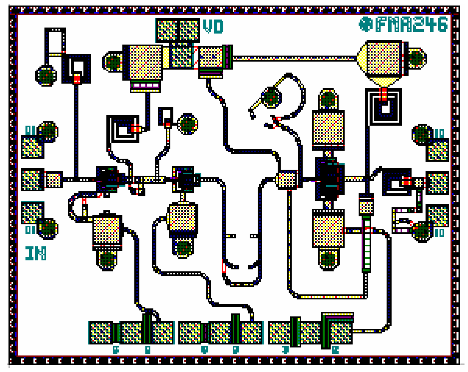
- PERFORMANCE
  - ♦ 8.0 – 14.0 GHz Operating Bandwidth
  - ♦ 2.5 dB Noise Figure
  - ♦ 30 dB Small-Signal Gain
  - ♦ 19 dm Output Power
  - ♦ +6V Single Bias Supply
  - ♦ Adjustable Operating Current
  - ♦ DC De-coupled Input and Output Ports



- DESCRIPTION AND APPLICATIONS

The FMA246 is a 3-stage, reactively matched pHEMT high-gain MMIC amplifier designed for use over the 8 to 14 GHz bandwidth. The amplifier requires a single +6V supply and one off-chip component for supply de-coupling; the supply voltage can be varied from +3V to +6V if needed. Both the input and output ports are DC de-coupled. Grounding of the amplifier is provided by plated thru-vias to the bottom of the die, no additional ground is required. Operating current can be adjusted using the Source resistor ladders located along the bottom edge, by bonding a particular pad to ground. Typical applications include general (low noise) gain block utilizations in X-band. The amplifier is unconditionally stable over all load states (-45 to +85°C), and conditionally stable if the input port is open-circuited.

- ELECTRICAL SPECIFICATIONS AT 22°C

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operating Frequency Bandwidth	BW		8		14	GHz
Small Signal Gain	S_{21}	$V_{DD} = +6$ V $I_{DD} \approx 60\%$ I_{DSS}	27	29	31	dB
Saturated Drain Current (see Note)	I_{DSS}	$V_{DD} = +3$V	220	250	280	mA
Operating Current	I_{DQ}	$V_{DD} = +6$V	145	170	195	mA
Small Signal Gain Flatness	ΔS_{21}	$V_{DD} = +6$ V $I_{DD} \approx 60\%$ I_{DSS}		± 0.6	± 1.0	dB
Noise Figure	NF	$V_{DD} = +6$ V $I_{DD} \approx 60\%$ I_{DSS}	2.3	2.5	2.8	dB
3rd-Order Intermodulation Distortion	IMD	$V_{DD} = +6$ V $I_{DD} \approx 60\%$ I_{DSS} $P_{OUT} = +9$ dBm SCL		-44		dBc
Power at 1dB Compression	P_{1dB}	$V_{DD} = +6$ V $I_{DD} \approx 60\%$ I_{DSS}	18	20	22	dBm
Input Return Loss	S_{11}	$V_{DD} = +6$ V $I_{DD} \approx 60\%$ I_{DSS}		-10	-8	dB
Output Return Loss	S_{22}	$V_{DD} = +6$ V $I_{DD} \approx 60\%$ I_{DSS}		-16	-9	dB
Reverse Isolation	S_{12}	$V_{DD} = +6$ V $I_{DD} \approx 60\%$ I_{DSS}		-60	-50	dB

- NOTE: Continuous operation at I_{DSS} is not recommended

ABSOLUTE MAXIMUM RATINGS[1]

Parameter	Symbol	Test Conditions	Min	Max	Units
Supply Voltage	V_{DD}	For any operating current		8	V
Supply Current	I_{DD}	For V_{DD} < 7V		75% I_{DSS}	mA
RF Input Power	P_{IN}	For standard bias conditions		-8	dBm
Storage Temperature	T_{STG}	Non-Operating Storage	-40	150	ºC
Total Power Dissipation	P_{TOT}	See De-Rating Note below		1400	mW
Gain Compression	Comp.	Under any bias conditions		5	dB
Simultaneous Combination of Limits[2]		2 or more Max. Limits		80	%

[1] $T_{Ambient}$ = 22°C unless otherwise noted [2] Users should avoid exceeding 80% of 2 or more Limits simultaneously

Notes:

- Operating conditions that exceed the Absolute Maximum Ratings will result in permanent damage to the device.
- Total Power Dissipation defined as: $P_{TOT} \equiv (P_{DC} + P_{IN}) - P_{OUT}$, 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} = 1.4 - (0.004W/°C) x $T_{CARRIER}$
  - where $T_{CARRIER}$ = *carrier or heatsink temperature above 22°C*
  - (coefficient of de-rating formula is the Thermal Conductivity)

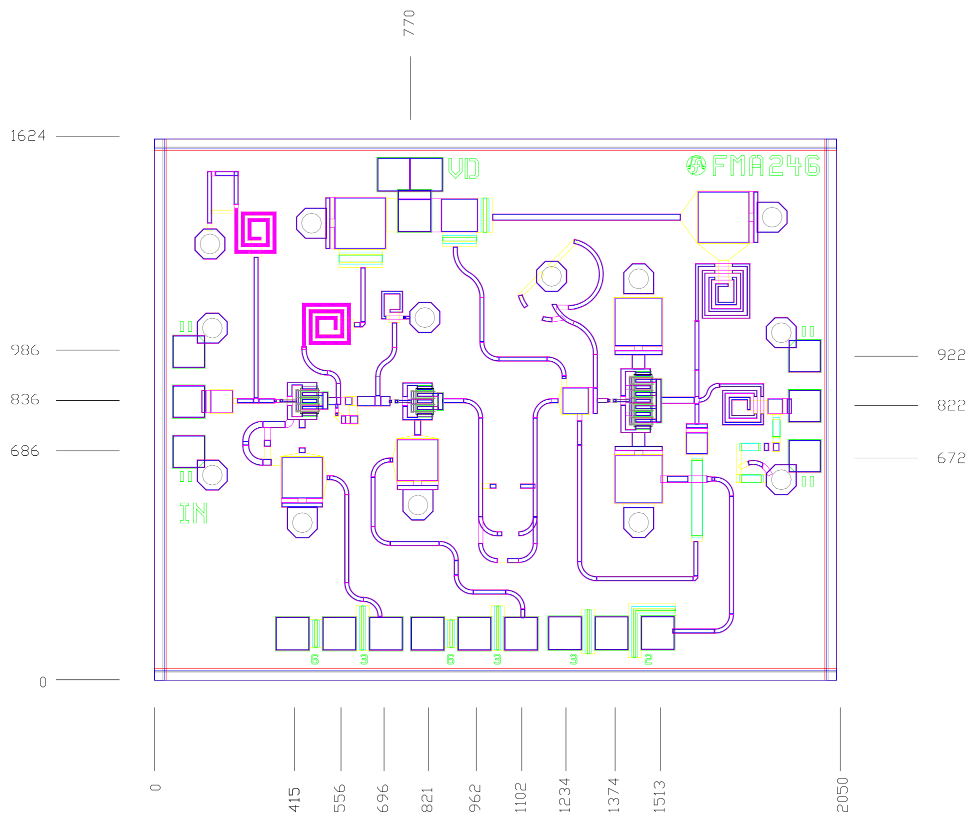
Example: For a 55°C carrier temperature: P_{TOT} = 1.4 - (0.004 x (55 – 22)) = 1.26W

- **For optimum heatsinking eutectic die attach is recommended; conductive epoxy die attach is acceptable with some degradation in thermal de-rating performance (P_{TOT} = 550mW)**
- *Note on Thermal Resistivity:* The nominal value of 250°C/W is stated for the input stage, which will reach temperature limits before the output stage. The aggregate MMIC thermal resistivity is approximately 80°C/W.

• 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 per ESD-STM5.1-1998, Human Body Model. Further information on ESD control measures can be found in MIL-STD-1686 and MIL-HDBK-263.

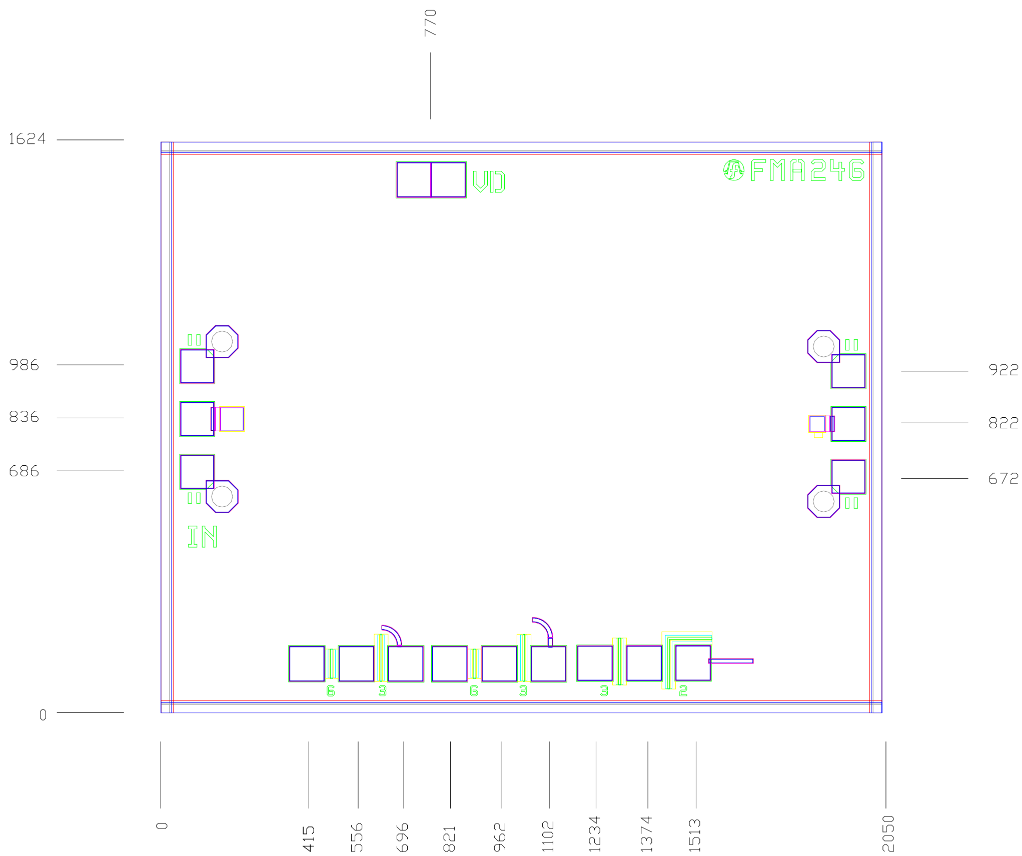
- MECHANICAL OUTLINE:



Notes:

1) All units are in microns, unless otherwise specified.
2) All bond pads are 100x100 μm^2
3) Bias pad (V_{DD}) size is 100x100 μm^2

- MECHANICAL OUTLINE:



Notes:

4) All units are in microns, unless otherwise specified.
5) All bond pads are 100x100 μm^2
6) Bias pad (V_{DD}) size is 100x100 μm^2