

Surface Mount

# Monolithic Amplifier

DC-4 GHz

## Product Features

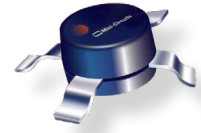
- DC-4 GHz
- Single Voltage Supply
- Internally matched to 50 Ohms
- Unconditionally Stable
- Low Performance Variation Over Temperature
- Transient protected
- Aqueous washable
- Protected by US Patent 6,943,629

## Typical Applications

- Cellular/ PCS/ 3G Base Station
- CATV, Cable Modem & DBS
- Fixed Wireless & WLAN
- Microwave Radio & Test Equipment

## General Description

ERA-5XSM+ (RoHS compliant) is a wideband amplifier offering high dynamic range. It has repeatable performance from lot to lot. It is enclosed in an Micro-X package. ERA-5XSM+ uses Darlington configuration and is fabricated using InGaP HBT technology. Expected MTTF is 850 years at 85°C case temperature.

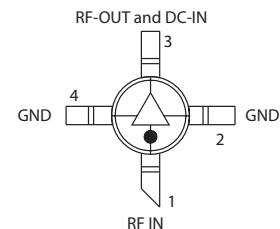
**ERA-5XSM+**

CASE STYLE: WW107

**+RoHS Compliant**

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

## 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.

### 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](http://www.minicircuits.com/MCLStore/terms.jsp)



## Electrical Specifications at 25°C and 65mA, unless noted

Parameter		Min.	Typ.	Max.	Units	Cpk
Frequency Range*		DC		4	GHz	
Gain	f=0.1GHz	19	20.2	22	dB	≥1.5
	f=1 GHz	—	19.5			
	f=2 GHz	16	17.6	19		
	f=3 GHz	—	15.6	—		
	f=4 GHz	12	14	16		
Magnitude of Gain Variation versus Temperature (values are negative)	f=0.1GHz	—	.0025	.005	dB/°C	
	f=1 GHz	—	.0034	.007		
	f=2 GHz	—	.0043	.0085		
	f=3 GHz	—	.0052	.0105		
	f=4 GHz	—	.0065	.013		
Input Return Loss	f=0.1 GHz		21		dB	
	f=2 GHz		23			
	f=4 GHz		21			
Output Return Loss	f=0.1 GHz		30		dB	
	f=2 GHz		26			
	f=4 GHz		17			
Reverse Isolation	f=2 GHz	19	22	—	dB	
Output Power @1 dB compression	f=0.1 GHz	16.5	18.4	—	dBm	≥1.5
	f=1 GHz	16.5	18.4	—		
	f=2 GHz	15.5	17	—		
	f=4 GHz	—	12.5	—		
Saturated Output Power (at 3dB compression)	f=0.1 GHz		19.5		dBm	
	f=1 GHz		18.5			
	f=2 GHz		18			
Output IP3	f=0.1 GHz	30	33	—	dBm	≥1.5
	f=1 GHz	30	33	—		
	f=2 GHz	26	30	—		
	f=4 GHz		26	—		
Noise Figure	f=0.1GHz	—	3.5	4.5	dB	≥1.5
	f=2 GHz	—	3.5	4.5		
	f=4 GHz	—	3.5	4.5		
Group Delay	f=2 GHz		90		psec	
Recommended Device Operating Current			65		mA	
Device Operating Voltage		4.5	4.9	5.3	V	≥1.5
Device Voltage Variation vs. Temperature at 65mA			-3.2		mV/°C	
Device Voltage Variation vs. Current at 25°C			6.9		mV/mA	
Thermal Resistance, junction-to-case <sup>1</sup>			133		°C/W	

\*Guaranteed specification DC-4 GHz. Low frequency cut off determined by external coupling capacitors.

## Absolute Maximum Ratings

Parameter	Ratings
Operating Temperature*	-45°C to 85°C
Storage Temperature	-65°C to 150°C
Operating Current	85mA
Power Dissipation	451mW
Input Power	13 dBm

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

<sup>1</sup>Case is defined as ground leads.

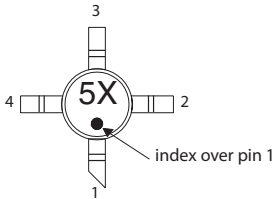
\*Based on typical case temperature rise 10°C above ambient.

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### Product Marking



Markings in addition to model number designation may appear for internal quality control purposes.

### 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: WW107

Plastic micro-x, .085 body diameter, lead finish: tin-silver over nickel

### Tape & Reel: F4

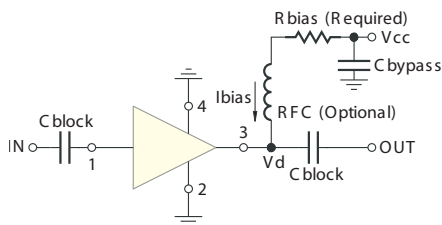
7" Reels with 20, 50, 100, 200, 500, 1K devices

### Suggested Layout for PCB Design: PL-075

### Evaluation Board: TB-408-5+

### Environmental Ratings: ENV08T2

### 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	33.2
8	48.7
9	63.4
10	78.7
11	95.3
12	110
13	124
14	140
15	158
16	174
17	187
18	205
19	221
20	232

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## Monolithic InGaP HBT MMIC Amplifier

### ESD Rating

Human Body Model (HBM): Class 1B (500 v to < 1,000 v) in accordance with ANSI/ESD STM 5.1 - 2001

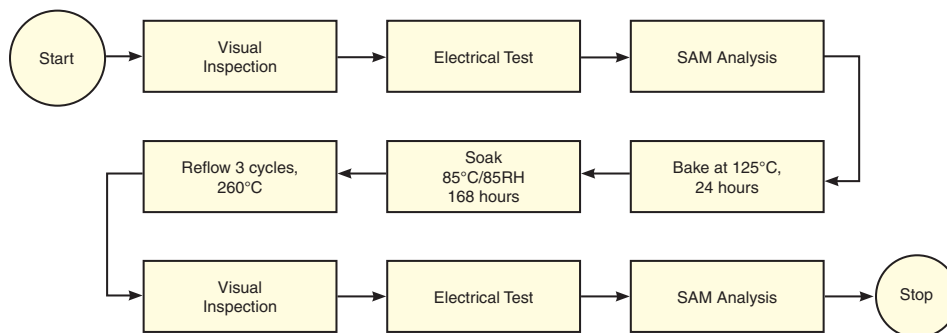
Machine Model (MM): Class M1 (< 100 v) in accordance with ANSI/ESD STM 5.2 - 1999

### MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDECJ-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



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