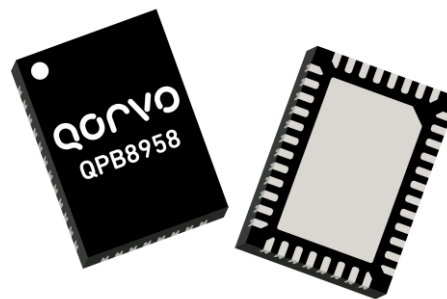


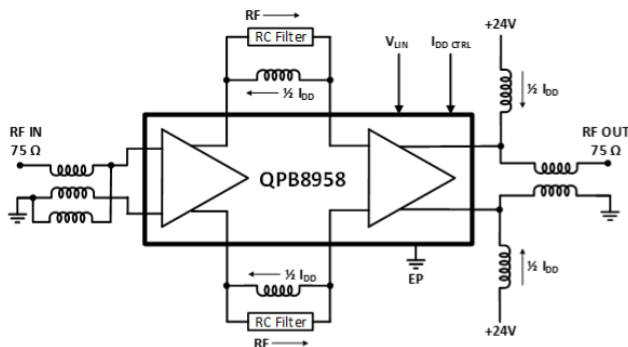
### Product Overview

The QPB8958 is a GaAs pHEMT/MESFET 75-ohm push-pull RF amplifier IC featuring over 34dB of flat gain and low noise. This IC is designed to support applications up to 1003MHz using a single 24V supply. The QPB8958 offers low noise and low distortion at high efficiency consuming only 5.8W in a 5x7 QFN package. Its compact size and low  $\Theta_{jc}$  enable integration that is ideally suited for hybrid module applications.



40 pin 5x7 QFN Package

### Functional Block Diagram



### Key Features

- High Gain: 34dB @ 1003MHz
- Adjustable Bias
- 50 - 1003 MHz BW
- 46dBmV/ch flat tilt
- Low Noise: 4.5dB
- Excellent Composite Distortion
- pHEMT / MESFET device technologies
- Compact Size: 40P 5x7 QFN
- Power Consumption (24V, 260mA –5.8W)

### Applications

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

### Ordering Information

| Part No.    | Description               |
|-------------|---------------------------|
| QPB8958SB   | Sample bag with 5 pieces  |
| QPB8958SR   | 7" Reel with 100 pieces   |
| QPB8958TR13 | 13" Reel with 2500 pieces |
| QPB8958EVB  | 47 – 1003MHz PCBA         |

## Absolute Maximum Ratings

| Parameter                         | Rating        |
|-----------------------------------|---------------|
| Supply Voltage ( $V_{DD}$ )       | +28V (5min)   |
| Supply Current ( $I_{DD}$ )       | 350mA         |
| Maximum Input Level (single tone) | +10dBmV       |
| Operating Temperature Range       | -40 to +100°C |
| Storage Temperature Range         | -65 to +150°C |
| Maximum Junction Temperature      | +165°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.

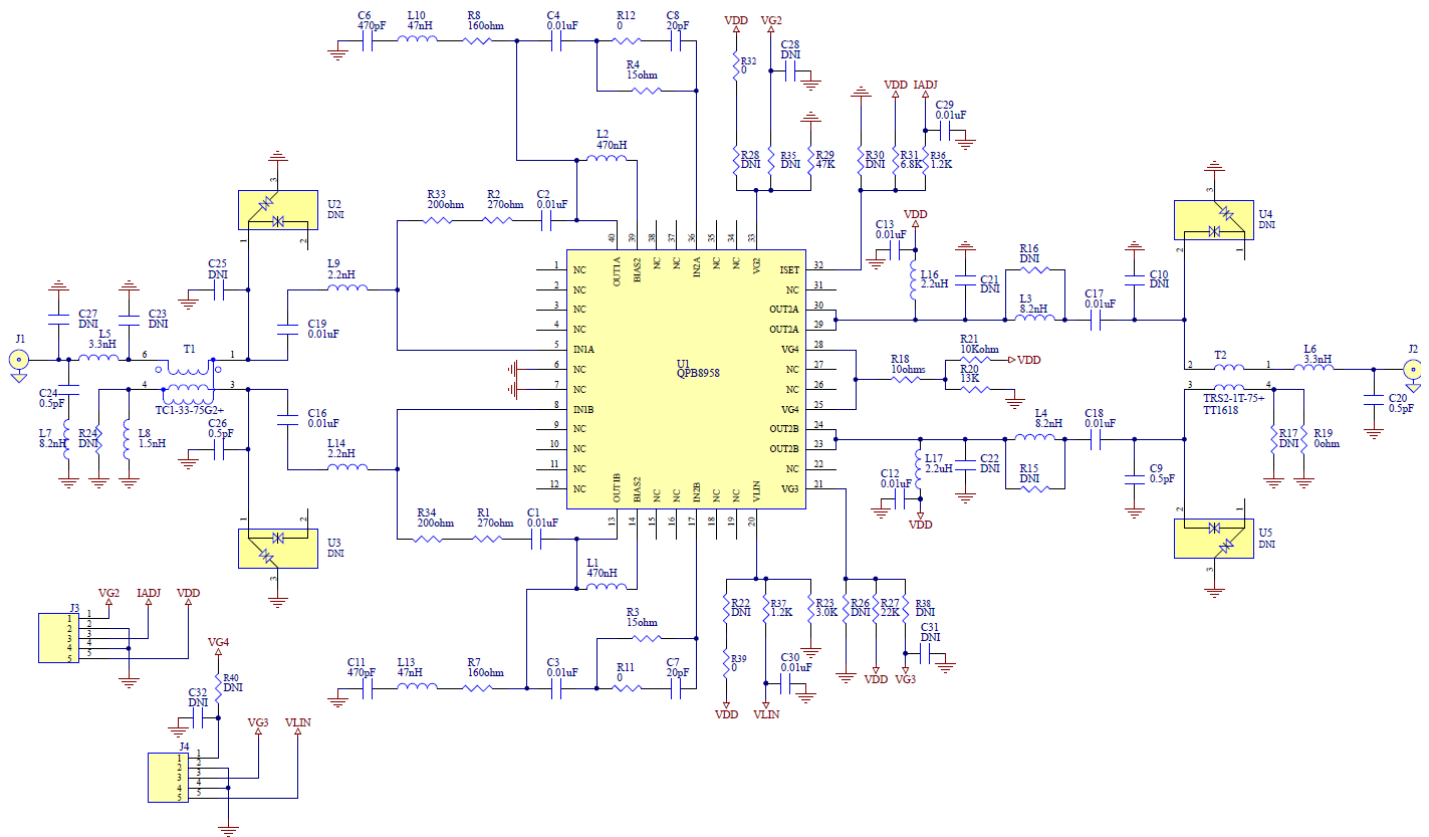
## Electrical Specifications – 24V

| Parameter                   | Condition <sup>(1)</sup>                                             | Min | Typ  | Max  | Unit |
|-----------------------------|----------------------------------------------------------------------|-----|------|------|------|
| Supply Voltage ( $V_{DD}$ ) |                                                                      |     | 24   |      | V    |
| Supply Current ( $I_{DD}$ ) | $V_{DD}$ total current                                               |     | 260  |      | mA   |
| Frequency Range             |                                                                      | 50  |      | 1003 | MHz  |
| Gain <sup>2</sup>           | 1003MHz                                                              |     | 34   |      | 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           |                                                                      |     | -45  |      | dB   |
| Input Return Loss           |                                                                      |     | 18   |      | dB   |
| Output Return Loss          |                                                                      |     | 18   |      | dB   |
| Noise Figure                |                                                                      |     | 4.5  |      | dB   |
| CSO                         | 80 NTSC + 72 QAM (-6dB offset), 46dBmV/ch out, 0dB tilt              |     | -70  |      | dBc  |
| CTB                         |                                                                      |     | -75  |      | dBc  |
| CCN                         |                                                                      |     | 65   |      | dB   |
| OIP2                        | Low band: 225MHz, 325MHz, 12dBm/tone                                 |     | 85   |      | dBm  |
|                             | High band: 900MHz, 950.5MHz, 12dBm/tone                              |     | 85   |      | dBm  |
| OIP3                        | Low band: 225MHz, 325MHz, 12dBm/tone                                 |     | 51   |      | dBm  |
|                             | High band: 900MHz, 325MHz, 12dBm/tone                                |     | 49   |      | dBm  |
| Output P1dB                 | 1003 MHz                                                             |     | 27   |      | 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

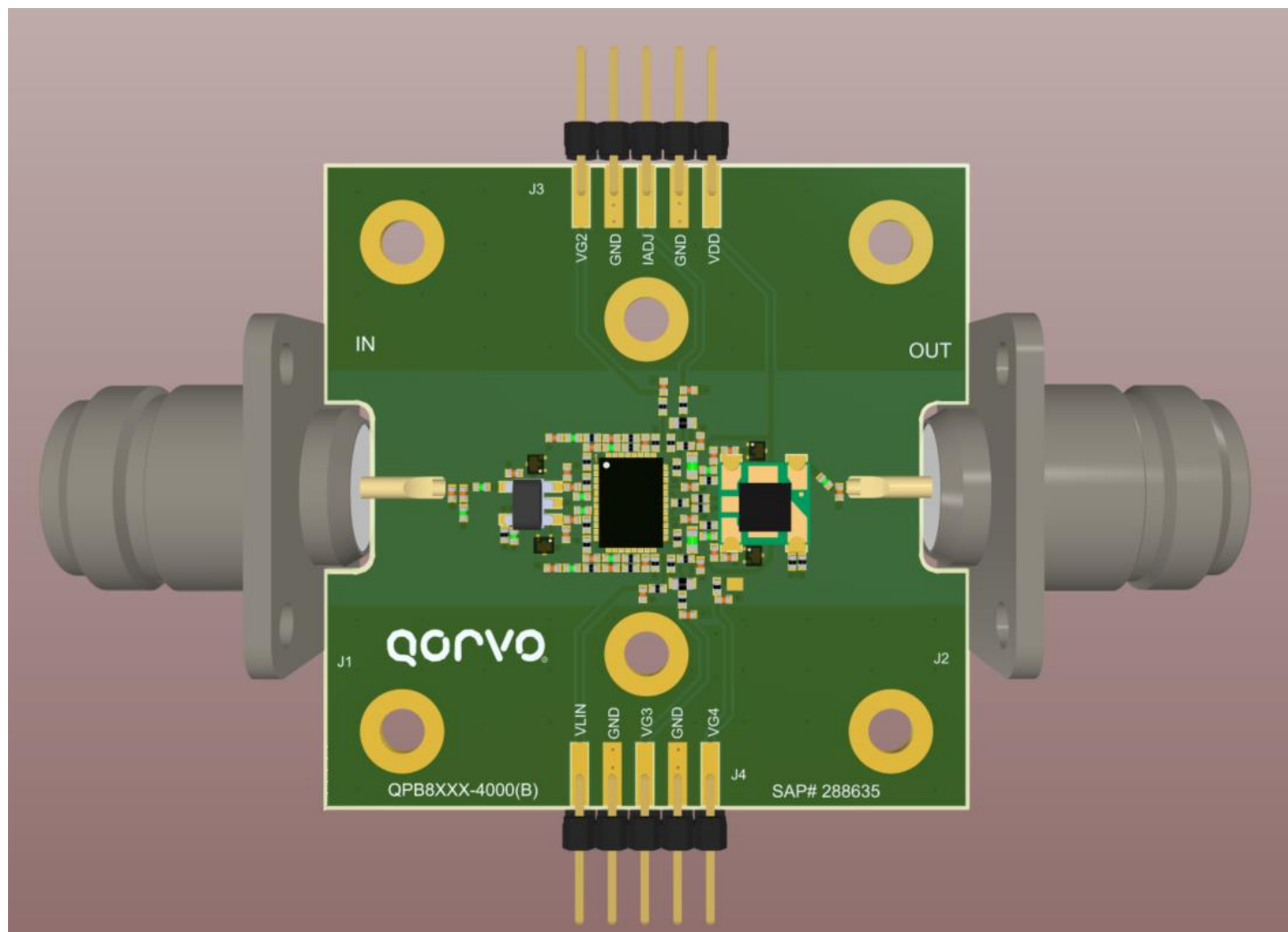
### Evaluation Board Schematic



**Evaluation Board Bill of Materials**

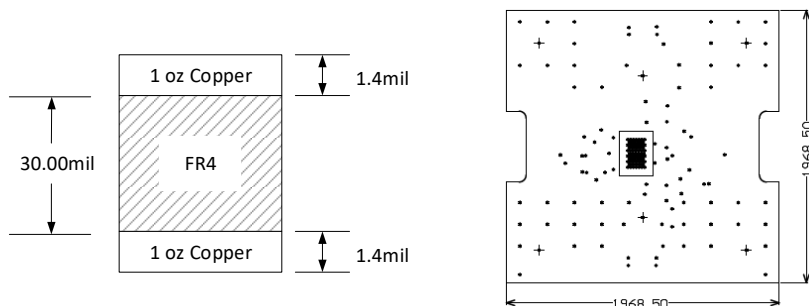
| Reference Designator                                                    | Description                              | Manufacturer  | PART #             |
|-------------------------------------------------------------------------|------------------------------------------|---------------|--------------------|
| U1                                                                      | PCB, QPB8958                             | Qorvo         | QPB8958            |
| C1,C2,C3,C4,C12,<br>C13,C16,C17,C18,<br>C19,C29,C30                     | CAP, 0.01uF, ±10%, 50V, X7R, 0402        | MURATA        | GRM155R71H103KA88D |
| C9,C26,C20,C24                                                          | CAP0402, 0.5pF, ±0.1pF, 50V, COG, HIQ    | MURATA        | GJM1555C1HR50BB01D |
| C7,C8                                                                   | CAP, 20pF, 2%, 50V, HI-Q, 0402           | MURATA        | GJM1555C1H200GB01D |
| C6, C11                                                                 | CAP, 470pF, 5%, 50V, COG, 0402           | MURATA        | GRM1555C1H471JA01D |
| 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,R11,R12                                                             | RES, 0 OHM, 5%, 1/10W, 0402              | Kamaya        | RMC1/16SJPTH       |
| R33, R34                                                                | RES, 200 OHM, 1%, 1/16W, 0402            | Panasonic     | ERJ-2RKF2000X      |
| R21                                                                     | RES, 10K, 1%, 1/16W, 0402                | Panasonic     | ERJ-2RKF1002X      |
| R23                                                                     | RES, 3K OHM, 1%, 1/10W, 0402, T/F        | Panasonic     | ERJ-2RKF3001X      |
| R29                                                                     | RES, 47K, 1%, 1/16W, 0402                | Yageo         | RC0402FR-0747KL    |
| R31                                                                     | RES, 6.8K, 1%, 1/10W, 0402               | Panasonic     | ERJ-2RKF6801X      |
| R27                                                                     | RES, 22K, 1%, 1/10W, 0402                | Panasonic     | ERJ-2RKF2202X      |
| R20                                                                     | RES, 13K, 1%, 1/10W, 0402                | Panasonic     | ERJ-2RKF1302X      |
| R1,R2                                                                   | RES, 270 OHM, 5%, 1/16W, 0402            | Panasonic     | ERJ-2GEJ271        |
| R32,R39                                                                 | RES, 0 OHM, 0603                         | Kamaya        | RMC1/16JPTP        |
| R36,R37                                                                 | RES, 1.2K, 5%, 1/16W, 0402               | Panasonic     | ERJ-2GEJ122        |
| R7,R8                                                                   | 160 OHM,5%,1/16W,0402, LEAD FREE         | KOA           | RK73B1ETTP161J     |
| L1, L2                                                                  | IND, 470nH, ±5%, 310mA, 650mHZ, 0402     | Coilcraft     | 0402AF-471XJLW     |
| L9,L14                                                                  | IND, 2.2nH, +/-0.3nH, M/L, 0402          | MURATA        | LQG15HN2N2S02D     |
| L3, L4, L7                                                              | IND, 8.2nH, 5%, M/L, 0402                | MURATA        | LQG15HN8N2J02D     |
| L10,L13                                                                 | IND, 47nH, 5%, M/L, 0402                 | MURATA        | LQG15HN47NJ02D     |
| L5,L6                                                                   | IND, 3.3nH, +/-0.1nH, T/F, 0402          | MURATA        | LQP15MN3N3B02D     |
| L8                                                                      | IND, 1.5nH, +/-0.2nH, T/F, 0402          | KOA           | KL731ETP1N5C       |
| 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                                                                      | XFMR, 2:1, 5-1200MHz, 75 OHM, 0.25W, SMD | Mini Circuits | TRS2-1T-75+        |
| C10,C21,C22,C23,<br>C25,C27,R15,R16,<br>R17,R24,R26,R30,<br>U2,U3,U4,U5 | NO LOAD - 0402                           |               |                    |
| C28,C31,C32,R22,R25<br>R28,R35,R38,R40                                  | NO LOAD - 0402                           |               |                    |

### Evaluation Board Assembly Drawing

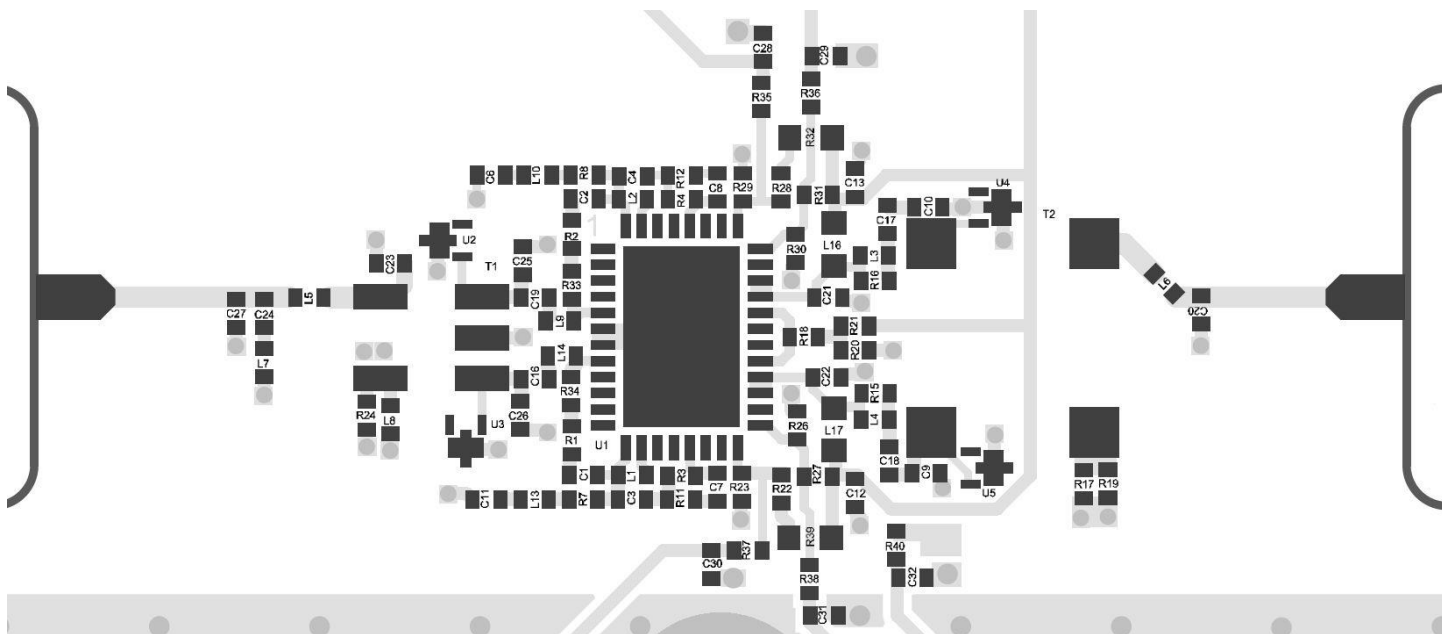


#### EVB PCB Material and Stack-up

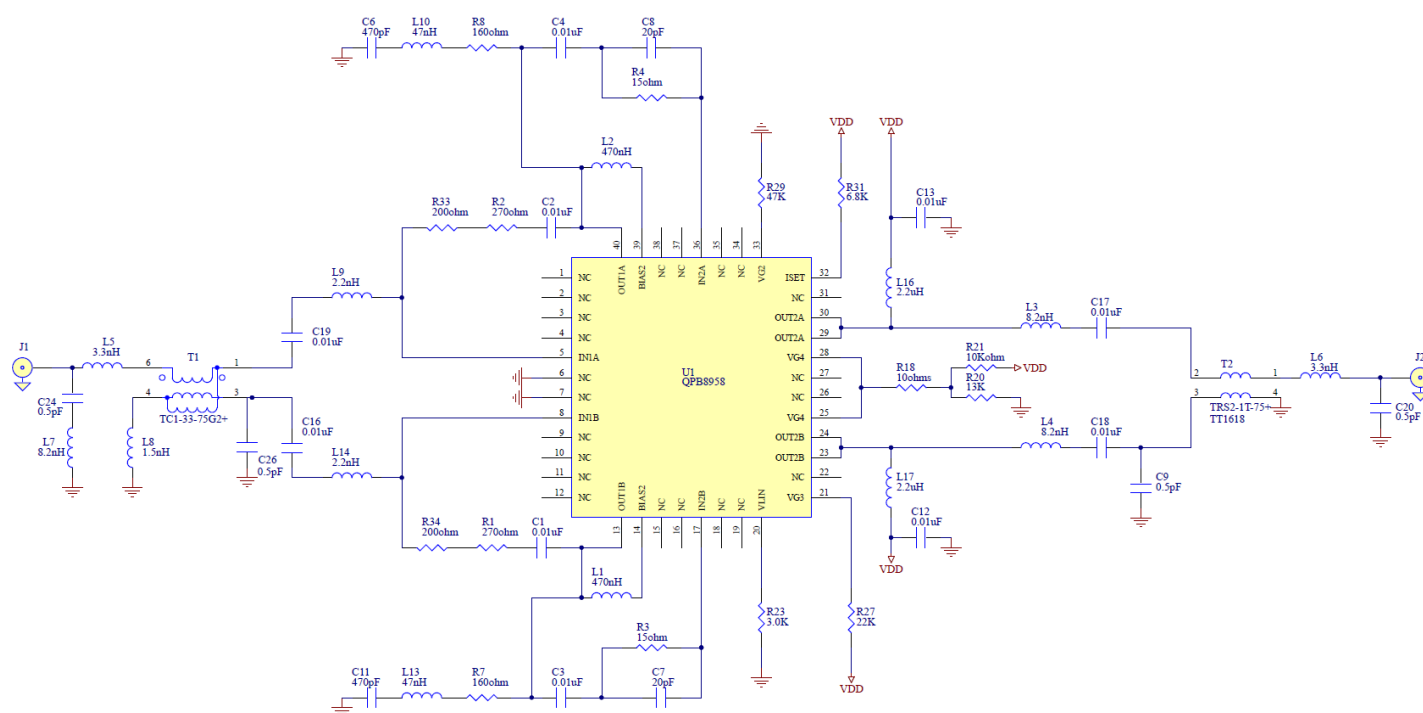
Board Material: 0.030" FR4,  $\epsilon_r=4.2$   
 Plating: 1oz Copper  
 Board Dimension: 1.9685" x 1.9685"



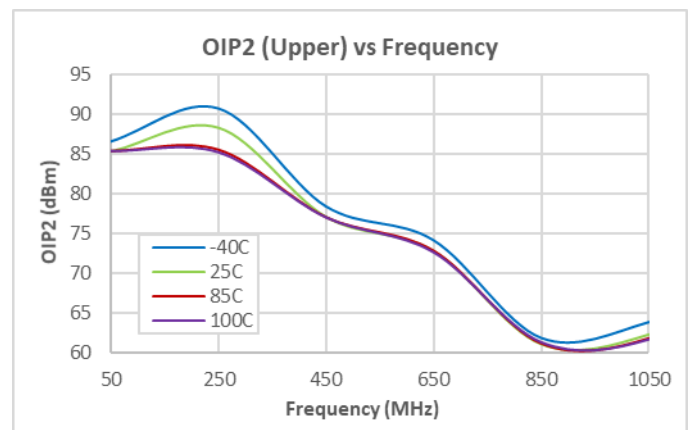
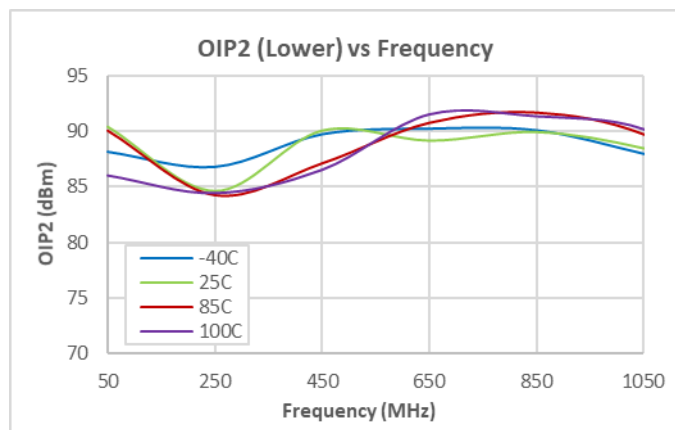
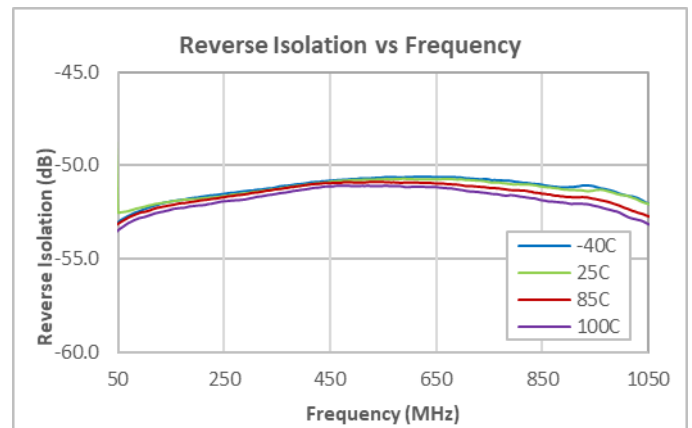
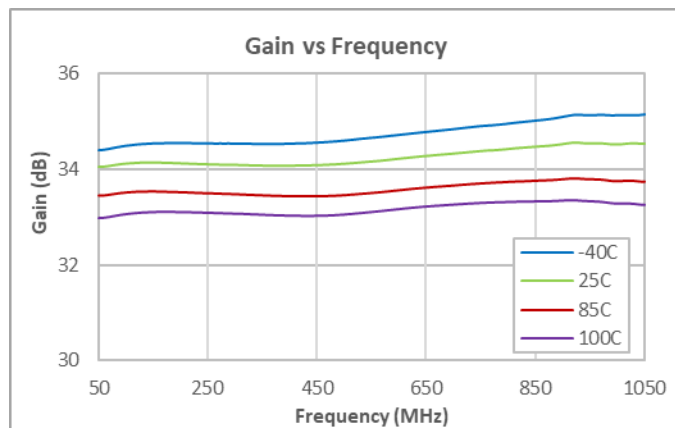
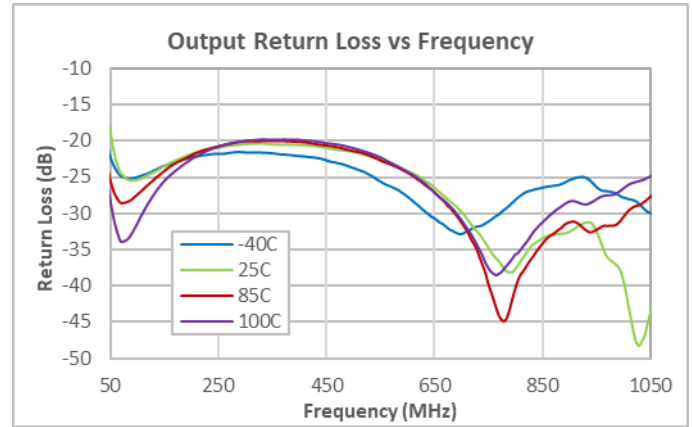
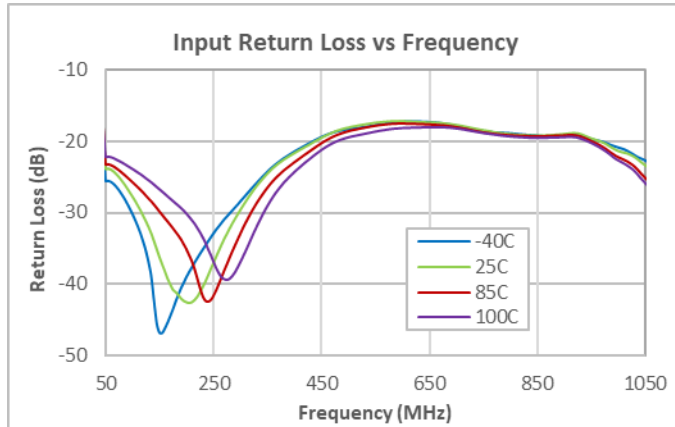
## Evaluation Board Component Placement



## Typical Application Schematic; 24V



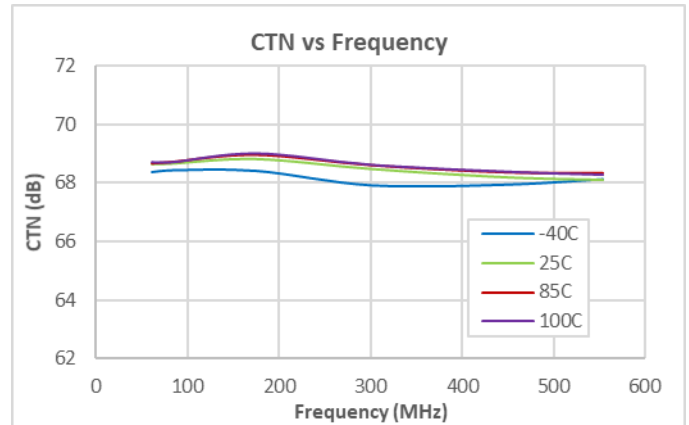
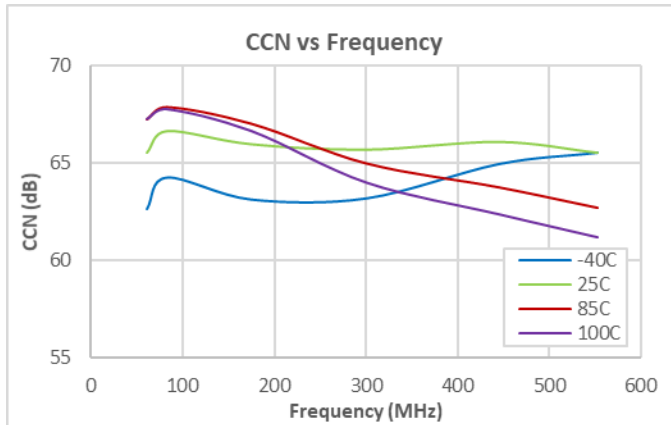
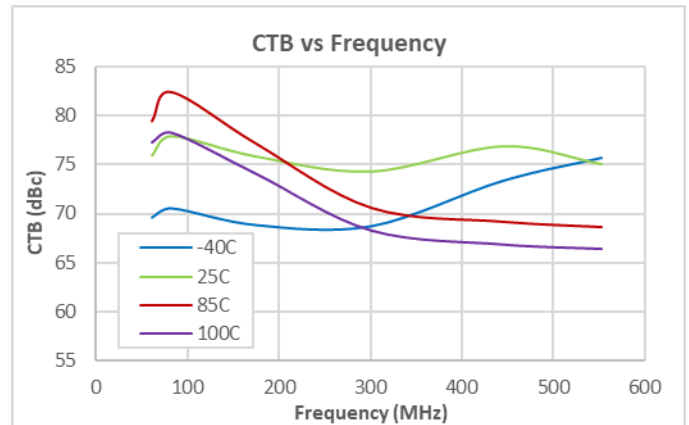
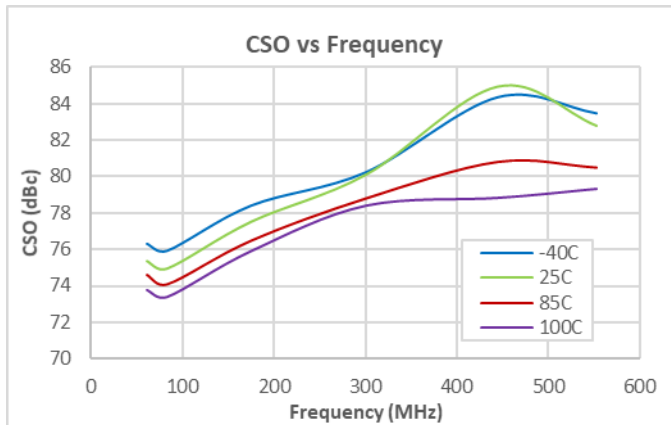
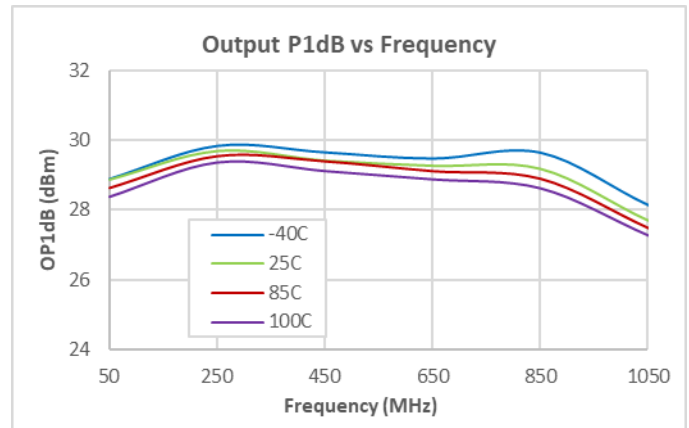
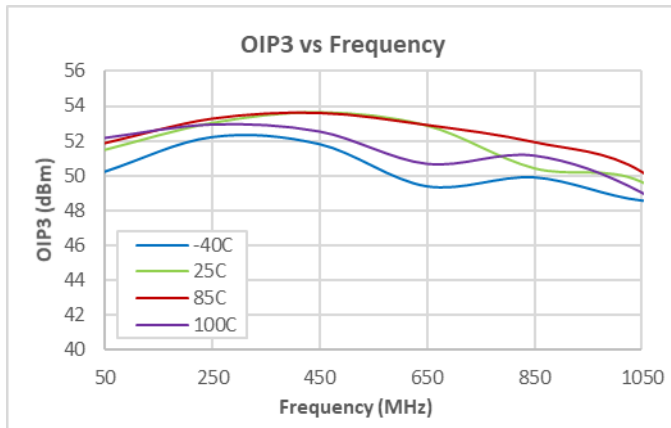
## Performance Data 24V



### Test Conditions:

1. Test conditions unless otherwise noted:  $V_{DD} = +24V$ ,  $Z_o = 75\Omega$
2. OIP2: +12dBm per Tone.

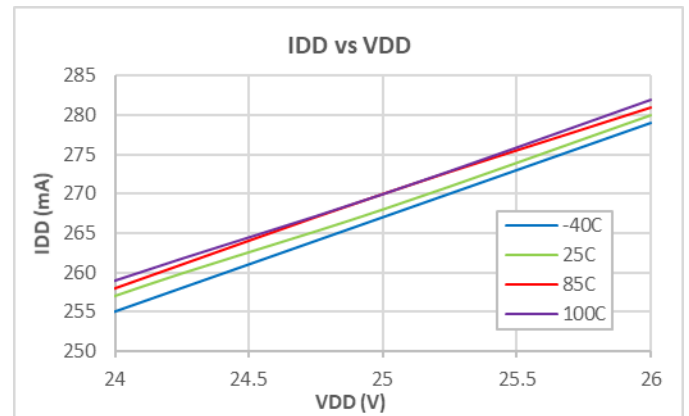
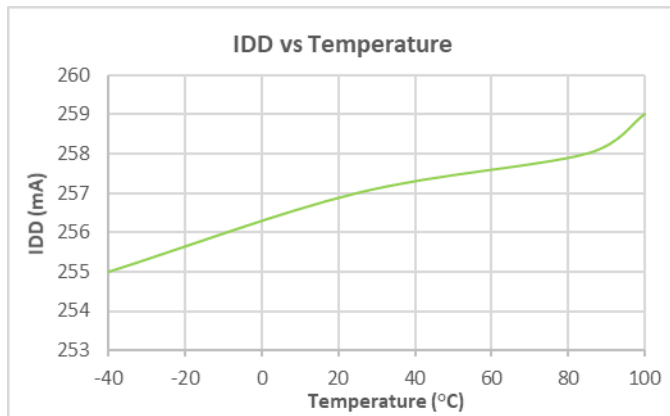
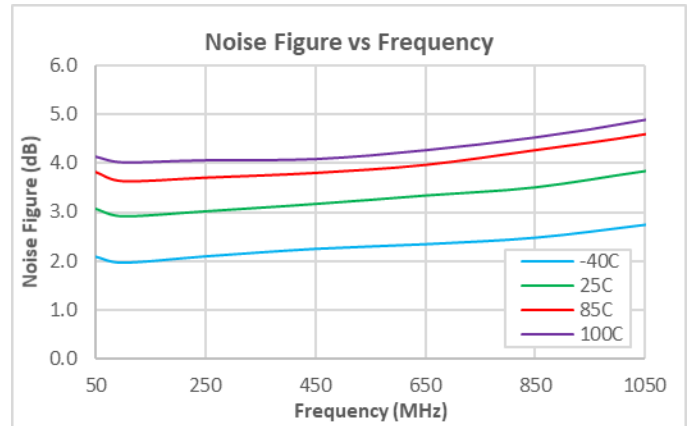
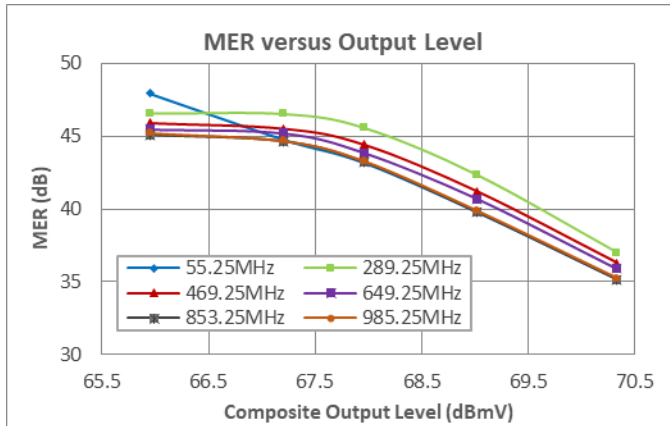
### Performance Data 24V



#### Test Conditions:

1. Test conditions unless otherwise noted:  $V_{DD} = +24V$ ,  $Z_o = 75\Omega$
2. OIP3: +12dBm per Tone.
3. CSO, CTB, CCN, CTN: 80 NTSC + 72 QAM (-6dB offset), 46dBmV/ch out, 0dB tilt

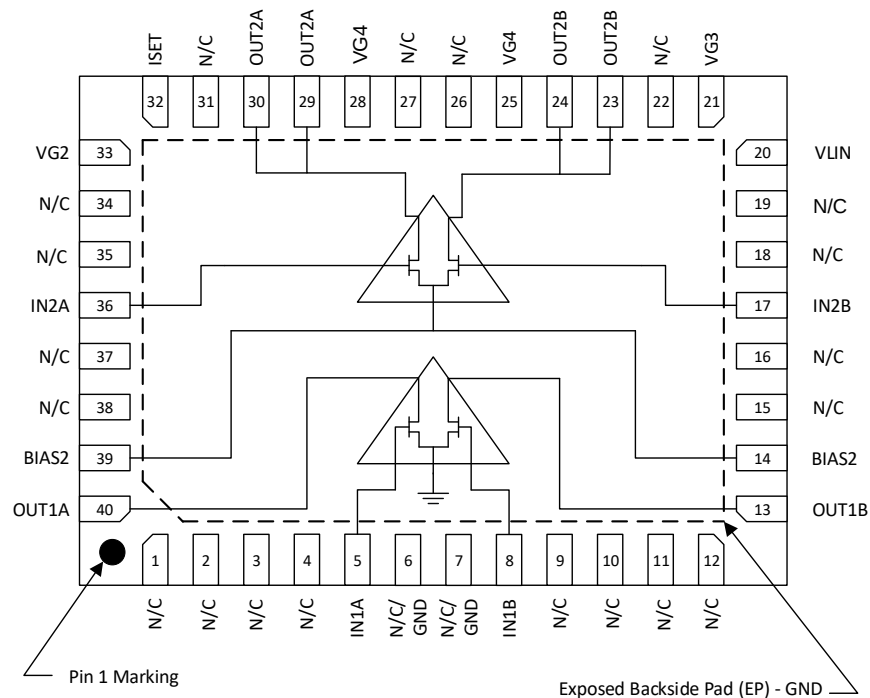
### Performance Data 24V



#### 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

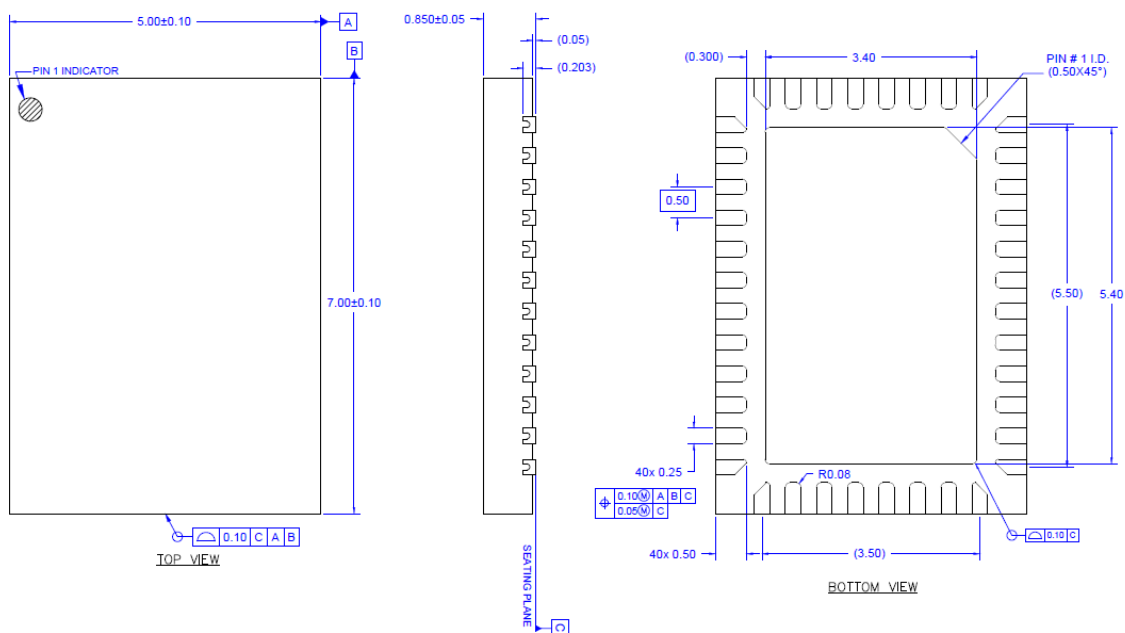
## Pin Configuration and Description



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     | VG2 adjust                                                                                                                           |
| 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. |

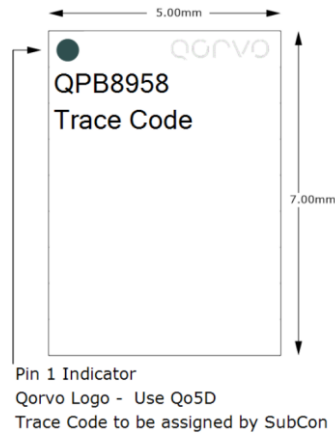
## Package Outline



### Notes:

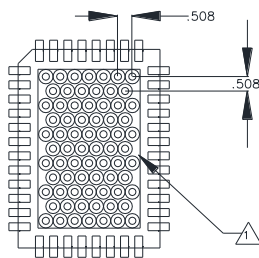
1. Dimensions in millimeters

### Package Marking

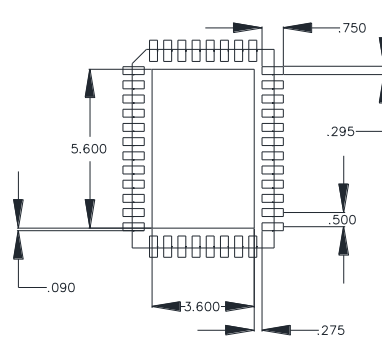


1. Dimension and tolerance formats conform to ASME Y14.4M-1994.
2. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.
3. Co-planarity applies to the exposed ground/thermal pad as well as the contact pins.
4. Package body length/width does not include plastic flash protrusion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

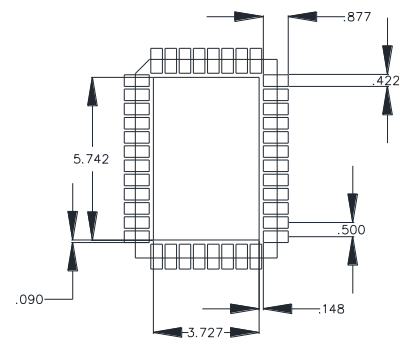
### Recommended Mounting Pattern



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)**

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- 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;
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- 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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