

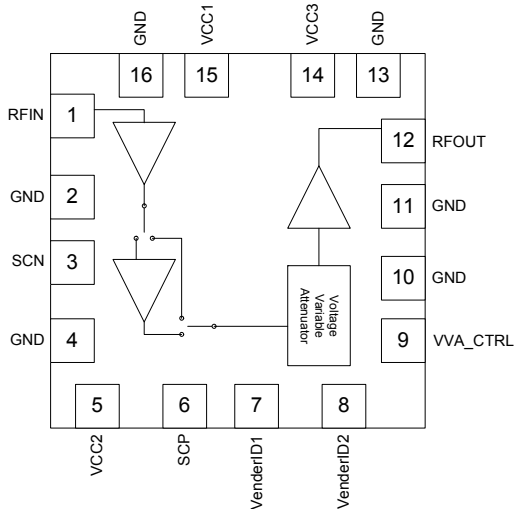


**Features**

- Frequency Range 1710MHz to 1785MHz
- Internally Matched to 50Ω on All RF Ports
- Analog Voltage Variable Attenuator with 3.3V Control Range
- Bypass Mode of LNA for High Dynamic Range
- Max Gain=35dB
- Noise Figure of 0.65dB Typical
- Gain Control Range=35dB
- High IIP3=2dBm
- Single +5V Supply
- Small 16-Pin, 8.0mmx8.0mm, Multi-Chip Module (MCM)

**Applications**

- Cellular Base Station, Remote Radio Heads
- Active Antenna Radios
- 3G, LTE Infrastructure
- Low Noise, Variable Gain with High Linearity



Functional Block Diagram

**Product Description**

RFMD's RFLA1038 is an analog-controlled voltage, variable gain amplifier featuring high linearity and very low noise figure. This LNA with bypass mode and variable attenuator provides over 35dB of dynamic gain range. The RFLA1038 has a 3.3V analog control range with maximum gain at 0V. The LNA is temperature compensated to reduce gain variation. A noise figure of 0.65dB and an IIP3 of 2dBm make this component ideal for receiver input lineups. The RFLA1038 is packaged in a small 8.0mmx8.0mm leadless laminate MCM. This module is internally matched to 50Ω on all RF ports making it easy to use with no external matching components required.

**Ordering Information**

RFLA1038SR	7" Sample reel with 100 pieces
RFLA1038SQ	Sample bag with 25 pieces
RFLA1038TR7	7" Reel with 750 pieces
RFLA1038TR13	13" Reel with 2500 pieces
RFLA1038PCK-410	1710MHz to 1785MHz 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     |

## Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage	+5.5	V <sub>DC</sub>
Control Voltage	+5.5	V <sub>DC</sub>
DC Supply Current	400	mA
Power Dissipation	2000	mW
Max RF Input Power	27	dBm
Operating Temperature (T <sub>CASE</sub> )	-40 to +85	°C
Storage Temperature	-40 to +150	°C
Max Junction Temperature (T <sub>J</sub> )	150	°C
ESD Rating (HBM)	1000 (Class 1C)	V
Moisture Sensitivity Level	MSL3	



**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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RFMD Green: RoHS compliant per EU Directive 2002/95/EC, halogen free per IEC 61249-2-21, < 1000 ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

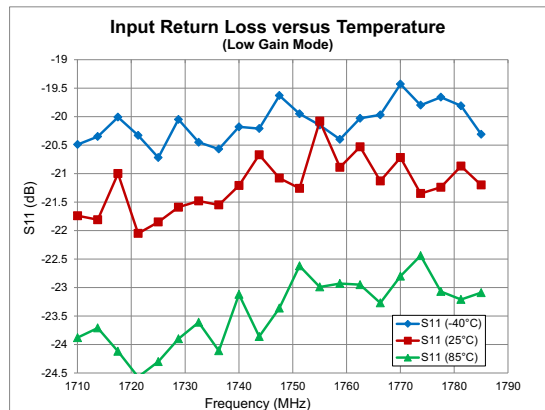
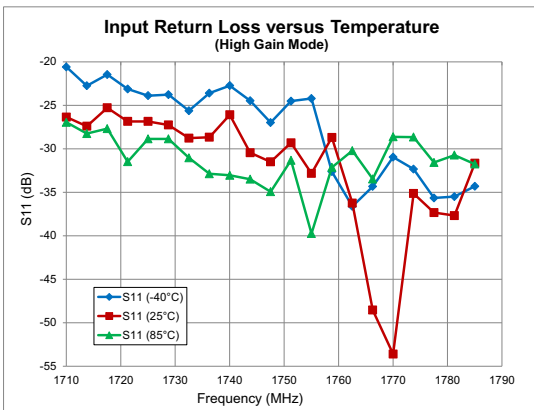
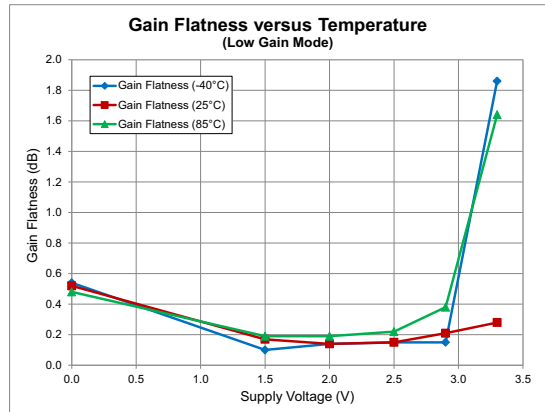
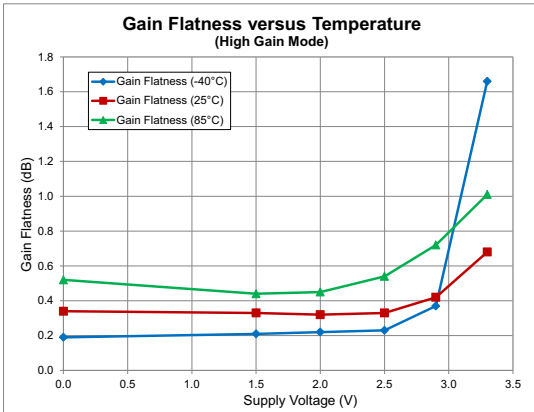
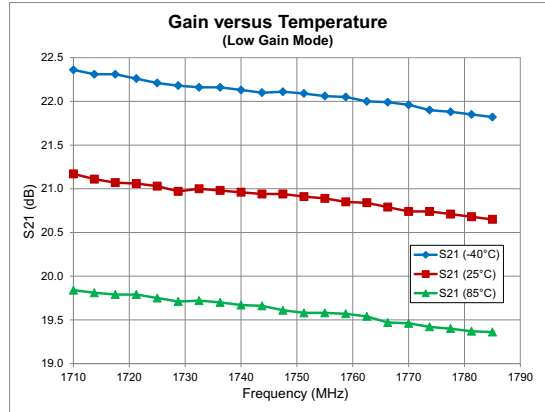
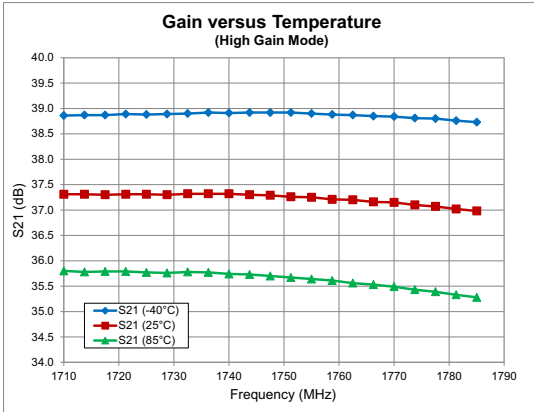
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>Overall</b>					T=25 °C, V <sub>CC</sub> =5V, Standard Application Circuit.
<b>High Gain Mode Data: 1710MHz to 1785MHz</b>					
Frequency Range	1710		1785	MHz	
Max Gain		37.5		dB	Attenuation = Min, VVA_CV=0V
Gain Flatness		0.7		dB	
Gain Range HG	13.5		37.5	dB	
OIP3 (Max Gain)		39.5		dBm	Attenuation = Min, VVA_CV=0V
IIP3 (30dB to 35dB Gain)		4		dBm	
IIP3 (18dB to 29dB Gain)		8		dBm	
OP1dB (Max Gain)		24		dBm	Attenuation = Min, VVA_CV=0V
IP1dB (30dB to 35dB Gain)		-7.5		dBm	
IP1dB (18dB to 29dB Gain)		-4.5		dBm	
NF (Max Gain)		0.65		dB	Attenuation = Min, VVA_CV=0V
Input Return Loss		-30		dB	
Output Return Loss		-20		dB	
<b>Low Gain Mode Data: 1710MHz to 1785MHz</b>					
Frequency Range	1710		1785	MHz	
Max Gain LG		21.5		dB	Attenuation = Min, VVA_CV=0V
Gain Range LG	-3.3		21.5	dB	
OIP3 (Max Gain)		39		dBm	Attenuation = Min, VVA_CV=0V
IIP3 (12dB to 17dB Gain)		22.5		dBm	
IIP3 (3dB to 11dB Gain)		25		dBm	
OP1dB (Max Gain)		24		dBm	Attenuation = Min, VVA_CV=0V
IP1dB (12dB to 17dB Gain)		9.5		dBm	
IP1dB (6dB to 11dB Gain)		10		dBm	
IP1dB (3dB to 5dB Gain)		10		dBm	
NF (Max Gain)		1.6		dB	Attenuation = Min, VVA_CV=0V
Input Return Loss		-23		dB	
Output Return Loss		-20		dB	

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>Power Supply</b>					
Supply Voltage		5		V	
Gain Control Voltage	0		3.3	V	
Logic High	2		5	V	
Logic Low	0		1	V	
Thermal Resistance		42		°C/W	85 °C at 5.25V
<b>Current</b>					
Power Supply	4.75	5	5.25	V	
Current	250	290	320	mA	HG Mode
Current <sup>1</sup>	250	290	320	mA	LG Mode1
Current <sup>2</sup>	180	290	225	mA	LG Mode2

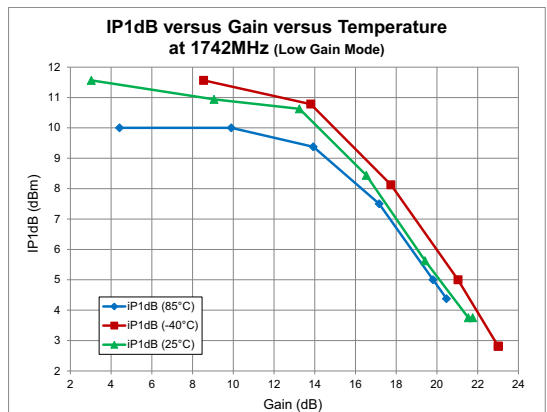
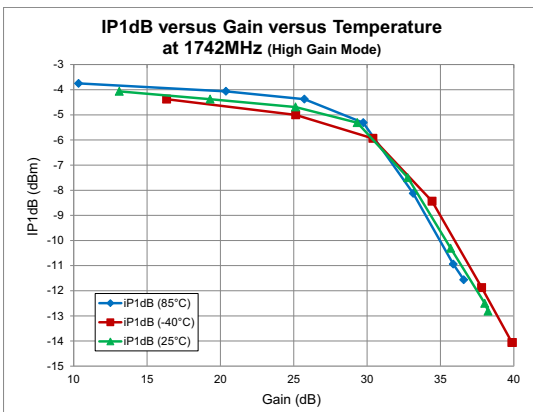
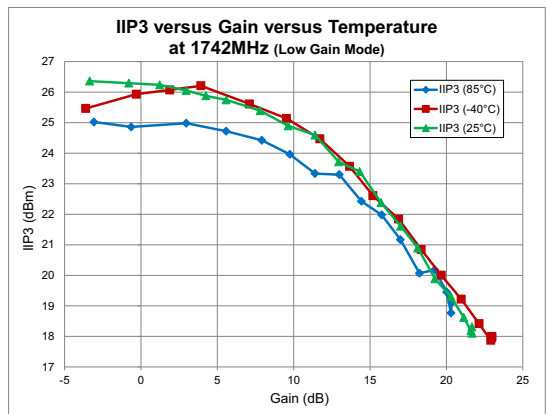
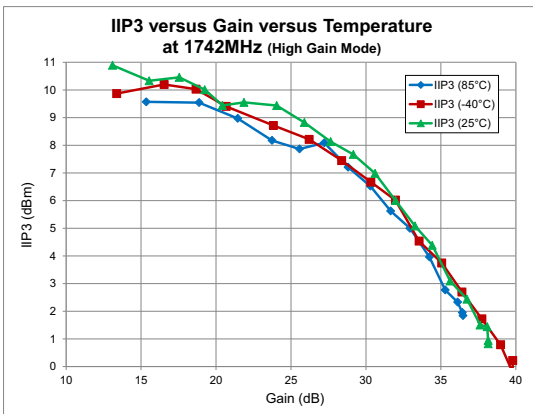
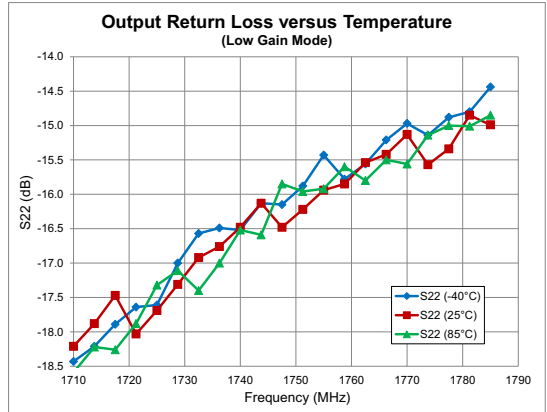
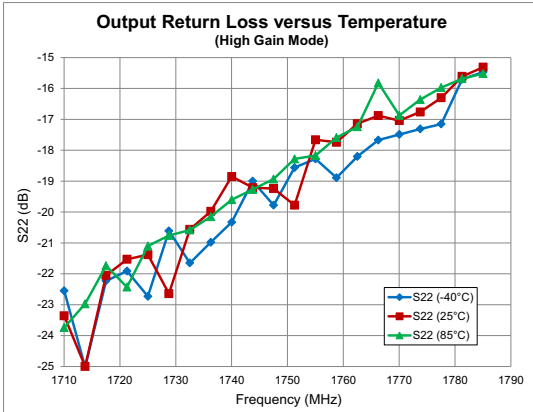
Notes:

1. LG mode with 2nd LNA bypass  $V_{CC2}$  still applied
2. LG mode with 2nd LNA bypass  $V_{CC2}$  disabled

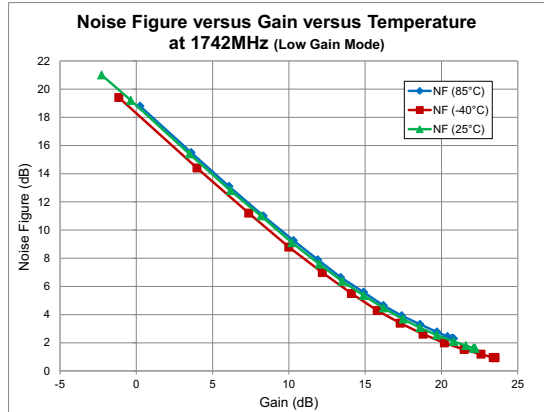
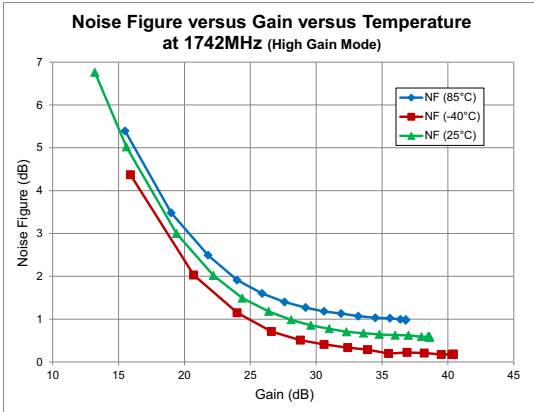
## Typical Performance



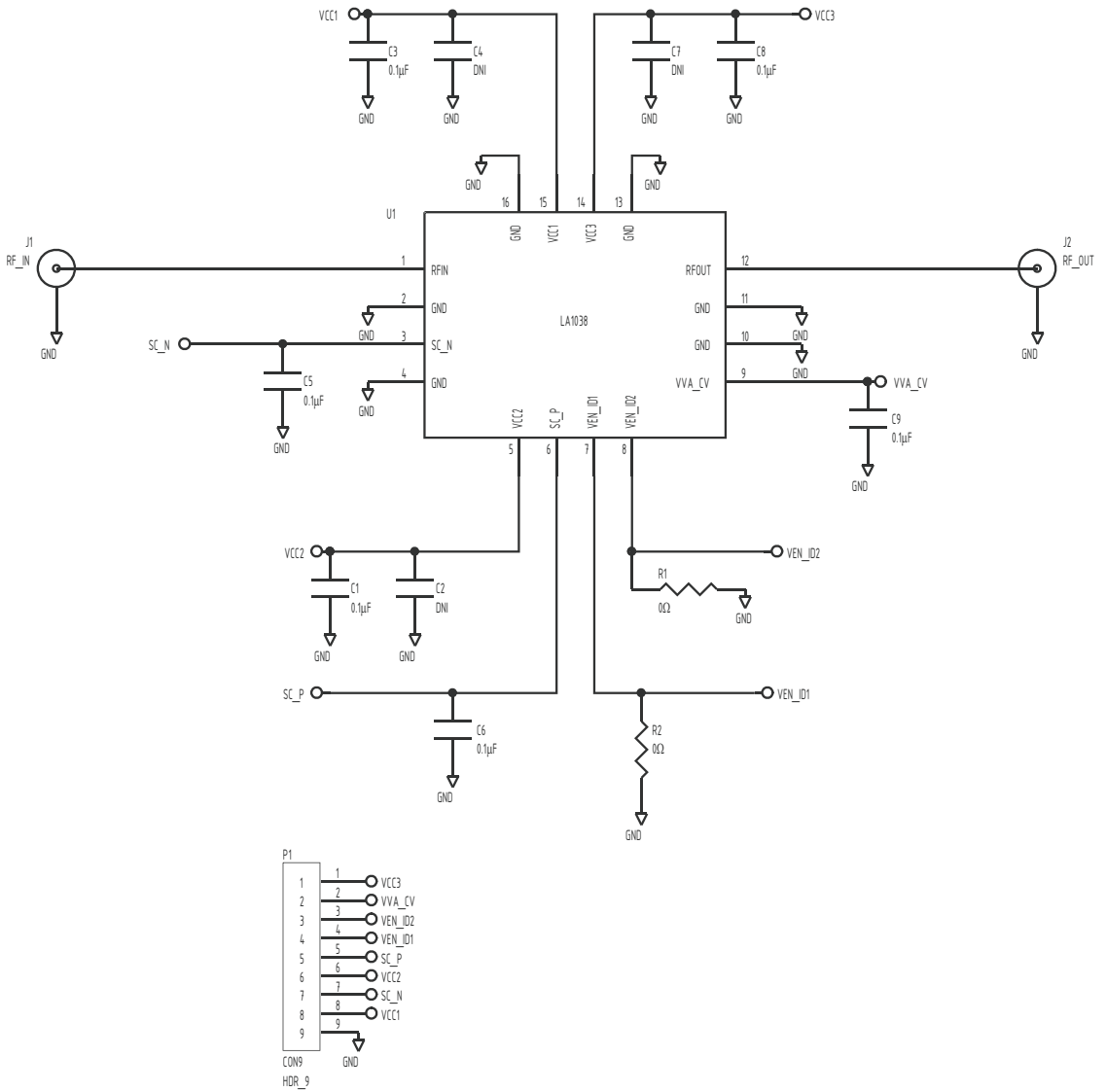
**Typical Performance**



## Typical Performance



**Evaluation Board Schematic**



## Evaluation Board Build of Materials (BOM)

Description	Reference Designator	Manufacturer	Manufacturer's P/N
Evaluation Board		DDI	LA1038410(E)
CAP, 0.1μF, 10%, 16V, X7R, 0402	C1 ,C3, C5-C6, C8-C9	Murata Electronics	GRM155R71C104KA88D
	C2*, C4*, C7*		
CONN, SMA, END LNCH, UNIV, HYB MNT, FLT	J1-J2	HEILIND ELECTRONICS	PER MAT-21-1038
RES, 0Ω, 0402	R1-R2	Kamaya, Inc	RMC1/16SJPTH
CONN, HDR, ST, PLRZD, 9-PIN	P1	ITW Pancon	MPSS100-9-C
RFLA1038 Module	U1	RFMD	RFLA1038

\* Should not be populated on PCBA.

### Truth Table

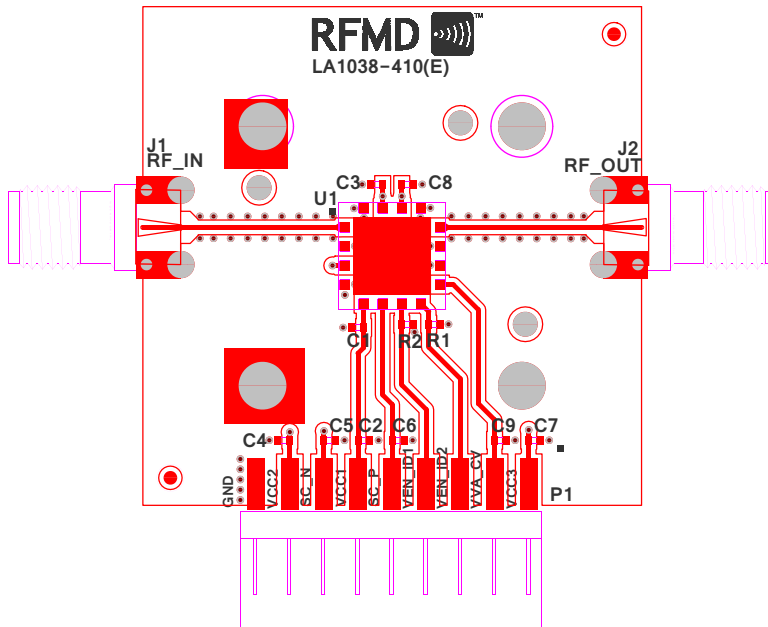
	SC_N	SC_P
High Gain	0	1
Low Gain	1	0

### Pin Names and Description Table

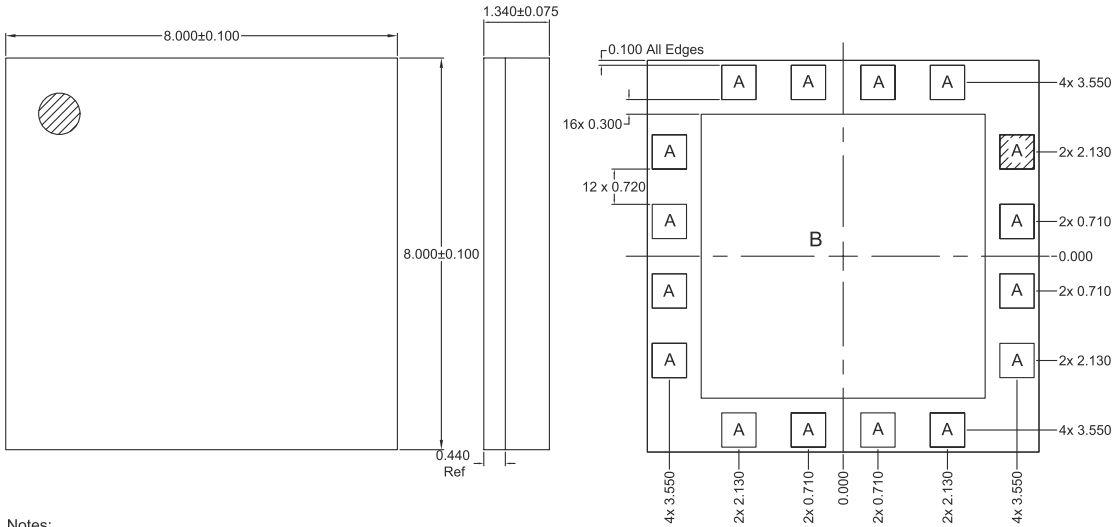
Pin	Function	Description
1	RFIN	RF Input; Internally 50Ω Matched and DC-Blocked
2	GND	Connect to Low Inductance Path to Ground
3	SC_N	Switch Control Line; See Truth Table
4	GND	Connect to Low Inductance Path to Ground
5	VCC2	VCC Supply, 10nF Decoupling Internal; Supply Voltage to 2nd Stage LNA; Disable VCC Supply in Bypass Mode to Save DC Current.
6	SC_P	Switch Control Line; See Truth Table
7	ID1/GND	Pin Grounded in Module
8	ID2/GND	Pin Grounded in Module
9	VVA_CV	Voltage Variable Attenuator Control Line; 0V to 3.3V Range; Max Gain is at 0V.
10	GND	Connect to Low Inductance Path to Ground
11	GND	Connect to Low Inductance Path to Ground
12	RFOUT	RF Output Internally 50Ω Match and DC-Blocked
13	GND	Connect to Low Inductance Path to Ground
14	VCC3	VCC Supply, 0.1μF Decoupling Internal. Supply Voltage to 3rd Stage Amplifier.
15	VCC1	VCC Supply, 0.1μF Decoupling Internal. Supply Voltage to 1st Stage LNA.
16	GND	Connect to Low Inductance Path to Ground



**Evaluation Board Assembly Drawing**



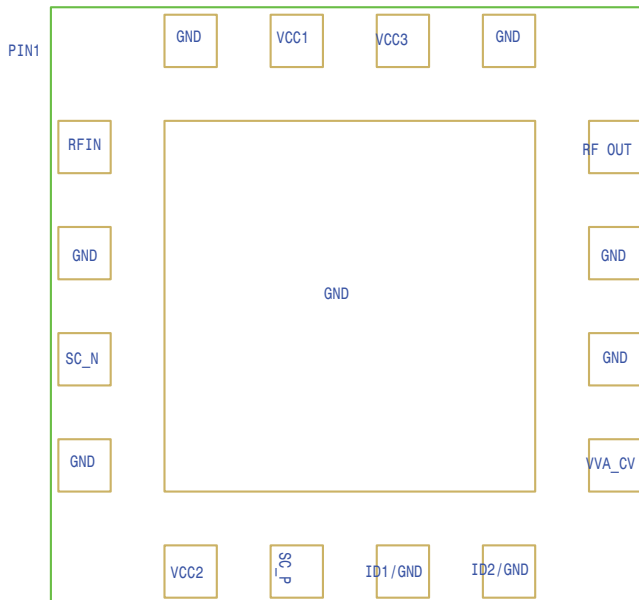
## Package Drawing 8.0mmx8.0mm Laminate Module



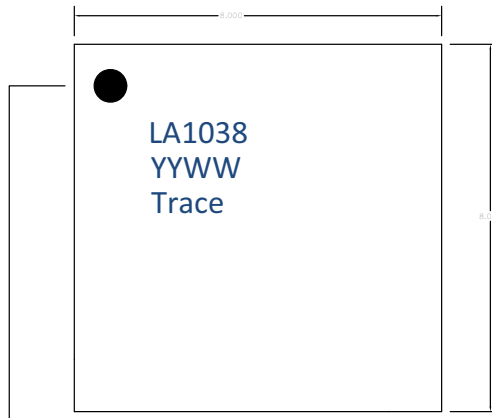
Notes:  
1. Shaded area represents Pin 1 location

A = 0.700 x 0.700 mm  
B = 5.800 x 5.800 mm

## IO Pattern Label



**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