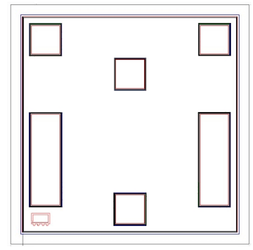
Flat Gain, High IP3

Monolithic Amplifier Die GVA-63-D+

50Ω 0.01 to 6 GHz



The Big Deal

- High gain, up to 22 dB
- ±1.3 dB gain flatness over 0.05 to 3 GHz
- Broadband high dynamic range without external matching components

Product Overview

GVA-63-D+ is a wideband amplifier die fabricated using InGaP HBT technology, offering high gain over a broad frequency range and high IP3. It provides good input and output return loss over a broad frequency range without the need for external matching components. Provided as an unpackaged amplifier die on GaAs, this model allows easy integration directly into the user's hybrids.

Key Features

Feature	Advantages
Broadband, 0.01 to 6.0 GHz	Covers the primary wireless communications bands: cellular, PCS, LTE, and WiMAX
High gain, up to 22 dB.	High gain reduces the number of gain stages, saving board space, reducing component, and lowering overall system cost.
Good gain flatness: • ±1.3 dB over 0.05 to 3 GHz • ± 0.6 dB over 0.7 to 2.6 GHz	Eliminates the need for gain flattening using external components.
High IP3 versus DC power consumption • +32 dBm typical at 0.05 GHz • +33 dBm typical at 0.8 GHz	The GVA-63-D+ matches industry leading IP3 performance relative to device size and power consumption. The combination of the design and InGaP HBT structure provides enhanced linearity over a broad frequency range, evident in IP3 values typically 14 dB above the P1dB point to 0.8 GHz. This feature makes this amplifier ideal for use in: • Driver amplifiers for complex waveform up converter paths • Drivers in linearized transmit systems
No External Matching Components Required	GVA-63-D+ provides input and output return loss of 10 to 21 dB up to 6 GHz without the need for external matching components, saving real estate and reducing component count.
Unpackaged die	Enables user to integrate the amplifier directly into hybrids.

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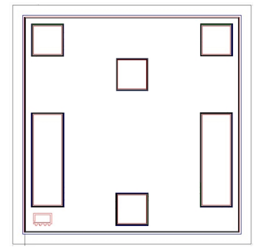


+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Ordering Information: Refer to Last Page

Product Features

- Gain, 21 dB typ. at 0.8 GHz
- Flat gain, ±1.3, 50 to 3000 MHz
- High POUT, P1dB 19.0 dBm typ. at 0.8 GHz
- High IP3, 33 dBm typ. at 0.8 GHz
- Excellent ESD protection, Class 1C for HBM
- No external matching components required

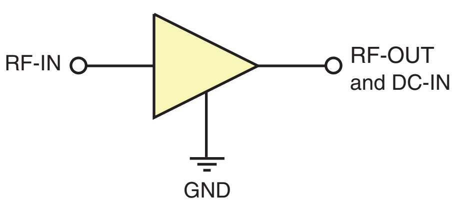
Typical Applications

- Base station infrastructure
- Portable Wireless
- CATV & DBS
- MMDS & Wireless LAN
- LTE

General Description

GVA-63-D+ (RoHS compliant) is an advanced wideband amplifier die fabricated using InGap HBT technology offering high gain over a broad frequency range and high IP3. In addition, the GVA-63-D+ has good input and output return loss over a broad frequency range without the need for external matching components.

simplified schematic and pad description



Pad	Description
RF-IN	RF input pad. This pad requires the use of an external DC blocking capacitor chosen for the frequency of operation.
RF-OUT and DC-IN	RF output and bias pad. DC voltage is present on this pad; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection.
GND	Connections to ground.

Electrical Specifications[1] at 25°C unless noted

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		0.01		6	GHz
Gain	0.05		22.0		dB
	0.8		21.0		
	2.0		20.5		
	3.0		19.3		
	4.0		17.5		
	6.0		14.1		
Gain Flatness	0.05-3.0		±1.3		dB
	0.7-2.6		±0.6		
Input Return Loss	0.05		16.8		dB
	0.8		21.5		
	2.0		21.5		
	3.0		17.5		
	4.0		14.0		
	6.0		11.7		
Output Return Loss	0.05		14.5		dB
	0.85		17.7		
	2.0		14.0		
	3.0		10.6		
	4.0		10.2		
	6.0		10.6		
Reverse Isolation	2.0		23.9		dB
Output Power at 1dB Compression	0.05		18.7		dBm
	0.8		18.8		
	2.0		18.2		
	3.0		16.5		
	4.0		14.7		
	6.0		12.0		
Output IP3	0.05		32.4		dBm
	0.8		33.2		
	2.0		31.9		
	3.0		29.5		
	4.0		28.0		
	6.0		26.1		
Noise Figure	0.05		3.7		dB
	0.8		3.8		
	2.0		3.7		
	3.0		4.1		
	4.0		4.1		
	6.0		4.7		
Supply Operating Voltage (Vcc)			5.0		V
Device Operating Current		57	69	79	mA
Device Current Variation vs. Voltage			0.040		mA/V
Thermal Resistance, junction-to-ground lead			81		°C/W

(1) Electrical Specifications are typical measured characteristics in Mini-Circuits die characterization test board. See Figure 1 for Test Circuit.

Absolute Maximum Ratings[2]

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Operating Current at 5V	100 mA
Power Dissipation	0.5 W
Input Power (CW)	+13 dBm
DC Voltage at RF-OUT Pad [(3)]	5.7V

2. Permanent damage may occur if any of these limits are exceeded. These maximum ratings are not intended for continuous normal operations. Die performance measured in industry standard SOT-89 package.
3. For continuous operation, do not exceed 5.2V

Characterization Test Circuit

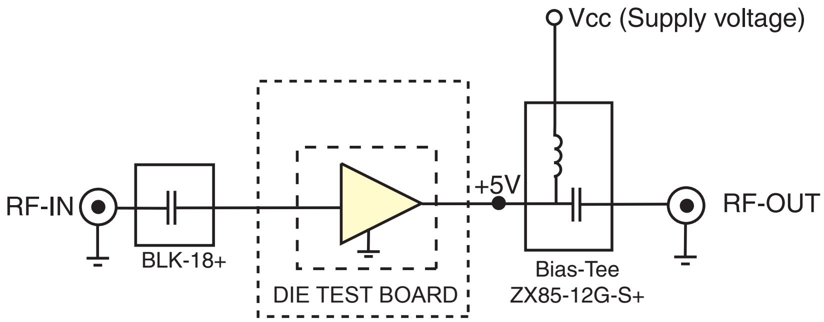


Figure 1: Block Diagram of Test Circuit used for characterization. Gain, Return loss, Output power at 1dB compression (P1 dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:
1. Gain and Return loss: Pad= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.

Die Layout

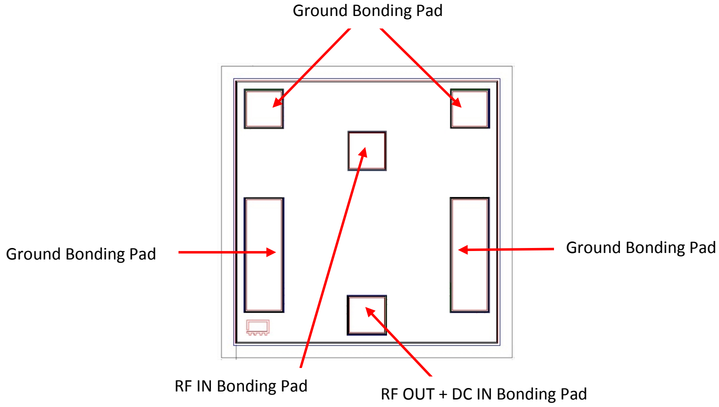


Fig 2. Die Layout

Bonding Pad Position

(Dimensions in µm, Typical)

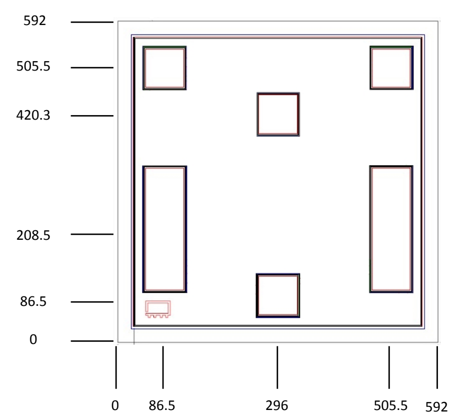


Fig 3. Bonding Pad Positions

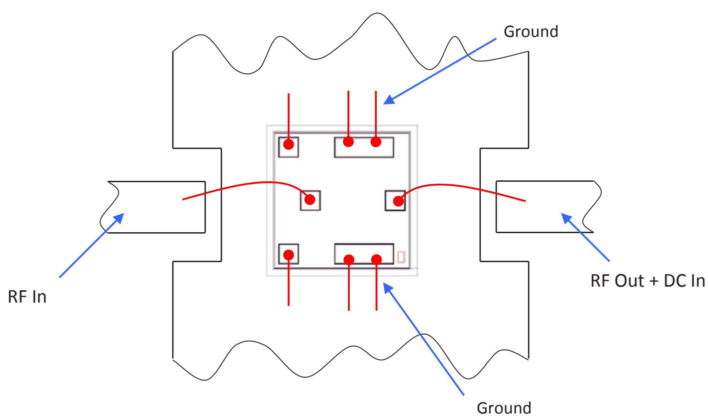
Critical Dimensions

Parameter	Values
Die Thickness, µm	100
Die Width, µm	592
Die Length, µm	592
Bond Pad Size, µm	80 x 80
Large Ground Bond Pad Size, µm	80 x 235

Assembly and Handling Procedure

1. Storage
   Dice should be stored in a dry nitrogen purged desiccators or equivalent.
2. ESD
   MMIC Gallium Arsenide (GaAs) amplifier dice are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic protected material, which should be opened in clean room conditions at an appropriately grounded anti-static worksta tion. Devices need careful handling using correctly designed collets, vacuum pickup tips or sharp antistatic tweezers to deter ESD damage to dice.
3. Die Attach
   The die mounting surface must be clean and flat. Using conductive silver filled epoxy, recommended epoxies are DieMat DM6030HK-PT or Ablestik 84-1LMISR4. Apply sufficient epoxy to meet required epoxy bond line thickness, epoxy fillet height and epoxy coverage around total die periphery. Parts shall be cured in a nitrogen filled atmosphere per manufacturer's cure condition. It is recommended to use antistatic die pick up tools only.
4. Wire Bonding
   Bond pad openings in the surface passivation above the bond pads are provided to allow wire bonding to the dice gold bond pads. Thermosonic bonding is used with minimized ultrasonic content. Bond force, time, ultrasonic power and temperature are all critical parameters. Suggested wire is pure gold, 1 mil diameter. Bonds must be made from the bond pads on the die to the package or substrate. All bond wires should be kept as short as low as reasonable to minimize performance degradation due to undesirable series inductance.

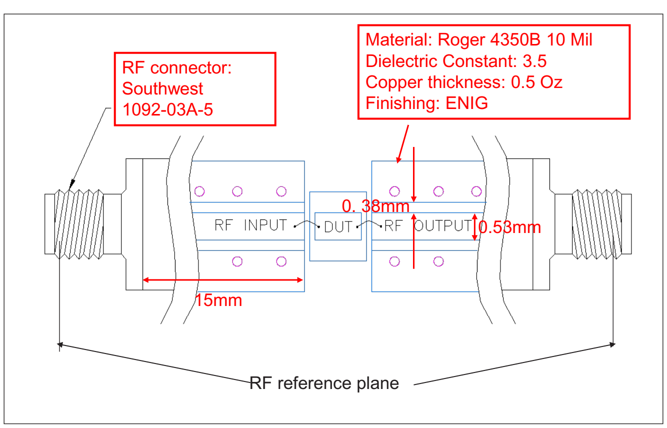
Assembly Diagram



Recommended Wire Length, Typical

Wire	Wire Length (mm)	Wire Loop Height (mm)
RF-IN, RF-OUT and DC-IN	0.8	0.15
GROUND	0.3	0.15

RF Reference Plane - No port extension



Additional Detailed Technical Information

additional information is available on our dash board. To access this information click here

Performance Data	Data Table	
	Swept Graphs	
	S-Parameter (S2P Files) Data Set with and without port extension(.zip file)	
Case Style	Die	
Die Ordering and packaging information	Quantity, Package	Model No.
	Small, Gel - Pak: 10,50,100 KGD*	GVA-63-DG+
	Medium†, Partial wafer: KGD*<5K	GVA-63-DP+
	Large†, Full Wafer	GVA-63-DF+
	†*Available upon request contact sales representative*	
	Refer to AN-60-067	
Environmental Ratings	ENV-80	

*Known Good Dice ("KGD") means that the dice in question have been subjected to Mini-Circuits DC test performance criteria and measurement instructions and that the parametric data of such dice fall within a predefined range. While DC testing is not definitive, it does help to provide a higher degree of confidence that dice are capable of meeting typical RF electrical parameters specified by Mini-Circuits.

ESD Rating**

Human Body Model (HBM): Class 1C (1000 to <2000V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M2 (100 to <200V) in accordance with ANSI/ESD STM5.2-1999

** Tested in industry standard SOT-89 package.

Additional Notes

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

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