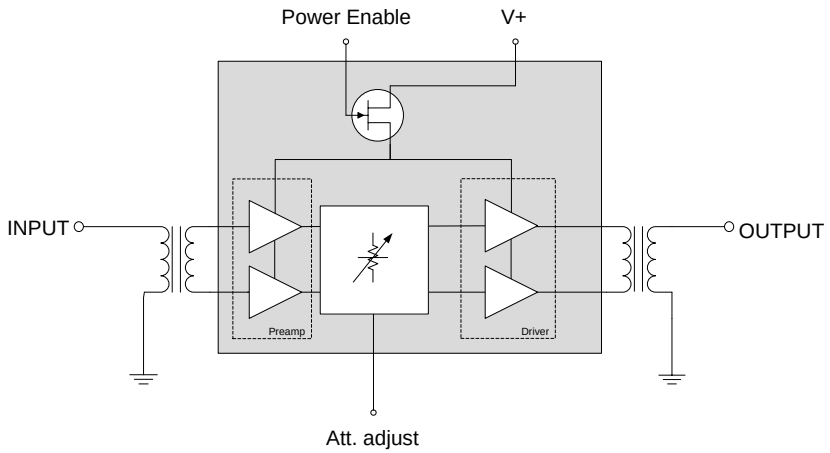
# RFAM3790

## 45-1218MHZ GAAS
## EDGE QAM INTEGRATED AMPLIFIER


The RFAM3790 is an Integrated Edge QAM Amplifier Module. The part employs GaAs pHEMT die, GaAs MESFET die, a 20dB range variable attenuator and a power enable feature, has high output capability, and is operated from 45MHz to 1218MHz. It provides excellent linearity and superior return loss performance with low noise and optimal reliability.

Package: 9 pin,
11.0 mm x 11.0 mm x 1.375mm




Functional Block Diagram

### Features

- Excellent Linearity
- Extremely High Output Capability
- Voltage Controlled Attenuator
- Power Enable Featrure
- Extremely Low Distortion
- Optimal Reliability
- Low Noise
- Unconditionally Stable Under all Terminations
- 27.5 dB Typical Gain at 1218MHz
- 410mA Typical at 12VDC

### Applications

- 45MHz to 1218MHz Downstream Edge QAM RF Modulators
- Headend Equipment

### Ordering Information

| | |
|---|---|
| RFAM3790SB | Sample bag with 5 pieces |
| RFAM3790SQ | Sample bag with 25 pieces |
| RFAM3790SR | 7” Reel with 100 pieces |
| RFAM3790TR7 | 7” Reel with 250 pieces |
| RFAM3790TR13 | 13” Reel with 750 pieces |
| RFAM3790PCBA-410 | Fully Assembled Evaluation Board |
| RFAM3790PCK-410 | Fully Assembled Evaluation Board with Sample Bag |

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DS140820

## 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 +100 | °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.

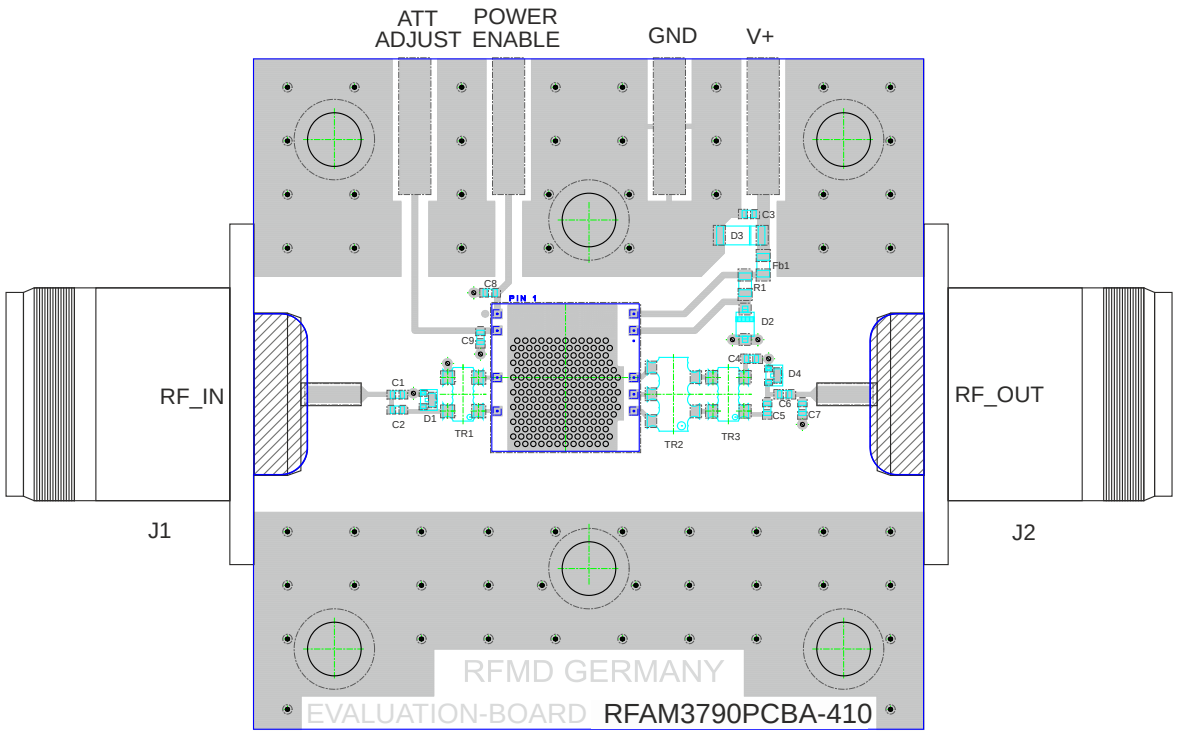
## Nominal Operating Parameters

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min | Typ | Max | | |
| **General Performance** | | | | | **V+= 12V; TMB=30°C; ZS=ZL=75Ω; Att=0dB** |
| Power Gain | | 27.0 | | dB | f=45MHz |
| | 27.5 | 28.5 | 29.5 | dB | f=1218MHz |
| Slope [1] | 0.5 | 1.5 | 2.5 | dB | f=45MHz to 1218MHz |
| Flatness of Frequency Response | | 0.5 | 1.0 | dB | f=45MHz to 1218MHz (Peak to Valley) |
| Input Return Loss | 18 | | | dB | f=45MHz to 1003MHz |
| | 16 | | | dB | f=1003MHz to 1218MHz |
| Output Return Loss | 15 | | | dB | f=45MHz to 1003MHz |
| | 15 | | | dB | f=1003MHz to 1218MHz |
| Noise Figure | | 4.0 | 5.0 | dB | f=50MHz to 1218MHz |
| Total Current Consumption (DC) | | 410 | 450 | mA | |
| **Attenuator** | | | | | **V+= 12V; TMB=30°C; ZS=ZL=75Ω;** |
| Attenuator Range | 0 to 20 | | | dB | Attenuator Voltage 0V to 12V |
| **Power Enable/Disable** | | | | | |
| | | Amp enabled | | | Logic high (3.3V) applied to power enable pin [2] |
| | | Amp disabled | | | Logic low (0V) applied to power enable pin [3] |

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min | Typ | Max | | |
| **Distortion** | | | | | **V+= 12V; TMB=30°C; ZS=ZL=75Ω; Att=0dB** |
| Adjacent Channel Power Ratio (ACPR); N=4 contiguous 256QAM channels | | | -58 | dBc | Channel Power = 58dBmV; Adjacent channel up to 750 kHz from channel block edge |
| | | | -60 | dBc | Channel Power = 58dBmV; Adjacent channel (750 kHz from channel block edge to 6MHz from channel block edge) |
| | | | -63 | dBc | Channel Power = 58dBmV; Next-adjacent channel (6 MHz from channel block edge to 12 MHz from channel block edge) |
| | | | -65 | dBc | Channel Power = 58dBmV; Third-adjacent channel (12 MHz from channel block edge to 18 MHz from channel block edge) |
| 2nd Order Harmonic (HD2); N=1 256QAM channel | | | -63 | dBc | Channel Power = 66dBmV; In each of 2N contiguous 6 MHz channels coinciding with 2nd harmonic components (up to 1000MHz); |
| 3rd Order Harmonic (HD3); N=1 256QAM channel | | | -63 | dBc | Channel Power = 66dBmV; In each of 3N contiguous 6 MHz channels coinciding with 3rd harmonic components (up to 1000MHz); |
| CTB | | -67 | | dBc | $V_O$=46dBmV, flat, 79 analog channels plus 75 digital channels (-6dB offset) [4], [6] |
| XMOD | | -60 | | dBc | |
| CSO | | -70 | | dBc | |
| CIN | | 64 | | dB | |
| CTB | | -67 | | dBc | $V_O$=45dBmV, flat, 79 analog channels plus 111 digital channels (-6dB offset) [5], [6] |
| XMOD | | -61 | | dBc | |
| CSO | | -70 | | dBc | |
| CIN | | 65 | | dB | |

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. 79 analog channels, NTSC frequency raster: 55.25MHz to 547.25MHz, +46dBmV flat output level, plus 75 digital channels, -6dB offset relative to the equivalent analog carrier.
5. 79 analog channels, NTSC frequency raster: 55.25MHz to 547.25MHz, +45dBmV flat output level, plus 111 digital channels, -6dB offset relative to the equivalent analog carrier.
6. 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. Carrier to Intermodulation Noise (CIN) - The CIN parameter is defined by ANSI/SCTE 17 (Test procedure for carrier to noise).

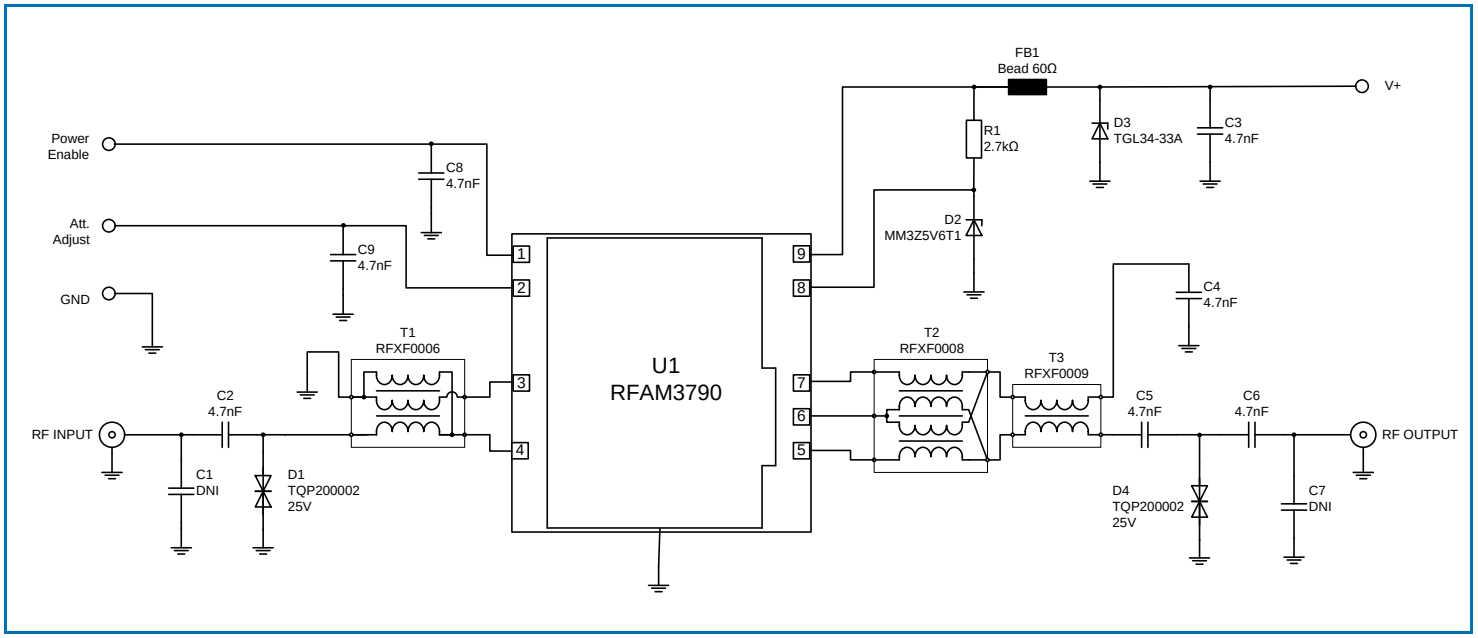
## Evaluation Board Assembly Drawing




Note:

The ground plane of the RFAM3790 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.

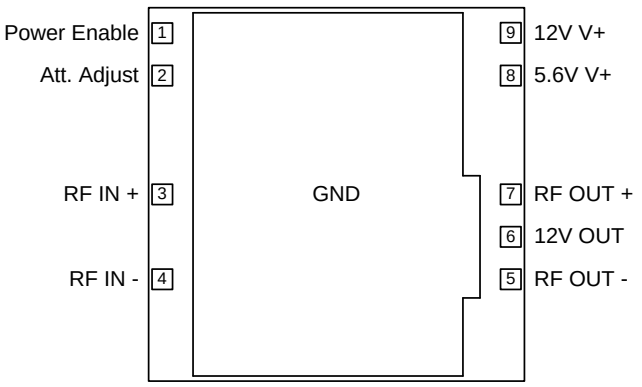
## Evaluation Board Schematic




## Evaluation Board Bill of Materials (BOM)

| Designator | Value | Description | Manufacturer | Part Number |
|---|---|---|---|---|
| C1 | DNI | optional to improve matching in application | | |
| C2, C3, C4, C5, C6, C8, C9 | 4.7nF | Capacitor, X7R, 50V, 10% | | |
| C7 | DNI | optional to improve matching in application | | |
| R1 | 2.7kΩ | Resistor, TK200, 5% | | |
| FB1 | 60Ω @ 100MHz | Impedance Bead, DCR 0.1Ohm, 800mA | Taiyo Yuden | BK 1608HS600-T |
| D1, D4 | 25V | ESD Protection | Triquint | TQP200002 |
| D2 | 5.6V | Zener Diode, 200mW | On Semiconductor | MM3Z5V6T1G |
| D3 | 33V | Transient Suppressor Diode, 5% | Diotec | TGL34-33A |
| T1 | 1:1 | Transformer | RFMD | RFXF0006 |
| T2 | 2.8:1 | Transformer | RFMD | RFXF0008 |
| T3 | 1:1 | Transformer | RFMD | RFXF0009 |
| U1 | | Amplifier | RFMD | RFAM3790 |

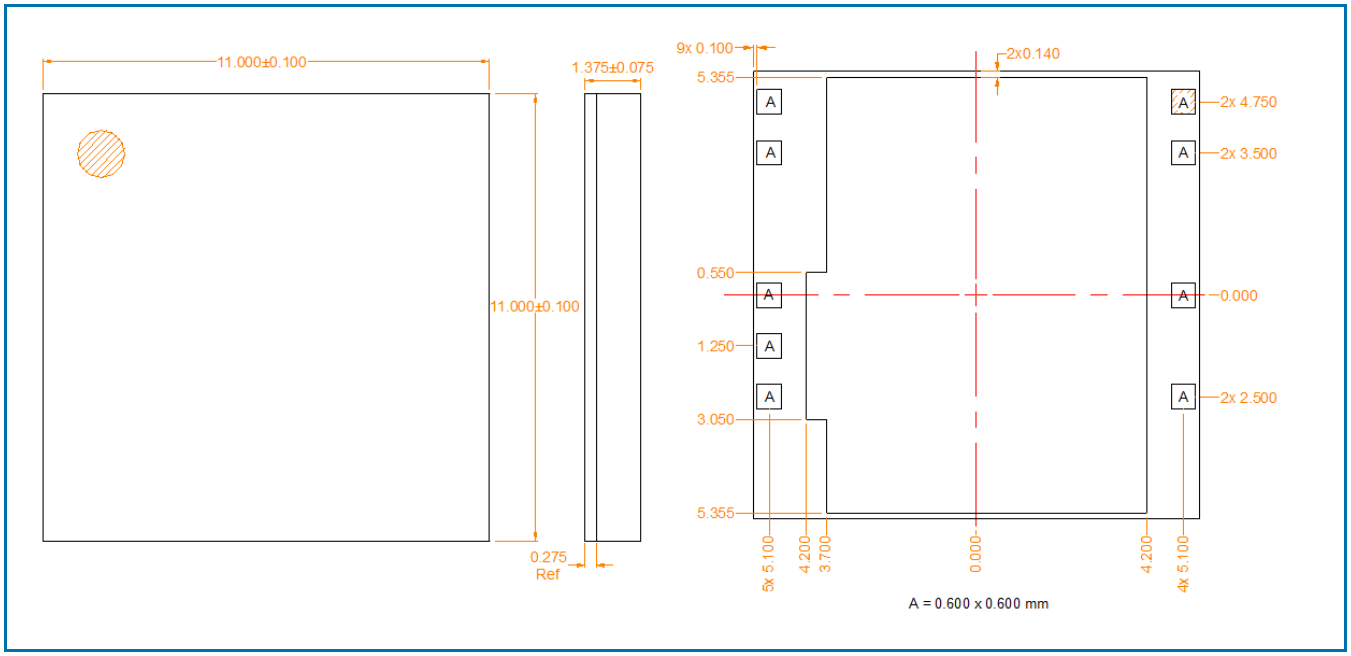
## Pin Out




## 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 | **RF OUT (-)** | RF AMP Negative Output |
| 6 | **12V Out** | 12V Output |
| 7 | **RF OUT (+)** | RF AMP Positive Output |
| 8 | **5.6V V+** | Supply Voltage 5.6V |
| 9 | **12V V+** | Supply Voltage 12V |

## **Package Outline Drawing** (Dimensions in millimeters)




## **PCB Metal Land Pattern** (Dimensions in millimeters)