ULTRA LOW NOISE, LOW CURRENT, SHUTDOWN

Monolithic Amplifier PMA2-133LN+

50Ω 10 to 13 GHz

THE BIG DEAL

- Low noise figure, 1.3 dB at 11 GHz
- Low current, 13 mA at 3V, 29 mA typ. at 5V
- Excellent ESD protection Class 1C
- Small size, 2 x 2 x 1 mm
- Shutdown feature

Generic photo used for illustration purposes only

CASE STYLE: MC1630-1

+RoHS Compliant

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

APPLICATIONS

- Satellite communication
- Military Radar
- VSAT
- Point to Point
- Radio Astronomy

PRODUCT OVERVIEW

Mini-Circuits' PMA2-133LN+ is an E-PHEMT* based, ultra-low noise MMIC amplifier. The model offers a unique combination of low current consumption, low noise and high IP3, making it an ideal for sensitive, high-dynamic-range receiver applications. This design operates at both 3V & 5V supply, is well matched for 50Ω systems, and comes in a tiny, low-profile package,accommodating dense circuit board layouts.

KEY FEATURES

Feature	Advantages
Ultra-low noise, 1.3 dB at 11 GHz	Enables lower system noise figure performance.
High IP3, 28.6 dBm typ. at 11 GHz	The combination of low noise and high IP3 makes the PMA2-133LN+ ideal for use in low noise receiver front end (RFE) as it gives the user the advantages of sensitivity and two-tone IM performance at both ends of the dynamic range.
Support Low operating voltage, 3V&5V	Usable in battery operated systems.
Low current consumption, 13 mA at 3V 29 mA at 5V	Enables prolonged battery life.
Shutdown feature (Ven=0V, V_{DD}=3/5V)	Saves DC power consumption when it is not reguired.
Separate pads for V_{DD} and RF-OUT	Built-in RF-choke separates VDD and RF-OUT ports, minimizing external components, cost and saving PCB space.
Excellent ESD protection, Class 1C	Robust ESD performance eliminates the need for external ESD protection circuits, saving PCB space, minimizing noise figure degradation, and reducing cost.
2 x 2mm, 6-lead MCLP package	Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

*Enhancement mode Pseudomorphic High Electron Mobility Transistor

REV. A
ECO-011027
PMA2-133LN+
RS/CP
211209

ELECTRICAL SPECIFICATIONS[1] AT 25°C, 3V&5V, AND 50 OHMS UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	3V Min.	3V Typ.	3V Max.	5V Typ.	Units
Frequency Range		10		13		GHz
Noise Figure	10.0		1.4		1.5	dB
	10.7		1.4		1.3	
	11.0		1.4		1.3	
	12.0		1.5		1.4	
	13.0		1.6		1.5	
Gain	10.0	—	14.1	—	15.3	dB
	10.7	—	14.1	—	15.3	
	11.0	—	14.1	—	15.3	
	12.0	11.1	14.1	15.3	15.6	
	13.0	—	14.0	—	15.8	
Reverse Isolation	11.0		22.7		23.3	dB
Input Return Loss	10.0		13		16	dB
	10.7		14		17	
	11.0		14		17	
	12.0		17		21	
	13.0		27		24	
Output Return Loss	10.0		18		14	dB
	10.7		16		12	
	11.0		16		12	
	12.0		26		18	
	13.0		13		18	
Output Power at 1dB Compression	10.0		8.4		13.3	dBm
	10.7		9.4		14.4	
	11.0		8.9		13.5	
	12.0		8.5		13.1	
	13.0		7.1		11.5	
Output IP3 Pout=-10 dBm/tone	10.0		23.4		27.9	dBm
	10.7		23.7		29.3	
	11.0		23.6		28.6	
	12.0		23.8		28.8	
	13.0		23.5		28.9	
Device Operating Voltage (V_{DD})[3]			3.0		5.0	V
Device Operating Current (I_{DD})			13	21	29	mA
Device Current Variation vs. Temperature[2]			-10		-53	µA/°C
Device Current Variation vs. Voltage			0.0079		0.0076	mA/mV
Thermal Resistance, junction-to-ground lead			124		118	°C/W

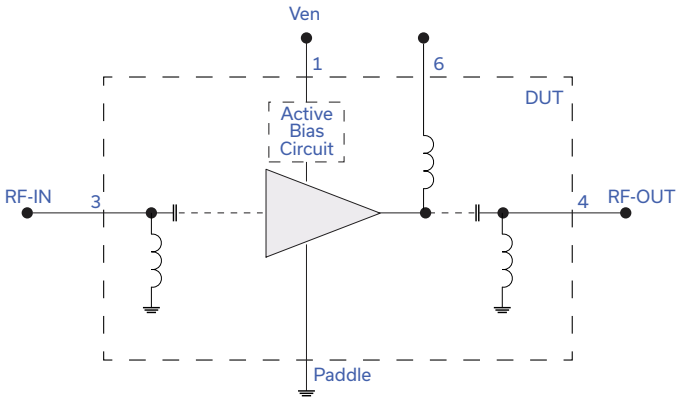
1 Measured on Mini-Circuits Characterization test board TB-991+. See Characterization Test Circuit (Fig. 1)
2 (Current at 85°C - Current at -45°C)/130
3 VDD is connected to Ven.

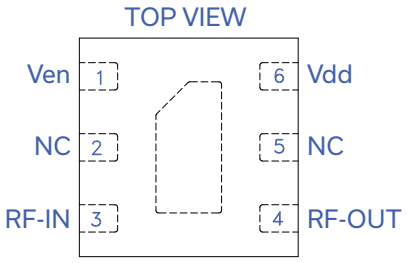
MAXIMUM RATINGS[4]

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to 85°C
Storage Temperature	-65°C to 150°C
Total Power Dissipation	0.31W
Input Power (CW)	+19 dBm (5minutes max) +10 dBm (continuous)
DC Voltage	+7.7V

4. 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	3	RF Input pad. This pad requires the use of an external DC blocking capacitor.
RF-OUT	4	RF Output pad. This pad requires the use of an external DC blocking capacitor.
V_{DD}	6	DC Supply pad, Connect to external DC power supply.
Ven	1	Gain or shutdown model enable voltage pad. Connect to VDD for Gain mode operation. Connect to Ground to shut-down the amplifier.
GND	Paddle	Connections to Ground.
NC	2,5	Pads have no connections internally. Connect pads to Ground externally.

RECOMMENDED APPLICATION AND CHARACTERIZATION TEST CIRCUIT

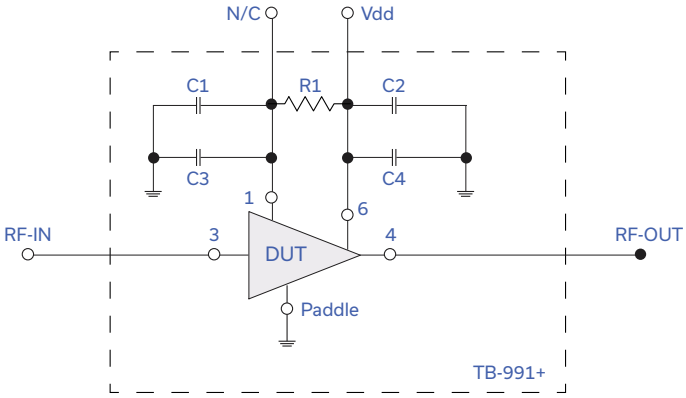


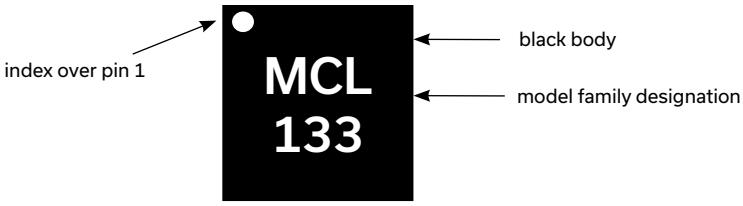
Fig 1. Application and Characterization Circuit
This block diagram is used for DUT characterization in Gain Mode operation. (DUT soldered on Mini-Circuits Characterization test board TB-991+).
Gain, Return loss, Output power at 1dB compression (P1dB), Output IP3 (OIP3) and noise figure measured using 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, -10 dBm/tone at output.

FOR GAIN MODE OPERATION:

Component	Size	Value	Manufacturer	P/N
C1, C2	0402	0.1uF	Murata	GRM155R71C104KA88D
C3, C4	0402	100pF	Murata	GRM1555C1H101J01D
R1	0402	0 ohms	KOA	RK73Z1JTTD

PRODUCT MARKING



Marking may contain other features or characters for internal lot control

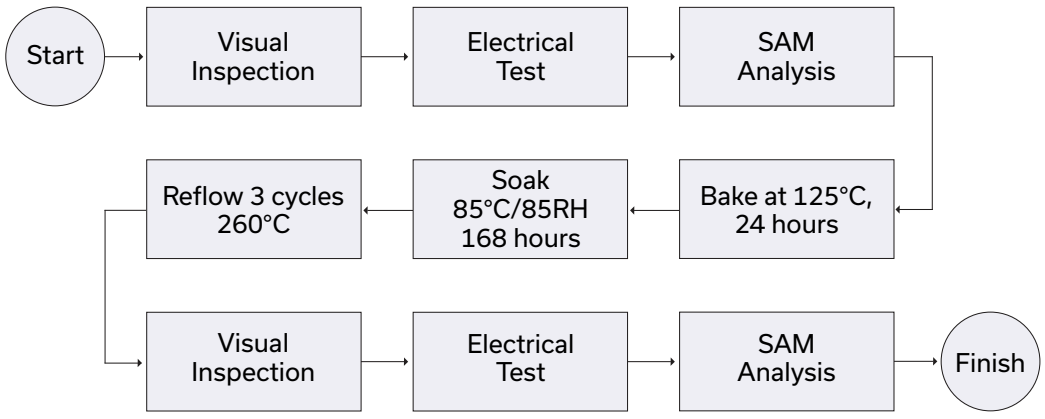
ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS CLICK HERE

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	MC1630-1 Plastic package, exposed paddle, lead finish: matte-tin
Tape & Reel **Standard quantities available on reel**	F66 7" reels with 20, 50, 100, 200, 500 or 1K devices
Suggested Layout for PCB Design	PL-585
Evaluation Board	TB-991+
Environmental Ratings	ENV08T1

ESD RATING

Human Body Model (HBM): Class 1C (Pass 1000V) in accordance with ANSI/ESD STM 5.1 - 2001

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/MCLStore/terms.jsp