

## Product Features

- DC – 3.5 GHz
- +18.6 dBm P1dB at 1 GHz
- +36 dBm OIP3 at 1 GHz
- 14.8 dB Gain at 1 GHz
- 5.5 dB Noise Figure at 2 GHz
- Available in SOT-86, SOT-89 and lead-free / green SOT-89 Package Styles
- Internally matched to 50 Ω

## Applications

- Mobile Infrastructure
- CATV / DBS
- W-LAN / ISM
- RFID
- Defense / Homeland Security
- Fixed Wireless

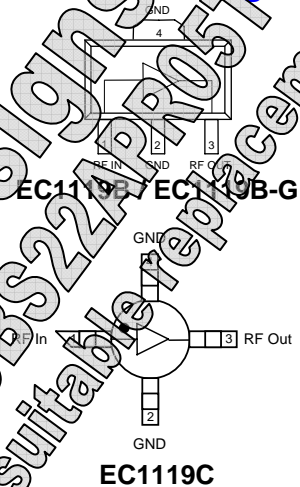
## Product Description

The EC1119 is a general-purpose buffer amplifier that offers high dynamic range in a low-cost surface-mount package. At 1 GHz, the EC1119 typically provides 14.8 dB of gain, +36 dBm Output IP3, and +18.6 dBm P1dB.

The EC1119 consists of Darlington pair amplifiers 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 low-cost surface-mountable plastic SOT-86 and SOT-89 packages. The EC1119 is also available in a lead-free/green/RoHS-compliant SOT-89 package. All devices are 100% RF and DC tested.

The broadband MMIC amplifier can be directly applied to various current and next generation wireless technologies such as GPRS, GSM, CDMA, and W-CDMA. In addition, the EC1119 will work for other various applications within the DC to 3.5 GHz frequency range such as W-LAN and fixed wireless.

## Functional Diagram



## Specifications <sup>(1)</sup>

Parameter	Units	Min	Typ	Max
Operational Bandwidth	MHz	DC		3500
Test Frequency	MHz		1000	
Gain	dB		14.8	
Output P1dB	dBm		+18.6	
Output IP3 <sup>(2)</sup>	dBm		+36	
Test Frequency	MHz		2000	
Gain	dB		14.8	
Large-signal Gain <sup>(3)</sup>	dB		14.8	
Input Return Loss	dB		20	
Output Return Loss	dB		20	
Output P1dB	dBm		+18.6	
Output IP3 <sup>(2)</sup>	dBm		+36	
Noise Figure	dB		5.5	
Device Voltage	V		4.8	
Device Current	mA		80	

1. Test conditions unless otherwise noted: Supply Voltage = +6 V, R<sub>bias</sub> = 15 Ω, 50 Ω System.  
 2. 3OIP measured with two tones at an output power of +5 dBm, tone separated by 1 MHz. The suppression of the largest IM3 product is used to calculate the 3OIP using a 2:1 rule.  
 3. Large-signal gain is tested with an input power level of +5 dBm.

## Typical Performance <sup>(4)</sup>

Parameter	Units	Typical
Frequency	MHz	500 900 1900 2140
Gain	dB	15 14.8 13.8 13
Gain Compression	dB	-32 -22.5 -20 -19.5
Output P1dB	dBm	-25.5 -25 -25 -25
Output IP3 <sup>(2)</sup>	dBm	+19 +18.6 +18.6 +18.5
Output IP3 <sup>(2)</sup>	dBm	+36 +36 +33.2 +33
Noise Figure	dB	4.5 4.9 5 5.2

4. Test conditions: T = 25°C, Supply Voltage = +6 V, Device Voltage = +6V, R<sub>bias</sub> = 15 Ω, 50 Ω System.

## Absolute Maximum Rating

Parameter	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-55 to +150 °C
Device Current	130 mA
RF Output Power (continuous)	+12 dBm
Junction Temperature	+250 °C

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

## Ordering Information

Part No.	Description
EC1119B	InGaP HBT Gain Block (lead-tin SOT-89 Pkg)
EC1119B-G	InGaP HBT Gain Block (lead-free/green/RoHS-compliant SOT-89 Pkg)
EC1119C	InGaP HBT Gain Block (SOT-86 Pkg)

Specifications and information are subject to change without notice

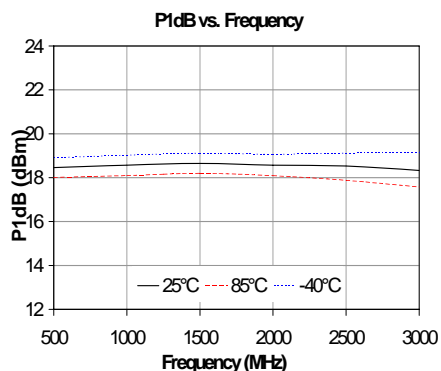
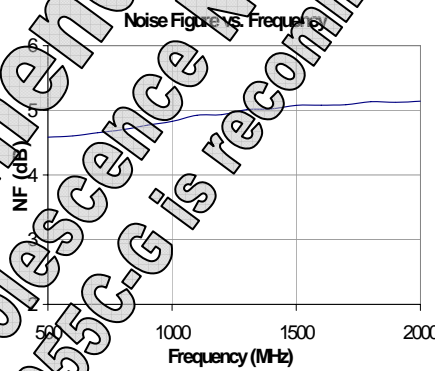
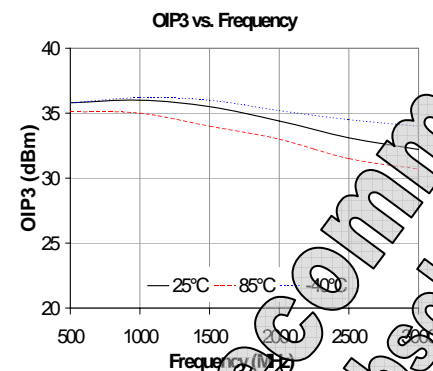
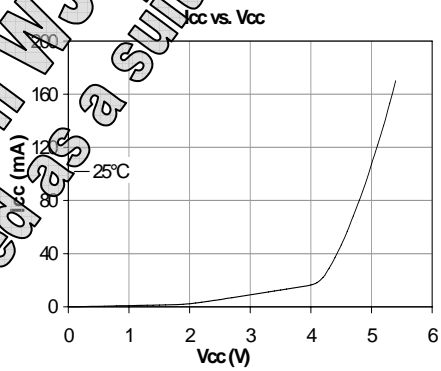
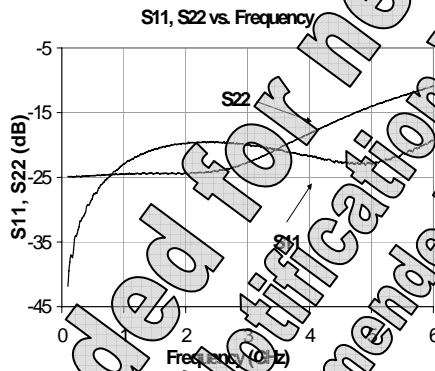
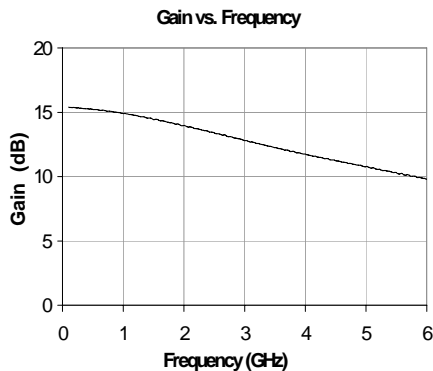


## Typical Device RF Performance

Supply Bias = +6 V, R<sub>bias</sub> = 15 Ω, I<sub>cc</sub> = 80 mA

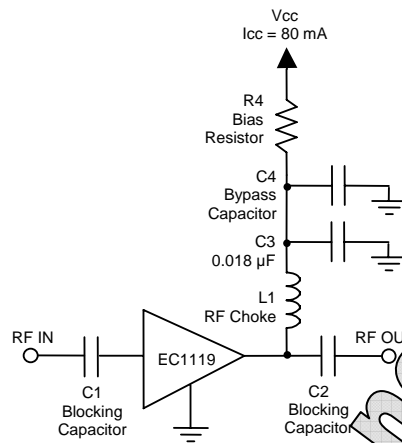
Frequency	MHz	100	500	900	1900	2140	2400	2500
S21	dB	15.2	15	15	14	13.5	13.3	12.9
S11	dB	-35	-33	-23	-20	-21	-21	-23
S22	dB	-25	-25	-25	-25	-25	-25	-20
Output P1dB	dBm	+18.8	+18.6	+18.6	+18.6	+18.5	+18.5	+18.1
Output IP3	dBm	+36	+36	+36	+33.2	+32.6	+32.4	+32.1
Noise Figure	dB	4.4	4.6	4.8	5.1	5.2	5.4	

1. Test conditions: T = 25° C, Supply Voltage = +6 V, Device Voltage = 4.8 V, R<sub>bias</sub> = 15.0 Ω, I<sub>cc</sub> = 80 mA typical, 50 Ω System.
2. 3OIP measured with two tones at an output power of +5 dBm/tone separated by 1 MHz. The suppression on the largest IM3 product is used to calculate the 3OIP using the table.
3. Data is shown as device performance only. Actual implementation for the desired frequency band will be determined by external components shown in the application circuit.



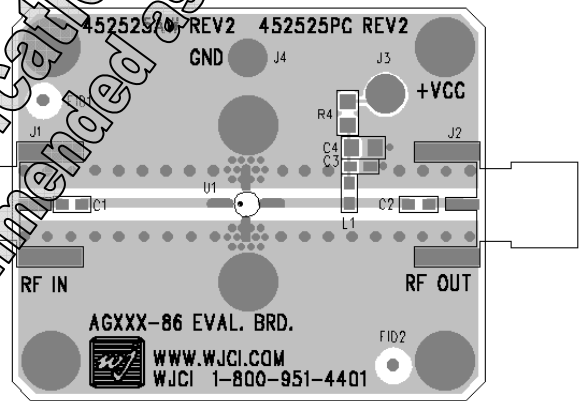
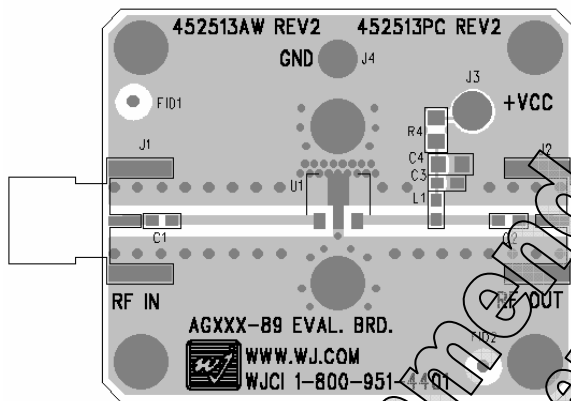
Not recommended for new designs. Refer to Product Obsolescence Notification WJ0BS22APR05TC1. The AG602-89G or ECG055C-G is recommended as a suitable replacement.

Recommended Application Circuit



EC1119B-PCB

EC1119C-PCB



Recommended Component Values

Reference Designator	Frequency (MHz)						
	50	500	900	1900	2200	2500	3500
L1	820 nH	220 nH	68 pF	47 pF	22 nH	18 nH	15 nH
C1, C2, C4	.018 µF	.001 µF	10 pF	5 pF	68 pF	56 pF	39 pF

Recommended Bias Resistor Values

Supply Voltage	R1 value	Size
6 V	15.0 ohms	0805
7 V	27.5 ohms	1210
8 V	40 ohms	1210
9 V	53 ohms	2010
10 V	65 ohms	2010
12 V	90 ohms	2512

- The proper values for the components are dependent upon the intended frequency of operation.
- The following values are contained on the evaluation board to achieve optimal broadband performance:

Ref. Desig.	Value / Type	Size
L1	39 nH wirewound inductor	0603
C1, C2	0.018 µF chip capacitor	0603
C3	0.018 µF chip capacitor	0603
C4	Do Not Place	
R4	10 Ω 1% tolerance	0805

The proper value for R1 is dependent upon the supply voltage and allows for bias stability over temperature. WJ recommends a minimum supply bias of +6 V. A 1% tolerance resistor is recommended.









### Typical Device S-Parameters – EC1119B / EC1119C

S-Parameters ( $V_{device} = +4.8\text{ V}$ ,  $I_{cc} = 80\text{ mA}$ ,  $T = 25^\circ\text{C}$ , calibrated to device leads)

Freq (MHz)	S11 (dB)	S11 (ang)	S21 (dB)	S21 (ang)	S12 (dB)	S12 (ang)	S22 (dB)	S22 (ang)
50	-13.68	176.59	14.77	177.82	-18.65	-0.55	-6.68	177.77
500	-14.01	153.66	14.53	159.01	-18.56	-7.01	-6.22	158.74
1000	-13.92	131.55	14.23	139.34	-18.53	-13.71	-6.00	133.17
1500	-13.50	111.69	13.78	120.21	-18.54	-20.59	-3.64	110.08
2000	-13.09	94.24	13.37	101.77	-18.45	-27.67	-14.56	128.42
2500	-12.45	78.40	12.79	83.65	-18.45	-35.03	-13.28	114.00
3000	-11.98	64.36	12.18	66.77	-18.45	-42.00	-11.14	100.00
3500	-11.08	52.22	11.59	50.14	-18.54	-49.93	-9.83	89.41
4000	-10.24	41.68	11.01	34.26	-18.59	-57.20	-8.75	75.46
4500	-9.23	32.47	10.39	18.45	-18.76	-65.04	-8.32	67.58
5000	-8.35	25.22	9.77	3.11	-18.89	-72.73	-7.13	57.41
5500	-7.32	17.75	9.15	-11.87	-19.10	-80.58	-6.00	48.08
6000	-6.62	11.34	8.54	-26.85	-19.31	-88.42	-5.00	38.50

### Typical Device S-Parameters – EC1119C

S-Parameters ( $V_{device} = +4.8\text{ V}$ ,  $I_{cc} = 80\text{ mA}$ ,  $T = 25^\circ\text{C}$ , calibrated to device leads)

Freq (MHz)	S11 (dB)	S11 (ang)	S21 (dB)	S21 (ang)	S12 (dB)	S12 (ang)	S22 (dB)	S22 (ang)
50	-29.84	171.31	15.62	178.01	-18.67	-0.57	-33.15	-0.11
500	-27.21	114.27	15.45	161.35	-18.55	-7.05	-36.51	-20.37
1000	-23.51	84.84	15.11	143.51	-18.55	-14.15	-38.59	-13.39
1500	-21.04	60.73	14.59	126.59	-18.74	-6.46	-40.63	-110.86
2000	-18.84	47.72	14.00	107.74	-18.63	-8.51	-32.74	167.54
2500	-18.08	38.70	13.44	95.42	-18.51	-11.20	-27.40	153.51
3000	-17.09	29.43	12.85	81.77	-18.51	-13.35	-22.54	141.19
3500	-16.67	28.85	12.35	68.07	-18.51	-16.25	-20.09	131.04
4000	-17.03	26.34	11.68	55.20	-18.24	-18.90	-17.22	125.60
4500	-16.76	25.72	11.19	44.74	-18.07	-22.13	-15.23	115.08
5000	-17.03	33.78	10.75	30.35	-17.98	-25.40	-13.55	108.62
5500	-17.23	37.92	10.27	17.57	-17.87	-29.21	-12.07	99.49
6000	-16.53	45.54	9.88	5.47	-17.79	-32.98	-10.88	92.53

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