



WIDEBAND

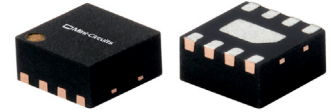
# Monolithic Amplifier

## TSY-172LNB+

50Ω 0.03 to 1.7 GHz

### THE BIG DEAL

- Very wideband, 30 MHz to 1.7 GHz
- Low NF over entire frequency band, 1.4 dB
- Low current and low voltage (2.7V and 7.7 mA)
- Internal bypass switching
- Suitable for low phase noise applications
- P1dB: +17.5 dBm typ.



Generic photo used for illustration purposes only

CASE STYLE: MC1630-1

### +RoHS Compliant

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

### APPLICATIONS

- Wireless Base Station Systems
- Test and Measurement Systems
- Multi-Band Receivers

### PRODUCT OVERVIEW

TSY-172LNB+(RoHS compliant) is an advanced Low Voltage, Low Current, Low Noise wideband Bypass amplifier fabricated using GaAs E-PHEMT technology offering extremely high dynamic range over a broad frequency range. It has integrated switches enabling users to bypass the amplifier. TSY-172LNB+ is enclosed in a 8-lead 2 x 2 mm MCLP package for good thermal performance.

### KEY FEATURES

Feature	Advantages
Ultra-wideband: 30 MHz to 1.7 GHz	Ideal for a wide range of receiver applications including military, commercial wireless, and instrumentation.
Low Voltage & Low Current +2.7V & 7.7 mA	Ideal for Battery operated systems
High IP3 +24.7 dBm typ at 1 GHz	Provides enhanced linearity over broad frequency range under high signal conditions.
Bypass feature Low insertion loss	Unlike other amplifiers, insertion loss is low in Bypass mode. (For Bypass, both V <sub>DD</sub> and V <sub>e</sub> are set to 0V.)
Compact size: 2 x 2 x 1 mm	Saves space in dense system layouts. Low inductance, repeatable transitions, and excellent thermal contact.
Low additive phase noise, typically -155 dBc/Hz @10 KHz offset	Ideal for low phase noise synthesizer applications

REV. C  
ECO-013495  
TSY-172LNB+  
MCL NY  
220527



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**TSY-172LNB+**

Mini-Circuits

**ELECTRICAL SPECIFICATIONS<sup>1</sup> AT 25°C, Z<sub>0</sub>=50Ω & V<sub>DD</sub>=+2.7V UNLESS OTHERWISE NOTED**

Parameter	Condition (GHz)	Amplifier - ON			Amplifier - Bypass	Units
		Min.	Typ.	Max.	Typ.	
Frequency Range		0.03		1.7	0.03 - 1.7	GHz
Noise Figure	0.03		1.3		0.5	dB
	0.5		1.2		0.8	
	1.0		1.4		1.8	
	1.5		1.8		3.2	
	1.7		1.9		3.7	
Additive Phase Noise 2.0 GHz, 10KHz offset			-155		—	dBc/Hz
Gain	0.03	—	15.3	—	-0.5	dB
	0.5	—	14.7	—	-0.8	
	1.0	11.8	13.1	14.4	-1.8	
	1.5	—	11.0	—	-3.2	
	1.7	—	10.1	—	-3.7	
Input Return Loss	0.03		13		19	dB
	0.5		14		14	
	1.0		10		8	
	1.5		6		6	
	1.7		6		5	
Output Return Loss	0.03		16		18	dB
	0.5		18		13	
	1.0		14		7	
	1.5		11		5	
	1.7		10		6	
Output Power at 1dB Compression, AMP-ON <sup>2</sup>	0.03		15.8		1.2	dBm
	0.5		17.1		2.7	
	1.0		17.5		3.1	
	1.5		17.8		2.6	
	1.7		17.4		1.4	
Output IP <sub>3</sub> <sup>3</sup>	0.03		25.6		24.9	dBm
	0.5		26.4		28.4	
	1.0		24.7		30.4	
	1.5		24.0		23.5	
	1.7		22.4		19.5	
Device Operating Voltage (V <sub>DD</sub> ) <sup>5</sup>		2.5	2.7	2.9	0	V
Device Operating Current (I <sub>D+I<sub>e</sub></sub> )		—	7.7	10.6	0	mA
Enable Voltage (V <sub>e</sub> ) <sup>5</sup>		+2.5	+2.7	+2.9	0	V
Device Current Variation vs. Temperature <sup>4</sup>			1.5		—	μA/°C
Device Current Variation vs. Voltage			0.0067		—	mA/mV
Thermal Resistance, junction-to-ground lead			229		—	°C/W

1. Measured on Mini-Circuits Characterization Test Board TB-943+. See Characterization Test Circuit (Fig. 1)

2. Current increases to 28-54 mA typ. at P1dB

3. Tested at Pout=+6 dBm/tone

4. ((Current at 85°C - Current at -45°C)/130)

5. V<sub>DD</sub> is always connected to V<sub>e</sub>



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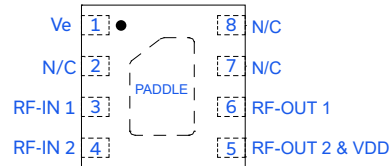
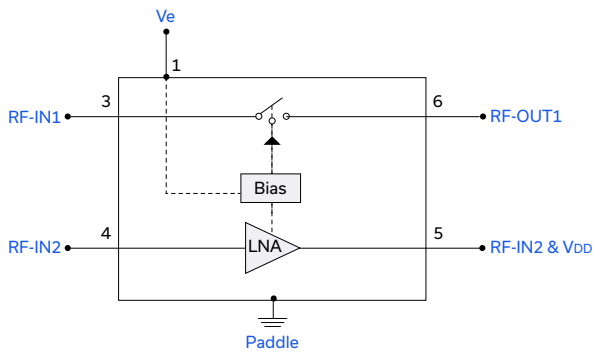
## MAXIMUM RATINGS<sup>6</sup>

Parameter	Ratings	
Operating Temperature (ground lead)	-40°C to 85°C	
Storage Temperature	-65°C to 150°C	
Total Power Dissipation	0.2W	
Input Power	Amplifier - ON	10 dBm (continuous), +23 dBm (5 min. max)
	Amplifier Bypass	15 dBm (continuous), +22 dBm (5 min. max)
DC Voltage V <sub>DD</sub> (Pad 5)	6V	
DC Voltage V <sub>e</sub> (Pad 1)	6V	

	Min.	Typ.	Max.	Units
Amplifier-ON (V <sub>DD</sub> , V <sub>e</sub> )	2.5	2.7	2.9	V
Amplifier-Bypass (V <sub>DD</sub> , V <sub>e</sub> )	—	—	0.3	

6. Permanent damage may occur if any of these limits are exceeded.  
Electrical maximum ratings are not intended for continuous normal operation.

## SIMPLIFIED SCHEMATIC & PAD DESCRIPTION



Function	Pad Number	Description (See Figure 1)
RF-IN 1 & RF-IN 2	3,4	RF-Input pads. Pad 4 is connected to Pad 3 via two 0.1µF Capacitors
RF-OUT 1 & RF-OUT2 & VDD	5,6	RF-Output pads. Pad 6 is connected to Pad 5 via 0.1µF Capacitor.
Voltage Enable (Ve)	1	Enable Voltage pad. Ve is always connected to V <sub>DD</sub> . For amplifier bypass, V <sub>DD</sub> & Ve should be turned OFF simultaneously.
Ground	Paddle	Connect to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.
N/C	2,7,8	No connection



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## SWITCHING SPECIFICATIONS

Parameter		Min.	Typ.	Max.	Units
Amplifier ON to Bypass	OFF TIME (50% Control to 10% RF)	—	6	—	μS
	FALL TIME (90 TO 10% RF)	—	7	—	
Amplifier Bypass to ON	ON TIME (50% Control to 90% RF)	—	59	—	μS
	RISE TIME (10% to 90% RF)	—	20	—	
Control Voltage Leakage		—	443	—	mV

## CHARACTERIZATION TEST CIRCUIT

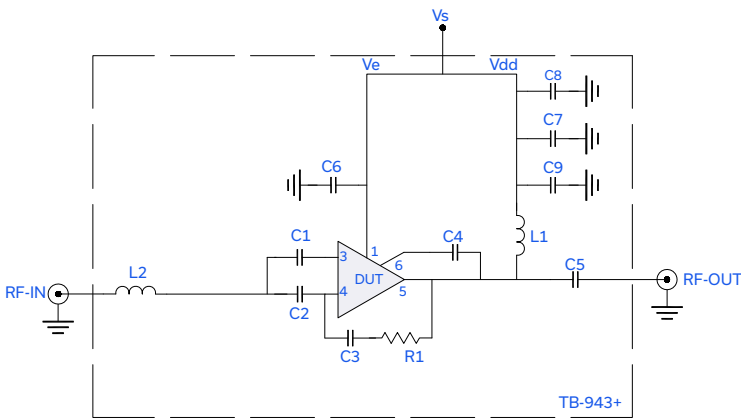


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-943+)

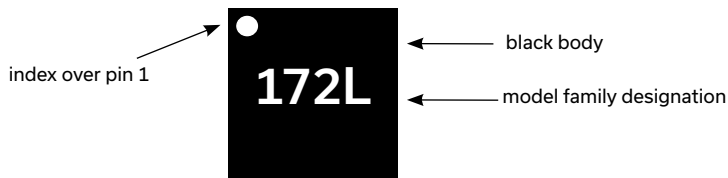
Gain, Return loss, Output power at 1dB compression (P1dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain and Return loss: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, +6 dBm/tone at output.
3. Switching Time RF Signal: Pin=-10 dBm at 500 MHz.  
VDD=Ve=0 to 2.5 / 2.7 / 2.9V, Pulse Signal=500 Hz, 50% duty cycle.

Component	P/N	Supplier	Value	Size
L1	1008CS-102XJLC	Coilcraft	1uH	0.115" x 0.11"
L2	LQG15HS3N0S02D	Murata	3nH	0402
C1 to C8	GRM155R71C104KA88D	Murata	0.1uF	0402
C9	GRM1555C1H102JA01D	Murata	1000pF	0402
R1	RK73H1ETTP4320F	KOA	432 Ω	0402

## PRODUCT MARKING



Marking may contain other features or characters for internal lot control



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Mini-Circuits

ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS [CLICK HERE](#)

Performance Data	Data Table
	Swept Graphs
	S-Parameter (S2P Files) Data Set (.zip file)
Case Style	MC1630-1 Plastic package, exposed paddle, lead finish: Matt Tin
Tape & Reel Standard quantities available on reel	F66 7" reels with 20, 50, 100, 200, 500 or 2K devices
Suggested Layout for PCB Design	PL-536
Evaluation Board	TB-943+
Environmental Ratings	ENV08T1

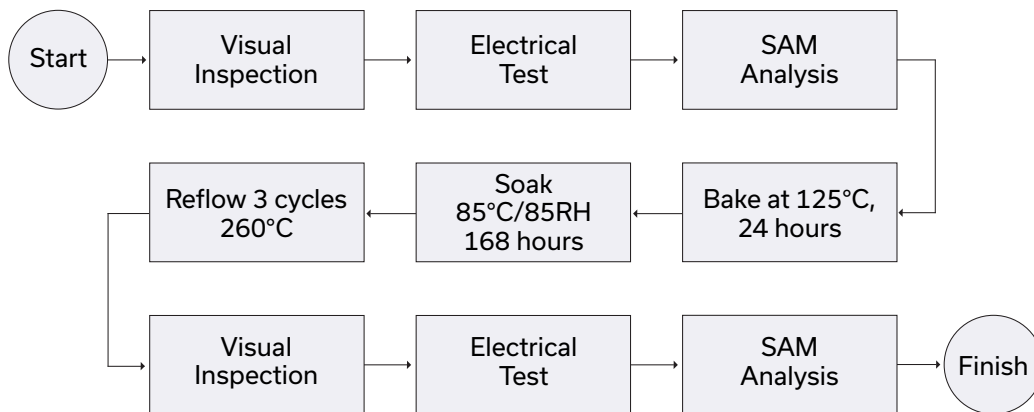
### ESD RATING

Human Body Model (HBM): Class 1A (Pass 250) in accordance with ANSI/ESD STM 5.1 - 2001 Machine.

### MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

### MSL TEST FLOW CHART



#### 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.
- C. The parts covered by this specification document 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/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)

