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RF6519

3.3V TO 5.0V, 915MHz TRANSMIT/RECEIVE MODULE

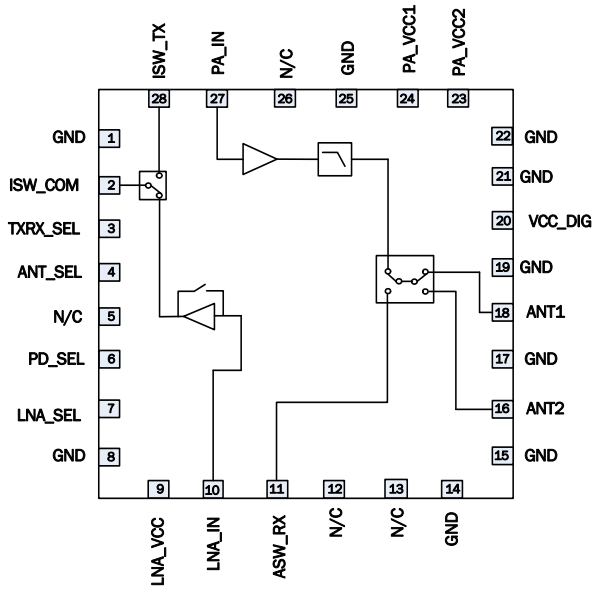
Package: LGA, 28-Pin, 5.5mm x 5.0mm

Features

- Tx Output Power: 26dBm
- 50Ω Bi-directional Transceiver Interface
- Rx Noise Figure: 1.5dB
- Antenna Diversity Switch
- LNA By-Pass Mode With Low Insertion Loss

Applications

- Wireless Automated Metering
- Wireless Alarm Systems
- Portable Battery Powered Equipment
- Wireless Automatic Metering Applications
- 868MHz/900MHz ISM Band Application
- Single Chip RF Front End Module



Functional Block Diagram

Product Description

This module is intended for 915MHz AMR solutions. It provides a single TDD access for Rx and Tx paths and two ports on the output for connecting a diversity solution or a test port. The PA section provides a nominal 27dBm to any internal filtering before the ANT switch. The LNA section provides a nominal 17dB gain and 1.5dB noise figure, along with a bypass mode. The device is provided in a 5.5mm x 5.0mm, 28-pin package.

Ordering Information

RF6519	ISM Band Transmit/Receive Module with Diversity Antenna Switch
RF6519SB	5-Piece Bag
RF6519SR	Standard 100-Piece Reel
RF6519TR13	Standard 2500-Piece reel
RF6519PCK-410	Fully Assembled Evaluation Board and 5-Piece 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	

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Absolute Maximum Ratings

Parameter	Rating	Unit
DC Supply Voltage	5	V
Operating Case Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C
ESD Human Body Model RF Pins	500	V
ESD Human Body Model All Other Pins	500	V
ESD Charge Device Model All Pins	500	V
Moisture Sensitivity Level	MSL 3	
Maximum Input Power to PA and LNA (no damage)	+5	dBm

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.		
Power Amplifier					PA_VCC = 4.2V, TXRX_SEL Logic = LOW, Pin = 0dBm at Pin 27
Frequency Range	868	902 to 928		MHz	
Operating Output Power		26		dBm	
CW Output Power	25	27		dBm	Near Saturation
Gain	27	30	35	dB	
Output Harmonic Levels					
2nd			-20	dBc	
3rd			-50	dBc	
4th through 10th			-60	dBc	
Input Return Loss	10			dB	
Ruggedness		6:1			All phase angles, no damage
Power Supply Voltage	3.3	4.2	5.0	V	
Current					
Operating		275	380	mA	
Power Down Current		0.5	5	uA	PD_SEL Logic = 0.0V
Low Noise Amplifier					
Frequency Range	868	902 to 928		MHz	
Power Supply Voltage	4	4.2	5	V	LNA_VCC
Power Down Current		0.1	1	uA	LNA_VCC = 5V, PD_SEL = LOW
High Gain Mode					LNA_VCC = 4.2V, TXRX_SEL Logic = HIGH, LNA_SEL Logic = HIGH
Gain	15	17	22	dB	LNA-IN Port at Pin 10 to ISW-COM Port at Pin 2
Noise Figure		1.5	2	dB	
Input IP3	5	8		dBm	
Input Return Loss	8	10		dB	Measured at LNA-IN Port at Pin 10
Output Return Loss	8	10		dB	Measured at ISW-COM Port at Pin 2
Operating Current	8	10	11	mA	

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Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Low Gain Mode					VCC_LNA = 4.2V, TXRX_SEL Logic = LOW, LNA_SEL Logic = LOW
Insertion Loss	4.25	5.1	5.5	dB	
Input IP3	12	18		dBm	
Input Return Loss	10			dB	
Output Return Loss	10			dB	
Operating Current		3.0	4.0	mA	
Transmit/Receive Switch					
Frequency Range	868	902 to 928		MHz	
Insertion Loss					
ISW_COM to ISW_TX		0.4	0.5	dB	TXRX_SEL = LOW
Isolation					
ISW_COM to ISW_TX	20	25		dB	ISW-COM at Pin 2 to ISW-TX at Pin 28, TXRX_SEL Logic = HIGH
TX-RX	20	25		dB	TX or Rx State
Return Loss					
ISW_COM		-30		dB	Measured at Pin 2, TXRX_SEL Logic = LOW
ISW_TX		-35		dB	Measured at Pin 28, TXRX_SEL Logic = LOW
Antenna Switch					
Insertion Loss ANT1 - ASWRX		0.8	1.0	dB	Pin 18 to Pin 11, TXRX_SEL = HIGH, ANT_SEL = HIGH
Insertion Loss ANT2 - ASWRX		0.8	1.0	dB	Pin 16 to Pin 11, TXRX_SEL = HIGH, ANT_SEL = LOW
Isolation	20			dB	Any used port to any unused port
ANT1 Port Return Loss (Tx Mode)	8	12		dB	Measured at Pin 18, TXRX_SEL = LOW, ANT_SEL Logic = HIGH
ANT2 Port Return Loss (Tx Mode)	8	12		dB	Measured at Pin 16, TXRX_SEL = LOW, ANT_SEL Logic = LOW
ASWRX Port Return Loss	15	20		dB	Measured at Pin 11, TXRX_SEL Logic = High, ANT1 or ANT2 State
ANT1 Port Return Loss (RX Mode)	15	20		dB	Measured at Pin 18, TXRX_SEL = HIGH, ANT_SEL Logic = HIGH
ANT2 Port Return Loss (RX Mode)	15	20		dB	Measured at Pin 16, TXRX_SEL = HIGH, ANT_SEL Logic = LOW
Logic Circuit and Power Supply					
VCC_DIG	3.0	3.3	3.6	V	Digital Supply Voltage - see note 1
VCC_DIG Supply Current - Rx Mode		0.75	3.0	mA	In any Module Rx Mode
VCC_DIG Supply Current - Tx Mode		3.0	10.0	mA	In any Module Tx Mode
VCC_DIG Power Down Current		3	20	μA	All Four Logic Inputs = LOW
Select Control Logic - HIGH	2.8	3.1	3.4	V	All Four Logic I/O's - see note 2
Select Control Logic - LOW	0	0.2	0.3	V	All Four Logic I/O's
Select Control Logic HIGH Current		5	10	μA	All Four Logic I/O's
Select Control Logic LOW Current		0.1	2	μA	All Four Logic I/O's (sink current)

Notes:
1. VCC_DIG is regulated voltage input to FEM and always "ON".
2. Select Control Voltages are same supply, regulated, standard CMOS inputs.

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Operating Mode	Module Logic Truth Table			
	ANT_SEL	TXRX_SEL	LNA_SEL	PD_SE:
Tx - ANT1	High	Low	Low	High
Tx - ANT2	Low	Low	Low	High
Rx - ANT1 - Hi Gain	High	High	High	High
Rx - ANT2 - Hi Gain	Low	High	High	High
Rx - ANT1 - Low Gain	High	High	Low	High
Rx = ANT2 - Low Gain	Low	High	Low	High
Power Down	Low	Low	Low	Low

NOTE:
*Switch Control Logic High = Min 2.8V to Max 3.4V
*Switch Control Logic Low = Min 0.0V to Max 0.3V

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Pin Names and Descriptions

Pin	Name	Description
1	GND	Ground I/O.
2	ISW_COM	Input Switch Common Port.
3	TXRX_SEL	Transmit Mode and Receive Mode Select.
4	ANT_SEL	Antenna 1 and Antenna 2 Select.
5	NC	No connect.
6	PD_SEL	Module Power Down Select.
7	LNA_SEL	LNA High Gain and Low Gain Select.
8	GND	Corner ground I/O.
9	LNA_VCC	LNA Battery Bias.
10	LNA_IN	LNA Signal Input.
11	ASW_RX	Antenna Switch Receive Output.
12	NC	No connect.
13	NC	No connect.
14	GND	Ground I/O.
15	GND	Corner ground I/O.
16	ANT2	Antenna 2 Output/Input.
17	GND	Ground I/O.
18	ANT1	Antenna 1 Output/Input.
19	GND	Ground
20	VCC_DIG	Digital Reference Voltage.
21	GND	Ground
22	GND	Corner ground I/O.
23	PA VCC2	PA Battery Bias for Second Stage.
24	PA VCC1	PA Battery Bias for First Stage.
25	GND	Ground I/O.
26	NC	No connect.
27	PA_IN	Power Amplifier Signal Input Port.
28	ISW_TX	Input Switch Transmit Signal Output Port.
29	GND	Center Ground Flag.

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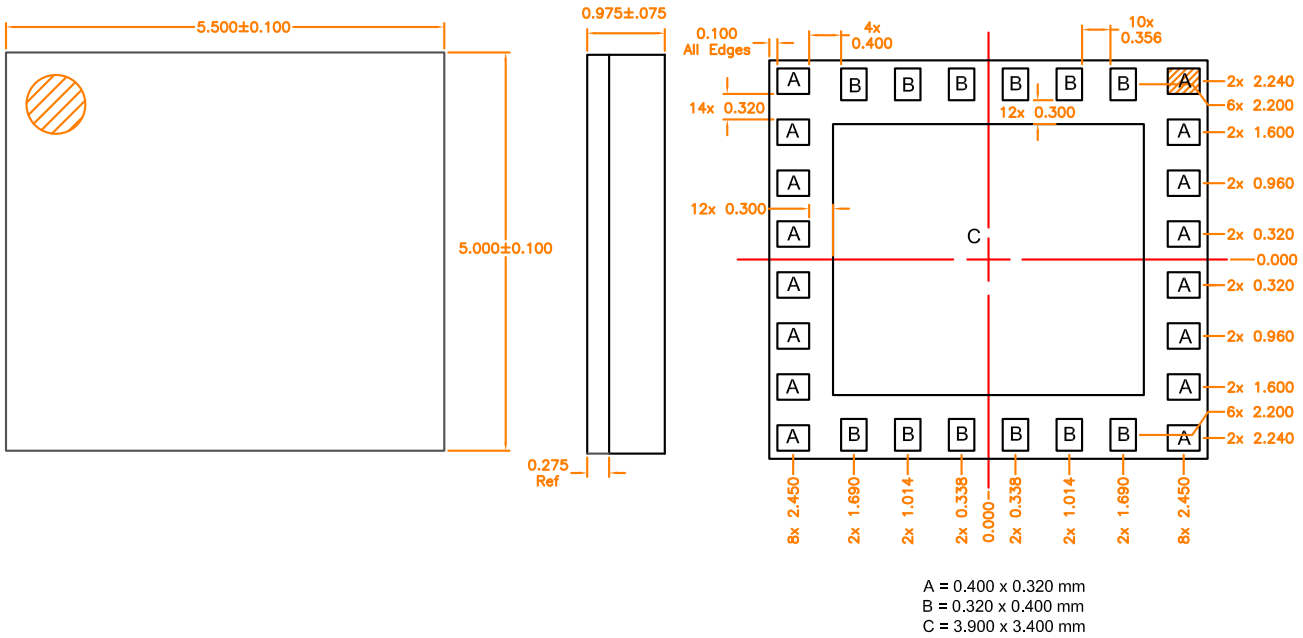
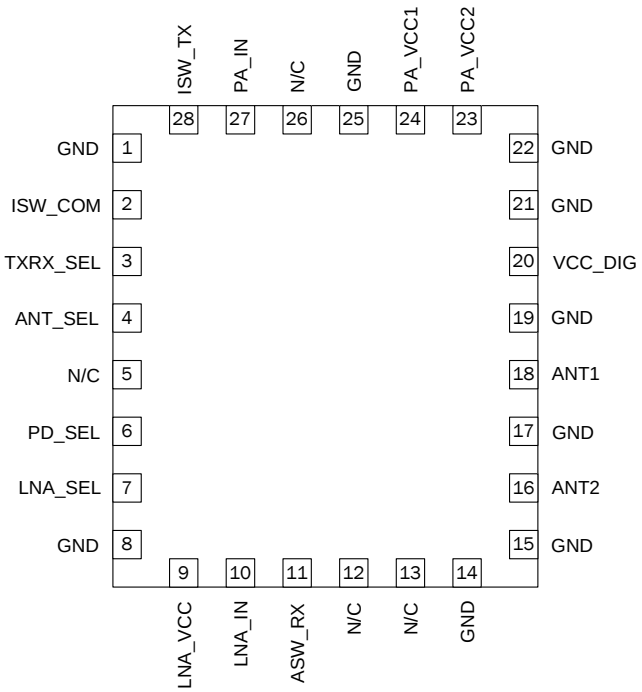
Package Drawing



A = 0.400 x 0.320 mm
B = 0.320 x 0.400 mm
C = 3.900 x 3.400 mm

All units in µm.

Pin Out



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PCB Design Requirements

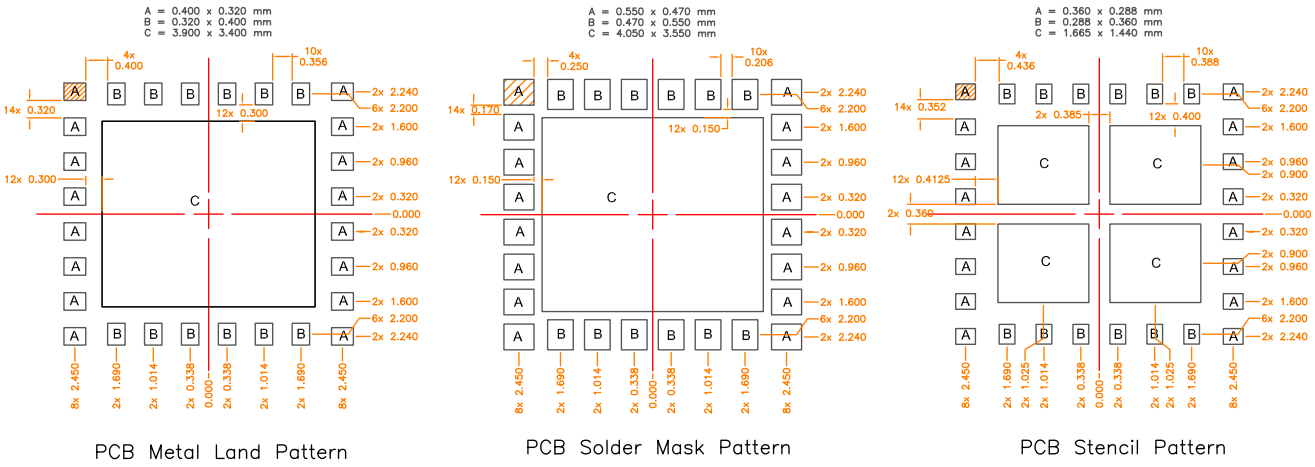
PCB Surface Finish

The PCB surface finish used for RFMD's qualification process is electroless nickel, immersion gold. Typical thickness is 3µinch to 8µinch gold over 180µinch nickel.

PCB Land Pattern Recommendation

PCB land patterns for RFMD components are based on IPC-7351 standards and RFMD empirical data. The pad pattern shown has been developed and tested for optimized assembly at RFMD. The PCB land pattern has been developed to accommodate lead and package tolerances. Since surface mount processes vary from company to company, careful process development is recommended.

PCB Metal Land and Solder Mask Pattern



PCB Metal Land Pattern

PCB Solder Mask Pattern

PCB Stencil Pattern

Notes:
1. Shaded area represents Pin 1 location.

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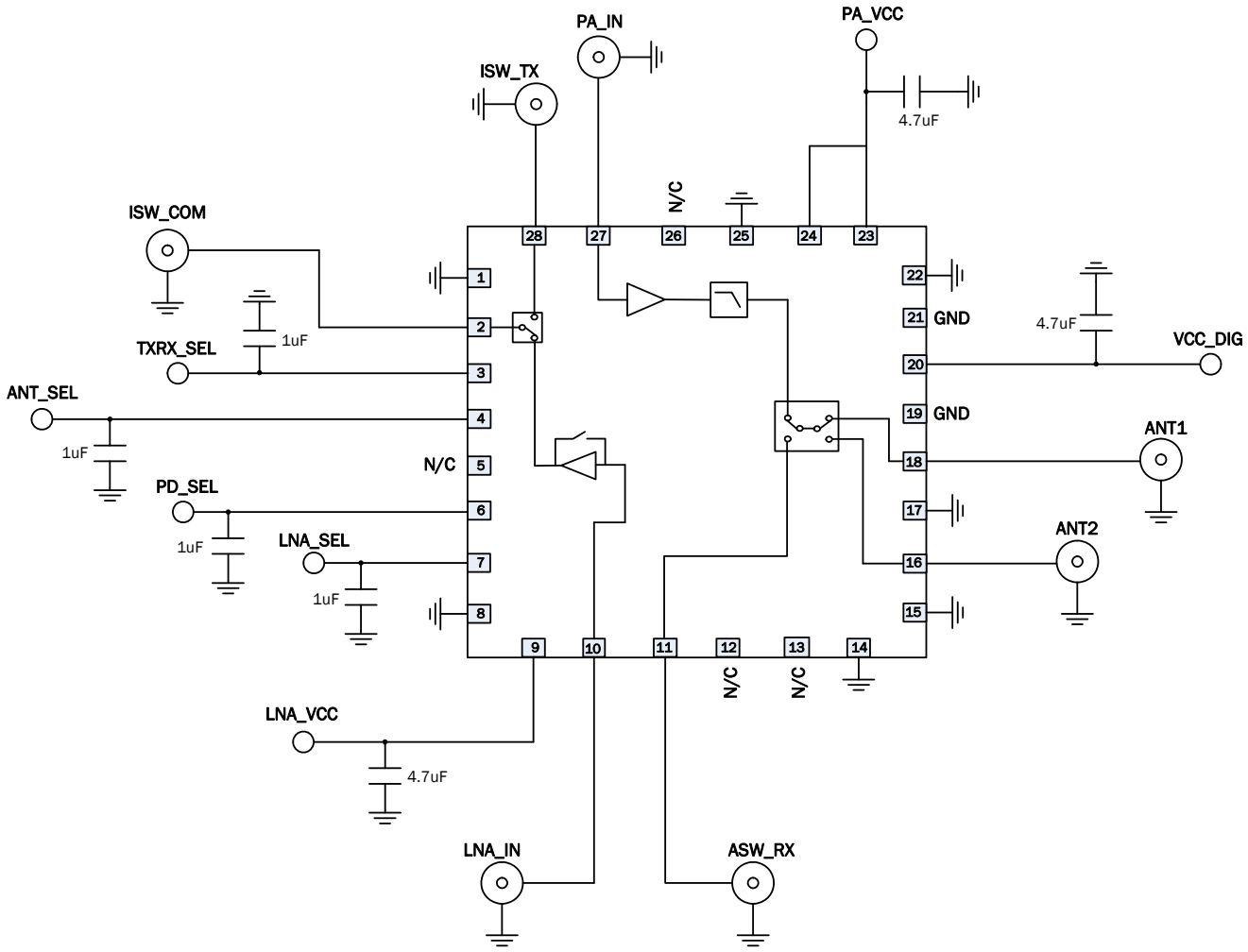
Evaluation Board Schematic



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