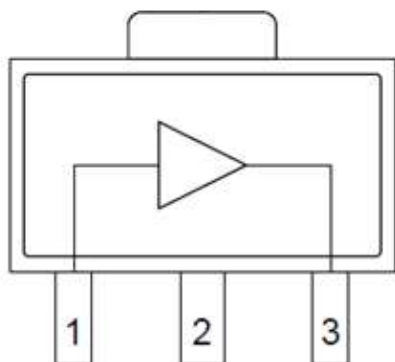


### Product Overview

The QPL1810 is a GaAs pHEMT single ended RF amplifier IC featuring 20dB of flat gain and low noise. This IC is designed to support Fiber to The Home (FTTH) applications from 50 to 1800MHz using a single 5V supply, or it can be used from 5V to 8V depending on linearity requirements. QPL1810 is packaged in a SOT-89 package for convenient layout and design in set top and infrastructure projects for 75  $\Omega$  CATV and satellite applications.



### Functional Block Diagram



Top View

### Key Features

- 50 MHz to 1800 MHz Operation
- 5 V to 8 V Operation
- Gain: 20 dB Typical
- Noise Figure: 1.5 dB Typical at 850 MHz
- Adjustable Bias Using External Resistors
- Convenient SOT-89 Package
- RoHS Compliant

### Applications

- FTTH GPON and GEPON
- DOCSIS 4.0
- Head End CMTS Equipment
- Optical Node
- Satellite Low Noise Amplifier
- Cable Modem and Set Top Box
- Single Ended Gain Block

### Ordering Information

| Part Number   | Description               |
|---------------|---------------------------|
| QPL1810SB     | Sample bag with 5 pieces  |
| QPL1810SR     | 7" Reel with 100 pieces   |
| QPL1810TR13   | 13" Reel with 2500 pieces |
| QPL1810EVB-01 | Evaluation Board          |



## Absolute Maximum Ratings

| Parameter                    | Rating         |
|------------------------------|----------------|
| Supply Voltage ( $V_{DD}$ )  | +10 V          |
| Supply Current ( $I_{DD}$ )  | 140 mA         |
| Maximum Input Level          | 65 dBmV        |
| Operating Temperature Range  | -40 to +85 °C  |
| Storage Temperature Range    | -65 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 at +5 V

| Parameter                   | Condition <sup>(1)</sup> | Min | Typ | Max  | Unit |
|-----------------------------|--------------------------|-----|-----|------|------|
| Supply Voltage ( $V_{DD}$ ) |                          |     | 5   |      | V    |
| Supply Current ( $I_{DD}$ ) |                          |     | 61  |      | mA   |
| Frequency Range             |                          | 50  |     | 1800 | MHz  |
| Gain                        |                          |     | 20  |      | dB   |
| Gain Slope                  |                          |     | 1   |      | dB   |
| Reverse Isolation           |                          |     | 23  |      | dB   |
| Input Return Loss           |                          |     | 18  |      | dB   |
| Output Return Loss          |                          |     | 16  |      | dB   |
| Noise Figure                |                          |     | 1.2 |      | dB   |
| OIP2                        | 3 dBm / tone output      |     | 46  |      | dBm  |
| OIP3                        | 7 dBm / tone output      |     | 35  |      | dBm  |
| OP1dB                       |                          |     | 20  |      | dBm  |
| Thermal Resistance          | $\Theta_{JC}$            |     | 35  |      | °C/W |

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

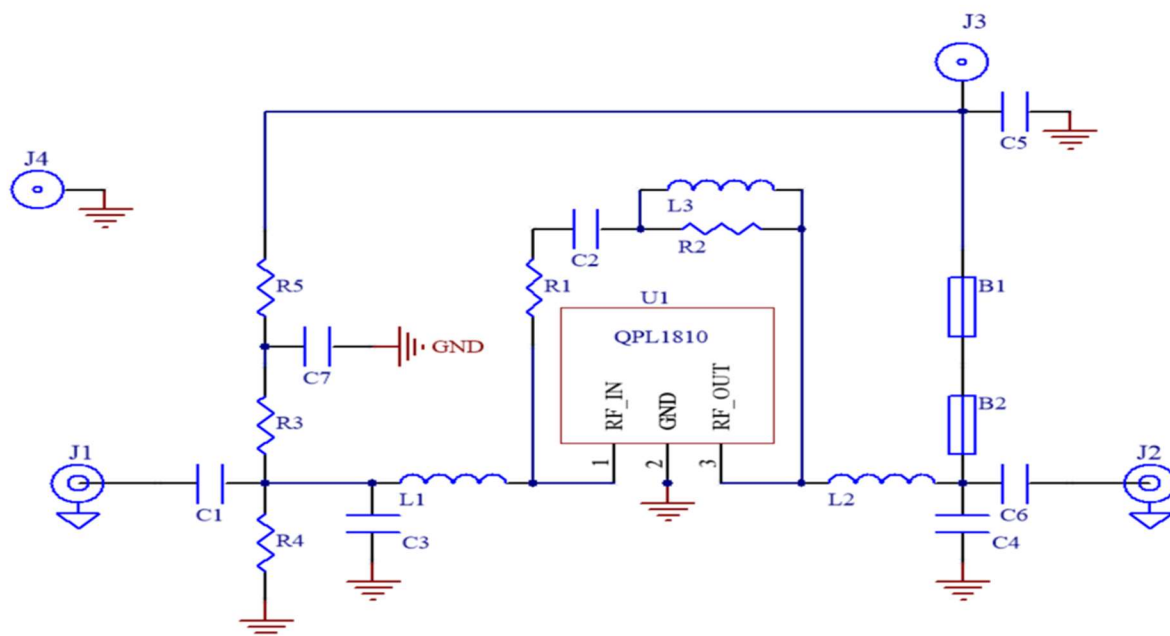
### Electrical Specifications at +8V

| Parameter                               | Condition <sup>(1)</sup> | Min | Typ  | Max  | Unit                 |
|-----------------------------------------|--------------------------|-----|------|------|----------------------|
| Supply Voltage ( $V_{DD}$ )             |                          |     | 8    |      | V                    |
| Supply Current ( $I_{DD}$ )             |                          |     | 102  |      | mA                   |
| Frequency Range                         |                          | 50  |      | 1800 | MHz                  |
| Gain                                    |                          |     | 20   |      | dB                   |
| Gain Slope                              |                          |     | 1.0  |      | dB                   |
| Reverse Isolation                       |                          |     | 23   |      | dB                   |
| Input Return Loss                       |                          |     | 17   |      | dB                   |
| Output Return Loss                      |                          |     | 16   |      | dB                   |
| Noise Figure                            |                          |     | 1.5  |      | dB                   |
| MER <sup>(2)</sup>                      | At 255MHz                |     | 46   |      | dB                   |
| At +55dBmV Total Composite Output power | At 1245MHz               |     | 44   |      | dB                   |
|                                         | At 1791MHz               |     | 42   |      | dB                   |
| OIP2L                                   | 3 dBm / tone output      |     | 50   |      | dBm                  |
| OIP3                                    | 7 dBm / tone output      |     | 40   |      | dBm                  |
| OP1dB                                   |                          |     | 24.2 |      | dBm                  |
| Thermal Resistance                      | $\Theta_{JC}$            |     | 35   |      | $^{\circ}\text{C/W}$ |

1. Typical performance at these conditions: Temp = +25  $^{\circ}\text{C}$ ,  $V_{DD}$  = +8 V, 75  $\Omega$  system, Full band unless otherwise noted

2. 54MHz to 1794MHz, 0dB tilt, 1 OFDM (54-246MHz) + 254 QAM (252-1794MHz) Channels. CCN Noise BW (ANSI/SCTE 17): 5.36MHz for J.83/B. Tx Data: ITU-T, Annex B, QAM256, 5.36 MSymbols/s

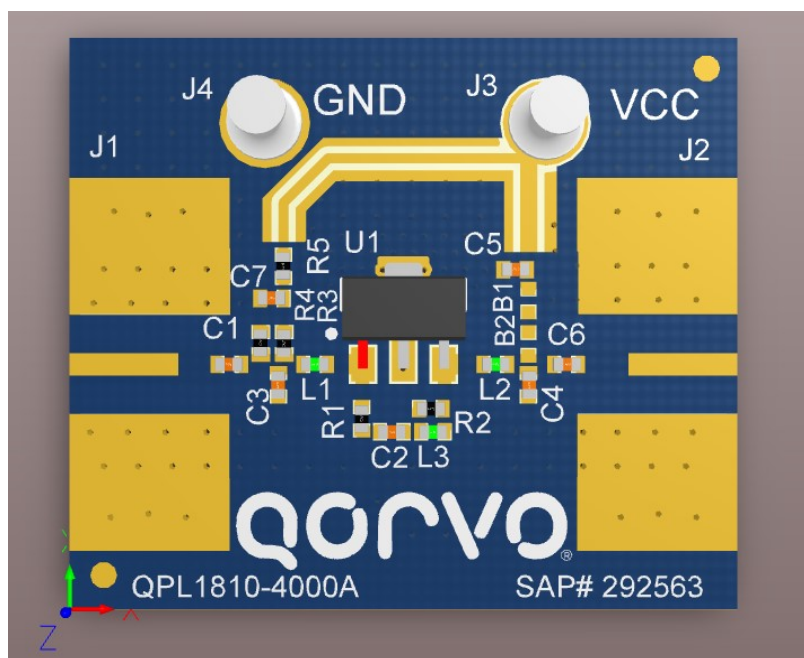
### Evaluation Board Schematic 50 MHz – 1800 MHz



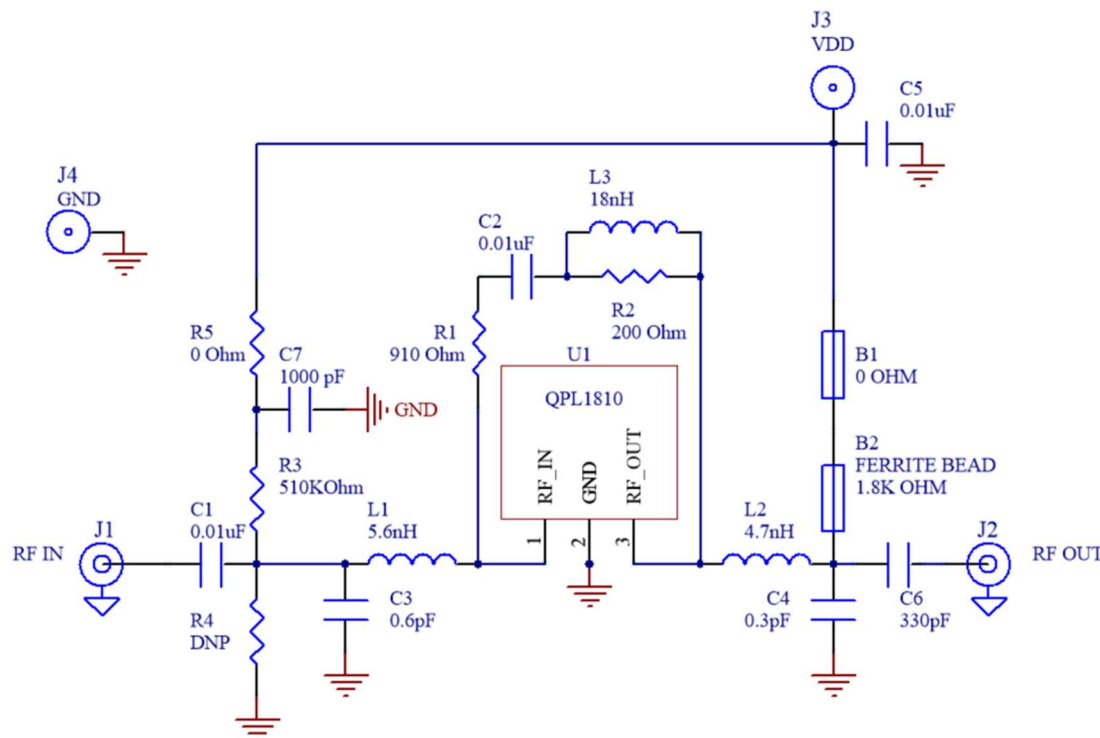
### Evaluation Board Bill of Materials

| Designator | Description                             | Manufacturer           | Part Number             |
|------------|-----------------------------------------|------------------------|-------------------------|
| PCB        | QPL1810-4000                            | DDI                    | QPL1810-4000(A)         |
| U1         | 20dB FTTH Amplifier                     | Qorvo                  | QPL1810SB               |
| B1         | RES, 0 $\Omega$ , 5%, 1/10W, 0402       | Kamaya, Inc            | RMC1/16SJPTH            |
| B2, R5     | FER, BEAD, 1.8K, 200mA, 0402            | TDK                    | MMZ1005A182ET000        |
| C1, C2, C5 | CAP, 0.01uF, 10%, 50V, X7R, 0402        | Murata Electronics     | GRM155R71H103KA88D      |
| C3         | CAP, 0.6pF, +/-0.1pF, 50V, HI-Q, 0402   | Murata Electronics     | GJM1555C1HR60BB01D      |
| C4         | CAP, 0.3pF, +/-0.05pF, 50V, C0G, 0402   | Murata Electronics     | GRM1555C1HR30WA01D      |
| C6         | CAP, 330pF, 5%, 50V, C0G, 0402          | Murata Electronics     | GRM1555C1H331JA01D      |
| C7         | CAP, 4.7pF, +/-0.25pF, 50V, HI-Q, 0402  | Murata Electronics     | GJM1555C1H4R7CB01D      |
| J1, J2     | CONN, F FEM EDGE MOUNT, 75 OHMS, 0.068" | Millimeter Wave Tech   | MW-846-C-DD-75          |
| J3, J4     | TERM. SOLDER TURRET, 0.062 PCB          | Mill-Max Manufacturing | 2533-0-00-44-00-00-07-0 |
| L1         | IND, 5.6nH, +/- 0.3nH, 0402             | Murata Electronics     | LQG15HN5N6S02           |
| L2         | IND, 4.7nH, +/- 0.3nH, 0402             | Murata Electronics     | LQG15HN4N7S02           |
| L3         | IND, 18nH, 5%, 0402                     | Murata Electronics     | LQG15HN18NJ02           |
| R1         | RES, 910 $\Omega$ , 5%, 1/16W, 0402     | Panasonic Industrial   | ERJ-2GEJ911X            |
| R2         | RES, 150 OHM, 5%, 1/16W, 0402           | Kamaya, Inc            | RMC1/16S-151JTH         |
| R3         | RES, 510 K $\Omega$ , 1/10W, 0402       | Kamaya, Inc            | RMC1/16S-514JTH         |
| R4         | Not Populated                           |                        |                         |

### Evaluation Board Assembly Drawing



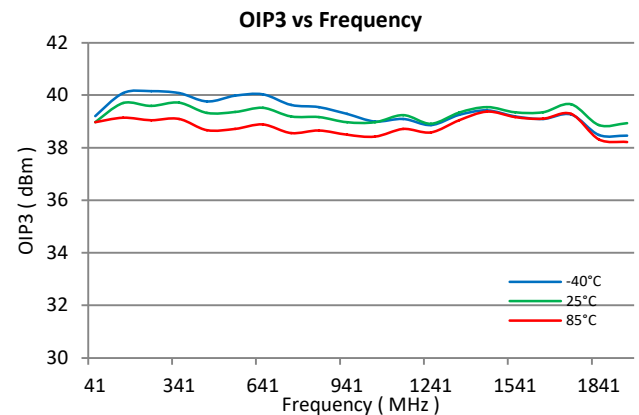
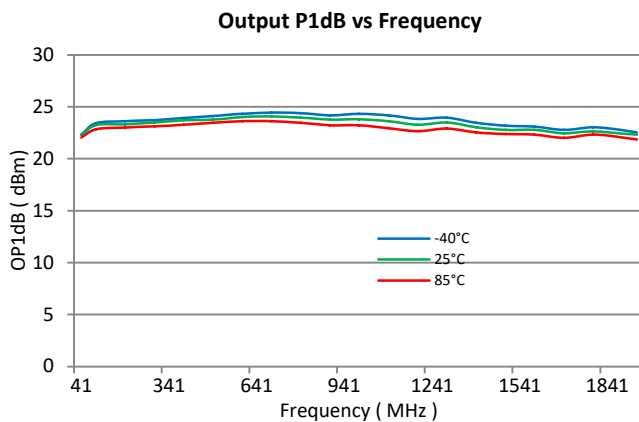
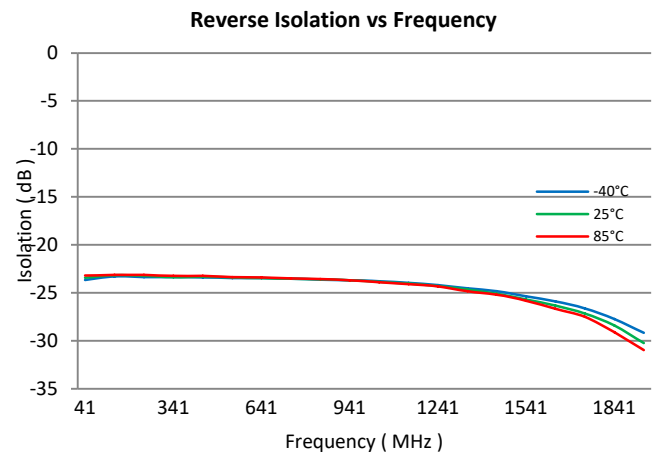
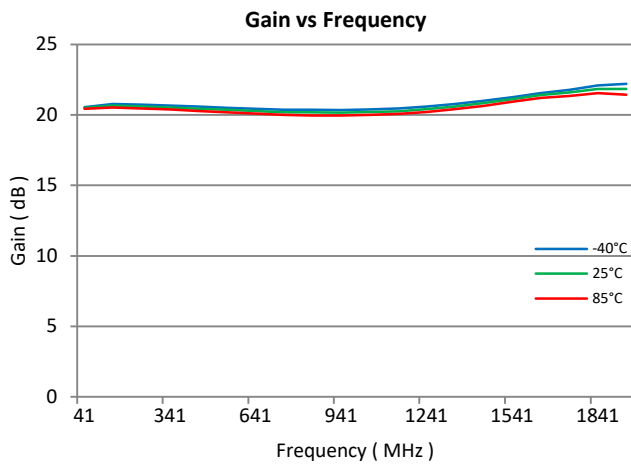
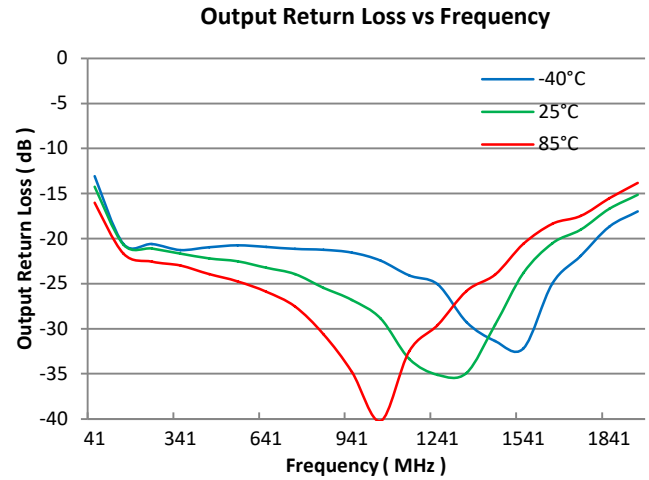
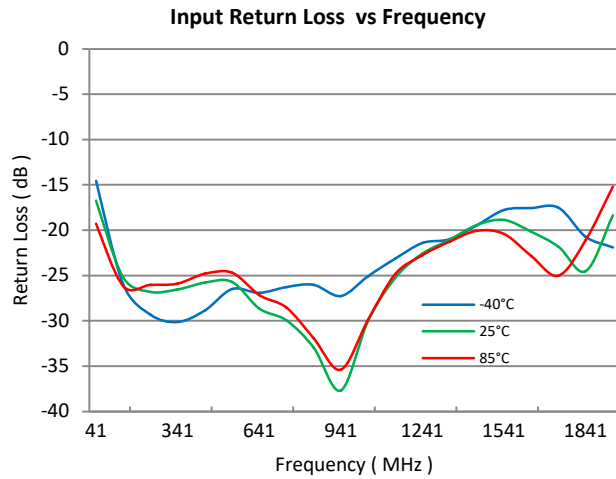
### Typical Application Schematic, 50 MHz – 1800 MHz



#### Notes:

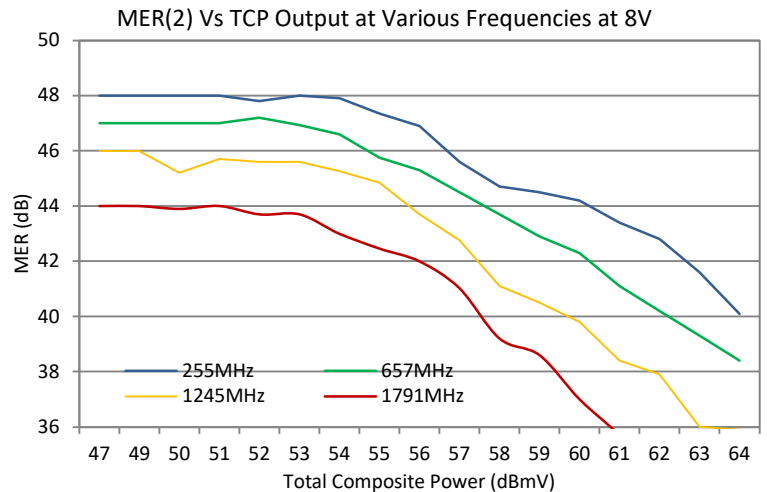
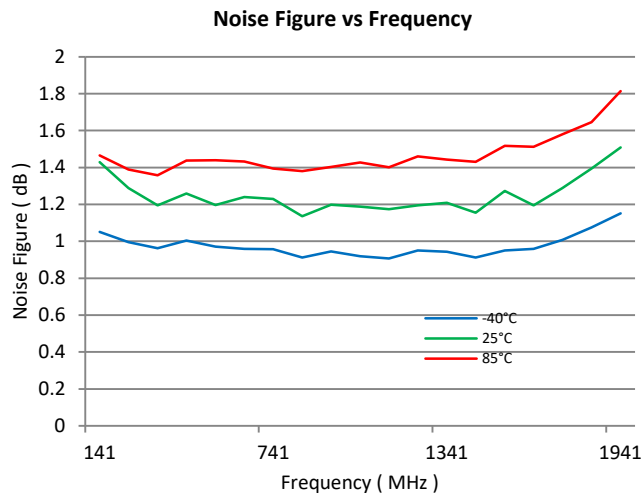
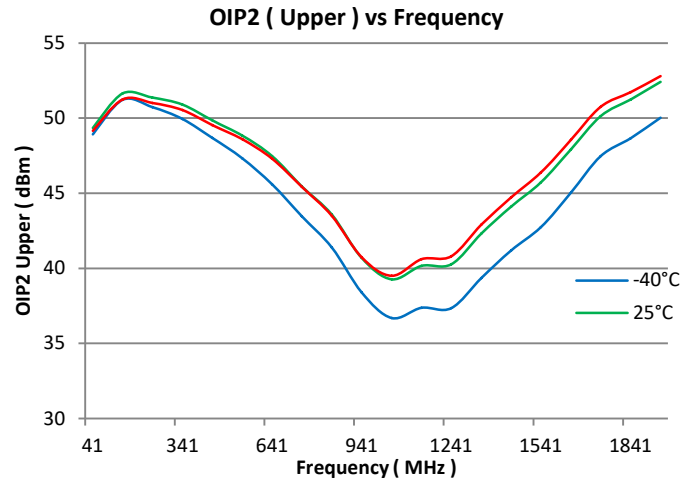
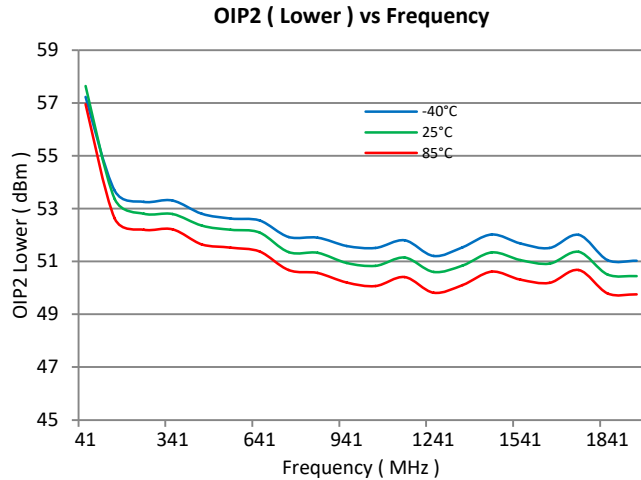
1. C3/L1 tunes input return loss.
2. L2/C4 tunes output return loss with some contribution from C6.
3. The feedback network is composed of R1 and R2, with C2 being a DC block and L3 providing high end peaking. The ratio of R1 to R2 controls flatness and tilt while the total feedback resistance affects device gain.
4. B2 provides the bias path with RF isolation from the RF output path.
5. R3 value is optimized to increase linearity.

### Performance Data at +5V



Notes: (1) OIP3: 7 dBm/tone output

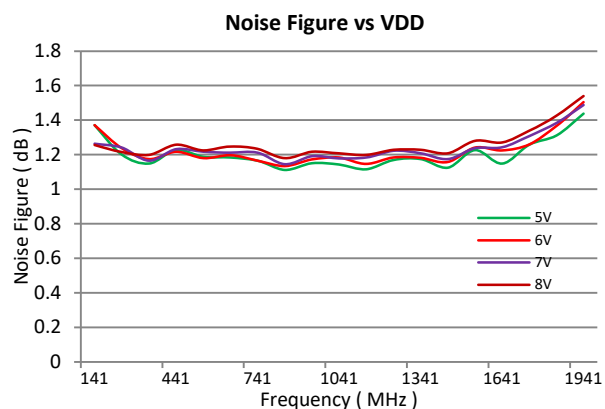
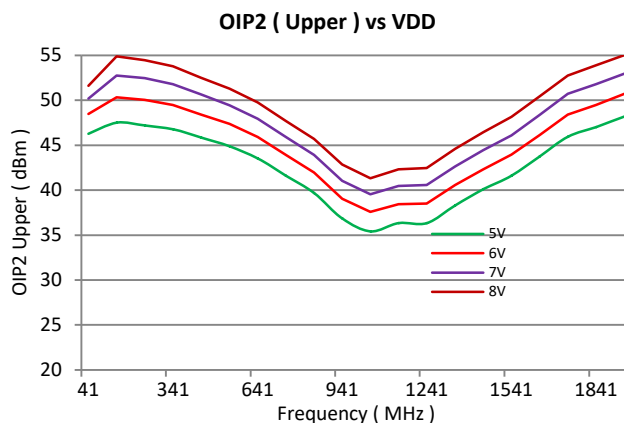
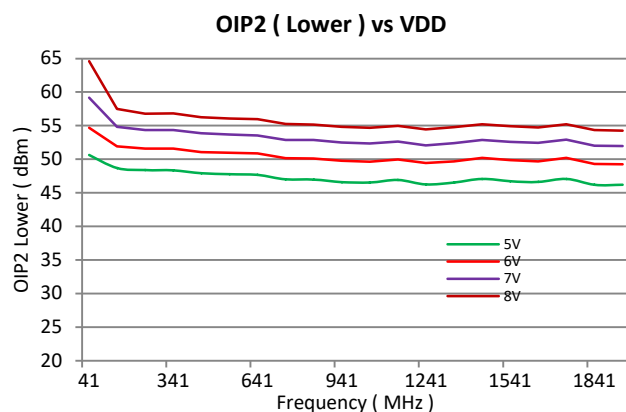
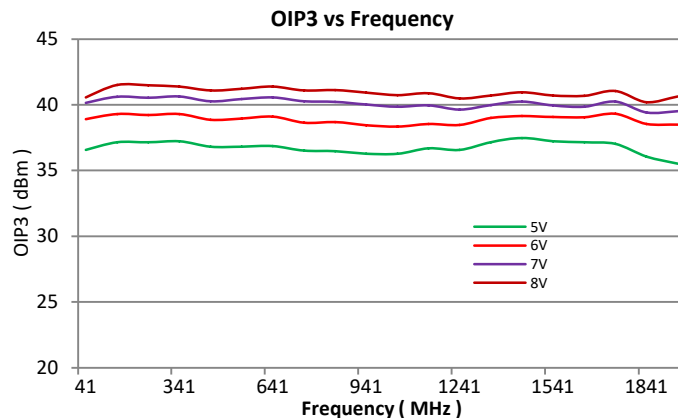
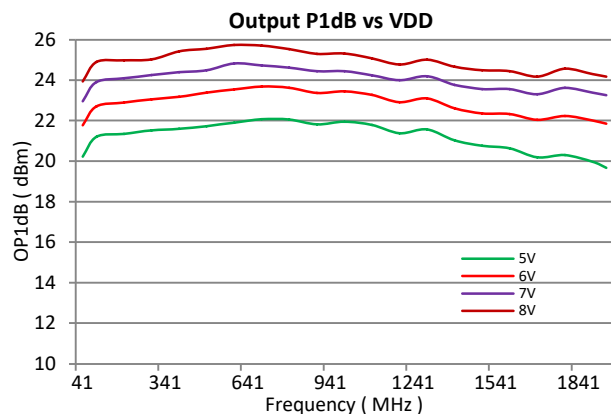
#### Performance Data at +5 V



#### Notes:

- (1) OIP2: 3 dBm/ tone output
- (2) 54MHz to 1794MHz, 0dB tilt, 1 OFDM (54-246MHz) + 254 QAM (252-1794MHz) Channels. CCN Noise BW (ANSI/SCTE 17): 5.36MHz for J.83/B. Tx Data: ITU-T, Annex B, QAM256, 5.36 MSymbols/s

### Performance Data vs Supply Voltage

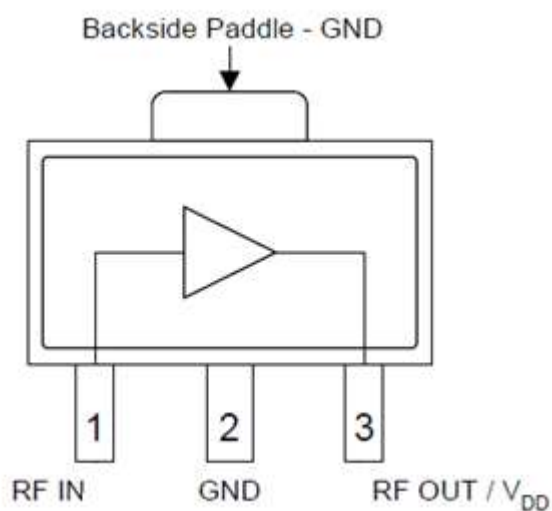


Notes:

- (1) OIP3: 7 dBm / tone output
- (2) OIP2: 3 dBm / tone output



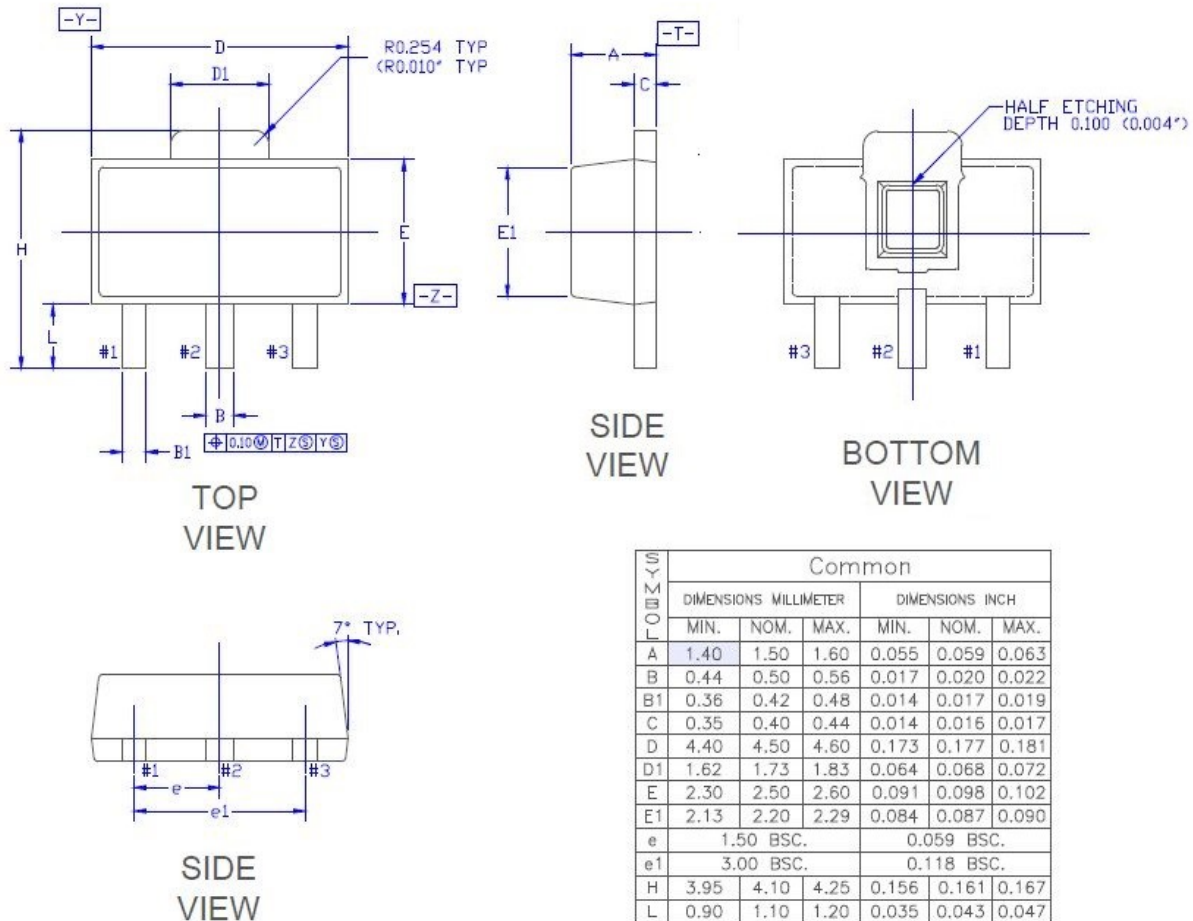
### Pin Configuration and Description



Top View

| Pin Number      | Label        | Description                                                                                                                          |
|-----------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1               | RF IN        | RF Input, DC blocking capacitor required                                                                                             |
| 2               | GND          | Internally Not Connected                                                                                                             |
| 3               | RF OUT / VDD | RF Output – VDD bias choke required                                                                                                  |
| Backside Paddle | GND          | Ground. Use recommended via pattern to minimize inductance and thermal resistance. See PCB Mounting Pattern for suggested footprint. |

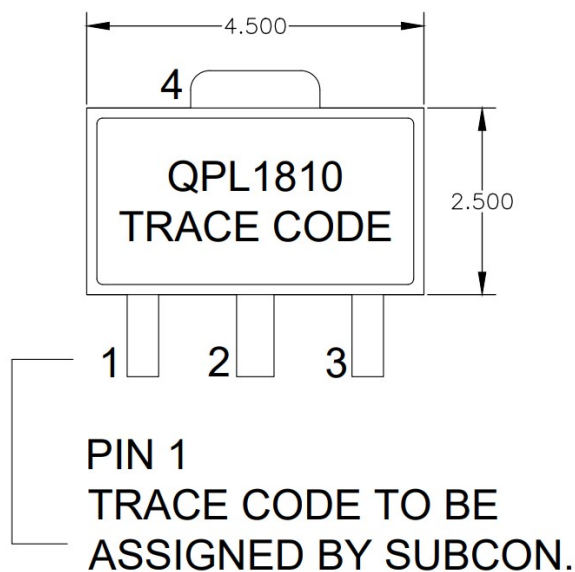
### Package Outline



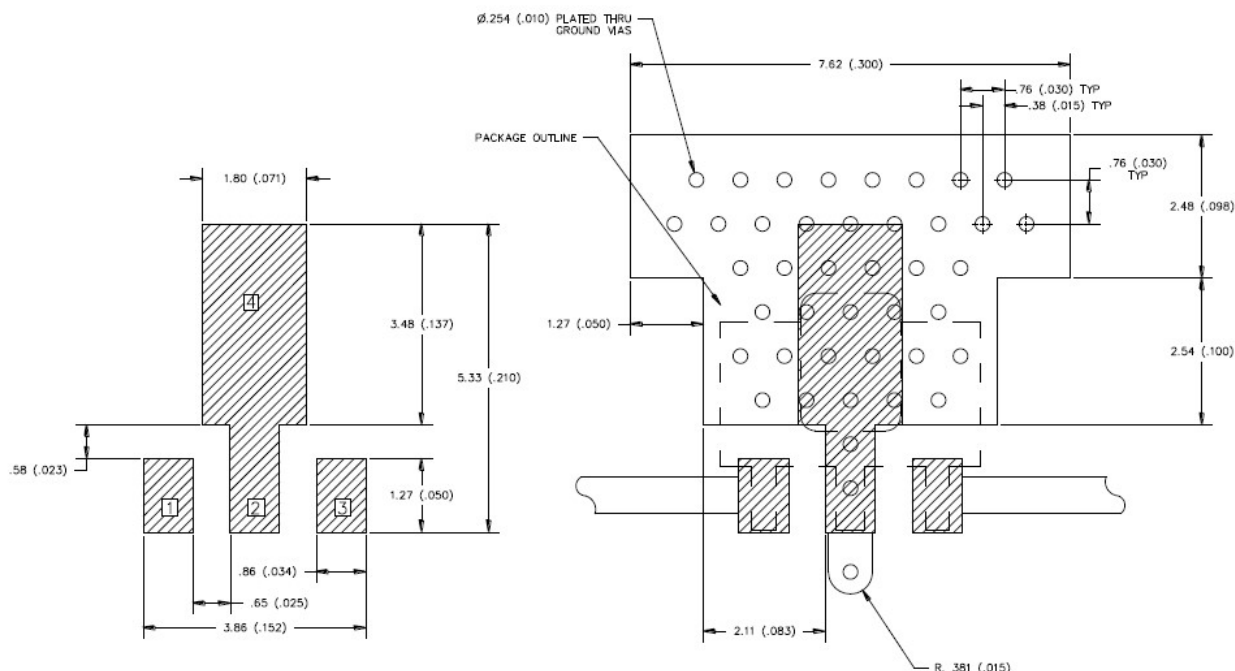
#### Notes:

1. Dimensions in millimeters

### Package Marking



### Recommended Mounting Pattern



#### Notes:

1. Ground/thermal vias are critical for the proper performance of this device. Vias should use a .35 mm (#80/.0135") diameter drill and have a final, plated thru diameter of 0.25 mm (0.010").
2. Add as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.
3. RF trace width depends upon the PC board material and construction.
4. All dimensions are in millimeters (inches). Angles are in degrees.

**QPL1810****75  $\Omega$  20 dB CATV Amplifier 50 – 1800 MHz**Classification | **SENSITIVE: CT**

## Handling Precautions

| Parameter                        | Rating            | Standard            |
|----------------------------------|-------------------|---------------------|
| ESD – Human Body Model (HBM)     | Class 1C (2000V)  | ESDA/JEDEC JS-001   |
| ESD – Charged Device Model (CDM) | Class C3 (>1000V) | ESDA/JEDEC JS-002   |
| MSL – Moisture Sensitivity Level | Level 3           | IPC/JEDEC J-STD-020 |

**Caution!**  
ESD-Sensitive Device

## Solderability

Compatible with both lead-free (260 °C max. reflow temp.) and tin/lead (245 °C max. reflow temp.) soldering processes.

Solder profiles available upon request.

Contact plating: NiPdAu

## RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) Free
- PFOS Free
- SVHC Free



## Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

**Tel: 1-844-890-8163**

**Web: [www.qorvo.com](http://www.qorvo.com)**

**Email: [customer.support@qorvo.com](mailto:customer.support@qorvo.com)**

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