Filtronic

FMA3007

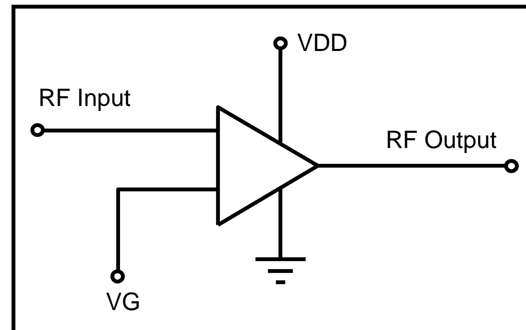
Preliminary Datasheet v2.1

2-20GHz Broadband MMIC Amplifier

Features:

- Cascode Configuration
- 10dB Gain
- pHEMT Technology
- AGC control with gate bias
- Input Return Loss <-15dB
- Output Return Loss <-10dB

Functional Schematic:



General Description:

The FMA3007 is a high performance 2-20GHz Gallium Arsenide monolithic travelling wave amplifier. It is suitable for use in broadband communication, instrumentation and electronic warfare applications. Setting a second gate bias voltage between +1.0V and –1.0V can control the gain. Using an on chip diode for temperature monitoring the gain can be automatically controlled.

Typical Applications:

- Test Instrumentation
- Electronic Warfare
- Broadband Communication Infrastructure

Electrical Specifications:

Parameter	Conditions (VDD=3.5V)	Min	Typ	Max	Units
Small Signal Gain	2-20GHz		10		dB
Input Return Loss	2-20GHz		-15		dB
Output Return Loss	2-20GHz		-11		dB
Reverse Isolation	2-20GHz		<-30		dB
Output Power at 1dB compression point	10GHz 18GHz		20 18		dBm dBm
Noise Figure	2-20GHz		4.5		dB
Gate Voltage	For Id=70mA		-0.37		V

Parameter	Conditions (VDD=7V)	Min	Typ	Max	Units
Small Signal Gain	2-20GHz		11.5		dB
Input Return Loss	2-20GHz		-15		dB
Output Return Loss	2-20GHz		-11		dB
Reverse Isolation	2-20GHz		<-30		dB
Output Power at 1dB compression point	10GHz 18GHz		25 23		dBm dBm
Noise Figure	2-20GHz		4.5		dB
Gate Voltage	For Id=135mA		-0.26		V

Note: $T_{AMBIENT}$ = +25°C, Z_0 = 50Ω

Specifications subject to change without notice

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ABSOLUTE MAXIMUM RATINGS:

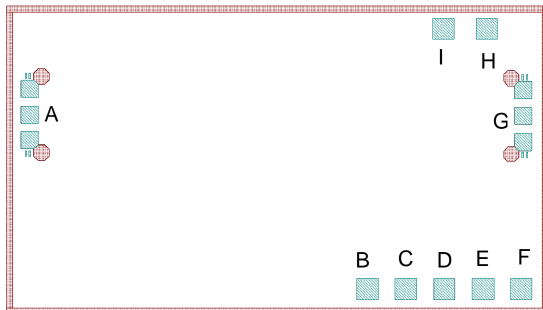
PARAMETER	SYMBOL	ABSOLUTE MAXIMUM
Max Input Power	Pin (Table cell)	+25dBm
Gate Voltage	VG1	-2V
Drain Voltage	VDD	+10V
Total Power Dissipation	Ptot	tbd
Gain Compression	Comp	tbd
Thermal Resistivity	θ_{JC}	0.66°C/W
Operating Temp	Toper	-40°C to +85°C
Storage Temp	Tstor	-55°C to +150°C

Note: Exceeding any one of these absolute maximum ratings may cause permanent damage to the device.

PAD REF	PAD NAME	DESCRIPTION	PIN COORDINATES (µm)
A	RF in	RF in	(140, 1153)
B	VDP	(+Ve) Temperature Monitoring Diode	(2097, 140)
C	VDN	(-Ve) Temperature Monitoring Diode	(2321, 140)
D	GND	Ground	(2545, 140)
E	VG1	Gate Control	(2769, 140)
F	VG2	Gain Control	(2993, 140)
G	RF Out	RF Out	(3004, 1141)
H	VDD	Drain Voltage	(2540, 1650)
I	GND	Ground	(2792, 1650)

Note: Co-ordinates are referenced from the bottom left hand corner of the die to the centre of bond pad opening

PAD LAYOUT:



DIE SIZE (µm)	DIE THICKNESS (µm)	MIN. BOND PAD PITCH (µm)	MIN. BOND PAD OPENING (µm x µm)
3150 x 1780	100	220	120 x 120

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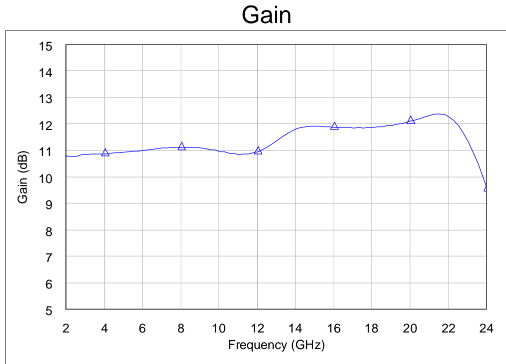
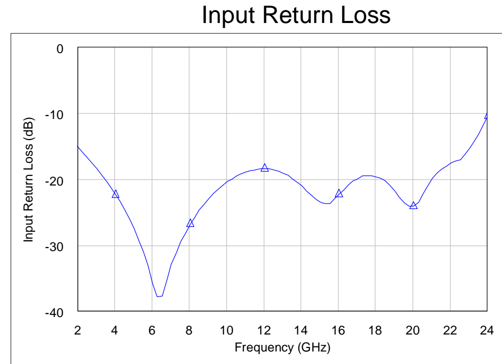
TYPICAL PERFORMANCE FOR ON WAFER MEASUREMENTS:

Note: Measurement Conditions V_{G1}= -0.26V, I_D= 130mA, V_{DD}= 3.5V, V_{G2}=+1V, $T_{AMBIENT}$ = 25°C

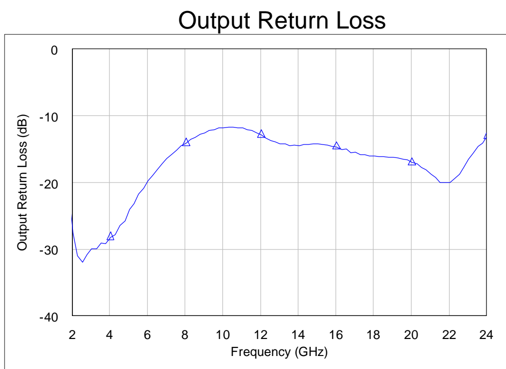
Gain



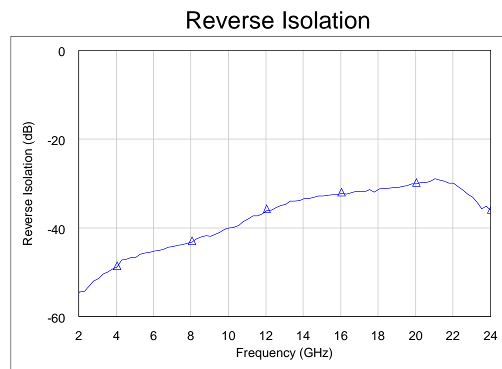
Input Return Loss



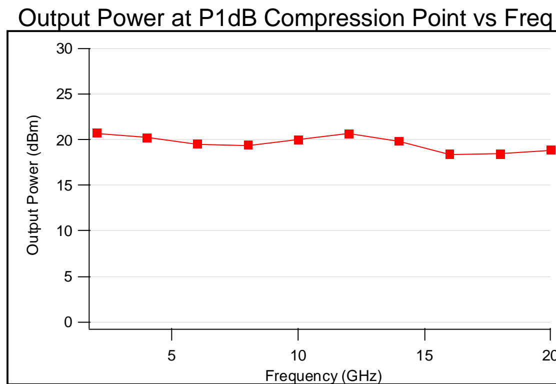
Output Return Loss



Reverse Isolation



Output Power at P1dB Compression Point vs Freq



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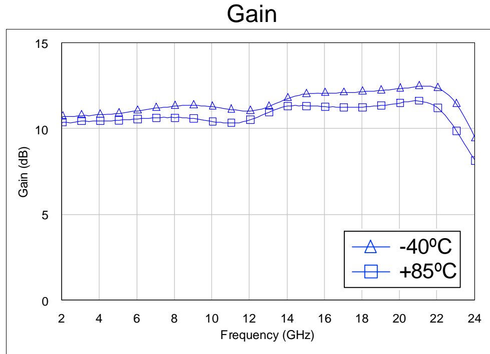
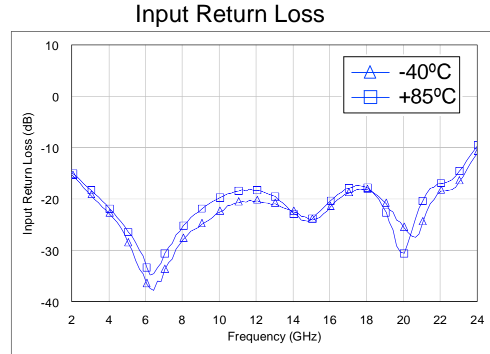
TYPICAL MEASURED PERFORMANCE FOR ON WAFER TEMPERATURE MEASUREMENTS:

Note: Measurement Conditions V_{G1}= -0.26V, V_{DD}= 3.5V, V_{G2}= +1V, $T_{AMBIENT}$ = -40°C to +85°C

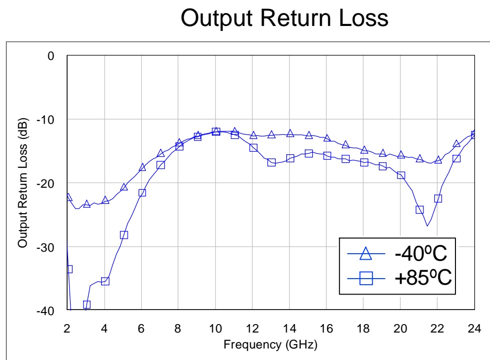
Gain



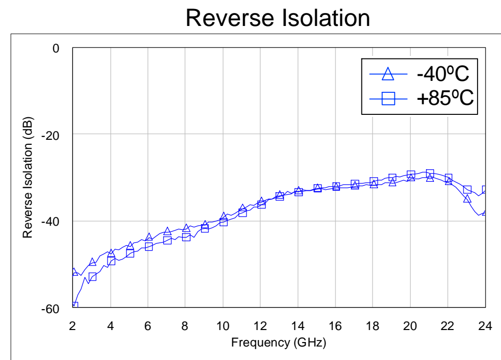
Input Return Loss



Output Return Loss



Reverse Isolation



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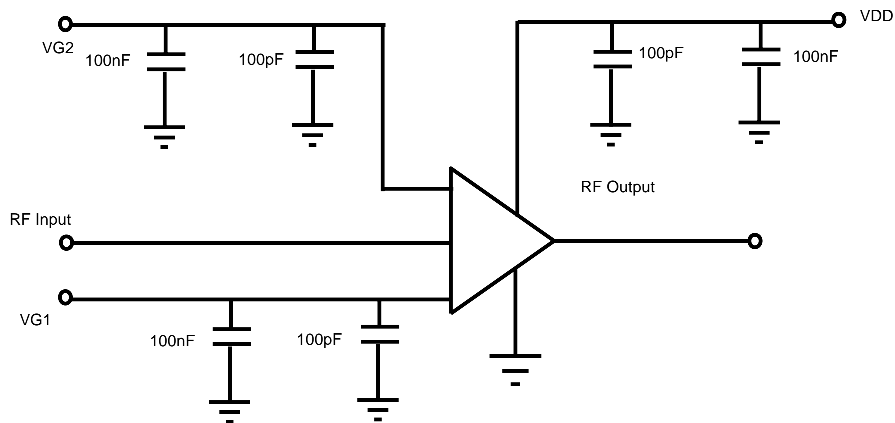
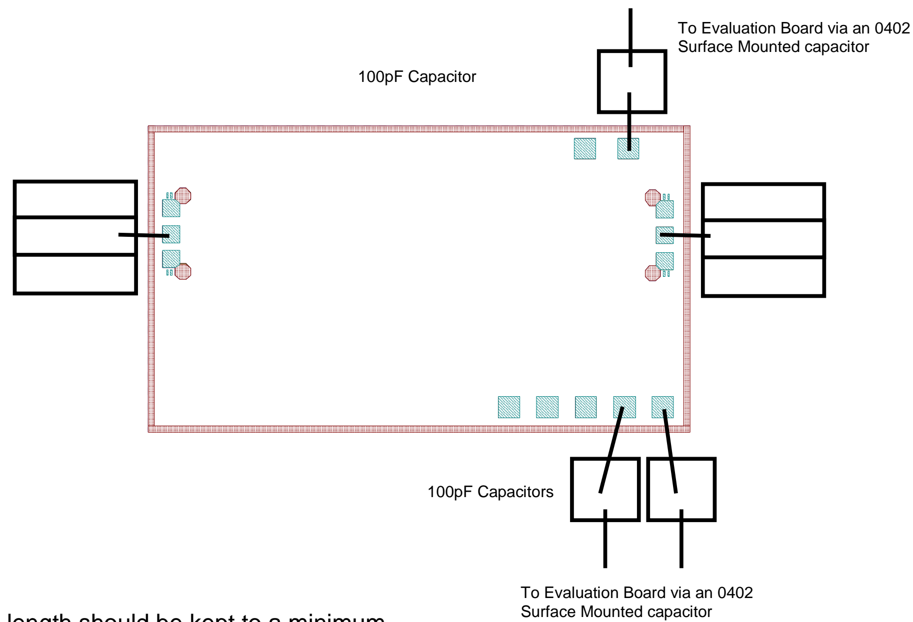
BIASING CIRCUIT SCHEMATIC:



ASSEMBLY DIAGRAM:



Note: Bond Wire length should be kept to a minimum

BILL OF MATERIALS:

COMPONENT
All RF tracks should be 50Ω characteristic material
Capacitor, 100pF, chip capacitor
Capacitor, 100pF, 0402

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PREFERRED ASSEMBLY INSTRUCTIONS:

GaAs devices are fragile and should be handled with great care. Specially designed collets should be used where possible.

The recommended die attach is gold/tin eutectic solder under a nitrogen atmosphere. Stage temperature should be 280-290°C; maximum time at temperature is one minute. The recommended wire bond method is thermo-compression wedge bonding with 0.7 or 1.0 mil (0.018 or 0.025 mm) gold wire. Stage temperature should be 250-260°C.

Bonds should be made from the die first and then to the mounting substrate or package. The physical length of the bondwires should be minimised 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. These devices should be treated as Class 1A (0-500 V) as defined in JEDEC Standard No. 22-A114. Further information on ESD control measures can be found in MIL-STD-1686 and MIL-HDBK-263.

APPLICATION NOTES & DESIGN DATA:

Application Notes and design data including S-parameters, noise data and large-signal models are available on request.

DISCLAIMERS:

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

ORDERING INFORMATION:

PART NUMBER	DESCRIPTION
FMA3007	Die in Waffle-pack (Gel-pak available on request)

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