

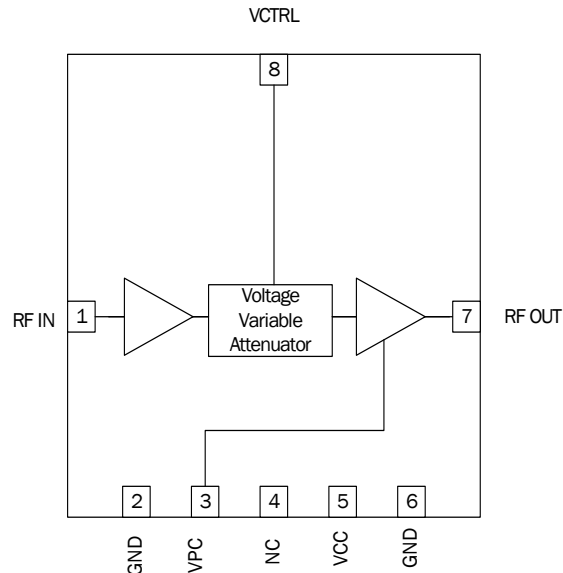


### Features

- 2260MHz to 2440MHz Operation
- Gain = 24dB Typical
- Gain Adjustment Range >19dB
- ACPR = -66dBc Typ. at +12dBm  $P_{OUT}$  (Dual Carrier WCDMA)
- Small 7mm x 7mm, Multi-Chip Module

### Applications

- Cellular, 3G and 4G Infrastructure
- WiBro, WiMax, LTE
- Microwave Radio
- High Linearity Power Control



Functional Block Diagram

### Product Description

RFMD's RFVA2017 is a fully integrated analog controlled variable gain amplifier featuring exceptional linearity over a greater than 19dB gain control range. This variable gain amplifier is controlled by a single 0V to 3.3V positive supply voltage. The RFVA2017 is packaged in a small 7mm x 7mm leadless laminate MCM which contains thermal vias for ultra low thermal resistance. This module is internally matched to 50Ω and is easy to use with no external matching components required.

### Ordering Information

|                 |                                                 |
|-----------------|-------------------------------------------------|
| RFVA2017SQ      | Sample bag with 25 pieces                       |
| RFVA2017SR      | 7" Sample reel with 100 pieces                  |
| RFVA2017TR7     | 7" Reel with 1500 pieces                        |
| RFVA2017TR13    | 13" Reel with 2500 pieces                       |
| RFVA2017PCK-410 | 2260MHz to 2440MHz PCBA with 5-piece sample bag |

### Optimum Technology Matching® Applied

|                                               |                                      |                                                |                                    |
|-----------------------------------------------|--------------------------------------|------------------------------------------------|------------------------------------|
| <input type="checkbox"/> GaAs HBT             | <input type="checkbox"/> SiGe BiCMOS | <input checked="" type="checkbox"/> GaAs pHEMT | <input type="checkbox"/> GaN HEMT  |
| <input type="checkbox"/> GaAs MESFET          | <input type="checkbox"/> Si BiCMOS   | <input type="checkbox"/> Si CMOS               | <input type="checkbox"/> BiFET HBT |
| <input checked="" type="checkbox"/> InGaP HBT | <input type="checkbox"/> SiGe HBT    | <input type="checkbox"/> Si BJT                | <input type="checkbox"/> LDMOS     |

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## Absolute Maximum Ratings

| Parameter                                           | Rating               | Unit |
|-----------------------------------------------------|----------------------|------|
| Max Device Current                                  | 770                  | mA   |
| Max Device Voltage                                  | 5.5                  | V    |
| Max Control Line Voltage                            | 6                    | V    |
| Max RF Input Power*                                 | 25                   | dBm  |
| Max Junction Temp (T <sub>J</sub> )                 | +150                 | °C   |
| Max Storage Temp                                    | +150                 | °C   |
| Thermal Resistance (junction to backside of module) | 14.8                 | °C/W |
| ESD                                                 | Class 1C (1000V min) |      |
| Moisture Sensitivity Level                          | MSL3                 |      |

\*Load condition: Z<sub>L</sub> = 50Ω



**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.

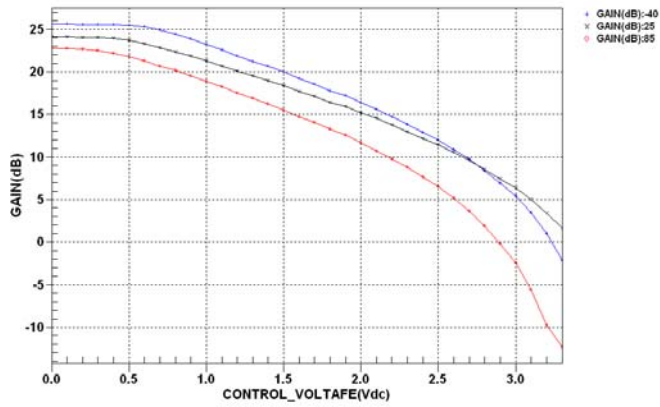
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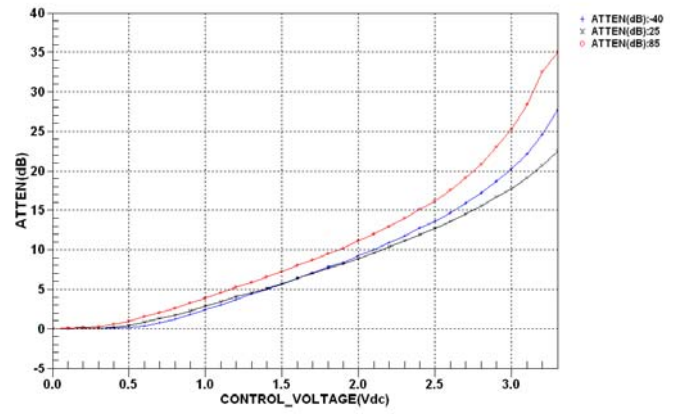
RoHS (Restriction of Hazardous Substances): Compliant per EU Directive 2002/95/EC.

| Parameter                      | Specification |      |      | Unit | Condition                                                                            |
|--------------------------------|---------------|------|------|------|--------------------------------------------------------------------------------------|
|                                | Min.          | Typ. | Max. |      |                                                                                      |
| Frequency                      | 2260          |      | 2440 | MHz  |                                                                                      |
| Temperature Range              | -40           | 25   | 85   | °C   | Operating Range                                                                      |
| Gain                           | 21            | 24   | 27   | dB   | Min attenuator setting                                                               |
| Nominal Operating Output Power |               | 12   |      | dBm  | Operating power for ACPR rating                                                      |
| Output IP3                     | 40            | 44   |      | dBm  | In high gain setting                                                                 |
| P1dB                           | 25            | 29   |      | dBm  | In high gain setting                                                                 |
| ACPR                           | -60           | -66  |      | dBc  | Dual carrier WCDMA, 7.5dB CF at nominal operating power; over full attenuation range |
| Gain Flatness                  |               | 0.2  | 0.4  | dB   | Over 50MHz BW                                                                        |
| Gain Adjustment Range          | 19            | 22   |      | dB   |                                                                                      |
| Control Voltage Range          | 0             |      | 3.3  | V    |                                                                                      |
| Noise Figure                   |               | 4.3  | 5.3  | dB   | Min attenuator setting                                                               |
| Impedance                      |               | 50   |      | Ω    |                                                                                      |
| Input Return Loss              | 14            | 22   |      | dB   | Over attenuation range                                                               |
| Output Return Loss             | 14            | 23   |      | dB   | Over attenuation range                                                               |
| Supply Voltage                 | 4.75          | 5.0  | 5.25 | V    |                                                                                      |
| Supply Current                 | 300           | 460  | 600  | mA   | Max current at -40°C                                                                 |
| Supply Current (VPC = 0V)      | 120           | 126  | 140  | mA   | Output amplifier shutdown total current                                              |

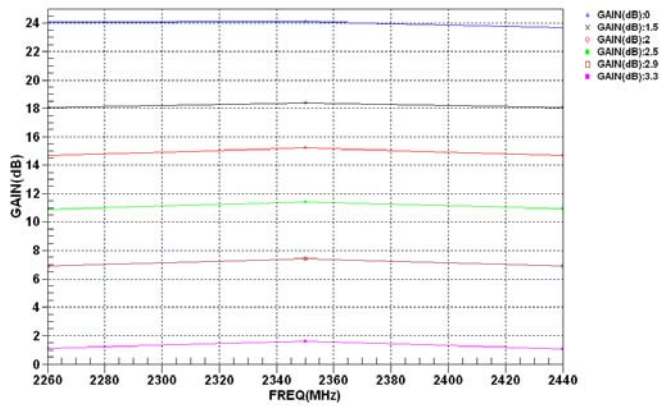
GAIN VS. CONTROL VOLTAGE VS. TEMPERATURE @ 2350 MHz



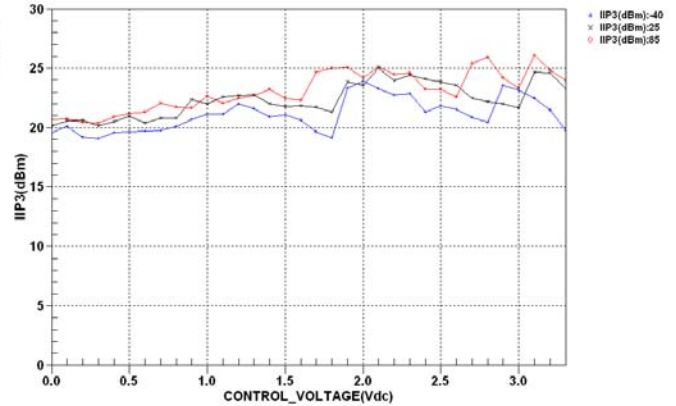
ATTENUATION VS. CONTROL VOLTAGE VS. TEMPERATURE @ 2350 MHz



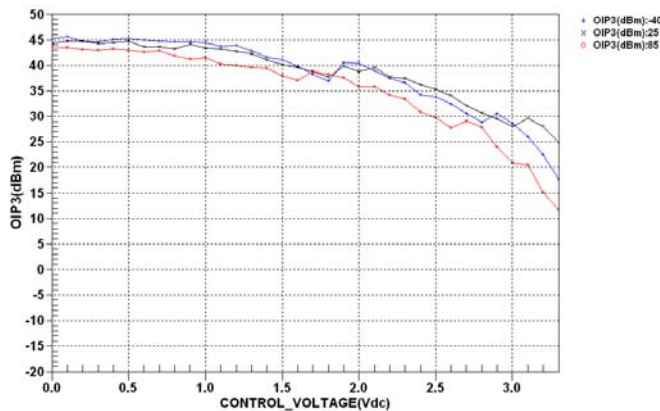
GAIN VS. FREQUENCY VS. CONTROL VOLTAGE



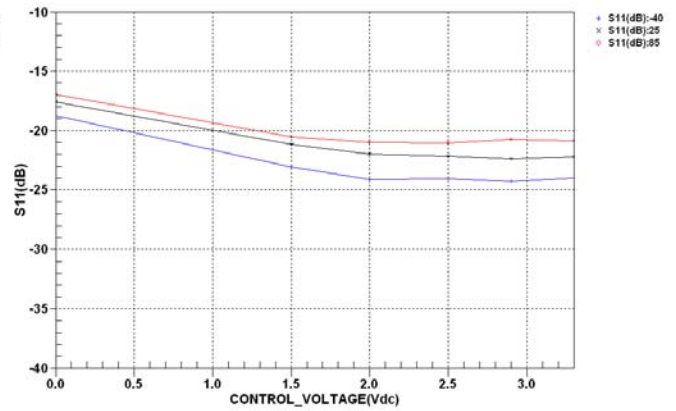
INPUT IP3 VS. CONTROL VOLTAGE VS. TEMPERATURE @ 2350 MHz



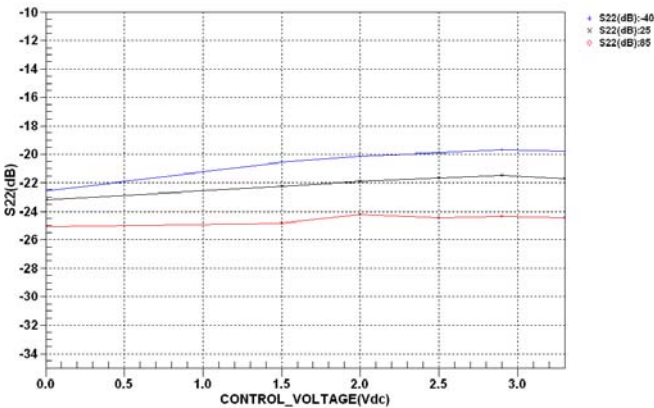
OUTPUT IP3 VS. CONTROL VOLTAGE VS. TEMPERATURE @ 2350 MHz



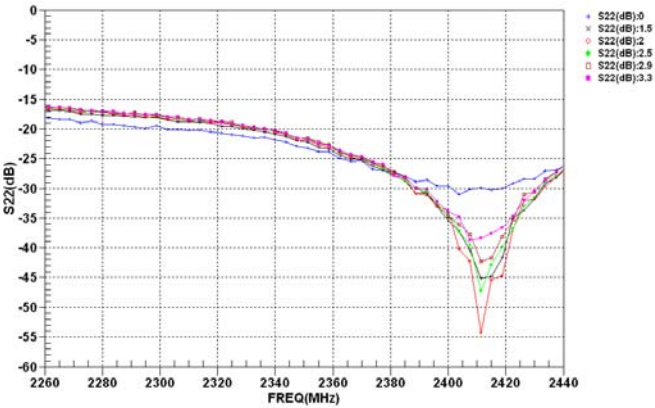
INPUT RETURN LOSS VS. CONTROL VOLTAGE VS. TEMPERATURE @ 2350 MHz



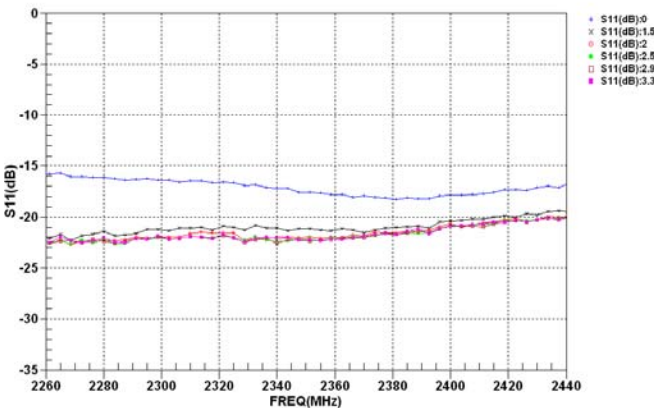
OUTPUT RETURN LOSS VS. CONTROL VOLTAGE VS. TEMPERATURE @ 2350 MHz



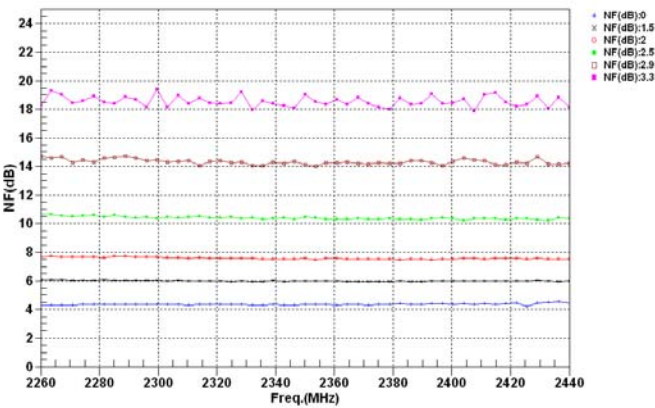
OUTPUT RETURN LOSS VS. FREQUENCY VS. CONTROL VOLTAGE



INPUT RETURN LOSS VS. FREQUENCY VS. CONTROL VOLTAGE



NOISE FIGURE VS. FREQUENCY VS. CONTROL VOLTAGE



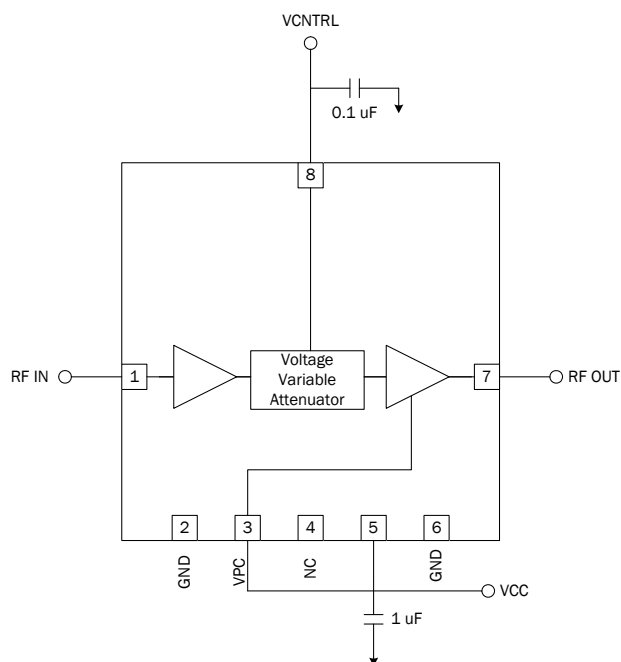
| Description                               | Reference Designator          | Manufacturer        | Manufacturer's P/N |
|-------------------------------------------|-------------------------------|---------------------|--------------------|
| EVALUATION BOARD                          |                               | DDI                 | RFVAX007L410(A)    |
| CAP, 1μF, 10%, 10V, X5R, 0402             | C7, C9-C10                    | MURATA ELECTRONICS  | GRM155R61A105KE15D |
| RES, 0Ω , 0402                            | R1                            | KAMAYA, INC         | RMC1/16SJPTH       |
| CONN, SMA, END LAUNCH, UNIV, HYB MNT, FLT | J1-J2                         | HEILIND ELECTRONICS | PER MAT-21-1038    |
| CONN, HDR, ST, PLRZD, 4-PIN, 0.100"       | P2                            | ITW PANCON          | MPSS100-4-C        |
| CONN, HDR, ST, PLRZD, 2-PIN, 0.100"       | P1                            | ITW PANCON          | MPSS100-2-C        |
| DNP                                       | C1, C3-C4, C6, C11-C12, R3-R5 |                     |                    |
| RFVA2017 MODULE                           | U1                            | RFMD                | RFVA2017           |

## Pin Table and Description

| Pin        | Function | Description                                                                                                                                                                                                                                                                                 |
|------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1          | RFIN     | RF input pin. Internal DC block.                                                                                                                                                                                                                                                            |
| 2          | GND      | Ground pin.                                                                                                                                                                                                                                                                                 |
| 3          | VPC      | Power up/down control for 2nd stage amplifier. Apply $V_{CC}$ to power on 2nd stage amplifier. Apply 0V to disable 2nd stage amplifier. Do not exceed $V_{CC} + 0.5V$ . Connect to $V_{CC}$ if not needed. Decoupling capacitor may be desired on application board for control line noise. |
| 4          | NC       | No connection.                                                                                                                                                                                                                                                                              |
| 5          | VCC      | Power supply for the module. Recommending $1\mu F$ decoupling cap on the application board.                                                                                                                                                                                                 |
| 6          | GND      | Ground pin.                                                                                                                                                                                                                                                                                 |
| 7          | RFOUT    | RF output pin. Internal DC block.                                                                                                                                                                                                                                                           |
| 8          | VCTRL    | Gain control voltage; 0V to 3.3V range. Maximum gain at 0V. Recommending $0.1\mu F$ decoupling on the application board.                                                                                                                                                                    |
| Center Pad | GND      | Center ground pads need to have a good thermal path on the application board. Use solder stencil pattern shown in the document to define solder paste during assembly.                                                                                                                      |

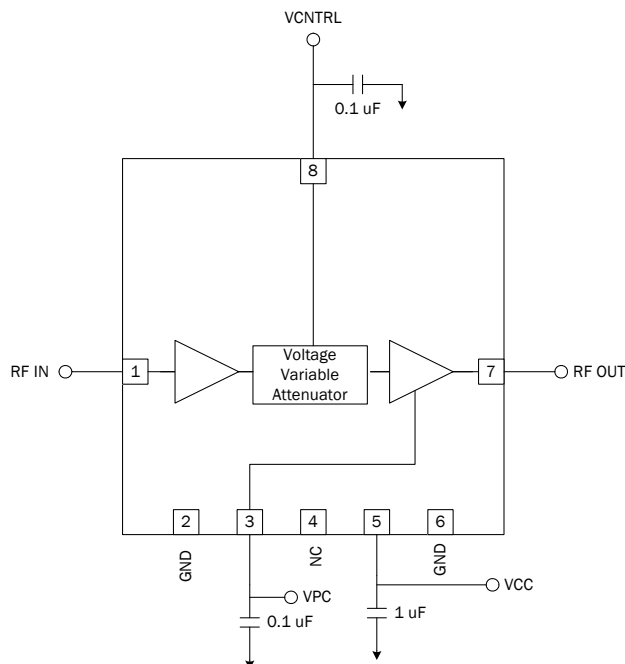
## Application Schematic

(Without using final stage amplifier power down control)

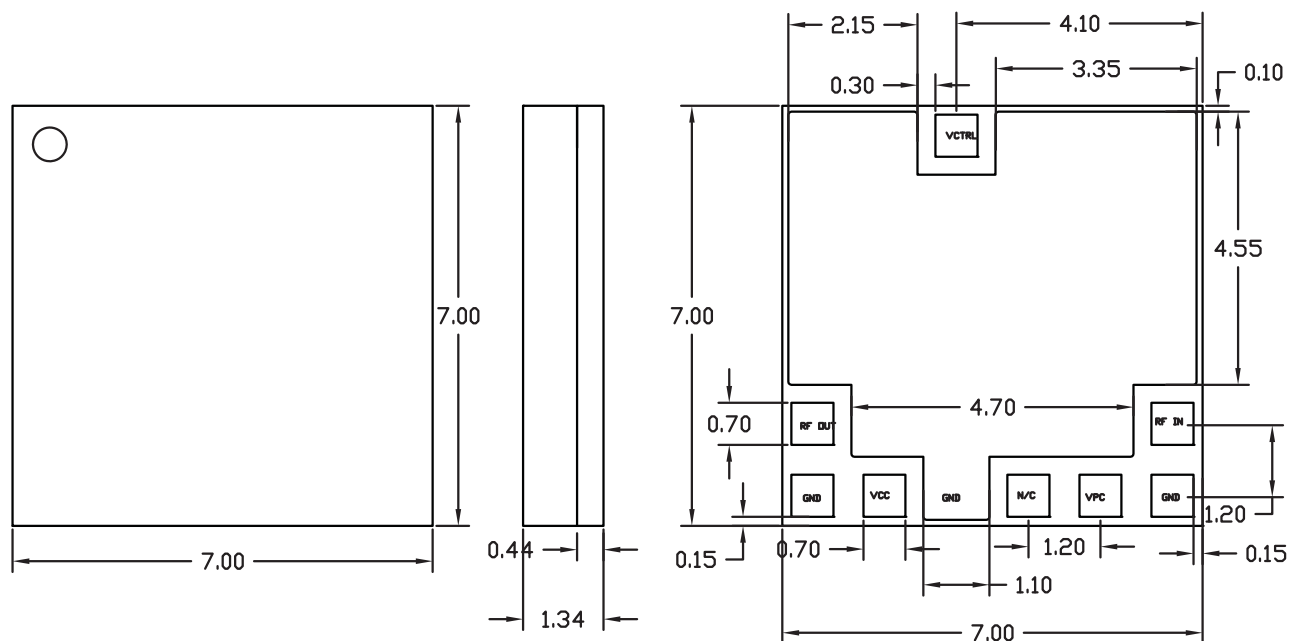


## Application Schematic

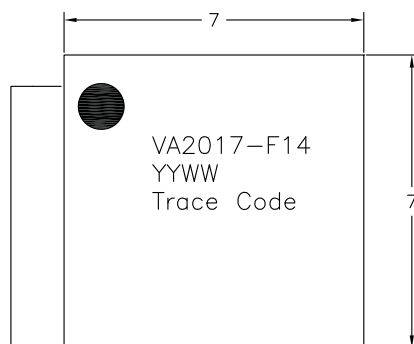
(Using final stage amplifier power down control)



## Package Drawing



## Branding Diagram



## Pin 1 Indicator

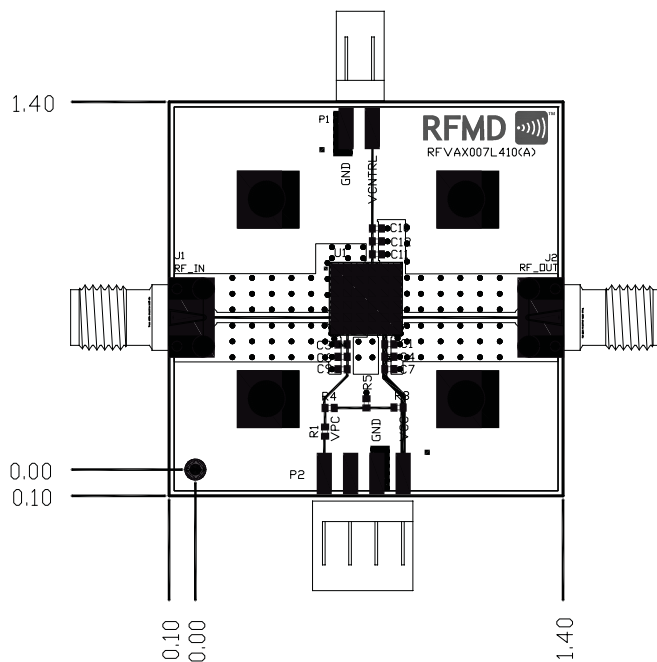
### Fill in the YYWW Notation with the Date Code

YY = Year

WW = Week

Trace Code to be assigned by SubCon

## Evaluation Board Assembly Drawing



## PCB Design Requirements

