

# RFCM5304

## 5-220MHz SI-BJT INTEGRATED AMPLIFIER

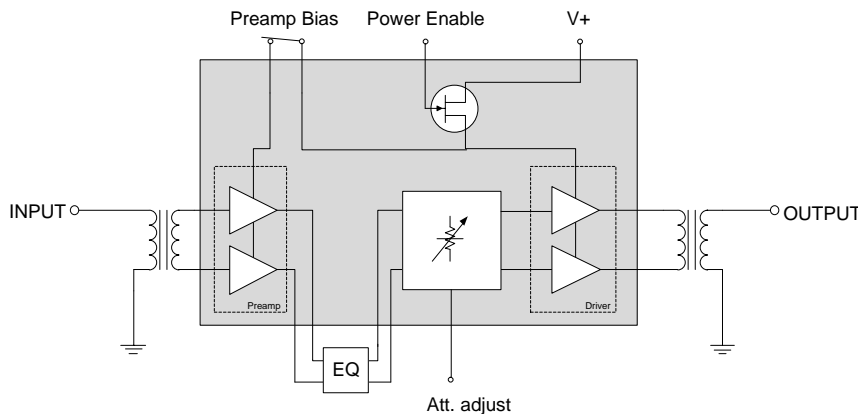
The RFCM5304 is an Integrated Reverse Amplifier Module. The part employs Silicon die, a 20dB range variable attenuator, Preamp switch off, interstage port and a power enable feature, has high output capability and is operated from 5MHz to 220MHz. It provides excellent linearity and superior return loss performance with low noise and optimal reliability.



Package: 21 pin,  
11.0 mm x 11.0 mm x 1.375mm

### Features

- Excellent Linearity
- Extremely High Output Capability
- Voltage Controlled Attenuator
- Power Enable Feature
- Preamp Power Off Feature
- Low Distortion
- Optimal Reliability
- Low Noise
- Unconditionally Stable Under all Terminations
- 39dB Typical Gain at 220MHz
- 208mA Typical at 12VDC



Functional Block Diagram

### Ordering Information

RFCM5304SB	Sample bag with 5 pieces
RFCM5304SQ	Sample bag with 25 pieces
RFCM5304SR	7" Reel with 100 pieces
RFCM5304TR7	7" Reel with 250 pieces
RFCM5304TR13	13" Reel with 750 pieces
RFCM5304PCBA-410	Fully Assembled Evaluation Board
RFCM5304PCK-410	Fully Assembled Evaluation Board with Sample Bag

### Applications

- 5MHz to 220MHz CATV Amplifier For Reverse Channel Systems
- Headend Equipment

## Absolute Maximum Ratings

Parameter	Rating	Unit
DC Supply Over-Voltage (5 minutes)	14	V
Storage Temperature	-40 to +100	°C
Operating Mounting Base Temperature	-30 to +110	°C
Moisture Sensitivity Level IPC/JEDEC J-STD-20	MSL 3 @260	°C



**Caution!** ESD sensitive device.



RoHS status based on EU Directive 2011/65/EU

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.

## Nominal Operating Parameters

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
<b>General Performance</b>					<b>V+= 12V; TMB=30°C; ZS=ZL=75Ω; Att=0dB</b>
Power Gain	38.5	39.2	40.5	dB	f=5MHz
	38.3		41.2	dB	f=220MHz
Slope <sup>[1]</sup>	-0.2		1.2	dB	f=5MHz to 220MHz
Flatness of Frequency Response			1.0	dB	f=5MHz to 220MHz (Peak to Valley)
Input Return Loss	20			dB	f=5MHz to 200MHz
	18			dB	f=200MHz to 220MHz
Output Return Loss	20			dB	f=5MHz to 200MHz
	18			dB	f=200MHz to 220MHz
Noise Figure		2.5	2.8	dB	f=10MHz
		2.9	3.2	dB	f=100MHz
		3.2	3.5	dB	f=220MHz
Total Current Consumption (DC)		205	220	mA	
<b>Attenuator</b>					<b>V+= 12V; TMB=30°C; ZS=ZL=75Ω;</b>
Attenuator Range	0 to 20			dB	Attenuator Voltage 0V to 12V
<b>Power Enable/Disable</b>					
		Amp enabled			Logic high (3.3V) applied to power enable pin <sup>[2]</sup>
		Amp disabled			Logic low (0V) applied to power enable pin <sup>[3]</sup>

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
<b>Distortion</b>					<b>V+= 12V; TMB=30°C; ZS=ZL=75Ω; Att=0dB</b>
CTB			-70	dBc	7 ch flat; VO=50dBmV <sup>[4]</sup>
XMOD			-60	dBc	7 ch flat; VO=50dBmV <sup>[4]</sup>
CSO			-70	dBc	7 ch flat; VO=50dBmV <sup>[4]</sup>
CTB			-63	dBc	28 ch flat; VO=46dBmV <sup>[5]</sup>
XMOD			-55	dBc	28 ch flat; VO=46dBmV <sup>[5]</sup>
CSO			-60	dBc	28 ch flat; VO=46dBmV <sup>[5]</sup>
OIP2		65		dBm	VO=11dBm <sup>[6]</sup>
OIP3		41.5		dBm	VO=11dBm <sup>[7]</sup>

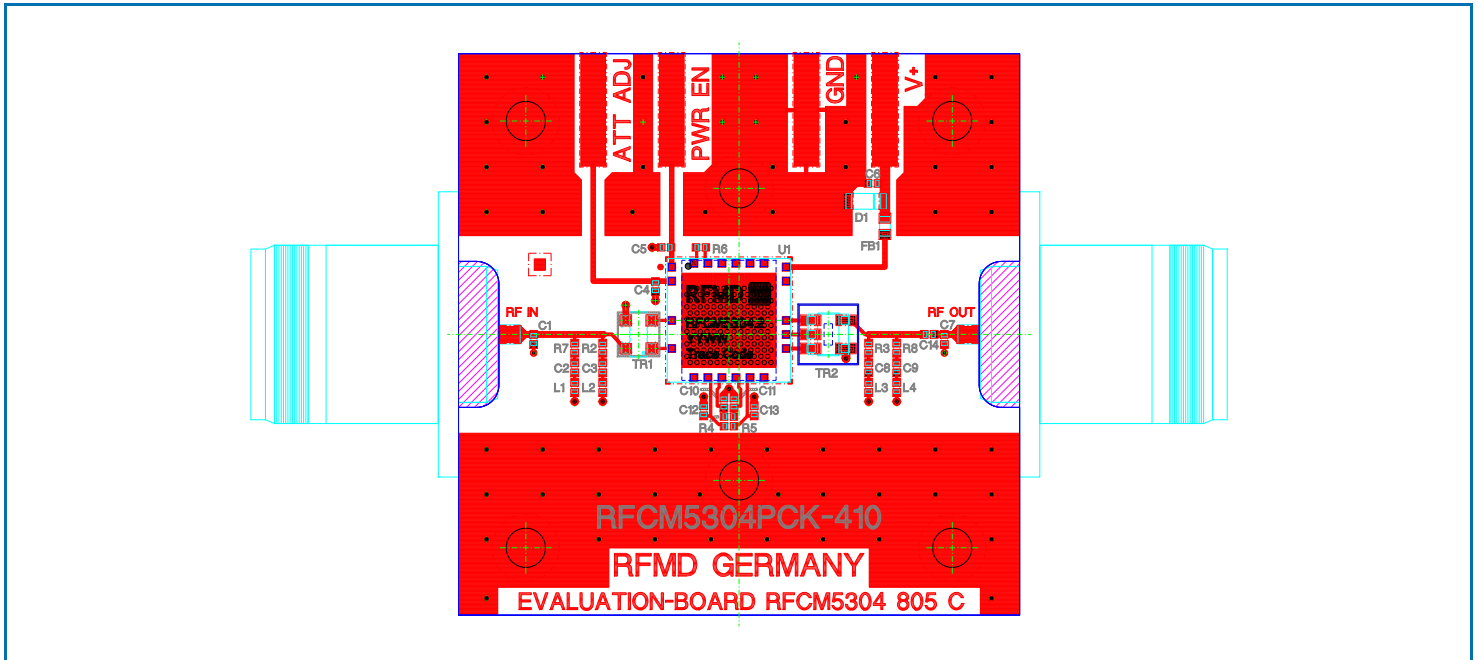
1. The slope is defined as the difference between the gain at the start frequency and the gain at the stop frequency.
2. Logic high is defined as power enable voltage >2V
3. Logic low is defined as power enable voltage <0.4V
4. 7 channels, NTSC frequency raster: T7-T13 (7.0MHz to 43.0MHz), +50dBmV flat output level.
5. 28 channels, NTSC frequency raster: T7-T13 (7.0MHz to 43.0MHz), 2-6 (55.25MHz to 83.25MHz), A2-11 (121.25MHz to 199.25MHz), +46dBmV flat output level.
6. 2-tone, 11dBm/tone, f1=99.0MHz, f2=100.0MHz, 1 MHz tone spacing, fm=199.0MHz (f1+f2)
7. 2-tone, 11dBm/tone, f1=199.0MHz, f2=200.0MHz, 1 MHz tone spacing, fm=201.0MHz (2xf2-f1)

Composite Second Order (CSO) - The CSO parameter (both sum and difference products) is defined by the NCTA.

Composite Triple Beat (CTB) - The CTB parameter is defined by the NCTA.

Cross Modulation (XMOD) - Cross modulation (XMOD) is measured at baseband (selective voltmeter method), referenced to 100% modulation of the carrier being tested.

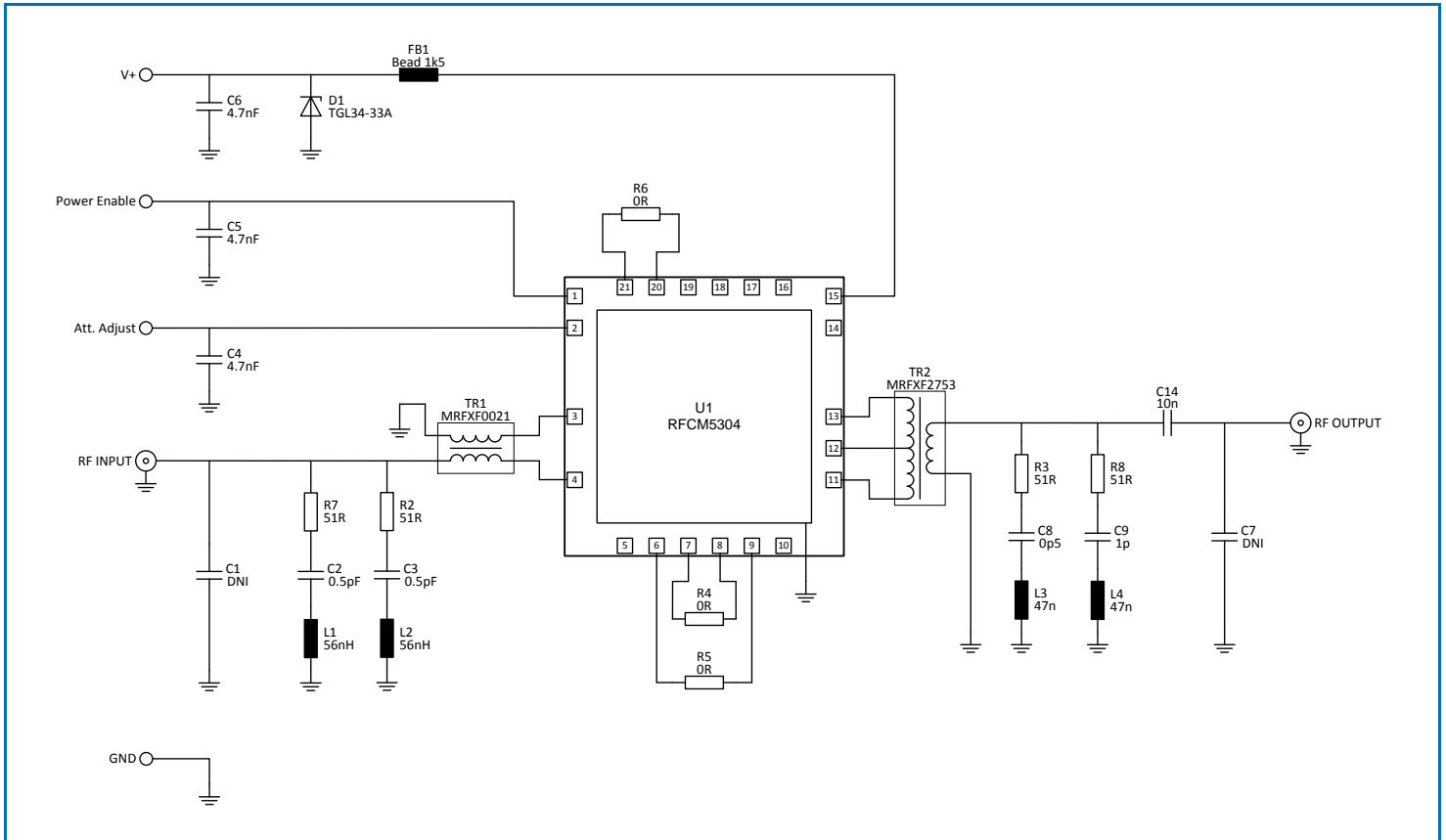
## Evaluation Board Assembly Drawing



### Note:

The ground plane of the RFCM5304 module should be soldered onto a board equipped with as many thermal vias as possible. Underneath this thermal via array a heat sink with thermal grease needs to be placed which is able to dissipate the complete module DC power. In any case the module backside temperature should not exceed 100°C.

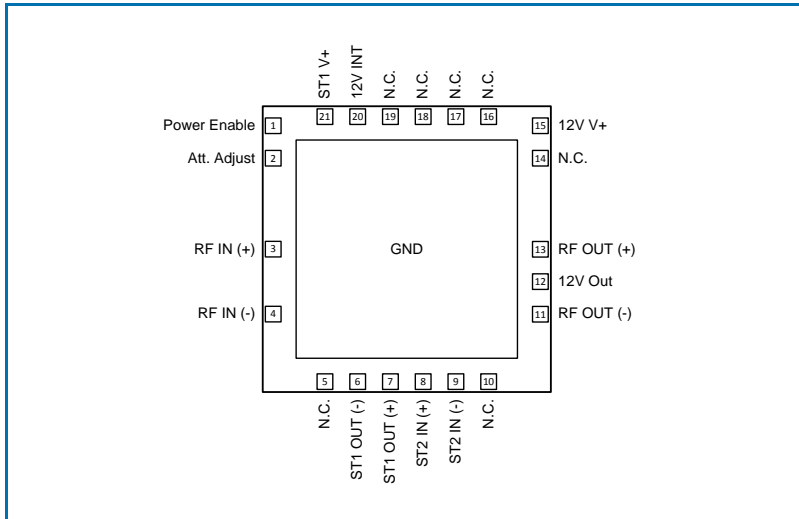
## Evaluation Board Schematic



## Evaluation Board Bill of Materials (BOM)

Designator	Value	Description	Manufacturer	Part Number
C1, C7	DNI			
C2, C3, C8	0.5 pF	Capacitor, 0402, NPO, 50V, 0.25pF		
C4, C5, C6	4.7 nF	Capacitor, 0402, X7R, 50V, 10%		
C9	1.0 pF	Capacitor, 0402, NPO, 50V, 0.25pF		
C14	10nF	Capacitor, 0402, X7R, 25V, 10%		
R2, R3, R7, R8	51 R	Resistor, 0402, TK100, 1%		
R4, R5, R6	0 R	Resistor, 0402, Jumper		
L1, L2	56 nH	Inductor, 0402, 5%		
L3, L4	47 nH	Inductor, 0402, 5%		
FB1	1k5 @ 100MHz	Impedance Bead, DCR 0.75Ω, 250mA, 0603	Taiyo Yuden	BK 1608LM152-T
D1	33V	Transient Suppressor Diode, 5%	Diotec	TGL34-33A
T1	1:1	Transformer Input	Mini-RF	MRFXF0021
T2	1:4	Transformer Output	Mini-RF	MRFXF2753
U1		Amplifier	RFMD	RFCM5304

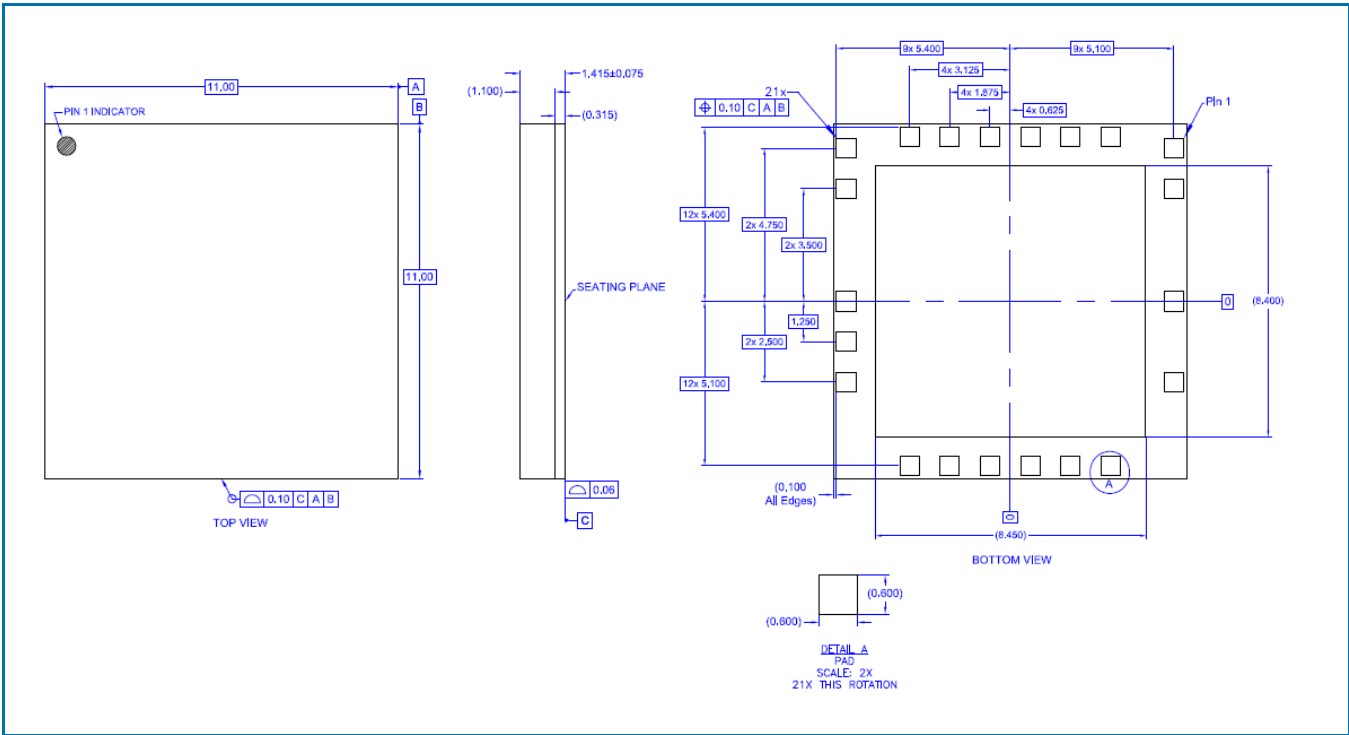
### Pin Out



### Pin Names and Descriptions

Pin	Name	Description
1	<b>Power Enable</b>	Logic Level (3.3V) Power Enable Control
2	<b>Att. Adjust</b>	Voltage Adjustable Attenuator
3	<b>RF IN (+)</b>	RF AMP Positive Input
4	<b>RF IN (-)</b>	RF AMP Negative Input
5	<b>N.C.</b>	
6	<b>ST1 OUT (-)</b>	Stage 1 Positive Output
7	<b>ST1 OUT (+)</b>	Stage 1 Negative Output
8	<b>ST2 IN (+)</b>	Stage 2 Positive Input
9	<b>ST2 IN (-)</b>	Stage 2 Negative Input
10	<b>N.C.</b>	
11	<b>RF OUT (-)</b>	RF AMP Negative Output
12	<b>12V Out</b>	12V Output
13	<b>RF OUT (+)</b>	RF AMP Positive Output
14	<b>N.C.</b>	
15	<b>12V V+</b>	Supply Voltage 12V
16 - 19	<b>N.C.</b>	
20	<b>12V INT</b>	12V Internal
21	<b>ST1 V+</b>	12V Stage 1

Package Outline Drawing (Dimensions in millimeters)



PCB Metal Land Pattern (Dimensions in millimeters)

