



Mini-Circuits®

WIDEBAND

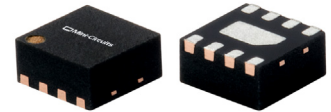
Monolithic Amplifier

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: MC1631-1

+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 operates 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_{DD} and V_e 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





WIDEBAND

Monolithic Amplifier

TSY-172LNB+

ELECTRICAL SPECIFICATIONS¹ AT 25°C, Z₀=50Ω & V_{DD}=+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 ²	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 ₃ ³	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 _{DD}) ⁵		2.5	2.7	2.9	0	V
Device Operating Current (I _{D+I_e})		—	7.7	10.6	0	mA
Enable Voltage (V _e) ⁵		+2.5	+2.7	+2.9	0	V
Device Current Variation vs. Temperature ⁴			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 P_{1dB}3. Tested at P_{out}=+6 dBm/tone

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

5. V_{DD} is always connected to V_e

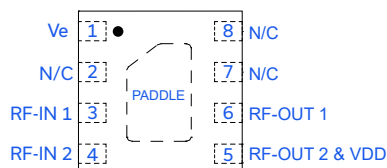
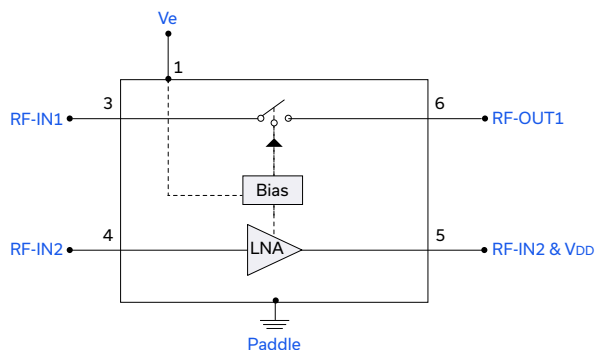
MAXIMUM RATINGS⁶

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_{DD} (Pad 5)		6V
DC Voltage V_e (Pad 1)		6V

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

	Min.	Typ.	Max.	Units
Amplifier-ON (V_{DD} , V_e)	2.5	2.7	2.9	V
Amplifier-Bypass (V_{DD} , V_e)	—	—	0.3	

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 0.1 μ F Capacitors
RF-OUT 1 & RF-OUT2 & VDD	5,6	RF-Output pads. Pad 6 is connected to Pad 5 via 0.1 μ F Capacitor.
Voltage Enable (V_e)	1	Enable Voltage pad. V_e is always connected to V_{DD} . For amplifier bypass, V_{DD} & V_e 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



WIDEBAND

Monolithic Amplifier

TSY-172LNB+

SWITCHING SPECIFICATIONS

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

CHARACTERIZATION TEST CIRCUIT

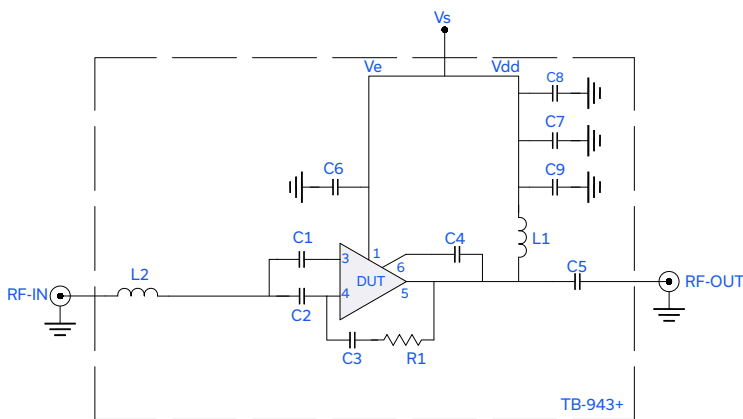


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-943+)

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





WIDEBAND

Monolithic Amplifier

TSY-172LNB+

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	MC1631-1 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

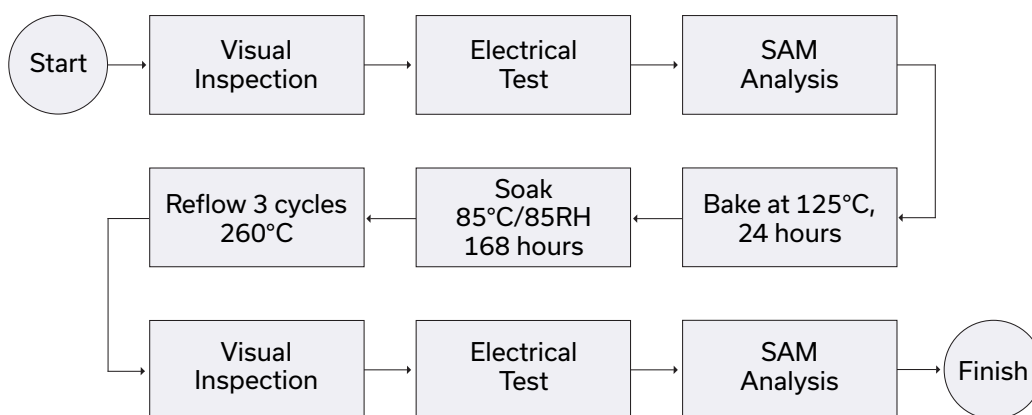
ESD RATING

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

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



Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Mini-Circuits:](#)

[TSY-172LNB+](#)