TDLNA2626SEP

17 – 23 GHz Low Noise Amplifier

Product Overview

Teledyne e2v HiRel's TDLNA2626SEP is a packaged high-performance, low noise MMIC amplifier fabricated on a 90 nm pHEMT process. Covering 17 – 23 GHz, the TDLNA2626SEP provides 25 dB small signal gain and P1dB of 20 dBm, while supporting a noise figure of 1.3 dB and IM3 levels of −55 dBc (at Pout=0 dBm/ tone).

Packaged in a small 4 mm x 4 mm plastic overmold QFN, the TDLNA2626SEP is matched to 50 ohms with integrated DC blocking caps on both I/O ports for easy handling and simple system integration.

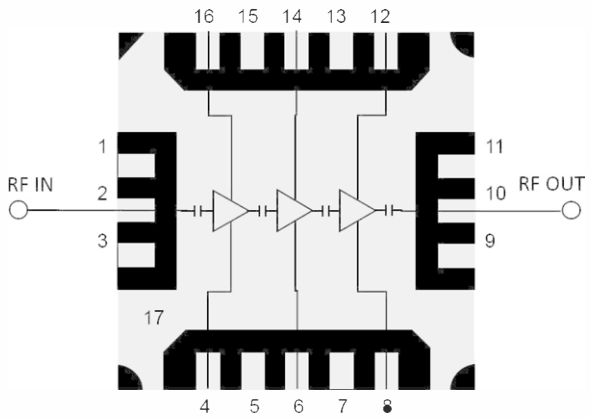
The high performance of the TDLNA2626SEP makes it ideal for satellite and millitary point to point communication systems.

Lead-free and RoHS compliant.

Features

- Frequency Range: 17 – 23 GHz
- Noise Figure: 1.3 dB (typical)
- Small Signal Gain: 25 dB (typical)
- P1dB: 20 dBm (typical)
- IM3: -55 dBc (typical) (Pout=0 dBm/tone)
- Bias: VD = 3.5 V, IDQ = 90 mA, VG = −0.46 V (typical)
- Plastic Overmolded Package
- Package Dimensions: 4.0 x 4.0 x 0.85 mm

Functional Block Diagram



Space Enhanced Product (SEP) Qualification

- Long term availability – 10 years+
- Extended temperatures
  - Cold temperature down to -55 °C
  - Hot temperatures up to +125 °C
- Baseline control
- Guaranteed traceability throughout the process
  - Product repeatability
- Full qualification over specified temperature range
- Extended Change Notification
- Customized ordering options
- Standard Teledyne part number

A Teledyne Defense Electronics Company

TELEDYNE e2v HIREL ELECTRONICS Everywhereyoulook™

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage (V_D)	4.5 V
Drain Current ($I_{D1}/I_{D2}/I_{D3}$)	45/45/160 mA
Gate Voltage Range (V_G)	−1.3 V to 0 V
Gate Current ($I_{G1}/I_{G2}/I_{G3}$ at 125 °C)	5.0/5.0/6.6 mA
RF Input Power (50 Ω, 85 °C)	20 dBm
Channel Temperature, T_{CH}	175 °C
Mounting Temperature (30 seconds)	260 °C
Storage Temperature	−55 to 150 °C

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Recommended Operating Conditions

Parameter	Typ	Units
Drain Voltage	3.5 V	V
Drain Current (quiescent, I_{DQ})	90 mA	mA
Drain Current (I_D, Low noise / P_{SAT})	90 / 175 mA	mA
Gate Voltage (typical)	−0.46 V	V
Operating Temperature Range	−55 to 125	°C

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

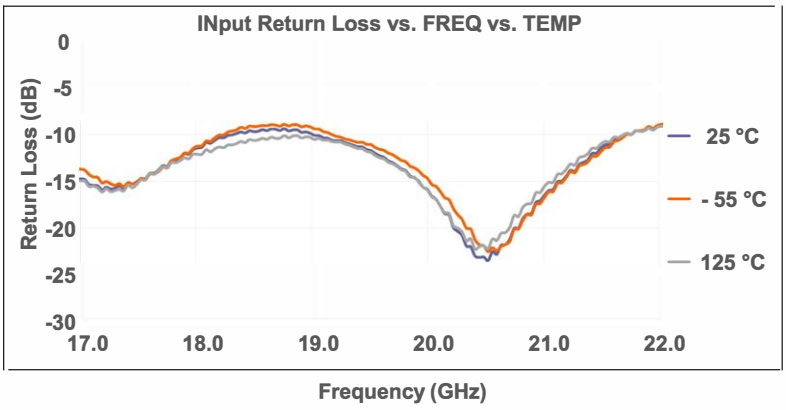
Electrical Specifications

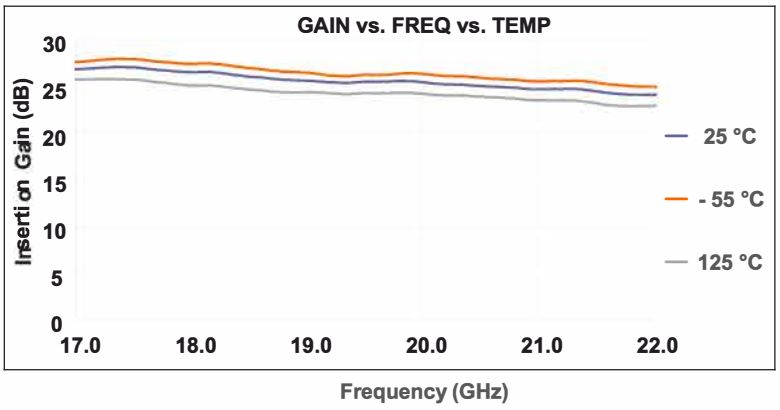
Test conditions unless otherwise noted: V_D = +3.5V, I_{DQ} = 90 mA, Temp. = +25 °C unless otherwise indicated. Data de-embedded to device reference plane.

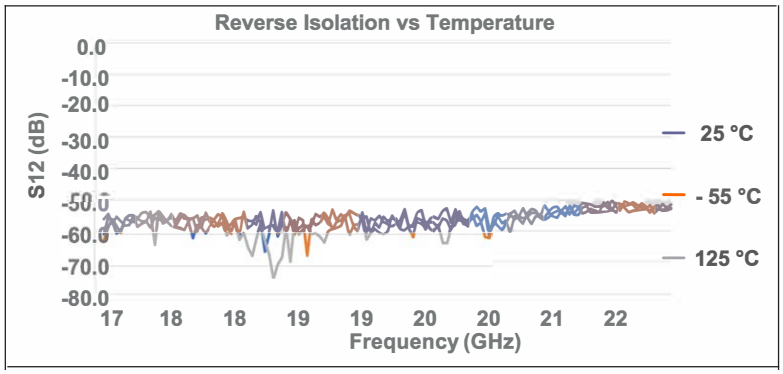
Parameter	Min	Typical	Max	Units
Frequency	17		23	GHz
Small Signal Gain	20	25		dB
Noise Figure		1.3		dB
1-dB Compression Point		20		dBm
Input Return Loss		12		dB
Output Return Loss		17		dB
3RD Order Intermodulation level (Pout=0 dBm/tone)		−55		dBc
Output TOI (Pout=0 dBm/tone)		28		dBm
Gain Temperature Coefficient		−0.013		dB/°C

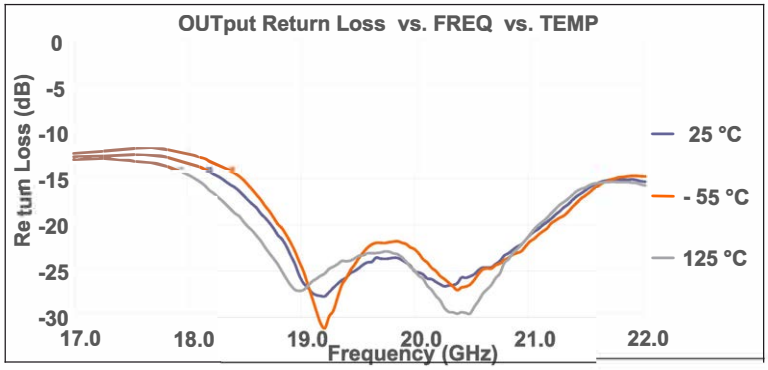
Small Signal Performance Plots

Test conditions unless otherwise noted: V_D = +3.5V, I_{DQ} = 90 mA, Temp. = +25 °C unless otherwise indicated.
Data de-embedded to device reference plane.



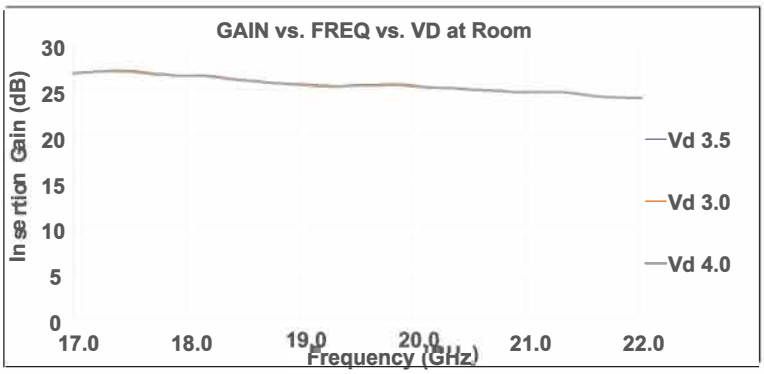


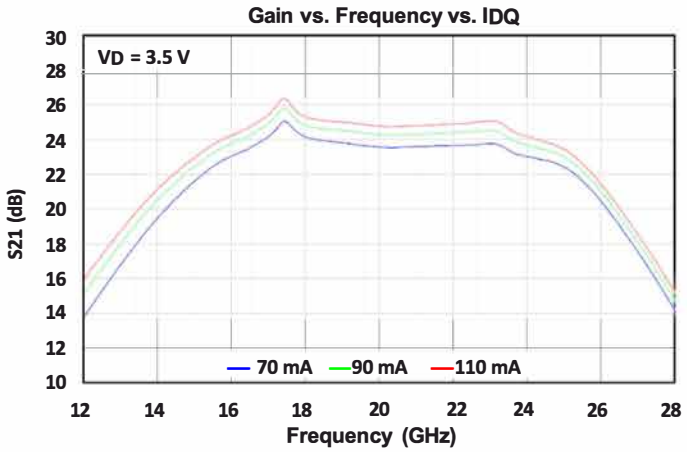


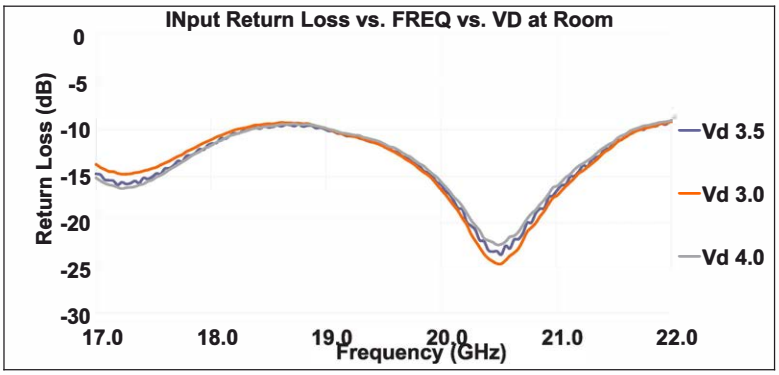


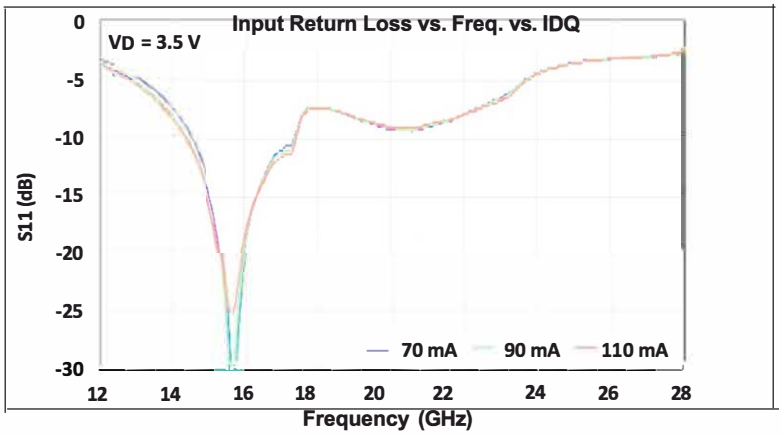
Small Signal Performance Plots

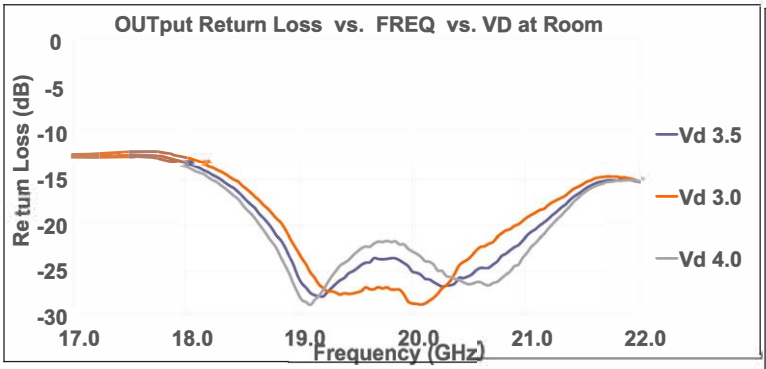
Test conditions unless otherwise noted: V_D = +3.5V, I_{DQ} = 90 mA, Temp. = +25 °C unless otherwise indicated. Data de-embedded to device reference plane.

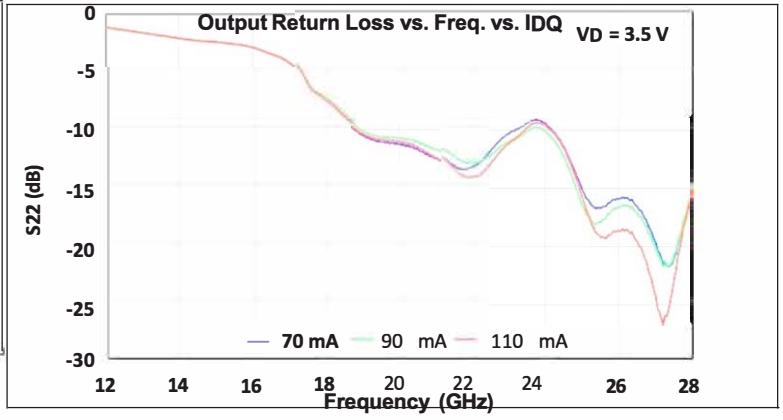






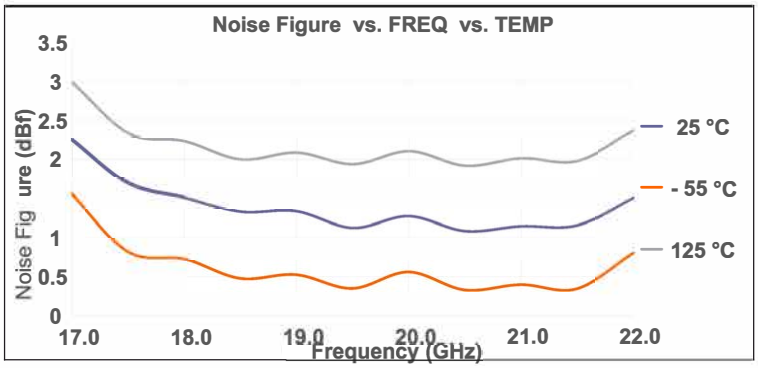


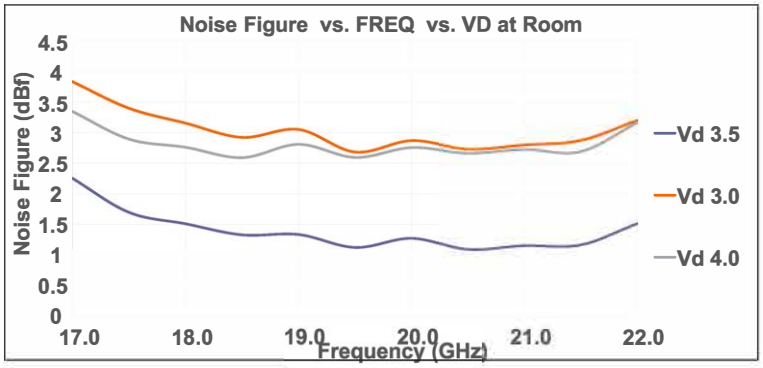


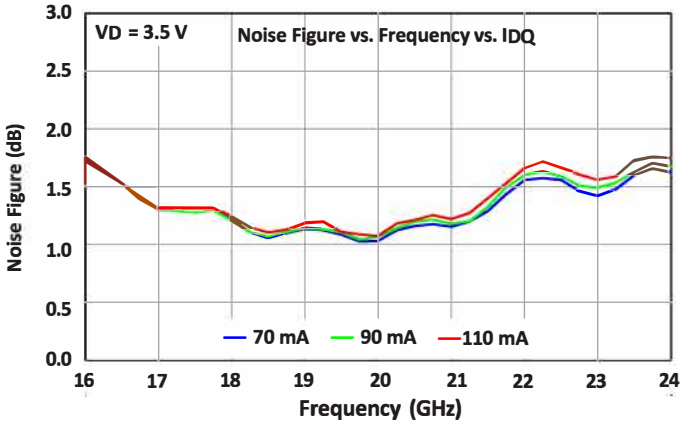


Noise Figure Performance Plots

Test conditions unless otherwise noted: V_D = +3.5V, I_{DQ} = 90 mA, Temp. = +25 °C unless otherwise indicated. Data de-embedded to device reference plane.

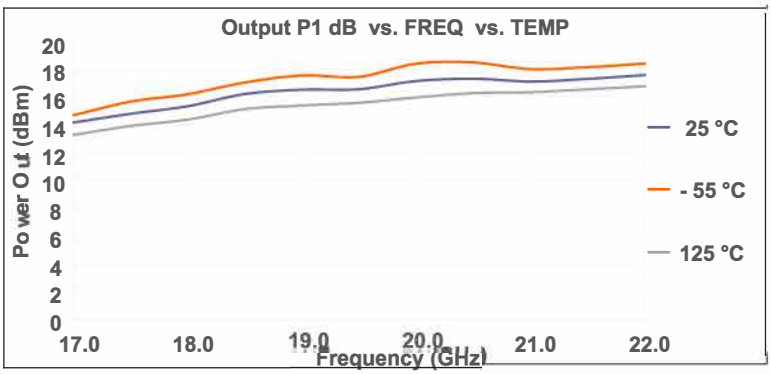


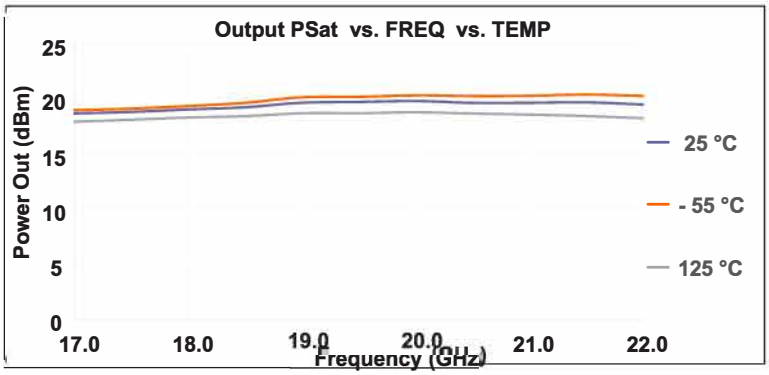


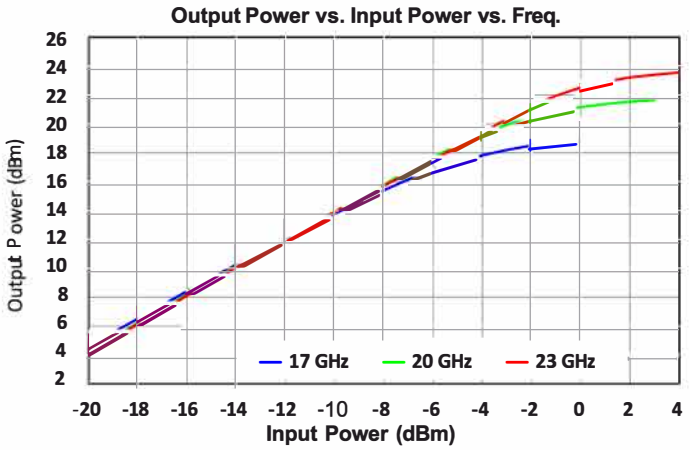


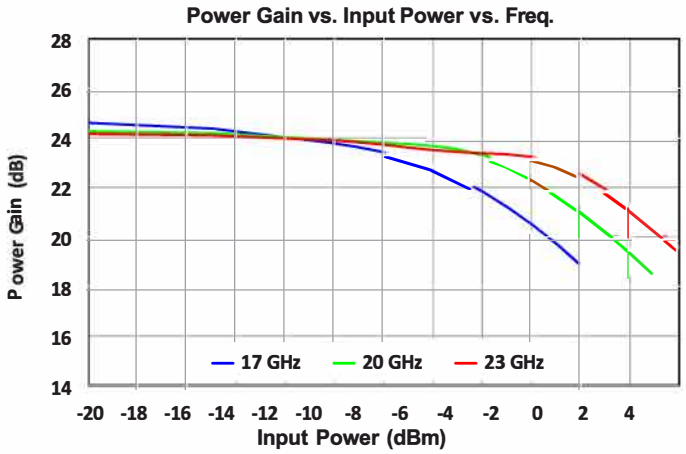
Large Signal Performance Plots

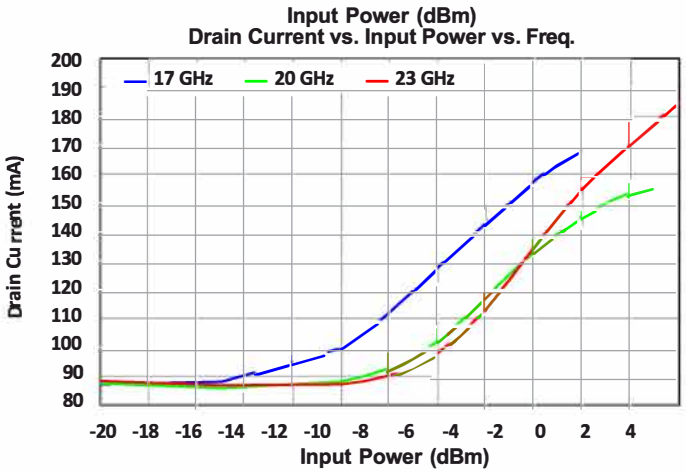
Test conditions unless otherwise noted: V_D = +3.5V, I_{DQ} = 90 mA, Temp. = +25 °C unless otherwise indicated. Data de-embedded to device reference plane.





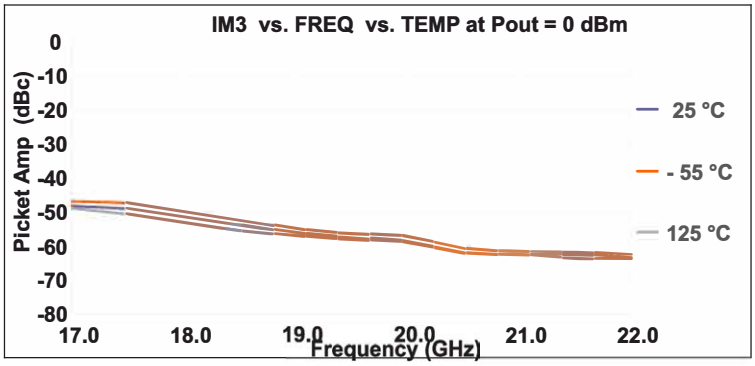


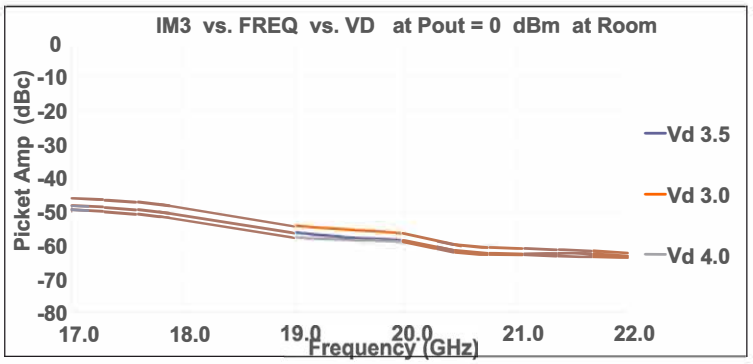


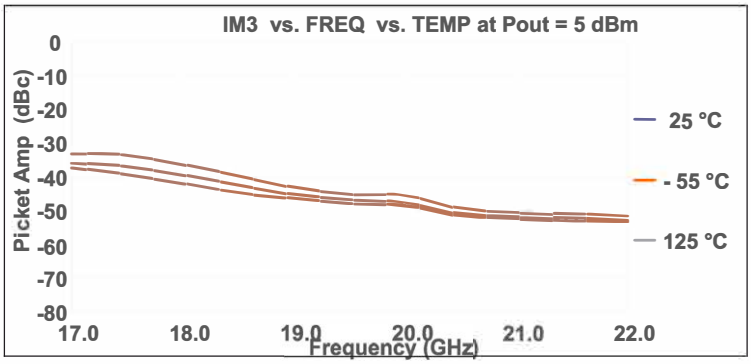


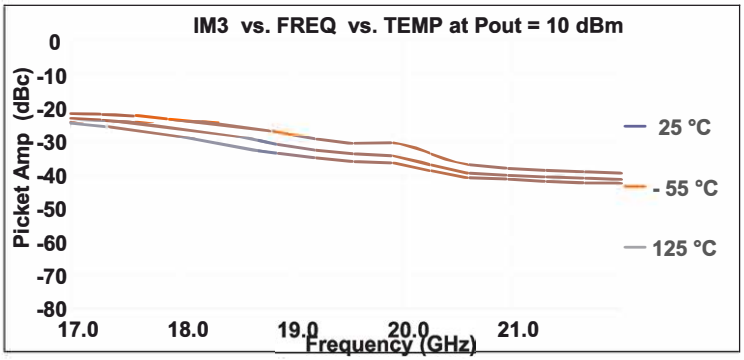
Linearity Performance Plots

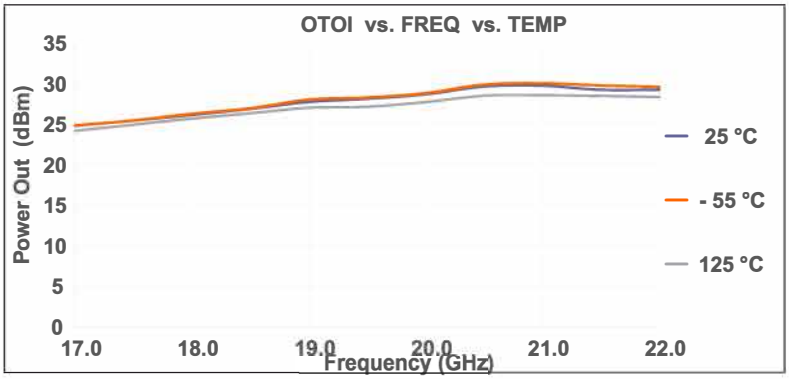
Test conditions unless otherwise noted: V_D = +3.5V, I_{DQ} = 90 mA, Temp. = +25 °C unless otherwise indicated. Data de-embedded to device reference plane.



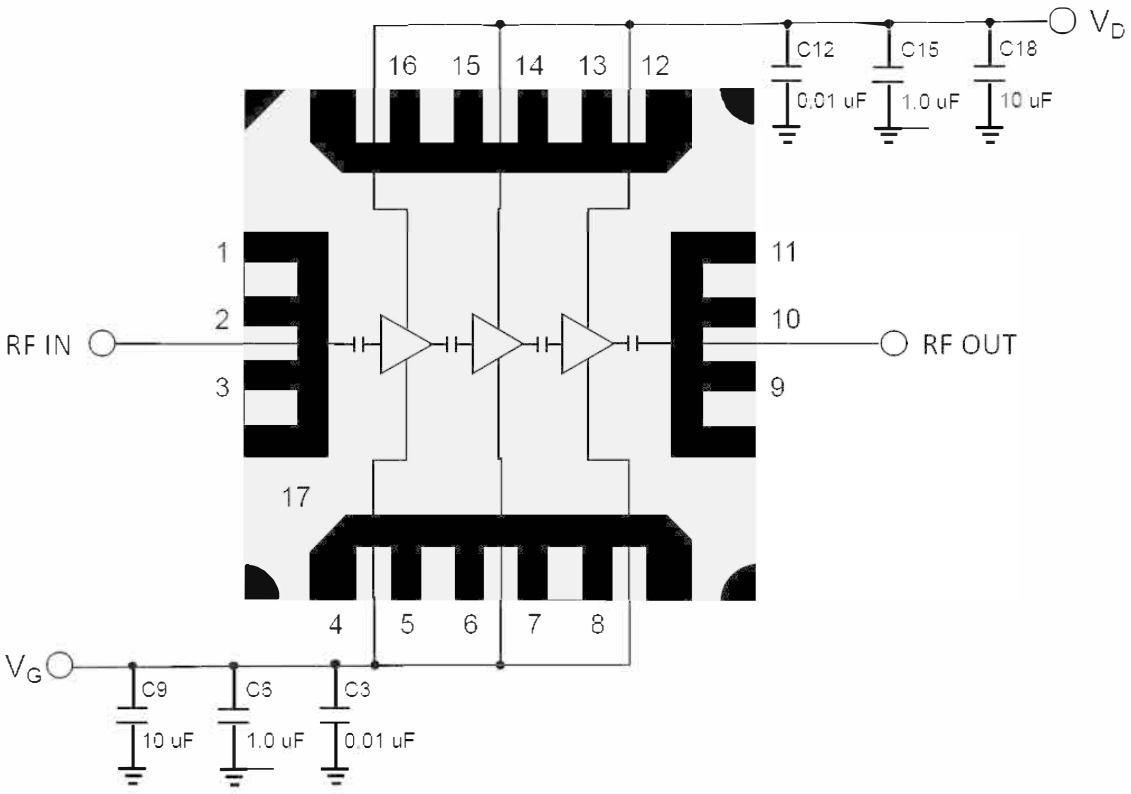






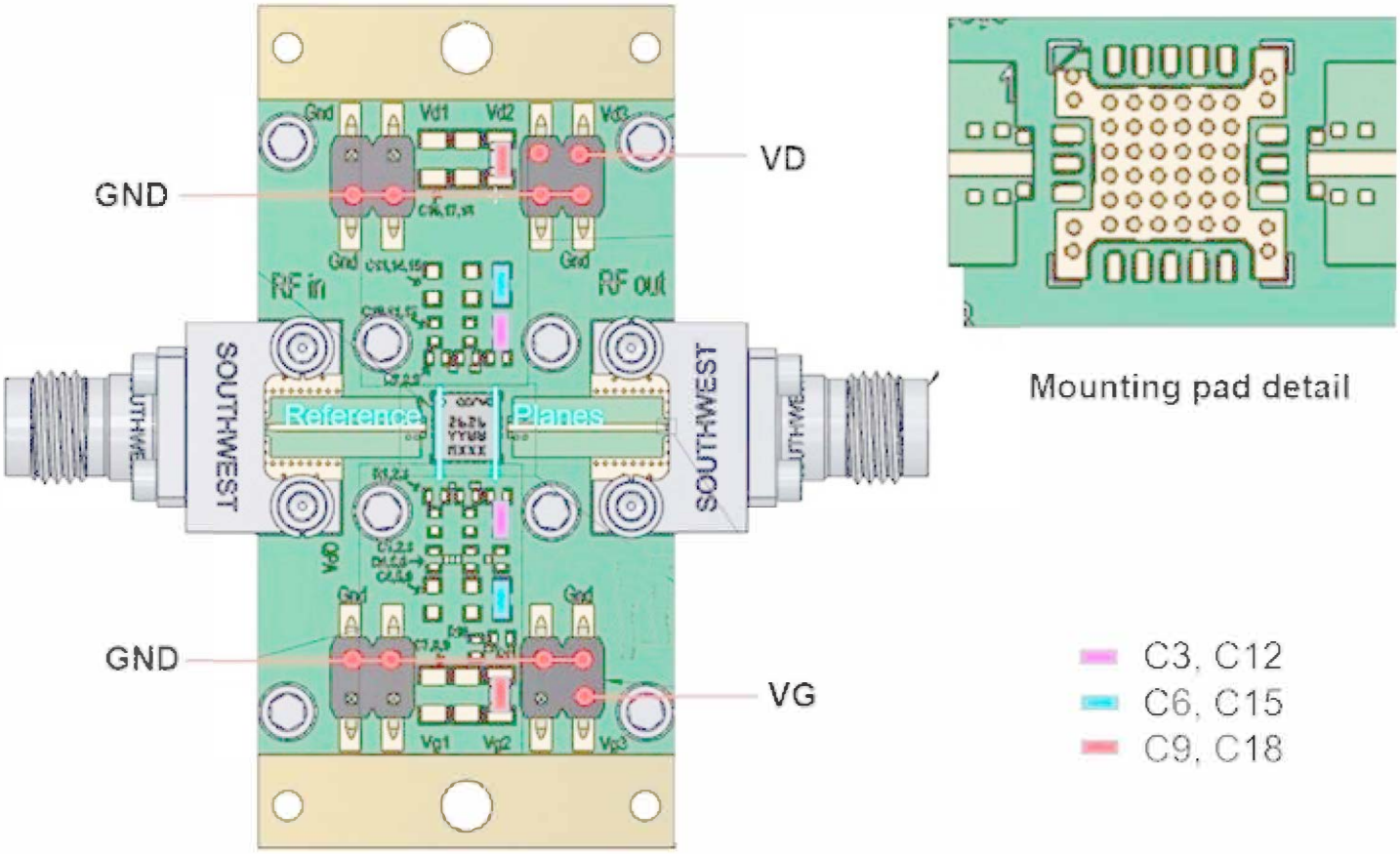


Application Circuit



Bias-up Procedure	Bias-down Procedure
1. Set I_D limit to 220 mA, I_G limit to 10 mA	1. Turn off RF signal
2. Set V_G to −1.5 V	2. Reduce V_G to −1.5 V. Ensure $I_{DQ} \approx 0$ mA
3. Set V_D +3.5 V	3. Set V_D to 0 V
4. Adjust V_G more positive until I_{DQ} = 90 mA ($V_G \approx -0.46$ V Typical)	4. Turn off V_D supply
5. Apply RF signal	5. Turn off V_G supply

Evaluation Board and Mounting Detail



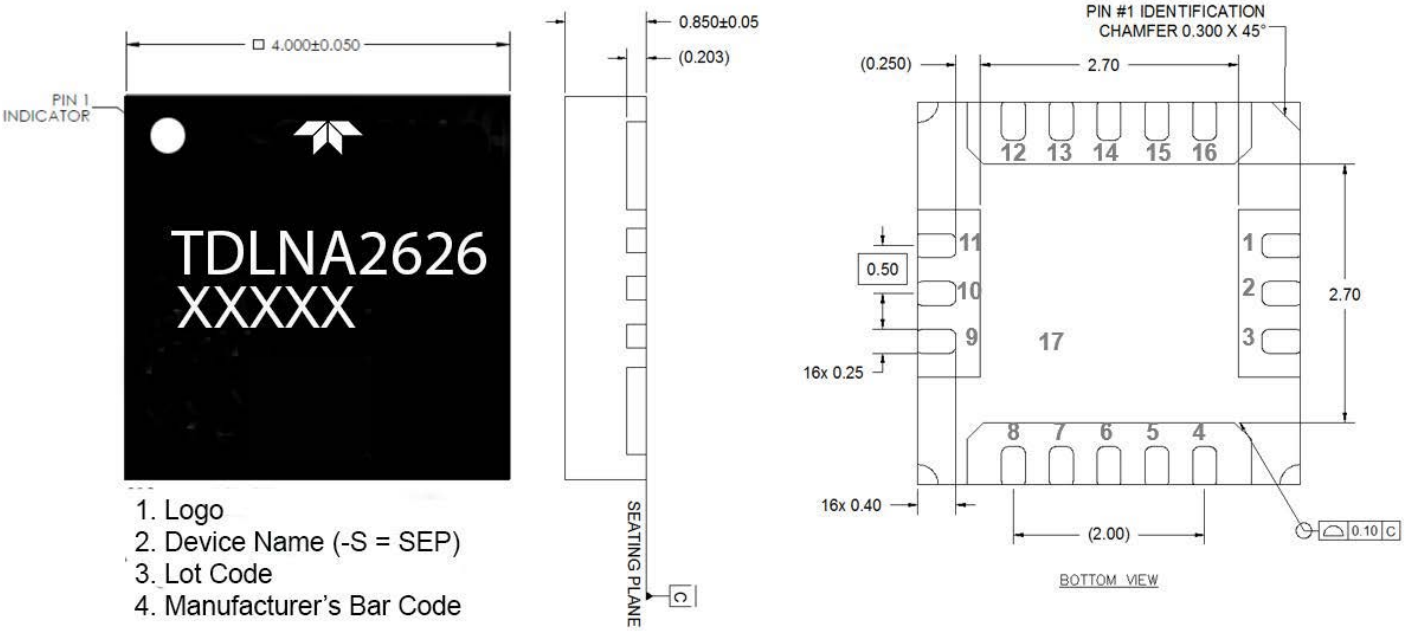
RF Layer is 0.008" thick Rogers Corp. RO4003C (ε_r = 3.35). Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1492-04A-5.

All data de-embedded to the device reference plane (shown).

Bill of Materials

Ref. Des.	Value	Description	Manuf.	Part Number
C3, C12	0.01 µF	CAP 0.01 µF +/-10% 50 V 0402 X7R ROHS	Various	
C6, C15	1.0 µF	CAP 1.0 µF +/-10% 16 V 0603 X7R ROHS	Various	
C9, C18	10 µF	CAP CER 10 µF 10 V X7R 10% 0805 TDK ROHS	Various	
RF IN, RF OUT	2.40 mm	2.40 mm END LAUNCH CONNECTOR	Southwest Microwave	1492-04A-5

Mechanical Drawing & Pad Descriptionl



Dimensions in mm, package is mold encapsulated with NiPdAu plated leads

Part Marking: TDLNA2626, Lot Code/Lot Number: XXXXX. Note: -S will be appended to the part number for the SEP screening option (space screening option).

Pin Number	Label	Description
1, 3, 9, 11, 17 (slug)	GND	GROUND
2	RF Input	Matched to 50 ohms, DC blocked
4	VG1	Gate Voltage; bias network is required (V_G can be tied together at PCB)
6	VG2	Gate Voltage; bias network is required (V_G can be tied together at PCB)
8	VG3	Gate Voltage; bias network is required (V_G can be tied together at PCB)
10	RF Output	Matched to 50 ohms, DC blocked
12	VD3	Drain Voltage; bias network is required (V_D can be tied together at PCB)
14	VD2	Drain Voltage; bias network is required (V_D can be tied together at PCB)
16	VD1	Drain Voltage; bias network is required (V_D can be tied together at PCB)
5, 7, 13, 15	N/C	No internal connection. Recommend to GND at the PCB level

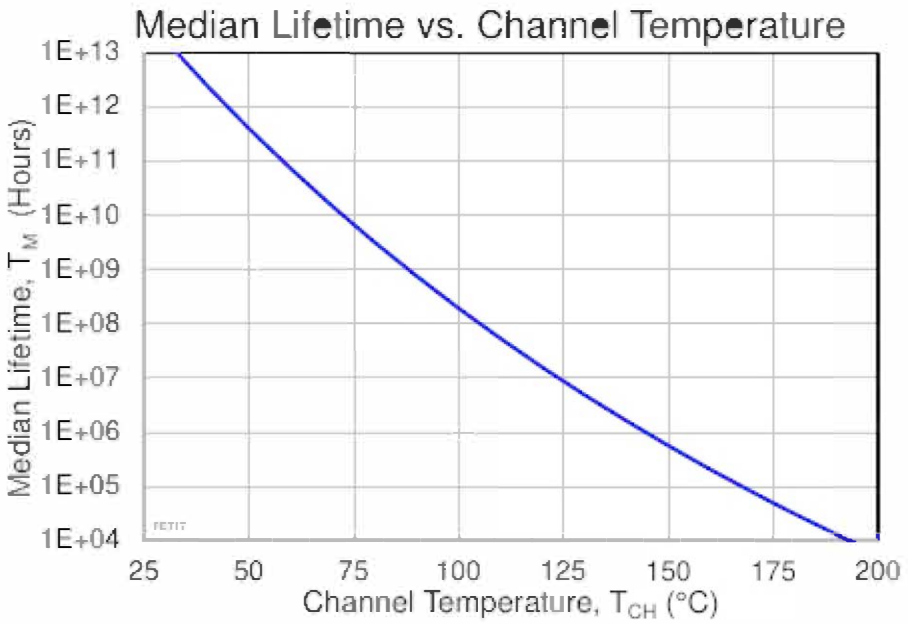
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	T_{base} = 85°C, V_D = 3.5 V, I_{DQ} = 90 mA Quiescent/Small Signal operation P_{DISS} = 0.315 W	65.1	°C/W
Channel Temperature (T_{CH})		105.5	°C
Median Lifetime (T_M)		1.236E08	Hrs

Notes:
1. Thermal resistance is measured to back of the package.

Median Lifetime

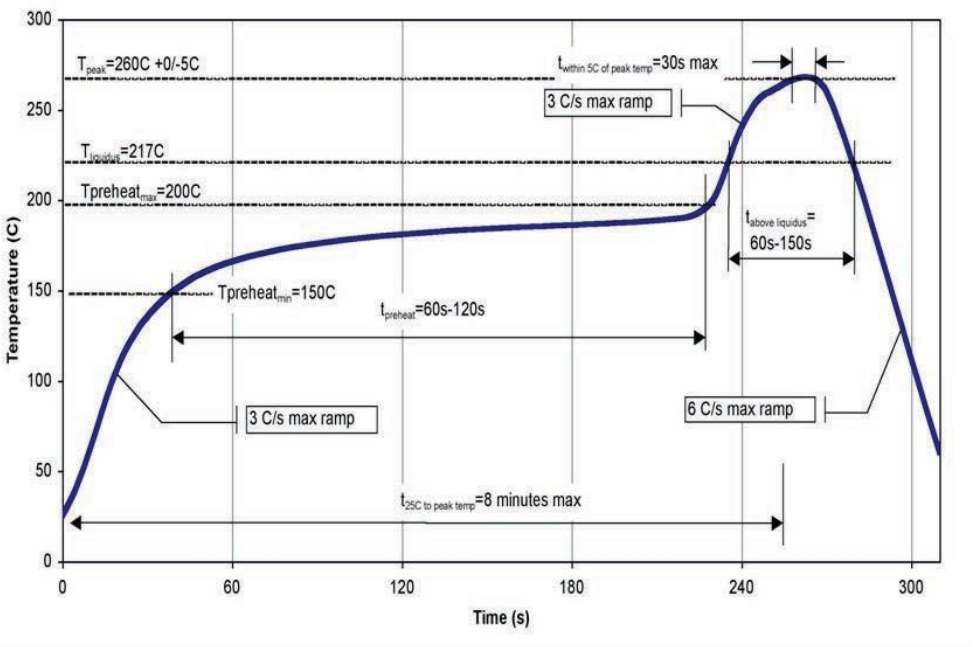
Test Conditions: V_D = 4 V
Failure Criteria = 10% reduction in I_{D_MAX}



Solderability

1. Compatible with the latest version of J-STD-020, Lead-free solder, peak reflow temperature: 260 °C.

Recommended Soldering Temperature Profile



Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	1A	ANSI/ESD/JEDEC JS-001
ESD – Charge Device Model (CDM)	C2b	ANSI/ESD/JEDEC JS-002
MSL – Moisture Sensitivity Level	3	IPC/JEDEC J-STD-020

Caution!
ESD-Sensitive Device

RoHS Compliance

This product is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- SVHC Free
- PFOS Free

TELEDYNE e2v
HIREL ELECTRONICS
Everywhereyoulook™

Ordering Information

Order Code	Description	Package	Shipping Method
TDLNA2626SEP	17 – 23 GHz Low Noise Amplifier	16-QFN	Tray
TDLNA2626EP	17 – 23 GHz Low Noise Amplifier	16-QFN	Tray
TDLNA2626EP-00	EVK with EP LNA		Box
TDLNA2626SEP-00	EVK with SEP LNA		Box

Revision Information

Document	Description - Date	Change/Revision	Details
TDLNA2626 Aug-1-2023 Rev. –	Product Specification - 08-01-2023	Initial Release / Revision –	
TDLNA2026 April-23-2024 Rev 1	Order Code for EVK updated 04_23_2024	Removed "S" from the Order Code	
TDLNA2026 May-07-2024 Rev 2	Order Code for EVK updated 05_07_2024	Returned "SEP" to the order code options and kept EP, too	

Document Category and 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

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

Disclaimers

The information in this document is believed to be reliable. However, Teledyne e2v HiRel Electronics assumes no liability for the use of this information. Use shall be entirely at the user's own risk. No patent rights or licenses to any circuits described in this document are implied or granted to any third party. Teledyne e2v's products are not designed or intended for use in devices or systems intended for surgical implant, or in other applications intended to support or sustain life, or in any application in which the failure of the Teledyne e2v product could create a situation in which personal injury or death might occur. Teledyne e2v assumes no liability for damages, including consequential or incidental damages, arising out of the use of its products in such applications.

Copyright and Trademark

Trademarks are the property of their respective owners.

TELEDYNE e2v
HIREL ELECTRONICS
Everywhereyoulook™