

GaInP/GaAs HBT MMIC Distributed Amplifier DC-17 GHz

NDA-210-D

6000045 Rev. A

Features

- Reliable low-cost HBT-based design
- 6 dB Gain, +12.6 dBm P1dB @ 2 GHz
- High P1dB of +13.4 dBm at 6.0 GHz and +8.5 dBm at 14.0 GHz
- Distributed amplifier with fixed gain or Adjustable Gain Control (AGC) operation
- 50 Ω input/output matched for high-frequency utilization
- Low junction temperature operation
- Flexible supply voltage operation

Description

RF Nitro's NDA-210-D GaInP/GaAs HBT MMIC distributed amplifier is a low-cost high-performance solution for your high-frequency RF, microwave, or optical amplification needs. This 50-Ohm matched distributed amplifier is based upon a reliable HBT (Heterojunction Bipolar Transistor) proprietary MMIC design, providing unsurpassed performance for small-signal applications.

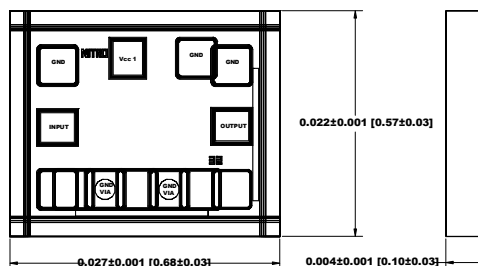
The NDA-210-D incorporates external dc decoupling capacitors, which limit the low-frequency response. Designed with an external bias resistors, the NDA-210-D provides flexibility and stability for your requirement. In addition, the NDA-210-D chip was designed with an additional ground via to enable low junction temperature operation. NDA-series distributed amplifiers provide design flexibility by incorporating AGC functionality into their designs.

Applications

- Narrow & broadband commercial & military radio designs.
- Linear & saturated amplifier applications.
- Gain stage or driver amplifiers, providing AGC capability, utilized in microwave radio and optical designs such as PTP, PMP, LMDS, UNII, VSAT, WLAN, cellular, and 10 & 20 Gbps optical modulator systems.

Chip Dimension 0.027" X 0.022" X 0.004"

UNITS: INCHES
[mm]



Electrical Specifications $V_{cc1}=+10V$, $V_{cc2}=+10V$, $V_{c1}=+4.71V$, $V_{c2}=+2.98V$, $I_{cc2}=36mA$, $Z_o=50\Omega$, $T_A=+25^\circ C$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Small Signal Power Gain, S_{21}	$f=0.1$ to 4.0 GHz	dB	5.0	6.0	
	$f=4.0$ to 6.0 GHz	dB		7.0	
	$f=6.0$ to 10.0 GHz	dB	7.5	9.0 (avg.)	
	$f=10.0$ to 17.0 GHz	dB	4.0	6.0 (avg.)	
Input and Output VSWR	$f=0.1$ to 4.0 GHz			2.3	
	$f=4.0$ to 10.0 GHz			2.0	
	$f=10.0$ to 17.0 GHz			3.0	
Bandwidth - BW	BW3 (3dB)	GHz		17.5	
Output Power @ 1-dB Compression	$f=2.0$ GHz	dBm		12.6	
	$f=6.0$ GHz	dBm		13.4	
	$f=14.0$ GHz	dBm		8.5	
Noise Figure, NF	$f=2.0$ GHz	dB		6.5	
3 rd Order Intercept, IP3	$f=2.0$ GHz	dBm		+27.6	
Reverse Isolation, S_{12}	$f=0.1$ to 12.0 GHz	dB		-13	
Output Device Voltage, V_{c2}	.	V	2.70	2.98	3.2
AGC Control Voltage, V_{c1}		V		4.7	
Gain Temperature Coefficient $\frac{dG_T}{dT}$		dB/ $^\circ C$		-0.0015	

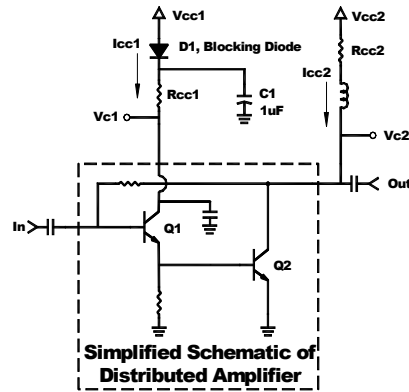
GainP/GaAs HBT MMIC Distributed Amplifier

Absolute Maximum Ratings

Exceeding any one or a combination of these limits may cause permanent damage.

Parameter	Absolute Maximum
RF Input Power	+15 dBm
Power Dissipation	300 mW
Device Current, I_{cc1}	42 mA
Device Current, I_{cc2}	42 mA
Output Device Voltage, V_{c2}	3.5 V
Junction Temperature, T_j	200° C
Operating Temperature	-45 °C to +85 °C
Storage Temperature	-65 °C to +150 °C

Typical Bias Configuration



MTTF vs. Junction Temperature

For $T_j < 150$ °C, MTTF > 1,000,000 hours

Ordering Information

Part Number	Package
NDA-210-D	Chip

Suggested Voltage Supply:

$$V_{CC1} \geq 4.7V$$

$$V_{CC2} \geq 5.0V$$

Bias Resistor Selection:

R_{cc1} :

For $4.7V < V_{cc1} < 5.0V$

$$R_{cc1} = 0\Omega$$

For $5.0 < V_{cc1} < 10.0V$

$$R_{cc1} = \frac{V_{cc1} - 4.7}{0.029} \Omega$$

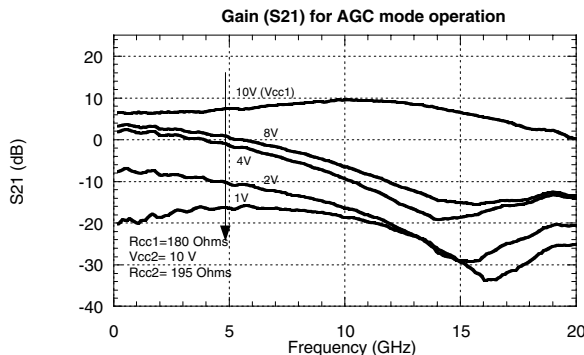
R_{cc2} :

For $5.0 < V_{cc2} < 10.0V$

$$R_{cc2} = \frac{V_{cc2} - 2.98}{0.036} \Omega$$

Typical Bias Parameters for $V_{cc1}=V_{cc2}=10V$:

V_{cc1} (V)	V_{cc2} (V)	I_{cc1} (mA)	V_{c1} (V)	R_{cc1} (Ω)	I_{cc2} (mA)	V_{c2} (V)	R_{cc2} (Ω)
10	10	29	4.7	180	36	2.98	195



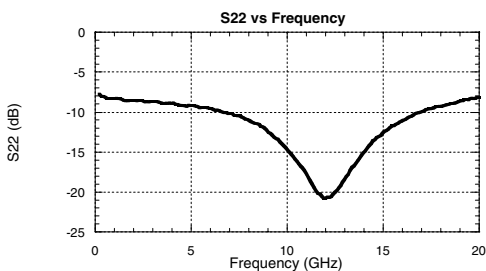
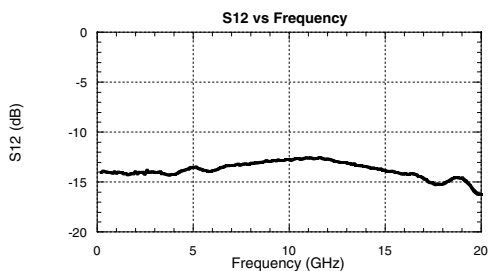
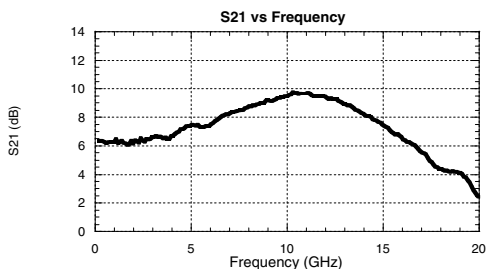
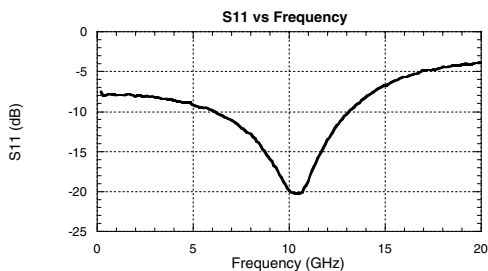
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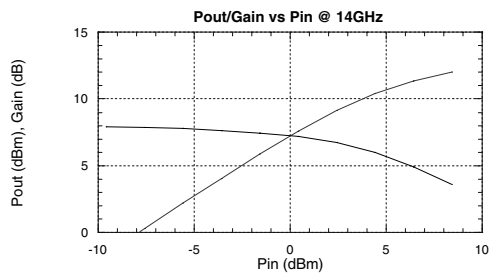
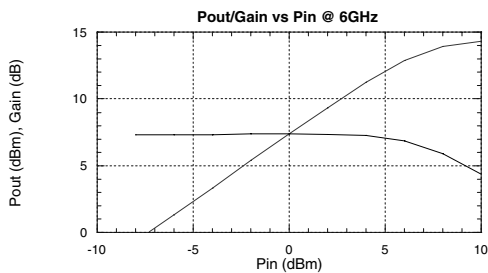
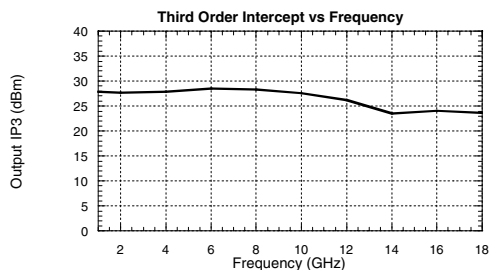
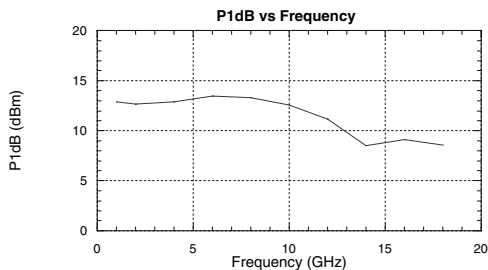
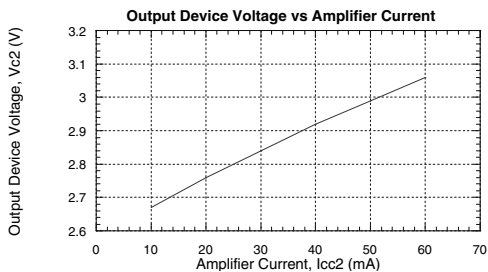
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Typical S-Parameter Data $V_{cc1}=+10V$, $V_{cc2}=+10V$, $V_{c1}=+4.71V$, $V_{c2}=+2.98V$, $I_{cc2}=36mA$, $Z_o=50\Omega$, $T_A=+25^\circ C$

Freq. GHz	S11 (dB)	S11 Mag	S11 Ang	S21 (dB)	S21 Mag	S21 Ang	S12 (dB)	S12 Mag	S12 Ang	S22 (dB)	S22 Mag	S22 Ang
.10	-8.0	0.4	178.2	6.0	2.0	178.5	-14.0	0.2	0.5	-8.0	0.4	175.8
.25	-8.0	0.4	175.1	6.4	2.1	177.8	-14.0	0.2	-1.2	-8.0	0.4	173.7
.50	-8.0	0.4	170.6	6.4	2.1	176.0	-14.0	0.2	-1.9	-8.0	0.4	166.4
1.0	-8.0	0.4	156.7	6.4	2.1	172.8	-14.0	0.2	-2.5	-8.0	0.4	153.0
2.0	-8.0	0.4	129.6	6.4	2.1	164.4	-14.0	0.2	-3.8	-8.0	0.4	125.2
4.0	-8.0	0.4	78.3	6.8	2.2	149.1	-14.0	0.2	-6.0	-8.0	0.4	68.9
6.0	-10.5	0.3	21.6	7.6	2.4	126.7	-14.0	0.2	-10.3	-10.5	0.3	7.2
8.0	-14.0	0.2	-28.7	8.6	2.7	102.9	-14.0	0.2	-15.7	-10.5	0.3	-59.4
10.0	-20.0	0.1	-45.9	9.8	3.1	74.8	-14.0	0.2	-23.5	-14.0	0.2	-139.5
12.0	-14.0	0.2	-40.3	9.8	3.1	42.2	-14.0	0.2	-34.2	-20.0	0.1	85.3
14.0	-8.0	0.4	-91.4	8.3	2.6	14.8	-14.0	0.2	-41.8	-14.0	0.2	-40.0
16.0	-6.0	0.5	-154.5	6.4	2.1	-9.0	-14.0	0.2	-46.7	-10.5	0.3	-120.2
17.0	-4.4	0.6	176.4	5.6	1.9	-21.0	-14.0	0.2	-51.3	-10.5	0.3	-153.9

Typical Performance Measurements $V_{cc1}=+10V$, $V_{cc2}=+10V$, $V_{c1}=+4.71V$, $V_{c2}=+2.98V$, $I_{cc2}=36mA$, $Z_o=50\Omega$, $T_A=+25^\circ C$

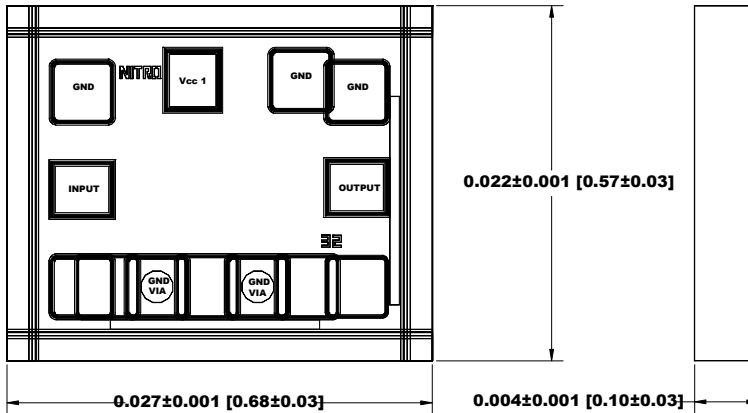




NDA-210-D (Die)

Chip Dimensions: 0.027" X 0.022" X 0.004" Back of chip is ground.

UNITS: INCHES
[mm]

**Application Notes****Die Attach:**

The die attach process mechanically attaches the die to the circuit substrate. In addition, it electrically connects the ground to the trace on which the chip is mounted, and establishes the thermal path by which heat can leave the chip.

Wire Bonding:

Electrical connections to the chip are made through wire bonds. Either wedge or ball bonding methods are acceptable practices for wire bonding.

Assembly Procedure:

Epoxy or eutectic die attach are both acceptable attachment methods. Top and bottom metalization are gold. Conductive silver-filled epoxies are recommended. This procedure involves the use of epoxy to form a joint between the backside gold of the chip and the metalized area of the substrate. A 150°C cure for 1 hour is necessary. Recommended epoxy is Ablebond 84-1LMI from Ablestik.

Bonding Temperature (Wedge or Ball):

It is recommended that the heater block temperature be set at 160°C +/- 10°C.

ESD Sensitive Device

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