Low Noise, Wideband, High IP3

Monolithic Amplifier

CMA-83LN+

50Ω 0.5 to 8.0 GHz

The Big Deal

- Ceramic, hermetically sealed, nitrogen filled
- Low profile case, 0.045”
- Flat gain over wideband
- Low noise figure, 1.3 dB
- High IP3, up to +30 dBm

CASE STYLE: DL1721

MIL Screening Available
Please consult Applications Dept.

Product Overview

The CMA-83LN+ is a PHEMT based wideband, low noise MMIC amplifier with a unique combination of low noise, high IP3, and flat gain over wideband making it ideal for sensitive, high-dynamic-range receiver applications. This design operates on a single 5V or 6V supply, is well matched for 50Ω and comes in a tiny, low profile package (0.12 x 0.12 x 0.045”), accommodating dense circuit board layouts. The amplifier is bonded to a multilayer integrated LTCC substrate, then hermetically sealed under a controlled Nitrogen atmosphere with gold-plated cover, eutectic Au-Sn solder, and Ni-Pd-Au termination finish. CMA-series amplifiers are capable of meeting MIL requirements for gross leak, fine leak, thermal shock, vibration, acceleration, mechanical shock, and HTOL. The testing can be done if requested.

Key Features

Feature	Advantages
Hermetically Sealed	Ideal for use anywhere long-term reliability adds bottom-line value: high moisture areas, busy production lines, high-speed distribution centers, heavy industry, outdoor settings, and unmanned facilities, as well as military applications.
Low noise, 1.3 dB at 2 GHz	Enables lower system noise figure performance.
High IP3 • +30 dBm at 2 GHz • +26.7 dBm at 8 GHz	Combination of low noise and high IP3 makes this MMIC amplifier ideal for use in low noise receiver front end (RFE) as it gives the user advantages of sensitivity and two- tone IM performance at both ends of the dynamic range.
Low operating voltage, 5V/6V.	Achieves high IP3 using low voltage.
Wide bandwidth with flat gain • ±1.2 dB over 0.5 to 7 GHz • ±1.5 dB over 0.5 to 8 GHz	Enables a single amplifier to be used in many wideband applications including defense, instrumentation and more.
Ceramic, hermetic package	Low inductance, repeatable performance, outstanding reliability in tough operating con- ditions, and small size (0.12 x 0.12 x 0.045”)

Low Noise, Wideband, High IP3

Monolithic Amplifier

0.5-8.0 GHz

Product Features

- Ceramic, hermetically sealed, high reliability
- Low profile case, .045” high
- Low Noise figure, 1.3 dB at 2 GHz
- High IP3, 30 dBm typ. at 2 GHz
- High Pout, P1dB 20.3 dBm typ. at 2 GHz and 6V
- Excellent Gain flatness, ±1.2 dB over 0.5 to 7 GHz and 6V

Generic photo used for illustration purposes only

CASE STYLE: DL1721

CMA-83LN+

+RoHS Compliant

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

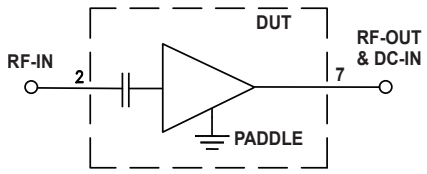
Typical Applications

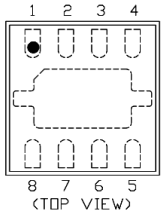
- High Rel Systems
- Defense and Aerospace
- WiFi
- WLAN
- UMTS
- LTE
- WiMAX
- S-band Radar
- C-band Satcom

General Description

The CMA-83LN+ is a PHEMT based wideband, low noise MMIC amplifier with a unique combination of low noise, high IP3, and flat gain over wideband making it ideal for sensitive, high-dynamic-range receiver applications. This design operates on a single 5V or 6V supply, is well matched for 50Ω and comes in a tiny, low profile package (0.12 x 0.12 x 0.045”), accommodating dense circuit board layouts. The MMIC amplifier is bonded to a multilayer integrated LTCC substrate and then hermetically sealed under a controlled Nitrogen atmosphere with gold plated cover and eutectic Au-Sn solder. Terminal finish is Ni-Pd-Au. It has repeatable lot to lot performance due to tightly controlled semiconductor and assembly processes. These amplifiers are capable of meeting MIL requirements and have been tested for hermeticity.

simplified schematic and pad description





Function	Pad Number	Description
RF IN	2	Connects to RF input and to ground via L1 (optional blocking capacitor of 100pF may be used)
RF-OUT and DC-IN	7	Connects to RF out via C3 and VDD via L2
GND	1, 3, 5, 6, 8, Paddle	Connects to ground
NC	4	Not used internally. Connected to ground on test board.

* Enhancement mode pseudomorphic High Electron Mobility Transistor.

Electrical Specifications[1] at 25°C and 5V/6V, unless noted

Parameter	Condition (GHz)	V_{DD}=6.0			V_{DD}=5.0			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Frequency Range		0.5		8.0	0.5		8.0	
Noise Figure	0.5	—	1.6	—	—	1.6	—	dB
	2.0	—	1.3	1.8	—	1.3	—	
	4.0	—	1.5	—	—	1.5	—	
	5.0	—	1.6	—	—	1.6	2.2	
	8.0	—	1.8	—	—	1.8	—	
Gain	0.5	—	21.2	—	—	20.2	—	dB
	2.0	18.5	21.5	24.4	—	20.8	—	
	4.0	—	20.6	—	—	19.7	—	
	5.0	—	20.1	—	14.9	19.3	—	
	8.0	—	19.2	—	—	18.7	—	
Input Return Loss	0.5		12.3			11.2		dB
	2.0		17.2			16.3		
	4.0		10.0			9.2		
	5.0		8.3			7.7		
	8.0		6.5			6.0		
Output Return Loss	0.5		14.4			15.0		dB
	2.0		17.5			21.4		
	4.0		20.1			17.4		
	5.0		13.6			12.4		
	8.0		6.4			6.3		
Output Power @1dB compression	0.5		17.6			16.0		dBm
	2.0		20.3			19.5		
	4.0		18.0			16.0		
	5.0		18.8		13.0	16.6	—	
	8.0		16.9			16.4		
Output IP3	0.5		29.4			26.1		dBm
	2.0		30.1			26.6		
	4.0		28.1			24.8		
	5.0		27.2		12.3	24.0	—	
	8.0		26.7			24.5		
Device Operating Voltage			6.0			5.0		V
Device Operating Current			62	94		50		mA
DC Current Variation Vs. Temp. [2]			-157			-109		µA/°C
DC Current Variation Vs. Voltage at 25°C			0.016			0.016		mA/mV
Thermal Resistance			70			70		°C/W

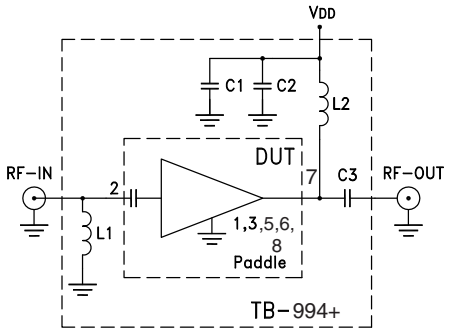
1. Measured on Mini-Circuits Characterization test board TB-994+. See Characterization Test Circuit (Fig. 1)
2. (Current at 125°C - Current at -45°C)/170

Absolute Maximum Ratings[3]

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to 125°C
Storage Temperature	-65°C to 150°C
Junction Temperature	150°C
Total Power Dissipation	0.95 W
Input Power (CW), Vd=5,6V[4]	+19 dBm (5 minutes max.) +16 dBm (continuous)
DC Voltage	7 V

Note:
3. Permanent damage may occur if any of these limits are exceeded.
Electrical maximum ratings are not intended for continuous normal operation.
4. Measured on Mini-Circuits test board, TB-994+

Recommended Application and Characterization Test Circuit

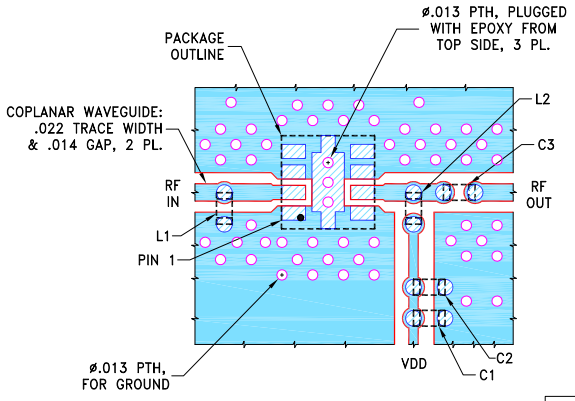


Component	Vendor	Vendor P/N	Value	Size
C1	Murata	GRM155R71E103KA01D	0.01µF	0402
C2	Murata	GJM1555C1H100JB01D	10pF	0402
C3	Murata	GRM1555C1H101JA01D	100pF	0402
L1	Murata	LQG15HS18NJ02D	18nH	0402
L2	Coilcraft	0402CS-39NXGLW	39nH	0402

Fig 1. Application and Characterization Circuit
Note: This block diagram is used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-994+) 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: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.

Suggested PCB Layout (PL-606)



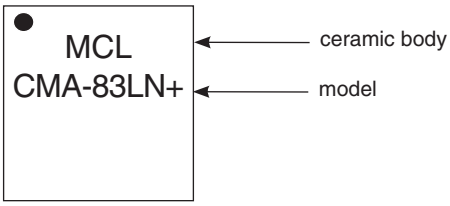
COMPONENT	SIZE
C1–C3, L1–L2	0402

NOTES:
1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010"±.001". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. CHIP COMPONENT FOOT PRINTS SHOWN FOR REFERENCE. FOR COMPONENT VALUES REFER TO TB-994+.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

Product Marking



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 (.zip file)
Case Style	DL1721 *Ceramic package, exposed paddle, Terminal finish: NiPdAu*
Tape & Reel **Standard quantities available on reel**	F66-1 *7" reels with 20, 50, 100, 200, 500 or 1K, 2K devices.*
Suggested Layout for PCB Design	PL-606
Evaluation Board	TB-994+
Environmental Ratings	ENV-68

ESD Rating

Human Body Model (HBM): Class 1A (250 to <500V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M1 (pass 50V) in accordance with ANSI/ESD STM5.2-1999

MSL Rating

Moisture Sensitivity: MSL1 (these parts are hermetic, air cavity and therefore, MSL ratings do not strictly apply. For handling purpose, use MSL1)

Qualification Testing

The table below shows the initial qualification testing performed. If required, parts can be subjected to 100% screening and qualifications testing per MIL standard requirement.

Test Description		Test Method/Process	Results
1	Hermeticity (fine and gross leak)	MIL-STD-202 Method 112, Cond. C & D	Pass
2	Acceleration, 30Kg, Y1 Direction	MIL-STD-883 Method 2001 Cond. E	Pass
3	Vibration , 10-2000Hz sine, 20g, 3 axis	MIL-STD-202 Method 204, Cond. D	Pass
4	Mechanical shock	MIL-STD-202 Method 213, Cond . A	Pass
5	PIND 20G's @130 Hz	MIL-STD-750 Method 2052.2	Pass
6	Temp Cycle -55C/+125C, 1000 Cycles	MIL-STD-202 Method 107	Pass
7	Autoclave, 121C, RH 100%, 15 Psig, 96 hrs	JESD22-A102C	Pass
8	HTOL, 1000hrs, 105C at rated Voltage condition	MIL-STD-202 Method 108, Cond . D	Pass
9	Bend Test	JESD22-B113	Pass
10	Resistance to soldering heat, 3x reflow, 260C peak	JESD22-B102	Pass
11	Drop Test	JESD22-B111	Pass
12	Adhesion Strength	Push Test>10 lb	Pass

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.

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/MCLStore/terms.jsp