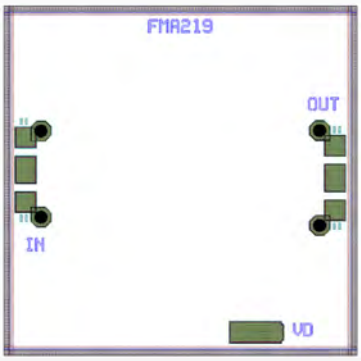
II-VI



FMA219

X-Band LNA MMIC

GENERAL DESCRIPTION

The FMA219 is a two-stage, reactively matched pHEMT low-noise MMIC amplifier designed for use over 7.0GHz to 11.0GHz. The amplifier requires a single +3V supply and one off-chip component for supply decoupling. Both the input and output ports are DC decoupled. Grounding of the amplifier is provided by plated thru-vias to the bottom of the die, no additional ground is required.

Bare Die

1.624mm x 1.624mm x 0.1mm

100% RoHS Compliant

Key Characteristics

- 7.0GHz - 11.0GHz Operating Bandwidth
- 1.3dB Noise Figure
- 21dB Small-Signal Gain
- 14dBm Output Power
- +3V Single Bias Supply
- DC Decoupled Input and Output Ports

Applications

- Low Noise Front End Amplifiers
- General X-Band Gain Block

Typical Performance

		SPECIFICATION				
PARAMETER	**SYMBOL**	**MIN**	**TYP**	**MAX**	**UNIT**	**CONDITIONS**
ELECTRICAL SPECIFICATIONS						
P_{1dB} Gain Compression	P_{1dB}	11.5	14		dBm	V_{DD}=+3V
Small Signal Gain	SSG	19	22	23	dB	V_{DD}=+3V, I_{DD}=I_{OP}
Small Signal Gain Flatness	SSGF		0.65	0.8		V_{DD}=+3V, I_{DD}=I_{OP}, 9GHz ≤ f ≤ 10GHz
Operating Frequency Bandwidth	BW	7		11	GHz	V_{DD}=+3V, I_{DD}=I_{OP}
Operating Current	I_{OP}	40	65	80	mA	No RF input
3rd Order Intermodulation Distortion	IMD3		-47		dBc	V_{DD}=+3V, I_{DD}=I_{OP}, P_{OUT}=+1.5dBm SCL
Input Return Loss	S11	7	15		dB	V_{DD}=+3V, I_{DD}=I_{OP}
Input Return Loss	S11	9			dB	9.5GHz and 10GHz V_{DD}=+3V, I_{DD}=I_{OP}
Output Return Loss	S22	9	12		dB	V_{DD}=+3V, I_{DD}=I_{OP}
Reverse Isolation	S12	30	33		dB	V_{DD}=+3V, I_{DD}=I_{OP}
Noise Figure	NF		1.3		dB	V_{DD}=+3V, I_{DD}=I_{OP}
Noise Figure	NF		1.25	1.4	dB	V_{DD}=+3V, I_{DD}=I_{OP}, 9GHz ≤ f ≤ 10GHz

Note: $T_{AMBIENT}$ = 22°C

Absolute Maximum Ratings[1]

PARAMETER	TEST CONDITIONS	ABSOLUTE MAXIMUM
Source Voltage (V_{DD})		6V
Supply Current (I_{DD})		100mA
RF Input Power[2] (P_{IN})	For standard bias conditions	5dBm
Storage Temperature (T_{STG})	Non-Operating Storage	-40 to 150°C
Total Power Dissipation[2, 3] (P_{TOT})		750mW
Gain Compression	Under bias conditions	5dB
Thermal Resistance[4] (θ_{JC})	750mW dissipation, heatsink temp 22°C	175°C/W

Notes:

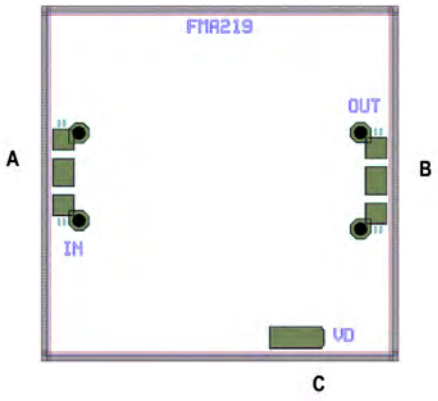
[1]$T_{AMBIENT}$=22°C unless otherwise noted; exceeding any one of these absolute maximum ratings may cause permanent damage to the device.

[2]Total Power Dissipation (P_{TOT}) defined as (PDC+PIN)–P_{OUT}, where P_{DC}: DC Bias Power, P_{IN}: RF Input Power, P_{OUT}: RF Output Power.
Total Power Dissipation to be de-rated as follows above 22°C:
P_{TOT}= (150-T_{CASE})/ θ_{JC}, where T_{CASE}=temperature of the package or substrate.

[3]The quoted thermal resistance value is a worst-case figure assuming Gold/Tin attach onto a Copper substrate. The use of epoxy die attach and substrate materials of lower thermal conductivity will increase the Thermal Resistance.
Further information and assistance is available on request.

[4]θ_{JC} increases linearly from 175°C/W at a T_{CASE} of 22°C to 210°C/W at a T_{CASE} of 145°C.

Die Layout



Pad Layout

PAD	NAME	DESCRIPTION	PIN COORDINATES
A	IN	RF INPUT	100, 863
B	OUT	RF OUTPUT	1522, 825
C	VD	DRAIN VOLTAGE	1157, 108

Note: Coordinates are referenced from the bottom left corner of the die to the centre of bond pad opening.

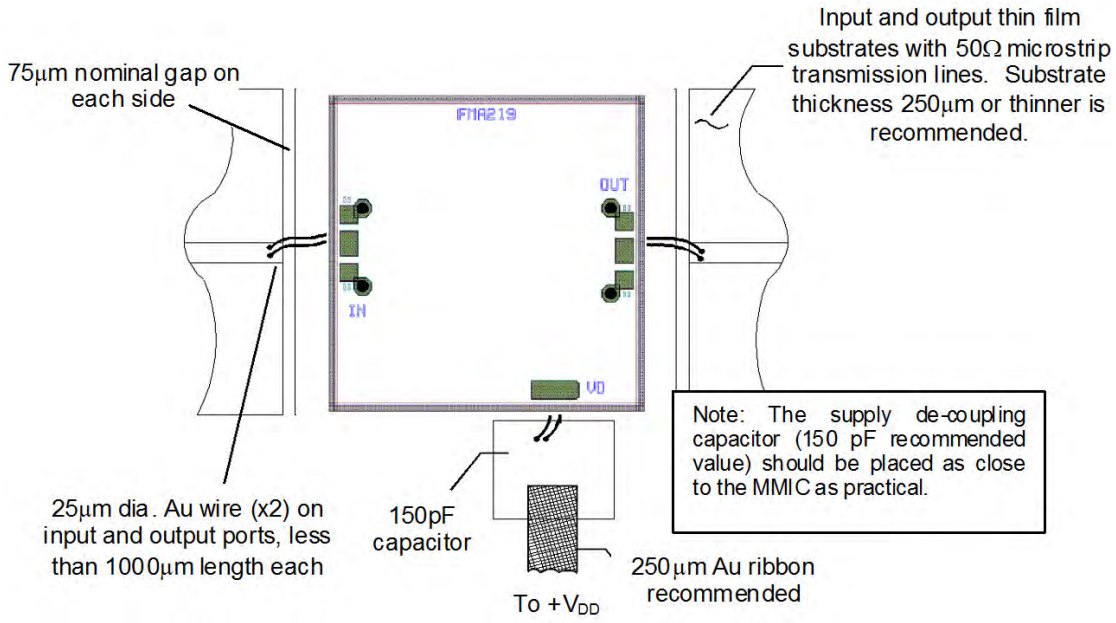
DIE SIZE (µm)	DIE THICKNESS (µm)	MIN. BOND PAD PITCH (µm)	MIN. BOND PAD OPENING (µm x µm)
1624 x 1624	100	150	88 x 118

Caution! ESD sensitive device

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

RoHS status based on EUDirective2002/95/EC (at time of this document revision).

Recommended Assembly Schematic



Preferred Assembly Instructions

GaAs devices are fragile and should be handled with great care. Specially designed collets should be used where possible.
The back of the die is metallized and the recommended mounting method is by the use of conductive epoxy. Epoxy should be applied to the attachment surface uniformly and sparingly to avoid encroachment of epoxy onto the top face of the die, and ideally should not exceed half the chip height. For automated dispense Ablestick LMISR4 is recommended, and for manual dispense Ablestick 84-1 LMI or 84-1 LMIT are recommended. These should be cured at a temperature of 150°C for one hour in an oven especially set aside for epoxy curing only. If possible the curing oven should be flushed with dry nitrogen. The gold-tin (80% Au 20% Sn) eutectic die attach has a melting point of approximately 280°C but the absolute temperature being used depends on the leadframe material used and the particular application. The time used at maximum temperature should be kept to a minimum.
This part has gold (Au) bond pads requiring the use of gold (99.99% pure) bondwire. It is recommended that 25µm diameter gold wire be used. Recommended lead bond technique is thermocompression wedge bonding with 0.001" (25µm) diameter wire. Bond force, time, stage temperature, and ultrasonics are all critical parameters and the settings are dependent on the setup and application being used. Ultrasonic or thermosonic bonding is not recommended.
Bonds should be made from the die first and then to the mounting substrate or package. The physical length of the bondwires should be minimized especially when making RF or ground connections.

Handling Precautions

To avoid damage to the devices, care should be exercised during handling. Proper Electrostatic Discharge (ESD) precautions should be observed at all stages of storage, handling, assembly, and testing.

ESD/MSL Rating

These devices should be treated as Class 0B (125V to <250V) as defined in JEDEC Standard No. JS-001. Further information on ESD control measures can be found in MIL-STD-1686 and MIL-HDBK-263.

Reliability

An MTTF in excess of 4 million hours at a channel temperature of 150°C is achieved for the process used to manufacture this device.

Disclaimers

This product is not designed for use in any space based or life sustaining/supporting equipment.

Ordering Information

DELIVERY QUANTITY	ORDERING CODE
Standard Order Quantity (Waffle Pack)	FMA219 - 100
Small Quantity (25)	FMA219 - 025
Sample Quantity (3)	FMA219 - 003