

TDLNA3024SP

2 – 22 GHz Low Noise Amplifier with Adjustable Gain Control

Product Overview

Teledyne e2v HiRel's TDLNA3024SP is a distributed Low Noise Amplifier with Adjustable Gain Control (AGC) which operates between 2 GHz and 22 GHz.

It is designed for a wide range of applications, such as Space, electronic warfare, X and Ku point to point radio, and test instrumentation.

The circuit is manufactured with a pHEMT process, 0.15 μm gate length, via holes through the substrate, air bridges and electron beam gate lithography.

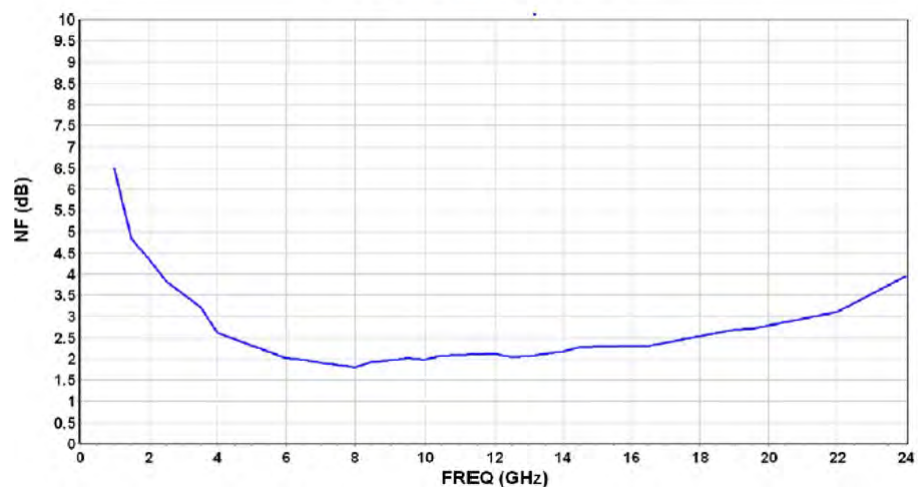
Packaged in a 7 mm x 7 mm 16-Lead hermetic leadless ceramic package.

Features

- Frequency Range: 2 – 22 GHz
- Noise Figure: 3 dB (typical)
- Linear Gain: 15 dB (typical)
- Up to 30 dB adjustable gain with V_{G2}
- DC Bias: $V_D = 3.5 \text{ V}$ @ $I_{DQ} = 100 \text{ mA}$, $V_{G1} = -0.3 \text{ V}$ and $V_{G2} = 1.7 \text{ V}$
- Hermetic ceramic leadless packaging
- Package Dimensions: 7.0 x 7.0 mm
- Radiation Performance: 100kRad (Si)



Noise Figure versus Frequency



Absolute Maximum Ratings ⁽¹⁾

T_{amb.} = +25°C

Symbol	Parameter	Values	Unit
V _d	Drain bias voltage	7V	V
I _{oo}	Drain bias current	190	mA
V _{G1}	Gate bias voltage	-2 to 0	V
V _{G2}	Gate bias voltage (AGC)	-2 to 2	V
P _{1N}	Maximum CW input power overdrive	15	dBm

(1) Operation of this device above anyone of these parameters may cause permanent damage.

Main Electrical Characteristics

T_{amb.} = +25°C V_o = +5V V_{G2} = 1.7V V_{G1} set to have I_{DQ} = 100mA

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	2		22	GHz
Gain	Linear Gain		15		dB
NF	Noise Figure		3		dB
P _{out}	Output Power@1dB comp.		18		dBm

Electrical Specifications

T_{amb.} = +25°C V_o = +5V V_{G2} = 1.7V V_{G1} set to have I_{DQ} = 100mA

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	2		22	GHz
Gain	Linear Gain	14	15		dB
ΔG	Gain control		30		dB
NF	Noise Figure		3		dB
IRL	Input Return Loss		10		dB
ORL	Output Return Loss		10		dB
P _{1dB}	Output power for 1dB Gain Compression		18		dBm
P _{sat}	Saturated output power		22		dBm
I _{DQ}	Quiescent current on V _d		100		mA
V _D	Supply voltage on V _d	4.5	5	5.5	V
I _D	Drain current @3dB gain compression		125		mA

Temperature Range¹⁾

Ta	Operating Temperature Range	-40 to 85	°C
Tstg	Storage Temperature Range	-55 to 150	°C

Typical Bias Conditions

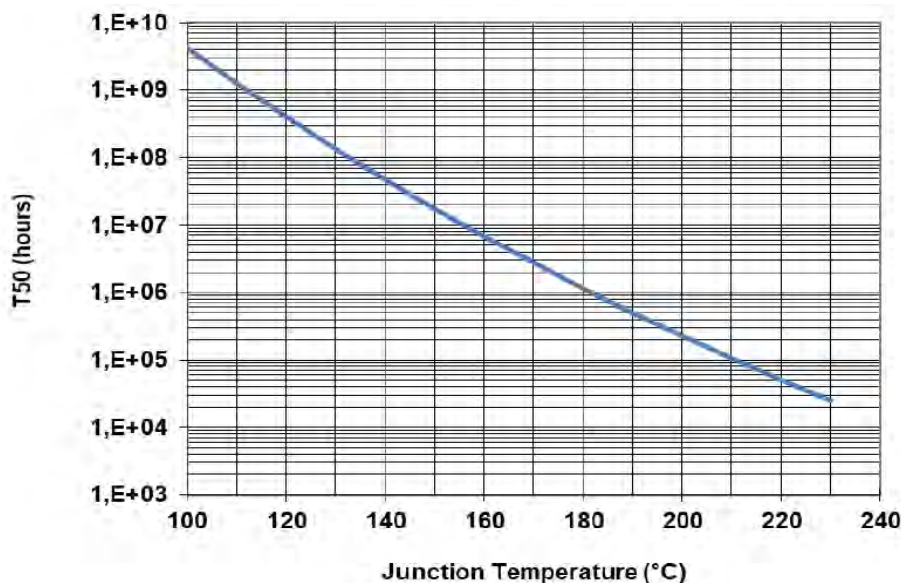
Tamb.= +25° C

Symbol	Pad #	Parameter	Values	Unit
V _{G1}	5	Maximum Gain	-0.3	V
V _{G2}	18	Mean Value to reach I _{DO} = 100mA	1.7	V
V _D	14	Drain Bias Voltage	5	V

Device Thermal Performance

The temperature is monitored at the package back-side interface (Tease). The system maximum temperature must be adjusted in order to guarantee that Tjunction remains below the maximum value specified in the Absolute Maximum Ratings table. So, the system PCB must be designed to comply with this requirement.

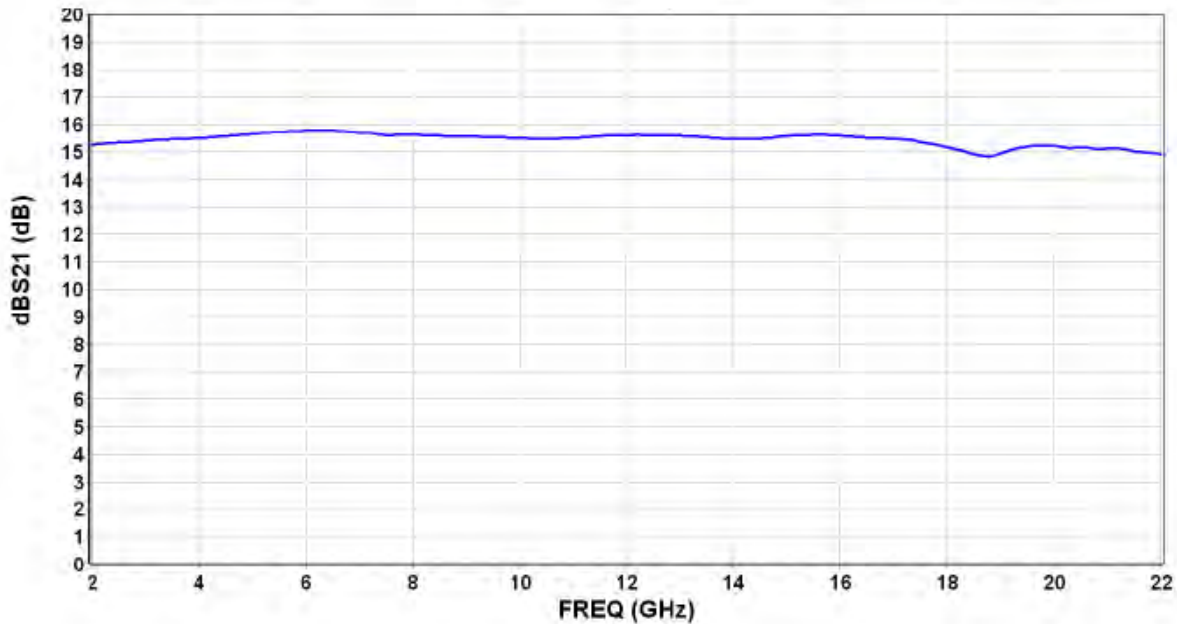
Parameter	Biasing conditions	Tjunction (°C)	RTH (°C/W)	TSO (hours)
R _{TH} ⁽¹⁾ Thermal Resistance (Junction to Case)	V _O = 5V I _O =100mA P _{o1ss} = 0.5W	145	40	3E+07



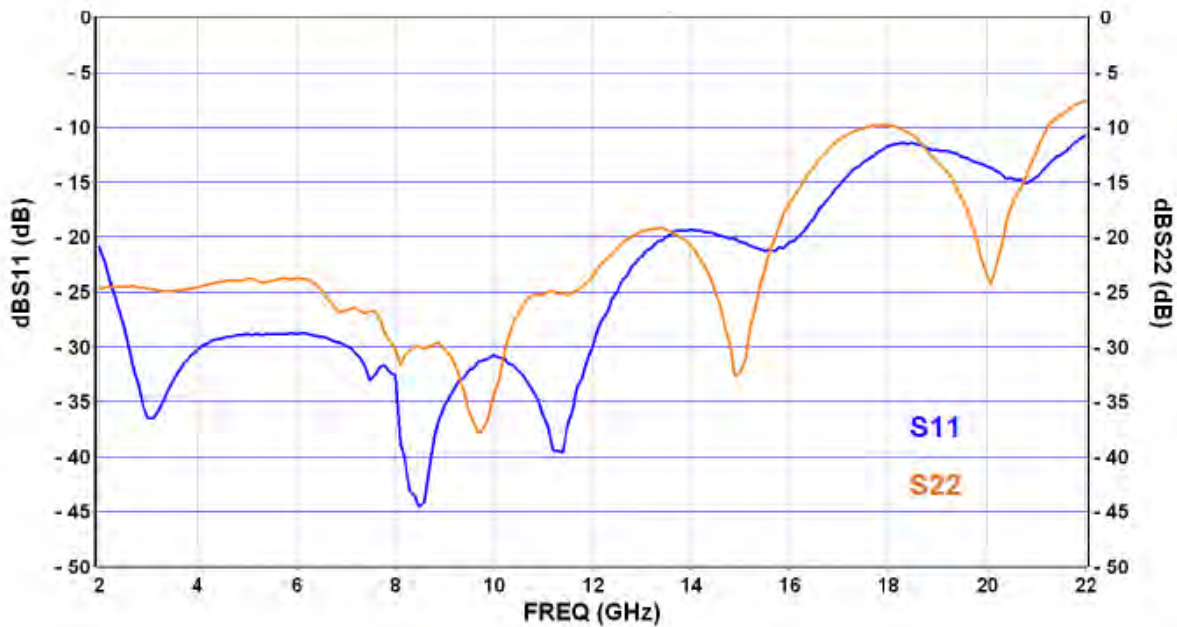
Typical Board Measurements

Tamb.= +25° C Vd=+SV $V_{G2}=1.7V$ V_{G1} set to have $I_{DQ} = 100mA$
Measurements in the package access planes

Linear Gain versus Frequency



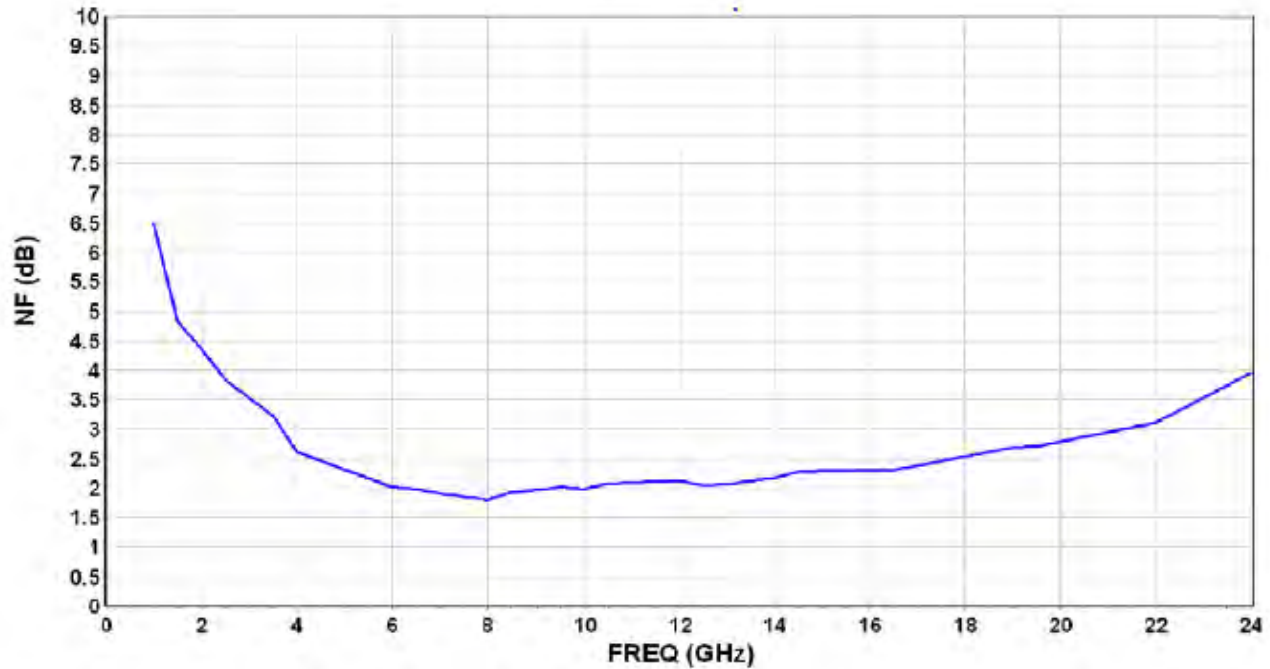
Return Loss Versus Frequency



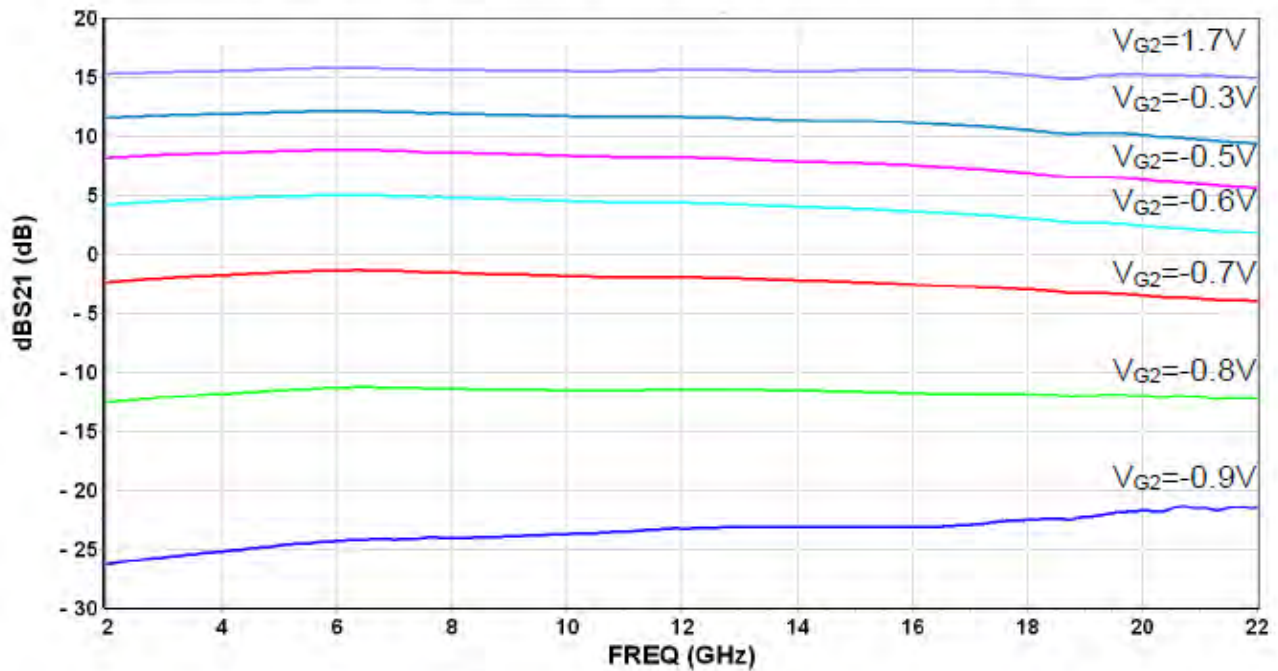
Typical Board Measurements

Tamb.= +25° C Vd=+5V $V_{G2}=1.7V$ V_{G1} set to have $I_{DQ} = 100mA$
Measurements in the package access planes

Noise Figure versus Frequency



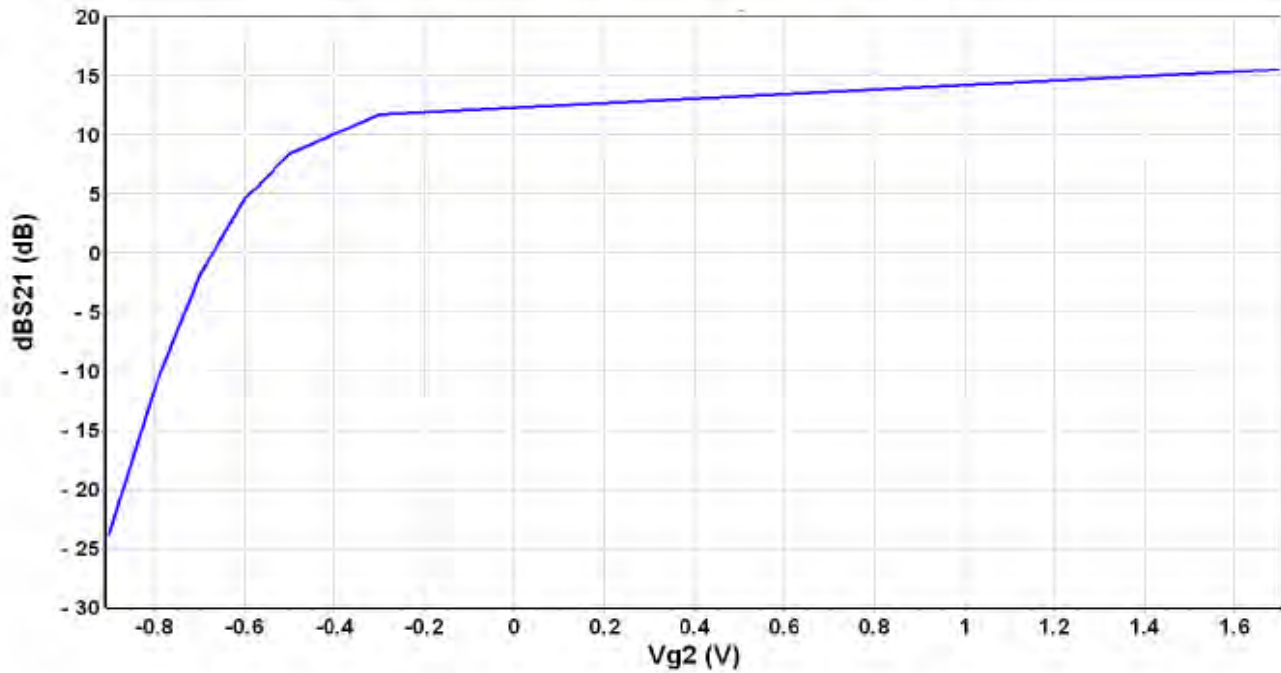
Gain tuning with VG2 at VD=+5V and IDQ=100mA



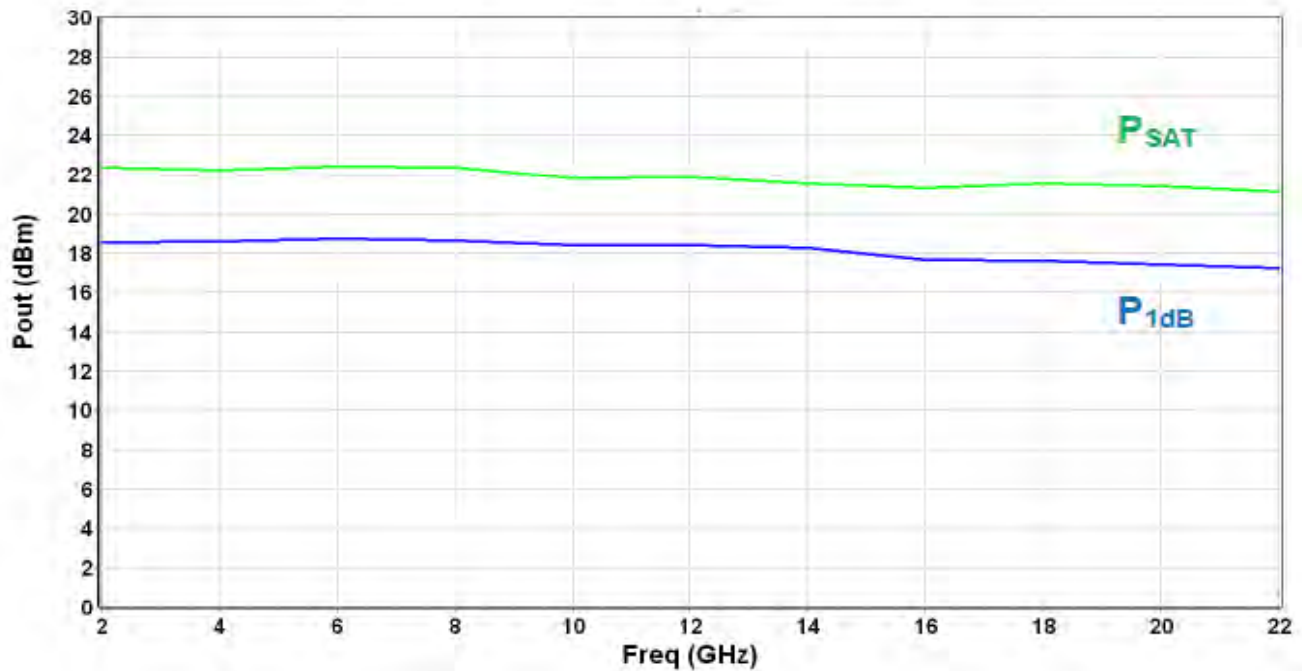
Typical Board Measurements

Tamb.= +25° C Vd=+SV $V_{G2}=1.7V$ V_{G1} set to have $I_{DQ} = 100mA$
Measurements in the package access planes

Linear gain versus V_{G2} control voltage @freq=10GHz



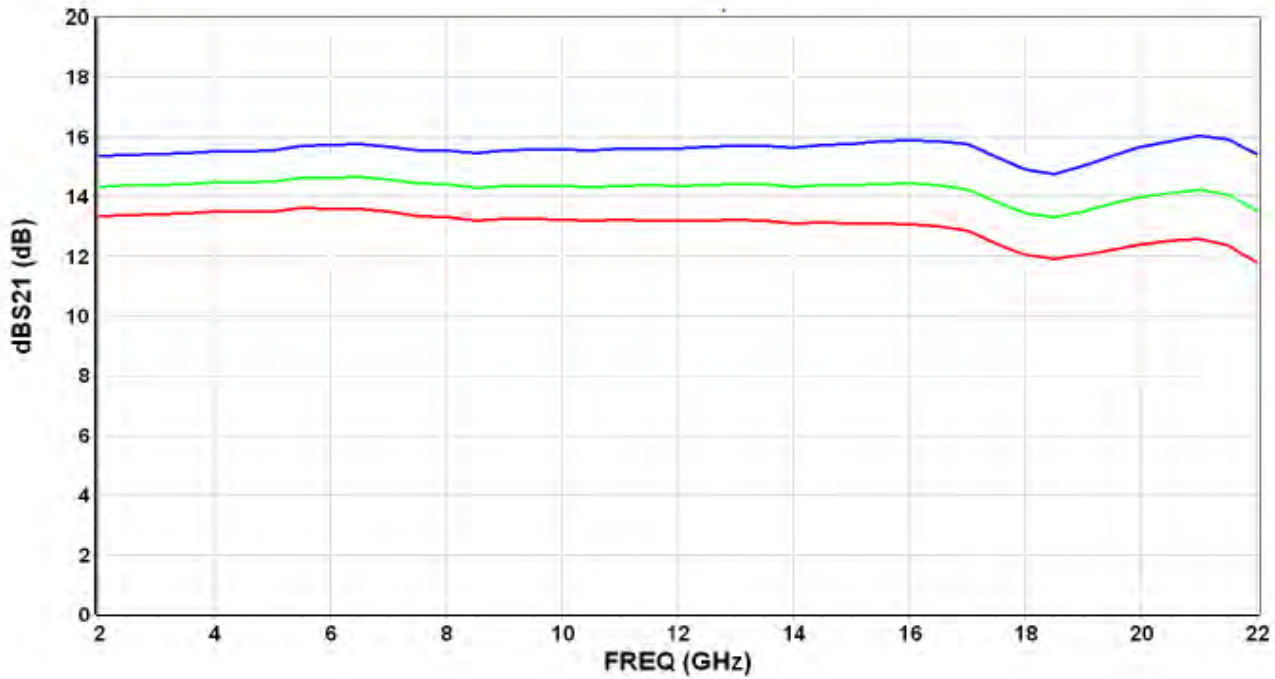
P_{out} compression level versus Frequency



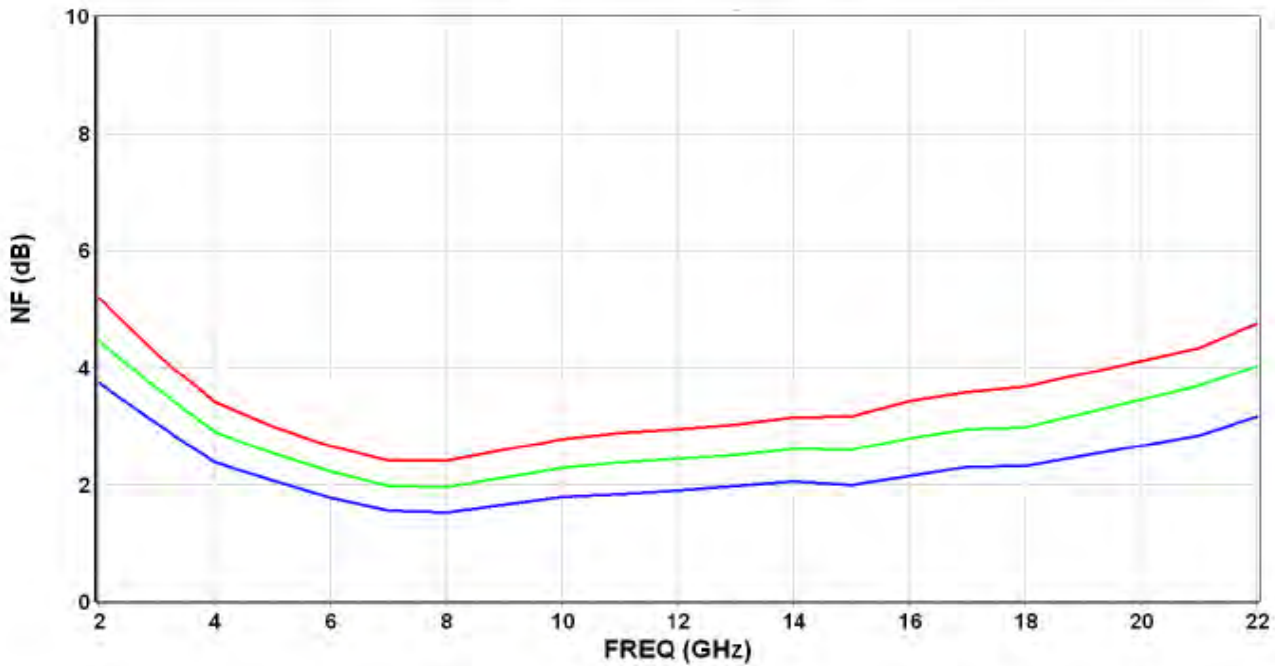
Typical Board Measurements

Tamb.= -40 / +25° / +85C Vd=+SV V_{G2}=1.7V V_{G1} set to have I_{DQ} = 100mA
Measurements in the package access planes

Linear Gain versus Frequency



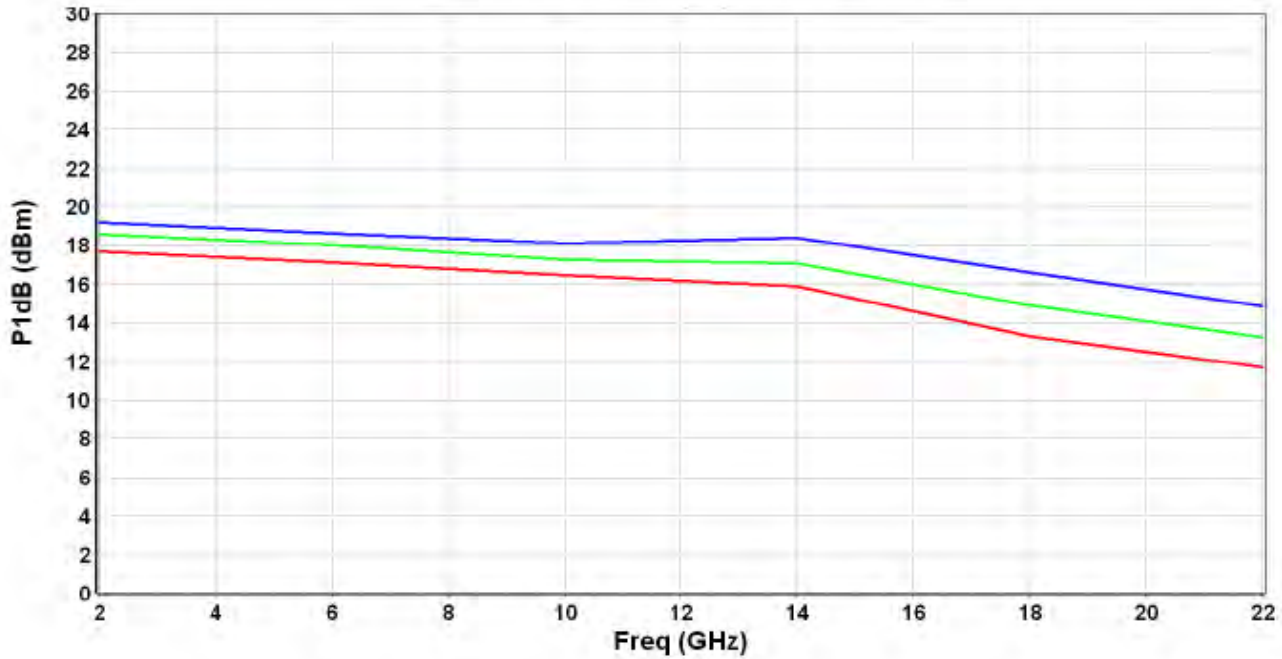
Noise Figure versus Frequency



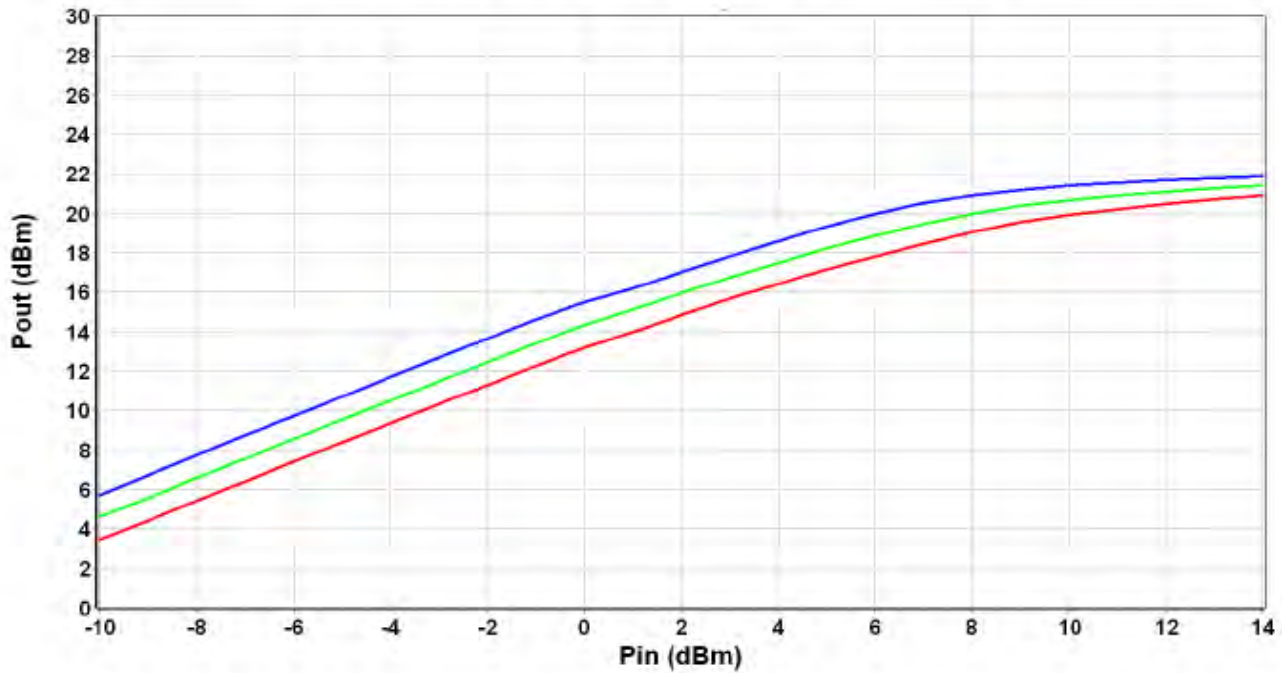
Typical Board Measurements

Tamb.= -40 / +25° / +85C Vd=+SV V_{G2}=1.7V V_{G1} set to have I_{DQ} = 100mA
Measurements in the package access planes

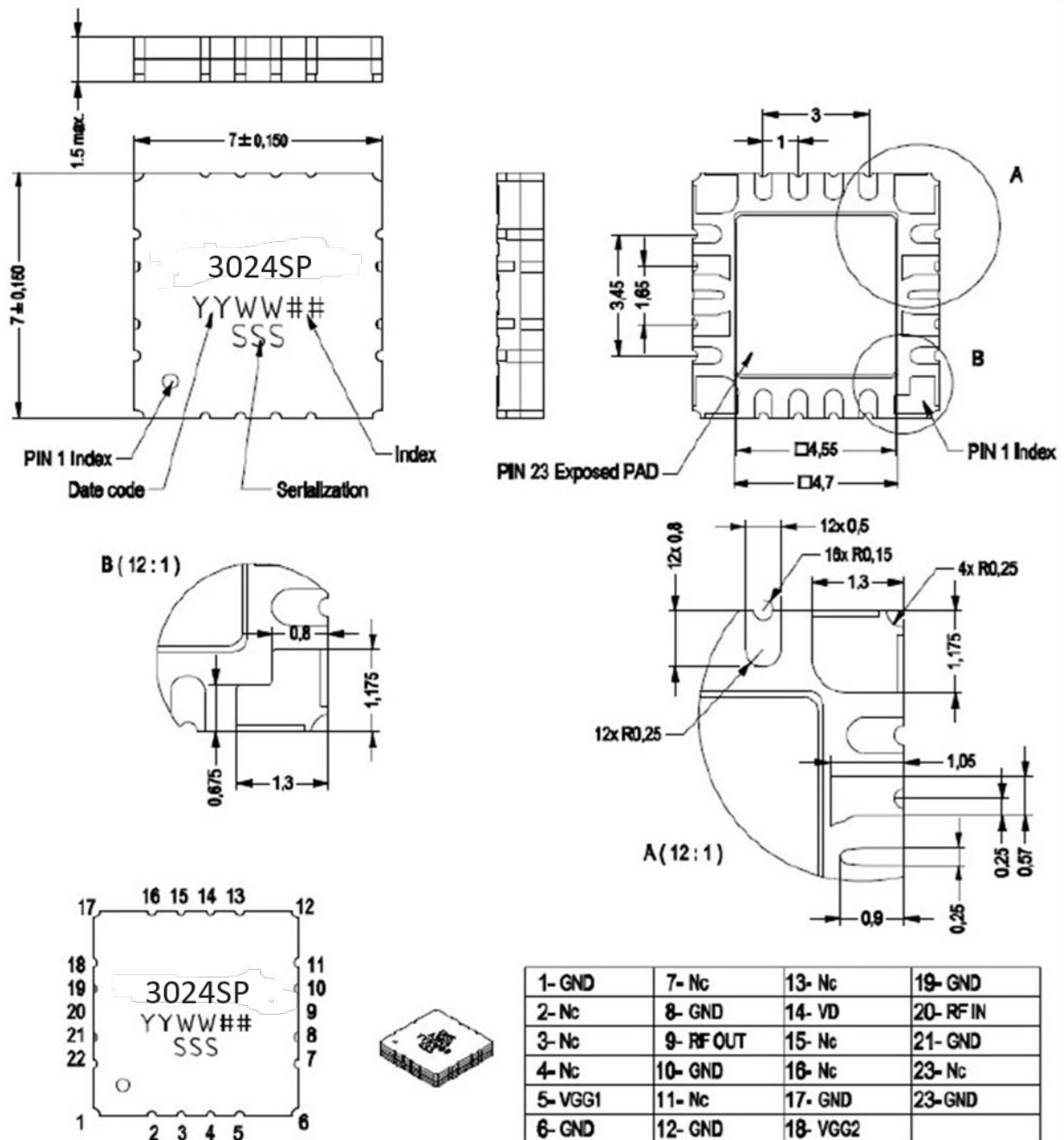
Output power at 1dBc versus frequency



Output power versus Input power @freq=10GHz



Package Outline ¹



All dimensions are in mm

¹ It is strongly recommended to ground all pins marked "Gnd" through the PCB board. Ensure that the PCB board is designed to provide the best possible ground to the package.

Ordering Information

Order Code	Description	Package	Shipping Method
TDLNA3024SP	2 - 22 GHz Low Noise Amplifier	7 x 7 Ceramic QFN	Tray

Revision Information

Document	Description / Date	Change/Revision Details
TDLNA3024SP-04-2024 Rev 0.2	TDLNA3024SP / Mar 2024	Initial Release

Document Categories and :

Advance Information

The product is in a formative or design stage. The data sheet contains design target specifications for product development. Specifications and features may change in any manner without notice.

Preliminary Specification

The data sheet contains preliminary data. Additional data may be added at a later date. Teledyne e2v HiRel Electronics reserves the right to change specifications at any time without notice in order to supply the best possible product.

Product Specification

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Sales Contact

For additional information, Email us at: hirel@teledyne.com website: www.tdehirel.com

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