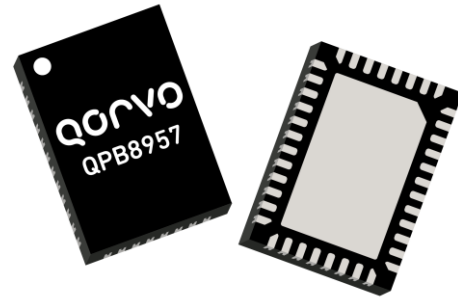


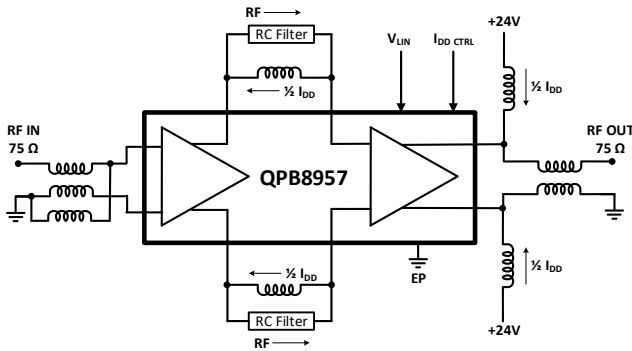
### Product Overview

The QPB8957 is a GaAs pHEMT/MESFET 75-ohm Doupler 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.

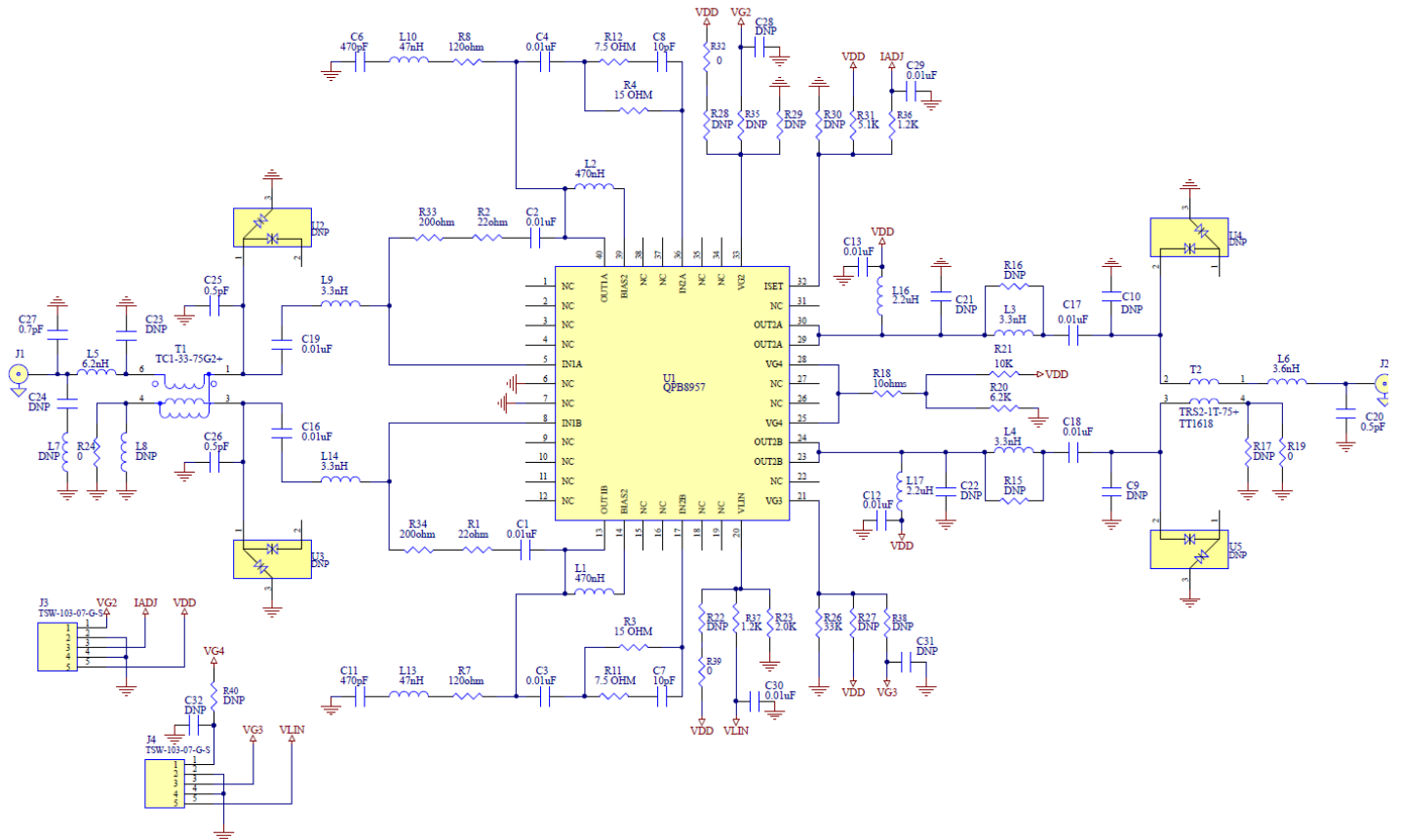
## Electrical Specifications – 24V

| 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

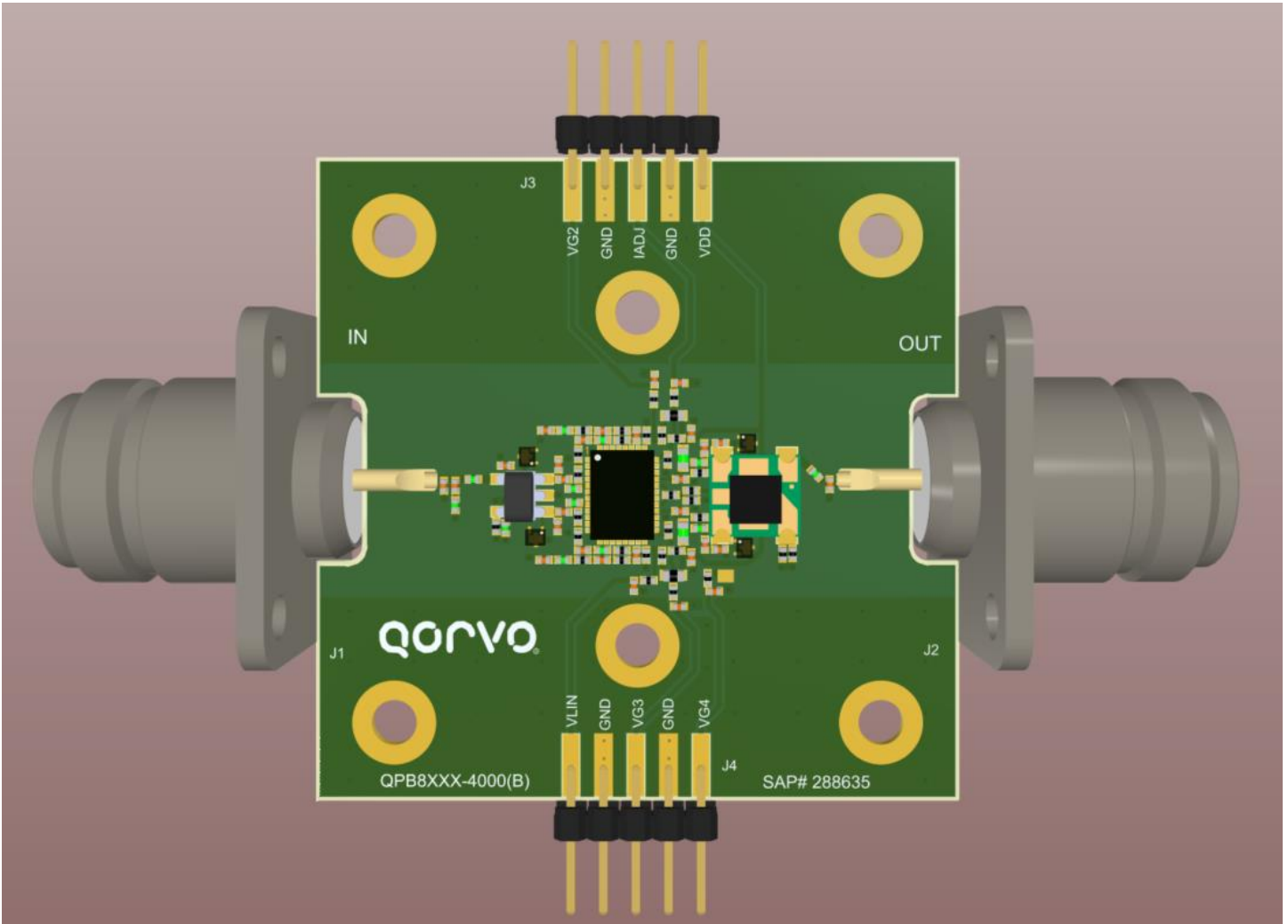
## Evaluation Board Schematic



**Evaluation Board Bill of Materials**

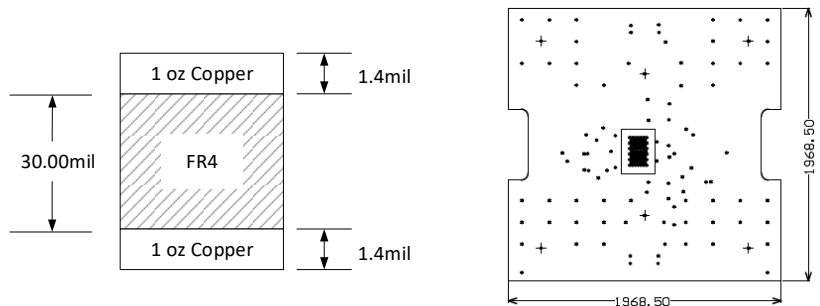
| Reference Designator   | Description                              | Manufacturer    | PART #             |
|--|--|-----------------|--------------------|
| U1   | 1GHz, 28dB Power Doubler                 | Qorvo           | QPB8957            |
| C1,C2,C3,C4,C12,<br>C13,C16,C17,C18,<br>C19,C29,C30          | 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

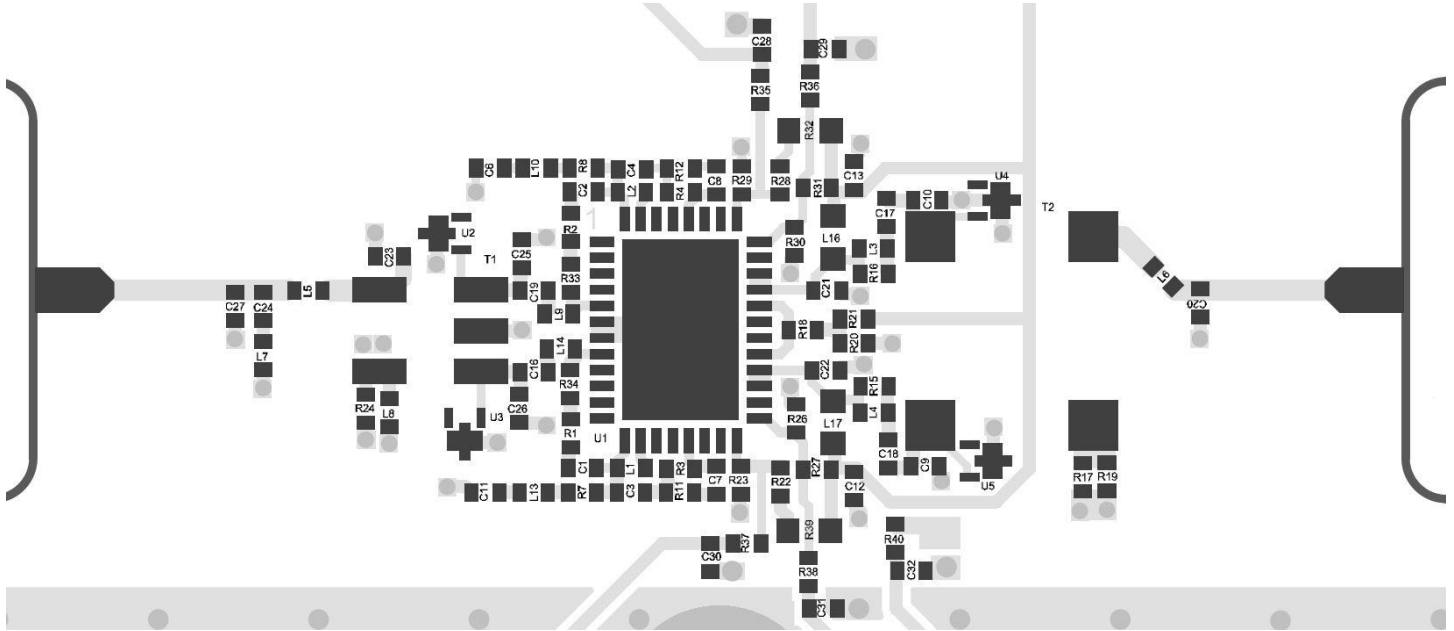


#### EVB PCB Material and Stack-up

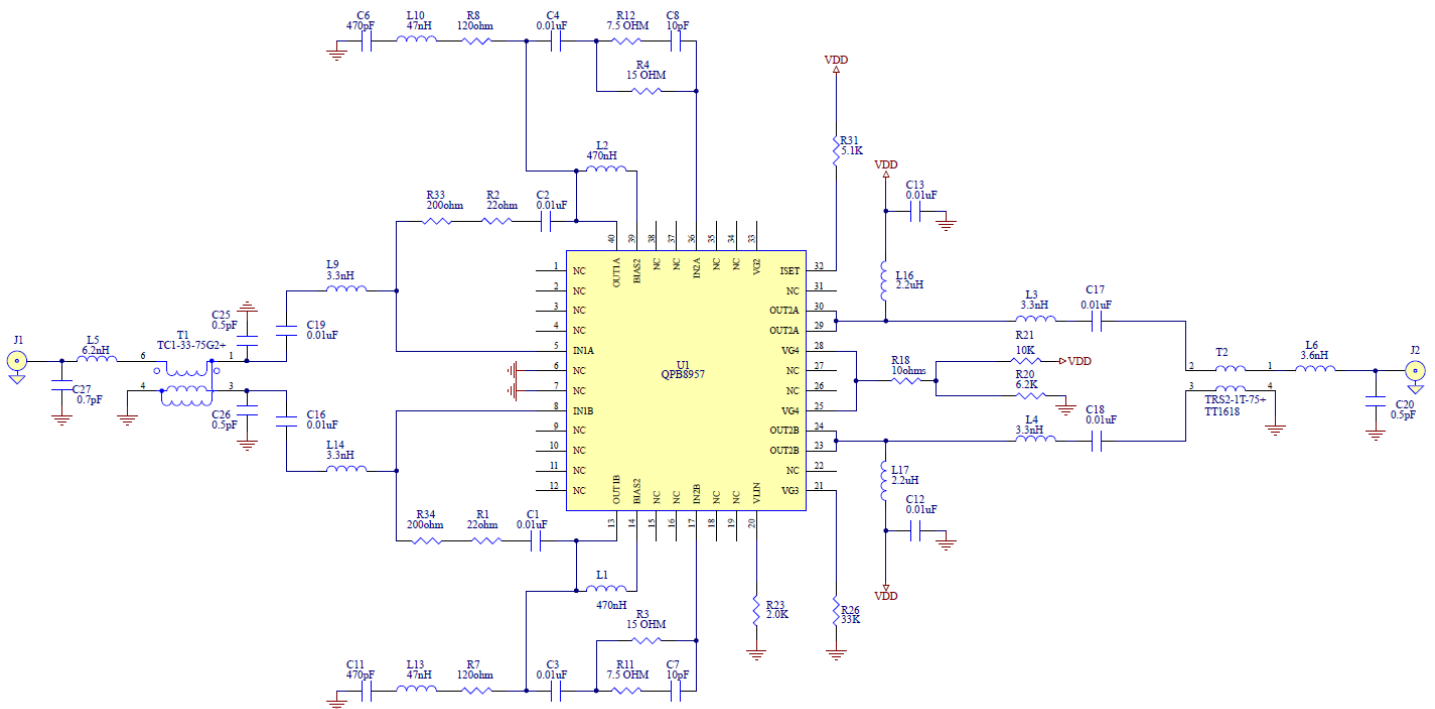
Board Material: 0.030" FR4,  $\epsilon_r=4.2$   
 Plating: 1oz Copper  
 Board Dimension: 1.9685" x 1.9685"



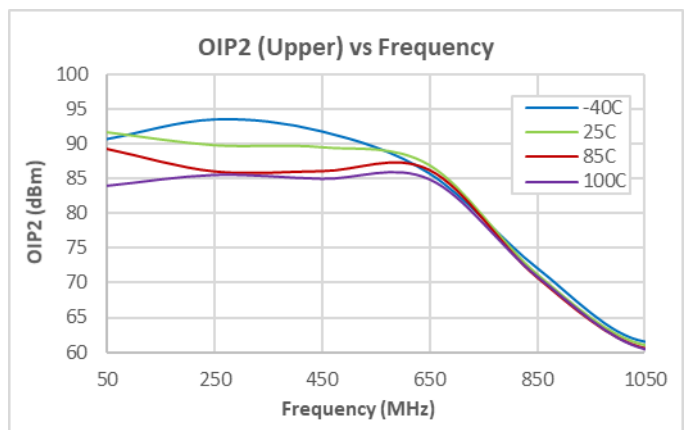
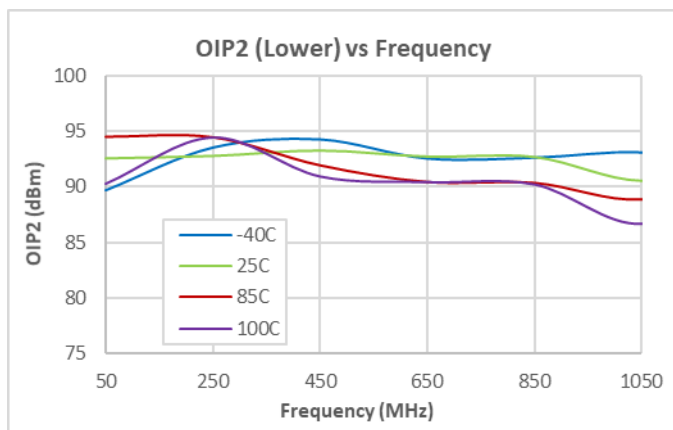
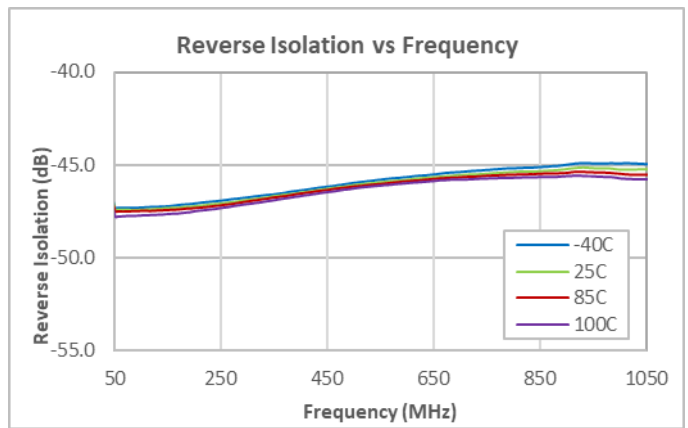
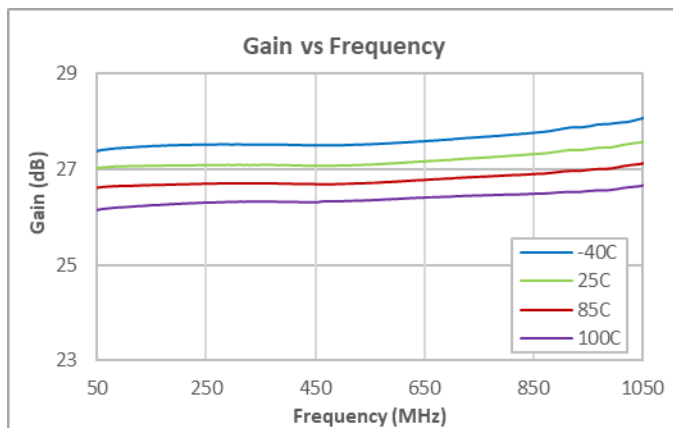
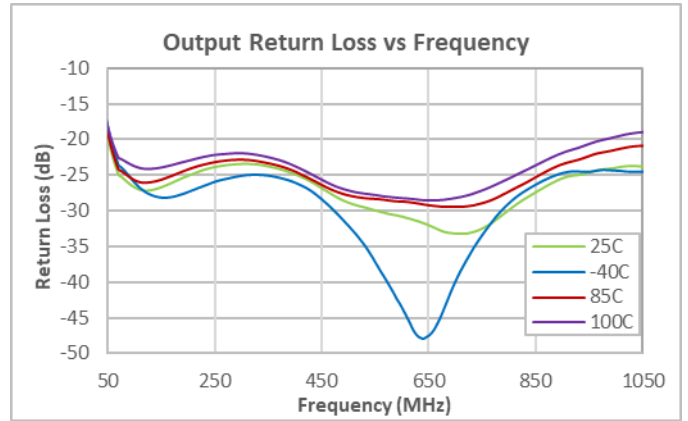
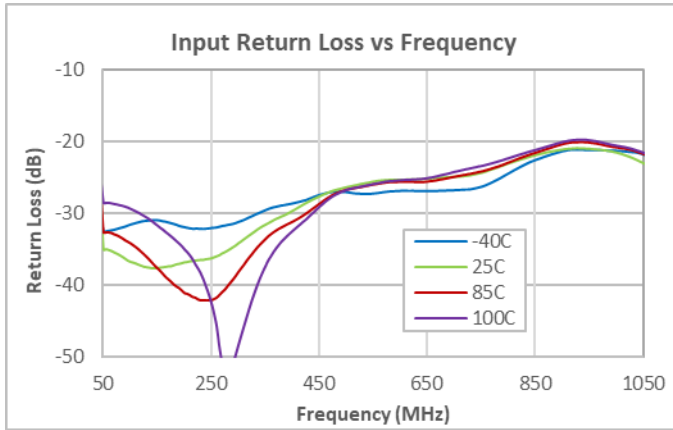
### Evaluation Board Component Placement



### Typical Application Schematic; 24V



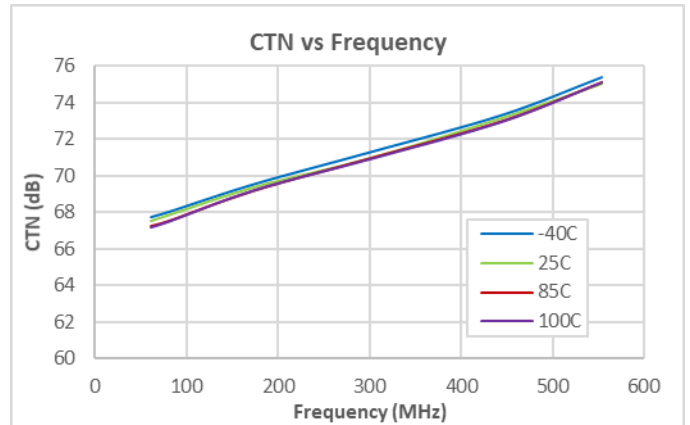
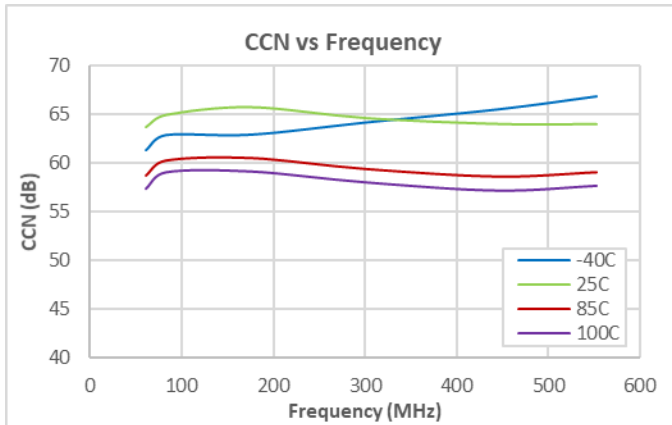
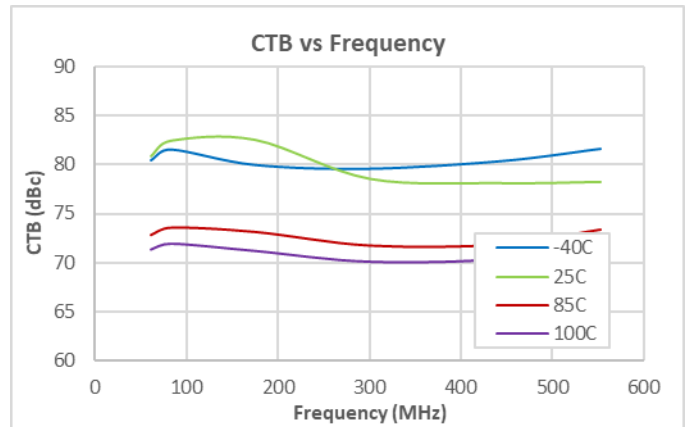
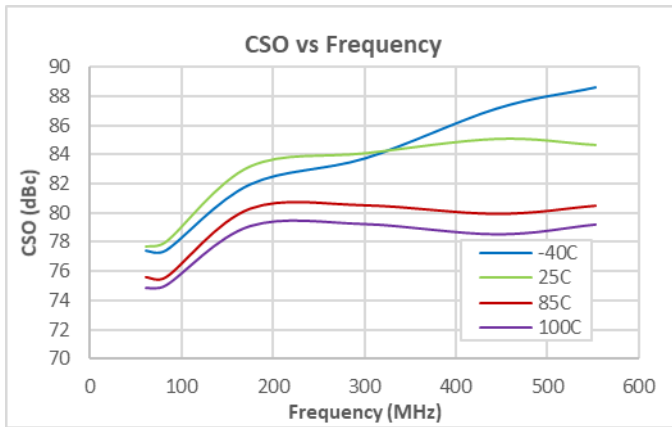
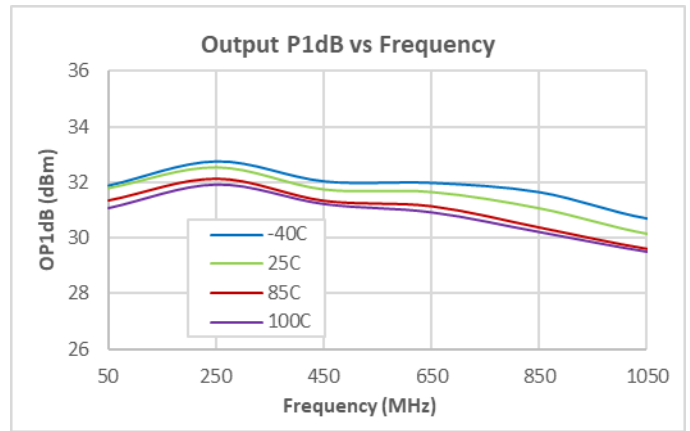
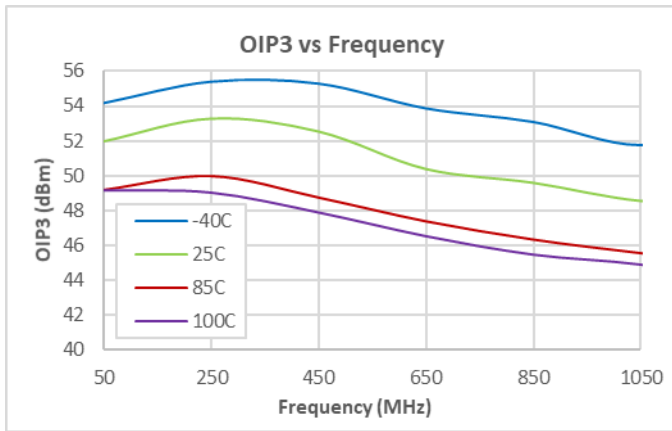
Performance Data 24V



Test Conditions:

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

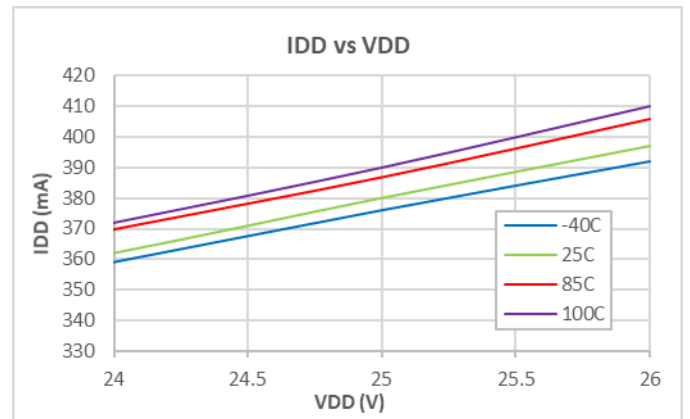
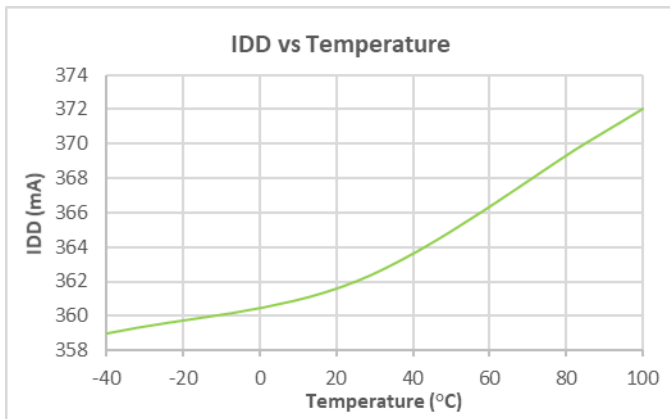
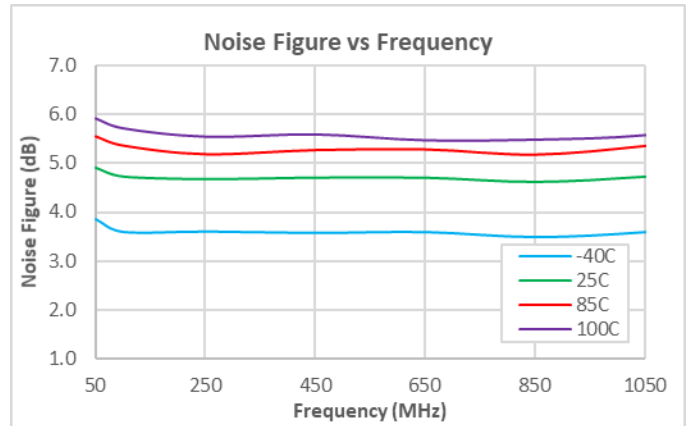
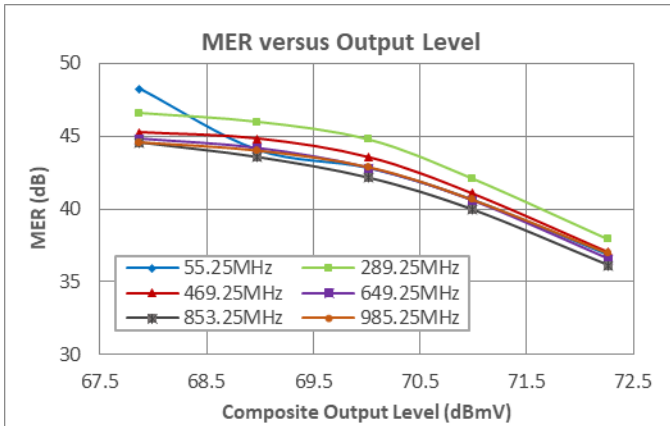
**Performance Data 24V**



- 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



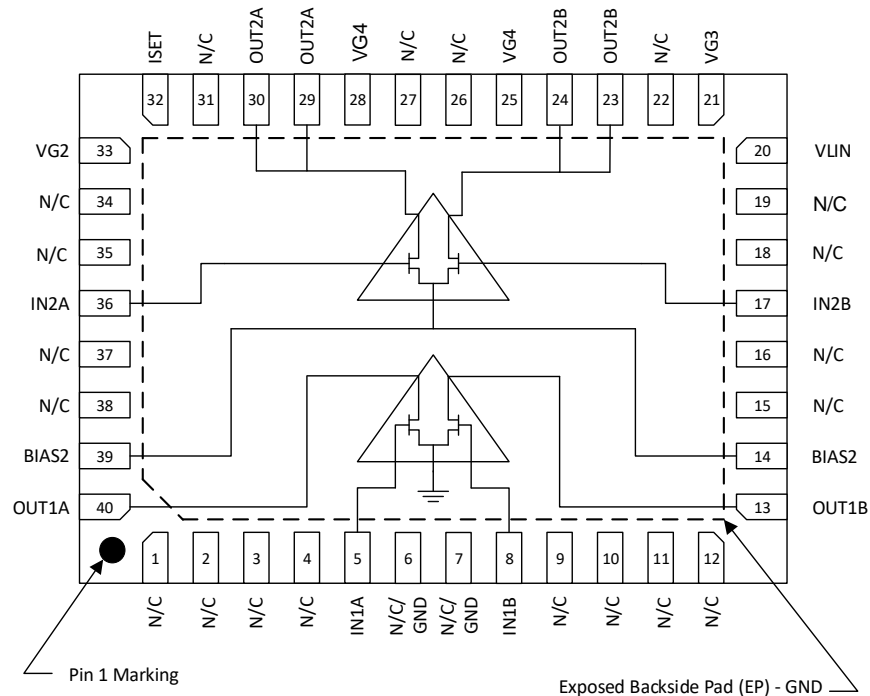
Performance Data 24V



Test Conditions:

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

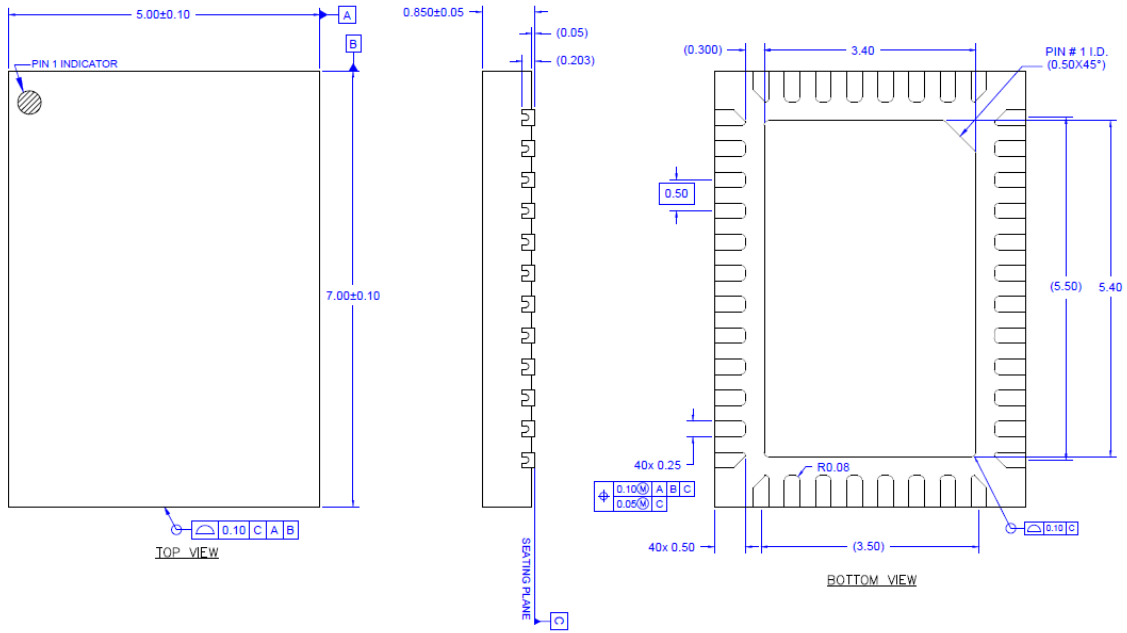
## Pin Configuration and Description



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. |

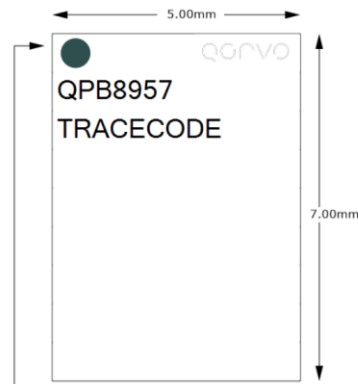
Package Outline



Notes:

1. Dimensions in millimeters

### Package Marking



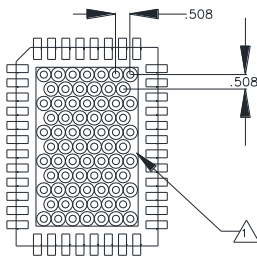
Pin 1 Indicator

Qorvo Logo - Use Qo5D

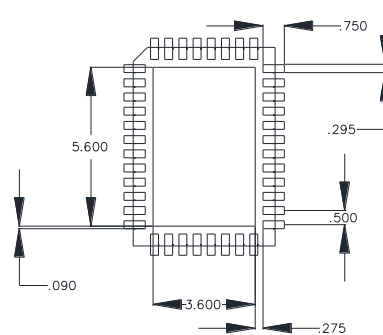
Trace Code to be assigned by SubCon

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.

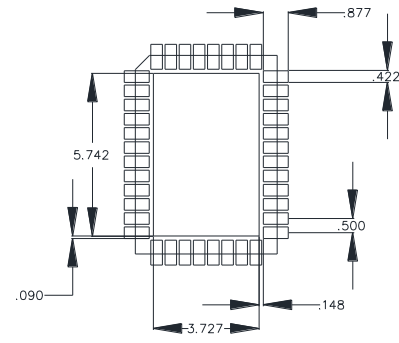
### Recommended Mounting Pattern



VIA PATTERN



LAND PATTERN



SOLDER MASK

NOTES:

1. 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.

- 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)

## 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 2020 © Qorvo, Inc. | Qorvo is a registered trademark of Qorvo, Inc.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.