Ultra Linear Low Noise, Ceramic

Monolithic Amplifier

CMA-103+

50Ω 0.05 to 4 GHz

The Big Deal

- Ceramic, hermetically sealed, nitrogen filled
- Low profile case, 0.045”
- Ultra High IP3
- Broadband High Dynamic Range

CASE STYLE: DL1721

MIL Screening Available
Please consult Applications Dept.

Product Overview

Mini-Circuits’ CMA-103+ is an advanced wideband amplifier fabricated using E-PHEMT technology and offers extremely high dynamic range over a broad frequency range and with low noise figure. In addition, the CMA-103+ has good input and output return loss over a broad frequency range without the need for external matching components and has demonstrated excellent reliability. 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.
Broad Band: 0.05 to 4.0 GHz	Broadband covering primary wireless communications bands: Cellular, PCS, LTE, WiMAX
Ultra High IP3 Versus DC power Consumption: 45 dBm typical at 2 GHz at +5.0V Supply Voltage and only 97mA	The CMA-103+ provides excellent IP3 performance relative to device size and power consumption. The combination of the design and E-PHEMT Structure provides en- hanced linearity over a broad frequency range as evidence in the IP3 being typically 20 dB above the P 1dB point. This feature makes this amplifier ideal for use in: • Driver amplifiers for complex waveform up converter paths • Drivers in linearized transmit systems • Secondary amplifiers in ultra High Dynamic range receivers
Low Noise Figure: 0.5 dB up to 1.0 GHz	A unique feature of the CMA-103+ which separates this design from all competitors is the low noise figure performance in combination with the high dynamic range.
Ceramic, hermetic package	Low inductance, repeatable performance, outstanding reliability in tough operating conditions, and small size (0.12 x 0.12 x 0.045”)

Ultra Linear Low Noise, Ceramic

Monolithic Amplifier

0.05-4.0 GHz

Product Features

- Ceramic, hermetically sealed, high reliability
- Low profile case, .045” high
- 5V/3V operation
- High IP3, 45 dBm typ. at 2 GHz, Vd=5V
- Low Noise Figure, 0.5 at 1 GHz; 0.8 dB at 2 GHz
- Gain, 10.9 dB typ. at 2 GHz
- P1dB 23.1 dBm typ. at 2 GHz at Vd=5V

Generic photo used for illustration purposes only

CASE STYLE: DL1721

CMA-103+

+RoHS Compliant

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

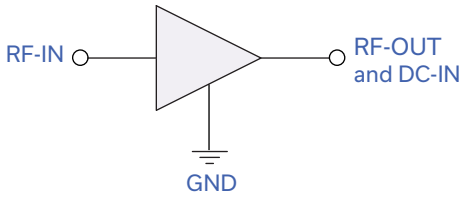
Typical Applications

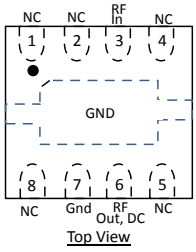
- High Rel Systems
- Defense and Aerospace
- Base station infrastructure
- Portable Wireless
- CATV & DBS
- MMDS & Wireless LAN
- LTE

General Description

Mini-Circuits’ CMA-103+ is an advanced wideband amplifier fabricated using E-PHEMT technology and offers extremely high dynamic range over a broad frequency range and with low noise figure. In addition, the CMA-103+ has good input and output return loss over a broad frequency range without the need for external matching components and has demonstrated excellent reliability. 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.

simplified schematic and pad description





Top View

Function	Pad Number	Description
RF IN	3	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
RF-OUT and DC-IN	6	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in “Recommended Application Circuit”, Fig. 2
GND	7, Paddle	Connections to ground. Use via holes as shown in “Suggested Layout for PCB Design” to reduce ground path inductance for best performance.
NC	1,2,4,5,8	Not used internally. Connected to ground on test board

Electrical Specifications[1] at 25°C, 50Ω, unless noted

Parameter	Condition (GHz)	Vd=5V Min.	Vd=5V Typ.	Vd=5V Max.	Vd=3V Typ.	Units
Frequency Range		0.05		4.0		GHz
Gain	0.05	—	26.3	—	25.7	dB
	0.4	—	22.1	—	21.7	
	1.0	14.7	16.3	18.0	16.0	
	2.0	—	11.0	—	10.7	
	3.0	—	7.9	—	7.7	
	4.0	—	5.8	—	5.7	
Noise Figure	0.05		0.4		0.3	dB
	0.4		0.4		0.4	
	1.0		0.5		0.4	
	2.0		0.8		0.9	
	3.0		1.1		0.8	
	4.0		1.3		1.3	
Input Return Loss	0.05	—	6.2	—	5.8	dB
	0.4	—	10.9	—	10.2	
	1.0	10.0	14.0	—	13.0	
	2.0	—	16.0	—	15.0	
	3.0	—	17.3	—	16.4	
	4.0	—	18.6	—	17.3	
Output Return Loss	0.05	—	12.9	—	13.0	dB
	0.4	—	19.9	—	21.8	
	1.0	14.0	18.2	—	22.1	
	2.0	—	16.4	—	19.9	
	3.0	—	15.2	—	18.2	
	4.0	—	14.5	—	17.1	
Reverse Isolation	1.0		21.1		20.3	dB
Output Power @1dB compression [2]	0.05		20.0		15.6	dBm
	0.4		22.1		18.6	
	1.0		22.2		18.9	
	2.0		23.1		19.7	
	3.0		23.5		20.3	
	4.0		24.2		20.9	
Output IP3	0.05	—	37.4	—	34.9	dBm
	0.4	—	39.4	—	32.8	
	1.0	—	42.6	—	33.2	
	2.0	40.0	44.8	—	33.9	
	3.0	—	47.1	—	34.3	
	4.0	—	47.9	—	35.0	
Device Operating Voltage		4.8	5.0	5.2	3.0	V
Device Operating Current			97	120	60	mA
DC Current Variation Vs. Temp.			-178		-54	µA/°C
DC Current Variation Vs. Voltage			0.014		0.018	mA/mV
Thermal Resistance, junction-to-ground lead			61		61	°C/W

[1] Measured on Mini-Circuits Characterization test board TB-829-103+. See Characterization Test Circuit (Fig. 1)
[2] Current increases at P1dB

Absolute Maximum Ratings

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to 125°C
Storage Temperature	-65°C to 150°C
Operating Current at 5.0V	200 mA
Power Dissipation at 5.0V	1W
Input Power (CW)	+21 dBm (50 to 2000 MHz) +26 dBm (2000 to 4000 MHz)
DC Voltage on Pin 6	6V

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

Characterization Test Circuit

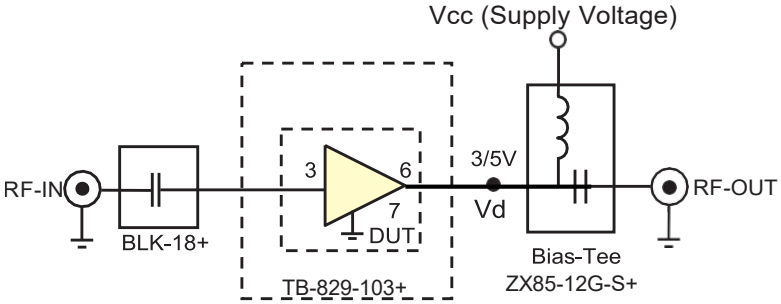
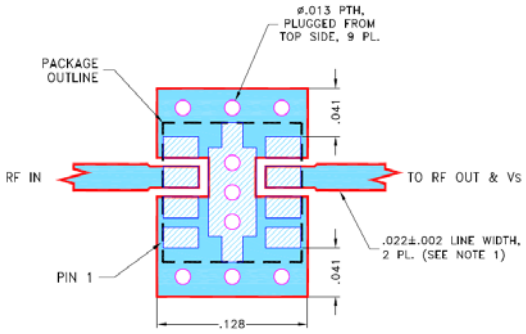


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT tested on Mini-Circuits Characterization test board TB-829-103+) Gain, Return loss, Output power at 1dB compression (P1 dB) , output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:
1. Gain and Return loss: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 5 dBm/tone at output.

Suggested PCB Layout (PL-602)

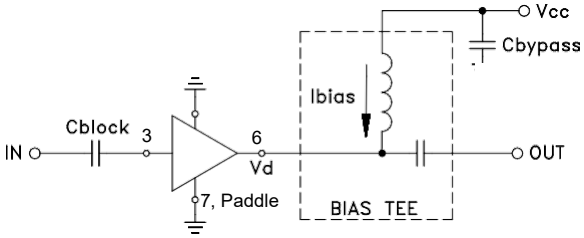


NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Recommended Application Circuit



Cblock=0.001µF, Bias-Tee=TCBT-14+, Cbypass=0.1µF

Fig 2a. Evaluation board TB-988-103+ includes case, connectors and components soldered to PCB

Product Marking