

Product Features

- 60 – 2500 MHz
- +20 dBm P1dB
- +36 dBm Output IP3
- 14 dB Gain @ 900 MHz
- 12.5 dB Gain @ 1900 MHz
- Single Positive Supply (+3V)
- Available in a lead-free / green SOT-89 Package Style

Applications

- Final stage amplifiers for Repeaters
- Mobile Infrastructure
- CATV / DBS
- Defense / Homeland Security

Specifications ⁽¹⁾

| Parameters | Units | Min | Typ | Max |
|-------------------------------------|-------|-----|------|------|
| Operational Bandwidth | MHz | 60 | | 2500 |
| Test Frequency | MHz | | 1900 | |
| Gain | dB | 11 | 12.5 | |
| Input Return Loss | dB | | 15 | |
| Output Return Loss | dB | | 10 | |
| Output P1dB | dBm | | +20 | |
| Output IP3 ⁽²⁾ | dBm | | +36 | |
| IS-95A Channel Power @ -45 dBc ACPR | dBm | | +13 | |
| Noise Figure | dB | | 4.9 | |
| Operating Current Range | mA | 65 | 100 | 145 |
| Device Voltage | V | | +3 | |

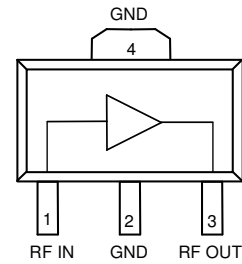
1. Test conditions unless otherwise noted: 25°C, Vsupply = +3 V, in a tuned application circuit.
 2. 3OIP measured with two tones at an output power of +6 dBm/tone separated by 1 MHz. The suppression on the largest IM3 product is used to calculate the 3OIP using a 2:1 rule.

Product Description

The ECG012 is a high dynamic range driver amplifier in a low-cost surface mount package. The InGaP/GaAs HBT is able to achieve high performance across a broad range with +36 dBm OIP3 and +20 dBm of compressed 1dB power. It is housed in a lead-free/green/RoHS-compliant SOT-89 SMT package. All devices are 100% RF and DC tested.

The ECG012 is targeted for use as a driver amplifier in wireless infrastructure where high linearity and medium power is required. An internal active bias allows the ECG012 to maintain high linearity over temperature and operate directly off a single +3 V supply. This combination makes the device an excellent candidate for transceiver line cards in current and next generation multi-carrier 3G base stations.

Functional Diagram



| Function | Pin No. |
|-------------|---------|
| Input | 1 |
| Output/Bias | 3 |
| Ground | 2, 4 |

Typical Performance ⁽³⁾

| Parameters | Units | Typical | | |
|-------------------|-------|---------------|------|------|
| Frequency | MHz | 900 | 1900 | 2140 |
| S21 - Gain | dB | 14 | 12.5 | 11.5 |
| S11 - Input R.L. | dB | -14 | -15 | -15 |
| S22 - Output R.L. | dB | -10 | -10 | -10 |
| Output P1dB | dBm | +20 | +20 | +20 |
| Output IP3 | dBm | +35 | +36 | +36 |
| Noise Figure | dB | 4.7 | 4.9 | 5.4 |
| Supply Bias | | +3 V @ 100 mA | | |

3. Typical parameters reflect performance in a tuned application circuit: Supply Voltage = +3 V, I = 100 mA, +25° C

Absolute Maximum Rating

| Parameter | Rating |
|-----------------------------|----------------|
| Operating Case Temperature | -40 to +85 °C |
| Storage Temperature | -65 to +150 °C |
| RF Input Power (continuous) | +15 dBm |
| Device Voltage | +6 V |
| Device Current | 220 mA |
| Junction Temperature | +250 °C |

Operation of this device above any of these parameters may cause permanent damage.

Ordering Information

| Part No. | Description |
|-----------------|--|
| ECG012B* | 0.1 Watt, High Linearity InGaP HBT Amplifier (lead-tin SOT-89 Pkg) |
| ECG012B-G | 0.1 Watt, High Linearity InGaP HBT Amplifier (lead-free/green/RoHS-compliant SOT-89 Pkg) |
| ECG012B-PCB900 | 900 MHz Evaluation Board |
| ECG012B-PCB1900 | 1900 MHz Evaluation Board |
| ECG012B-PCB2140 | 2140 MHz Evaluation Board |

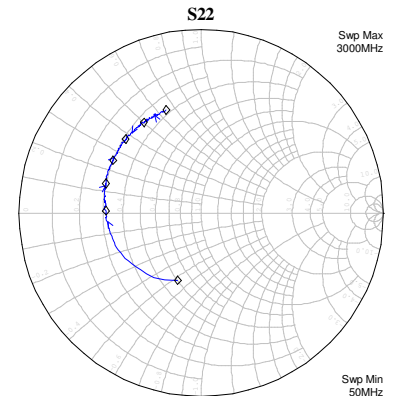
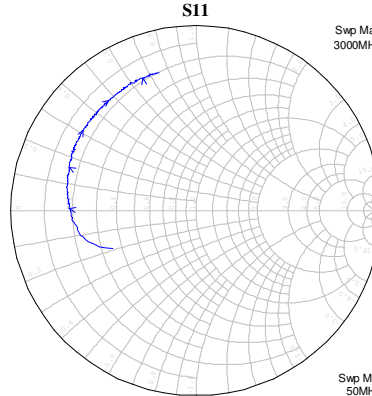
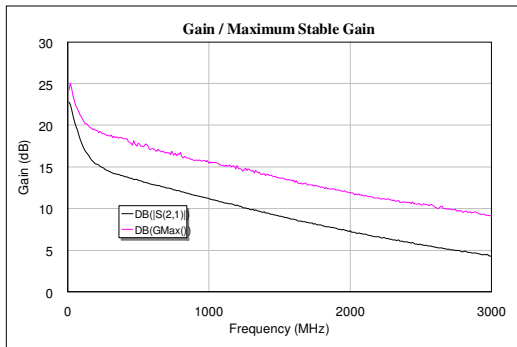
* This package is being phased out in favor of the green package type which is backwards compatible for existing designs. Refer to Product Change Notification WJPCN06MAY05TC1 on the WJ website.

Specifications and information are subject to change without notice



Typical Device Data

S-Parameters (Vcc = +3 V, Icc = 100 mA, T = 25°C, unmatched 50 ohm system)



Notes:

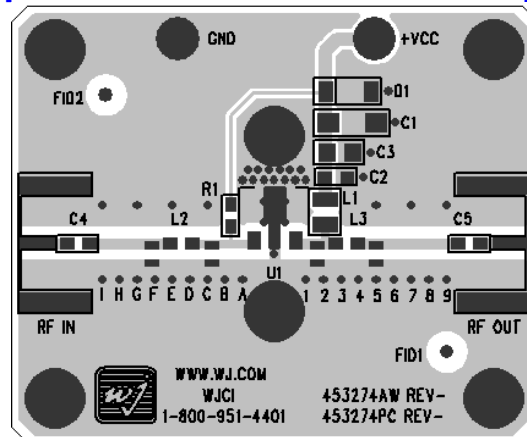
The gain for the unmatched device in 50 ohm system is shown as the trace in black color. For a tuned circuit for a particular frequency, it is expected that actual gain will be higher, up to the maximum stable gain. The maximum stable gain is shown in the dashed red line. The impedance plots are shown from 50 – 3000 MHz, with markers placed at 0.5 – 3.0 GHz in 0.5 GHz increments.

S-Parameters (Vcc = +3 V, Icc = 100 mA, T = 25°C, unmatched 50 ohm system, calibrated to device leads)

| Freq (MHz) | S11 (dB) | S11 (ang) | S21 (dB) | S21 (ang) | S12 (dB) | S12 (ang) | S22 (dB) | S22 (ang) |
|------------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 50 | -6.10 | -155.37 | 20.62 | 150.95 | -25.48 | 18.56 | -8.19 | -109.32 |
| 250 | -3.49 | -176.62 | 14.94 | 140.53 | -23.11 | 6.69 | -5.84 | -166.90 |
| 500 | -3.10 | 174.48 | 13.45 | 129.49 | -22.77 | 5.89 | -5.64 | 178.74 |
| 750 | -2.96 | 167.11 | 12.26 | 115.68 | -22.45 | 3.33 | -5.43 | 170.66 |
| 1000 | -2.79 | 160.22 | 11.17 | 102.37 | -22.24 | 1.71 | -5.27 | 162.86 |
| 1250 | -2.64 | 153.20 | 10.12 | 89.48 | -21.89 | -0.69 | -5.06 | 156.23 |
| 1500 | -2.55 | 146.05 | 9.07 | 78.22 | -21.32 | -2.91 | -5.01 | 149.29 |
| 1750 | -2.44 | 138.76 | 8.18 | 67.48 | -21.09 | -5.27 | -4.84 | 142.22 |
| 2000 | -2.49 | 132.13 | 7.30 | 57.62 | -20.45 | -7.61 | -4.77 | 135.81 |
| 2250 | -2.39 | 125.66 | 6.45 | 48.01 | -20.33 | -11.25 | -4.69 | 128.87 |
| 2500 | -2.35 | 119.11 | 5.69 | 39.53 | -19.88 | -16.63 | -4.68 | 122.52 |
| 2750 | -2.28 | 111.83 | 4.98 | 30.50 | -19.58 | -18.56 | -4.70 | 115.41 |
| 3000 | -2.29 | 104.87 | 4.30 | 21.43 | -18.98 | -24.51 | -4.54 | 108.72 |

Device S-parameters are available for download off of the website at: <http://www.wj.com>

Application Circuit PC Board Layout



Circuit Board Material: .014" Getek, 4 layers (other layers added for rigidity), .062" total thickness, 1 oz copper
Microstrip line details: width = .026", spacing = .026"

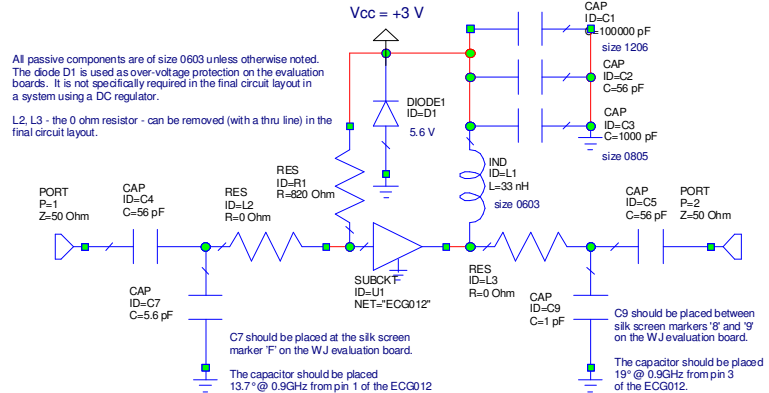


900 MHz Application Circuit (ECG012B-PCB900)

Typical RF Performance

| Frequency | 900 MHz |
|--|---------|
| S21 – Gain | 14 dB |
| S11 – Input Return Loss | -14 dB |
| S22 – Output Return Loss | -10 dB |
| Output IP3 (+6 dBm / tone, 1 MHz spacing) | +35 dBm |
| Output P1dB | +20 dBm |
| Noise Figure | 4.7 dB |
| Supply Voltage | +3 V |
| Supply Current | 100 mA |

Measured parameters were taken at 25 °C.

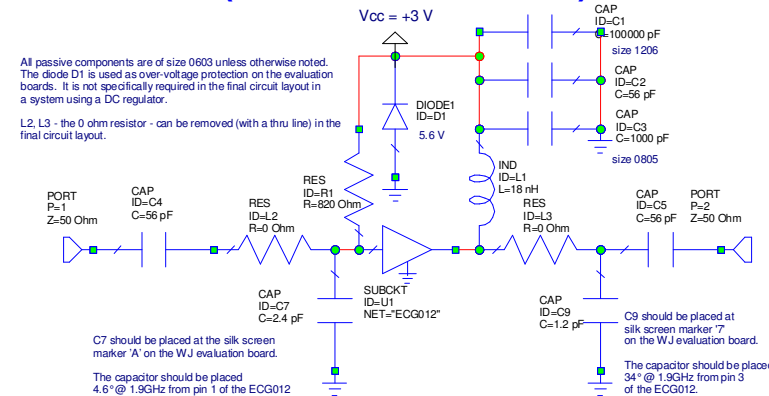


1900 MHz Application Circuit (ECG012B-PCB1900)

Typical RF Performance

| Frequency | 1900 MHz |
|--|----------|
| S21 – Gain | 12.5 dB |
| S11 – Input Return Loss | -15 dB |
| S22 – Output Return Loss | -10 dB |
| Output IP3 (+6 dBm / tone, 1 MHz spacing) | +36 dBm |
| Output P1dB | +20 dBm |
| Noise Figure | 4.9 dB |
| Supply Voltage | +3 V |
| Supply Current | 100 mA |

Measured parameters were taken at 25 °C.

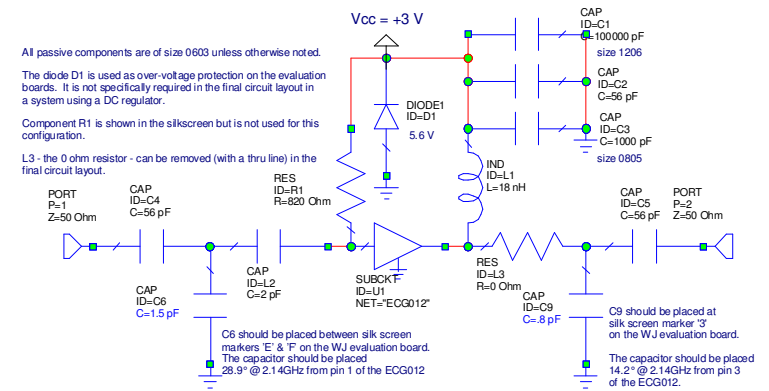


2140 MHz Application Circuit (ECG012B-PCB2140)

Typical RF Performance

| Frequency | 2140 MHz |
|--|----------|
| S21 – Gain | 11.5 dB |
| S11 – Input Return Loss | -15 dB |
| S22 – Output Return Loss | -10 dB |
| Output IP3 (+6 dBm / tone, 1 MHz spacing) | +34 dBm |
| Output P1dB | +20 dBm |
| Noise Figure | 5.4 dB |
| Supply Voltage | +3 V |
| Supply Current | 100 mA |

Measured parameters were taken at 25 °C.

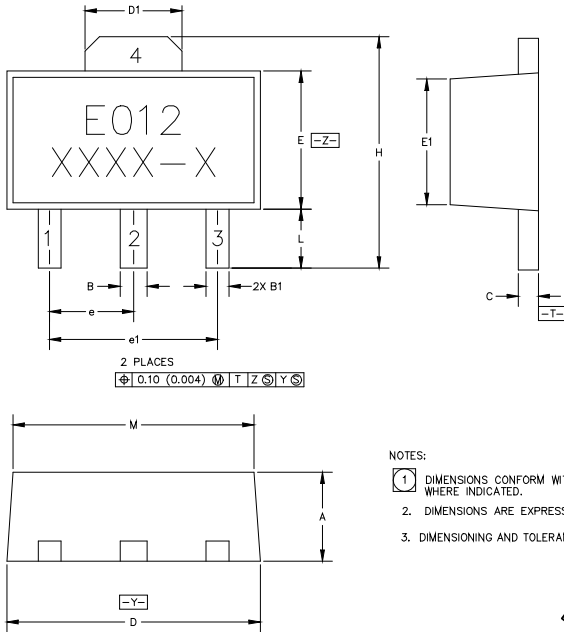




ECG012B (SOT-89 Package) Mechanical Information

This package may contain lead-bearing materials. The plating material on the leads is SnPb.

Outline Drawing



| SYMBOL | MIN | MAX |
|--------|--------------------|----------------|
| A | 1.40 (.055) | 1.60 (.063) |
| B | .44 (.017) | .56 (.022) |
| B1 | .36 (.014) | .48 (.019) |
| C | .35 (.014) | .44 (.017) |
| D | 4.40 (.173) | 4.60 (.181) |
| D1 | 1.62 (.064) | 1.83 (.072) |
| E | 2.29 (.079) | 2.60 (.102) |
| E1 | 2.13 (.084) | 2.29 (.090) |
| e | 1.50 BSC (.059) | |
| e1 | 3.00 BSC (.118) | |
| H | 3.94 (.155) | 4.16 (.163) |
| L | .89 (.035) | 1.27 (.050) |
| M | 4.04 (.159) | 4.16 (.163) |

NOTES:

1. DIMENSIONS CONFORM WITH JEDEC TO-243 WHERE INDICATED.
2. DIMENSIONS ARE EXPRESSED IN MILLIMETERS.
3. DIMENSIONING AND TOLERANCING IAW ASME Y14.5M-2009.

Product Marking

The component will be marked with an "E012" signator with an alphanumeric code on the top surface of the package.

Table 1 provides information on this part is located on the website for "Application" section.

ESD/MSL Information

Warning: ESD sensitive device.

ESD Rating: Class 1B

Value: Passes between 500 and 1000V

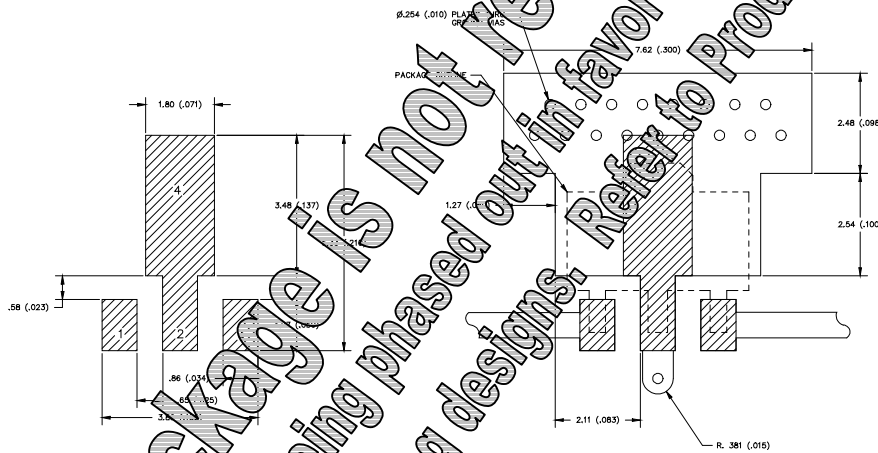
Test: Human Body Model (HBM)

Standard: JEDEC Standard JESD22-A114

MSL Rating: Level 3 at +235° C convection reflow

Standard: JEDEC Standard J-STD-020

Land Pattern



Mounting Config. Notes

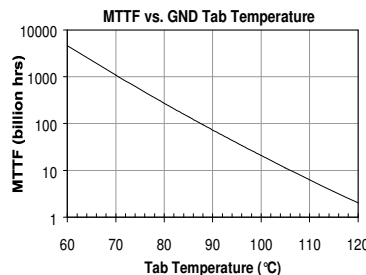
1. Ground / thermal vias are critical for the proper performance of this device. Vias should use a .35mm (#80 / .0135") diameter drill and have a final plated thru diameter of .25 mm (.010").
2. Add as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.
3. Mounting screws can be added near the part to fasten the board to a heatsink. Ensure that the ground / thermal via region contacts the heatsink.
4. Do not put solder mask on the backside of the PC board in the region where the board contacts the heatsink.
5. RF trace width depends upon the PC board material and construction.
6. Use 1 oz. Copper minimum.
7. All dimensions are in millimeters (inches). Angles are in degrees.

Thermal Specifications

| Parameter | Operating |
|------------------------------|---------------|
| Case Temperature, Tc | -40 to +85° C |
| Thermal Resistance, Rth(j-c) | 149° C / W |
| Junction Temperature, Tj | 130° C |

Notes:
The thermal resistance is referenced from the junction-to-case at a case temperature of 85° C.

2. This corresponds to the typical biasing condition of 100 mA at an 85° C case temperature. A minimum MTTF of 1 million hours is achieved for junction temperatures below 247° C.

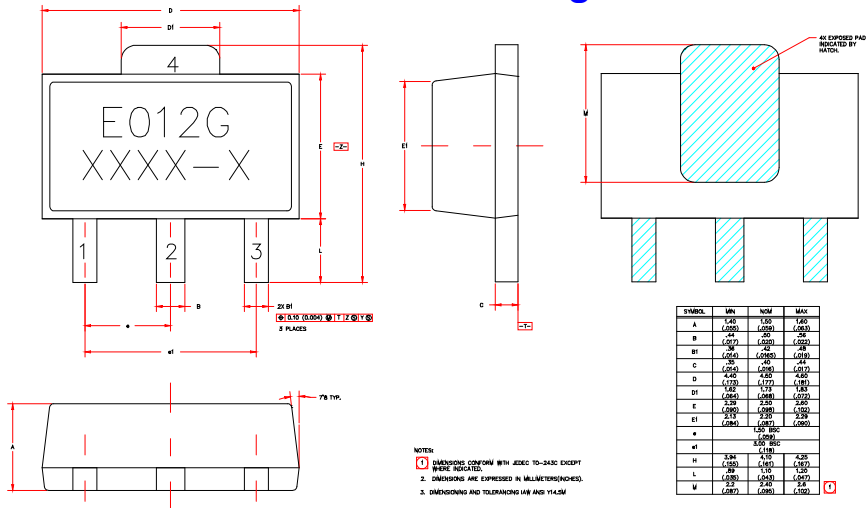


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ECG012B (Green / Lead-free SOT-89 Package) Mechanical Information

This package is lead-free/Green/RoHS-compliant. It is compatible with both lead-free (maximum 260°C reflow temperature) and leaded (maximum 245°C reflow temperature) soldering processes. The plating material on the leads is NiPdAu.

Outline Drawing



Product Marking

The component will be marked with an "E012G" designator with an alphanumeric lot code on the top surface of the package.

Tape and reel specification for this part is located on the website in the "Application Notes" section.

ESD / MSL Information

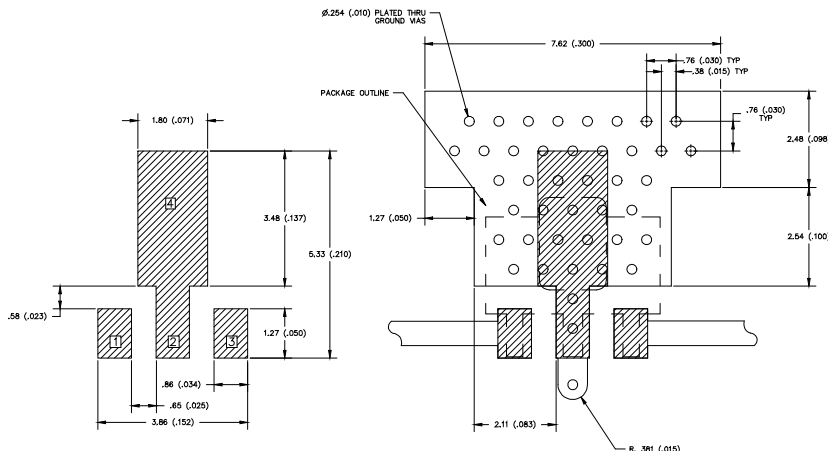


Caution! ESD sensitive device.

ESD Rating: Class 1B
 Value: Passes between 500 and 1000V
 Test: Human Body Model (HBM)
 Standard: JEDEC Standard JESD22-A114

MSL Rating: Level 3 at +260° C convection reflow
 Standard: JEDEC Standard J-STD-020

Land Pattern



Mounting Config. Notes

- Ground / thermal vias are critical for the proper performance of this device. Vias should use a .35mm (#80 / .0135") diameter drill and have a final plated thru diameter of .25mm (.010").
- Add as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.
- Mounting screws can be added near the part to fasten the board to a heatsink. Ensure that the ground / thermal via region contacts the heatsink.
- Do not put solder mask on the backside of the PC board in the region where the board contacts the heatsink.
- RF trace width depends upon the PC board material and construction.
- Use 1 oz. Copper minimum.
- All dimensions are in millimeters (inches). Angles are in degrees.

Thermal Specifications

| Parameter | Rating |
|--|---------------|
| Operating Case Temperature | -40 to +85° C |
| Thermal Resistance, Rth ⁽¹⁾ | 149° C / W |
| Junction Temperature, Tjc ⁽²⁾ | 130° C |

Notes:

- The thermal resistance is referenced from the junction-to-case at a case temperature of 85° C.
- This corresponds to the typical biasing condition of +3V, 100 mA at an 85° C case temperature. A minimum MTTF of 1 million hours is achieved for junction temperatures below 247° C.

