

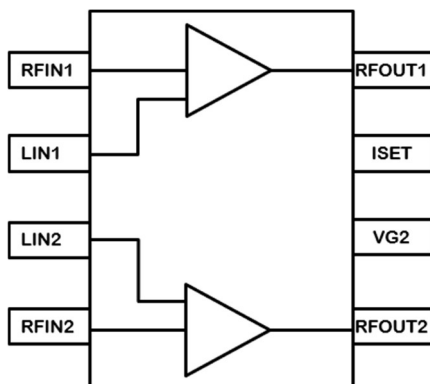
### Product Overview

The QPL8834 is an ultra-linear GaAs pHEMT 75-Ohm RF balanced amplifier IC with 5 MHz to 1218 MHz operating bandwidth, featuring high linearity, high gain and low noise for use as Post Amplifier in Optical Receivers or as a low noise balanced preamp. This IC uses a 5V supply for applications requiring lower power dissipation. Due to its wide operational bandwidth, the QPL8834 can be used as a downstream amp in DOCSIS 3.1 as well as an upstream amplifier for DOCSIS 3.1 or DOCSIS 4.0 applications.



8-Pin SOIC Package

### Functional Block Diagram



### Key Features

- Gain: 12 dB @ 1218 MHz
- Bandwidth: 5 – 1218 MHz
- OIP3: +42 dBm
- OP1dB: 24 dBm
- Low Noise Figure: 4 dB
- Excellent Composite Distortion
- pHEMT GaAs device technologies
- Compact Size: 8-pin SOIC
- Power Consumption (5 V, 280 mA, 1.4 W)

### Applications

- DOCSIS 3.1 Systems
- Balanced Antenna Applications
- HFC Optical Nodes
- 75-Ohm amplifiers
- Upstream amplifier for DOCSIS 3.1 and DOCSIS 4.0 Applications.

### Ordering Information

| Part Number   | Description               |
|---------------|---------------------------|
| QPL8834SB     | Sample bag with 5 pieces  |
| QPL8834SR     | 7" Reel with 100 pieces   |
| QPL8834TR13   | 13" Reel with 2500 pieces |
| QPL8834PCK-01 | 47 – 1218 MHz PCBA        |

## Absolute Maximum Ratings

| Parameter                         | Rating          |
|-----------------------------------|-----------------|
| Supply Voltage ( $V_{DD}$ )       | + 8 V           |
| Supply Current ( $I_{DD}$ )       | 400 mA          |
| Maximum Input Level (single tone) | + 15 dBm        |
| Operating Temperature Range       | - 40 to + 85 °C |
| Storage Temperature Range         | - 40 to +150 °C |
| Maximum Junction Temperature      | + 150 °C        |

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.

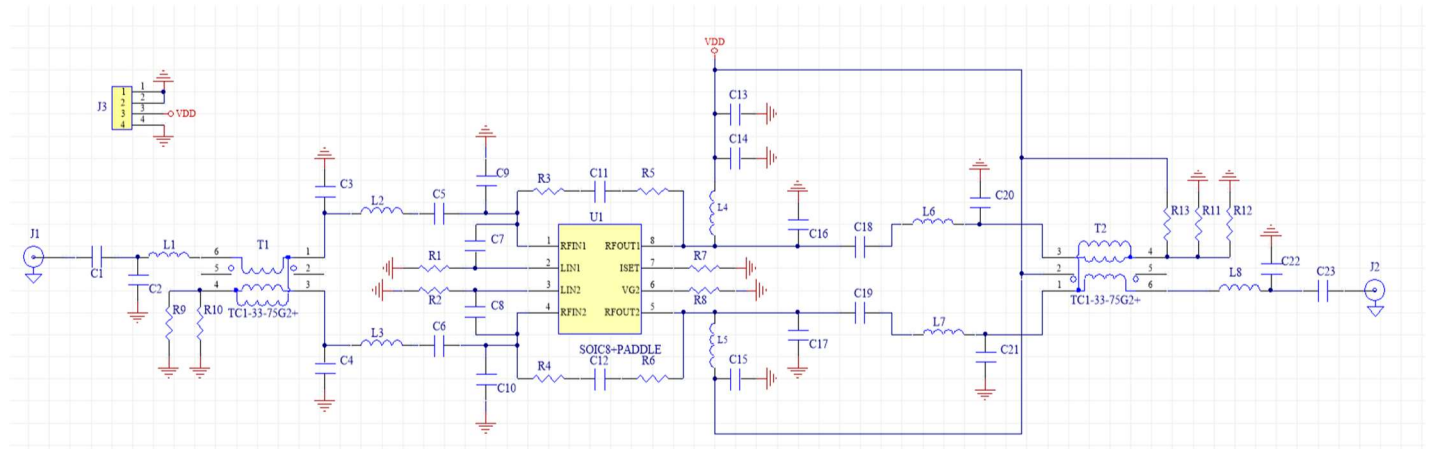
## Electrical Specifications

| Parameter                   | Condition <sup>(1)</sup>  | Min | Typ  | Max  | Unit |
|-----------------------------|---|-----|------|------|------|
| Supply Voltage ( $V_{DD}$ ) |   |     | 5    |      | V    |
| Supply Current ( $I_{DD}$ ) | $V_{DD}$ total current  | 255 | 280  |      | mA   |
| Frequency Range             |   | 5   |      | 1218 | MHz  |
| Gain                        | 5–1218 MHz  |     | 12   |      | dB   |
| Gain Flatness               |   |     | ±0.5 |      | dB   |
| Input Return Loss           |   |     | 18   |      | dB   |
| Output Return Loss          |   |     | 18   |      | dB   |
| Noise Figure                |   |     | 4    |      | dB   |
| CSO                         | 80 NTSC + 111 QAM, flat tilt, 42 dBmV / Ch<br>Output at 1218MHz |     | -73  |      | dBc  |
| CTB                         |   |     | -72  |      | dBc  |
| CCN                         |   |     | 62   |      | dB   |
| OIP2                        | 13 dBm / tone, $\Delta f = 50$ MHz, Full Band                   |     | 67   |      | dBm  |
| OIP3                        | 13 dBm / tone, $\Delta f = 6$ MHz, Full Band                    |     | 42   |      | dBm  |
| Output P1dB                 | Full Band   |     | 24   |      | dBm  |
| Thermal Resistance          |   |     | 13   |      | °C/W |

### Notes:

1. Typical performance at these conditions: Temp = + 25 °C,  $V_{DD} = + 5$  V, 75 Ω system, Full band unless otherwise noted

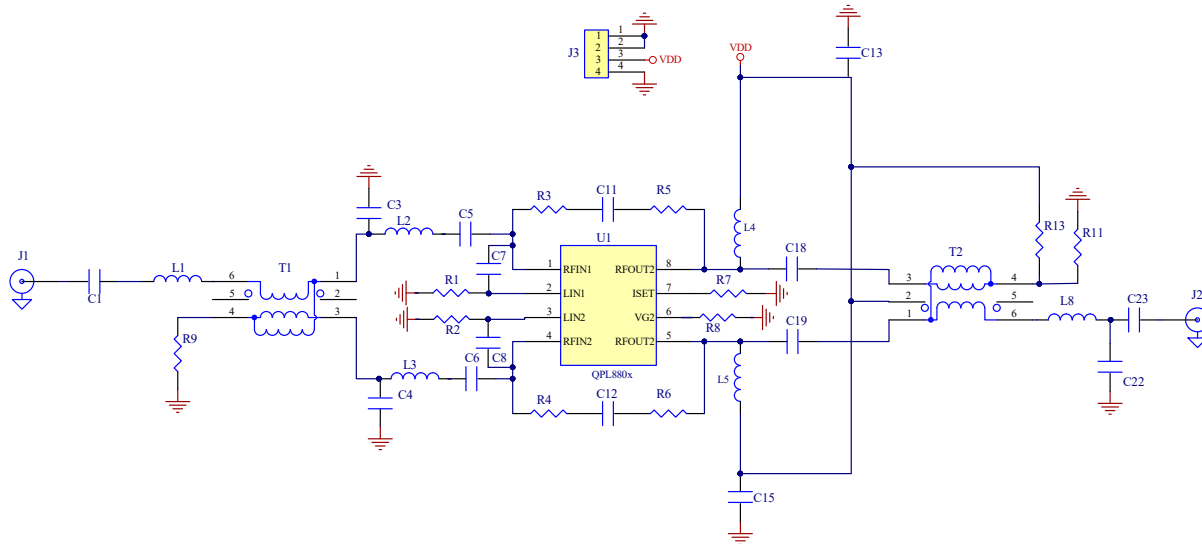
### Evaluation Board Schematic



### Evaluation Board Bill of Materials for Downstream (50-1218MHz)

| Reference Designator                             | Description                       | Manufacturer    | Manufacturer PN     |
|--|-----------------------------------|-----------------|---------------------|
| U1   | 1218 MHz, 12 dB Push-Pull Amp     | Qorvo           | QPL8834SB           |
| PCB  | EVB PCB, QPL8834                  | Qorvo           | QPL883x-4001        |
| C1, C5, C6, C7, C8, C11, C12, C13, C14, C15, C23 | CAP, 0.01uF, 5 %, 50 V, COG, 0402 | Murata          | GCM155R71H103KA55D  |
| C3, C4   | CAP, 0.3 pF, 0402                 | Murata          | GRM615COG0R3B50K500 |
| C18, C19   | CAP, 270 pF, 5 %, 0402            | Murata          | GCM1555C1H271JA16D  |
| C22  | CAP, 0.5pF, 0402                  | Murata          | GJM1555C1HR50WB01D  |
| R5, R6, R9, R11, L1, L6, L7                      | RES, 0 Ω, 0402                    | Kamaya          | RMC1/16SJPTH        |
| R7   | RES, 2.2 KΩ, 5 %, 1/16 W, 0402    | Kamaya          | RMC1/16S-222JTH     |
| R8   | RES, 6.8 KΩ, 5 %, 1/16 W, 0402    | Kamaya          | RMC1/16S-682JTH     |
| R3, R4   | RES, 330 Ω, 5 %, 1/16 W, 0402     | Kamaya          | RMC1/16S-331JTH     |
| R1, R2   | FER BEAD, 1.8K, 200mA, 0402       | TDK             | MMZ1005A182ET000    |
| L4, L5   | IND, 560nH, 5 %, 0603             | Coil craft      | 0603LS-561XJLB      |
| L2, L3   | RES, 4.7Ω, 0402                   | Kamaya          | RMC1/16S-4R7JTH     |
| L8   | IND, 2.7nH, 0402                  | Murata          | LQG15HS2N7S02D      |
| T1, T2   | TRANSFORMER, 1:1                  | Mini Circuits   | TC1-33-75-7+        |
| J3   | CONN, HDR                         | Samtec          | TSW-103-07-G-S      |
| J1, J2   | CONN, F FEM, 75Ω                  | Millimeter Wave | MW-846-C-DD-75      |
| C2, C9, C10, C16, C17, C20, C21, R10, R12, R13   | DNP                               |                 |                     |

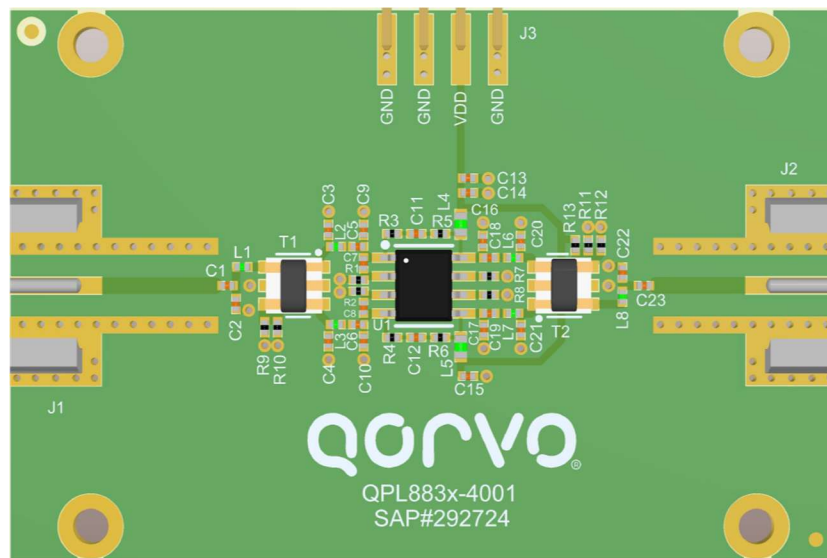
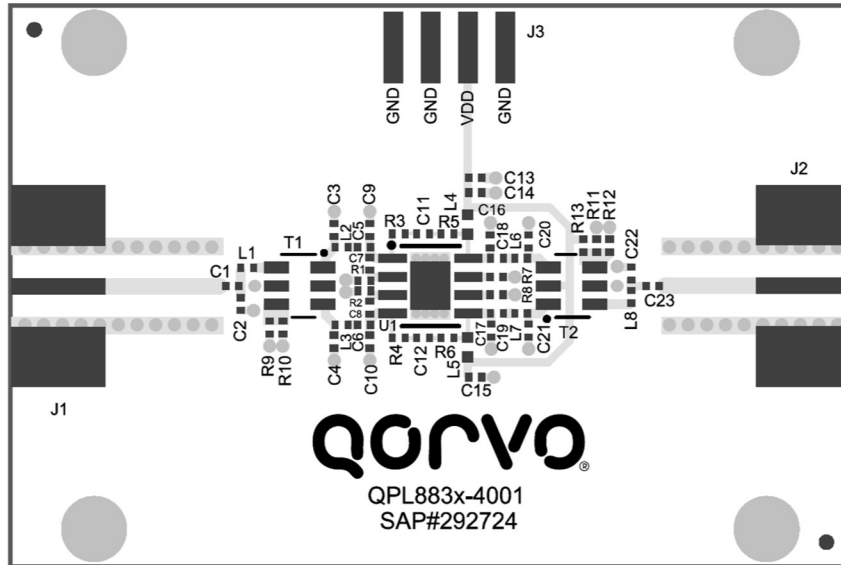
## Typical Application Circuit



## Evaluation Board Bill of Materials for Upstream (5-700MHz)

| Reference Designator                           | Description               | Manufacturer  | Manufacturer PN     |
|--|---------------------------|---------------|---------------------|
| U1   | 1218 MHz, 12 dB Amp       | Qorvo         | QPL8834SB           |
| PCB  | EVB PCB, QPL8834          | Qorvo         | QPL883x-4001        |
| C7, C8, C11, C12, C13, C14, C15                | CAP, 0.01uF, 5 %, 50 V    | Murata        | GCM155R71H103KA55D  |
| C1, C5, C6, C18, C19                           | CAP, 2.2uF, 10%, 16V, X5R | Murata        | GRM155R61C225KE11D  |
| C3, C4   | CAP, 0.3 pF, 0402         | Murata        | GRM615COG0R3B50K500 |
| C23  | CAP, 1nF                  | Murata        | GRM155R61C102KA01D  |
| C22  | CAP, 0.5pF, 0402          | Murata        | GJM1555C1HR50WB01D  |
| R5, R6, R9, R11, L1, L6, L7                    | RES, 0 Ω, 0402            | Kamaya        | RMC1/16SJPTH        |
| R7   | RES, 2.2 KΩ, 5 %, 1/16 W  | Kamaya        | RMC1/16S-222JTH     |
| R8   | RES, 6.8 KΩ, 5 %, 1/16 W  | Kamaya        | RMC1/16S-682JTH     |
| R3, R4   | RES, 330 Ω, 5 %, 1/16 W   | Kamaya        | RMC1/16S-331JTH     |
| L4, L5   | IND, 10uH, 5 %, 0603      | Coil craft    | 0603AF-103          |
| R1, R2   | IND, 22uH, 5 %, 0603      | Coil craft    | 0603LS-223          |
| L2, L3   | RES, 4.7Ω, 0402           | Kamaya        | RMC1/16S-4R7JTH     |
| L8   | IND., 2.7nH, 0402         | Murata        | LQG15HS2N7S02D      |
| T1, T2   | TRANSFORMER, 1:1          | Mini Circuits | TC1-33-75-7+        |
| J3   | CONN, HDR                 | Samtec        | TSW-103-07-G-S      |
| J1, J2   | CONN, F FEM, 750 Ω        | MM Wave       | MW-846-C-DD-75      |
| C2, C9, C10, C16, C17, C20, C21, R10, R12, R13 | DNP                       |               |                     |

### Evaluation Board Layout



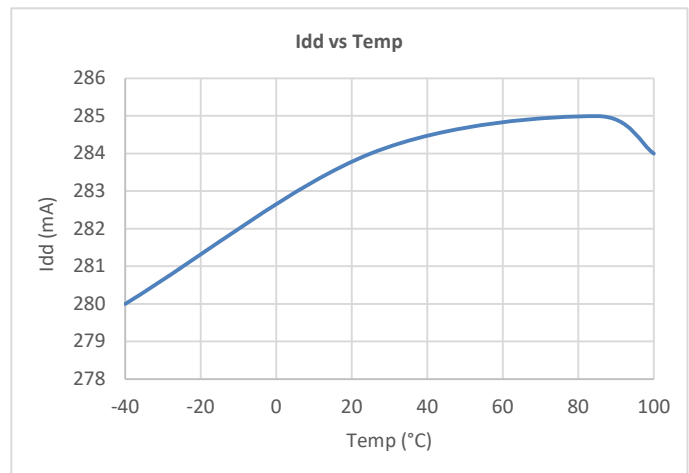
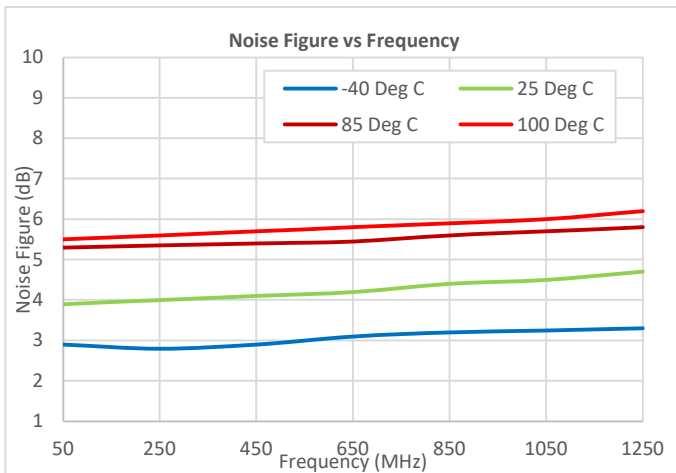
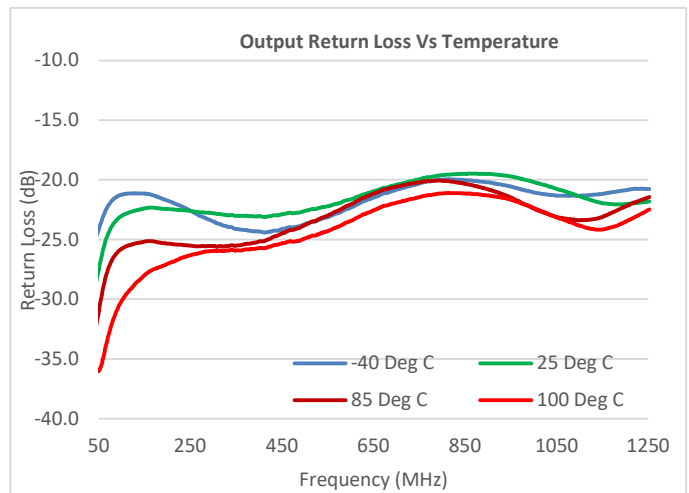
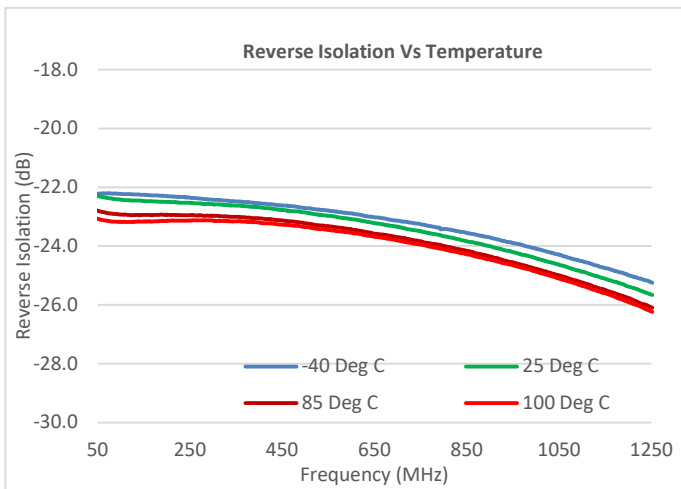
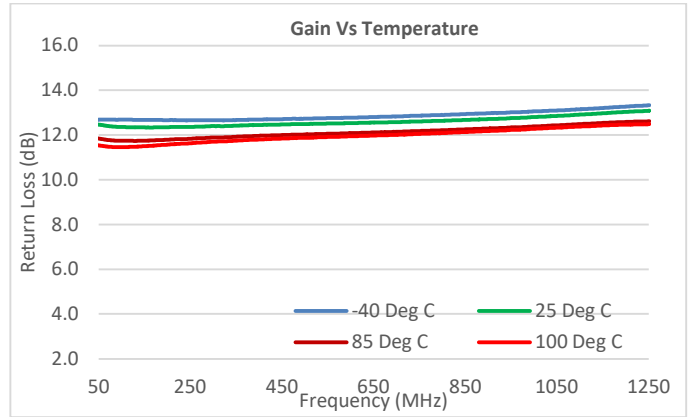
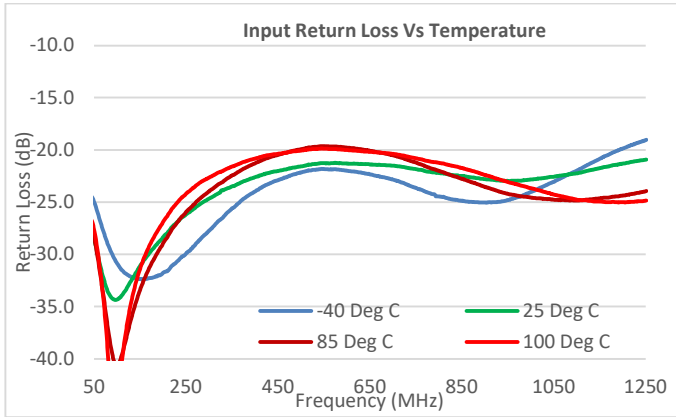
#### EVB PCB Material and Stack-up

Board Material: 59.8mil FR4,  $\epsilon_r=4.2$   
 Plating: 1oz Copper  
 Board Dimension: 2.250" x 1.500"

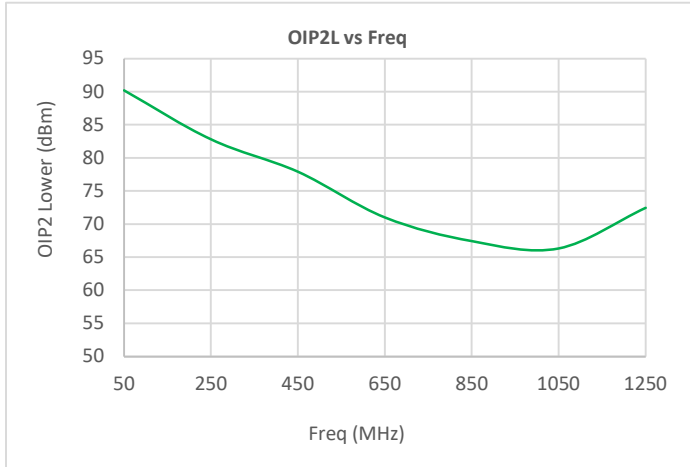
| Layer | Name         | Material | Thickness | Constant | Board Layer Stack |
|-------|--------------|----------|-----------|----------|-------------------|
|       | Top Overlay  |          |           |          |                   |
|       | Top Solder   | SM-001   | 0.40mil   | 3.5      |                   |
| 1     | Top Layer    | Copper   | 0.70mil   |          |                   |
|       | Dielectric 1 | FR4      | 58.00mil  | 4.2      |                   |
| 2     | Bottom Layer | Copper   | 0.70mil   |          |                   |

Total Thickness: 59.8mil

### Performance Data at +5V for Downstream (50-1218MHz), 75 Ω



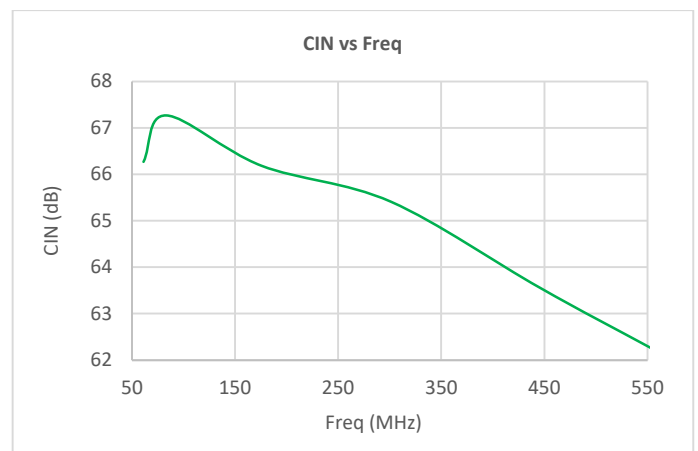
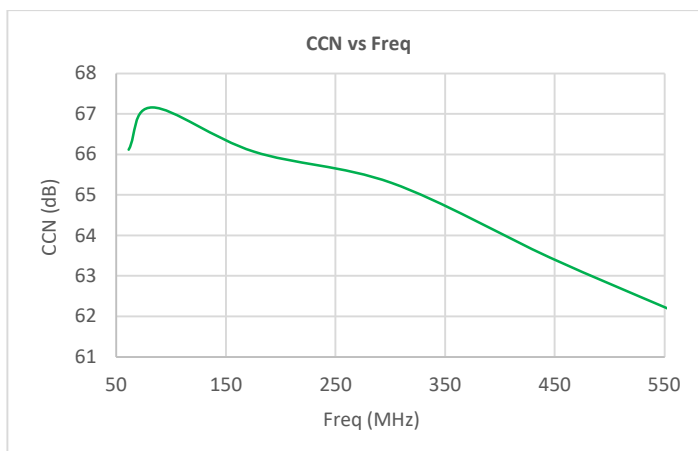
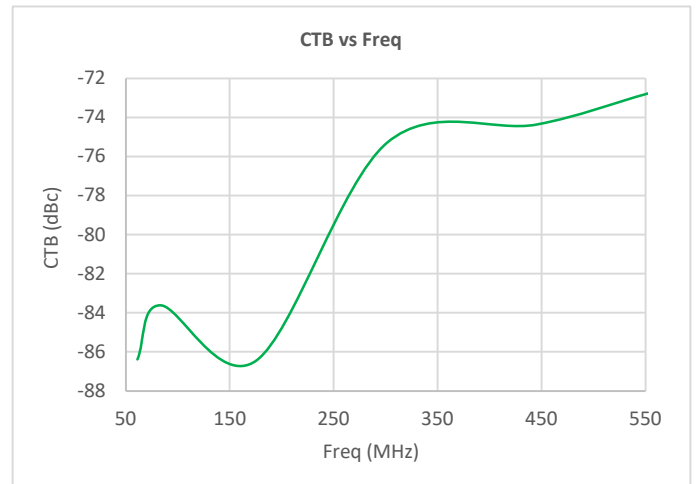
### Performance Data at +5V, 25°C for Downstream (50-1218MHz), 75 Ω



**Notes:**

1. OIP2: 13dBm / tone output,  $\Delta f = 50$  MHz, Full Band.
2. OIP3: 13dBm / tone output,  $\Delta f = 6$  MHz, Full Band
3. Temp = +25°C, VDD = +5V, 75Ω system.

### Performance Data at +5 V, 25°C for Downstream (50-1218MHz), 75 Ω

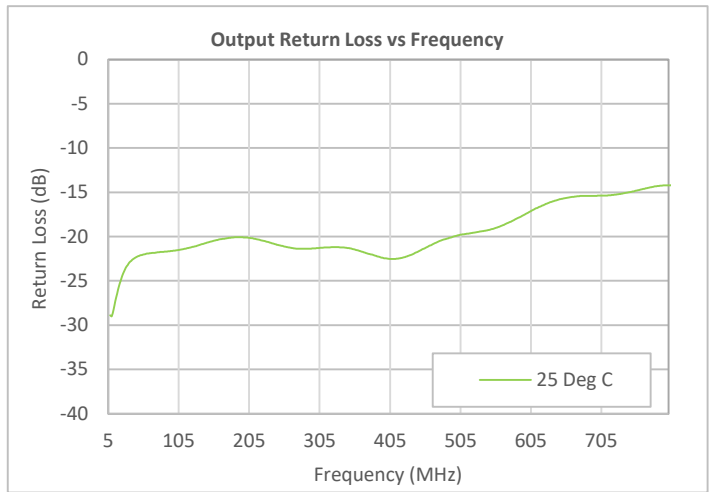
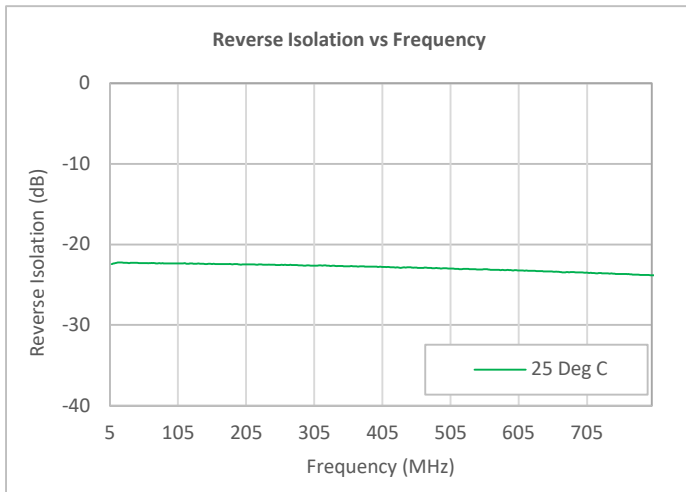
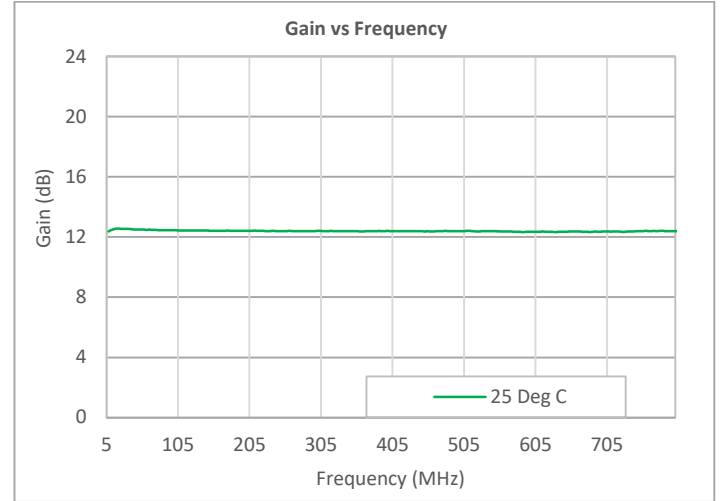
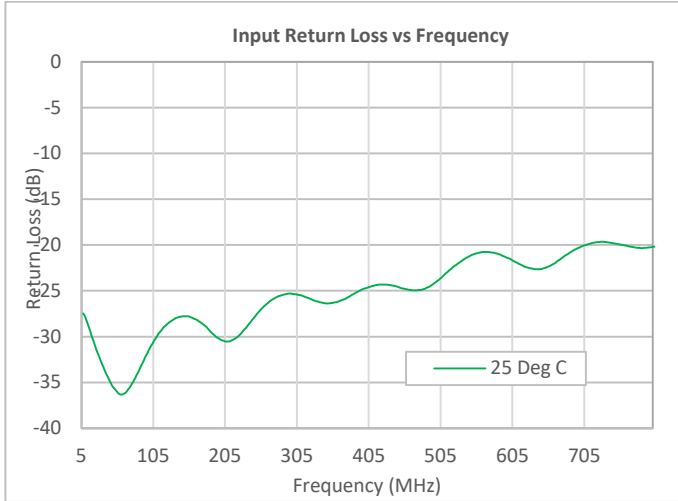


**Notes:**

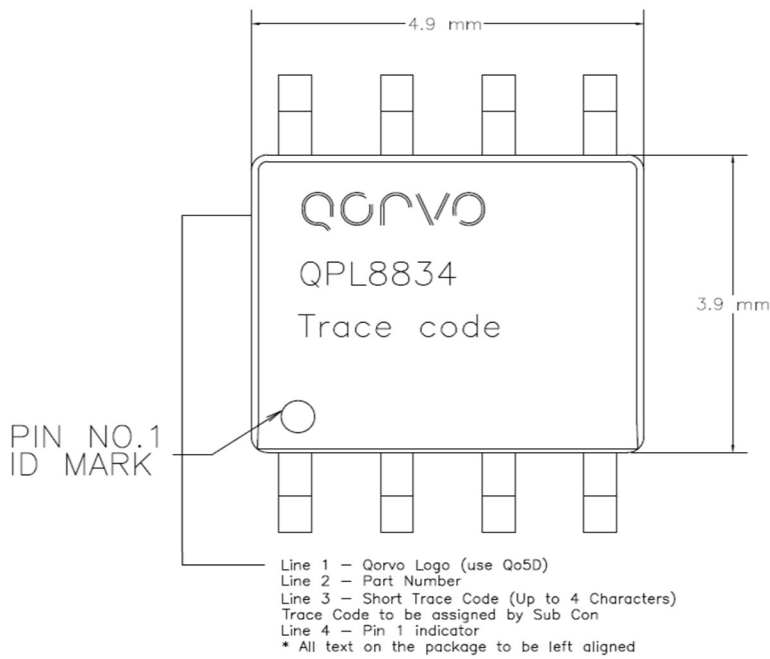
1. 80 NTSC + 111 QAM, Flat Tilt, 42dBmV / Ch, Output at 1218MHz.
2. Temp = +25°C, VDD = +5V, 75Ω system.



### Performance Data at +5 V, 25°C for Upstream (5 – 700 MHz), 75Ω



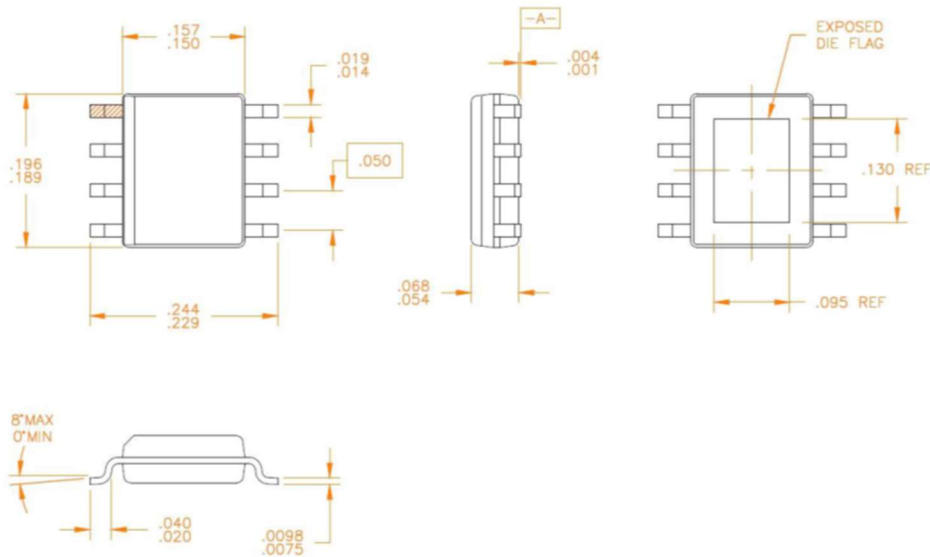
### Package Marking



### Pin Configuration and Description

| Pin | Name   | Description  |
|-----|--------|--|
| 1   | RFIN1  | RF input for plus side of the amplifier                |
| 2   | LIN1   | Linearizer Current Set for plus side of the amplifier  |
| 3   | LIN2   | Linearizer Current Set for minus side of the amplifier |
| 4   | RFIN2  | RF input for minus side of the amplifier               |
| 5   | RFOUT2 | RF output for minus side of the amplifier              |
| 6   | VG2    | VG2 Adjust   |
| 7   | ISSET  | IDD Set  |
| 8   | RFOUT1 | RF output for plus side of the amplifier               |
| 9   | GND    | Exposed bottom of part, device ground                  |

### Package Outline

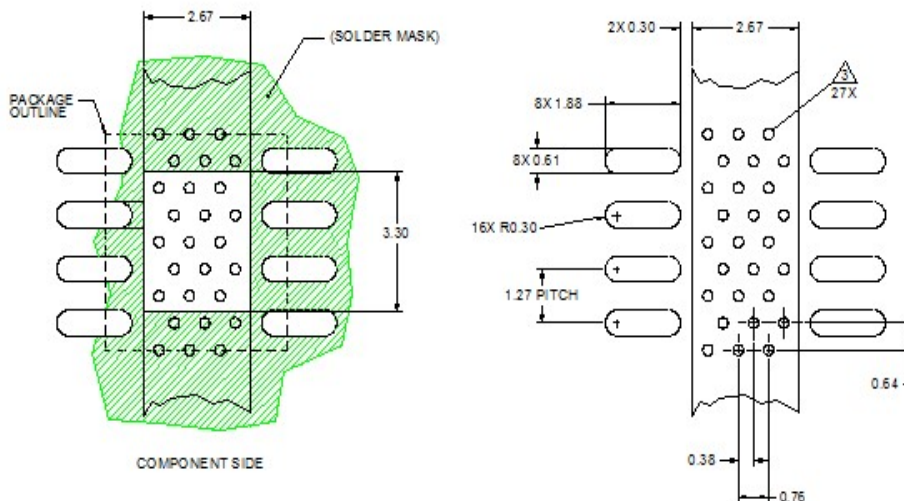


1. All dimensions are in inches. Angles are in degrees.

**Notes:**

1. All Dimensions are in inches.
2. Angles are in degrees.

### Recommended Mounting Pattern



**Notes:** All dimensions are in millimeters. Angles are in degrees.

1. Use 1 oz. copper minimum for top and bottom layer metal.
2. Vias are required under the backside paddle for proper RF/DC grounding and thermal dissipation.
3. Recommend a 0.35 mm diameter bit for drilling via holes and a final plated thru diameter of 0.25 mm.