

Anexo: Datasheet del Amplificador Modelo MAR-8A+

Drop-In Monolithic Amplifier

DC-1 GHz

Features

- Exact foot print substitute** MAR-8 and MSA-0885
- High gain, 31.5 dB at 0.1 GHz, reduces component count
- Internally Matched to 50 Ohms
- High power output, +12.5 dBm typ.
- Low noise
- Improved stability
- Protection against power supply transients
- Patent pending
- Aqueous washable

Applications

- Cellular
- PCN & instrumentation

** See resistor table; resistor values are higher than MAR-8/MSA-0885 how to replace: Increase bias resistor (Rbias) by 110 ohms.

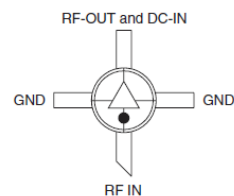
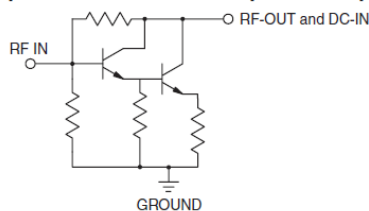
Benefits:

- lower device voltage, 3.7 typ.
- lower power dissipation in the MMIC
- may eliminate need for choke (RFC)

General Description

MAR-8A+ (RoHS compliant) is a wideband amplifier offering high dynamic range. It has repeatable performance from lot to lot. It is enclosed in a Micro-X package. MAR-8A+ uses Darlington configuration and is fabricated using InGaP HBT technology. Expected MTBF is 18,000 years at 85°C case temperature.

simplified schematic and pin description



Function	Pin Number	Description
RF IN	1	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	3	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".
GND	2,4	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

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RF/MICROWAVE COMPONENTS

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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/MCStore/terms.jsp.

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Electrical Specifications at 25°C and 36mA, unless noted

Parameter	Min.	Typ. ³	Max.	Units
Frequency Range*	DC		1	GHz
Gain	f=0.1 GHz f=1 GHz	31.5 25		dB
Input Return Loss	f=DC to 1 GHz	15.5		dB
Output Return Loss	f=DC to 1 GHz	11		dB
Output Power @ 1 dB compression	f=1 GHz	+12.5		dBm
Output IP3	f=1 GHz	+25		dBm
Noise Figure	f=1 GHz	3.1		dB
Recommended Device Operating Current		36		mA
Device Operating Voltage		3.7	4.2	V
Device Voltage Variation vs. Temperature at 36 mA		+1.2		mV/°C
Device Voltage Variation vs. Current at 25°C		11.3		mV/mA
Thermal Resistance, junction-to-case ¹		119		°C/W

*Guaranteed specification DC-1 GHz. Low frequency cut off determined by external coupling capacitors.

Absolute Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Operating Current	65mA
Power Dissipation	250mW
Input Power	13dBm

Note: Permanent damage may occur if any of these limits are exceeded.

These ratings are not intended for continuous normal operation.

¹Case is defined as ground leads.

²Full temperature range.

³Based on test data of Model MAR-8ASM+ (Case Style WW107).

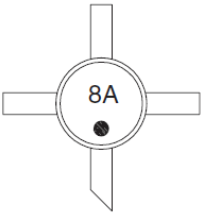


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Product Marking



Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

Performance data, graphs, s-parameter data set (.zip file)

Case Style: VV105
Plastic micro-x, .085 body diameter, lead finish: tin/silver/nickel

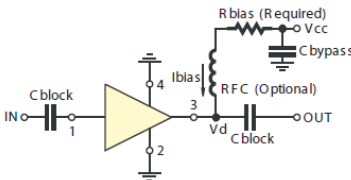
Tape & Reel: F20

Suggested Layout for PCB Design: PL-262

Evaluation Board: TB-432-8A+

Environmental Ratings: ENV08T3

Recommended Application Circuit



Test Board includes case, connectors, and components (in bold) soldered to PCB

R BIAS	
Vcc	"1%" Res. Values (ohms) for Optimum Biasing
7	88.7
8	118
9	143
10	174
11	200
12	226
13	255
14	280
15	309

ESD Rating

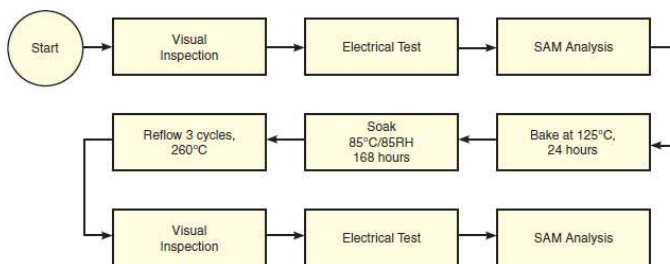
Human Body Model (HBM): Class 2 (2000v to < 4000v) in accordance with ANSI/ESD STM 5.1 - 2001

Charged Device Model (CDM): Class C4 (500v to <=1000v) in accordance with ESD STM 5.3.1 - 1999

MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020C

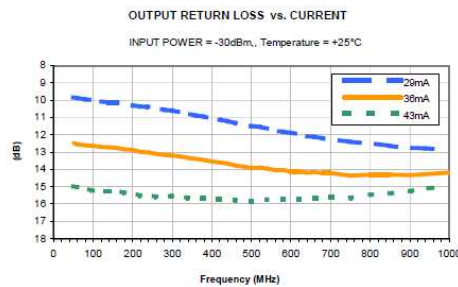
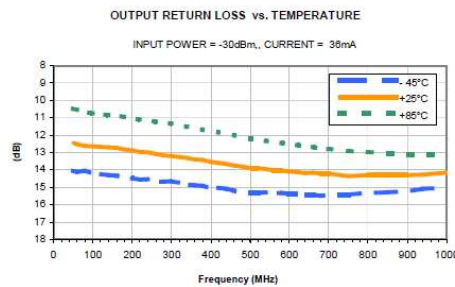
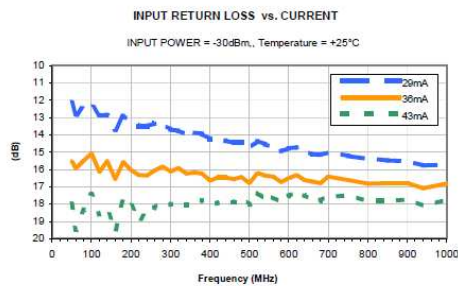
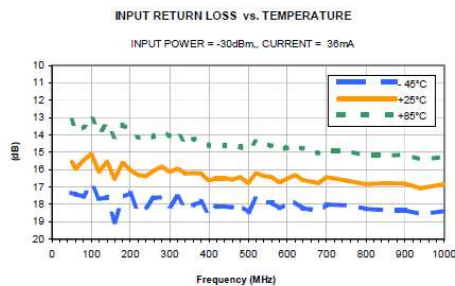
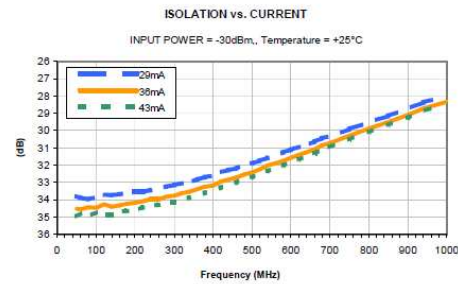
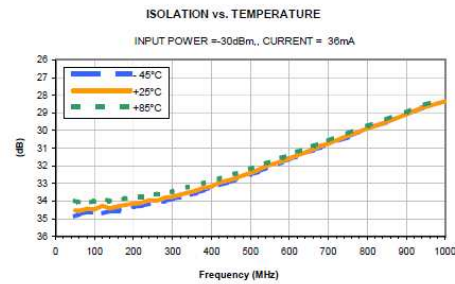
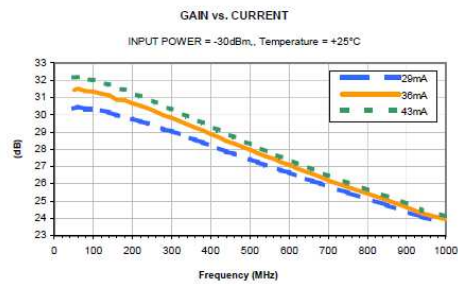
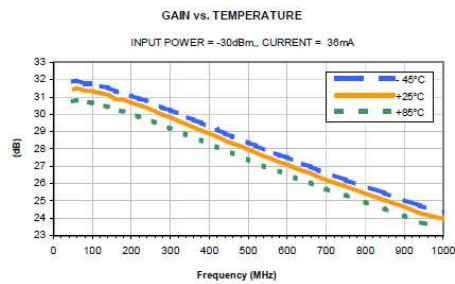
No.	Test Required	Condition	Standard	Quantity
1	Visual Inspection	Low Power Microscope Magnification 40x	MIP-IN-0003 (MCT spec)	45 units
2	Electrical Test	Room Temperature	SCD (MCL spec)	45 units
3	SAM Analysis	Less than 10% growth in term of delamination	J-Std-020C (Jedec Standard)	45 units
4	Moisture Sensitivity Level 1	Bake at 125°C for 24 hours Soak at 85°C/85%RH for 168 hours Reflow 3 cycles at 260°C peak	J-Std-020C (Jedec Standard)	45 units

MSL Test Flow Chart

MMIC Amplifier

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Typical Performance Curves



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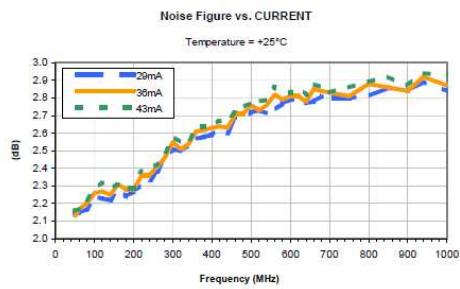
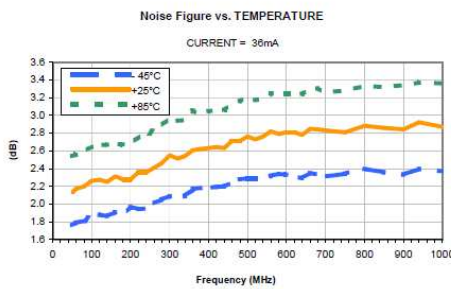
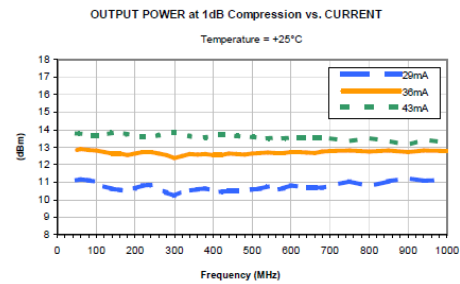
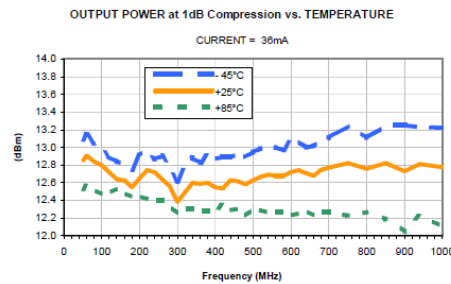
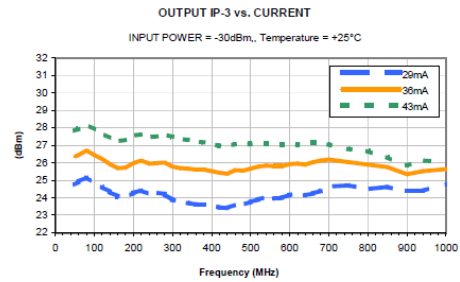
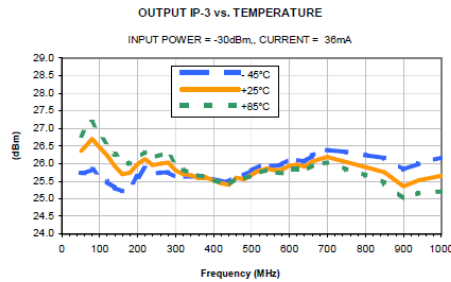


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MMIC Amplifier

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Typical Performance Data

**NOTE: Use PDF Bookmarks to view DATA at required conditions
or to view GRAPHS.**

Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Icc=36mA; Vcc=3.97V@Temp.=+25degC

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Delta	(dBm)	(dBm)	(dB)
50	31.43	34.52	15.52	12.46	1.04	0.74	26.36	12.85	2.13
60	31.50	34.53	15.95	12.54	1.04	0.74	26.45	12.91	2.17
80	31.37	34.43	15.47	12.61	1.04	0.74	26.70	12.84	2.20
100	31.34	34.46	15.08	12.65	1.04	0.74	26.46	12.80	2.26
120	31.23	34.26	16.14	12.68	1.04	0.74	26.22	12.72	2.27
140	31.12	34.40	15.51	12.71	1.05	0.72	25.93	12.64	2.25
160	30.87	34.30	16.55	12.75	1.05	0.71	25.69	12.63	2.31
180	30.83	34.21	15.57	12.83	1.05	0.71	25.74	12.55	2.28
200	30.66	34.15	16.03	12.87	1.06	0.70	25.98	12.65	2.28
220	30.51	34.09	16.32	12.98	1.06	0.69	26.13	12.74	2.36
240	30.37	33.95	16.36	13.01	1.06	0.69	25.95	12.72	2.36
260	30.17	33.96	16.06	13.10	1.07	0.67	26.00	12.64	2.41
280	29.96	33.80	15.82	13.16	1.07	0.67	26.02	12.56	2.46
300	29.82	33.75	16.13	13.19	1.07	0.66	25.79	12.38	2.55
320	29.63	33.62	15.92	13.26	1.08	0.66	25.69	12.49	2.51
340	29.44	33.52	16.23	13.33	1.08	0.65	25.67	12.60	2.54
360	29.25	33.39	16.19	13.40	1.08	0.64	25.60	12.59	2.61
380	29.07	33.24	16.23	13.45	1.08	0.64	25.60	12.60	2.62
400	28.89	33.16	16.64	13.55	1.09	0.63	25.53	12.55	2.63
420	28.71	32.95	16.47	13.60	1.08	0.63	25.43	12.54	2.64
440	28.47	32.82	16.47	13.67	1.09	0.62	25.39	12.63	2.63
460	28.32	32.70	16.56	13.76	1.09	0.62	25.59	12.62	2.71
480	28.15	32.54	16.43	13.82	1.09	0.62	25.55	12.58	2.71
500	27.96	32.40	16.78	13.91	1.09	0.61	25.68	12.63	2.76
520	27.78	32.24	16.20	13.90	1.09	0.61	25.79	12.67	2.73
540	27.58	32.01	16.37	13.96	1.09	0.61	25.85	12.69	2.76
560	27.43	31.89	16.42	14.04	1.09	0.60	25.81	12.68	2.82
580	27.24	31.74	16.74	14.04	1.09	0.60	25.82	12.68	2.79
600	27.10	31.56	16.50	14.11	1.09	0.60	25.94	12.72	2.81
620	26.88	31.40	16.32	14.12	1.09	0.59	25.97	12.74	2.81
640	26.72	31.25	16.61	14.19	1.09	0.59	25.91	12.71	2.78
660	26.58	31.07	16.70	14.16	1.09	0.59	26.06	12.68	2.85
680	26.39	30.85	16.78	14.22	1.08	0.60	26.13	12.75	2.84
700	26.20	30.73	16.42	14.22	1.08	0.59	26.19	12.77	2.83
750	25.82	30.29	16.63	14.37	1.08	0.59	26.04	12.82	2.81
800	25.42	29.88	16.83	14.31	1.08	0.59	25.90	12.76	2.88
850	25.04	29.50	16.78	14.30	1.07	0.59	25.76	12.82	2.86
900	24.65	29.08	16.80	14.32	1.07	0.58	25.35	12.73	2.84
940	24.29	28.71	17.07	14.27	1.07	0.58	25.52	12.81	2.92
1000	23.95	28.33	16.83	14.17	1.06	0.58	25.65	12.78	2.87



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Conclusión y Líneas Futuras de Investigación

Mediante la implementación práctica del circuito de microondas con dos amplificadores se ha podido dejar en claro el grave problema que supone una mala puesta a tierra en este tipo de circuitos. Se han interrelacionado en la medida de lo posible los resultados prácticos con los teóricos, gracias a la visualización de ciertos fenómenos que dejan patente el problema y la calidad de la solución propuesta.

Se propone al lector como futuras investigaciones sobre el tema los siguientes puntos:

- Estudio del circuito implementado con el apantallamiento por separado de cada amplificador componente de la cadena. De esta manera se podrá mejorar en cierta manera el problema observado del “leakage”, o realimentación parásita provocada por la presencia de señal procedente de la salida en la entrada de la red de microondas.
- Estudio del circuito implementado con el apantallamiento total de la placa. De esta manera se pretende evitar la formación de cavidades resonantes. Uno de los problemas que pueden aparecer ante la formación de dichas cavidades es que, ante ausencia de señal a la entrada del circuito, tengamos señal a la salida.
- Construcción de la placa de circuito impreso, junto a la realización de todas las medidas realizadas, con la ayuda de la instrumentación necesaria de laboratorio.

Bibliografía

A continuación se lista la serie de documentos que se han tenido en cuenta a la hora de elaborar el presente documento:

- “Essentials of RF and Microwave Grounding”, Eric Holzman.
- Ayuda de “momentum”: ADS 2008 Uptdate 1.
- Datasheet del componente amplificador modelo MAR-8A+ del fabricante Mini-Circuits.