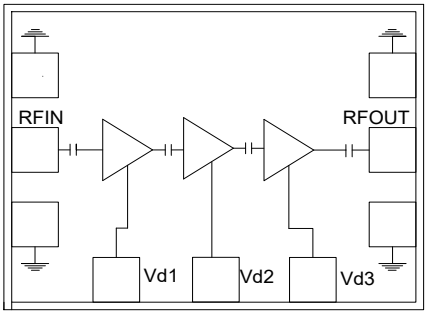
8.0 - 12.0 GHz Low Noise Amplifier

Features

- Frequency Range : 8.0 - 12.0 GHz
- Low Noise Figure < 1.7 dB
- 26 dB Nominal Gain
- 12 dBm P1dB
- High IP3
- Input Return Loss > 10 dB
- Output Return Loss > 10 dB
- ac coupled 50 ohm match (mid-band)
- 0.15 µm InGaAs pHEMT Technology
- Chip dimension: 3.0 x 3.0 x 0.1 mm

Functional Diagram



Typical Applications

- RADAR
- Military
- Test Equipment and sensors
- Point-to-Point Radios, Point-to-Multi-Point Radios & VSATS

Description

The Teledyne e2v TDLNA001013 is a three-stage, ultra-low-noise amplifier that operates from 8.0 - 12.0 GHz. The LNA features 26 dB gain and has a typical mid-band noise figure of 1.35 dB. The LNA has nominal input/output return losses of 10 dB. The nominal P1dB is 12 dBm.

Self-bias technique has been employed to facilitate single-supply operation. Circuit ground is provided through vias to backside die metallization. The TDLNA001013 performs well as a low noise amplifier in receive applications and as a driver or buffer amplifier where high gain, excellent linearity and low power consumption are important.

Absolute Maximum Ratings[1]

Parameter	Absolute Maximum	Units
Drain bias voltage (Vd)	+6	volts
RF input power	+10	dBm
Operating temperature	-50 to +85	^{o}C
Storage Temperature	-65 to +150	^{o}C

1. Operation beyond these limits may cause permanent damage to the component.

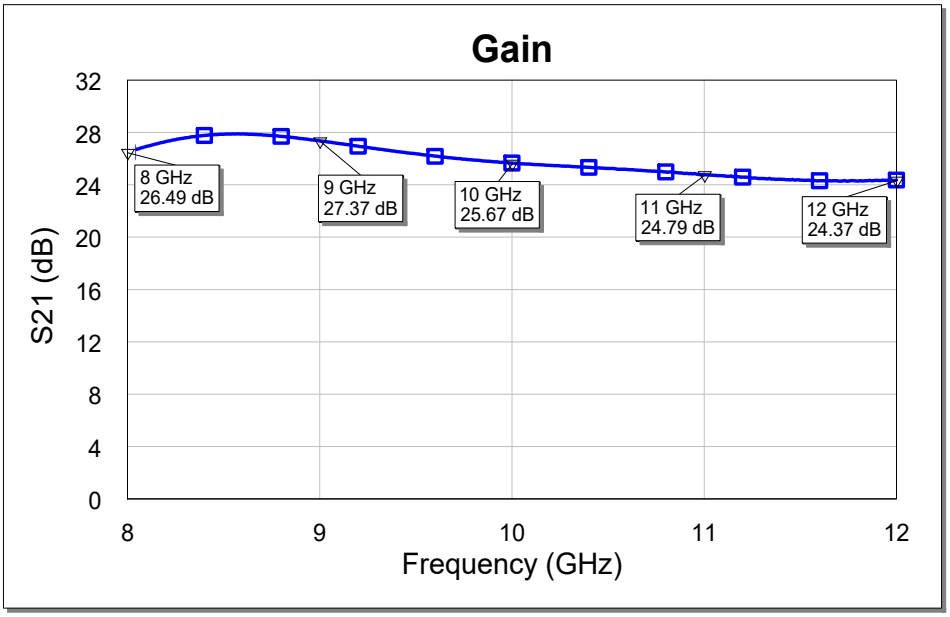
Electrical Specifications for Bare Die @ T_A = 25 °C, Vd1 = Vd2 = 2 V, Vd3= 5 V Z_O = 50 Ω[2]

Parameter	Min	Typ	Max	Units
Frequency Range	8	9.6	12	GHz
Gain	21	26	32	dB
Gain Flatness	4	6	8	dB
Noise Figure (mid-band)		1.4	2.5	dB
Input Return Loss		10		dB
Output Return Loss		10		dB
Output Power (P1dB) @ 9.6 GHz	+10	+12		dBm
Saturated Output Power (Psat) @ 9.6 GHz	+13	+15		dBm
Output Third Order Intercept (IP3) @ 9.6 GHz	23	27	30	dBm
Supply Current (Id) (Vd1 = Vd2 = 2 V, Vd3 = 5 V)	70	80	102	mA

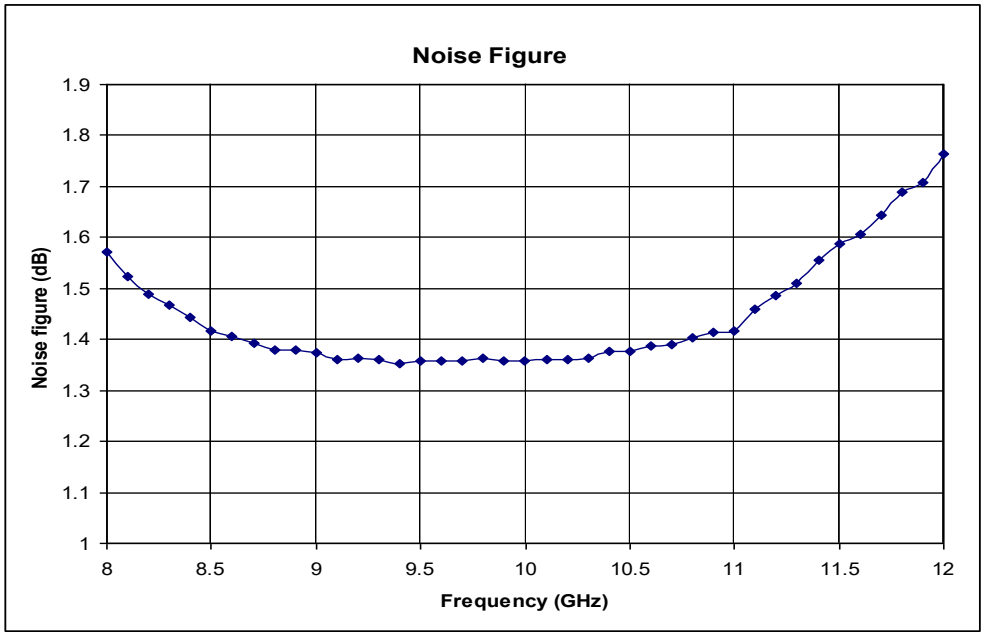
Notes:

2. Electrical performance from test fixture measurements

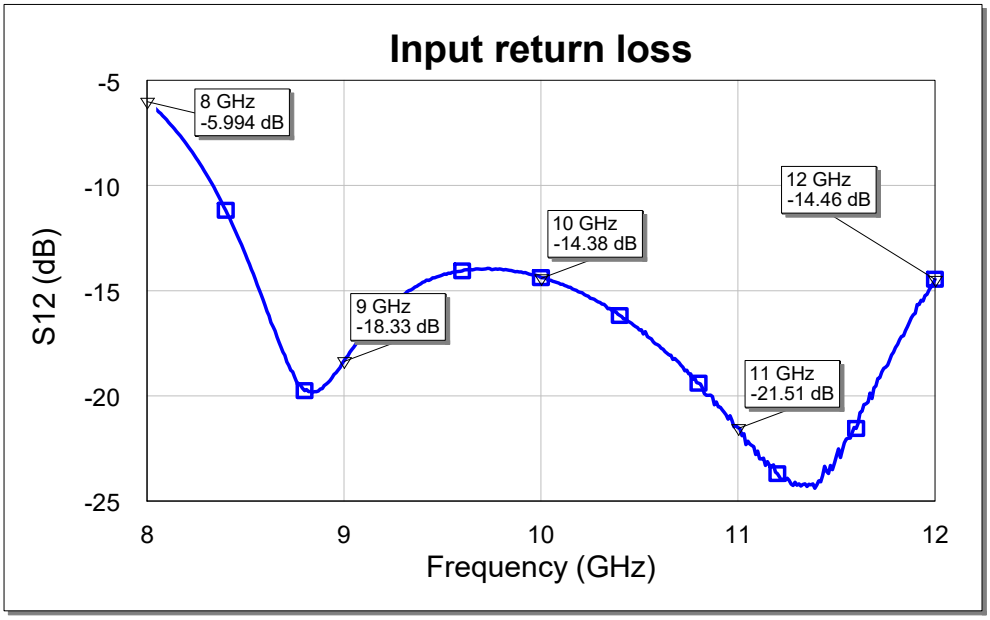
Test fixture data for Bare Die
Vd1 = Vd2 =2 V, Vd3 = 5 V, Total Current = 80 ma, T_A = 25 °C



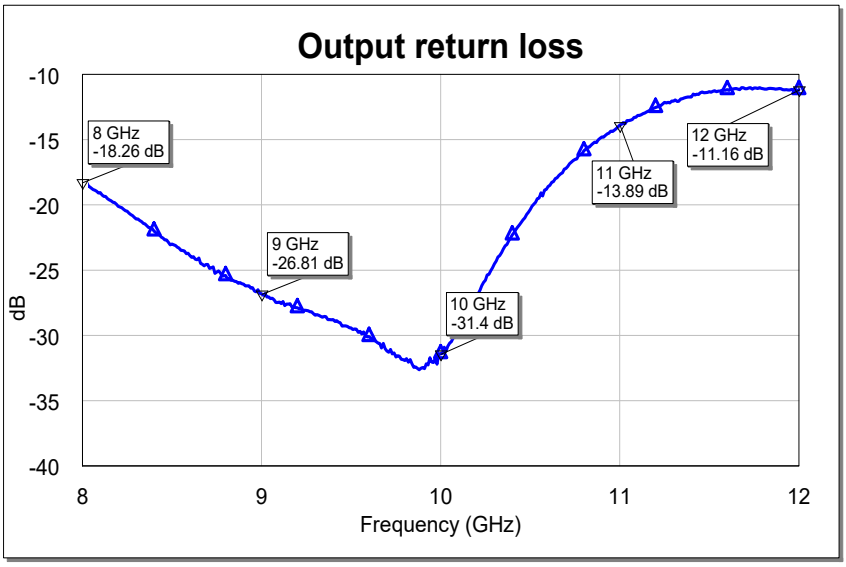
Test fixture data for Bare Die
Vd1=Vd2 = 2 V, Vd3 = 5 V, Total Current = 80 ma, T_A = 25°C



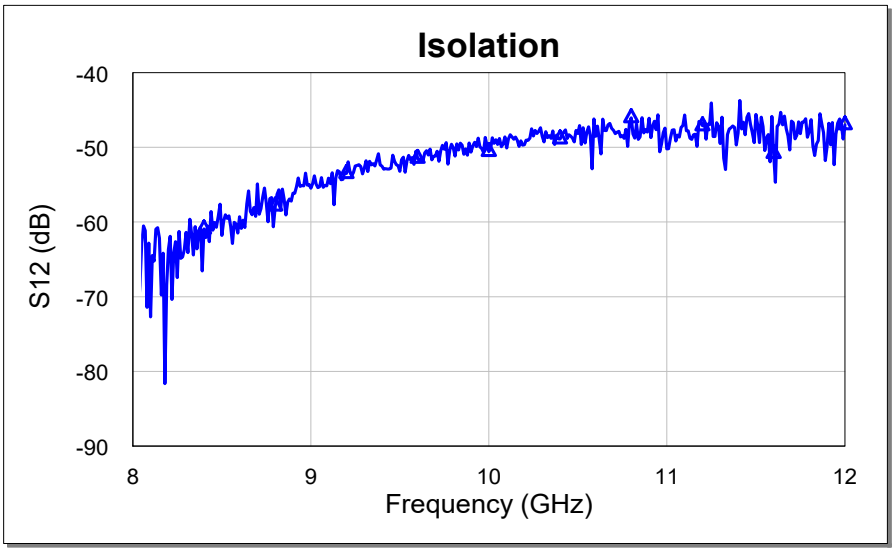
Test fixture data for Bare Die
Vd1 = Vd2 = 2 V, Vd3 = 5 V, Total Current = 80 ma, T_A = 25 °C



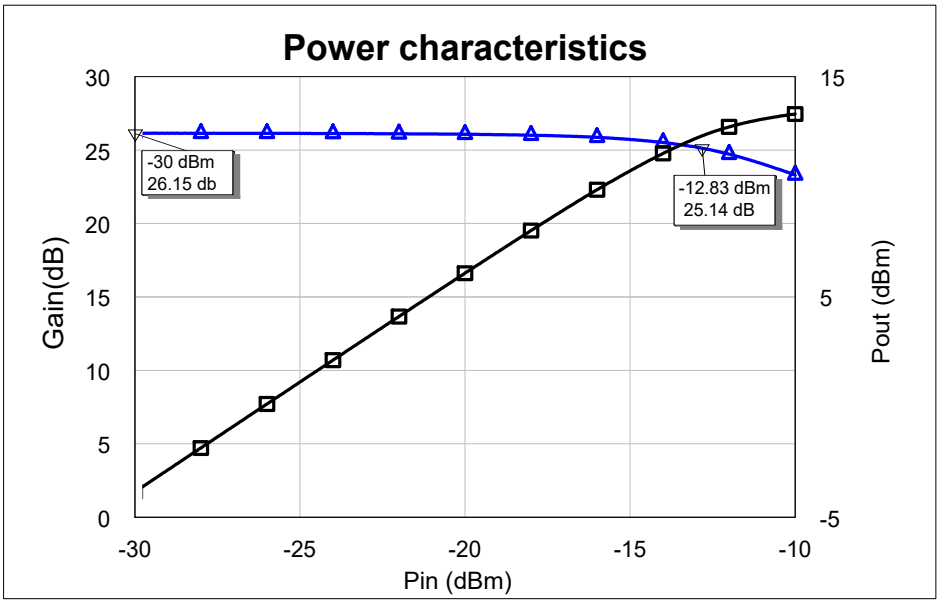
Test fixture data for Bare Die
Vd1 = Vd2 = 2 V, Vd3 = 5 V, Total Current = 80 ma, T_A = 25 °C



Test fixture data for Bare Die
Vd1 = Vd2 = 2 V, Vd3 = 5 V. Total Current = 75 ma, Gain Compression and P1dB measured at 9 GHz, T_A = 25 °C

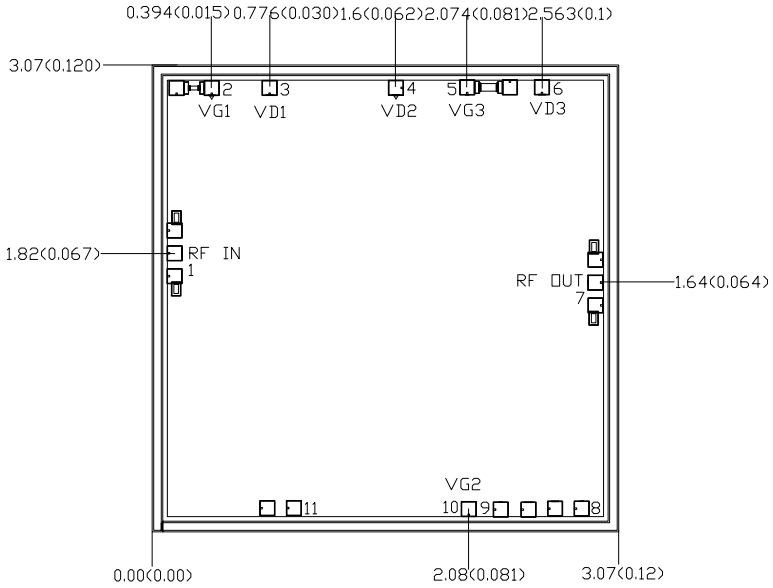


Test fixture data for Bare Die
Vd1 = Vd2 = 2 V, Vd3 = 5 V, Frequency = 9.6 GHz Total Current =75 ma, T_A = 25 °C



Pout at 1 dB compression @ 9.6 GHz = 12 dBm

Mechanical Characteristics



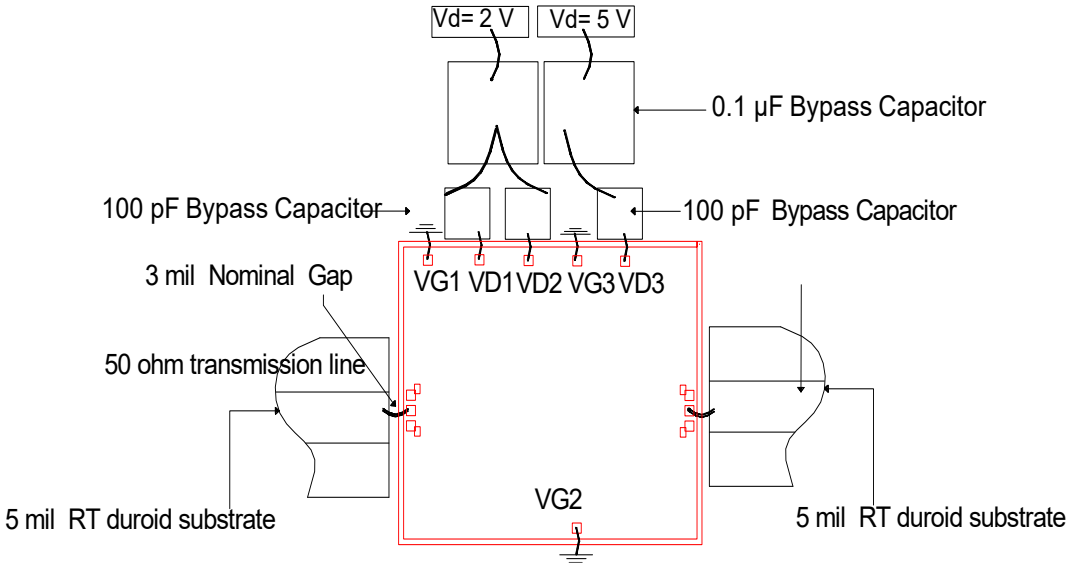
Units: Millimeters [Inches]

All RF and dc bond pads are 100 µm x 100 µm

Note:

Pad 1 : RF in
Pad 2 : VG1 (Source grounding)
Pad 3 : VD1 (Drain bias)
Pad 4 : VD2 (Drain Bias)
Pad 5 : VG3 (Source grounding)
Pad 6 : VD3 (Drain Bias)
Pad 7 : RF out
Pad 10 : VG2 (Source grounding)

Recommended Assembly Diagram



Notes:

1. Two 1 mil (0.0254 mm) bond wires of minimum length should be used for RF input and output.
2. Two 1 mil (0.0254 mm) bond wires of minimum length should be used from chip bond pad to 100 pF capacitor.
3. Input and output 50 ohm lines are on 5 mil substrate.
4. 0.1 µF capacitors may be additionally used as a second level of bypass for reliable operation.

Die attach: Use AuSn (80/20) 1-2 mil. Preform solder.

Wire bonding: For dc pad connections use either ball or wedge bonds. For best RF performance, use of 150 - 200 µm length of wedge bonds is advised. Ball bonds are acceptable, but may reduce RF performance.

GaAs MMIC devices are susceptible to Electrostatic discharge. Proper precautions should be observed during handling, assembly & testing

Ordering Information

Order Code	Description	Package	Shipping Method
TDLNA001013-98	TDLNA001013 EM / Evaluation die	Bare Die	Gel-Pack
TDLNA001013-99	TDLNA001013 FM / Flight die	Bare Die	Gel-Pack
TDLNA001013-00	TDLNA001013 Evaluation kit	Module	1 / Box

Document Revision History

Documnt Number	Description	Date
TDLNA001013 11_30_2021 Rev1	Initial Release	11/30/2021
TDLNA001013 11_27_2023 Rev2	Updated Ordering Information and revised accordingly	12/07/2023

Document Category Definitions:

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
The data sheet contains final data. In the event Teledyne e2v HiRel Electronics decides to change the specifications, Teledyne e2v HiRel Electronics will notify customers of the intended changes by issuing a CNF (Customer Notification Form).

Sales Contact
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