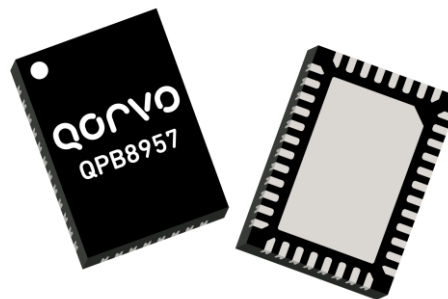


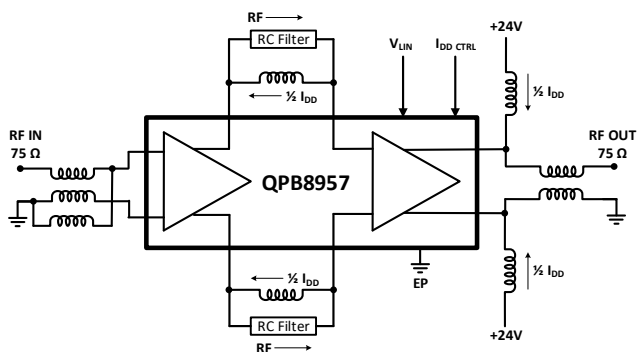
### Product Overview

The QPB8957 is a GaAs pHEMT/MESFET 75-ohm Doubler RF amplifier IC featuring over 28dB of flat gain and low noise. This IC is designed to support applications up to 1003MHz using a single 24V supply. The QPB8957 offers low noise and low distortion at high efficiency consuming only 8.4W in a 5x7 QFN package. Its compact size and low  $\Theta_{jc}$  enable integration that is ideally suited for hybrid module or an alternative to hybrid module applications.



40 pin 5x7 QFN Package

### Functional Block Diagram



### Key Features

- High Gain: 28dB @ 1003MHz
- Adjustable Bias
- 50 - 1003 MHz BW
- 57dBmV/ch virtual 1.0GHz, at 15dB tilt
- Low Noise: 4.5dB
- Excellent Composite Distortion
- pHEMT / MESFET device technologies
- Compact Size: 40P 5x7 QFN
- Power Consumption (24V, 350mA – 8.4W)

### Applications

- DOCSIS 3.0
- Broadband CATV hybrid modules
- Head End CMTS Equipment
- 75-ohm amplifiers

### Ordering Information

| Part No.    | Description               |
|-------------|---------------------------|
| QPB8957SB   | Sample bag with 5 pieces  |
| QPB8957SR   | 7" Reel with 100 pieces   |
| QPB8957TR13 | 13" Reel with 2500 pieces |
| QPB8957EVB  | 47 – 1003MHz PCBA         |

### Absolute Maximum Ratings

| Parameter                         | Rating        |
|-----------------------------------|---------------|
| Supply Voltage ( $V_{DD}$ )       | +28V (5min)   |
| Supply Current ( $I_{DD}$ )       | 500mA         |
| Maximum Input Level (single tone) | +70dBmV       |
| Operating Temperature Range       | -40 to +100°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.

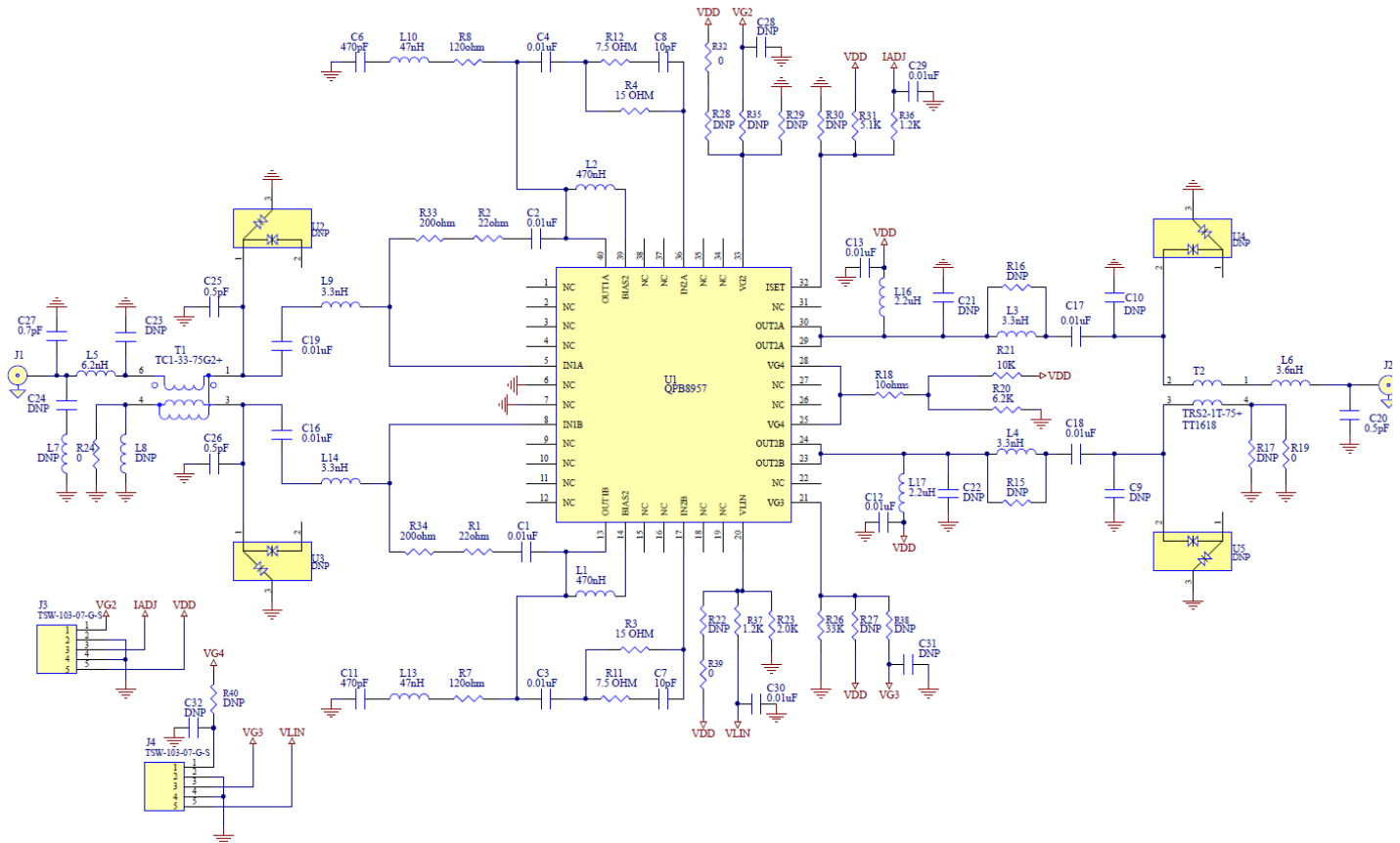
### Electrical Specifications – 24V

| Parameter                   | Condition <sup>(1)</sup>                                                         | Min | Typ  | Max  | Unit |
|-----------------------------|----------------------------------------------------------------------------------|-----|------|------|------|
| Supply Voltage ( $V_{DD}$ ) |                                                                                  |     | 24   |      | V    |
| Supply Current ( $I_{DD}$ ) | $V_{DD}$ total current                                                           |     | 350  |      | mA   |
| Frequency Range             |                                                                                  | 50  |      | 1003 | MHz  |
| Gain <sup>2</sup>           | 1003MHz                                                                          |     | 28   |      | dB   |
| Gain Flatness               | Max. deviation from line using least squares fit from 50 to 1003 MHz             |     | ±0.5 |      | dB   |
| Gain Slope                  | Gain(1003MHz) - Gain(50MHz)                                                      |     | 1.0  |      | dB   |
| Reverse Isolation           |                                                                                  |     | -42  |      | dB   |
| Input Return Loss           |                                                                                  |     | 18   |      | dB   |
| Output Return Loss          |                                                                                  |     | 18   |      | dB   |
| Noise Figure                |                                                                                  |     | 4.5  |      | dB   |
| CSO                         | 80 NTSC + 72 QAM (-6dB offset), 56dBmV/ch virtual output at 1003MHz @15.6dB tilt |     | -79  |      | dBc  |
| CTB                         |                                                                                  |     | -78  |      | dBc  |
| CCN                         |                                                                                  |     | 63.5 |      | dB   |
| OIP2                        | Low band: 225MHz, 325MHz, 15dBm/tone                                             |     | 90   |      | dBm  |
|                             | High band: 900MHz, 950.5MHz, 15dBm/tone                                          |     | 85   |      | dBm  |
| OIP3                        | Low band: 225MHz, 325MHz, 15dBm/tone                                             |     | 53   |      | dBm  |
|                             | High band: 900MHz, 950.5MHz, 15dBm/tone                                          |     | 49   |      | dBm  |
| Output P1dB                 | 1003 MHz                                                                         |     | 28   |      | dBm  |
| Thermal Resistance          | $\Theta_{JB}$ (Junction to backside of QFN)                                      |     | 6    |      | °C/W |

#### Notes:

1. Typical performance at these conditions: Temp = +25°C,  $V_{DD}$  = +24V, 75Ω system, Full band unless otherwise noted

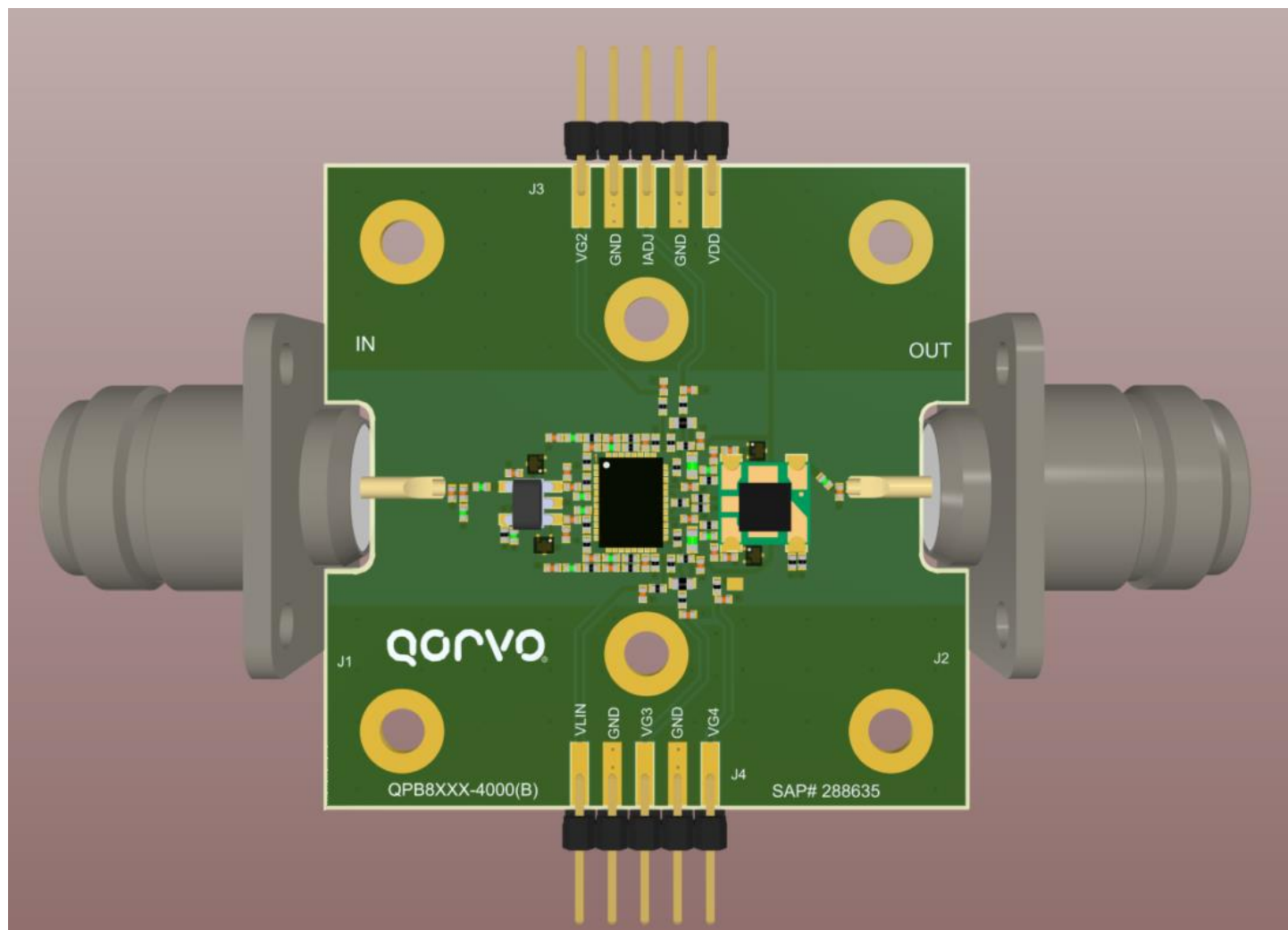
### Evaluation Board Schematic



**QPB8957****75Ω 28dB CATV Doubler Amplifier 50 - 1003MHz****Evaluation Board Bill of Materials**

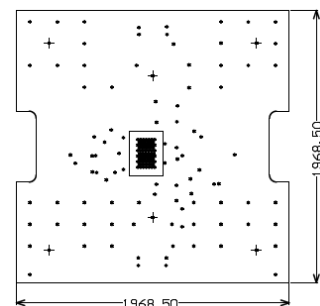
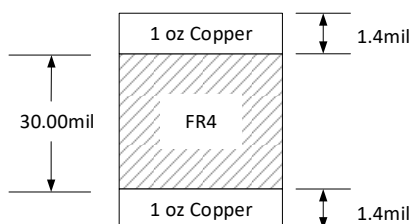
| Reference Designator                                         | Description                              | Manufacturer    | PART #             |
|--------------------------------------------------------------|------------------------------------------|-----------------|--------------------|
| U1                                                           | 1GHz, 28dB Power Doubler                 | Qorvo           | QPB8957            |
| C1,C2,C3,C4,C12,<br>C13,C16,C17,C18,<br>C19,C29,C30          | CAP, 0.01uF, ±10%, 50V, X7R, 0402        | MURATA          | GRM155R71H103KA88D |
| C20,C25,C26                                                  | CAP0402, 0.5pF, ±0.1pF, 50V, C0G, HIQ    | MURATA          | GJM1555C1HR50BB01D |
| C7,C8                                                        | CAP0402, 10pF, ±2%, 50V, C0G, HIQ        | MURATA          | GJM1555C1H100GB01D |
| C6,C11                                                       | CAP, 470pF, 5%, 50V, C0G, 0402           | MURATA          | GRM1555C1H471JA01D |
| C27                                                          | CAP, 0.7pF, +/-0.05pF, 50V, C0G, 0402    | MURATA          | GRM1555C1HR70WA01D |
| R3,R4                                                        | RES, 15 OHM, 1%, 1/16W, 0402             | Kamaya          | RMC1/16S-150FTH    |
| R18                                                          | RES, 10 OHM, 1%, 1/16W, 0402             | Panasonic       | ERJ-2RKF10R0X      |
| R19,R24                                                      | RES, 0 OHM, 5%, 1/10W, 0402              | Kamaya          | RMC1/16SJPTH       |
| R11,R12                                                      | RES, 7.5 OHM, 5%, 1/16W, 0402            | Kamaya          | RMC1/16S-7R5JTH    |
| R33,R34                                                      | RES, 200 OHM, 1%, 1/16W, 0402            | Panasonic       | ERJ-2RKF2000X      |
| R21                                                          | RES, 10K, 1%, 1/16W, 0402                | Panasonic       | ERJ-2RKF1002X      |
| R23                                                          | RES, 2.0K, 1%, 1/16W, 0402               | Panasonic       | ERJ-2RKF2001X      |
| R26                                                          | RES, 33K, 1%, 1/16W, 0402                | Yageo           | RC0402FR-0733KL    |
| R31                                                          | RES, 5.1K, 1%, 1/10W, 0402               | Panasonic       | ERJ-2RKF5101X      |
| R20                                                          | RES, 6.2K, 1%, 1/10W, 0402               | Panasonic       | ERJ-2RKF6201X      |
| R32,R39                                                      | RES, 0 OHM, 0603                         | Kamaya          | RMC1/16JPTP        |
| R36,R37                                                      | RES, 1.2K, 5%, 1/16W, 0402               | Panasonic       | ERJ-2GEJ122        |
| R1,R2                                                        | RES, 22 OHM, 5%, 1/16W, 0402             | Panasonic       | ERJ-2GEJ220        |
| R7,R8                                                        | 120 OHM,1%,1/16W,0402 LEAD FREE          | KOA             | RK73H1ETTP1200F    |
| L1,L2                                                        | IND, 470nH, ±5%, 310mA, 650mHZ, 0402     | Coilcraft, Inc. | 0402AF-471XJLW     |
| L10,L13                                                      | IND, 47nH, 5%, M/L, 0402                 | MURATA          | LQG15HN47NJ02D     |
| L3,L4,L9,L14                                                 | IND, 3.3nH, +/-0.1nH, T/F, 0402          | MURATA          | LQP15MN3N3B02D     |
| L6                                                           | IND, 3.6nH, +/-0.1nH, T/F, 0402          | MURATA          | LQP15MN3N6B02D     |
| L5                                                           | IND, 6.2nH, +/-0.1nH, T/F, 0402          | MURATA          | LQP15MN6N2B02D     |
| L16,L17                                                      | IND, 2.2uH, 20%, 0.36A, 0.7mm, W/W, 0603 | Taiyo Yuden     | BRL1608T2R2M       |
| T1                                                           | XFMR, SMT, 75 OHM, CD542, 1:1 BALUN, TC1 | Mini Circuits   | TC1-33-75G2+       |
| T2                                                           | Transformer, 2:1, 5 to 1200 MHz, TT1618  | Minicircuits    | TRS2-1T-75+        |
| R15,R16,R17,R22,<br>R27,R28,R29,R30,<br>R35,R38,R40          | Not Populated                            |                 |                    |
| C9,C10,C21,C22,C23,<br>C24,C28,C31,C32,L7,<br>L8,U2,U3,U4,U5 | Not Populated                            |                 |                    |

### Evaluation Board Assembly Drawing

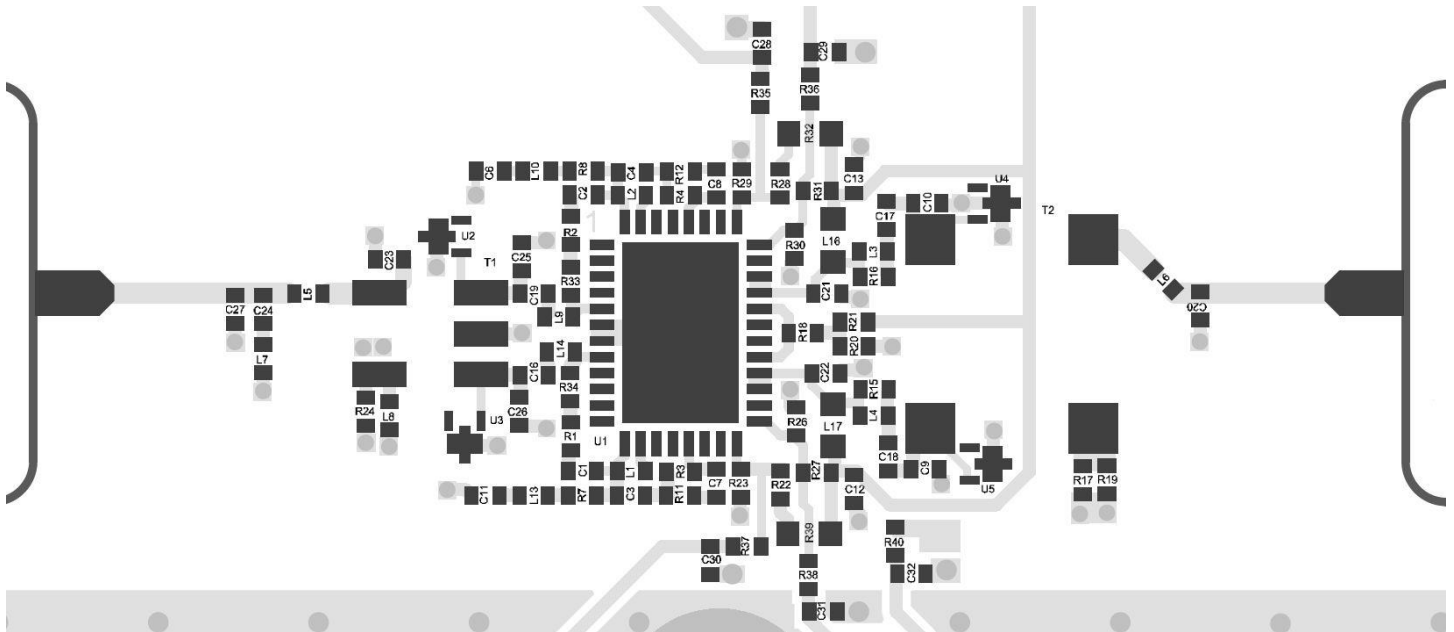


#### EVB PCB Material and Stack-up

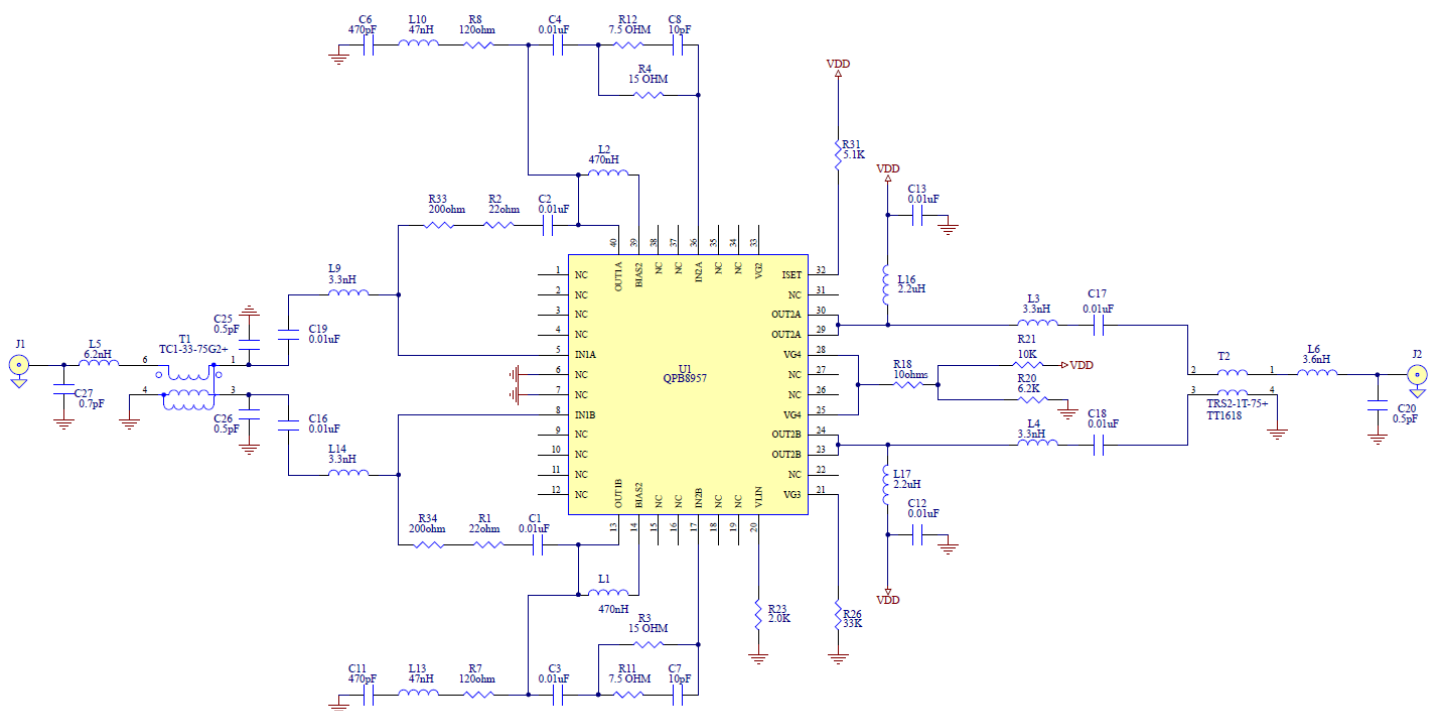
Board Material: 0.030" FR4,  $\epsilon_r=4.2$   
 Plating: 1oz Copper  
 Board Dimension: 1.9685" x 1.9685"



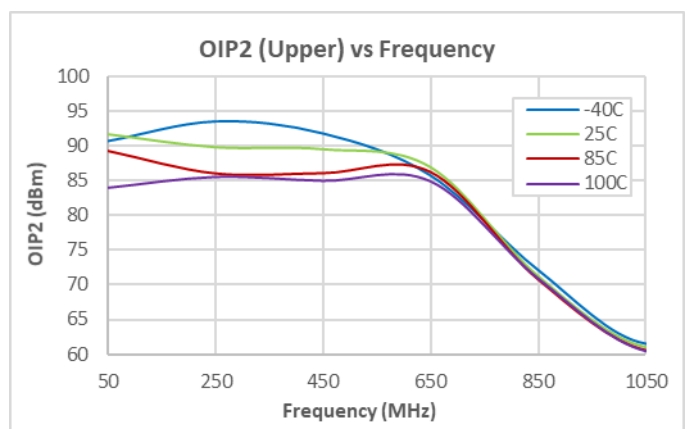
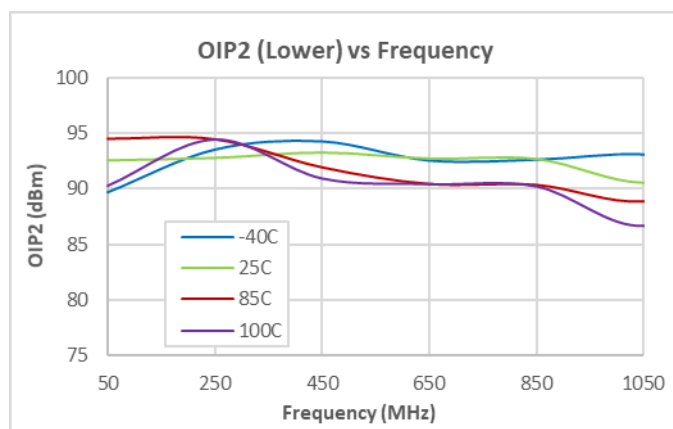
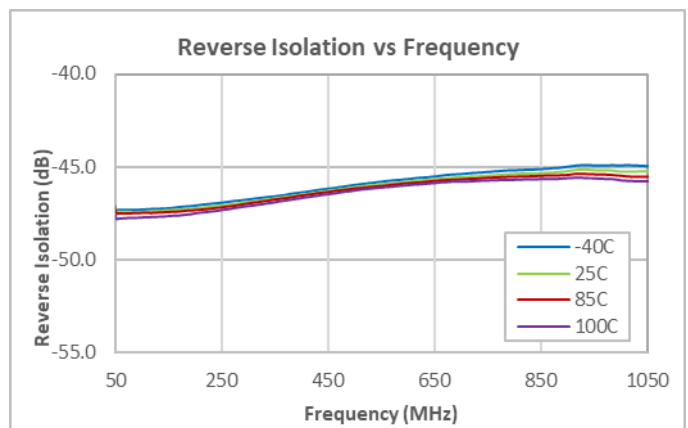
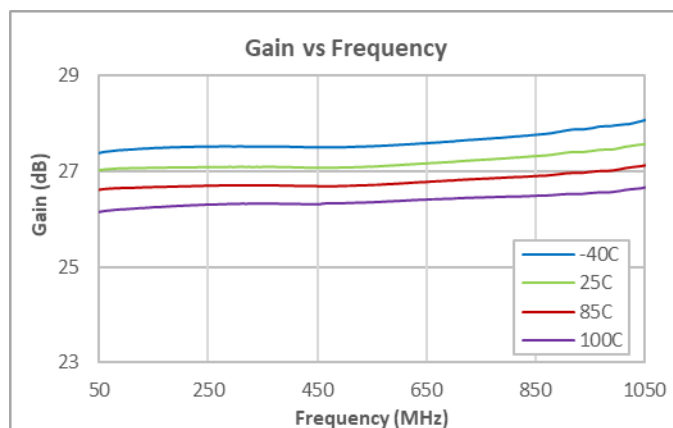
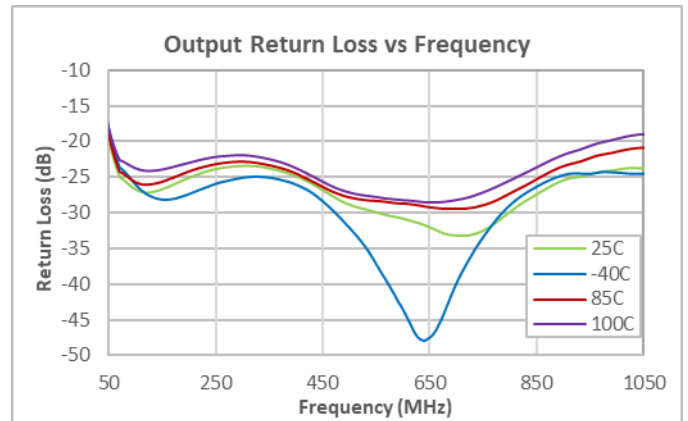
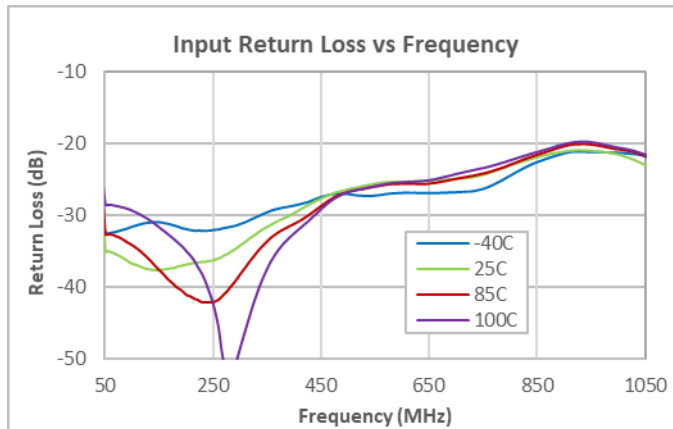
## Evaluation Board Component Placement



## Typical Application Schematic; 24V



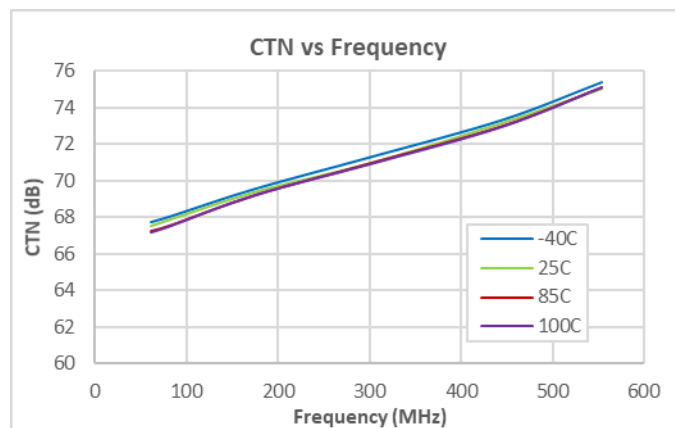
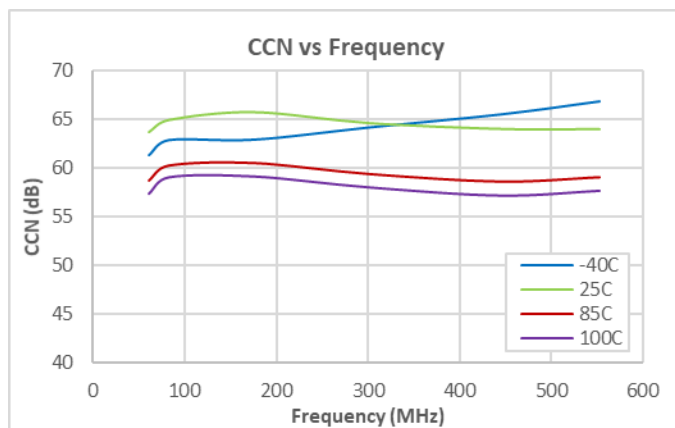
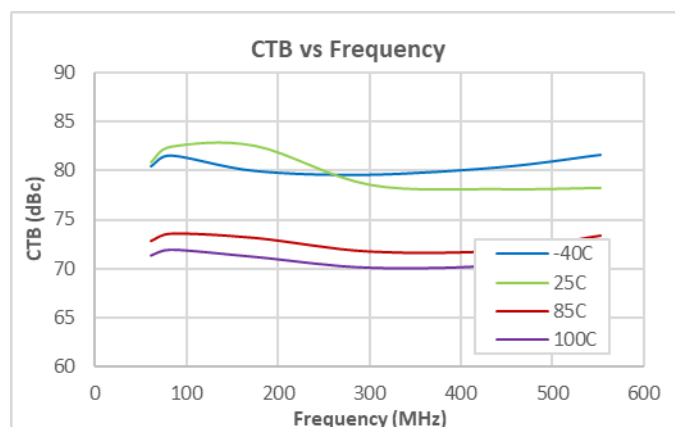
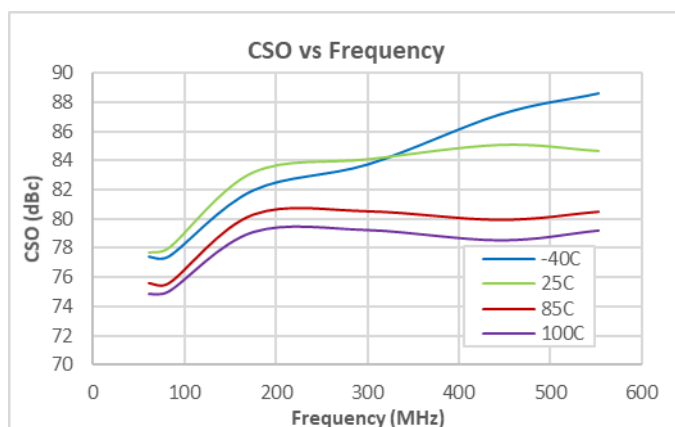
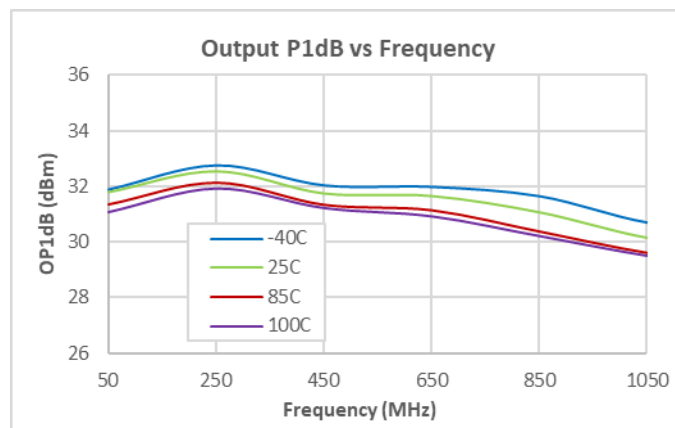
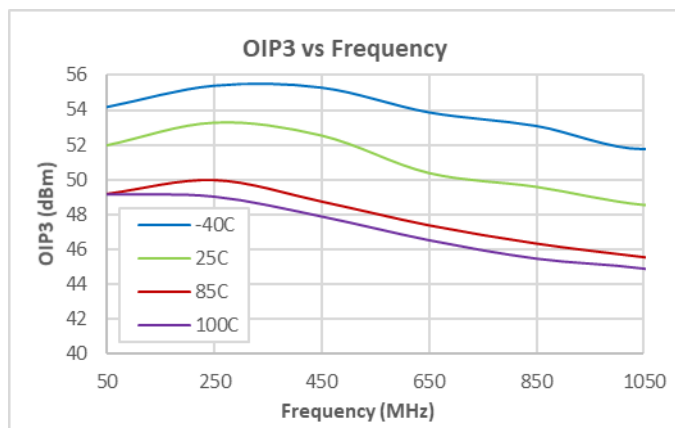
### Performance Data 24V



#### Test Conditions:

1. Test conditions unless otherwise noted:  $V_{DD} = +24V$ ,  $Z_o = 75\Omega$
2. OIP2: +15dBm per Tone.

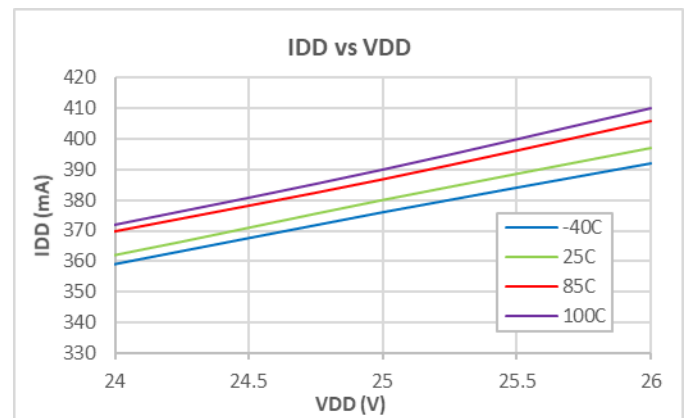
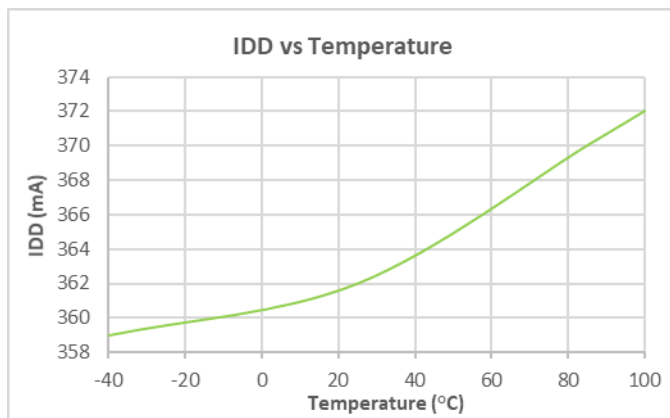
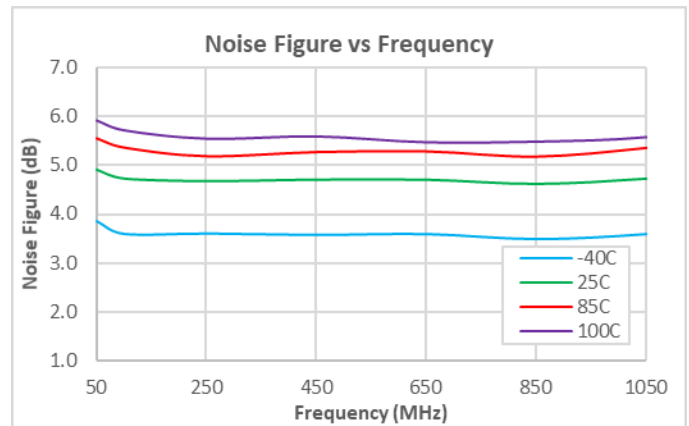
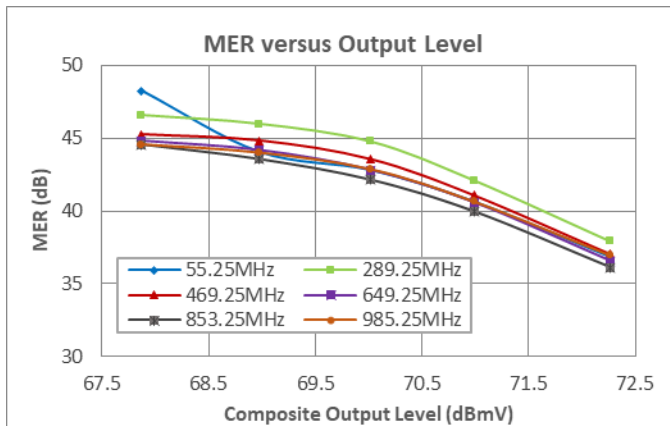
## Performance Data 24V



### Test Conditions:

1. Test conditions unless otherwise noted:  $V_{DD} = +24V$ ,  $Z_o = 75\Omega$
2. OIP3: +15dBm per Tone.
3. CSO, CTB, CCN, CTN: 80 NTSC + 72 QAM (-6dB offset), 56dBmV/ch out, 15.6dB tilt

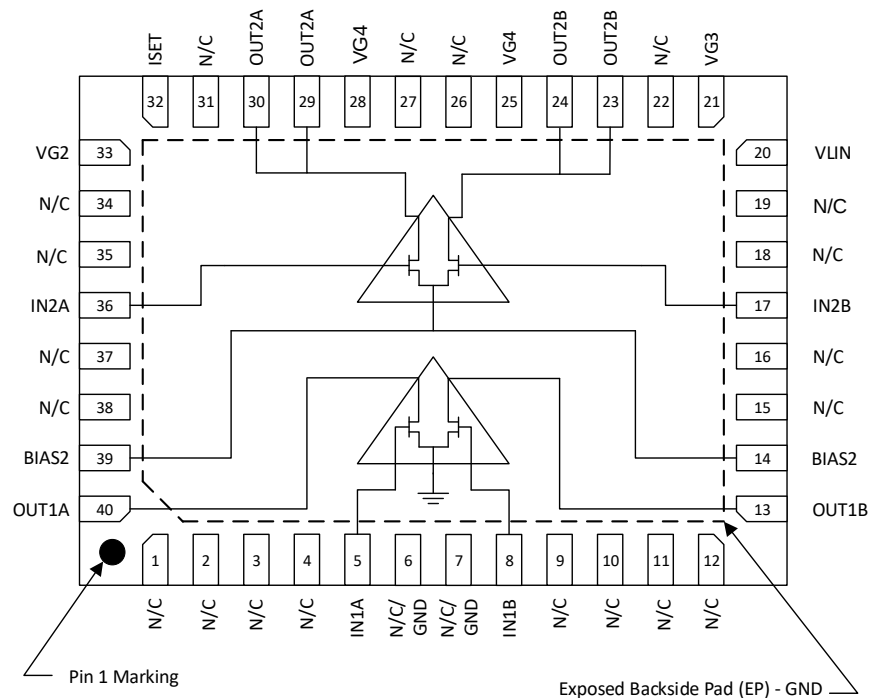
### Performance Data 24V



#### Test Conditions:

1. Test conditions unless otherwise noted:  $V_{DD} = +24\text{ V}$ ,  $Z_o = 75\Omega$
2. MER: 160 QAM256 Channels Flat Tilt, 57-1003MHz, ITU-T J.83, Annex B

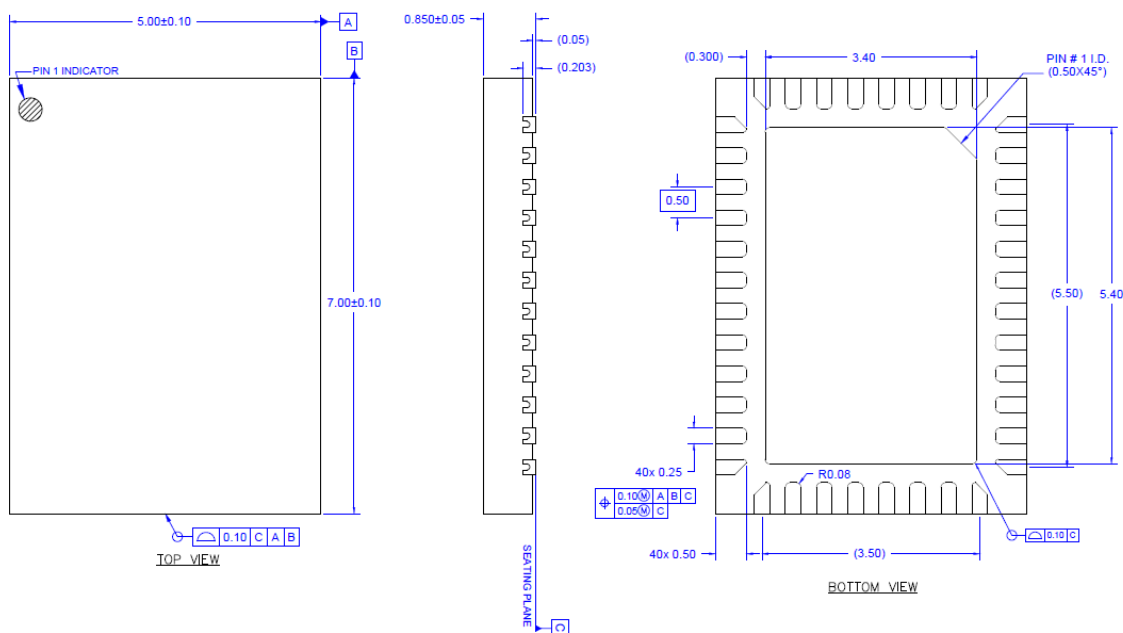
### Pin Configuration and Description



Top View

| Pad No.                                                                   | Label   | Description                                                                                                                          |
|---------------------------------------------------------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------|
| 5                                                                         | IN1A    | RF input 1A                                                                                                                          |
| 8                                                                         | IN1B    | RF input 1B                                                                                                                          |
| 13                                                                        | OUT1B   | RF output 1B                                                                                                                         |
| 14, 39                                                                    | BIAS2   | 2nd Stage virtual ground                                                                                                             |
| 17                                                                        | IN2B    | RF input 2B                                                                                                                          |
| 20                                                                        | VLIN    | Linearizer current set                                                                                                               |
| 21                                                                        | VG3     | VG3 adjust                                                                                                                           |
| 23, 24                                                                    | OUT2B   | RF output 2B                                                                                                                         |
| 25, 28                                                                    | VG4     | VG4 set                                                                                                                              |
| 29, 30                                                                    | OUT2A   | RF output 2A                                                                                                                         |
| 32                                                                        | ISET    | IDD set                                                                                                                              |
| 33                                                                        | VG2     | No Connect                                                                                                                           |
| 36                                                                        | IN2A    | RF input 2A                                                                                                                          |
| 40                                                                        | OUT1A   | RF output 1A                                                                                                                         |
| 1, 2, 3, 4, 9, 10, 11, 12, 15, 16, 18, 19, 22, 26, 27, 31, 34, 35, 37, 38 | N/C     | No Connect                                                                                                                           |
| 6, 7                                                                      | N/C/GND | No Connect or Ground                                                                                                                 |
| Backside Paddle                                                           | GND     | Ground. Use recommended via pattern to minimize inductance and thermal resistance. See PCB Mounting Pattern for suggested footprint. |

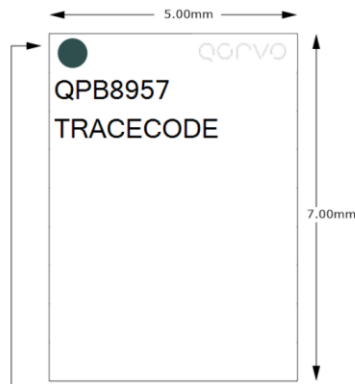
## Package Outline



### Notes:

1. Dimensions in millimeters

### Package Marking



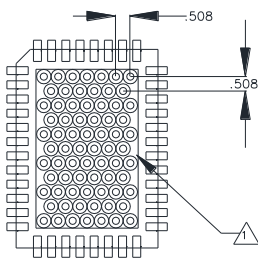
Pin 1 Indicator

Qorvo Logo - Use Qo5D

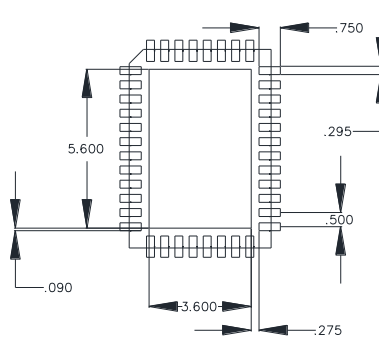
Trace Code to be assigned by SubCon

1. Dimension and tolerance formats conform to ASME Y14.4M-1994.
2. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.
3. Co-planarity applies to the exposed ground/thermal pad as well as the contact pins.
4. Package body length/width does not include plastic flash protrusion across mold parting line.

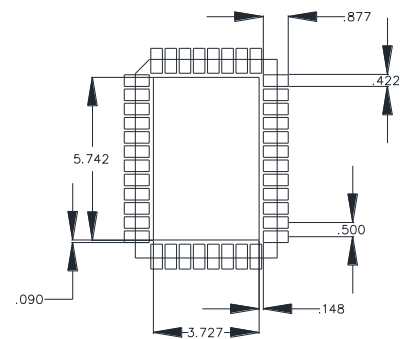
### Recommended Mounting Pattern



VIA PATTERN



LAND PATTERN



SOLDER MASK

#### NOTES:



GROUND/THERMAL VIAS AND MOUNTING HOLES ARE ESSENTIAL FOR THE PROPER DEVICE PERFORMANCE. DO NOT OMIT. VIAS SHOULD USE A .35mm (#80/.0135") DIAMETER DRILL AND HAVE A FINAL, PLATED THRU DIAMETER OF .25mm (.010").

2. TO ENSURE RELIABLE OPERATION, DEVICE GROUND PADDLE-TO-GROUND PAD SOLDER JOINT IS CRITICAL. NO SOLDER MASK ON BACKSIDE OF PCB IN HEAT SINK CONTACT AREA.
3. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.

- Ensure good package backside paddle solder attach for reliable operation and best electrical performance.
- Place mounting screws near the part to fasten a back-side heat sink.
- Do not apply solder mask to the back side of the PC board in the heat sink contact region.



# QPB8957

## 75Ω 28dB CATV Doubler Amplifier 50 - 1003MHz

- Ensure that the backside via region makes good physical contact with the heat sink.

### Handling Precautions

| Parameter                        | Rating     | Standard                   |
|----------------------------------|------------|----------------------------|
| ESD – Human Body Model (HBM)     | 1B (500V)  | ANSI / ESDA / JEDEC JS-001 |
| ESD – Charged Device Model (CDM) | C3 (1000V) | ANSI / ESDA / JEDEC JS-002 |
| MSL – Moisture Sensitivity Level | MSL3       | 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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- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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