

Applications

- Wireless Infrastructure
- CATV / SATV / MoCA
- Point to Point
- Defense & Aerospace
- Test & Measurement Equipment
- General Purpose Wireless

Product Features

- DC – 6 GHz
- 22 dB Gain at 1 GHz
- +12.5 dBm P1dB at 1 GHz
- +25 dBm OIP3 at 1 GHz
- 3.4 dB Noise Figure
- Internally Matched to 50 Ω
- Lead-free / green / RoHS-Compliant SOT-363 Package

General Description

The ECG001F-G is a general-purpose buffer amplifier that offers high dynamic range in a low-cost surface-mount package. At 1000 MHz, the ECG001F-G typically provides 22 dB of gain, +25 dBm Output IP3, and +12.5 dBm P1dB.

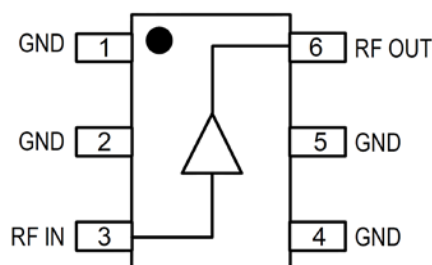
The ECG001F-G consists of a Darlington-pair amplifier using the high reliability InGaP/GaAs HBT process technology and only requires DC-blocking capacitors, a bias resistor, and an inductive RF choke for operation. The device is ideal for wireless applications and is available in a low-cost, surface-mountable lead-free / green / RoHS-compliant SOT-363 package. All devices are 100% RF and DC tested.

This broadband MMIC amplifier can be directly applied to various current and next generation wireless technologies. In addition, the ECG001F-G will satisfy general amplification requirements in the DC to 6 GHz frequency range such as CATV and mobile wireless.



6 Pin SOT-363 Package

Functional Block Diagram



Pin Configuration

Pin No.	Label
3	RF IN
6	RF OUT
1, 2, 4, 5	GND

Ordering Information

Part No.	Description
ECG001F-G	InGaP / GaAs HBT Gain Block

Standard T/R size = 3000 pieces on a 7" reel

Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-55 to 150 °C
RF Input Power, CW, 50Ω, T=25 °C	+12 dBm
Device Current (I _{CC})	150 mA

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
T _{CASE}	-40		+85	°C
T _j for >10 ⁶ hours MTTF			+160	°C

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

Test conditions unless otherwise noted: V_{SUPPLY} = +5 V, T_{CASE} = +25 °C, R_{BIAS} = 51 Ω, 50 Ω system

Parameter	Conditions	Min	Typ	Max	Units
Operational Frequency Range		DC		6000	MHz
Gain	Freq.=1000 MHz OIP3 Pout= -1 dBm / tone, Δf= 1 MHz		22.2		dB
Output P1dB			+12.5		dBm
Output IP3 ⁽¹⁾			+25		dBm
Gain	Freq.=2000 MHz	19.2	20.7	21.8	dB
Input Return Loss			35		dB
Output Return Loss			18		dB
Output P1dB			+12.5		dBm
Noise Figure			3.4		dB
Device Voltage		+3.0	+3.4	+3.8	V
Device Current			30		mA
Thermal Resistance, R _{TH}			270		°C / W

Typical RF Performance ⁽¹⁾

Test conditions unless otherwise noted: V_{SUPPLY} = +5 V, I_{CC} = 30 mA (typ.), R_{BIAS} = 51 Ω, Temp. = +25 °C, 50 Ω System

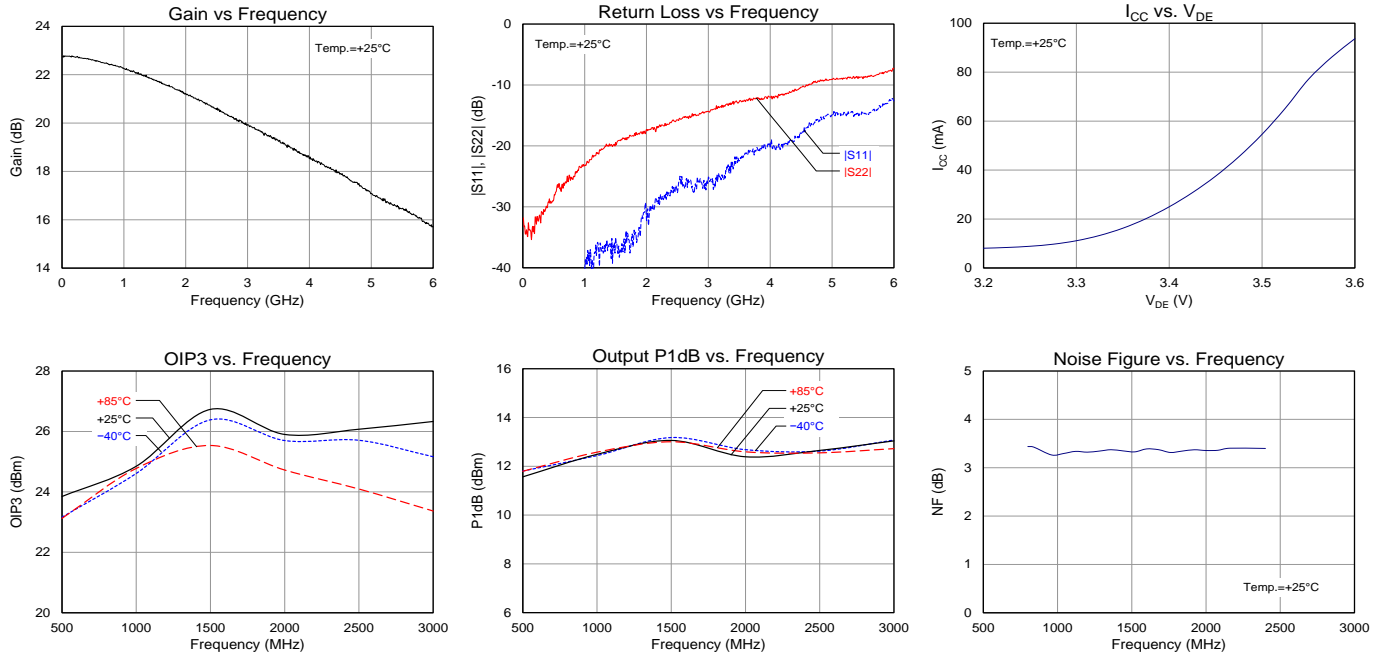
Parameter	Typical								Units
Frequency	100	500	900	1900	2140	2400	3500	5800	MHz
Gain	22.8	22.6	22.4	20.9	20.6	20.2	18.6	15.5	dB
Input Return Loss	48	46	42	35	29	28	22	14	dB
Output Return Loss	34	29	24	18	17	16	13	8	dB
Output P1dB	+11.6	+11.6	+12.6	+12.6	+12.6	+12.8	+12.2	+11	dBm
Output IP3 ⁽²⁾	+23.6	+23.5	+24.8	+26	+25.6	+25.4	+23		dBm
Noise Figure	3.4	3.4	3.4	3.4	3.4	3.4			dB

Notes:

- Gain and return loss values presented above, and in the plots of the following section, are measured at the device level. Application specific performance values will differ in accordance with external components selected for the desired frequency band of operation. P1dB, OIP3 and NF data is measured using the application circuit shown on page 4.
- Pout= -1 dBm / tone, 1 MHz tone spacing.

Typical RF Performance

Test conditions unless otherwise noted: $V_{\text{SUPPLY}} = +5 \text{ V}$, $I_{\text{CC}} = 30 \text{ mA (typ.)}$, $R_{\text{BIAS}} = 51 \Omega$, 50Ω System



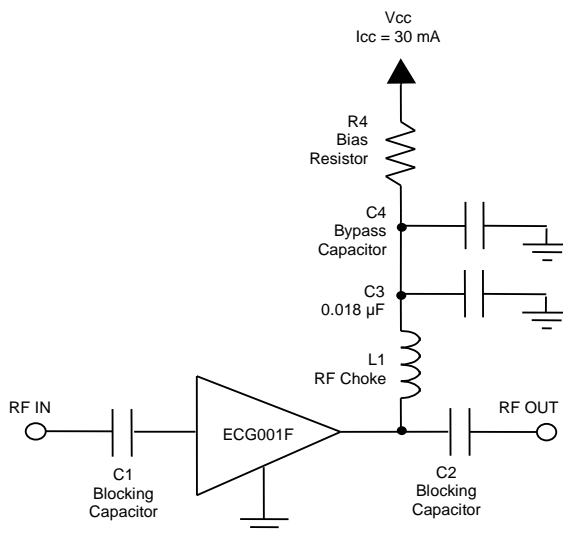
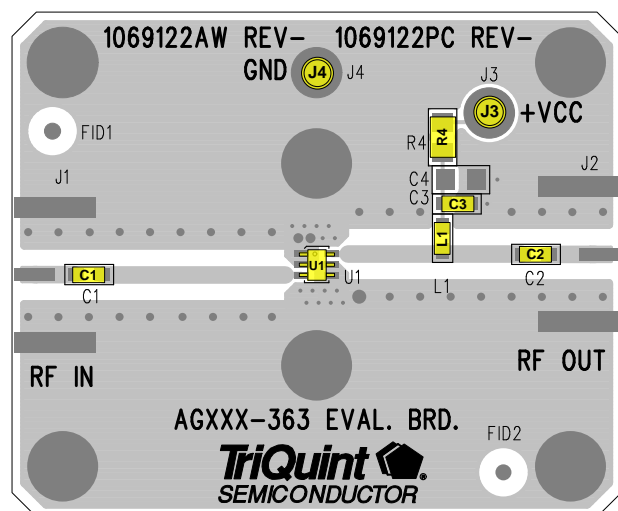
Typical Device S-Parameters

Test conditions unless otherwise noted: $V_{\text{DEVICE}} = +3.4 \text{ V}$, $I_{\text{CC}} = 30 \text{ mA}$, $\text{Temp.} = +25^\circ\text{C}$, calibrated to device leads

Frequency (MHz)	S11 (dB)	S11 (ang)	S21 (dB)	S21 (ang)	S12 (dB)	S12 (ang)	S22 (dB)	S22 (ang)
50	-33.58	15.96	22.85	178.01	-24.47	-1.35	-28.60	3.58
500	-24.53	12.09	22.63	162.01	-24.14	1.89	-22.29	-35.35
1000	-32.76	32.44	22.20	144.90	-23.99	4.76	-25.75	-100.14
1500	-28.56	153.22	21.54	129.42	-23.56	7.59	-20.80	-165.24
2000	-25.13	172.50	20.74	114.94	-23.12	9.11	-17.59	175.89
2500	-28.01	-117.92	20.11	103.13	-22.71	7.41	-20.44	169.69
3000	-28.65	-133.85	19.33	91.28	-22.14	7.37	-18.13	154.41
3500	-28.35	-142.02	18.59	79.59	-21.68	4.16	-16.41	140.24
4000	-25.99	-171.80	17.77	68.13	-20.88	2.49	-14.29	124.73
4500	-22.91	160.22	17.05	57.38	-20.50	2.47	-12.47	116.41
5000	-19.69	153.85	16.39	48.12	-20.03	-0.55	-11.36	113.60
5500	-17.30	152.52	15.78	39.49	-19.55	-5.36	-11.30	114.22
6000	-15.88	144.43	15.21	30.49	-19.14	-6.76	-11.31	113.24

Device S-parameters are available for download at www.triquint.com

Application Circuit



Bill of Material ⁽¹⁾

Reference Des.	Value	Description	Manuf.	Part Number
U1	n/a	InGaP HBT Gain Block	TriQuint	ECG001F-G
L1	39 nH	Wirewound Inductor, 0603	various	
C1, C2	56 pF	Chip Capacitor, 0603	various	
C3	0.018 µF	Chip Capacitor, 0603	various	
C4	n/a	Do Not Place		
R4 ⁽²⁾	51 Ω	1% Tolerance, 0805	various	

Notes:

1. Component values listed for the application have been selected to achieve optimal broadband performance.
2. The value of R4 is dependent upon the supply voltage and provides bias stability over temperature.
3. The minimum recommended supply voltage is +5 V.

Recommended Component Values ⁽¹⁾

Frequency (MHz)	50	500	900	1900	2200	2500	3500
L1	820 nH	220 nH	68 nH	27 nH	22 nH	18 nH	15 nH
C1, C2, C3	.018 uF	1000 pF	100 pF	68 pF	68 pF	56 pF	39 pF

Notes:

1. The values for the components are dependent upon the intended frequency of operation.

Recommended Bias Resistor Values

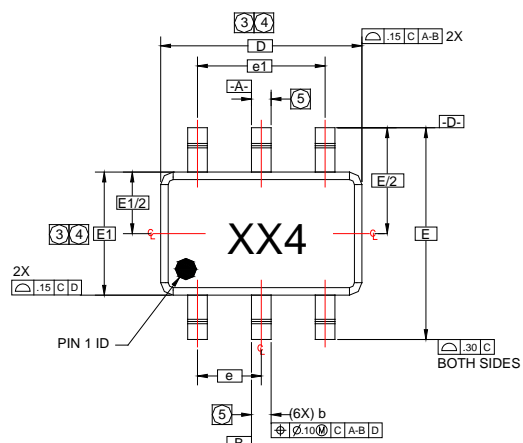
V _{SUPPLY} (V)	5	6	8	9	10	12
R4 (Ω)	53.3	86.7	153	187	220	287
Component Size	0805	0805	1210	1210	2010	2010

Package Marking and Dimensions

Product Marking:

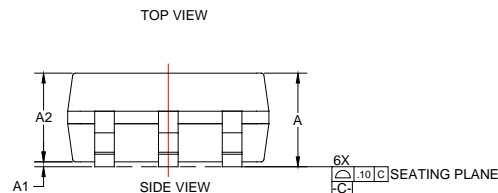
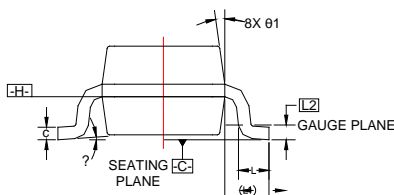
The top surface of the component will be marked with a two-digit numeric lot code (shown as “XX”) followed by a “4” designator.

SYMBOL	MIN	MAX
A	-	1.10 (0.043)
A1	0	0.10 (0.004)
A2	0.70 (0.028)	1.00 (0.039)
D	2.00 (0.079)	BASIC
E	2.10 (0.083)	BASIC
E1	1.25 (0.049)	BASIC
L	0.21 (0.008)	0.41 (0.016)
L1	0.42 (0.017)	REF
L2	0.15 (0.006)	BASIC
?	0°8	8°8
71	4°8	12°8
b	0.15 (0.006)	0.30 (0.012)
c	0.08 (0.003)	0.22 (0.009)
e	0.65 (0.026)	BASIC
e1	1.30 (0.051)	BASIC

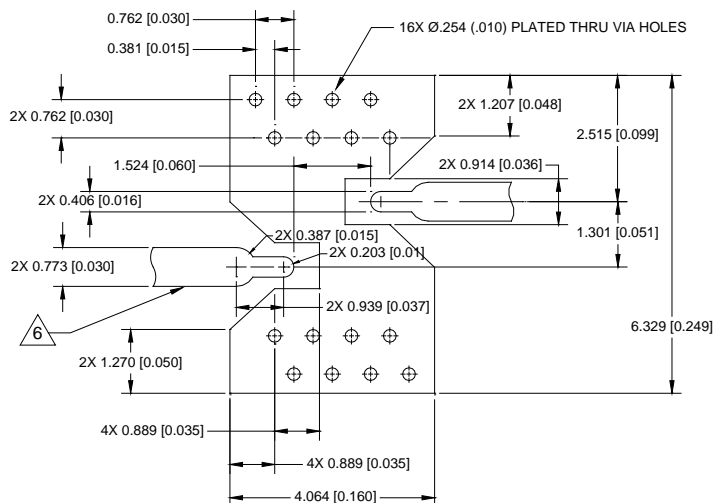


Notes:

1. Dimensions are in millimeters (Inches)
2. Dimensions and tolerances per ASME Y14.5M-1194. Package conforms to JEDEC MO-203, Issue B.



PCB Mounting Pattern



Notes:

1. All dimensions are in millimeters (inches). Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Vias are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation.
4. Do not remove or minimize via hole structure in the PCB. Thermal and RF grounding is critical.
5. We recommend a 0.35mm (#80/.0135") diameter bit for drilling via holes and a final plated thru diameter of 0.25 mm (0.10").
6. The RF I/O trace transition shown is to a 30 mil wide line. Modify transition as required to interface with other line widths.

Product Compliance Information

ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: Class 1A
Value: ≥ 250 V to < 500 V
Test: Human Body Model (HBM)
Standard: ESDA/JEDEC Standard JS-001-2012

MSL Rating

MSL Rating: Level 3
Test: 260 °C convection reflow
Standard: JEDEC Standard IPC/JEDEC J-STD-020

Solderability

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

Contact plating: NiPdAu

RoHS Compliance

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Contact Information

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