NS 2P N218

17 Aug. 2004

Preliminary

NEL®
CI0402

78 GHz – 100 GHz High - Power Amplifier

Features

- Wideband operation: 78 GHz – 100 GHz
- Pout = 17 dBm (typ, Pin = 5 dBm)
- P(-1dB) = 11 dBm (typ)
- Linear Gain: 14 – 23 dB
- Linear Gain Control Range: 10 dB
- WR-10 Waveguide Interface

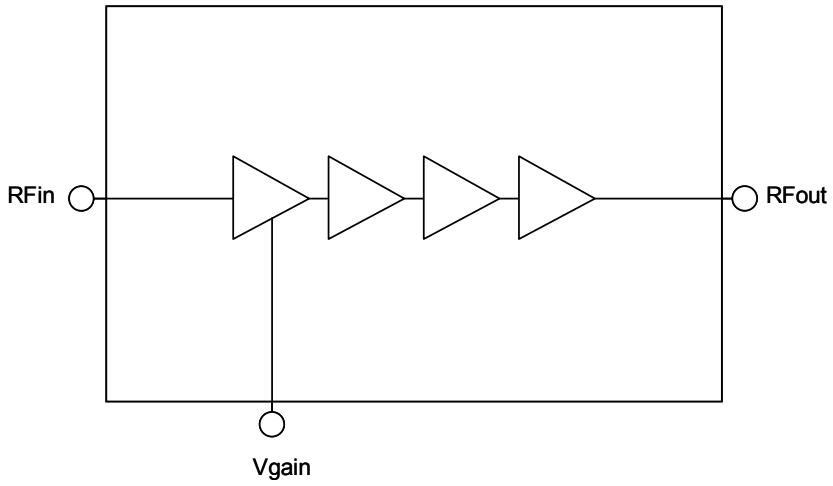
General Description

CI0402 is a high-power amplifier operated from 78 GHz to 100 GHz frequency range with output power up to 50 mW (typ). The MMIC is fabricated using a 0.1-μm InP HEMT process. CI0402 has WR-10 waveguide interface for the input and output.

Applications

- Astronomy
- Millimeter-wave spectrum measurement
- Millimeter-wave imaging system
- Other test equipment

Functional Diagram



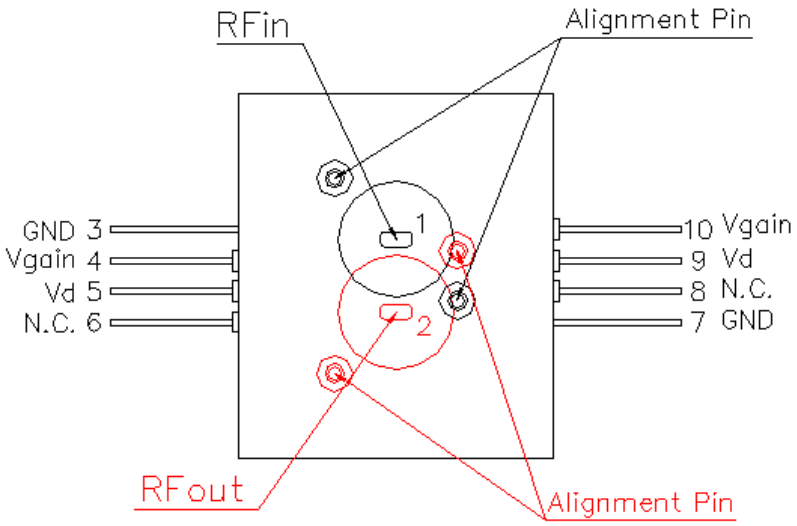
Connection Table

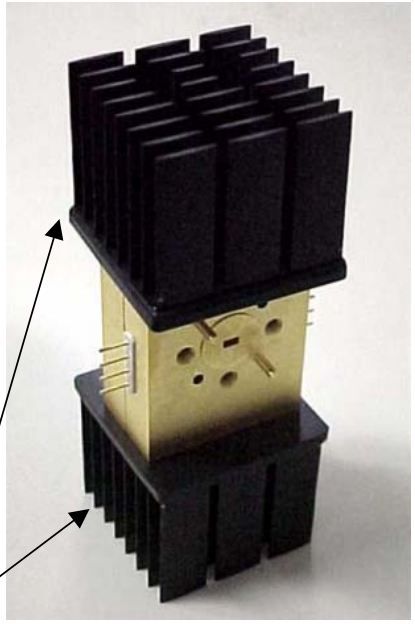
No.	NAME	FUNCTION	No.	NAME	FUNCTION
1	RFin	RF Input (WR-10, UG-387/U)	6	NC	No Internal Connection
2	RFout	RF Output (WR-10, UG-387/U)	7	GND	Ground (0.0 V)
3	GND	Ground (0.0 V)	8	NC	No Internal Connection
4	Vgain (1)	Gain Control (-3.0 - 0.0 V)	9	Vd	Power Supply (1.5 V)
5	Vd	Power Supply (1.5 V)	10	Vgain (1)	Gain Control (-3.0 - 0.0 V)

Note

Normally, the pins should be grounded.

Connection Diagram





Heat Sinks

Absolute Maximum Ratings

SYMBOL	PARAMETER	RATING	UNIT
Vd	Power Supply Voltage	-0.1 to +2.0	V
Vgain	Gain Control Voltage	-4.0 to +0.1	V
Pin	RF Input Power	10	dBm
Tc	Case Temperature under Bias	TBD	°C
Tstor	Storage Temperature	TBD	°C

TBD: To Be Determined

Recommended Operating Conditions

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
Vd	Power Supply Voltage	TBD	1.5	TBD	V
Vgain	Gain Control Voltage	-3.0		0	V
Pin	RF Input Power			5	dBm
Tc	Case Temperature under Bias	TBD		45	°C

TBD: To Be Determined

DC Characteristics

(Vd = 1.5V, Vgain = 0.0V, GND = 0.0 V, Tc [(1)] = 40 °C)

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
Id	Power Supply Current		2.3	TBD	A

TBD: To Be Determined

Note

Tc: Temperature at package base.

AC Characteristics

(Vd = 1.5 V, Vgain = 0.0 V, GND = 0.0 V, f = 78 GHz – 100 GHz, Tc [1] = 40 °C)

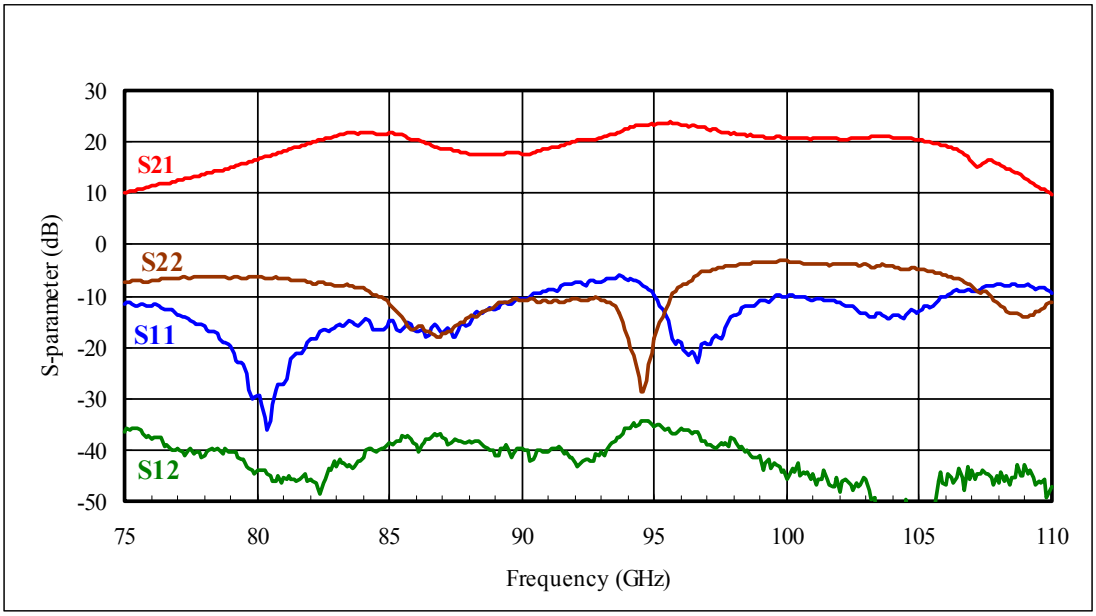
SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT
Gs	Linear Gain	TBD	20	TBD	dB
Pout	Output Power at 5 dBm Input	TBD	17	TBD	dBm
P(-1dB)	Output Power at 1dB Gain Compression	TBD	11		dBm
S_{11}	Maximum Input Return Loss		-7	TBD	dB
S_{22}	Maximum Output Return Loss		-4	TBD	dB
S_{12}	Maximum Reverse Isolation		-35	TBD	dB
Gc	Linear Gain Control Range Vgain = -3.0 – 0.0 V	TBD	10	TBD	dB

TBD: To Be Determined

Note

Tc: Temperature at package base.

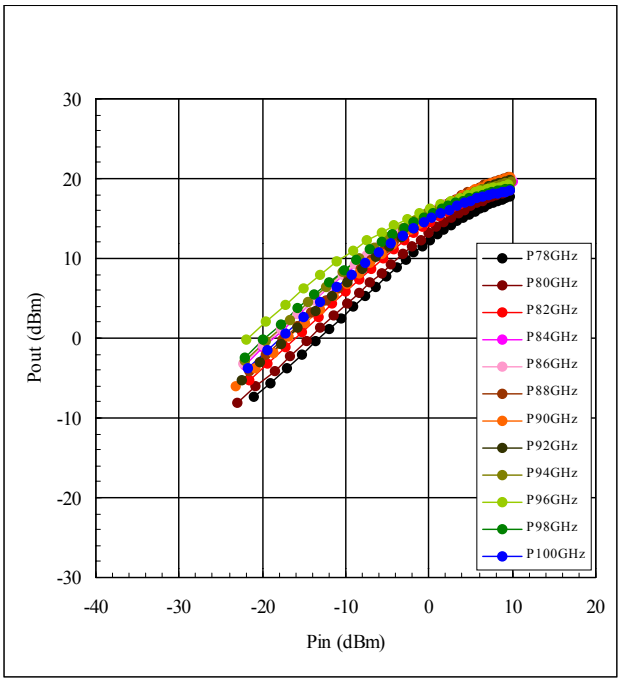
Sample Small Signal Characteristics (75 GHz – 110 GHz)

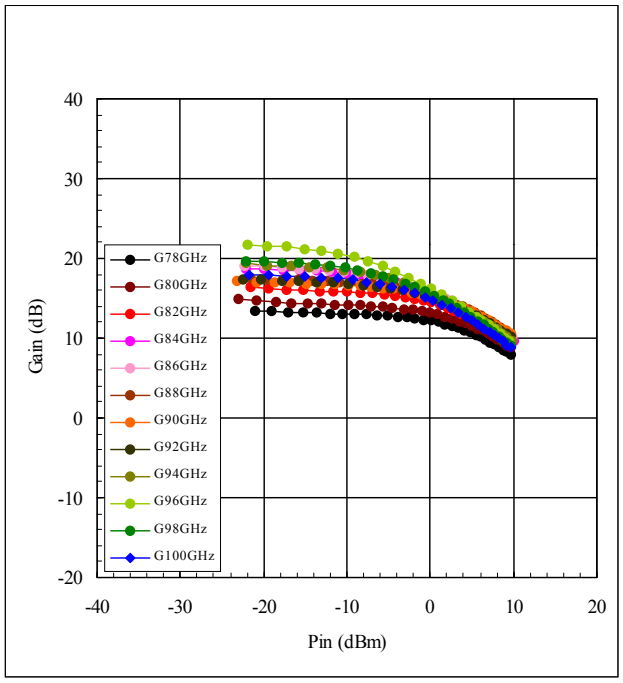


Measurement Conditions

Vd = 1.5 V, Vgain = 0.0 V, GND = 0.0 V

Sample Input and Output Characteristics

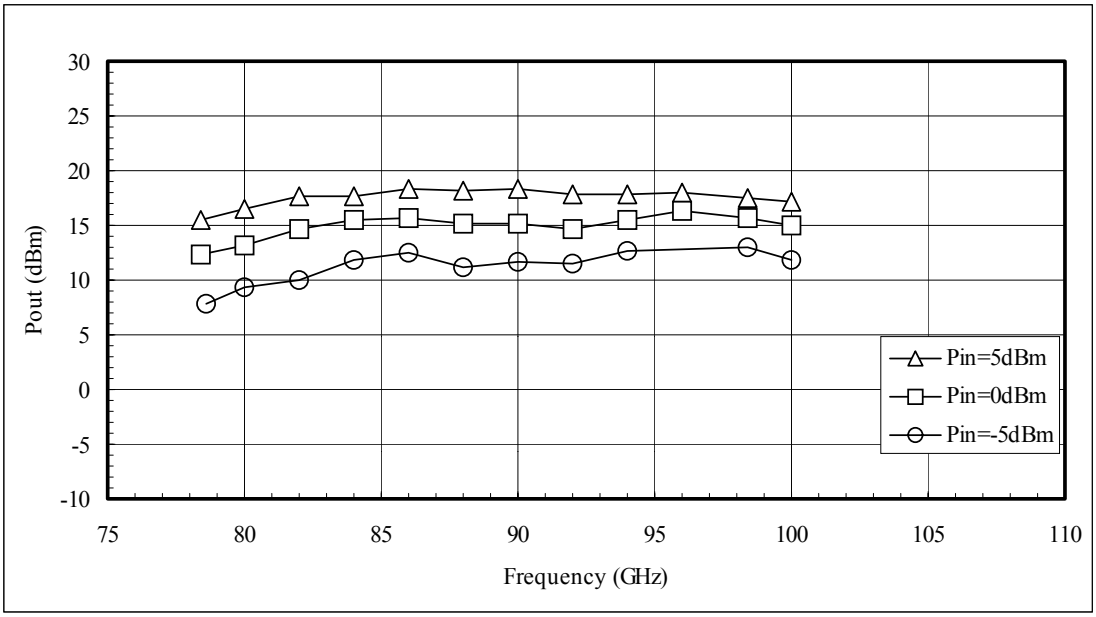




Measurement Conditions

Vd = 1.5 V, Vgain = 0.0 V, GND = 0.0 V

Sample Output Power vs Frequency (78 GHz - 100 GHz)

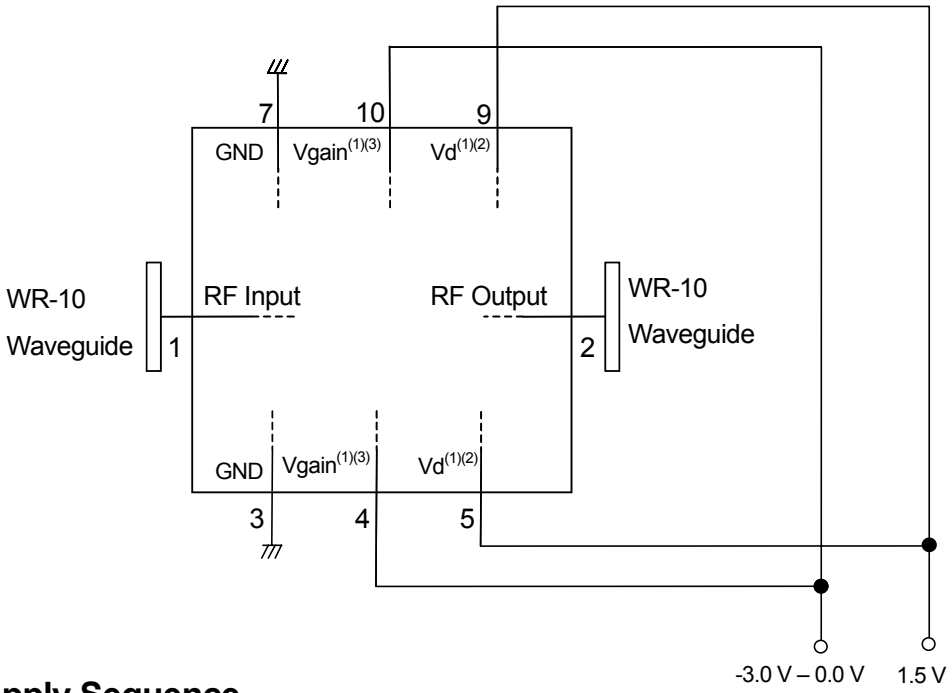


Measurement Conditions

Vd = 1.5 V, Vgain = 0.0 V, GND = 0.0 V

Sample Implementation

Note: Each number corresponds to a pin or a waveguide as shown in Connection Diagram.



Power Supply Sequence

(1) Set power supply voltage Vd, Vgain, and GND to 0 V.

(2) Apply 1.5 V to Vd.

(3) Apply –3.0 V – 0.0 V to Vgain.

(4) Supply RF Input.

Note.

(1) Use common power supply for both pin 5 and 9.

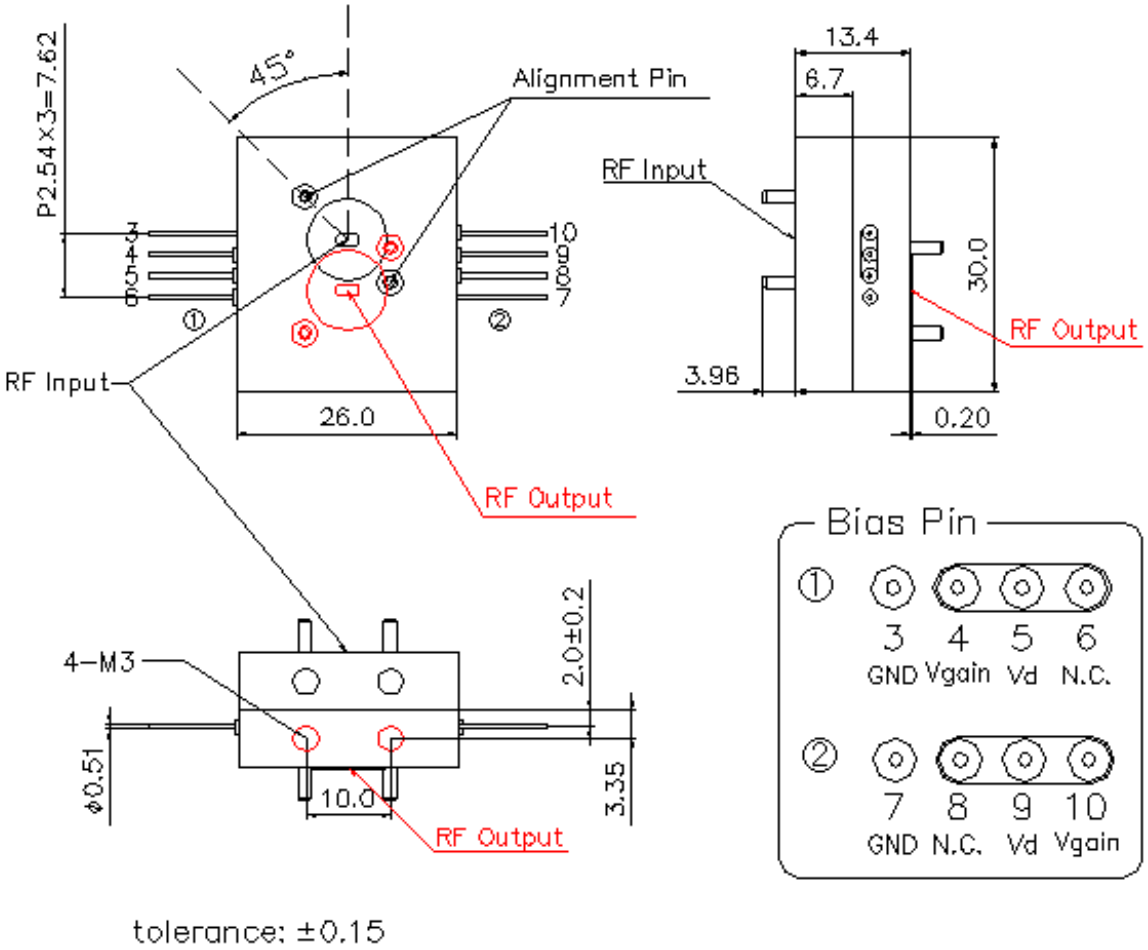
(2) Use common power supply for both pin 4 and 10.

(3) Use power supplies that do not generate over-voltages such as spikes. Many power supplies generate over-voltages when their outputs are turned on or turned off. To avoid these over-voltages, connect power supplies to Vd and Vgain after the power supply outputs are turned on and set to 0 V. Disconnect power supplies from Vs and Vgain after the power supply outputs are set to 0 V but before the outputs are turned off.

(4) Connect a power supply to Vd with compliance current of less than 3.0 A.

(5) Use the module in an air velocity of 0.5 m/sec or more and do not remove the heat sinks attached on the module surfaces.

Package Dimension (mm)



Handling Instructions

Since the IC is fabricated using InP HEMT process, users are recommended to follow the instructions below to prevent damage to the chip from electro-static discharge.

1) Use a conductive working desk connected to the ground (or, a conductive table top connected to the ground).
2) Require all handling personnel to wear a conductive bracelet or wrist-strap connected to the ground through a 1 M-ohm resistor.
3) Ground all test equipment.
4) Ground all soldering iron tops.
5) Store IC's and other devices such as chip capacitors in their conductive carriers until they are soldered.

Caution

1. In order to improve products and technology, specifications are subject to change without notice.
2. When using the products, be sure the latest information and specifications are used.
3. Circuit drawings etc. shall be provided for the purpose of information only on application examples not for actual installation of equipment. NTT Electronics Corp. shall not assume any liability for damage that may result from the use of these circuit drawings etc. NTT Electronics Corp. shall not assent to or guarantee any rights of execution for patent rights of the third parties and other rights that may be raised for use of these circuit drawings.
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