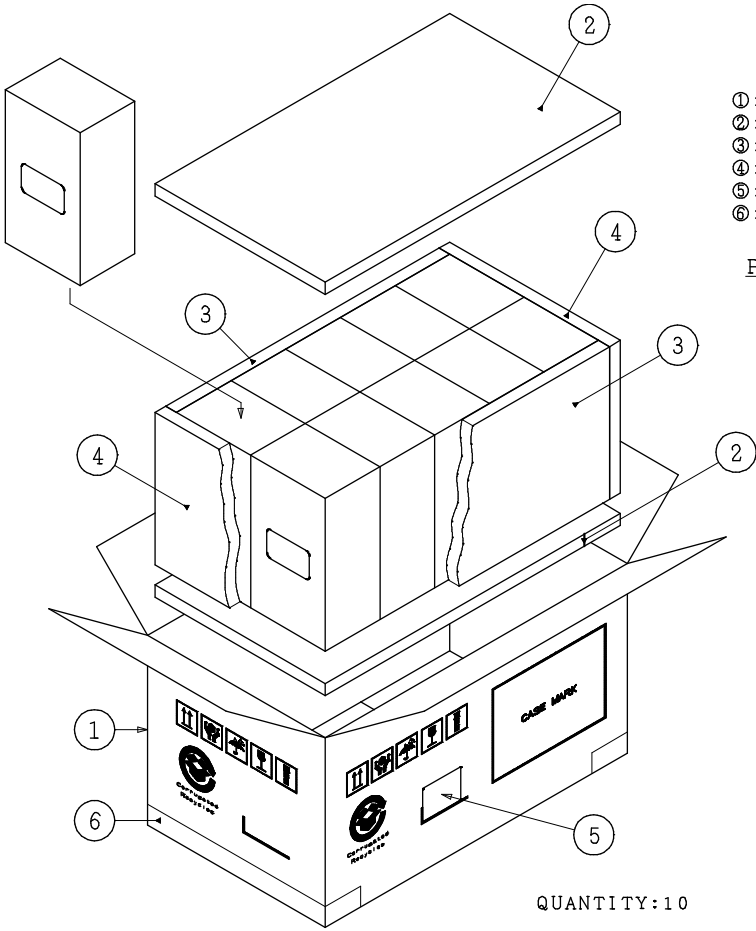
6.1. Individual Package

- ①: C-Band PLL LNB
- ②: Single wall corrugated fiberboard
 - Individual packaging box
- ③: Single wall corrugated fiberboard
 - Cushioning material
- ④: Accessories
 - O-RING (FULL)
- ⑤: Accessories
 - Cross recessed hex upset screws
M6×25 10 Pieces (SUS, SW and W) for Waveguide Flange Holes
 - Hexagon nuts
M6 Type 10 Pieces (SUS) for Waveguide Flange Holes



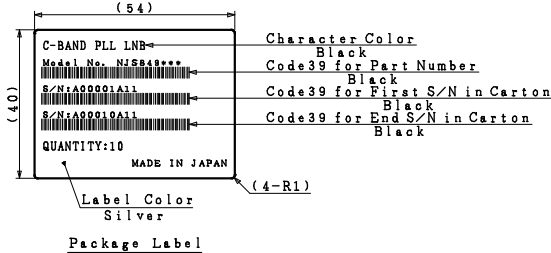
* Above Specifications are subject to change without notice.

6.2. Shipping Package



- ①: Double Wall Corrugated Fiberboard
- ②: Polyethylene Foam For Package Cushioning
- ③: Polyethylene Foam For Package Cushioning
- ④: Polyethylene Foam For Package Cushioning
- ⑤: Package Label
- ⑥: Carton Tape

Package Label



Pictorial Marking for Handling of Goods

	THIS WAY UP		HANDLE WITH CARE
	FRAGILE		LAYERS LIMIT: 6
	KEEP DRY		

* Above Specifications are subject to change without notice.

6.3. Enclosed Accessories

- O-ring Gasket, Qty (1), Full-type, for Waveguide Flange
- Bolts, Qty (10), M6 x 25, Cross Recessed Hexagon Head with Spring Washer and Flat Washer, SUS
- Nuts, Qty (10), M6, Hexagon Nuts, SUS

* Above Specifications are subject to change without notice.

7. Handling Precautions

7.1. DANGER



This statement indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Items	Description
Input Voltage	Only input a DC voltage within the range indicated in specifications. <u>Do</u> operate with the input voltage range between +12 and +24 V DC power. When applying higher voltage than specifications (+28 V as absolute maximum rating), it will not only cause this unit failure, but it may also result in <u>electric shock</u> and <u>fire</u> .
Disassembling	<u>Do not</u> disassemble the unit. Disassembling will not only cause this unit failure, but it may also result in <u>electric shock</u> .

7.2. CAUTION



This statement indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. The statement may also be used to indicate other unsafe practices or risks of property damage.

Items	Description
Disposal	This unit contains gallium arsenide (GaAs), classified as a harmful substance. To avoid danger, <u>do not</u> incinerate, crush, or chemically treat the unit in such a way that gases or dust are released. When disposing the unit, comply with all applicable laws and regulations and <u>do not</u> treat it as general industrial waste or household waste.

7.3. NOTE



This statement is used to notify of installation, operation, or maintenance information that is important, but not hazard-related.

Items	Description
Grounding	To reduce the risk of damage or broken by lightning surge, whole system such as antenna system that the unit is installed should be grounded.

* Above Specifications are subject to change without notice.

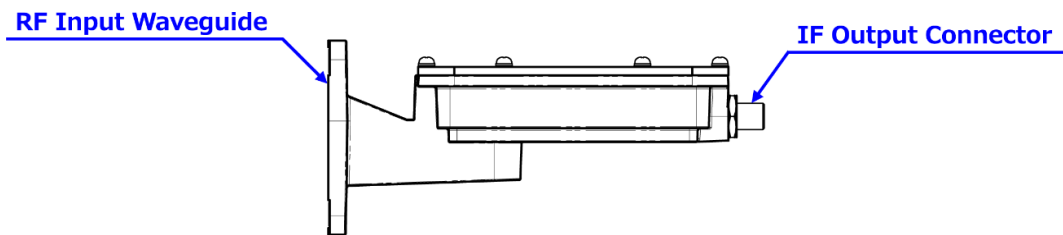
Items	Description
Torque Management	<p><u>Do not</u> tighten with excessive torque when attaching screws/bolts and connectors. The following value as tighten torque is recommended.</p> <ul style="list-style-type: none"> ■ Screws/Bolts/Nuts - M6: 1.58 N·m ± 0.158 N·m ■ IF Connector (N-type / F-type): 0.68 to 1.13 N·m (3.92 N·m as maximum allowable torque. When over this torque, connector may be damaged.)
Weatherproof	<p>The unit mounted in outdoor should be conducted with adequately weatherproof procedure.</p> <p>Do seal all of cable connection points from the connector to the cable sheath by usage of self-amalgamating tape.</p> <p>Ensure the waveguide connection is properly assembled with the enclosed o-ring gasket as accessories. The o-ring gasket is full-type and it is assumed to connect the unit to a grooved waveguide flange.</p>
Input Voltage	<p><u>Do</u> operate with the input voltage range between +12 and +24 V DC power. Avoid applying more than the maximum voltage in this range (including ripple voltage) under any conditions.</p>
Input RF Signal Power	<p><u>Do not</u> supply the input RF signal over the absolute maximum rating indicated in specifications (-10 dBm @ CW / +10 dBm @ Pulse).</p>
Input 10MHz Signal Power	<p><u>For only E-type(external reference) Model</u></p> <p>The 10 MHz reference signal should be supplied with the range between -10 and 0 dBm with sine-wave for correctly operation.</p> <p><u>Do not</u> supply the signal level of more than +13 dBm.</p>
High Temperature Operation	<p>It may cause damage and/or degradation of reliability / lifetime to operate the unit in a condition where the ambient temperature exceeds the maximum value, <u>+60 °C</u>, at operating temperature described in the specifications.</p>
Vibration / Shock	<p>When vibration and/or shock impact exceeding the conditions described in the specifications is applied, internal parts may be damaged.</p>
Warranty	<p>The unit is covered by a warranty for one(1) year following delivery unless otherwise stipulated in the contract or delivery conditions.</p> <p>Repairs may be possible under payment of charge even for the unit whose warranty period has expired.</p> <p>Opening, removing, disassembling and modifying any parts and components (including the product label, sealing tape and screws) without fan equipment will immediately void the warranty.</p> <p>In any case, the unit of invalid warranty cannot be repaired.</p>

* Above Specifications are subject to change without notice.

8. Instructions Manual

8.1. Descriptions

This section describes the information of connectors and etc.



Items	Description	Purpose
RF Input Waveguide	Waveguide: CPR-229G Flange: CPR-229G (with Groove)	The LNB receives an RF signal of C-band (3.4 to 4.2 GHz, 3.625 to 4.2 GHz, or 4.5 to 4.8 GHz) via this waveguide.
IF Output Connector	F-type Female Coaxial Connector, 75 Ohms OR N-type Female Coaxial Connector, 50 Ohms	The LNB outputs an IF signal of L-band (950 to 1,750 MHz, 950 to 1,525 MHz or 960 to 1,260 MHz) and requires to supply +12 to +24 V DC power via this connector. For external reference models, a 10 MHz reference signal must be supplied.

8.2. Connection and Installation

This section describes basic installation for the LNB.

8.2.1. Mounting Configuration

The Unit can be mounted with OMT or the waveguide filter of the satellite antenna.

When mounting with the OMT or the waveguide filter, the following steps should be complied:

Step 1: Verify that the groove on the waveguide flange for a gasket is clean. The enclosed gasket as accessories is full-type and it is assumed to connect the LNB to a grooved waveguide flange. Insert the gasket the groove of the waveguide flange CPR-229G of the Unit.

Step 2: Secure the OMT or the filter to the LNB by tightening the enclosed hexagon head bolts (M6×25) with 1.58 ± 0.158 N·m torque with the enclosed hexagon nuts, when the thickness of the flange of the OMT or filter is assumed to be 7 to 10 mm. When the thickness is other than 7 to 10 mm, the appropriate length screws or bolts based should be prepared on the table on the right.

Flange Thickness of OMT/Filter	Screw Length
4 to 7 mm [0.15" to 0.275"]	22 mm
7 to 10 mm [0.275" to 0.4"]	25 mm
10 to 13 mm [0.375" to 0.525"]	28 mm

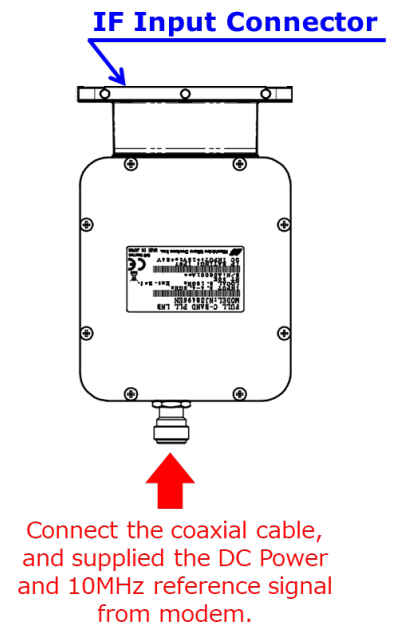
* Above Specifications are subject to change without notice.

8.2.2. Connecting Coaxial Cable

The LNB is connected the modem with a coaxial cable, and requires to supply +12 to +24 V DC power from the modem. For external reference models, a 10 MHz reference signal shall be supplied.

The connection of coaxial cable should be complied with the following steps:

- Step 1: Connect the coaxial cable with the N or F-type male connectors to the coaxial connector equipped with the LNB which is shown in the figure on the right below under 0.68 to 1.13 N·m tighten torque.
- Step 2: Use self-amalgamating tape to seal connector and cable entry points from the connector to the cable sheath.



Do not power on the modem before finishing all of steps of Connecting Coaxial Cable.

8.2.3. Start-up

Start-up will be immediately performed with the following step:

Step: Power on the modem and supply the DC voltage (and 10 MHz reference) from modem.

DANGER

- ✓ Only input a DC voltage within the range indicated in specifications.
Do operate with the input voltage range between +12 and +24 V DC power.
When applying higher voltage than specifications (+28 V as absolute maximum rating), it will not only cause this unit failure, but it may also result in electric shock and fire.

NOTE

- ✓ The 10 MHz reference signal should be supplied with the range between -10 and 0 dBm with sine-wave for correctly operation.
Do not supply the signal level of more than +13 dBm.
- ✓ Do not power on the modem before finishing all of steps of Connecting Coaxial Cable.
- ✓ The LNB must be adequately weatherproofed to place in outdoor.
 - Ensure that the waveguide joint is properly sealed with the enclosed o-ring gasket.
 - Do seal all of cable connection points from the connector to the cable sheath by usage of self-amalgamating tape.

* Above Specifications are subject to change without notice.