

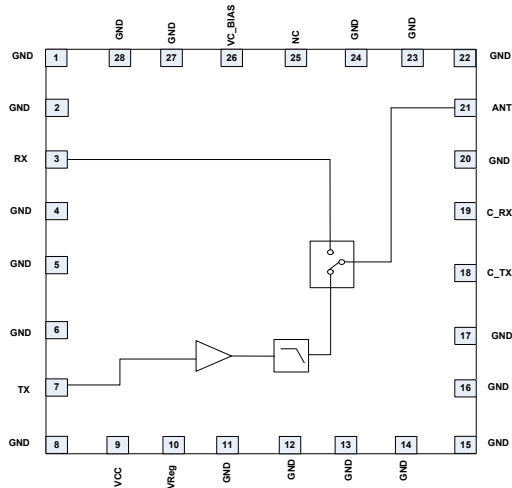


### Features

- Tx Output Power: 30dBm
- Tx Gain: 30dB
- Separate 50Ω Tx/Rx Transceiver Interface
- Rx Insertion Loss: 1dB

### Applications

- Wireless Automated Metering
- Wireless Alarm Systems
- Portable Battery Powered Equipment
- Smart Energy
- 433MHz/450MHz to 470MHz ISM Band Application
- Single Chip RF Front End Module



Functional Block Diagram

### Product Description

RFFM6401 is a front end module (FEM) intended for 433MHz to 470MHz AMI/AMR systems. This module provides separate ports for Rx and Tx paths. The Tx section provides a two stage PA with nominal output power of 30dBm and gain of 30dB. The Rx is a pass through. Both are combined to a single antenna port with a SP2T switch. The device is provided in a 5.5mm x 5.0mm, 28-pin package.

### Ordering Information

RFFM6401	3.3V to 4.0V, 450MHz to 470MHz Front End Module
RFFM6401SB	5-Piece Bag
RFFM6401SR	Standard 100-Piece Reel
RFFM6401TR13	Standard 2500-Piece reel
RFFM6401PCK-410	Fully Assembled Evaluation Board and 5-Piece Bag

## Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage	+5	V <sub>DC</sub>
DC Supply Current	800	mA
PA input RF Power	+10*	dBm
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C
Moisture Sensitivity	MSL3	

\*Maximum PA Input RF Power with a 50Ω load.



**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 2011/65/EU, 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.

## Nominal Operating Parameters

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>Overall</b>					
Frequency	450	460	470	MHz	
Battery Voltage	3.3	3.6	4.0	V	V <sub>CC</sub>
RF Port Impedance		50		Ω	
Total Leakage Current		0.5	2.0	μA	V <sub>CC</sub> = 3.6V, V <sub>REG</sub> ≤ 50mV, CTX=CRX=50mV
ESD, HBM	1000			V	RF Pins
ESD, HBM	1000			V	All Other Pins
ESD, CDM	1000			V	RF Pins
ESD, CDM	1000			V	All Other Pins
<b>Tx Section</b>					Nominal Condition: Temperature= 25 °C, V <sub>CC</sub> = 3.6V, V <sub>REG</sub> =2.8V, CTX= V <sub>CC</sub> -0.2V, Over Frequency unless otherwise noted
CW P <sub>OUT</sub> Saturation	30	30.5	31	dBm	Over Voltage, full temperature and Frequency
Large Signal Gain	30	32		dB	
2fo - 10fo Harmonic		-65	-60	dBc	
Small Signal Input Return Loss			-10	dB	
Transmit Current (I <sub>cc</sub> )	725	750	775	mA	V <sub>CC</sub> = 3.6V, P <sub>OUT</sub> = 30dBm
V <sub>REG</sub>	2.8	3.3	3.8	V	
V <sub>REG</sub> Current		5.0	7.5	mA	
<b>Rx Section</b>					
Rx Current		2.0		μA	V <sub>CC</sub> = 3.6, V <sub>REG</sub> = 3.4V C <sub>Tx</sub> = 0V, C <sub>Rx</sub> = 3.4V
Small Signal Insertion Loss	-1	-0.7		dB	
Large Signal Insertion Loss	-1	-0.7		dB	
Input P0.1dB	23			dBm	
Small Signal Input Return Loss		-10	-8	dB	
Small Signal Output Return Loss		-10	-8	dB	

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>Antenna Switch</b>					
Port Isolation		-25	-20	dB	Any used port to any unused port
Logic Voltage High	2.8	V <sub>CC</sub> -0.2	V <sub>CC</sub>		
Logic Voltage Low	0	0.05	0.2	V	All Logic I/Os
Logic Current High		1.5	5	μA	All Logic I/Os

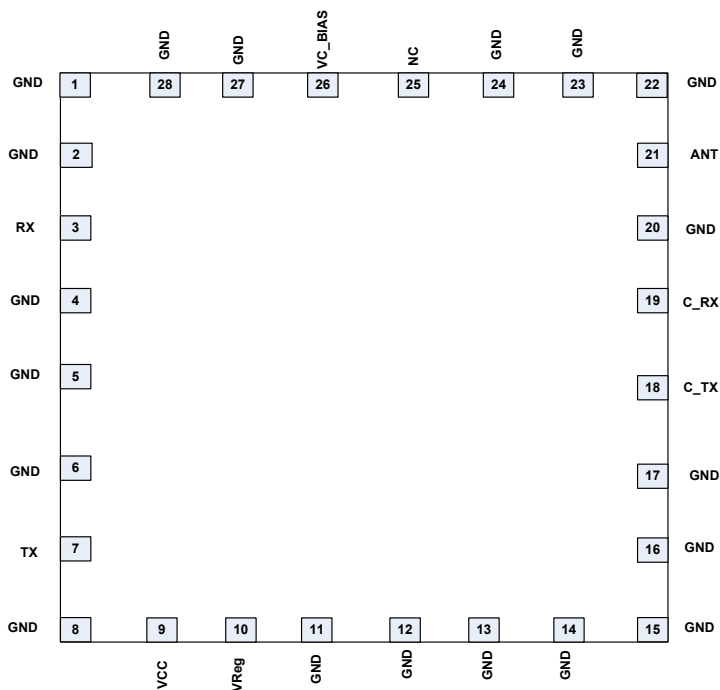
**Truth Table**

Operating Mode		
	C_TX	C_RX
<b>Tx - Ant</b>	1	0
<b>Rx - Ant</b>	0	1

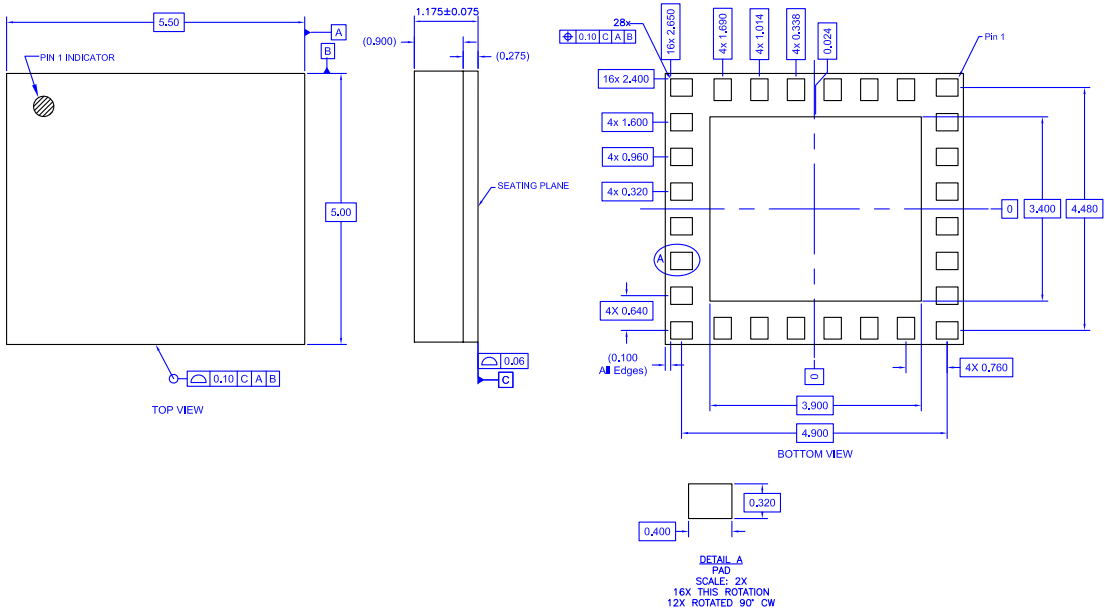
### Pin Names and Descriptions

Pin	Name	Description
1	GND	Ground connection.
2	GND	Ground connection.
3	RX	Receive Port
4	GND	Ground connection.
5	GND	Ground connection.
6	GND	Ground connection.
7	TX	Transmit Port
8	GND	Ground connection.
9	VCC	Power Amplifier Supply Voltage.
10	Vreg	Power Amplifier Bias Control
11	GND	Ground connection.
12	GND	Ground connection.
13	GND	Ground connection.
14	GND	Ground connection.
15	GND	Ground connection.
16	GND	Ground connection.
17	GND	Ground connection.
18	C_TX	Transmit Selection Control Line. Please see truth table for proper operation.
19	C_RX	Receive Selection Control Line. Please see truth table for proper operation
20	GND	Ground connection.
21	ANT	This is a common port (antenna). It is matched to 50Ω and DC block is provided internally.
22	GND	Ground connection.
23	GND	Ground connection.
24	GND	Ground connection.
25	NC	No Internal Connection.
26	VC_BIAS	First Stage PA Supply Voltage.
27	GND	Ground connection.
28	GND	Ground connection.

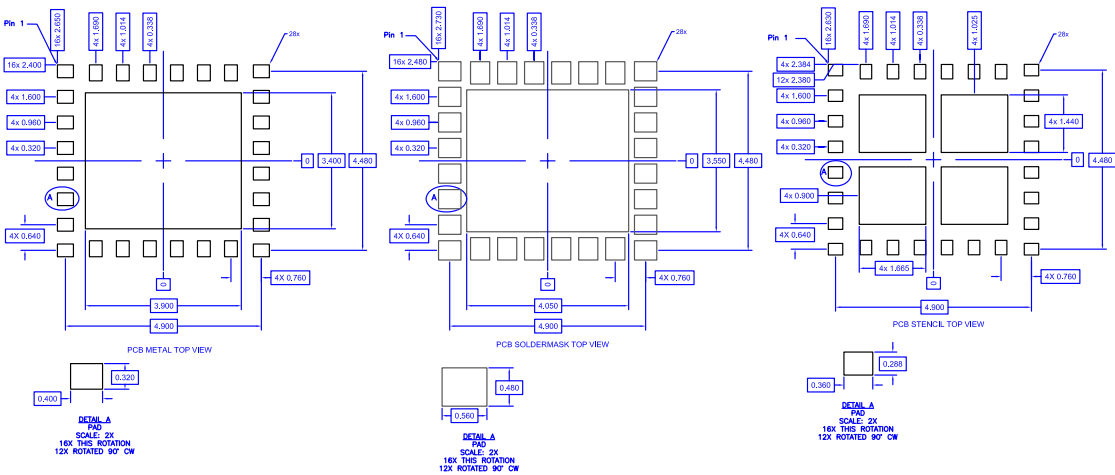
**Pin Out**



## Package Drawing



## Recommended PCB Patterns



**Evaluation Board Schematic**

