



Mini-Circuits®

WIDEBAND

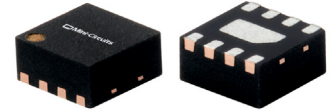
Monolithic Amplifier

TSY-172LNB+

50Ω 0.03 to 1.7 GHz Bypass Mode Feature

THE BIG DEAL

- Very Wideband, 30 MHz to 1.7 GHz
- Low NF, Typ. 1.4 dB
- Medium Power, P1dB Typ. +17.5 dBm
- Low Current and Low Voltage, Typ. 7.7 mA at +2.7 V
- Internal Bypass Switching
- Suitable for Low Phase Noise Applications



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 noise, wideband, bypass amplifier fabricated using GaAs E-pHEMT technology. This device offers an extremely high dynamic range over a broad frequency range with very low power consumption. It has integrated switches enabling users to bypass the amplifier. TSY-172LNB+ is enclosed in a tiny 8-lead 2x2 mm MCLP package for good thermal performance and ease of integration into dense circuit board layouts.

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 +2.7 V & 7.7 mA	Ideal for portable and 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_{DD} and V_e are set to 0 V.)
Compact Size: 2x2x1 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.





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ELECTRICAL SPECIFICATIONS¹ AT +25°C, Z₀= 50Ω & V_{DD}= +2.7 V, UNLESS NOTED OTHERWISE

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 P1dB

3. Tested at P_{OUT}= +6 dBm/tone

4. ((Current at 85°C - Current at -40°C)/130)

5. V_{DD} is always connected to V_e



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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

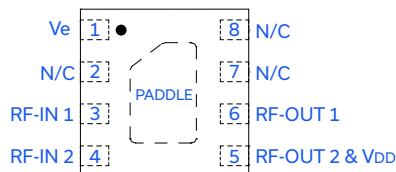
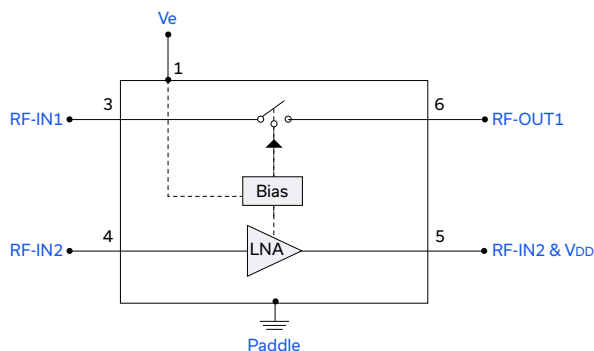
ABSOLUTE MAXIMUM RATINGS⁶

Parameter		Ratings
Operating Temperature (Ground Lead)		-40°C to +85°C
Storage Temperature		-65°C to +150°C
Total Power Dissipation		0.2 W
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)		+6 V
DC Voltage V _e (Pad 1)		+6 V

	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	

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
RF-IN 1 & RF-IN 2	3,4	RF-Input pads. Pad 4 is connected to Pad 3 via two 0.1 μF Capacitors
RF-OUT 1 & RF-OUT2 & VDD	5,6	RF-Output pads. Pad 6 is connected to Pad 5 via 0.1 μF Capacitor.
Voltage Enable (Ve)	1	Enable Voltage pad. Ve is always connected to V _{DD} . For amplifier bypass, V _{DD} & 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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CHARACTERIZATION TEST CIRCUIT

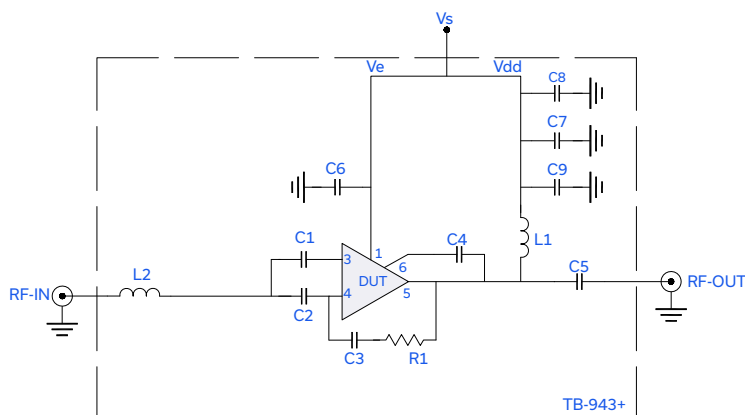


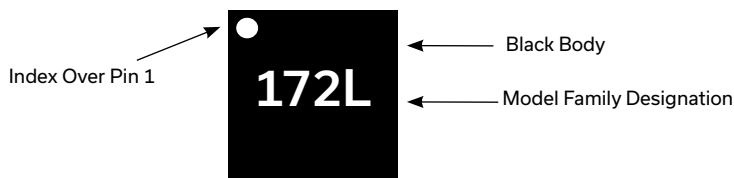
Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-943+) Gain, Return Loss, Output Power at 1 dB Compression (P_{1dB}), Output IP3 (OIP3) and Noise Figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain and Return Loss: P_{IN}= -25 dBm
 2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, +6 dBm/tone at output.
 3. Switching Time RF Signal: P_{IN}= -10 dBm at 500 MHz.
- V_{DD}=V_e=0 to +2.5 / +2.7 / +2.9 V, 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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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. 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 2000 devices
Suggested Layout for PCB Design	PL-536
Evaluation Board	TB-943+
Environmental Ratings	ENV08T1

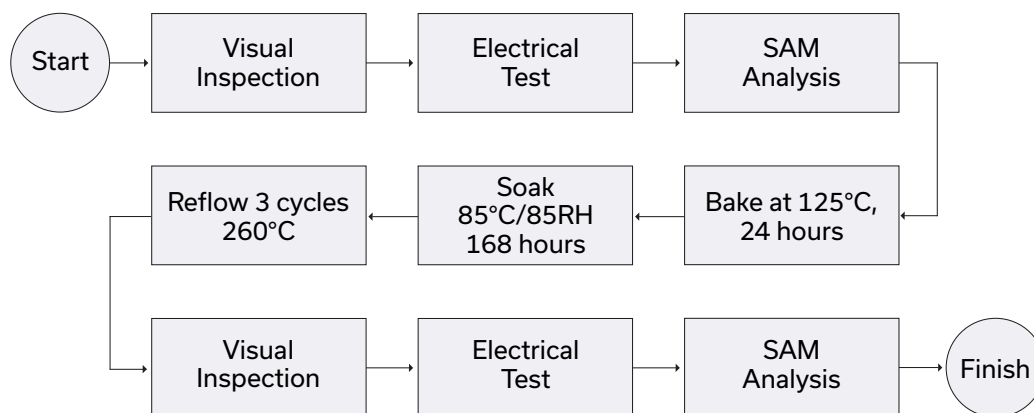
ESD RATING

Human Body Model (HBM): Class 1A (Pass 250 V) 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

