RFVA1017

ANALOG CONTROLLED VARIABLE GAIN AMPLIFIER

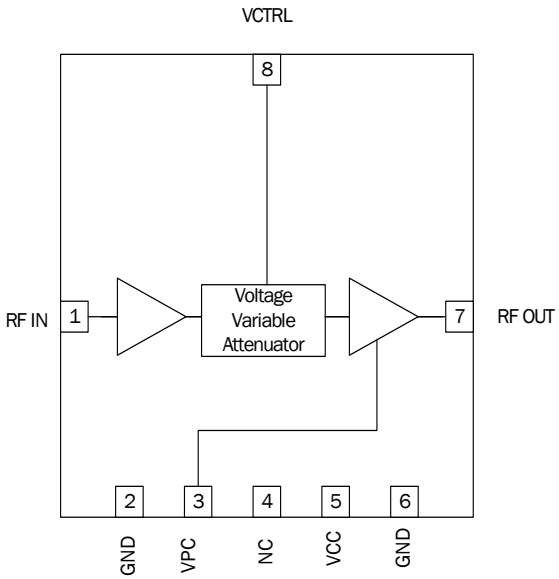
Package: MCM, 7mm x 7mm

Features

- 1425MHz to 1550MHz Operation
- Gain = 27dB Typical
- Gain Adjustment Range >19dB
- ACPR = -64dBc Typ. at +12dBm P_{OUT} (Dual Carrier WCDMA)
- Small, 7mm x 7mm, Multi-Chip Module

Applications

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



Functional Block Diagram

Product Description

RFMD's RFVA1017 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 RFVA1017 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

RFVA1017SQ	Sample bag with 25 pieces
RFVA1017SR	7" Sample reel with 100 pieces
RFVA1017TR7	7" Reel with 1500 pieces
RFVA1017TR13	13" Reel with 2500 pieces
RFVA1017PCK-410	1425MHz to 1550MHz PCBA with 5-piece sample bag

Optimum Technology Matching® Applied

☐ GaAs HBT	☐ SiGe BiCMOS	☑ GaAs pHEMT	☐ GaN HEMT
☐ GaAs MESFET	☐ Si BiCMOS	☐ Si CMOS	☐ BiFET HBT
☑ InGaP HBT	☐ SiGe HBT	☐ Si BJT	☐ 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_J)	+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_L = 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.

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

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Frequency	1425		1550	MHz	
Temperature Range	-40	25	+85	°C	Operating range
Gain	24	27	30	dB	Min attenuator setting
Nominal Operating Output Power		12		dBm	Operating power for ACPR rating
Output IP3	39	42		dBm	In high gain setting
P1dB	25	27.5		dBm	High gain setting
ACPR	-58	-64		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	23		dB	
Control Voltage Range	0		3.3	V	
Noise Figure		3.5	4.5	dB	Min attenuator setting
Impedance		50		Ω	
Input Return Loss	13	25		dB	Over attenuation range
Output Return Loss	12	16		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; VPC = 0V

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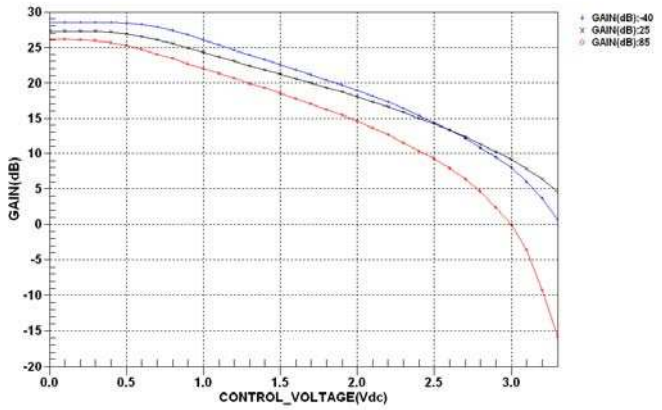
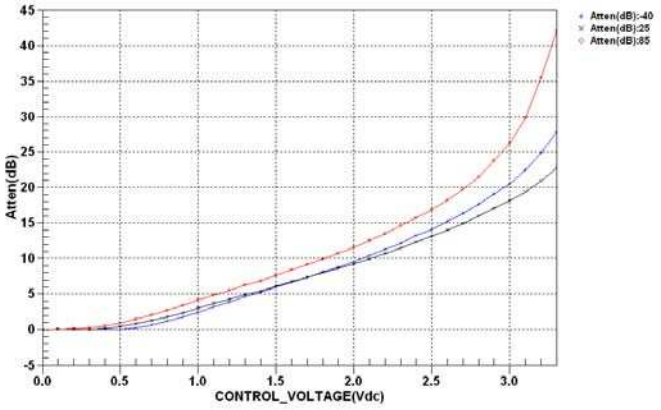
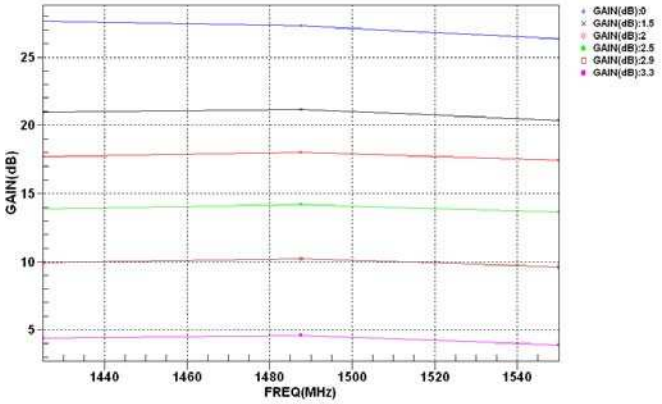
GAIN VS. CONTROL VOLTAGE VS. TEMPERATURE @ 1487.5 MHz



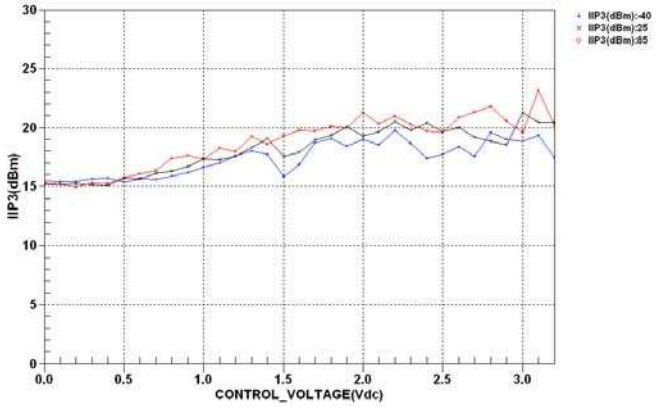
ATTENUATION VS. CONTROL VOLTAGE VS. TEMPERATURE @ 1487.5 MHz



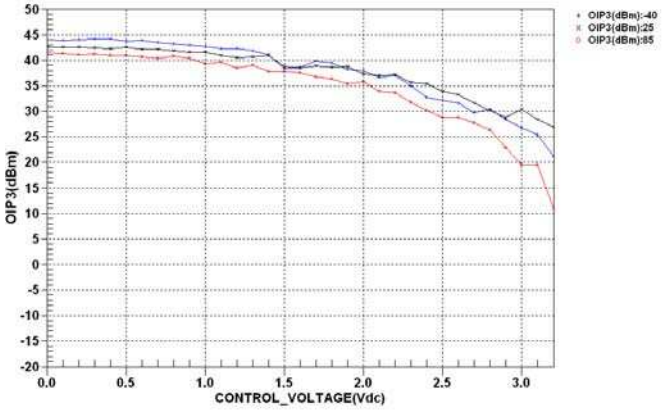
GAIN VS. FREQUENCY VS.CONTROL VOLTAGE



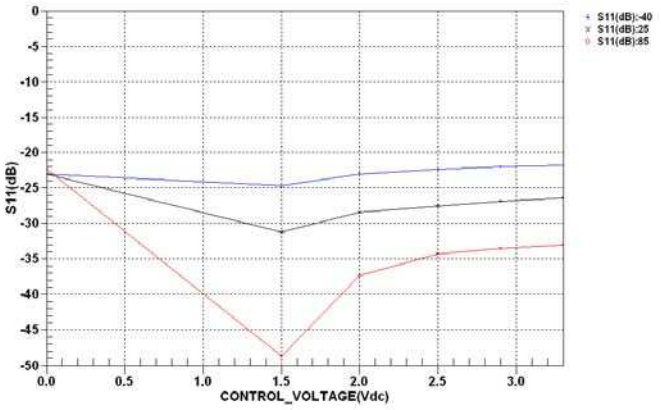
INPUT IP3 VS. CONTROL VOLTAGE VS. TEMPERATURE @ 1487.5 MHz



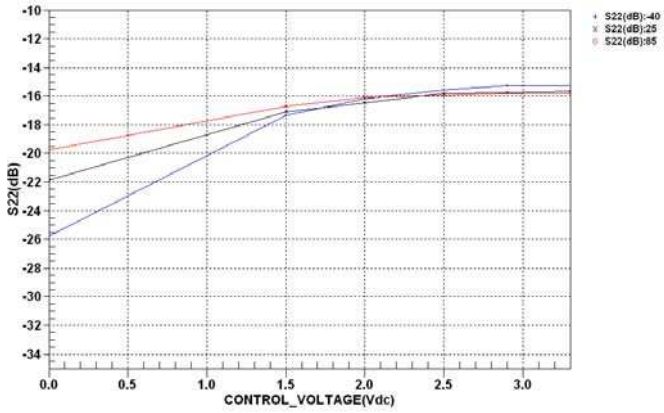
OUTPUT IP3 VS. CONTROL VOLTAGE VS. TEMPERATURE @ 1487.5 MHz



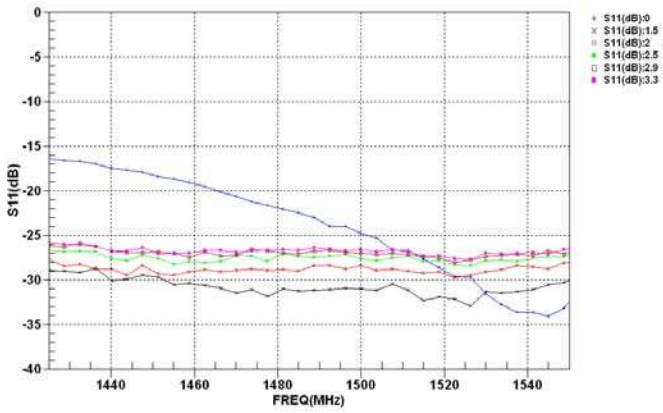
INPUT RETURN LOSS VS. CONTROL VOLTAGE VS. TEMPERATURE @ 1487.5 MHz



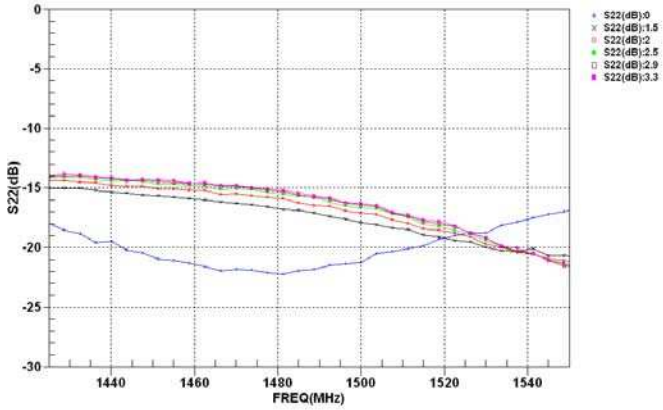
OUTPUT RETURN LOSS VS. CONTROL VOLTAGE VS. TEMPERATURE @ 1487.5 MHz



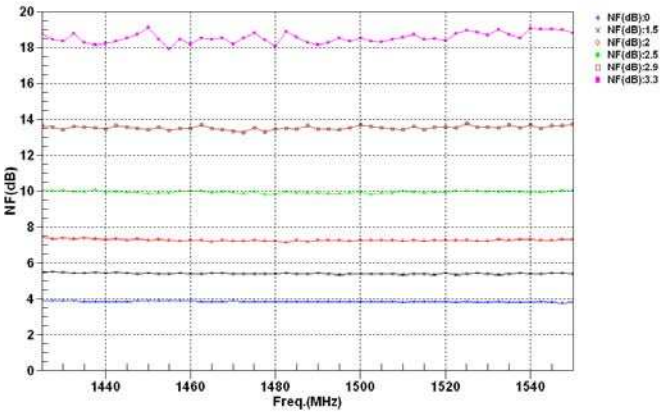
INPUT RETURN LOSS VS. FREQUENCY VS. CONTROL_VOLTAGE



OUTPUT RETURN LOSS VS. FREQUENCY VS. CONTROL VOLTAGE



NOISE FIGURE VS. FREQUENCY VS. CONTROL VOLTAGE



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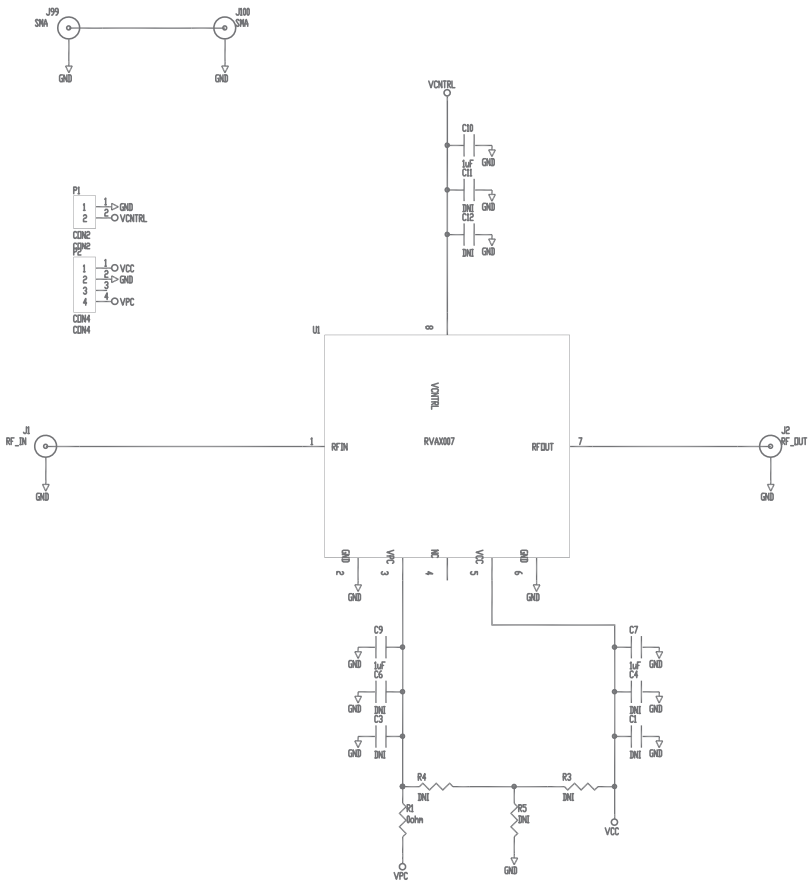
Evaluation Board Schematic



Evaluation Board Bill of Materials (BOM)

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		
RFVA1017 MODULE	U1	RFMD	RFVA1017

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 1μF 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 0.1μF 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.

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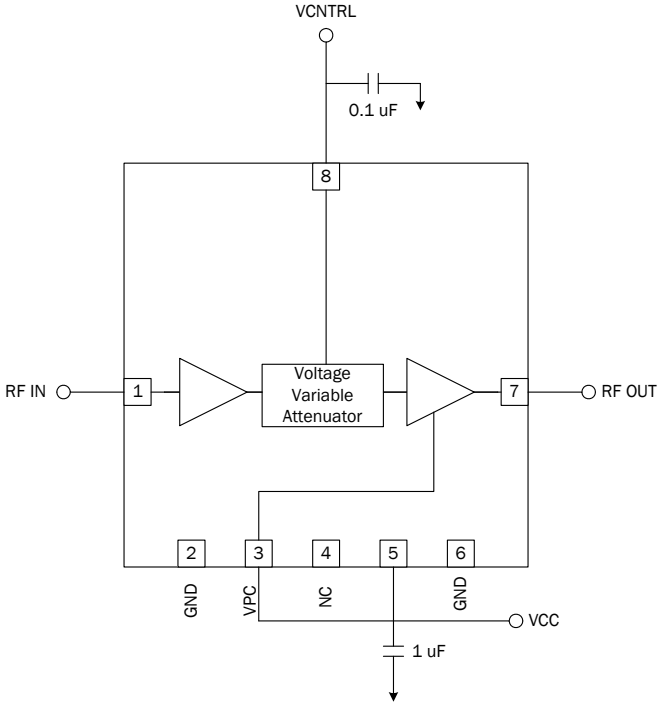
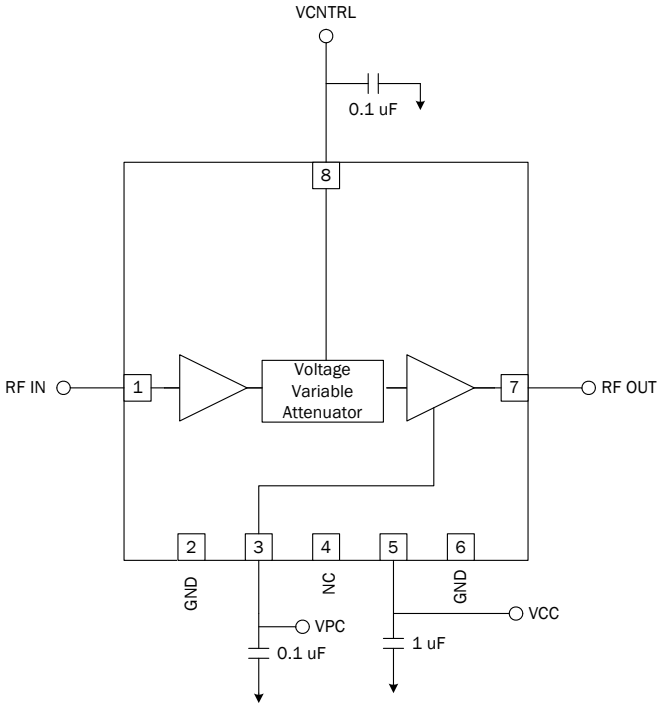
Application Schematic

(Without using final stage amplifier power down control)

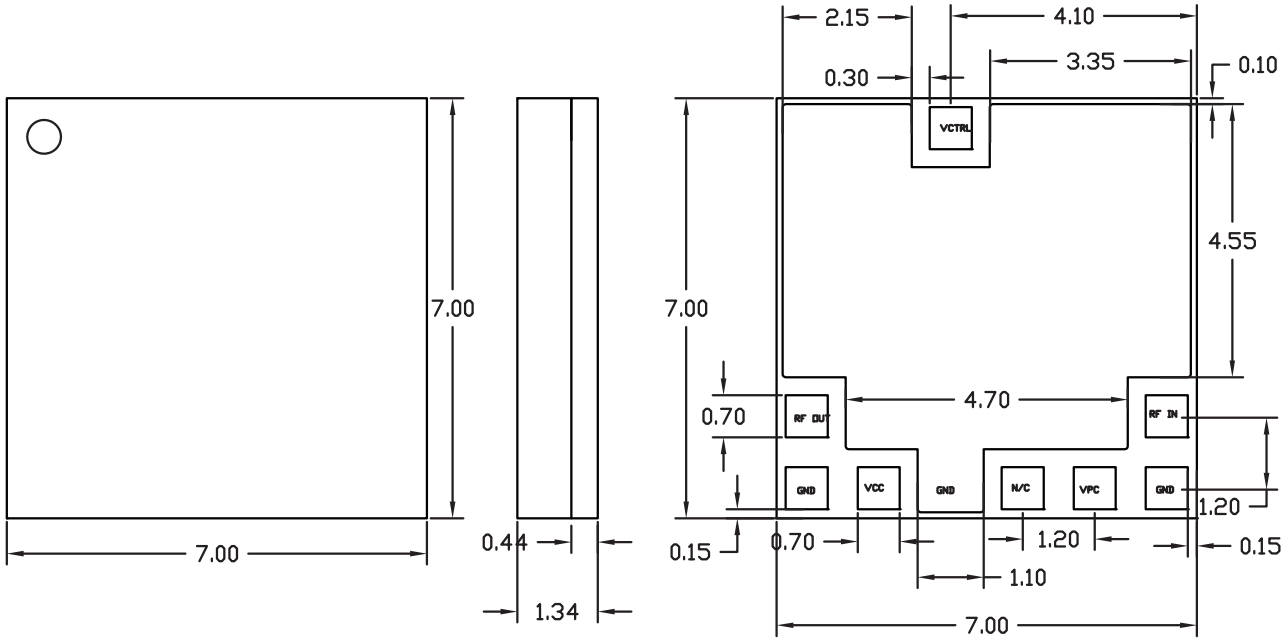


Application Schematic

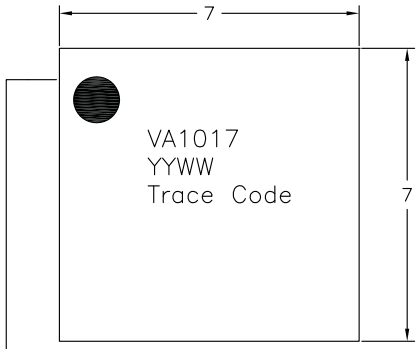
(Using final stage amplifier power down control)



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

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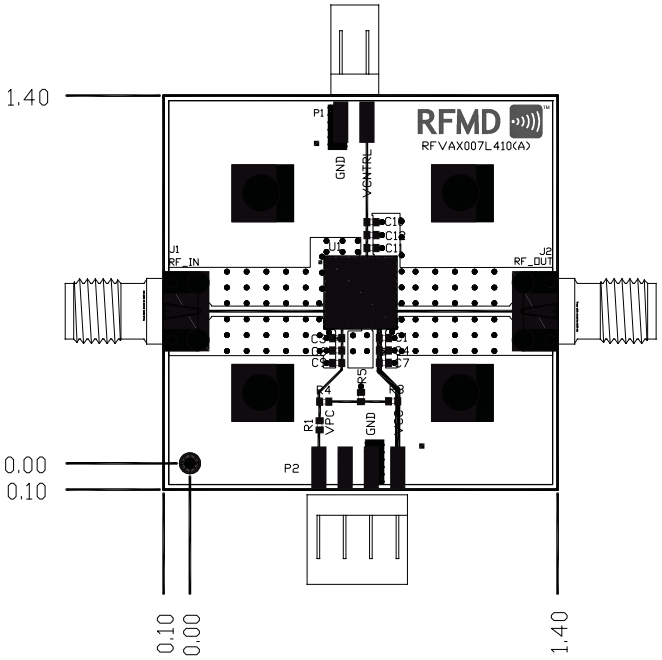
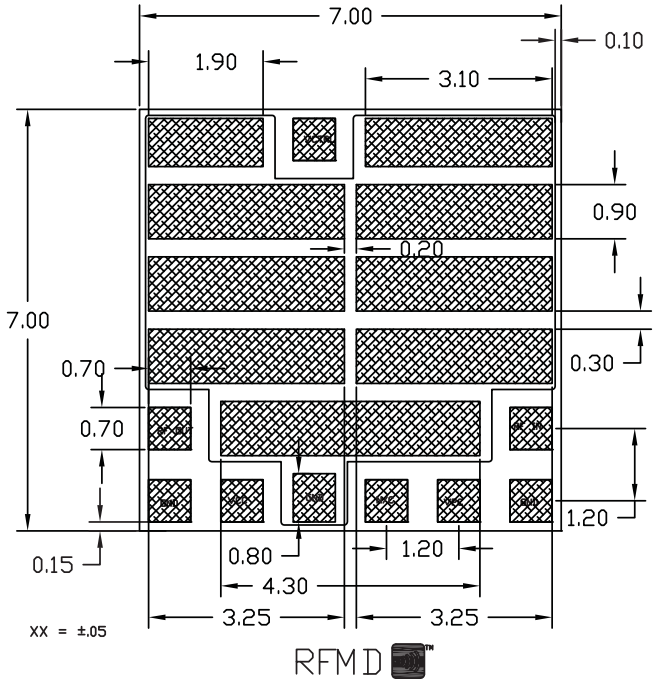
Evaluation Board Assembly Drawing



PCB Design Requirements



Note: This solder stencil pattern is required to prevent solder voiding that may impact thermal dissipation.