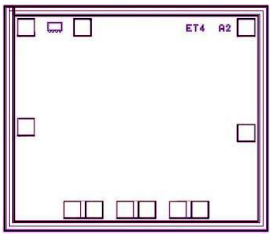
HIGH DIRECTIVITY

Monolithic Amplifier Die MNA-7A-D+

50Ω 1.5 to 6 GHz

THE BIG DEAL

- Choice of supply voltage, +2.8V to +5V
- Internal DC blocking at RF input and output
- High directivity, 18-38 dB typ.
- Output power, up to +17.4 dBm typ.



+RoHS Compliant
The +Suffix identifies RoHS Compliance.
See our website for methodologies and qualifications

SEE ORDERING INFORMATION ON THE LAST PAGE

APPLICATIONS

- Buffer amplifier
- Cellular infrastructure
- Communications satellite
- Defense

PRODUCT OVERVIEW

MNA-7A-D+ is a wideband PHEMT based MMIC amplifier die with high active Directivity. MNA integrates the entire matching network and majority of the bias circuit inside the die, reducing the need for complicated external circuits. This approach makes the MNA amplifier die extremely straightforward to use. This design operates on a single 2.8 to 5V supply, is well matched for 50Ω. MNA series models are available in Die and packaged form.

KEY FEATURES

Features	Advantages
Excellent Active Directivity (Isolation- Gain) 18-38 dB	Ideal for use as a buffer amplifier minimizing interaction of adjacent circuits
Integrates DC blocks and RF choke	Minimizes external components, component count and circuit area.
Single +2.8 to +5V operation	Amplifier can be used at low voltage such as +3V or standard +5V. +5V operation results in higher P1dB and OIP3.
Unpackaged die	Enables the user to integrate the amplifier directly into hybrids.

REV. B
ECO-015286
MNA-7A-D+
MCL NY
221007

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ELECTRICAL SPECIFICATIONS[1] AT 25°C

Parameter	Condition (GHz)	Vs=5V Min.	Vs=5V Typ.	Vs=5V Max.	Vs=2.8V Typ.	Units
Frequency Range		1.5		6.0	1.5-6.0	GHz
Gain	1.5		17.5		15.0	dB
	2.0		17.7		15.6	
	3.5		17.7		15.7	
	5.0		18.0		16.7	
	5.9		12.6		9.2	
	6.0		11.7		8.1	
Input Return Loss	1.5		7.5		7.5	dB
	2.0		11.0		10.5	
	3.5		17.4		15.9	
	5.0		15.5		15.5	
	5.9		11.2		10.1	
	6.0		11.1		10.2	
Output Return Loss	1.5		18.7		18.7	dB
	2.0		21.6		16.6	
	3.5		21.3		13.7	
	5.0		15.8		12.2	
	5.9		14.3		9.9	
	6.0		13.5		9.5	
Output Power at P1dB	1.5		17.4		12.4	dBm
	2.0		17.1		13.0	
	3.5		14.8		11.9	
	5.0		16.1		13.4	
	5.9		15.6		10.9	
	6.0		14.4		9.7	
Output IP3	1.5		28.8		23.7	dBm
	2.0		28.5		24.3	
	3.5		25.8		22.6	
	5.0		27.4		24.5	
	5.9		27.0		21.7	
	6.0		25.6		20.3	
Noise Figure (dB)	1.5		6.9		7.3	dB
	2.0		5.7		6.2	
	3.5		4.3		4.8	
	5.0		3.7		4.0	
	5.9		4.5		5.2	
	6.0		4.7		5.4	
Directivity (Isolation-Gain)	1.5		32.4		35.1	dB
	2.0		27.2		29.2	
	3.5		20.6		22.6	
	5.0		19.4		18.9	
	5.9		23.5		25.9	
	6.0		24.5		27.1	
DC Current			82	103	77	mA
Device Current Variation vs. Temperature[2]			31		21	µA/°C
Device Current Variation vs Voltage			0.0009[3]		0.003[4]	mA/mV
Thermal resistance at 85°C (Junction to Lead)			60		60	°C/W

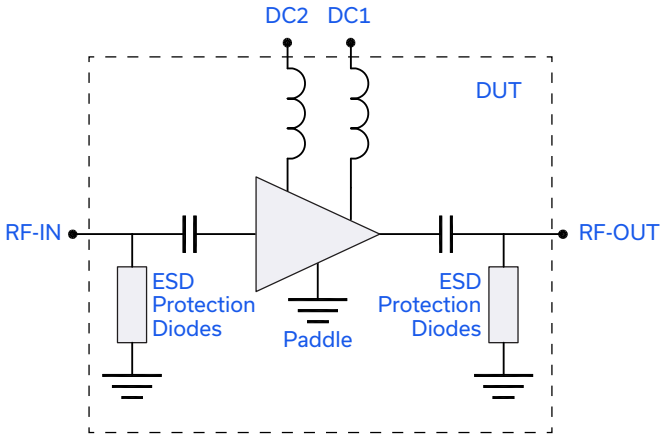
1. Measured on Mini-Circuits characterization test board. Die packaged in 3x3 mm MCLP package and soldered on test board TB-186-7A+
2. (Current at 85°C -Current at -45°C)/130
3. (Current at 5.25V-Current at 3.9V)/1.35
4. (Current at 3.9V-Current at 2.66V)/1.24

MAXIMUM RATINGS[1,5]

Parameter	Ratings
Operating Temperature	-40°C to 85°C
DC Voltage	7V at DC1 (DC2 connected to DC1 via 6.81Ω) 1V at RF IN & RF OUT
Power Dissipation	750 mW
Input Power	+10 dBm (continuous operation) +26 dBm over 1.5 to 3.7 GHz (5 minutes max) +20 dBm over 3.7 to 6 GHz (5 minutes max)

5. Permanent damage may occur if any of these limits are exceeded.
These ratings are not intended for continuous normal operation.

SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Description
RF IN	RF input pad.
RF-OUT	RF output pad
DC1 & DC2	DC Supply pad. Connect DC2 to DC1 via 6.81Ω resistor

1. Bond Pad material - Gold
2. Bottom of Die - Gold plated

CHARACTERIZATION CIRCUIT

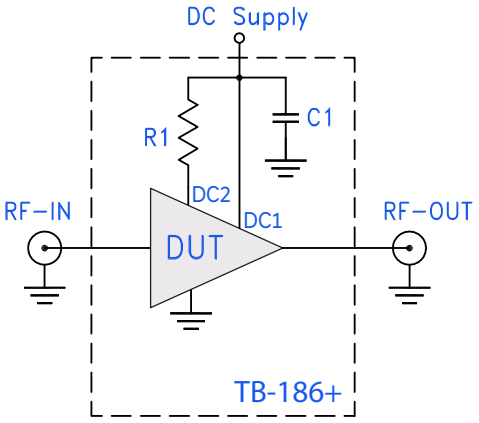


Fig 1. Block Diagram of Test Circuit used for characterization. (Die packaged in 3x3 mm MCLP package and soldered on Mini-Circuits Characterization test board TB-186+) Gain, Return loss, Output power at 1dB compression (P1 dB) , output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X 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.

Component	Value	Units
R1	6.81	Ω
C1	1000	pF

RECOMMENDED APPLICATION CIRCUIT

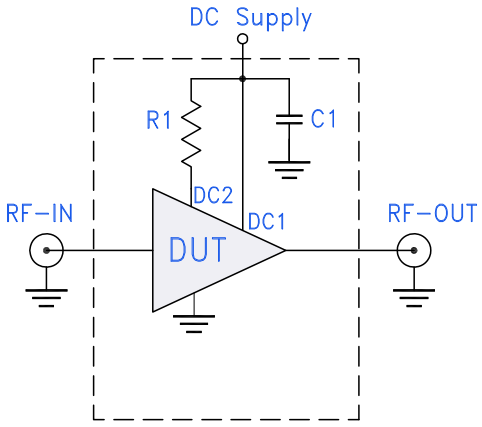


Fig 2. Test Board includes case, connectors, and components soldered to PCB

Component	Value	Units
R1	6.81	Ω
C1	1000	pF

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DIE LAYOUT

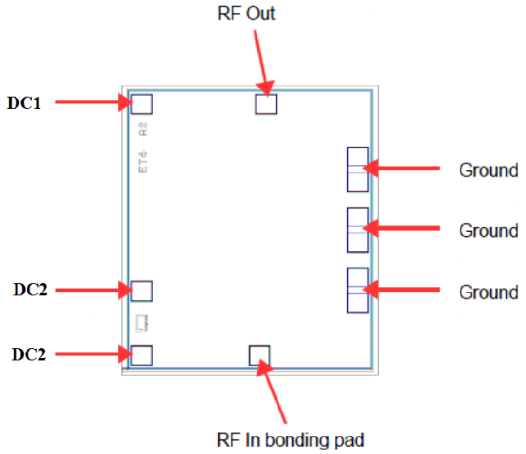


Fig 3. Die Layout

BONDING PAD POSITION

(Dimensions in µm, Typical)

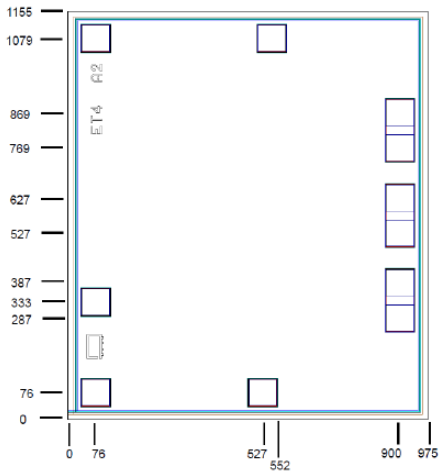
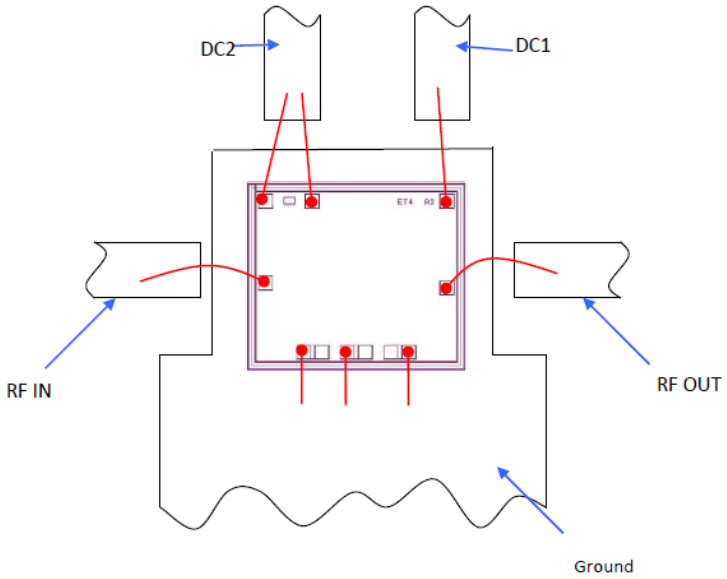


Fig 4. Bonding Pad Positions

CRITICAL DIMENSIONS

Parameter	Values
Die Thickness, µm	100
Die Width, µm	975
Die Length, µm	1155
Bond Pad Size (RF In, RF Out, DC), µm	80 x 80
Bond Pad Size (Ground pad), µm	80 x 180

ASSEMBLY DIAGRAM



Note: Ground bond wires are optional.

RECOMMENDED WIRE LENGTH, TYPICAL

Wire	Wire Length (mm)	Wire Loop Height (mm)
RF In, RF Out, DC	0.75	0.15
Ground	0.40	0.15

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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD.

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set with and without port extension(.zip file)	
Case Style	Die	
Die Ordering and packaging information	Quantity, Package Small, Gel - Pak: 5,10,50,100 KGD* Medium†, Partial wafer: KGD*<1395 Large†, Full Wafer †Available upon request contact sales representative Refer to AN-60-067	Model No. MNA-7A-DG+ MNA-7A-DP+ MNA-7A-DF+
Environmental Ratings	ENV-80	

*Known Good Die ('KGD') means that the die in question have been subjected to Mini-Circuits DC test performance criteria and measurement instructions and that the parametric data of such die fall within a predefined range. While DC testing is not definitive, it does provide a higher degree of confidence that die are capable of meeting typical RF electrical performance specified by Mini-Circuits.

ESD RATING**

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

**Tested in _x_ xxL MCLP Package

NOTES

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