Date
2024-01-15

Low Noise Factory

Datasheet

LNF-CIC0.9_1.1A

0.9-1.1 GHz Cryogenic Circulator

LNF-CIC0.9_1.1A

Product Features	
RF Bandwidth	0.9-1.1 GHz
Insertion Loss at 5 K	0.3 dB typical
Insertion Loss at 77 K	0.3 dB typical
Isolation	20 dB typical
Port Match	20 dB typical
RF Connectors	Female SMA

Absolute Maximum Ratings		
Parameter	**Min**	**Max**
Operating Temperature	0.01 K	100 K
RF Drive Level		30 dBm
DC Voltage on RF Input and Output	-50 V	50 V

Typical RF Characteristics at 77 K			
Parameter	**Condition**	**Value**	**Unit**
Insertion Loss	0.9-1.1 GHz	0.2	dB
Isolation	0.9-1.1 GHz	20	dB
Port Match	0.9-1.1 GHz	20	dB

LNF-CIC0.9_1.1A is ultra-low insertion loss cryogenic circulators operating in the 0.9-1.1 GHz frequency range. It has been designed from ground up to meet the strict requirements of ultra-low temperature physics research. The gold plated OFHC copper body ensures minimum loss and that this loss reaches the lowest possible temperature to minimize thermal noise. The isolator/circulator is packaged in a slim coaxial module using industry standard SMA connectors. The module measures 31.5x30.86x12.7 mm excluding the connectors.

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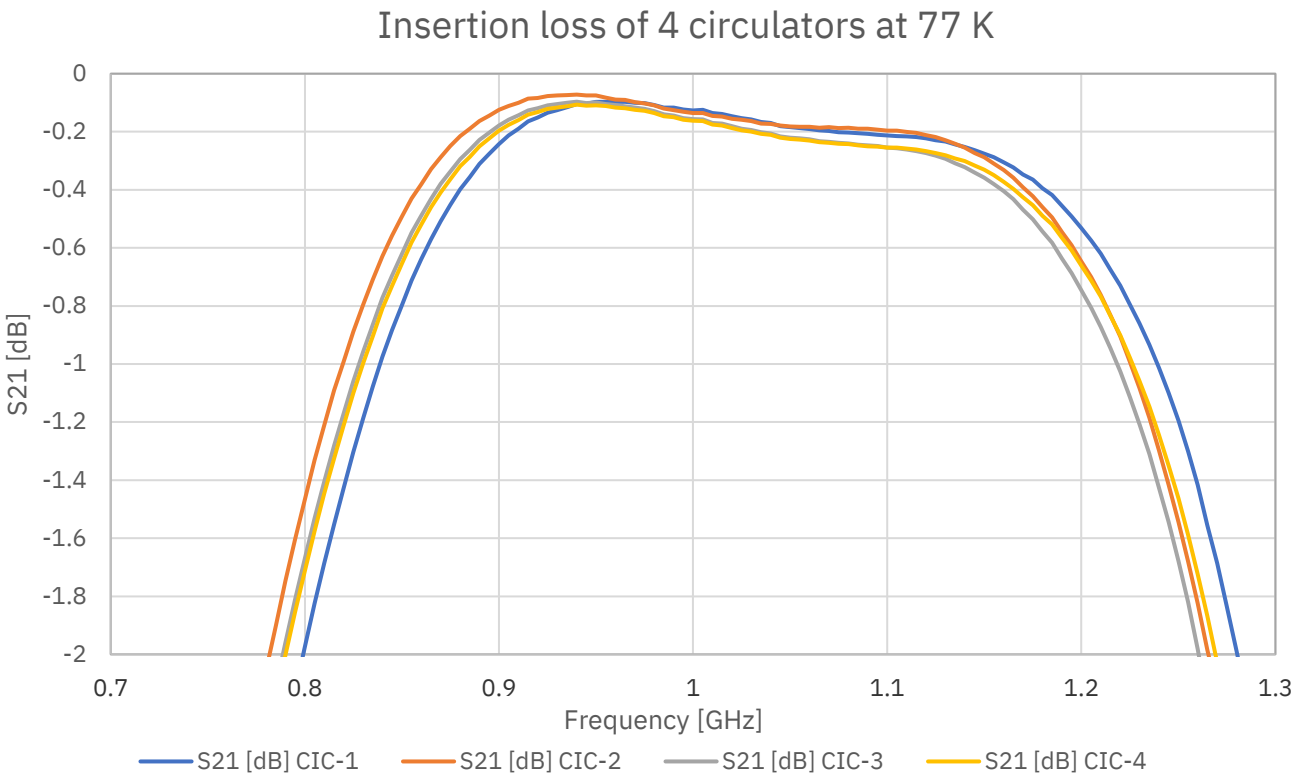
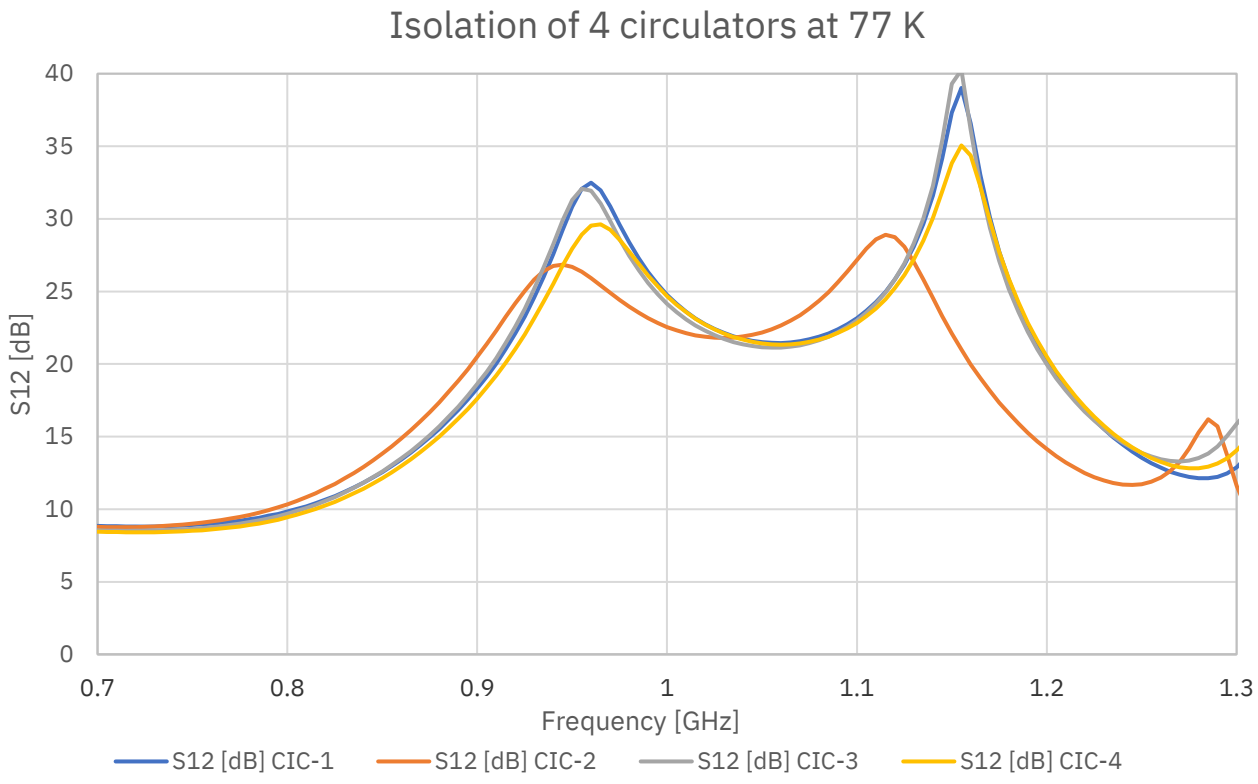
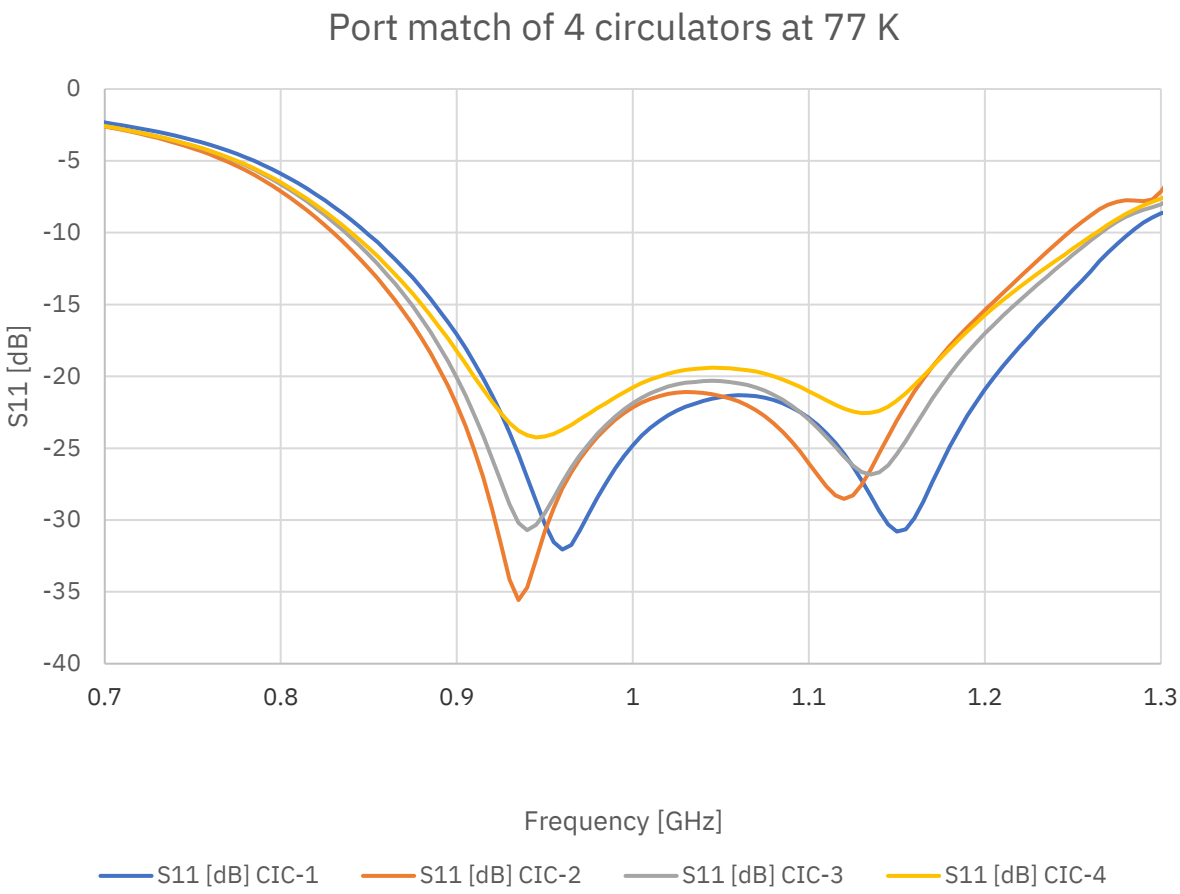
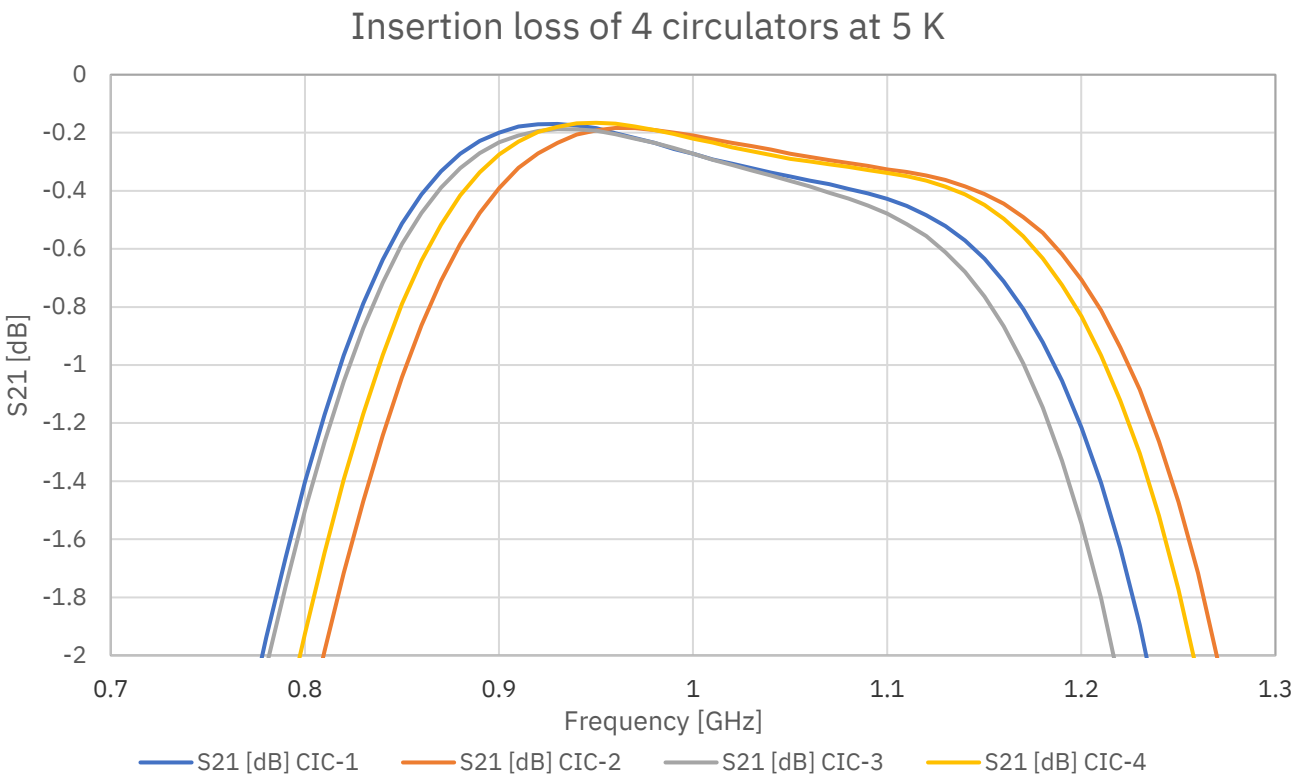
Measured data, T_{amb} = 77 K

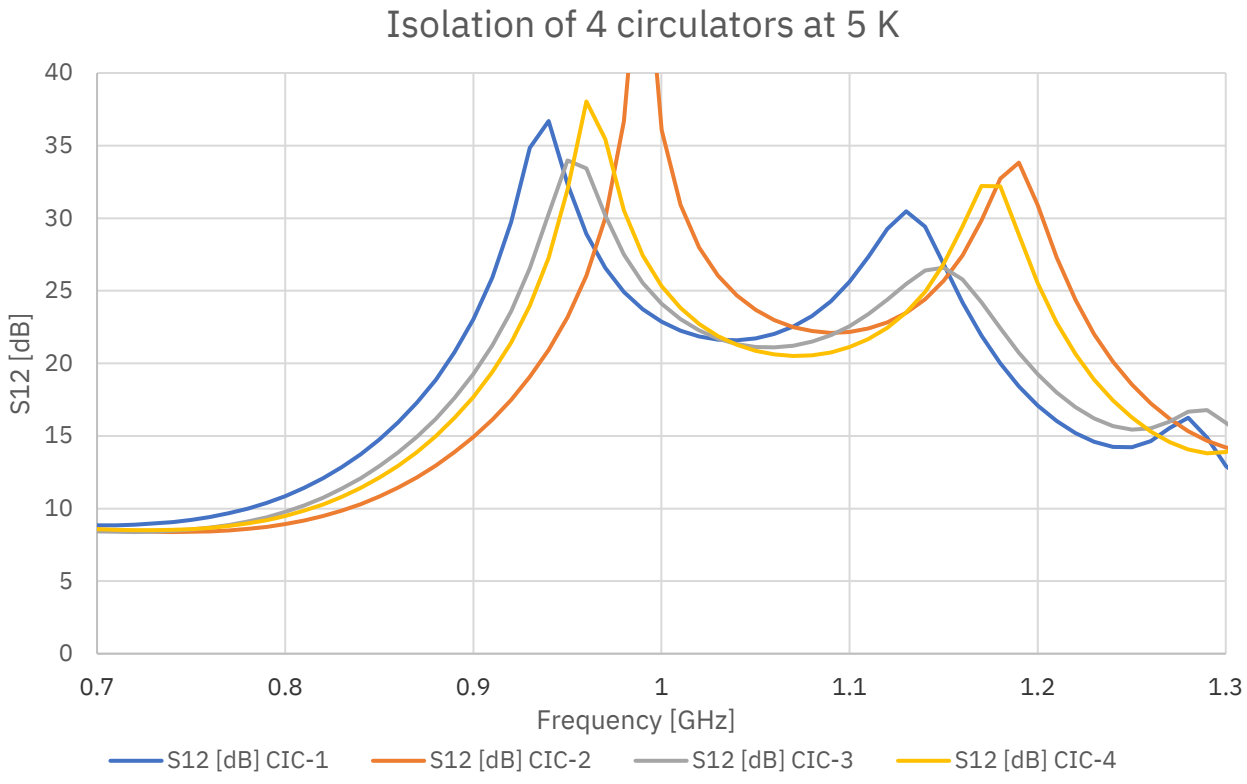


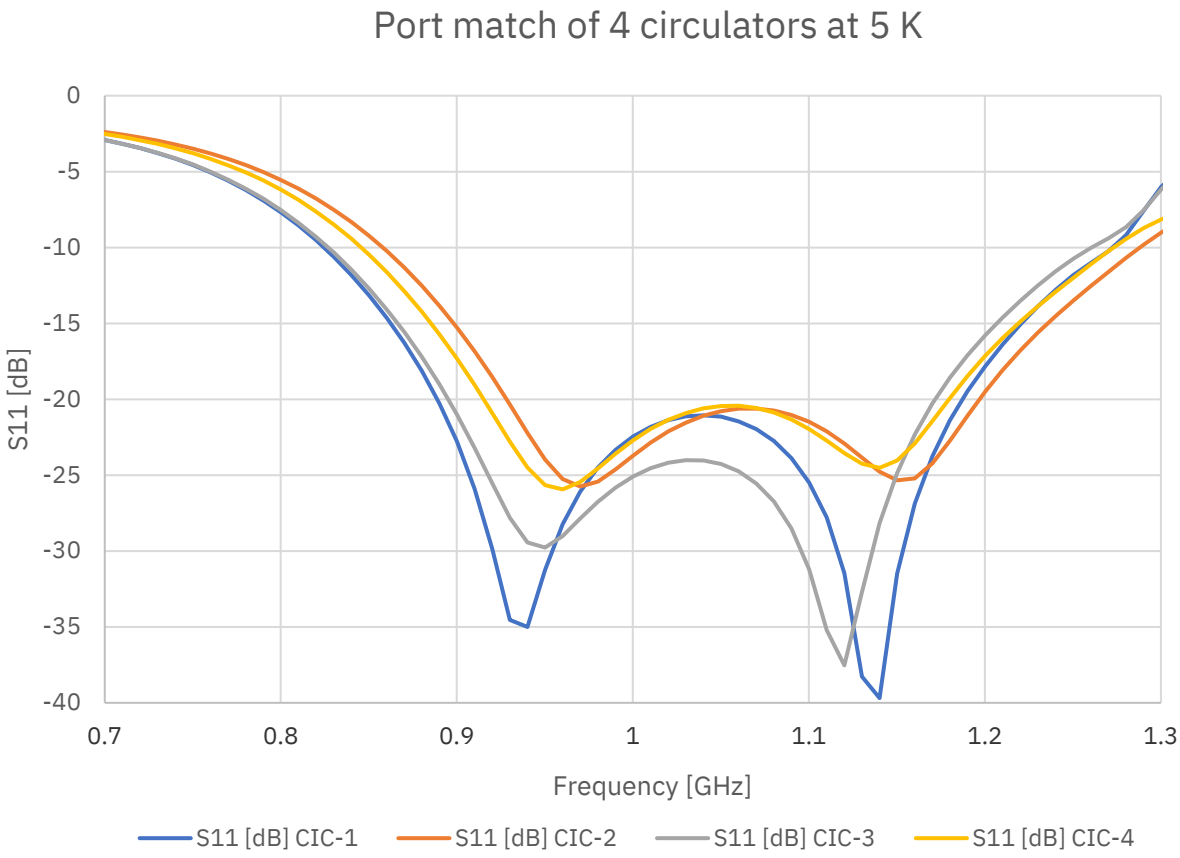



Port match of 4 circulators at 77 K
0
-5
-10
-15
-20
-25
-30
-35
-40
S11 [dB]
0.7
0.8
0.9
1
1.1
1.2
1.3
Frequency [GHz]
S11 [dB] CIC-1
S11 [dB] CIC-2
S11 [dB] CIC-3
S11 [dB] CIC-4

Measured data, T_{amb} = 5 K






Port match of 4 circulators at 5 K
0
-5
-10
-15
-20
-25
-30
-35
-40
S11 [dB]
0.7
0.8
0.9
1
1.1
1.2
1.3
Frequency [GHz]
S11 [dB] CIC-1
S11 [dB] CIC-2
S11 [dB] CIC-3
S11 [dB] CIC-4

Magnetic flux density generated by internal magnet

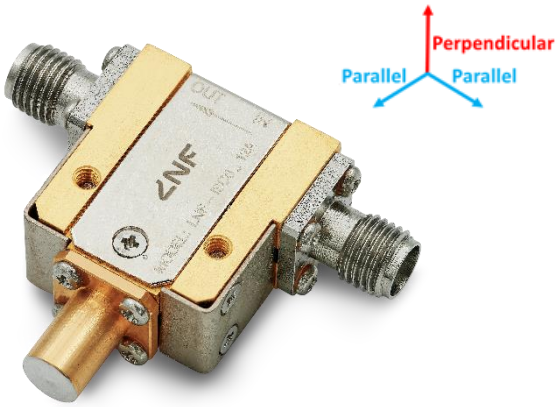
Parameter	Condition	Value	Unit
Magnetic flux density with standard shielding*	6 mm from chassis	< 4	Gauss

- This is the magnetic field generated by the internal magnet inside the isolator/circulator chassis, which potentially may influence nearby components.
- Two isolators/circulators can be placed 3.3 mm apart without interfering with each other.

Maximum external magnetic field imposed on the isolator

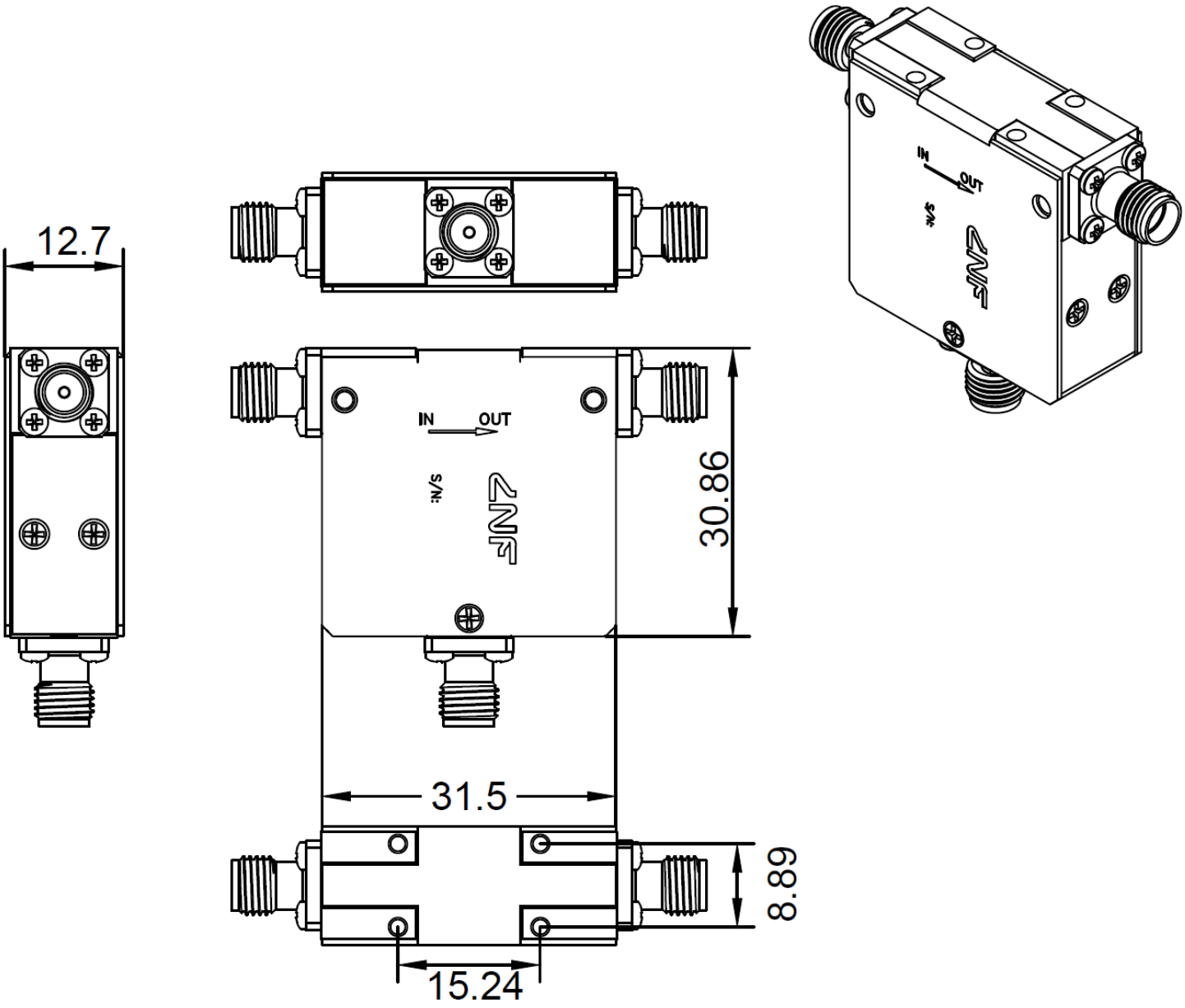
Parameter	Condition	Value	Unit
Maximum perpendicular external magnetic field	At chassis	650	Gauss
Maximum parallel external magnetic field	At chassis	1500	Gauss

- “Maximum field” means the field when the passband frequency edge has shifted 150 MHz, and insertion loss degradation becomes noticeable.

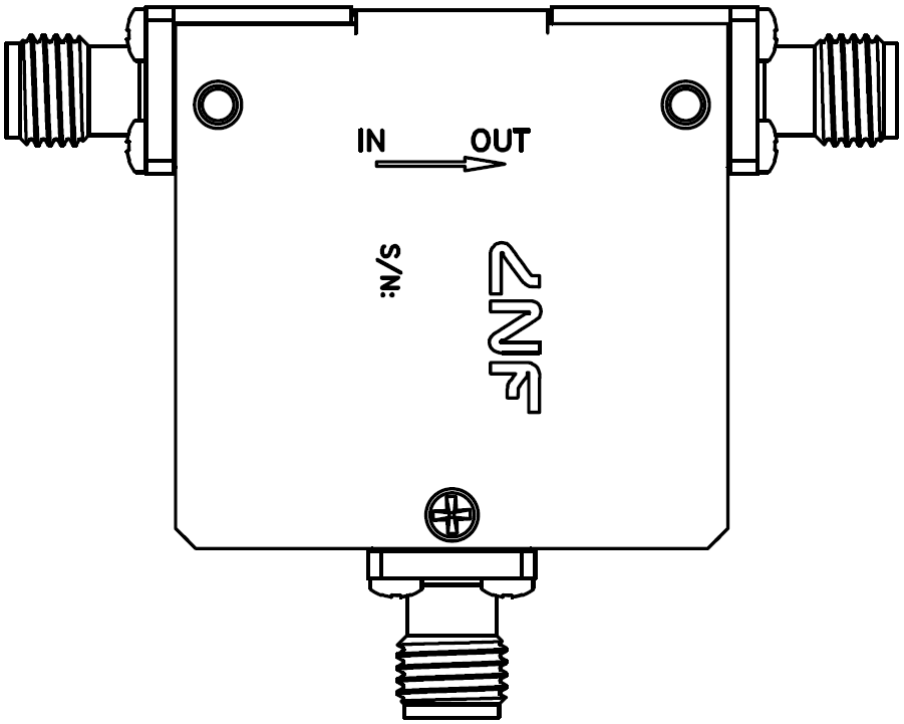


Dimensions without additional shielding

Units: mm



Model numbering



LNF-CIC0.9_1.1A

Single Junction Circulator

Port 1 : Female SMA

Port 2 : Female SMA

Port 3 : Female SMA

Version	Model number
Circulator	LNF-CIC0.9_1.1A