# MSiP<sup>™</sup> Mini-Circuits System In Package **Flat Gain Amplifier**



# The Big Deal:

- Ultra Flat Gain Response: ± 0.2 dB over 1700-2300 MHz
- 50 $\Omega$  Input and Output: no External Components Required



## **Product Overview:**

YSF-232+ is an advanced amplifier module in a Mini-Circuits System In Package MSIP. This module is fully matched to 50 n/out impedance and has built-in Input & Output DC block capacitors. It is enclosed in a 5 x 6 mm MCLP plastic package. The YSF-232+ uses E-PHEMT technology enabling it to work with a single positive supply voltage.

Feature	Advantages			
Superior Gain Flatness ± 0.2dB	The YSF-232+ provides industry leading gain flatness over the full PCS/UMTS com- munications band (1700-2300MHz) making this ideal for use in applications where gain-flatness and repeatability are critical performance requirements.			
High Gain	The YSF-232+ is a two-stage design with internal feedback and bias to provide flat 20 dB nominal gain, supporting applications where a single gain block must overcome large system losses such as long cable runs and lossy components.			
Strong Combination of Performance	The YSF-232+ provides a strong combination of performance parameters including high gain (20 dB), high IP3 (+35 dBm) and P1dB (+20 dBm) and low noise figures (2.9 dB) that are difficult to achieve in a single stage design and available only in the YSF amplifier series.			
Integrated Matching, DC Blocking and Bias in Small Package	The YSF-232+ includes all support circuits including: Matching, Bias and DC Block- ing, all integrated into a single 5x6mm package making the total footprint equal to or smaller than most solutions.			
Excellent Return Loss	The YSF-232+ includes integrated input and output matching and bias circuits to make this amplifier a simple, complete drop-in solution. The matching circuits provide excellent output return loss (20dB), and are designed to give optimal P1dB and IP3 performance in a $50\Omega$ environment.			
High Reverse Isolation	With 30 dB of reverse isolation – the YSF-232+ is an ideal gain block for use in inte- grated systems to minimize VSWR interactions resulting from cascading highly reflec- tive components such as sharp filters.			

## **Kev Features**



For detailed performance spece

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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-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuit's applicable established test are an entited to the rights and benefits contained therein. For a full statement of the Standard Terms'): Purchasers of this part are entited to the rights and benefits contained therein. For a full statement of the Standard Terms'): Purchasers of this part are entited to the rights and benefits contained therein. For a full statement of the Standard Terms'): Purchasers of this parts covered by this specification sheet are subject to Mini-Circuit's update the exclusive rights and benefits contained therein. For a full statement of the Standard Terms'): Purchasers of this part are entited to the rights and benefits contained therein. For a full statement of the Standard Terms'): Purchaser of the standard Terms'): purchasers of the standard Terms'): Purchaser of the standard Terms'): Purchasers of this part are entited to the rights and benefits contained therein. For a full statement of the Standard Terms'): Purchaser of the standard Terms'): Purcha

# MSIP Mini-Circuits System In Package **Flat Gain Amplifier**

#### **Product Features**

- Matched 50-ohm surface mount amplifier
- High gain, 20 dB typ.
- Up to +20 dBm typ. output power
- High IP3, +35 dBm
- Low Noise Figure, 2.9 dB typ.
- High directivity, 30 dB isolation
- Internal Input & Output DC Block
- Separate terminal for DC

### **Typical Applications**

- Cellular
- WCDMA
- Portable Wireless
- Receivers & transmitters
- PCS-Korea

# 1.7-2.3 GHz



CASE STYLE: DL1020 PRICE: \$2.69 ea. QTY. (20)

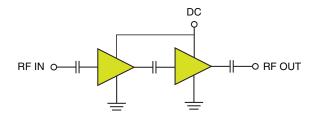
+ RoHS compliant in accordance with EU Directive (2002/95/EC)

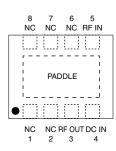
The +Suffix has been added in order to identify RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.

## **General Description**

YSF-232+ is an advanced amplifier module in a Mini-Circuits System In Package MSIP. This module is fully matched to  $50\Omega$  in/out impedance and has built-in Input & Output DC block capacitors. It is enclosed in a 5 x 6 mm MCLP plastic package. The YSF-232+ uses E-PHEMT\* technology enabling it to work with a single positive supply voltage.

#### simplified schematic and pad description





Function	Pad Number	Description
RF-IN	5	RF Input
RF-OUT	3	RF Output
DC	4	DC Supply
GND	Paddle	Connected to ground
NOT USED	1,2,6,7,8	No internal connection

\*Enhancement mode Pseudomorphic High Electron Mobility Transistor

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REV. OR YSF-232+

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## Electrical Specifications<sup>(1)</sup> at 25°C, Zo=50 $\Omega$ unless noted

Parameter	Condition (MHz)	Min.	Тур.	Max.	Units
Frequency Range		1700		2300	MHz
	1700	17.8	19.8	22.0	
Gain	2000	18.0	20.0	22.0	dB
	2300	17.6	19.5	21.5	
Gain Flatness			± 0.2		dB
	1700		10.0		
Input Return Loss	2000	8.0	10.8		dB
	2300		12.6		
	1700		23.5		
Output Return Loss	2000	18.0	23.0		dB
	2300		19.0		
Reverse Isolation			30.0		dB
	1700		20.0		
Output Power @1 dB compression	2000		20.0		dBm
	2300	18.0	20.0		
Output Power @3 dB compression			21.0		dBm
	1700		35.0		
Output IP3	2000	31.0	35.0		dBm
	2300		35.0		
	1700		3.0		
Noise Figure	2000		2.8	3.8	dB
	2300		2.5		
Device Operating Voltage			5		V
Device Operating Current			118	145	mA
Device Current Variation vs. Temperature <sup>(2)</sup>			2		µA/°C
Device Current Variation vs Voltage			0.002		mA/mV
Thermal Resistance, junction-to-ground lead <sup>(3)</sup>			56		°C/W

<sup>(1)</sup> Measured on Mini-Circuits Characterization test board TB-589+. See Characterization Test Circuit (Fig. 1)

(2) △(+85°C to -45°C)

<sup>(3)</sup> Thermal Resistance= Hot spot temperature - Ground lead temperature Power Dissipation

### **Absolute Maximum Ratings**

Parameter	Ratings	Units
Operating Temperature <sup>(4)</sup>	-40 to 85	°C
Storage Temperature	-65 to 150	°C
DC Voltage on Pad 4	7	V
Power Dissipation	1.5	W
Input Power	21	dBm

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

<sup>(4)</sup> Case is defined as ground paddle.

DC Current Histogram USL 8 8 100 105 110 130 125 115 140 135 둸 DC Current (mA) USL=Upper Spec Limit



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ISO 9001 ISO 14001 AS 9100 CERTIFIED P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 The Design Engineers Search Engine 2012 Provides ACTUAL Data Instantly at minicipaties.com

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## MSiP Flat Gain Amplifier

## **Characterization Test Circuit**

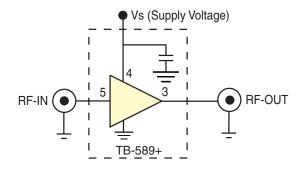


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization Test Fixture TB-589+) Gain, Return loss, Output power at 1dB compression (P1 dB), Output IP3 (OIP3) and Noise Figure measured using Agilent's N5242A PNA-X microwave network analyzer.

#### Conditions:

1. Gain: Pin= -25dBm

2. Output IP3 (OIP3): Two tones, spaced 10 MHz apart, 2.5 dBm/tone at output.

#### **Recommended Application Circuit**

(refer to evaluation board for PCB Layout and component values)

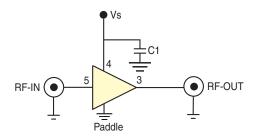
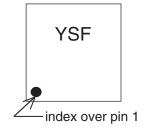


Fig 2. Recommended Application Circuit

### **Product Marking**





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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)				
	Data Table	go!		
Performance Data	Swept Graphs	go!		
	S-Parameter (S2P Files) Data Set (.zip file)	go!		
Case Style	DL1020 Plastic package, exposed paddle, lead finish: tin/silver/nickel	go!		
Tape & Reel	F68	go!		
Standard quantities available on reel	7" reels with 20, 50, 100, 200, 500, or 1K devices.	3.		
Suggested Layout for PCB Design	PL-335	go!		
Evaluation Board	TB-589-4+	go!		
Environmental Ratings	ENV08T1	go!		

## ESD Rating

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

Machine Model (MM): Class M3 (25V) in accordance with ANSI/ESD STM5.2-1999

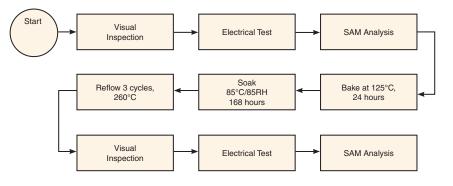


Attention Observe precautions for handling electrostatic sensitive devices

### **MSL** Rating

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

### **MSL Test Flow Chart**





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