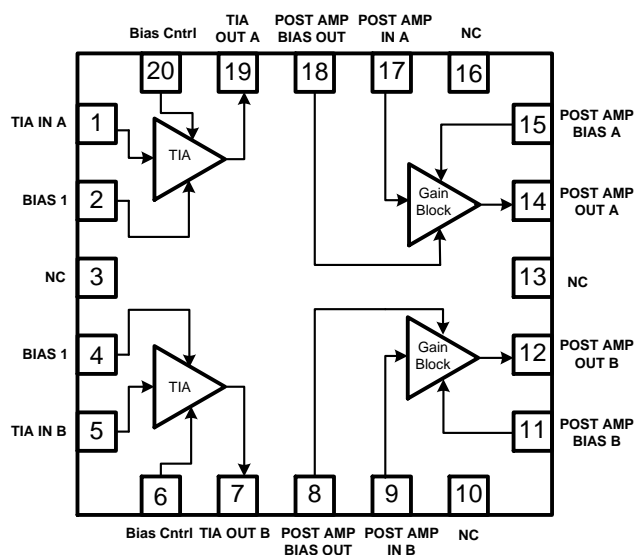


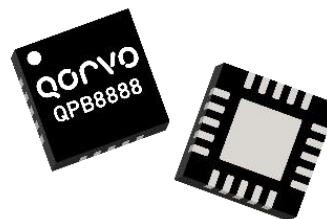
### Product Overview

The QPB8888 is a video receiver integrated circuit (IC) which provides a low noise analog interface to optical access triplexer modules used in single family ONTs in fiber to the premise (FTTP) applications. The QPB8888 exhibits low input noise and distortion to meet critical FTTP link requirements. QPB8888, with recommended external control circuitry, provides automatic gain control to maintain a constant +19 to +23 dBmV/channel output to insure consistent video quality. It runs on a single +12 V supply eliminating the need for an extra ONT supply.

### Functional Block Diagram



Top View



20 Pad 4.0 x 4.0 x 0.85 mm QFN Package

### Key Features

- +12 V Single Supply Operation
- +5 V Configuration Optional
- Efficient Power Consumption: 1.5 W for +12 V
- Low Noise: 3.5 pA /  $\sqrt{\text{Hz}}$  Equivalent Input Noise Current (EINC)
- Linearity: -65 dBc CSO and -66 dBc CTB at +22 dBmV RF Output per Channel (79-NTSC Equivalent Channels)
- 45 – 1218 MHz Operational Bandwidth
- 27 dB AGC Range with Recommended External Control Circuitry
- Best-in-Class +22 dBmV per Channel RF Output Capability

### Applications

- xPON RF Overlay Video Receiver for FTTH Triplexer-Equipped Optical Network Termination (ONT) and RFoG Network Interface Unit (NIU)

### Ordering Information

| Part No.     | Description  |
|--------------|--|
| QPB8888SQ    | Sample Bag with 25 Pieces                                  |
| QPB8888SR    | 7" Reel with 100 Pieces                                    |
| QPB8888TR13  | 13" Reel with 2500 Pieces                                  |
| QPB8888PCK-2 | 12V Transformer Coupled EVB Output with 5 Piece Sample Bag |
| QPB8888PCK-4 | 5V Transformer Coupled EVB Output with 5 Piece Sample Bag  |

## Absolute Maximum Ratings

| Parameter                   | Rating         |
|-----------------------------|----------------|
| Supply Voltage ( $V_{DD}$ ) | +15 V          |
| Storage Temperature Range   | -40 to +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.

## Recommended Operating Conditions

| Parameter               | Min   | Typ | Max   | Units |
|-------------------------|-------|-----|-------|-------|
| Operating Temperature   | -40   |     | +85   | °C    |
| Junction Temperature    |       |     | +160  | °C    |
| RF Power Supply Voltage | +11.4 | +12 | +12.6 | V     |

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

## Electrical Specifications

| Parameter                     | Condition <sup>(1)</sup>  | Min | Typ  | Max  | Unit                    |
|-------------------------------|---|-----|------|------|-------------------------|
| Supply Current ( $I_{SS}$ )   | Steady state operation, current draw during attenuation state transitions is higher.  |     | 130  |      | mA                      |
| Frequency Range               |   | 45  |      | 1218 | MHz                     |
| Gain                          |   |     | 37.5 |      | dB                      |
| Gain Flatness                 |   |     | 1.5  |      | dB                      |
| Tilt                          | Linear tilt from 45 – 1218 MHz; higher tilt can be achieved by changing components  |     | 3    |      | dB                      |
| Equivalent Input Noise        |   |     | 3.5  |      | pA / $\sqrt{\text{Hz}}$ |
| RF Output Level at 547.25 MHz | RF Output Level at 547.25 MHz   |     | 22   |      | dBmV/ch                 |
|                               | At 45 MHz   |     | -17  |      | dB                      |
| Output Return Loss            | At 600 MHz  |     | -18  |      | dB                      |
|                               | At 1218 MHz   |     | -15  |      | dB                      |
| CSO                           | 79-NTSC Equivalent analog channels, +2 dBm optical input OMI = 2.82%/ch; $RF_{OUT}$ = +22 dBmV per channel at 547.25 MHz (measured with complete evaluation board circuit in operation including PD and external AGC circuit) |     | -65  |      | dBc                     |
| CTB                           |   |     | -66  |      | dBc                     |
| Gain Control Range            | Using suggested application circuit   |     | 27   |      | dB                      |
| Thermal Resistance            | $T_{REF}$ taken at +85 °C from backside of PCB under the QPB8888  |     | 45.4 |      | °C / W                  |

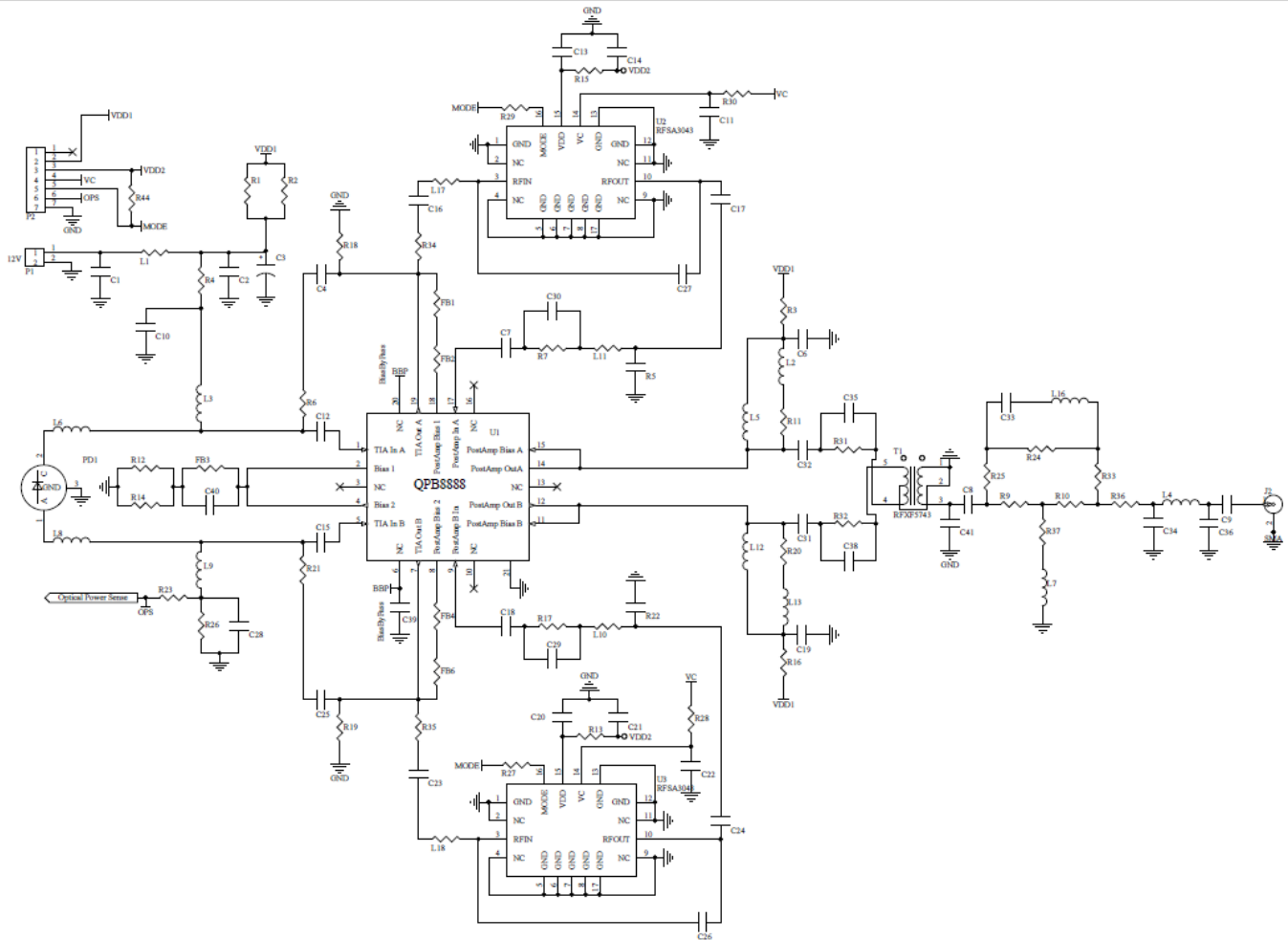
Notes:

1. Typical performance at these conditions: Temp. = +25 °C,  $V_{DD}$  = +12 V, 75 $\Omega$  system

## Optical Input Requirements

| Parameter                          | Unit        | Min | Typical | Max |
|------------------------------------|-------------|-----|---------|-----|
| Optical Input Power                | dBm         | -10 |         | 2   |
| Optical Modulation Index (OMI)     | %/ch (79ch) |     | 3       |     |
| Triplexer 1550 nm PIN Responsivity | mA/mW       |     | 0.95    |     |
| Triplexer 1550 nm PIN Capacitance  | pF          |     | 0.5     |     |

## Typical Application Schematic – 4001



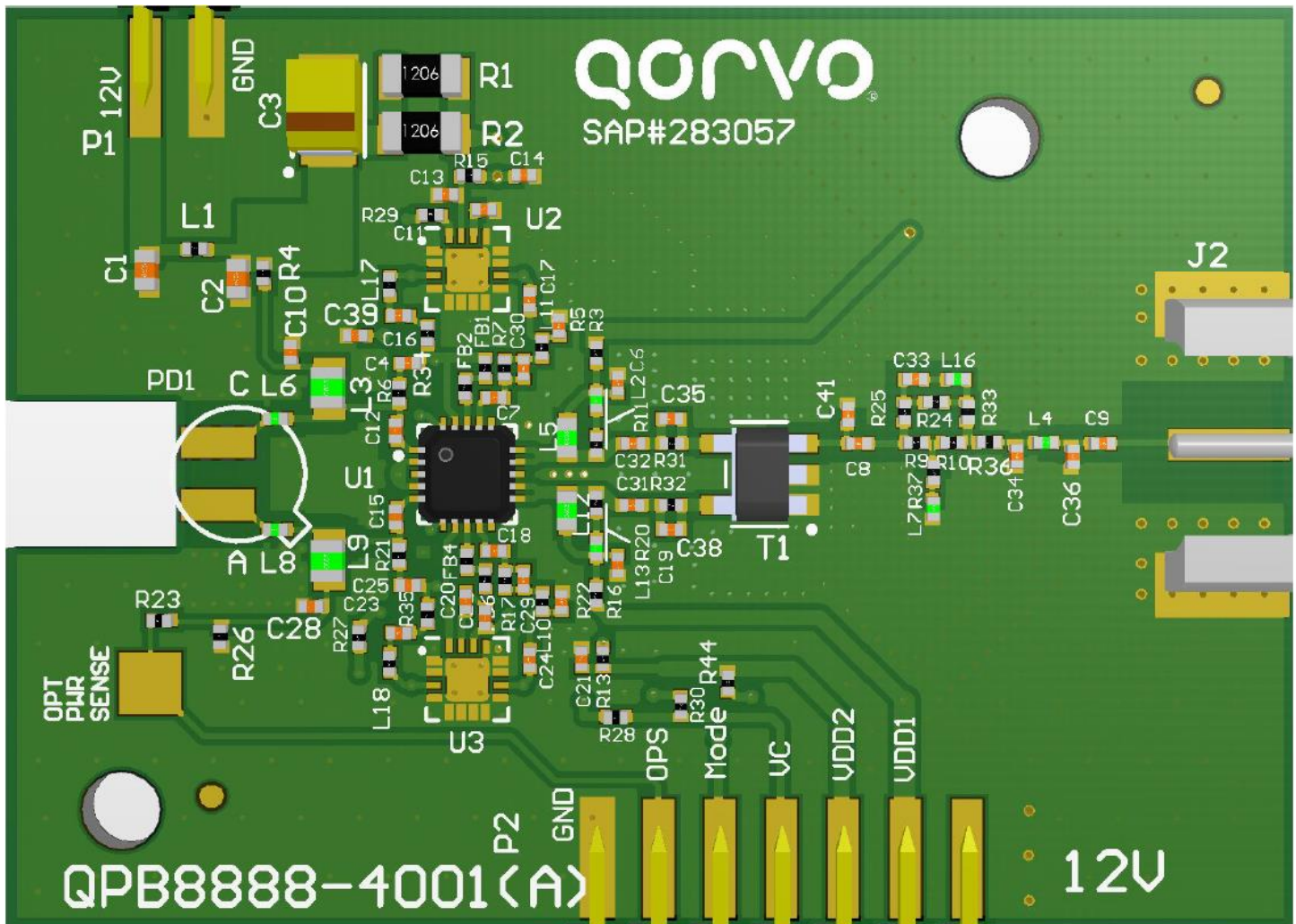


# QPB8888

## xPON Video Receiver

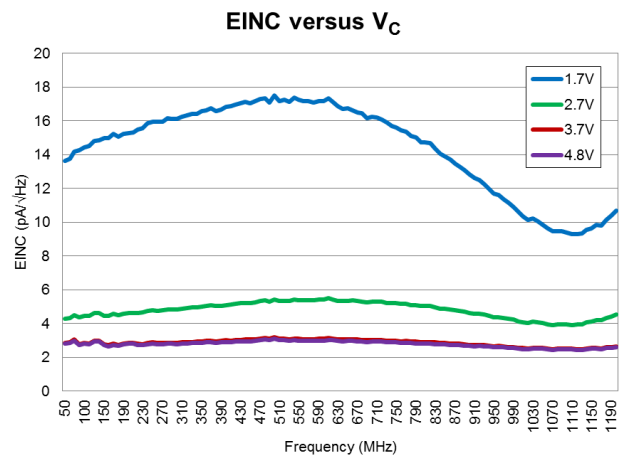
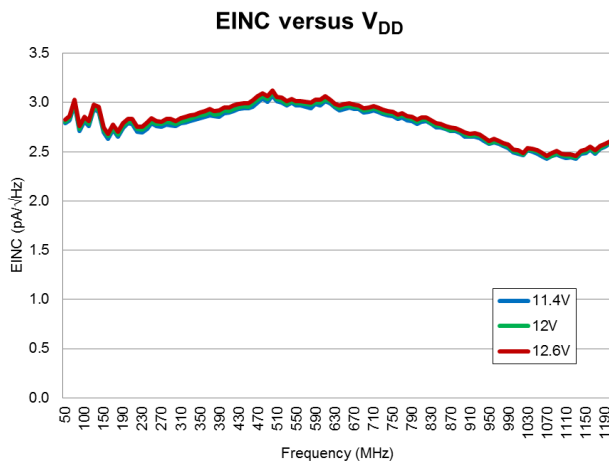
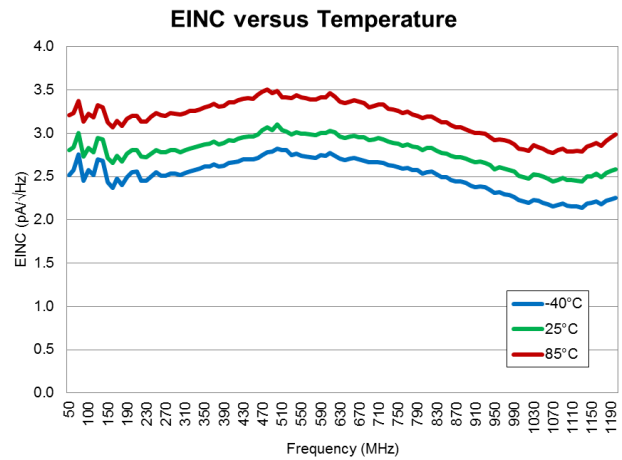
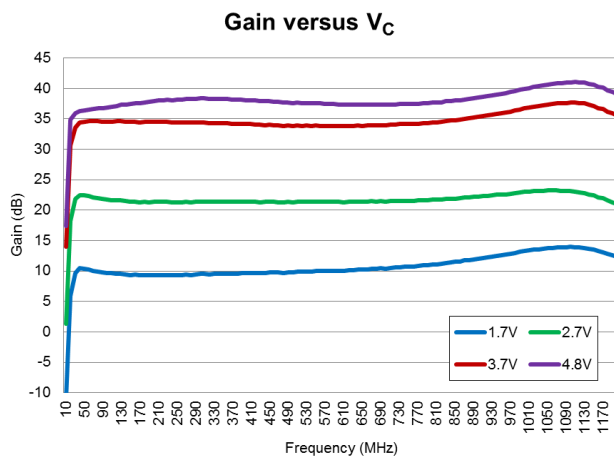
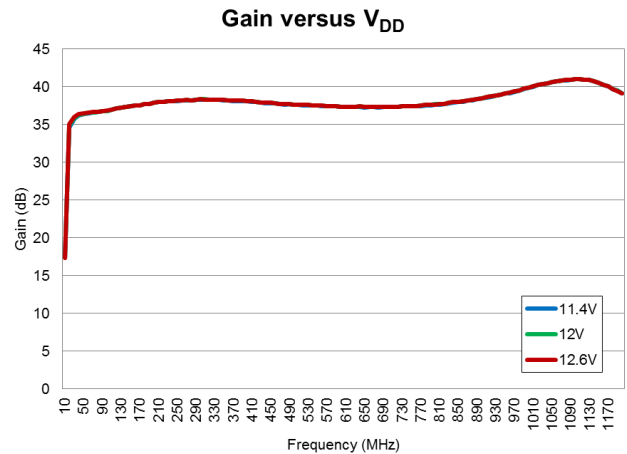
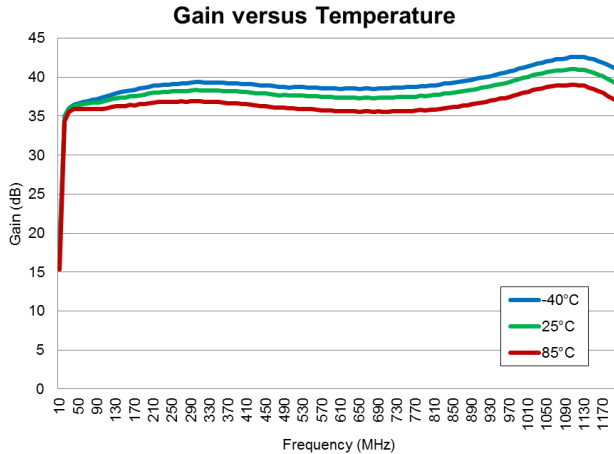
| Reference Designator                             | Description                                  | Manufacturer                                      | Manufacturer Part # |
|--|--|---|---------------------|
| U1   | Optical TIA                                  |   | QPB8888             |
| U2, U3   | CATV Voltage Controlled Attenuator           | Qorvo   | RFSA3043            |
| PCB  | PCB, QPB8888                                 | Viasystems Technologies Corp                      | QPB8888-4001(A)     |
| PD1  | InGaAs Photodiode                            | Beijing SWT Optical Comm. Technology Company, LTD | 1096964             |
| C34  | CAP, 0.5 pF ROHS, 0402                       | Johanson Technology                               | 500R07S0R5AV4T      |
| C41  | Cap0402 1pF ROHS                             | Johanson Technology                               | 500R07S1R0AV4T      |
| C36  | CAP, 1.3pF, +/-0.1pF, 50V, C0G, 0402         | Murata Electronics, Singapore                     | GRM1555C1H1R3BA01D  |
| C29, C30   | CAP, 6.8 pF, +/-0.1 pF, 50 V, C0G, 0402      | Murata Electronics, Singapore                     | GRM1555C1H6R8BA01D  |
| C40  | CAP, 5.6 pF, +/-0.25 pF, 50 V, HI-Q, 0402    | Murata Electronics, Singapore                     | GJM1555C1H5R6CB01D  |
| C7, C18  | CAP, 82 pF, 5%, 50 V, C0G, 0402              | Murata Electronics, Singapore                     | GRM1555C1H820JA01D  |
| C9, C13, C16, C17, C20, C23, C24                 | CAP, 1000 pF, 10%, 50 V, X7R, 0402           | Murata Electronics, Singapore                     | GRM155R71H102KA01D  |
| C4, C6, C10, C19, C25, C28, C39                  | CAP, 10000 pF, 10%, 25 V, X7R, 0402          | Murata Electronics, Singapore                     | GRM155R71E103KA01D  |
| C35, C38   | CAP, 10 pF, 2.5%, 50 V, C0G, 0402            | Murata Electronics, Singapore                     | GRM1555C1H100RA01D  |
| C1, C2   | CAP, 0.1 uF, 10%, 16 V, X7R, 0603            | Murata Electronics, Singapore                     | GRM188R71C104KA01D  |
| C12, C15   | CAP, 120 pF, 5%, 50 V, C0G, 0402             | Murata Electronics, Singapore                     | GRM1555C1H121JA01D  |
| C8   | CAP, 180 pF, 5%, 50 V, C0G, 0402             | Murata Electronics, Singapore                     | GRM1555C1H181JA01D  |
| C3   | CAP, 10 uF, 10%, 16 V, TANT-B                | AVX/Kyocera Asia LTD                              | TAJB106K016RNJ      |
| C14, C21   | CAP, 1 uF, 10%, 10 V, X5R, 0402              | Murata Electronics, Singapore                     | GRM155R61A105KE15D  |
| C31, C32   | CAP, 470 pF, 5%, 50 V, C0G, 0402             | Murata Electronics, Singapore                     | GRM1555C1H471JA01D  |
| C26, C27   | CAP, 0.1 pF, +/-0.05 pF, 50 V, HI-Q, 0402    | Murata Electronics, Singapore                     | GJM1555C1HR10WB01D  |
| C33  | CAP, 3.3 pF, +/-0.1 pF, 50 V, NPO, 0402      | Murata Electronics, Singapore                     | GRM1555C1H3R3BA01D  |
| R13, R15   | RES, 100 $\Omega$ ROHS, 0402                 | Kamaya, Inc                                       | RMC1/16SK1000FTH    |
| R4, R11, R20                                     | RES, 200 $\Omega$ ROHS, 0402                 | Kamaya, Inc                                       | RMC1/16SK2000FTH    |
| R24  | RES, 75 $\Omega$ ROHS, 0402                  | Kamaya, Inc                                       | RMC1/16SK75R0FTH    |
| L10, L11, L17, L18, R25, R33, R34, R35, R36, R44 | RES, 0 $\Omega$ , 5%, 1/10W, 0402            | Kamaya, Inc                                       | RMC1/16SJPTH        |
| R9, R10  | RES, 22 $\Omega$ , 5%, 1/16W, 0402           | Kamaya, Inc                                       | RMC1/16S-220JTH     |
| R23  | RES, 10K $\Omega$ , 1%, 1/16W, 0402          | Panasonic Industrial Devices                      | ERJ-2RKF1002X       |
| R1, R2   | RES, 39 $\Omega$ , 1%, 1/4W, 1206            | Panasonic Industrial Devices                      | ERJ-8ENF39R0V       |
| R12, R14   | RES, 4.99 $\Omega$ , 1%, 1/2W, 1206          | Vishay Dale Electronics                           | CRCW12064R99FKEAHP  |
| R37  | RES, 360 $\Omega$ , 1%, 1/10W, 0402          | Kamaya, Inc                                       | RMC1/16SK3600FTH    |
| R31, R32   | RES, 44.2 $\Omega$ , 1%, 1/10W, 0402         | Kamaya, Inc                                       | RMC1/16SK44R2FTH    |
| R3, R16  | RES, 2.49 $\Omega$ , 1%, 1/10W, 0402         | Kamaya, Inc                                       | RMC1/16SK2R49FTH    |
| R6, R21  | RES, 1.6K $\Omega$ , 1%, 1/10W, 0402         | Kamaya, Inc                                       | RMC1/16SK1601FTH    |
| R26, R27, R28, R29, R30                          | RES, 1K $\Omega$ , 1%, 1/10W, 0402           | Kamaya, Inc                                       | RMC1/16SK1001FTH    |
| R7, R17  | RES, 36 $\Omega$ , 1%, 1/10W, 0402           | KOA Speer Electronics                             | RK73B1ETTP360J      |
| L5, L12  | IND, 390 nH, W/W, 0603                       | Coilcraft, Inc                                    | 0603CS-R39XJRW      |
| L4   | IND, 9.1 nH, T/F, 0402                       | Murata Electronics, Singapore                     | LQP15MN9N1B02D      |
| L2, L13  | IND, 68 nH, 5%, M/L, 0402                    | Murata Electronics, Singapore                     | LQG15HN68NJ02D      |
| L16  | IND, 8.2 nH, +/-0.1 nH, T/F, 0402            | Murata Electronics, Singapore                     | LQP15MN8N2B02D      |
| L7   | IND, 68 nH, 5%, W/W, 0402                    | Coilcraft, Inc                                    | 0402CS-68NXJRW      |
| L3, L9   | IND, 880 nH, 5%, W/W, 0805                   | Gowanda Electronics                               | CC0805-880J-2       |
| L6, L8   | IND, 9 nH, 5%, 1.4A, W/W, 0402               | Coilcraft, Inc.                                   | 0402HP-9N0XJLW      |
| FB1, FB2, FB3, FB4, FB6, L1                      | FER, BEAD, 1K $\Omega$ , 50mA, 0402          | Murata Electronics, Singapore                     | BLM15AG102SN1D      |
| T1   | XFMR, 1:3, 5-1200 MHz, 75 $\Omega$ , 2W, S20 | MiniRF, Inc                                       | RFXF5743            |
| J2   | CONN, F FEM EDGE MOUNT, 75 $\Omega$          | Millimeter Wave Technologies                      | MW-846-C-DD-75      |
| P1   | CONN, HDR, ST, PLRZD, 2-PIN, 0.100"          | ITW Pancon  | MPSS100-2-C         |
| P2   | CONN, HDR, ST, PLRZD, 7-PIN                  | ITW Pancon  | MPSS100-7-C         |
| R5, R18, R19, R22, C11, C22                      | NOT POPULATED ITEM-1                         |   |                     |

## Evaluation Board Assembly Drawing



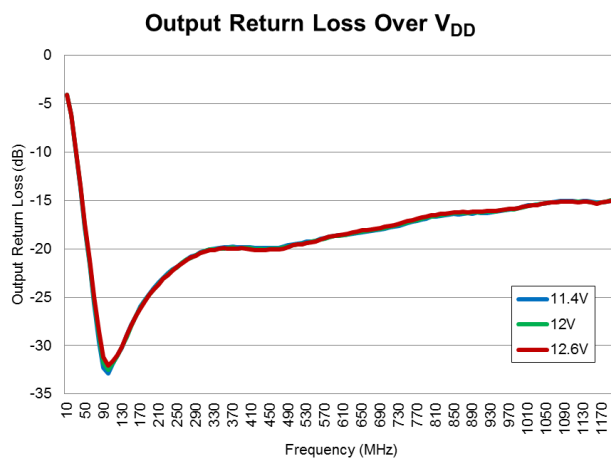
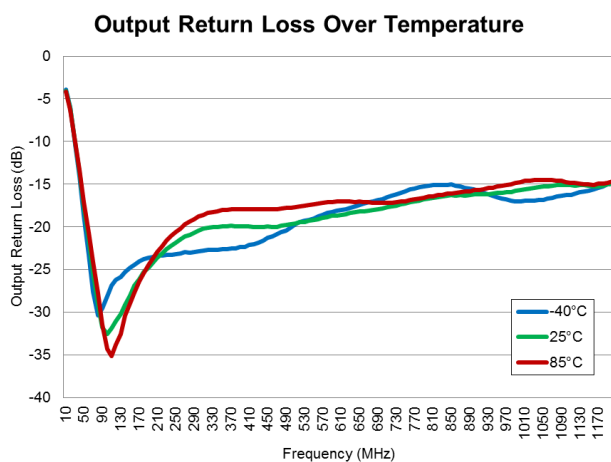
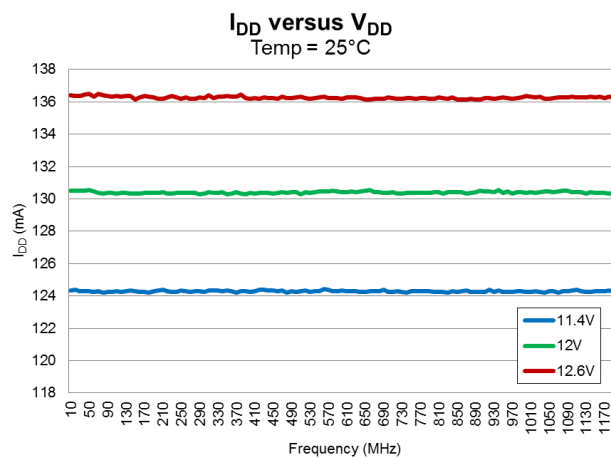
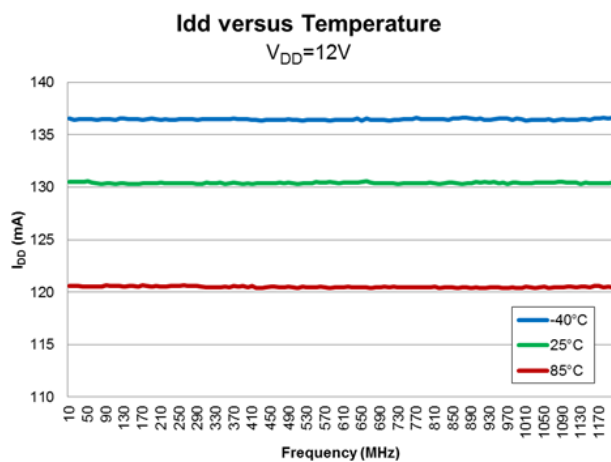
## Typical Performance

Test conditions unless otherwise stated: Temp. = +25 °C,  $V_{DD}$  = +12 V



## Typical Performance

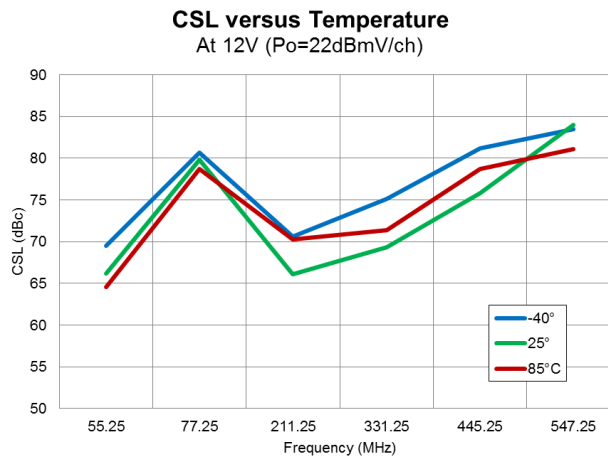
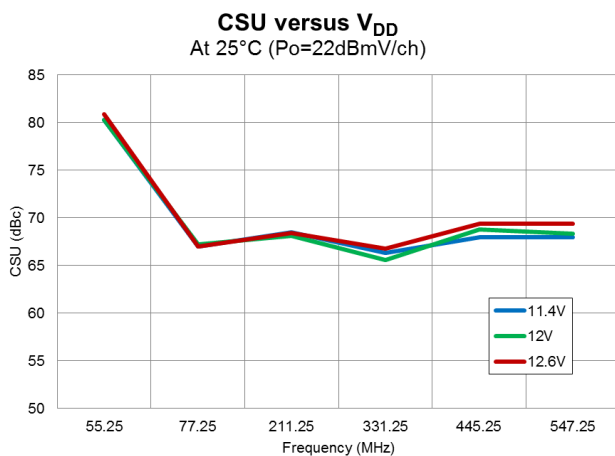
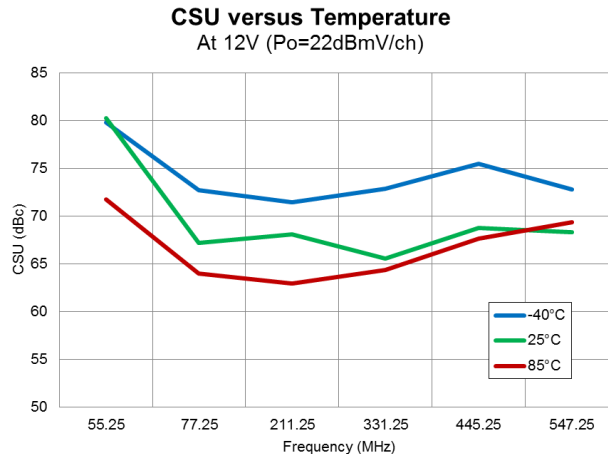
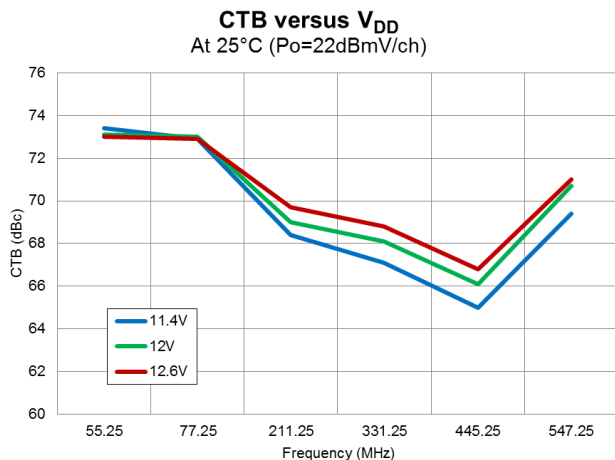
Test conditions unless otherwise stated:  $T = +25^{\circ}\text{C}$ ,  $V_{DD} = +12\text{ V}$





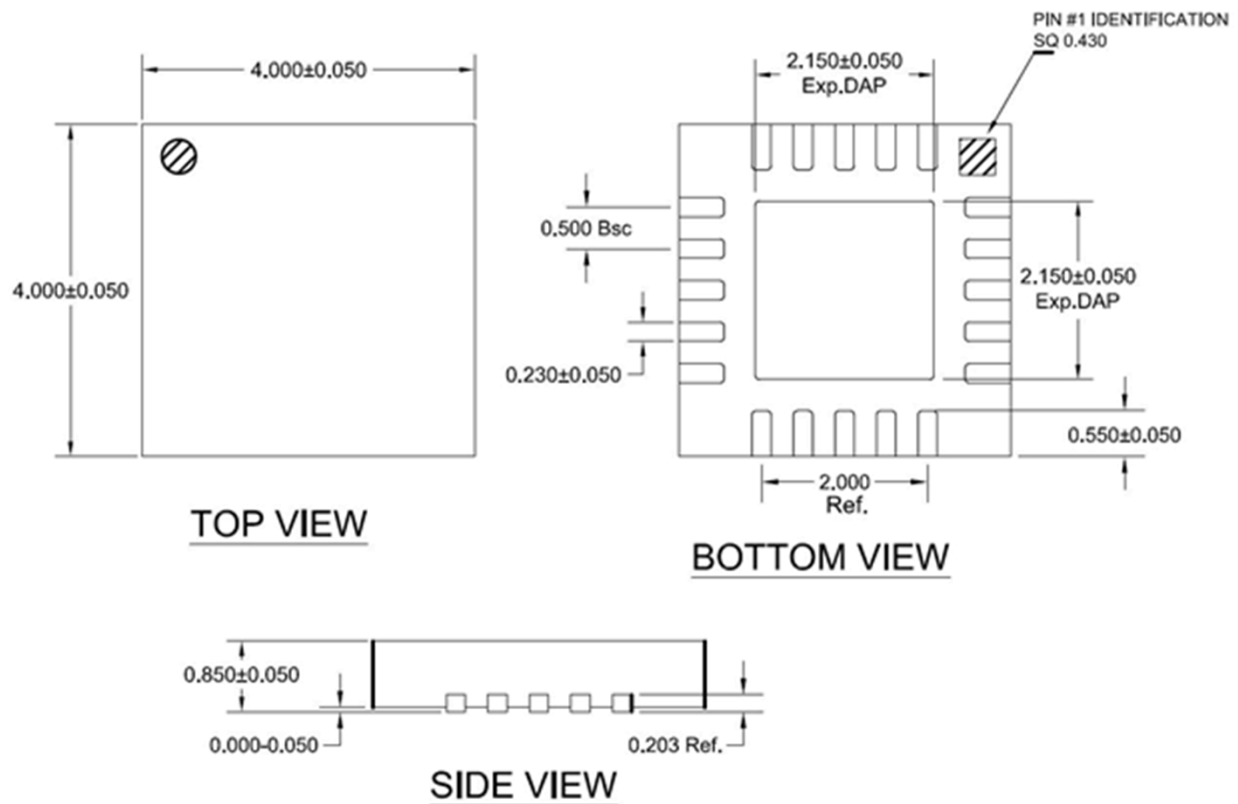
## Typical Performance

Test conditions unless otherwise stated:  $T = +25^{\circ}\text{C}$ ,  $V_{DD} = +12\text{ V}$



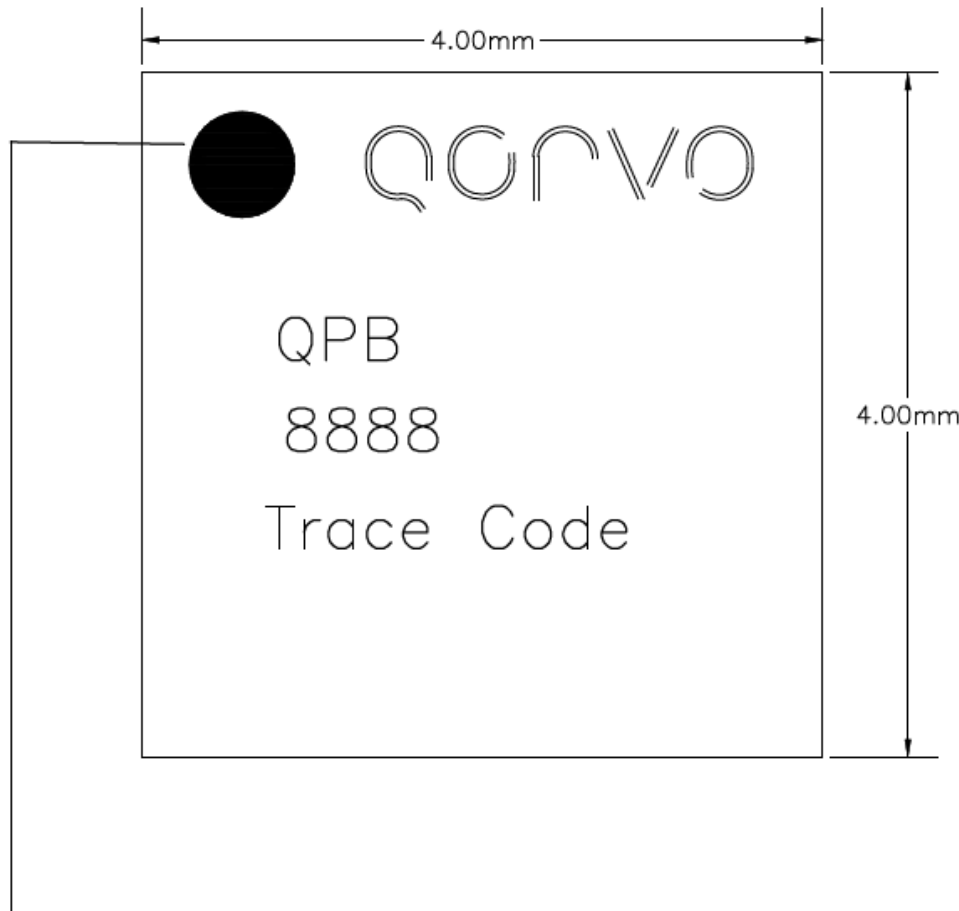


## Package Dimensions



Notes:  
1. Dimensions in millimeters

## Package Marking



Pin 1 Indicator  
Trace Code to be assigned by SubCon

## Pin Configuration and Description

| Pin | Name            | Description   |
|-----|-----------------|---|
| 1   | TIA INPUT A     | Input to the TIA stage of the receiver  |
| 2   | BIAS1           | Biassing for the first stage. The current flowing through this pin is used to control the biasing for the first stage amplifier |
| 3   | NC              | Not Connected   |
| 4   | BIAS1           | Biassing for the first stage. The current flowing through this pin is used to control the biasing for the first stage amplifier |
| 5   | TIA INPUT B     | Input to the TIA stage of the receiver  |
| 6   | BIAS CONTRL     | Bias Control pin not used for normal operation. A 0.1 $\mu$ F capacitor is connected to these pins for filtering                |
| 7   | TIA OUT B       | Output of the first stage TIA   |
| 8   | Post AMP BIAS   | Bias input for the second stage amplifier (post amp)  |
| 9   | Post AMP IN B   | Input for the second stage amplifier (post amp)   |
| 10  | NC              | Not Connected   |
| 11  | Post AMP BIAS B | Biassing for the second stage amplifier (post amp)  |
| 12  | Post AMP OUT B  | Output of the second stage amplifier (post amp)   |
| 13  | NC              | Not Connected   |
| 14  | Post AMP OUT A  | Output of the second stage amplifier (post amp)   |
| 15  | Post AMP BIAS A | Biassing for the second stage amplifier (post amp)  |
| 16  | NC              | Not Connected   |
| 17  | Post AMP IN A   | Input for the second stage amplifier (post amp)   |
| 18  | Post AMP BIAS   | Bias input for the second stage amplifier (post amp)  |
| 19  | TIA OUT A       | Output of the first stage TIA   |
| 20  | BIAS CONTRL     | Bias Control pin not used for normal operation. A 0.1 $\mu$ F capacitor is connected to these pins for filtering                |

## Handling Precautions

| Parameter                        | Rating   | Standard                 |
|----------------------------------|----------|--------------------------|
| ESD – Human Body Model (HBM)     | Class 1A | ESDA / JEDEC JS-001-2012 |
| ESD – Charged Device Model (CDM) | Class C3 | JEDEC JESD22-C101F       |
| MSL – Moisture Sensitivity Level | Level 2  | 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.

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:

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

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

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

## Important Notice

The information contained herein is believed to be reliable; however, Qorvo makes no warranties regarding the information contained herein and assumes no responsibility or liability whatsoever for the use of the information contained herein. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for Qorvo products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information. **THIS INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

Without limiting the generality of the foregoing, Qorvo products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.

Copyright 2019 © Qorvo, Inc. | Qorvo is a registered trademark of Qorvo, Inc.