



# SGA8343Z

## Heterostructure Bipolar Transistor

### Product Overview

The Qorvo® SGA8343Z is a high-performance Silicon Germanium Heterostructure Bipolar Transistor (SiGe HBT) designed for operation from DC to 6GHz.

The SGA8343Z is optimized for 3V operation but can be biased at 2V for low-voltage battery operated systems. The device provides high gain, low NF, and excellent linearity at a low cost. It can be operated at very low bias currents in applications where high linearity is not required.

The matte tin finish on the lead-free package utilizes a post annealing process to mitigate tin whisker formation and is RoHS compliant per EU Directive 2002/95.

This package is also manufactured with green molding compounds that contain no antimony trioxide nor halogenated fire retardants.



4-Pin SOT-343 Package

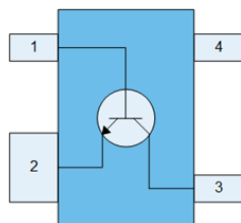
### Key Features

- DC – 6,000 MHz
- 0.9 dB Min Noise Figure at 900 MHz
- 24 dB Max Gain at 900 MHz
- 0.10  $\Gamma_{OPT}$  at 900 MHz
- +28dBm OIP3 at +9 dBm  $P_{1dB}$
- High performance and high versatility

### Applications

- Analog and Digital Wireless Systems
- 3G, Cellular, PCS, RFID
- Fixed Wireless, Pager Systems
- Driver Stage for Low Power Applications
- Oscillators

### Functional Block Diagram



Top View

### Ordering Information

| Part Number  | Description                                         |
|--------------|-----------------------------------------------------|
| SGA8343ZSQ   | Sample bag with 25 pieces                           |
| SGA8343ZSR   | 7" reel with 100 pieces                             |
| SGA8343Z     | 7" reel with 3,000 pieces                           |
| SGA8343ZPCK1 | 0.8-1 GHz Assembled Evaluation Board with 5 pc bag  |
| SGA8343ZPCK2 | 1.8-2 GHz Assembled Evaluation Board with 5 pc bag  |
| SGA8343ZPCK3 | 2.4-2.5GHz Assembled Evaluation Board with 5 pc bag |
| SGA8343ZPCK4 | 1,575MHz Assembled Evaluation Board with 5 pc bag   |

### Absolute Maximum Ratings

| Parameter                           | Conditions | Rating        |
|-------------------------------------|------------|---------------|
| Collector Current (ICE)             |            | 72 mA         |
| Base Current (IB)                   |            | 1 mA          |
| Collector – Emitter Voltage (VCE)   |            | 5 V           |
| Collector – Base Voltage (VCB)      |            | +12 V         |
| Emitter – Base Voltage (VEB)        |            | +4.5 V        |
| RF Input Power at Pin 1             |            | +5 dBm        |
| Storage Temperature Range (TSOR)    |            | -40 to 150 °C |
| Power Dissipation (PDISS)           |            | 350 mW        |
| Operating Junction Temperature (TJ) |            | +150 °C       |
| Operating Temperature Range         |            | -40 to 85 °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. For reliable continuous operation, the device voltage and current must not exceed the maximum operating values specified in the table on page one.

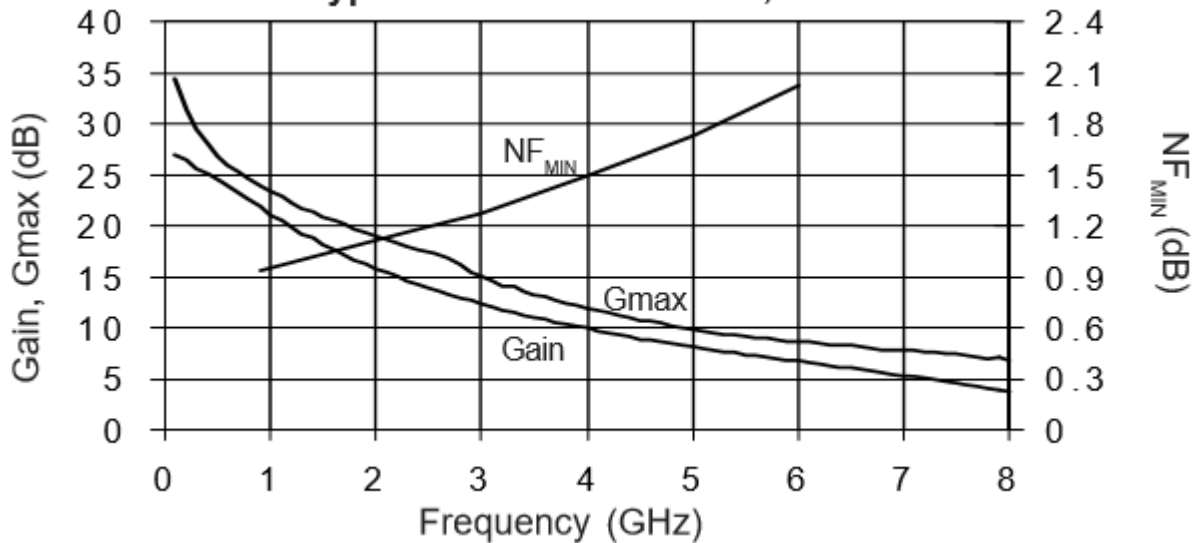
### Electrical Specifications

| Parameter                             | Conditions                                                                                         | Min.  | Typ.  | Max. | Units |
|---------------------------------------|----------------------------------------------------------------------------------------------------|-------|-------|------|-------|
| <b>Transmit (BASE-COLLECTOR) Mode</b> | <b>Unless otherwise noted: V<sub>CC/DB</sub>=3.3V, T=+25°C, PA_EN=High, LNA_EN=Low, C_RX=Low</b>   |       |       |      |       |
| Maximum Available Gain                | 0.90GHz. Z <sub>S</sub> =Z <sub>S</sub> <sup>*</sup> , Z <sub>L</sub> =Z <sub>L</sub> <sup>*</sup> |       | 23.9  |      | dB    |
|                                       | 1.90GHz                                                                                            |       | 19.3  |      | dB    |
|                                       | 2.40GHz                                                                                            |       | 17.7  |      | dB    |
| Minimum Noise Figure                  | 0.90GHz. Z <sub>S</sub> =Γ <sub>OPT</sub> , Z <sub>L</sub> =Z <sub>L</sub> <sup>*</sup>            |       | 0.94  |      | dB    |
|                                       | 1.90GHz                                                                                            |       | 1.10  |      | dB    |
|                                       | 2.40GHz                                                                                            |       | 1.18  |      | dB    |
| Insertion Gain                        | 0.90GHz. Z <sub>S</sub> =Z <sub>L</sub> =50Ω <sup>(1)</sup>                                        | 21.0  | 22.0  | 23.0 | dB    |
| Noise Figure                          | 1.9GHz, LNA Application Circuit Board <sup>(2)</sup>                                               |       | 1.40  | 1.75 | dB    |
| Gain                                  | 1.9GHz, LNA Application Circuit Board <sup>(2)</sup>                                               | 15.5  | 16.5  | 17.5 | mA    |
| Output IP3                            | 1.9GHz, LNA Application Circuit Board <sup>(2)</sup>                                               | +25.8 | +27.8 |      | dBm   |
| Output 1dB Compression Point          | 1.9GHz, LNA Application Circuit Board <sup>(2)</sup>                                               | +7.5  | +9.0  |      | dBm   |
| DC Current Gain                       |                                                                                                    | 120   | 180   | 300  |       |
| Breakdown Voltage                     | COLLECTOR-EMITTER                                                                                  | +5.7  | +6.0  |      | V     |
| Thermal Resistance, θ <sub>jc</sub>   | Junction - Lead                                                                                    |       | 200   |      | °C/W  |
| Operating Voltage                     | COLLECTOR-EMITTER                                                                                  |       |       | +4.0 | V     |
| Operating Current                     | COLLECTOR-EMITTER                                                                                  |       |       | 50   | mA    |

Notes:

- Performance is based on historical statistical analysis.
- 100% tested on test fixture optimized for 1.9GHz operation.

## Typical Performance – 3V, 10mA



Notes:

## Typical Performance – Engineering Application Circuits

| Frequency (GHz)      | VS (V) | VCE (V) | ICQ (mA) | NF (dB) | Gain (dB) | P1dB (dBm) | OIP3 <sup>(1)</sup> (dBm) | S11 (dB) | S22 (dB) |
|----------------------|--------|---------|----------|---------|-----------|------------|---------------------------|----------|----------|
| 0.90 <sup>(2)</sup>  | +3.0   | +3.0    | 12       | 1.25    | 18.2      | 9          | 27.3                      | -16      | -18      |
| 1.575 <sup>(2)</sup> | +3.3   | +2.7    | 10       | 1.25    | 15.7      | 6.8        | 26.5                      | -10      | -25      |
| 1.9 <sup>(2)</sup>   | +5.0   | +3.0    | 12       | 1.4     | 16.5      | 9          | 27.8                      | -9       | -24      |
| 2.4                  | +3.3   | +2.7    | 10       | 1.6     | 14.4      | 9          | 27.5                      | -13      | -24      |

Notes:

1. P<sub>OUT</sub>=0dBm per tone, 1MHz tone spacing.
2. Series feedback
3. Refer to the application note for additional RF data, PCB layouts, BOMs, biasing instructions, and other key issues to be considered.

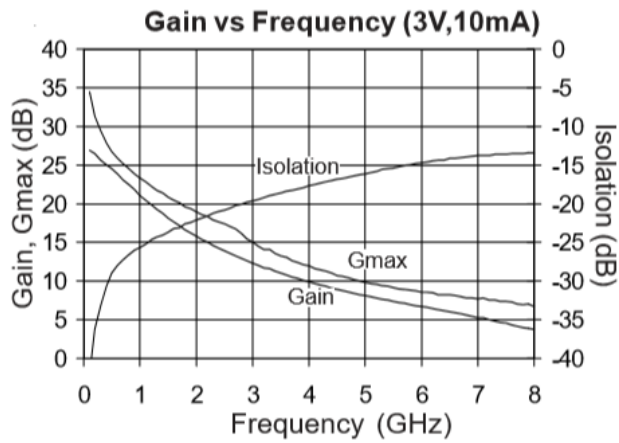
## Peak Performance Under Optimum Matching Conditions

| Frequency (GHz) | VCE (V) | ICQ (mA) | NF (dB) | Max Gain (dB) | P1dB (dBm) | OIP3 <sup>(1)</sup> (dBm) |
|-----------------|---------|----------|---------|---------------|------------|---------------------------|
| 0.90            | +2      | 10       | 0.90    | 23.7          | 10         | +25                       |
| 0.90            | +3      | 10       | 0.94    | 23.9          | 13         | +29                       |
| 1.90            | +2      | 10       | 1.05    | 19.1          | 10         | +25                       |
| 1.90            | +3      | 10       | 1.10    | 19.3          | 13         | +29                       |
| 2.40            | +2      | 10       | 1.15    | 17.4          | 10         | +25                       |
| 2.40            | +3      | 10       | 1.18    | 17.7          | 13         | +29                       |

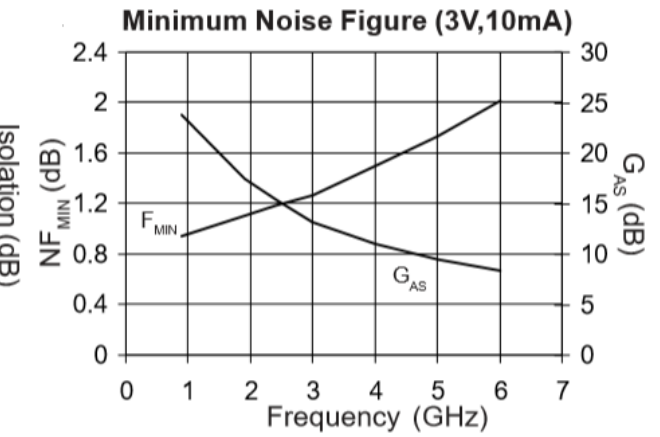
Notes:

4.  $Z_S = \Gamma_{OPT}$ ,  $Z_L = Z_L^*$ , The input matching circuit loss have been de-embedded
5.  $Z_S = Z_{SOPT}$ ,  $Z_L = Z_{LOPT}$ , where  $Z_{SOPT}$  and  $Z_{LOPT}$  have been tuned for max P1dB (current allowed to drive-up with constant VCE).series feedback
6.  $Z_S = Z_{SOPT}$ ,  $Z_L = Z_{LOPT}$ , where  $Z_{SOPT}$  and  $Z_{LOPT}$  have been tuned for max OIP3.
7. Optimum NF, P1dB, and OIP3 performance cannot be achieved simultaneously.

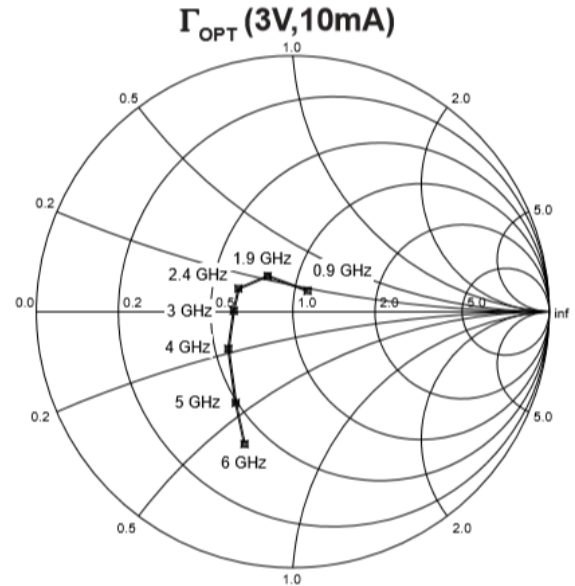
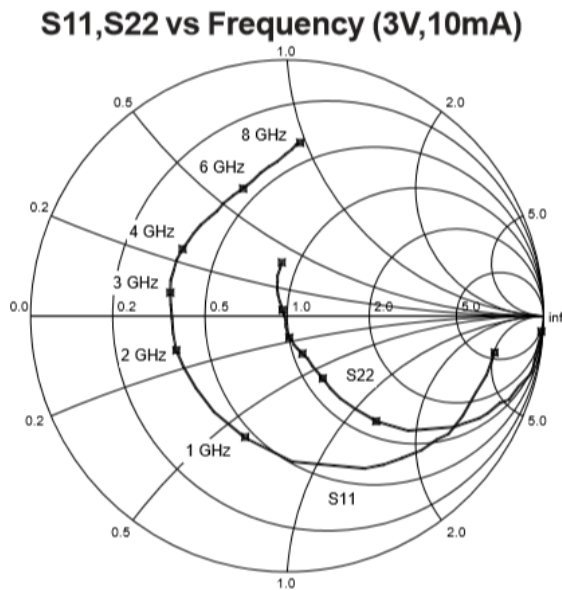
## Typical Performance – De-embedded S-Parameters



S11 versus Frequency



S22 versus Frequency



Notes:

S-parameters are de-embedded to the device leads with  $Z_S=Z_L=50\Omega$ . De-embedded S-parameters can be downloaded from our website ([www.qorvo.com](http://www.qorvo.com)).

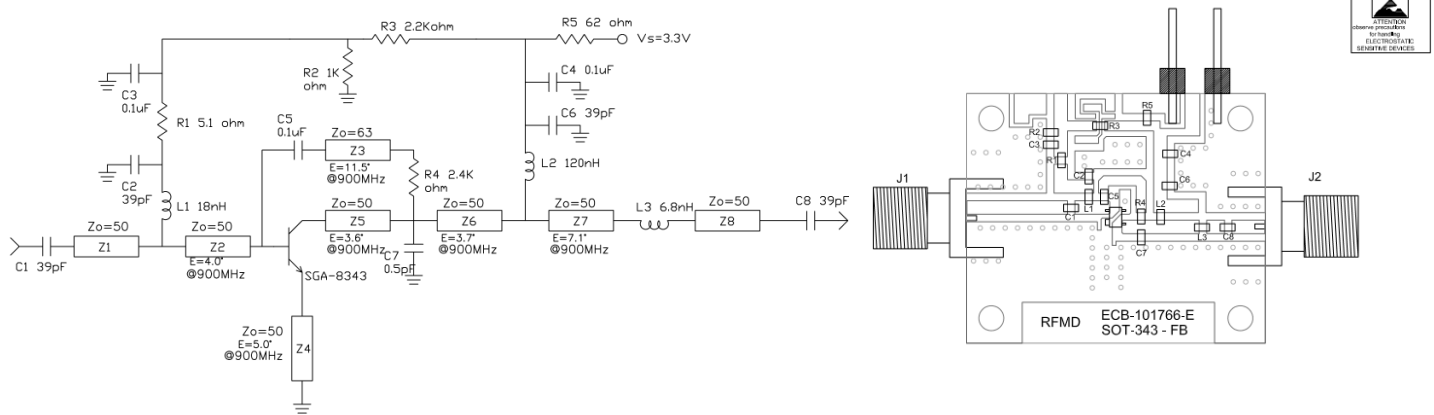
## Peak Performance Under Optimum Matching Conditions

| Frequency<br>(GHz) | Min NF <sup>(8)</sup><br>(dB) | $\Gamma_{OPT}$<br>(Mag<Ang) | $r_n$<br>( $\Omega$ ) | Max Gain<br>(dB) |
|--------------------|-------------------------------|-----------------------------|-----------------------|------------------|
| 0.9                | 0.94                          | 0.10<55                     | 0.11                  | 23.88            |
| 1.9                | 1.10                          | 0.71<125                    | 0.10                  | 19.33            |
| 2.4                | 1.18                          | 0.25<157                    | 0.09                  | 17.66            |
| 3                  | 1.27                          | 0.23<179                    | 0.09                  | 15.01            |
| 4                  | 1.50                          | 0.29<-150                   | 0.12                  | 11.94            |
| 5                  | 1.73                          | 0.42<-122                   | 0.18                  | 9.84             |
| 6                  | 2.02                          | 0.55<-110                   | 0.24                  | 8.62             |

Notes:

8.  $Z_S = \Gamma_{OPT}$ ,  $Z_L = Z_L^*$ , NFMIN is a noise parameter for which the input matching circuit losses have been de-embedded. The noise parameters were measured using a Maury Microwave Automated Tuner System. The device was mounted on a 0.010" PCB with plated-thru holes close to pins 2 and 4.

## EVB1 800-1000 MHz Evaluation Board Schematic and Layout

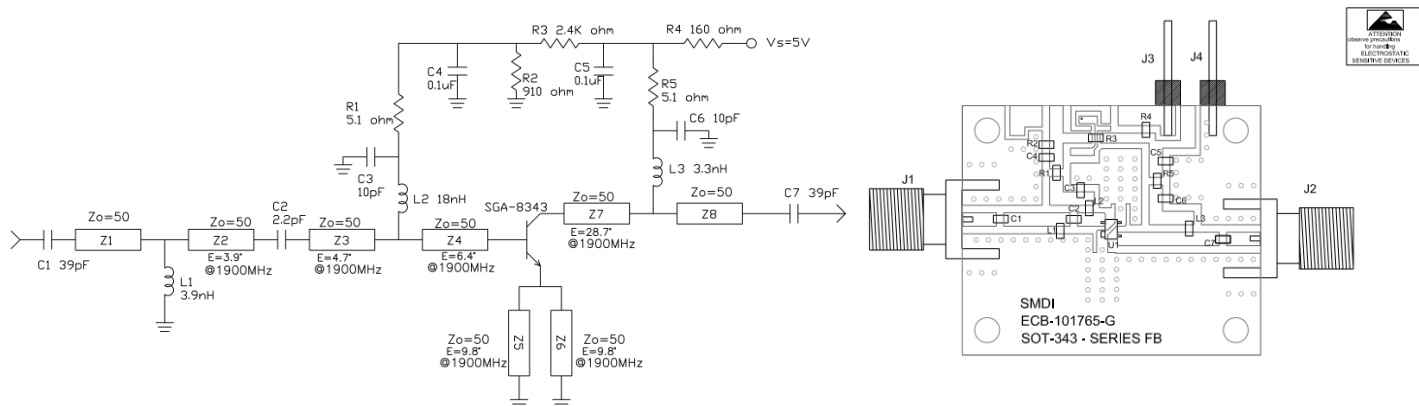


Notes:

## Bill of Material

| Ref. Des.      | Value          | Description                                | Manuf.       | Part number        |
|----------------|----------------|--------------------------------------------|--------------|--------------------|
| -              | -              | Printed Circuit Board                      |              |                    |
| U1             | -              | Low Noise, High Gain HBT                   | Qorvo        | SGA8343Z           |
| R1             | 5.1 $\Omega$   | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ5R1       |
| R2             | 1,000 $\Omega$ | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ102       |
| R3             | 2,200 $\Omega$ | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ222       |
| R4             | 2,400 $\Omega$ | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ242       |
| R5             | 62 $\Omega$    | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ620       |
| C1, C2, C6, C8 | 39 pF          | Capacitor, Chip, 0603                      | Johanson     | 500R14N390JV4T     |
| C3, C4, C5     | 0.1 $\mu$ F    | Capacitor, Chip, 10%, 16V, X7R, 0603       | Murata       | GRM188R71C104KA01D |
| C7             | 0.5 pF         | Capacitor, Chip, +/-0.25pF, 50V, C0G, 0603 | Panasonic    | ECJ-1VC1H0R5C      |
| L1             | 18 nH          | Inductor, Chip, 5%, M/L 0603               | Toko America | LL1608-FSL18NJ     |
| L2             | 120 nH         | Inductor, Chip, 5%, M/L 0603               | Toko America | LL1608-FSR12J      |
| L3             | 6.8 nH         | Inductor, Chip, 5%, M/L 0603               | Toko America | LL1608-FSL6N8J     |
| -              | -              | Do Not Install                             |              |                    |

## EVB2 1800-2000 MHz Evaluation Board Schematic and Layout

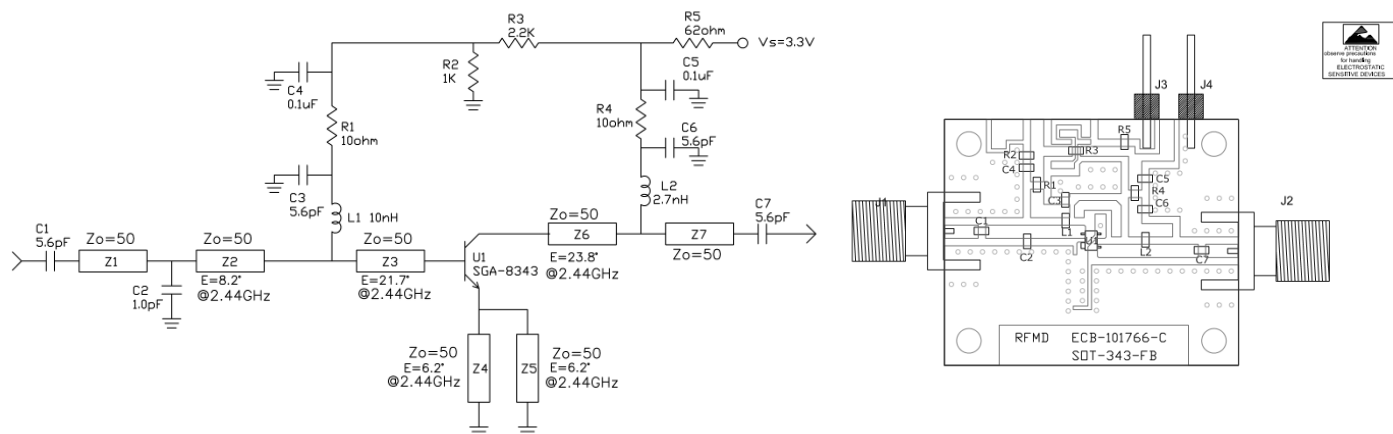


Notes:

## Bill of Material

| Ref. Des. | Value          | Description                                | Manuf.       | Part number        |
|-----------|----------------|--------------------------------------------|--------------|--------------------|
| -         | -              | Printed Circuit Board                      |              |                    |
| U1        | -              | Low Noise, High Gain HBT                   | Qorvo        | SGA8343Z           |
| R1, R5    | 5.1 $\Omega$   | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ5R1       |
| R2        | 910 $\Omega$   | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ911       |
| R3        | 2,400 $\Omega$ | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ242       |
| R4        | 160 $\Omega$   | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ161       |
| C1, C7    | 39 pF          | Capacitor, Chip, 0603                      | Johanson     | 500R14N390JV4T     |
| C2        | 2.2 pF         | Capacitor, Chip, +/-0.25pF, 50V, C0G, 0603 | Murata       | GRP1885C1H2R2CZ01D |
| C3, C6    | 10 pF          | Capacitor, Chip, 5%, 50V, C0G, 0603        | Johanson     | 500R14N100JV4      |
| C4, C5    | 0.1 $\mu$ F    | Capacitor, Chip, 10%, 16V, X7R, 0603       | Murata       | GRM188R71C104KA01D |
| L1        | 3.9 nH         | Inductor, Chip, +/-0.3nH, M/L 0603         | Toko America | LL1608-FS3N9S      |
| L2        | 18 nH          | Inductor, Chip, 5%, M/L 0603               | Toko America | LL1608-FSL18NJ     |
| L3        | 3.3 nH         | Inductor, Chip, +/-0.3nH, M/L 0603         | Toko America | LL1608-FSL3N3S     |
| -         | -              | Do Not Install                             |              |                    |

## EVB3 2.4-2.5 GHz Evaluation Board Schematic and Layout

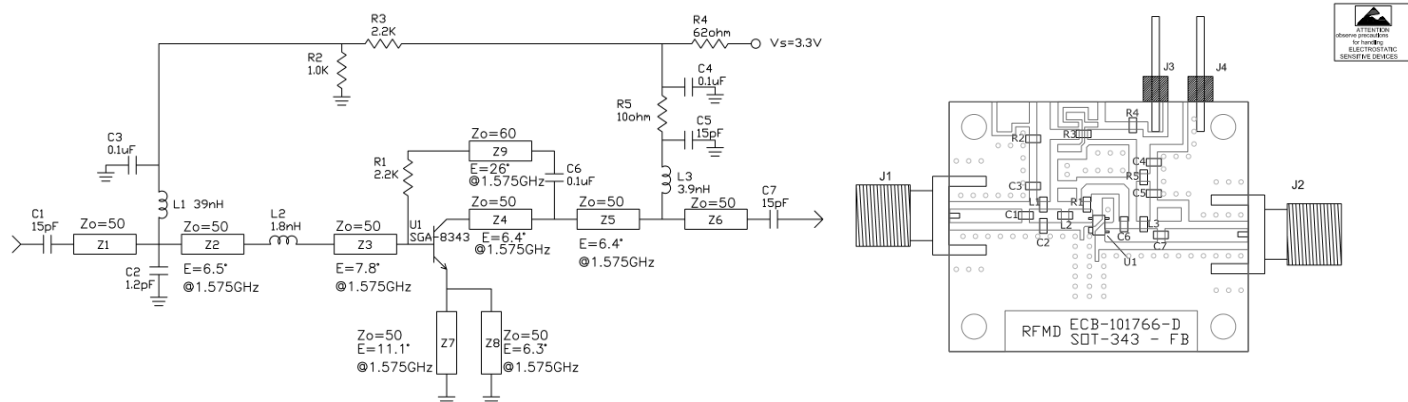


Notes:

### Bill of Material

| Ref. Des.      | Value          | Description                                | Manuf.       | Part number        |
|----------------|----------------|--------------------------------------------|--------------|--------------------|
| -              | -              | Printed Circuit Board                      |              |                    |
| U1             | -              | Low Noise, High Gain HBT                   | Qorvo        | SGA8343Z           |
| R1, R4         | 10 $\Omega$    | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ100       |
| R2             | 1,000 $\Omega$ | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ102       |
| R3             | 2,200 $\Omega$ | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ222       |
| R5             | 62 $\Omega$    | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ620       |
| C1, C3, C6, C7 | 5.6 pF         | Capacitor, Chip, +/-0.25pF, 50V, COG, 0603 | Murata       | GRM1885C1H5R6CZ01D |
| C4, C5         | 0.1 $\mu$ F    | Capacitor, Chip, 10%, 16V, X7R, 0603       | Murata       | GRM188R71C104KA01D |
| C2             | 1 pF           | Capacitor, Chip, +/-0.25pF, 50V, COG, 0603 | Murata       | GRM1885C1H1R0CZ01D |
| L1             | 10 nH          | Inductor, Chip, 5%, M/L 0603               | Toko America | LL1608-FSL18NJ     |
| L2             | 2.7 nH         | Inductor, Chip, +/-0.3nH, M/L 0603         | Toko America | LL1608-FSL2N7S     |
| -              | -              | Do Not Install                             |              |                    |

## EVB4 1575 MHz Evaluation Board Schematic and Layout

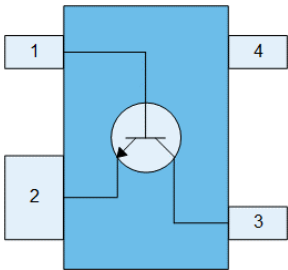


Notes:

## Bill of Material

| Ref. Des.  | Value          | Description                                | Manuf.       | Part number        |
|------------|----------------|--------------------------------------------|--------------|--------------------|
| -          | -              | Printed Circuit Board                      |              |                    |
| U1         | -              | Low Noise, High Gain HBT                   | Qorvo        | SGA8343Z           |
| R5         | 10 $\Omega$    | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ100       |
| R4         | 62 $\Omega$    | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ620       |
| R2         | 1,000 $\Omega$ | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ102       |
| R1, R3     | 2,200 $\Omega$ | Resistor, Chip, 5%, 1/16W, 0603            | Panasonic    | ERJ-3GEYJ222       |
| C2         | 1.2 pF         | Capacitor, Chip, +/-0.25pF, 50V, C0G, 0603 | Venkel       | C0603C0G500-1R2CNE |
| C1, C5, C7 | 15 pF          | Capacitor, Chip, 5%, 50V, C0G, 0603        | Panasonic    | ECJ-1VC1H150J      |
| C3, C4, C6 | 0.1 $\mu$ F    | Capacitor, Chip, 10%, 16V, X7R, 0603       | Murata       | GRM188R71C104KA01D |
| L1         | 39 nH          | Inductor, Chip, 5%, M/L 0603               | Toko America | LL1608-FSL39NJ     |
| L2         | 1.8 nH         | Inductor, Chip, +/-0.3nH, M/L 0603         | Toko America | LL1608-FSL1N8K     |
| L3         | 3.9 nH         | Inductor, Chip, +/-0.3nH, M/L 0603         | Toko America | LL1608-FS3N9S      |
| -          | -              | Do Not Install                             |              |                    |

Pin Configuration and Description



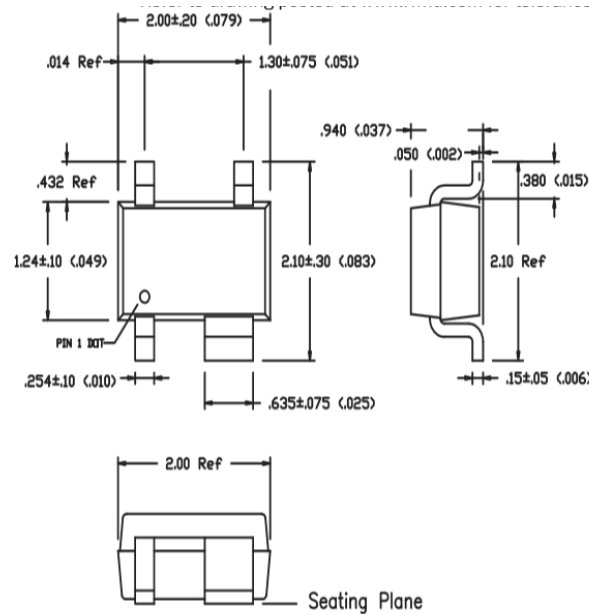
Top View

| Pin Number | Label     | Description                                                                |
|------------|-----------|----------------------------------------------------------------------------|
| 1          | BASE      | RF input/base pin.                                                         |
| 2          | EMITTER   | Connection to ground. Use multiple via holes to reduce emitter inductance. |
| 3          | COLLECTOR | RF output/collector bias.                                                  |
| 4          | EMITTER   | Connection to ground. Use multiple via holes to reduce emitter inductance. |

Notes:

## Mechanical Information

### Dimensions and PCB Mounting Pattern



Scale (mm) 1:2

### Recommended PCB Layout

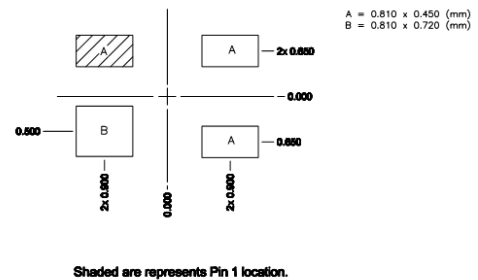
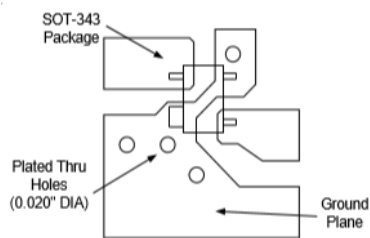


Figure 2. Stencil Recommendation

- Notes:
- All dimensions are in millimeters. Angles are in degrees.
  - Dimension and tolerance formats conform to ASME Y14.4M-1994.
  - The terminal #1 identifier and terminal numbering conform to JESD 95-1SPP-012
  - Use multiple plated-thru via holes located close to the package pins to ensure a good RF ground connection to a continuous ground plane on the backside of the board.

### Handling Precautions

| Parameter                        | Rating    | Standard              |
|----------------------------------|-----------|-----------------------|
| ESD – Human Body Model (HBM)     | Class 1A  | JESD22-A114           |
| ESD – Charged Device Model (CDM) | Class TBD | ANSI/ESD/JEDEC JS-002 |
| MSL – Moisture Sensitivity Level | Level 1   | IPC/JEDEC J-STD-020   |



Caution!

ESD sensitive device

### Solderability

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

Package lead metal: Cu lin 194

Package lead finish: 100% Matte Sn – 0.010 (0.0004) min thk

### RoHS Compliance

This part is compliant with the 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
- 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)

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Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- 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.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## 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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