

# RFCM5304

## 5-220MHz SI-BJT INTEGRATED AMPLIFIER

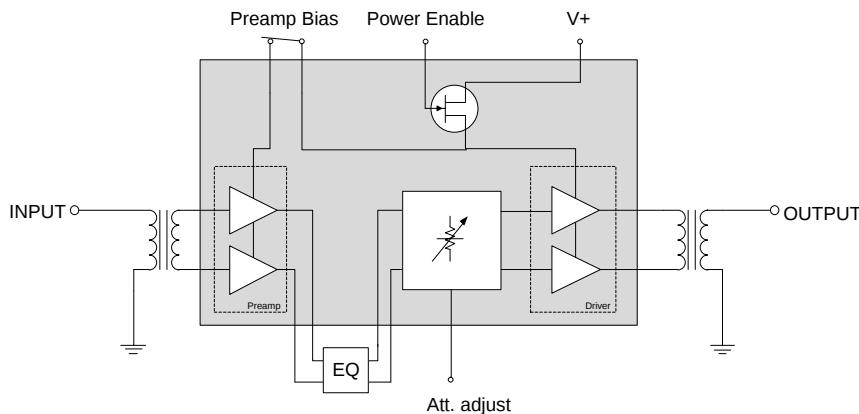
The RFCM5304 is an Integrated Reverse Amplifier Module. The part employs Silicon die, a 20dB range variable attenuator, Preamp switch off, interstage port and a power enable feature, has high output capability and is operated from 5MHz to 220MHz. It provides excellent linearity and superior return loss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

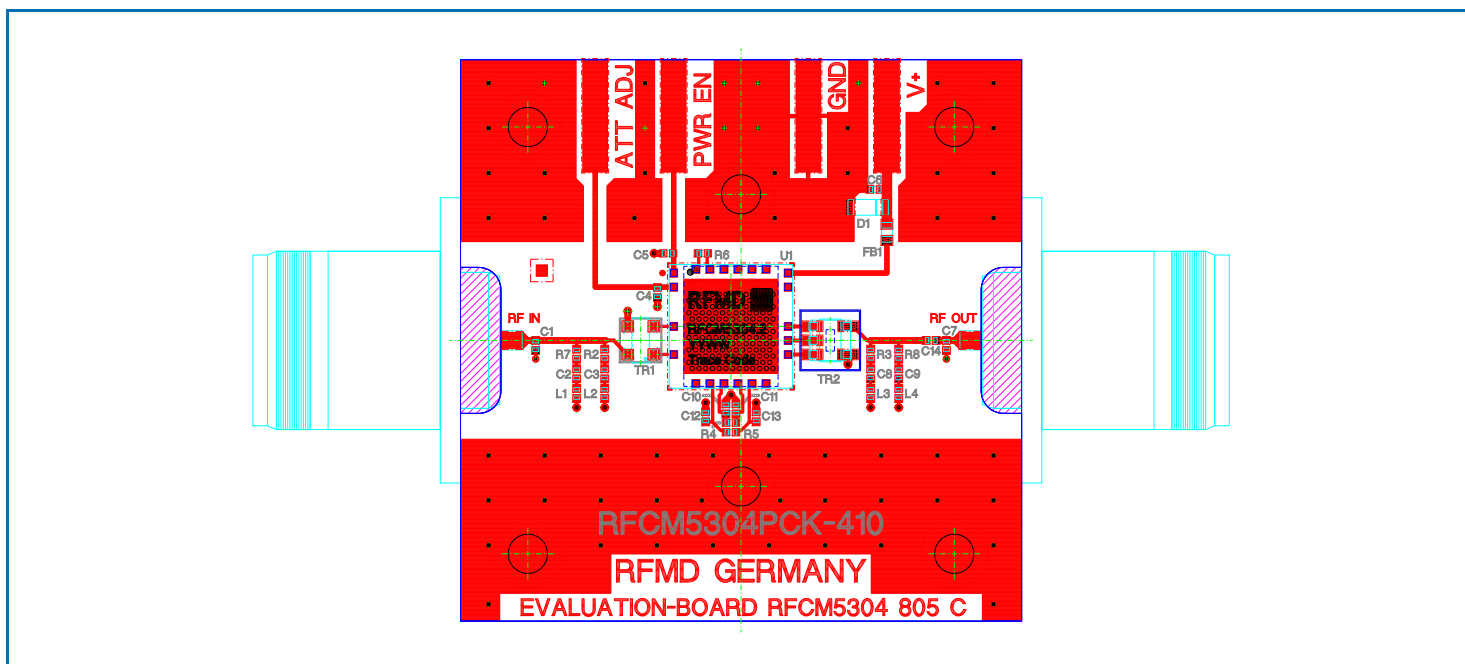
1. The slope is defined as the difference between the gain at the start frequency and the gain at the stop frequency.
2. Logic high is defined as power enable voltage >2V
3. Logic low is defined as power enable voltage <0.4V
4. 7 channels, NTSC frequency raster: T7-T13 (7.0MHz to 43.0MHz), +50dBmV flat 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.

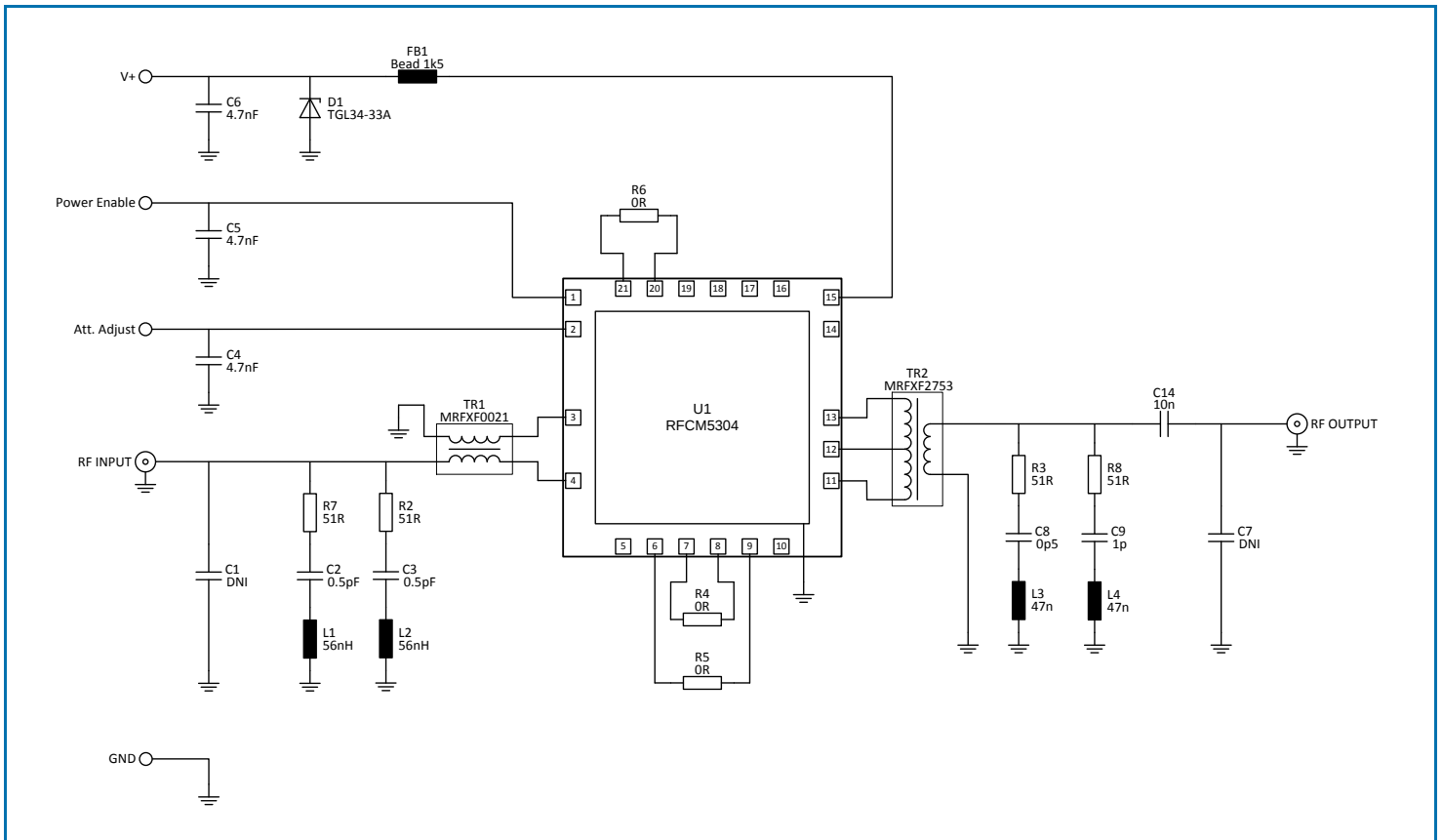
## Evaluation Board Assembly Drawing



### 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.

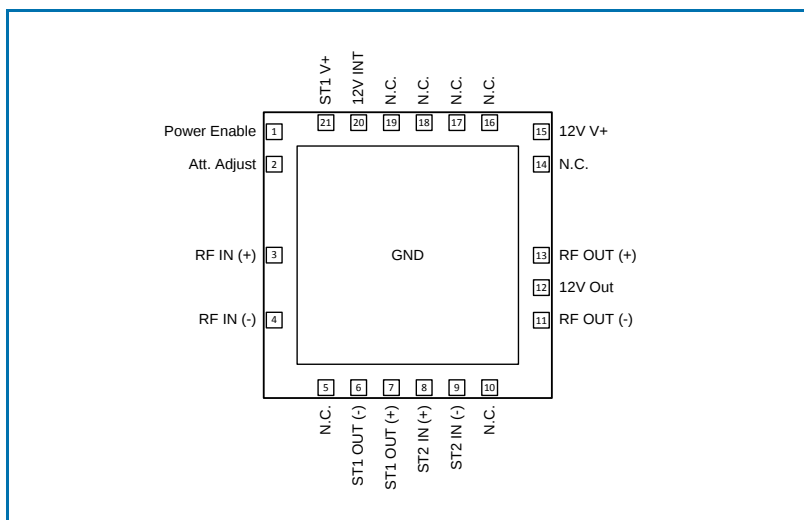
## Evaluation Board Schematic



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

[illegible][illegible]

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9