

Surface Mount

# Monolithic Amplifier

DC-6 GHz

## Product Features

- High gain, 25 dB typ. at 100 MHz
- High IP3, 35 dBm typ.
- High Pout, P1dB 19 dBm typ.
- Transient protected
- Excellent ESD Protection
- Unconditionally stable
- Aqueous washable
- Protected by US patent 6,943,629

## Typical Applications

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

## General Description

Gali $\square$ 24+ (RoHS compliant) is a wideband amplifier offering high dynamic range. Lead finish is SnAgNi. It has repeatable performance from lot to lot and is enclosed in a SOT-89 package. It uses patented Transient Protected Darlington configuration and is fabricated using InGaP HBT technology. Expected MTBF is 3,000 years at 85°C case temperature. Gali $\square$ 24+ is designed to be rugged for ESD and supply switch-on transients.



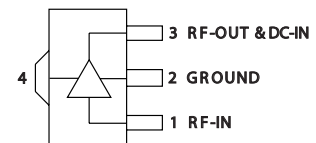
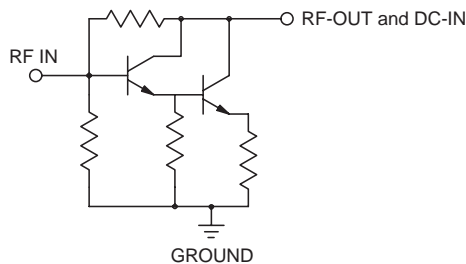
## Gali $\square$ 24+

CASE STYLE: DF782  
PRICE: \$1.75 ea. QTY. (30)

+ RoHS compliant in accordance with EU Directive (2002/95/EC)

The +Suffix has been added in order to identify RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.

## simplified schematic and pin description



Function	Pin Number	Description
RF IN	1	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
RF-OUT and DC-IN	3	RF output and bias pin. DC voltage is present on this pin; 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, as shown in "Recommended Application Circuit".
GND	2,4	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

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ISO 9001 ISO 14001 AS 9100 CERTIFIED

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IF/RF MICROWAVE COMPONENTS

For detailed performance specs & shopping online see web site

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp).

REV. A  
M108520  
ED-11756/3E  
GALI-24+  
091116  
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**Electrical Specifications at 25°C and 80mA, unless noted**

Parameter	Min.	Typ.	Max.	Units	Cpk
Frequency Range*	DC		6	GHz	
Gain				dB	≥1.5
	f=0.1 GHz	24.0	25.3	26.6	
	f=1 GHz		22.6		
	f=2 GHz	18.1	19.1	20.1	
	f=3 GHz		16.6		
	f=4 GHz	14.2	14.9	15.6	
	f=6 GHz		12.4		
Magnitude of Gain Variation versus Temperature (values are negative)				dB/°C	
	f=0.1 GHz		0.0021		
	f=1 GHz		0.0035		
	f=2 GHz		0.0045	0.0090	
	f=3 GHz		0.0056		
	f=4 GHz		0.0074		
	f=6 GHz		0.0154		
Input Return Loss				dB	
	f=0.1 GHz		21.6		
	f=1 GHz	14	20.4		
	f=2 GHz		17.5		
	f=3 GHz		15.4		
	f=4 GHz		14.9		
	f=6 GHz		19.0		
Output Return Loss				dB	
	f=0.1 GHz		18.5		
	f=1 GHz	7	11.5		
	f=2 GHz		9.1		
	f=3 GHz		8.8		
	f=4 GHz		8.8		
	f=6 GHz		7.2		
Reverse Isolation				dB	
	f=2 GHz		26.7		
Output Power @1 dB compression				dBm	≥1.5
	f=0.1 GHz	18.3	19.3		
	f=1 GHz	18.2	19.2		
	f=2 GHz	18.4	19.4		
	f=3 GHz		19.3		
	f=4 GHz		18.1		
	f=6 GHz		14.7		
Saturated Output Power (at 3dB compression)				dBm	
	f=0.1 GHz		21.1		
	f=1 GHz		20.9		
	f=2 GHz		21.0		
	f=3 GHz		20.4		
	f=4 GHz		19.1		
	f=6 GHz		16.0		
Output IP3				dBm	≥1.5
	f=0.1 GHz	30.4	33.8		
	f=1 GHz	31.5	35.0		
	f=2 GHz	32.7	36.3		
	f=3 GHz		35.3		
	f=4 GHz		33.1		
	f=6 GHz		30.3		
Noise Figure				dBm	≥1.5
	f=0.1 GHz		4.2	5.2	
	f=1 GHz		4.3		
	f=2 GHz		4.2	5.2	
	f=3 GHz		4.3		
	f=4 GHz		4.5	5.5	
	f=6 GHz		5.3		
Group Delay				psec	
	f=2 GHz		97		
Recommended Device Operating Current				mA	
			80		
Device Operating Voltage				V	≥1.5
		5.4	5.8	6.2	
Device Voltage Variation vs. Temperature at 80mA				mV/°C	
			-3.6		
Device Voltage Variation vs Current at 25°C				mV/mA	
			3.3		
Thermal Resistance, junction-to-case <sup>1</sup>				°C/W	
			64		

\*Guaranteed specification DC-6 GHz. Low frequency cut off determined by external coupling capacitors.

**Absolute Maximum Ratings**

Parameter	Ratings
Operating Temperature*	-45°C to 85°C
Storage Temperature	-65°C to 150°C
Operating Current	160mA
Power Dissipation	1W
Input Power	13 dBm

Note: Permanent damage may occur if any of these limits are exceeded. These ratings are not intended for continuous normal operation.  
<sup>1</sup>Case is defined as ground leads.  
 \*Based on typical case temperature rise 7°C above ambient.

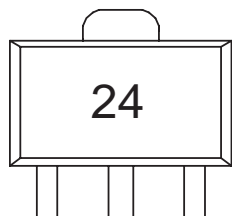


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**Product Marking**



**Additional Detailed Technical Information**

Additional information is available on our web site. To access this information enter the model number on our web site home page.

**Performance data, graphs, s-parameter data set (.zip file)**

**Case Style: DF782**

Plastic package, exposed paddle, lead finish: tin/silver/nickel

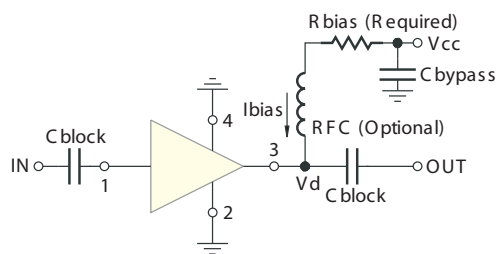
**Tape & Reel: F55**

**Suggested Layout for PCB Design: PL-019**

**Evaluation Board: TB-409-24+**

**Environmental Ratings: ENV08T2**

**Recommended Application Circuit**



Test Board includes case, connectors, and components (in bold) soldered to PCB

R BIAS	
Vcc	"1%" Res. Values (ohms) for Optimum Biasing
8	28.7
9	41.2
10	53.7
11	66.5
12	78.7
13	90.9
14	105
15	115
16	127
17	140
18	154
19	165
20	178

**ESD Rating**

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

Machine Model (MM): Class M2 (< 100v to < 200v) in accordance with ANSI/ESD STM 5.2 - 1999

**MSL Rating**

Moisture Sensitivity: MSL1 in accordance with IPC/JEDECJ-STD-020C

No.	Test Required	Condition	Standard	Quantity
1	Visual Inspection	Low Power Microscope Magnification 40x	MIP-IN-0003 (MCT spec)	45 units
2	Electrical Test	Room Temperature	SCD (MCL spec)	45 units
3	SAM Analysis	Less than 10% growth in term of delamination	J-Std-020C (Jedec Standard)	45 units
4	Moisture Sensitivity Level 1	Bake at 125°C for 24 hours Soak at 85°C/85%RH for 168 hours Reflow 3 cycles at 260°C peak	J-Std-020C (Jedec Standard)	45 units

**MSL Test Flow Chart**

