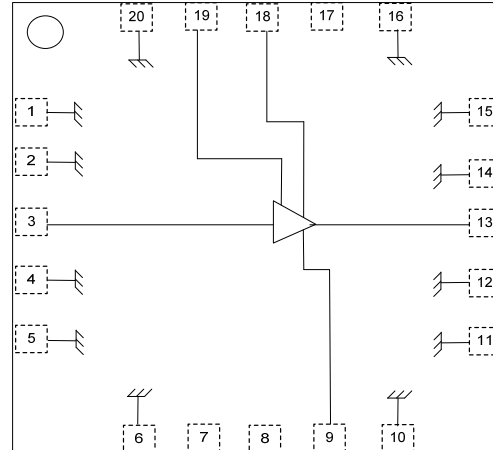


## Features:

- Frequency Range: 30KHz – 40 GHz
- P1dB: +22 dBm
- Vout: 7V p-p @50Ω
- Gain: 13.5 dB
- Vdd = 7 V
- Ids = 200 mA
- Input and Output Fully Matched to 50 Ω
- In 4x4mm QFN package

## Applications:

- Fiber optics communication systems
- Microwave and wireless communication systems
- Microwave and optical instrumentations
- Military and EW equipments



Functional block diagram

## Description:

The MMA-005022 is a broadband GaAs MMIC Traveling Wave Amplifier (TWA) with medium output power and high gain over full 30KHz to 50GHz frequency range. This amplifier is optimally designed for broadband applications requiring flat gain and group delay with excellent input and output matches over a 30KHz to 50GHz frequency range.

## Absolute Maximum Ratings: (Ta= 25 °C)\*

SYMBOL	PARAMETERS	UNITS	Min.	Max.
Vds	Drain-Source Voltage	V		10
Vg1	First Gate-Source Voltage	V	-8	0
Ig1	First Gate Current	mA	-38	1
Vg2	Second Gate-Source Voltage	V	-3.5	4
Ig2	Second Gate-Source Current	mA	-20	
Ids	Drain Current	mA		340
Pin max	RF Input Power	dBm		17
Tch	Channel Temperature	°C		+150
Tstg	Storage Temperature	°C		-55 to +165
Tmax	Max. Assembly Temp (60 sec max)	°C		+300

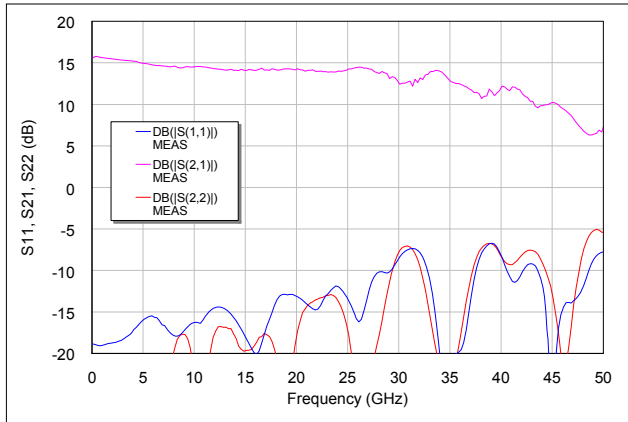
\*Operation of this device above any one of these parameters may cause permanent damage.

## Electrical Specifications: *V<sub>ds</sub>=7V, V<sub>g1</sub>=-2.7V, V<sub>g2</sub>=open, I<sub>ds</sub>=200mA, T<sub>a</sub>=25 °C Z<sub>0</sub>=50 ohm*

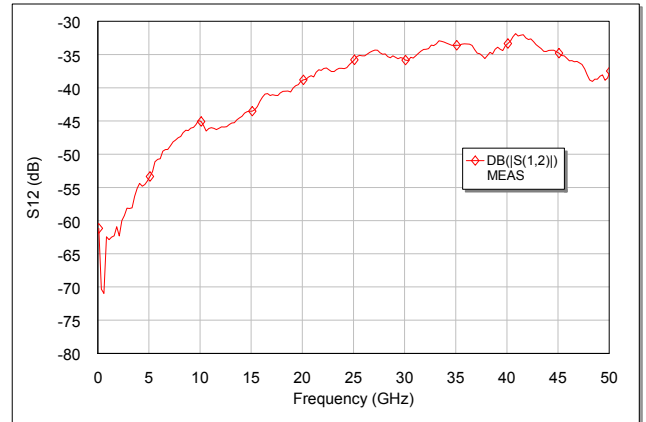
Parameter	Units	Min.	Typ.	Max.
Frequency Range	MHz	0.03		40,000
Gain (Typ / Min)	dB	12	13.5	
Gain Flatness (Typ / Max)	+/-dB		2.0	2.5
Input RL(Typ/Max)	dB	8	10	
Output RL(Typ/Max)	dB	8	10	
Output P1dB(Typ/Min)	dBm	19	22	
Output IP3 <sup>(1)</sup>	dBm		30	
Output P3dB(Typ/Min)	dBm	22	25	
Operating Current at P1dB (Typ/Max)	mA		210	230
Thermal Resistance	°C /W		16	

(1) Output IP3 is measured with two tones at output power of 10 dBm/tone separated by 20 MHz.

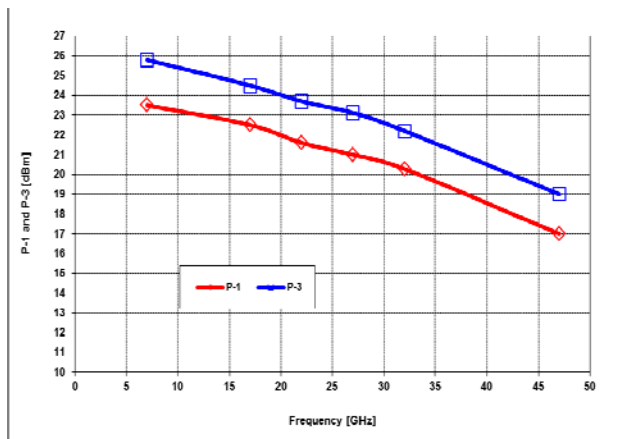
**Typical RF Performance:**  $V_{ds}=7V$ ,  $V_{g1}=-2.7V$ ,  $V_{g2}=open$ ,  $I_{ds}=200mA$ ,  $Z_0=50\ ohm$ ,  $T_a=25\ ^\circ C$



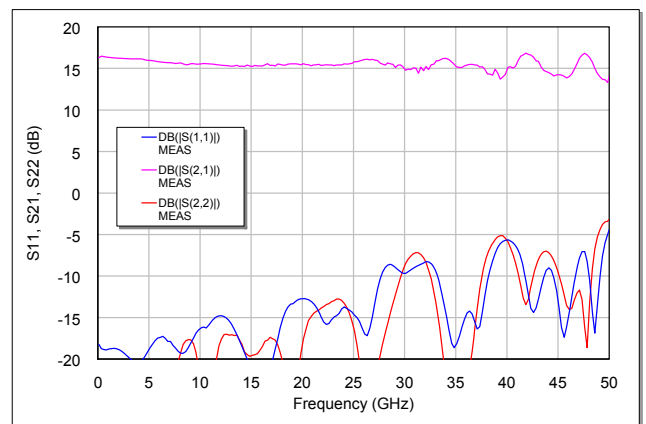
S11, S21, and S22 vs. Frequency



S12(dB) vs. Frequency



P-1 and P-3 vs. Frequency



S11, S21, and S22 vs. Frequency

@  $V_{ds}=5V$ ,  $I_{ds}=220mA$

## Applications

The MMA005022-R4 traveling wave amplifier is designed for use as a general purpose wideband power stage in microwave and optical communication systems, and test fiber optic/microwave test equipments. It is ideally suited for broadband applications requiring a flat gain response and excellent port matches over a 30KHz to 50 GHz frequency range. Dynamic gain control and low-frequency extension capabilities are designed into these devices.

## Biasing and Operation

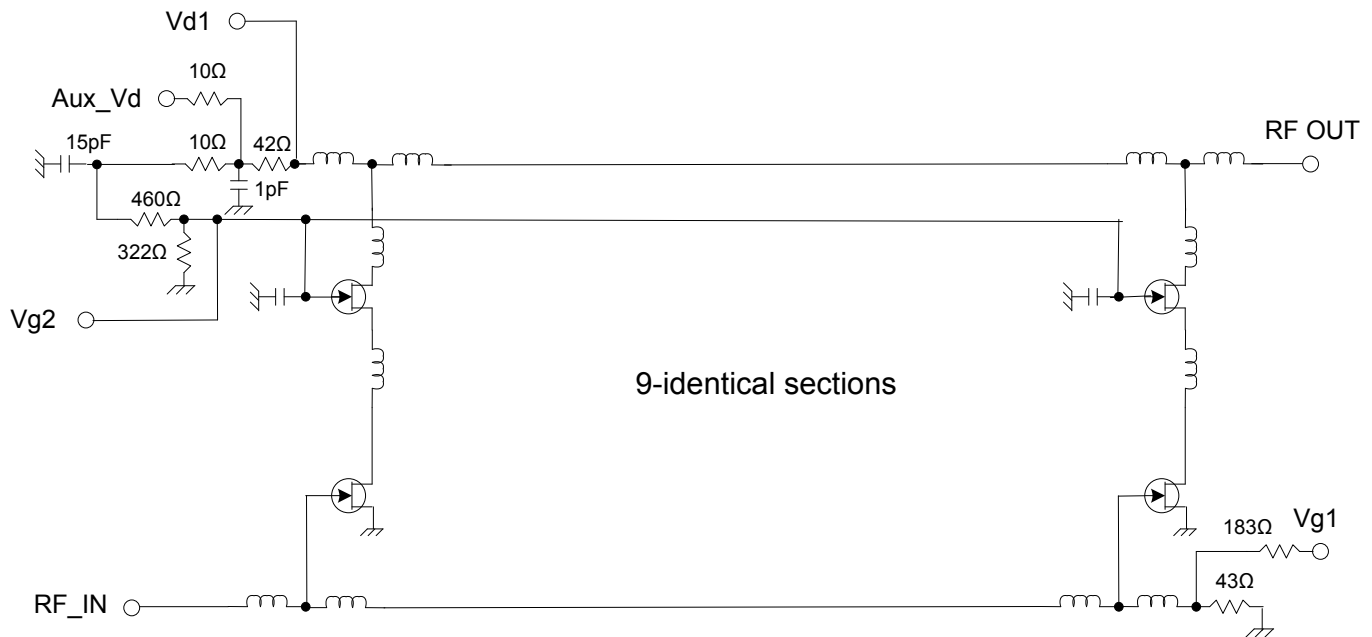
The recommended bias conditions for best performance for the MMA005022-R4 are  $V_{DD} = 7.0V$ ,  $I_{DD} = 200mA$ . To achieve these drain current levels,  $V_{g1}$  is typically biased between  $-2.7V$  with approximately 10mA. No other bias supplies or connections to the device are required for 30KHz to 50 GHz operation. Performance improvements are possible depending on applications. For high gain requirement at higher frequency, recommended bias conditions are  $V_{dd}=5V$ ,  $I_{dsq}=220mA$ . The drain bias voltage range is 3 to 7V and the quiescent drain current biasing range is 120mA to 250mA. The gate voltage ( $V_{g1}$ ) should be applied prior to the drain voltage ( $V_{dd}$ ) during power up and removed after the drain voltage during power down. The MMA005022-R4 is a DC coupled amplifier. External coupling capacitors are needed on RFIN and RFOUT ports. The drain bias pad is connected to RF and must be decoupled to the lowest operating frequency. An auxiliary drain contacts is provided when performance below 1 GHz is required. Connect external capacitors to ground to maintain input and output VSWR at low frequencies (see additional application note). Do not apply bias to these pads. The second gate ( $V_{g2}$ ) can be used to obtain 30 dB (typical) dynamic gain control. For normal operation, no external bias is required on this contact.

## Assembly Techniques

GaAs MMICs are ESD sensitive. ESD preventive measures must be employed in all aspects of storage, handling, and assembly. MMIC ESD precautions, handling considerations, die attach and bonding methods are critical factors in successful GaAs MMIC performance and reliability.

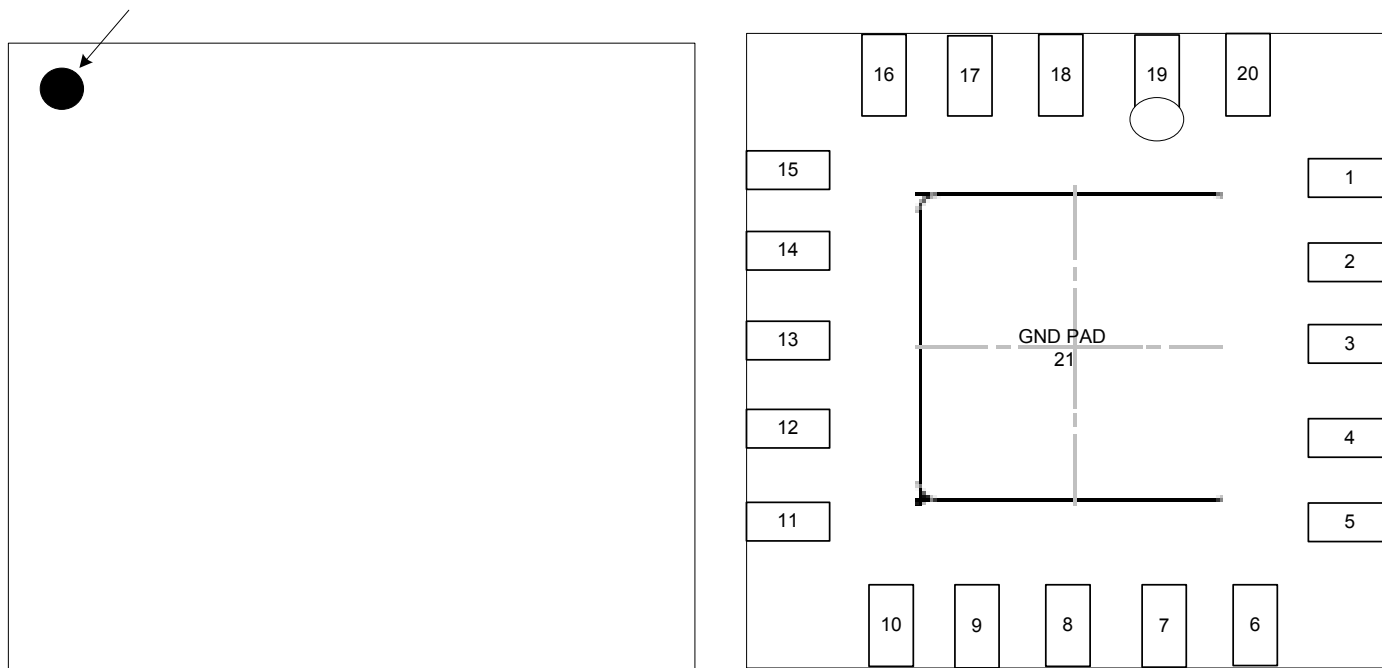
## Additional References:

MMA005022B Application note v.1.0



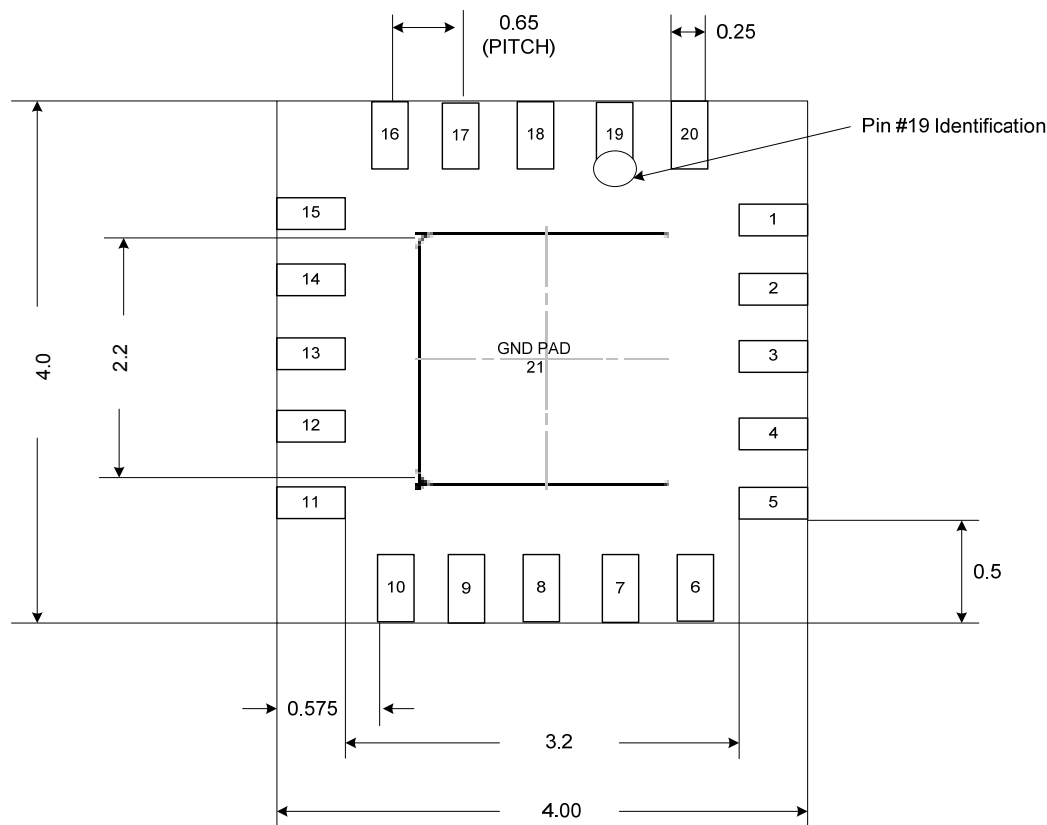
## Package Pin-out:

Pin #1 Dot

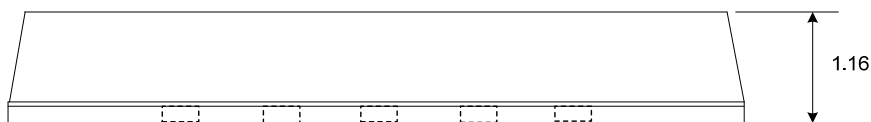


Pin	Description
3	RF Input
13	RF Output
9	Vg1
18	Vg2
19	Vdd_Aux
1, 2, 4, 5, 6, 10, 11, 12, 14, 15, 16, 20, 21	Ground
7, 8, 17	N/C

## Mechanical Information:



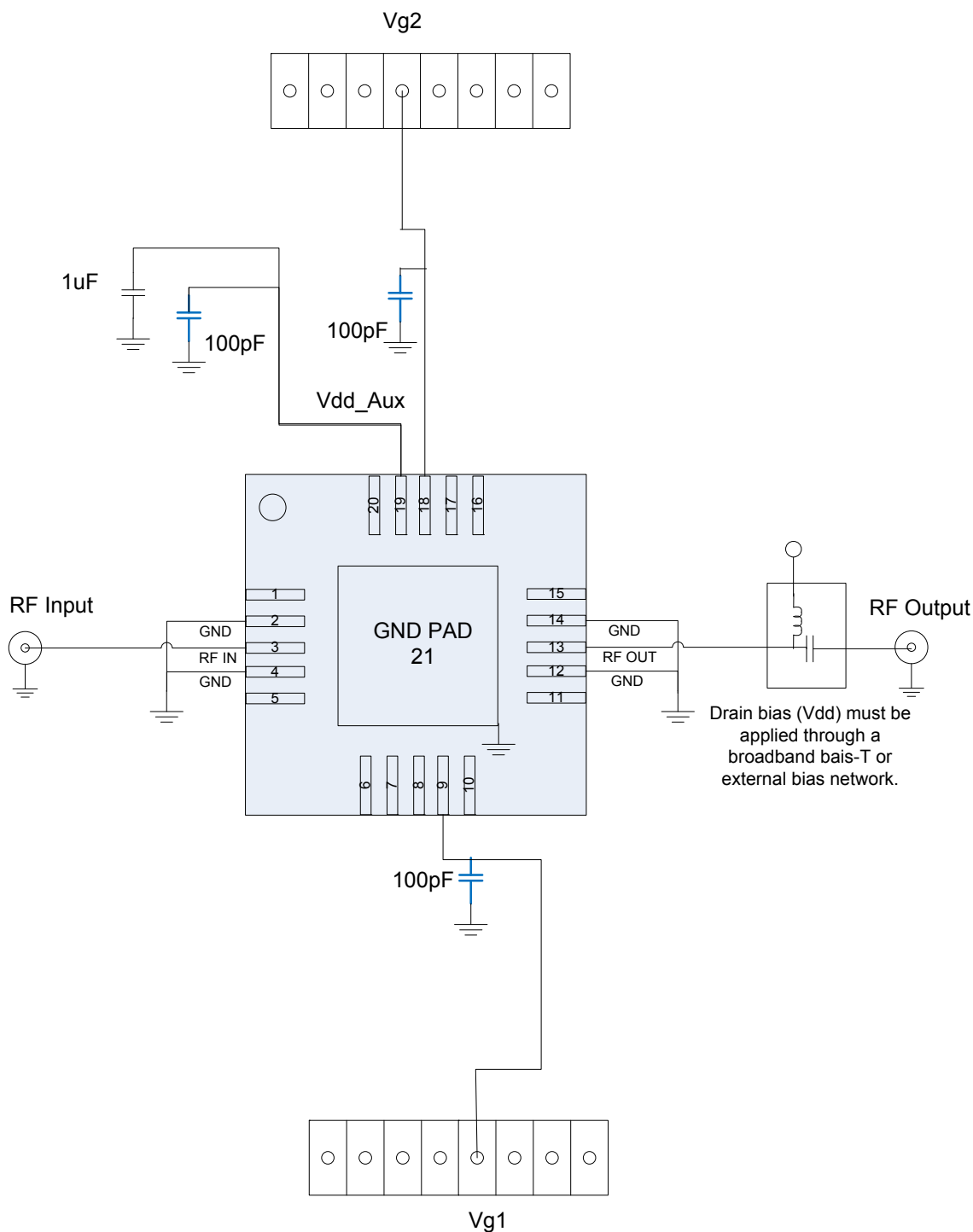
BOTTOM VIEW



SIDE VIEW

The units are in [mm].

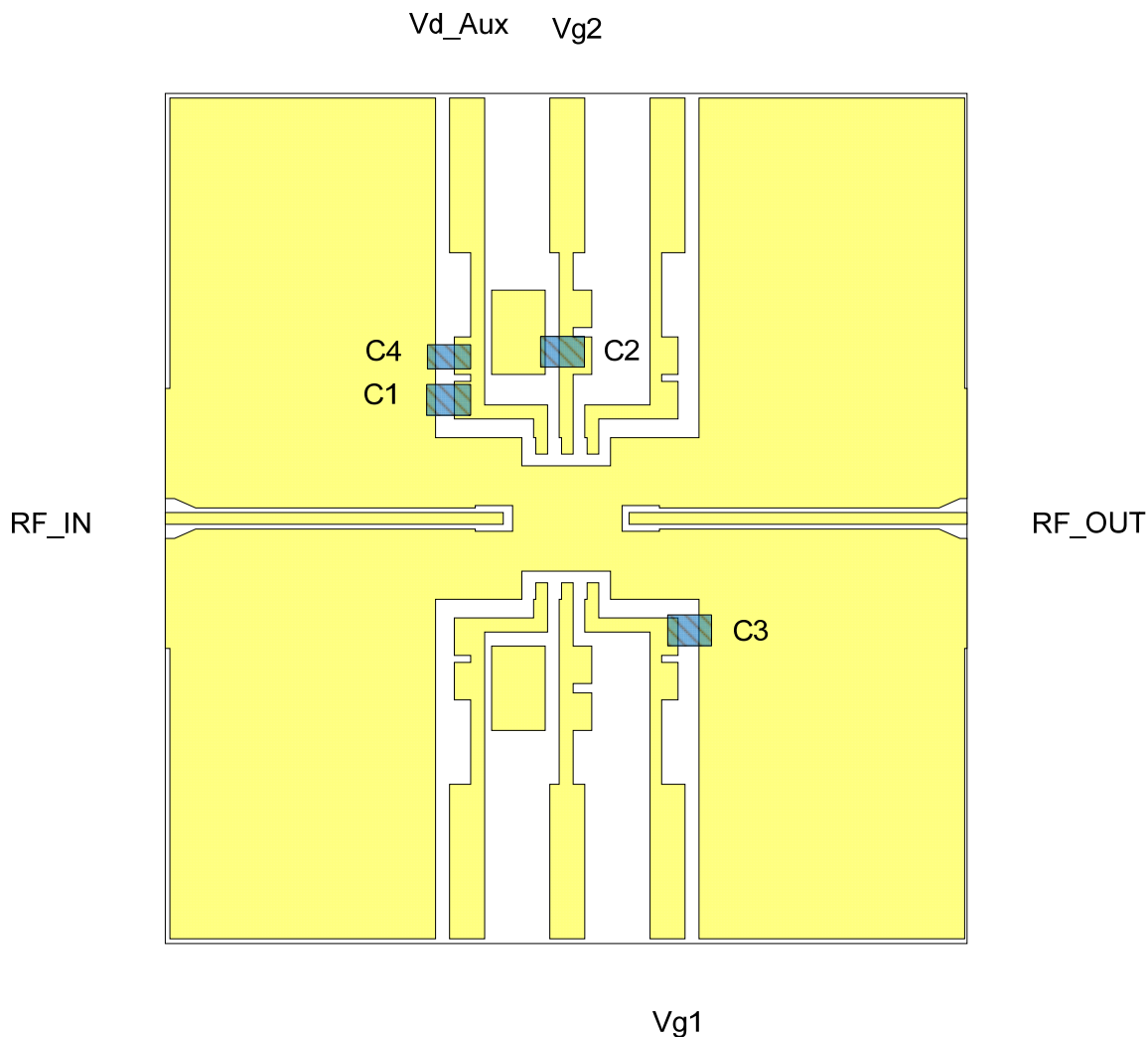
## Application Circuit:



## Recommended Application Board Design:

Board Material is 10mil (Dielectric) thickness Rogers 4350B with 0.5oz copper clads.

Board is soldered on a gold plated solid copper block and adequate heat-sinking is required for 3.4W total maximum power dissipation.



Part	Description
C1, C2, C3	1uF capacitor (0603)
C4	100pF Capacitor (0402)



## Recommended Application Board Design:

Board Material is 10mil (Dielectric) thickness Rogers 4350B with 0.5oz copper clads. The board material and mounting pattern, as defined in the data sheet, optimizes RF performance and is strongly recommended. An electronic drawing of the land pattern is available upon request from MwT Sales & Application Engineering.

