



## AGB3300

50Ω High Linearity Low Noise  
Wideband Gain Block

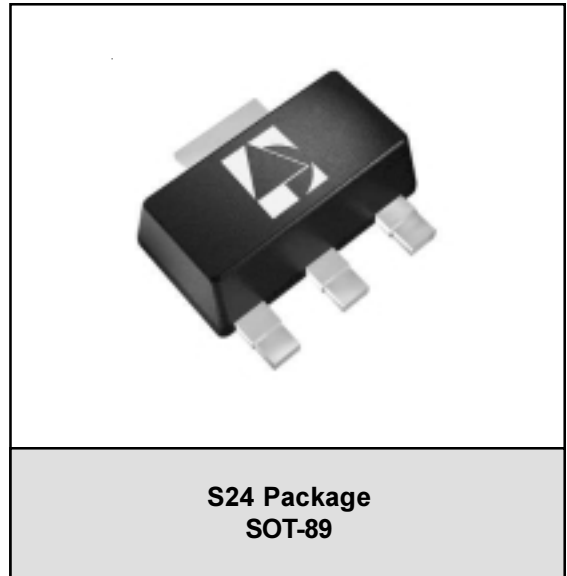
Data Sheet - Rev 2.1

### FEATURES

- 250-3000 MHz Frequency Range
- +43 dBm Output IP3
- Low Noise Figure: 2 dB at 900 MHz
- 14.5 dB Gain at 900 MHz (matched)
- +22 dBm P1dB
- SOT-89 Package
- Single +5V Supply
- Low Power: 700 mW
- Case Temperature: -40 to +85 °C

### APPLICATIONS

- Cellular Base Stations for CDMA, TDMA, GSM, PCS and CDPD systems
- Fixed Wireless
- MMDS/WLL
- WLAN, HyperLAN
- CATV



### PRODUCT DESCRIPTION

The AGB3300 is one of a series of GaAs MESFET amplifiers designed for use in applications requiring high linearity, low noise and low distortion. With a high output IP3, low noise figure and wide band operation, the AGB3300 is ideal for 50Ω

wireless infrastructure applications such as Cellular Base Stations, MMDS, and WLL. Offered in a low cost SOT-89 surface mount package, the AGB3300 requires a single +5V supply, and typically consumes 700 mW of power.

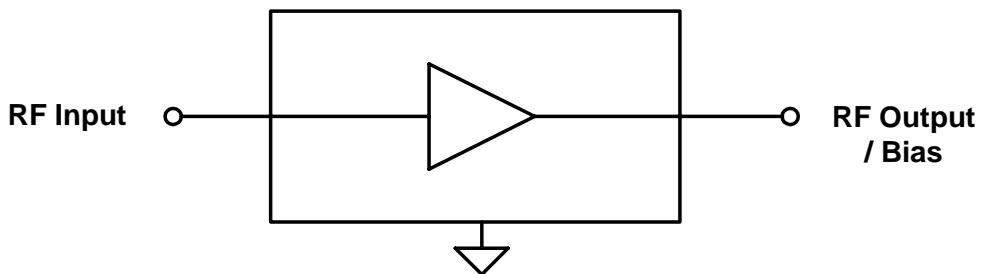


Figure 1: Block Diagram

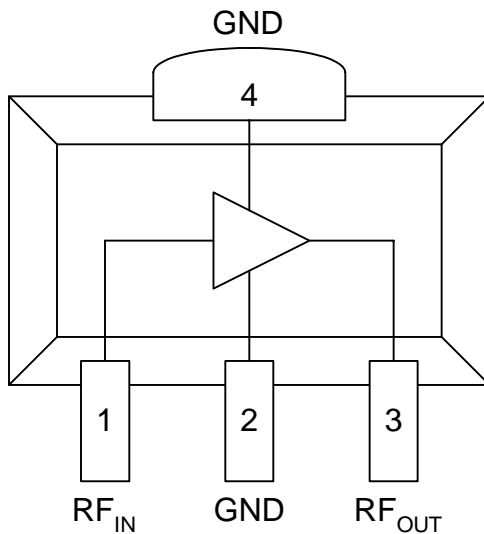


Figure 2: Pin Out

Table 1: Pin Description

PIN	NAME	DESCRIPTION
1	RF <sub>IN</sub>	RF Input
2	GND	Ground
3	RF <sub>OUT</sub>	RF Output / Bias
4	GND	Ground

**ELECTRICAL CHARACTERISTICS****Table 2: Absolute Minimum and Maximum Ratings**

PARAMETER	MIN	MAX	UNIT
Device Voltage	0	+8	VDC
RF Input Power	-	+15	dBm
Storage Temperature	-40	+150	°C
Channel Temperature	-	+150	°C

Stresses in excess of the absolute ratings may cause permanent damage. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability.

**Table 3: Operating Ranges**

PARAMETER	MIN	TYP	MAX	UNIT
Operating Frequency: f	250	-	3000	MHz
Device Voltage: V <sub>DD</sub>	-	+5	+6	VDC
Case Temperature: T <sub>c</sub>	-40	-	+85	°C

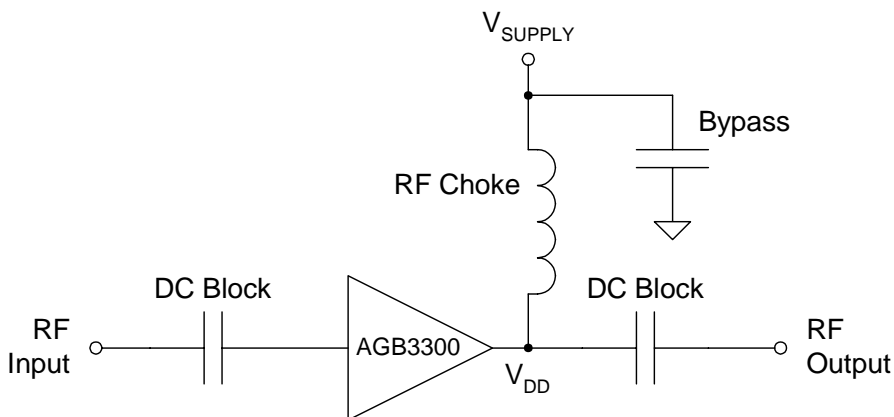
The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical specifications.

**Table 4: Electrical Specifications - Unmatched 50Ω Test Circuit**  
 ( $T_A = +25^\circ\text{C}$ ,  $V_{DD} = +5\text{VDC}$ ,  $f = 900\text{MHz}$ , see Figure 3)

PARAMETER	MIN	TYP	MAX	UNIT
Gain: S <sub>21</sub>	12.4	13.0	-	dB
Input Return Loss: S <sub>11</sub>	-	-6	-	dB
Output Return Loss: S <sub>22</sub>	-	-20	-	dB
Output IP <sub>3</sub> <sup>(1)</sup>	+38	+43	-	dBm
Noise Figure	-	2.0	-	dB
Output 1dB Compression: P <sub>1dB</sub>	-	+21	-	dBm
Thermal Resistance: $\theta_{JC}$	-	-	50	$^\circ\text{C/W}$
Supply Current	110	140	170	mA

Notes:

(1) OIP<sub>3</sub> is measured with two tones: 900 MHz and 901 MHz, +5dBm output per tone.

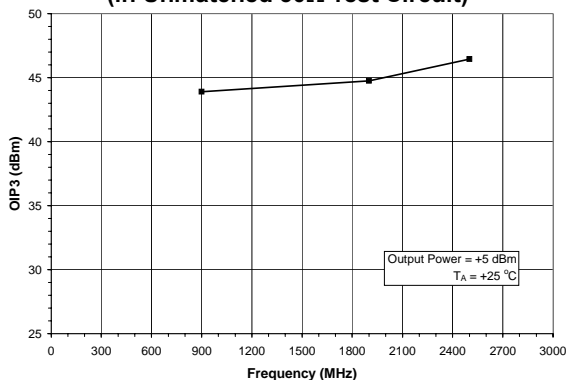


**Figure 3: Unmatched 50Ω Test Circuit**

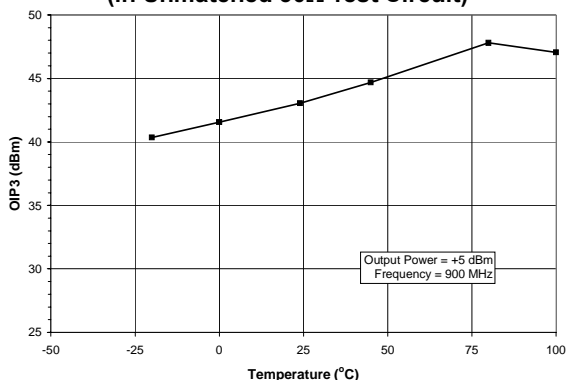
**PERFORMANCE DATA**

Figures 4 through 8 contain data for the device as tested in the unmatched 50Ω test circuit shown in Figure 3. Unless otherwise indicated,  $V_{DD} = +5$  VDC.

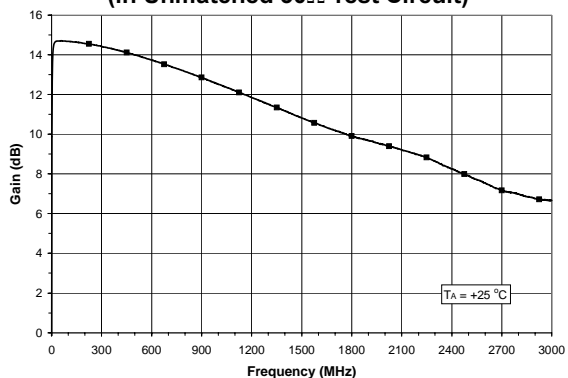
**Figure 4: OIP3 vs. Frequency  
(in Unmatched 50Ω Test Circuit)**



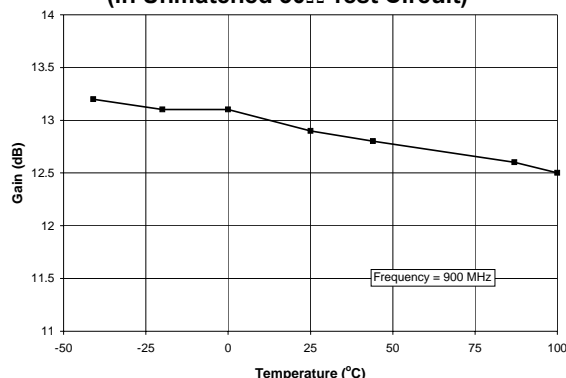
**Figure 5: OIP3 vs. Temperature  
(in Unmatched 50Ω Test Circuit)**



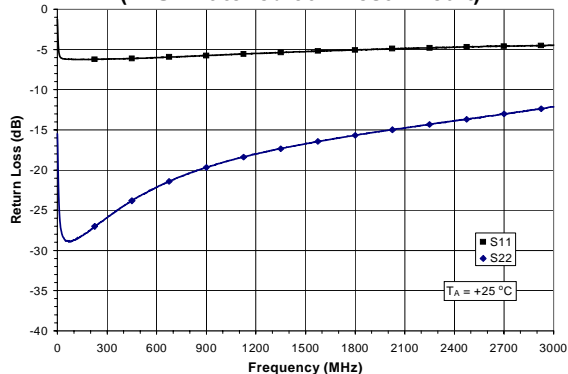
**Figure 6: Gain vs. Frequency  
(in Unmatched 50Ω Test Circuit)**



**Figure 7: Gain vs. Temperature  
(in Unmatched 50Ω Test Circuit)**



**Figure 8: Return Loss vs. Frequency  
(in Unmatched 50Ω Test Circuit)**



APPLICATION INFORMATION

900 MHz Application  
(824 - 960 MHz)

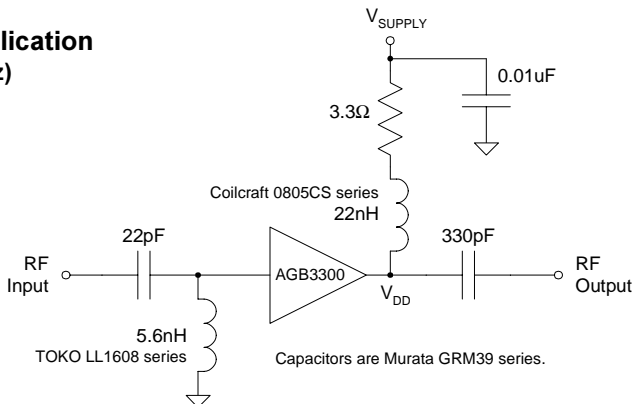


Figure 9: 900 MHz Application Circuit (50Ω Terminations)

Table 5: 900 MHz Application Performance

PARAMETER	TYP	UNIT
Gain: S21	14.5	dB
Input Return Loss: S11	-20	dB
Output Return Loss: S22	-11	dB
Output IP3 <sup>(1)</sup>	+43	dBm
Noise Figure	2	dB
Output 1dB Compression: P1dB	+22	dBm

Note:

(1) OIP3 is measured with two tones: 900 MHz and 901 MHz, +5dBm output per tone.

Figure 10: Output 3rd-Order Intercept vs. Power  
(V<sub>SUPPLY</sub> = +5 VDC, 900 MHz Application Circuit)

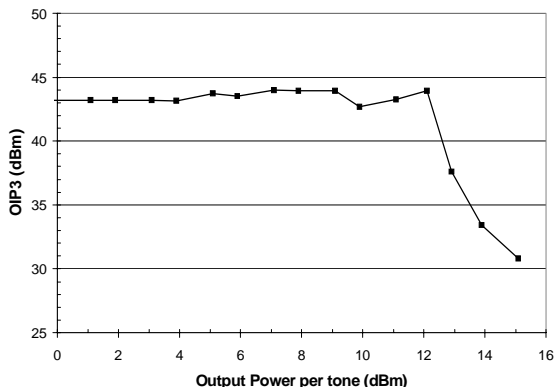


Figure 11: Gain vs. Frequency  
(V<sub>SUPPLY</sub> = +5 VDC, 900 MHz Application Circuit)

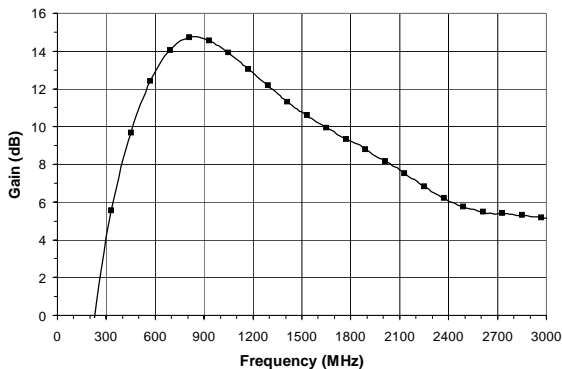
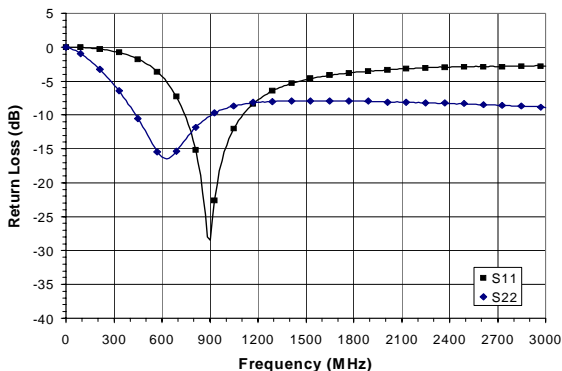
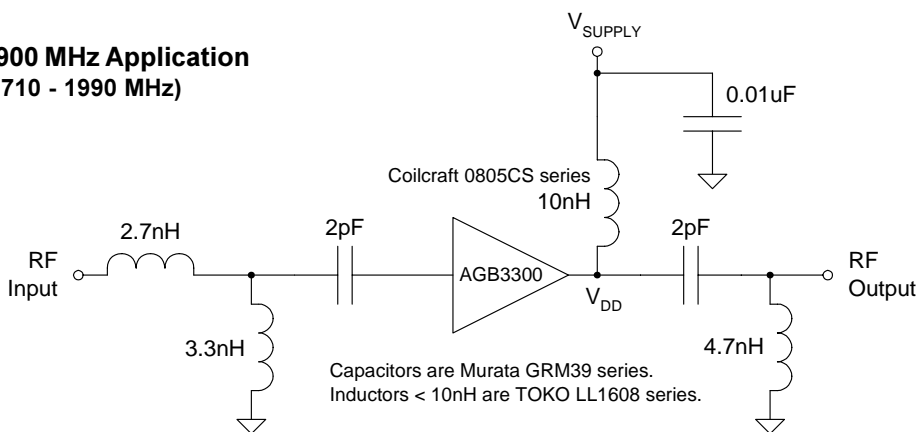


Figure 12: Return Loss vs. Frequency  
(V<sub>SUPPLY</sub> = +5 VDC, 900 MHz Application Circuit)



**1900 MHz Application  
(1710 - 1990 MHz)**



**Figure 13: 1900 MHz Application Circuit (50Ω Terminations)**

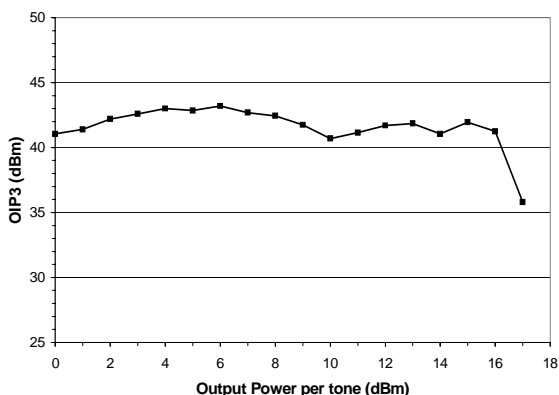
**Table 6: 1900 MHz Application Performance**

PARAMETER	TYP	UNIT
Gain: S21	11.5	dB
Input Return Loss: S11	-9	dB
Output Return Loss: S22	-10	dB
Output IP3 <sup>(1)</sup>	43	dBm
Noise Figure	2.3	dB
Output 1dB Compression: P1dB	+23	dBm

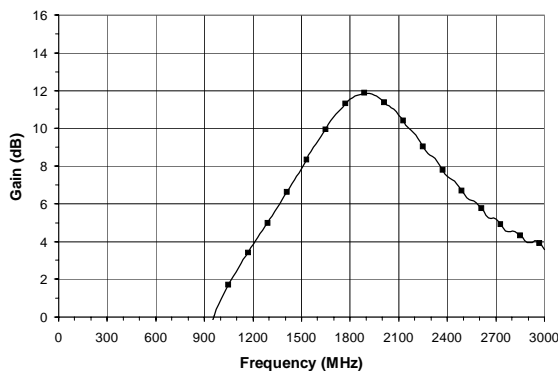
Note:

(1) OIP3 is measured with two tones: 1900 MHz and 1901 MHz, +5dBm output per tone.

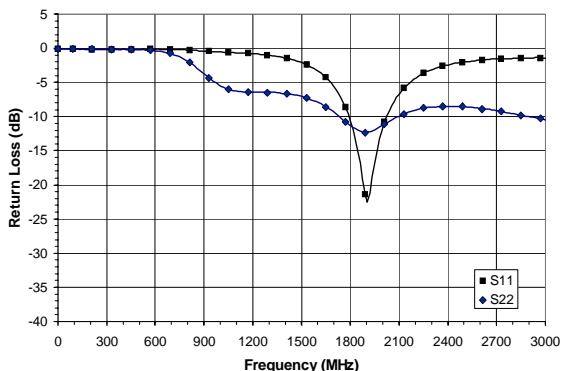
**Figure 14: Output 3rd-Order Intercept vs. Power  
(V<sub>SUPPLY</sub> = +5 VDC, 1900 MHz Application Circuit)**



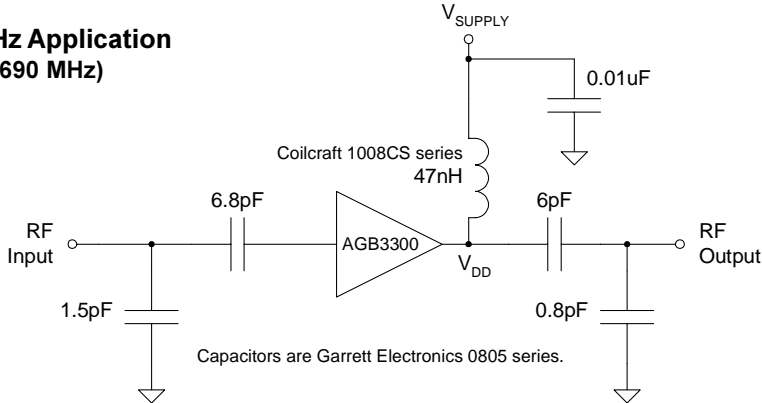
**Figure 15: Gain vs. Frequency  
(V<sub>SUPPLY</sub> = +5 VDC, 1900 MHz Application Circuit)**



**Figure 16: Return Loss vs. Frequency  
(V<sub>SUPPLY</sub> = +5 VDC, 1900 MHz Application Circuit)**



**2500 MHz Application  
(2400 - 2690 MHz)**



**Figure 17: 2500 MHz Application Circuit (50Ω Terminations)**

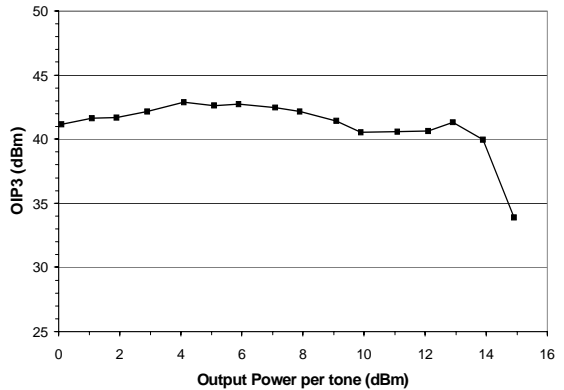
**Table 7: 2500 MHz Application Performance**

PARAMETER	TYP	UNIT
Gain: S21	10	dB
Input Return Loss: S11	-10	dB
Output Return Loss: S22	-15	dB
Output IP3 <sup>(1)</sup>	+42.5	dBm
Noise Figure	2.7	dB
Output 1dB Compression: P1dB	+22	dBm

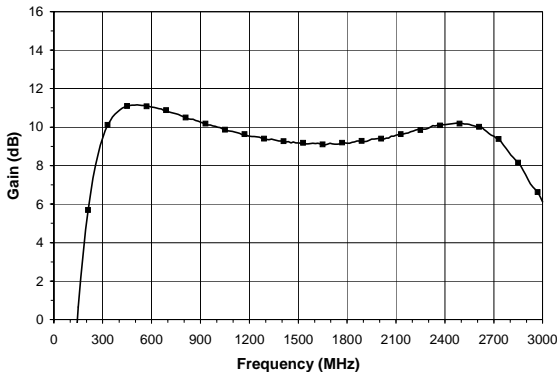
Note:

(1) OIP3 is measured with two tones: 2500 MHz and 2501 MHz, +5dBm output per tone.

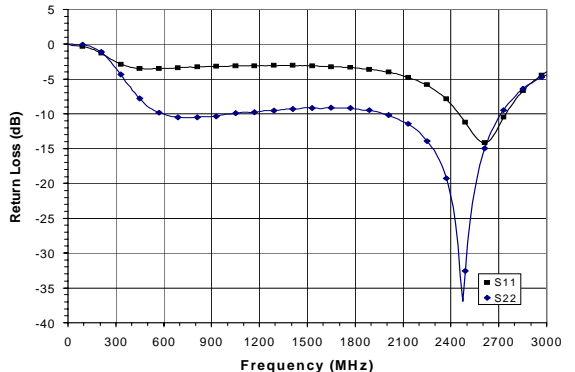
**Figure 18: Output 3rd-Order Intercept vs. Power  
(V<sub>SUPPLY</sub> = +5 VDC, 2500 MHz Application Circuit)**



**Figure 19: Gain vs. Frequency  
(V<sub>SUPPLY</sub> = +5 VDC, 2500 MHz Application Circuit)**



**Figure 20: Return Loss vs. Frequency  
(V<sub>SUPPLY</sub> = +5 VDC, 2500 MHz Application Circuit)**





## Bias Circuit

A schematic of the basic, unmatched bias circuit for the AGB Series Gain Blocks is shown in Figure 21. The RF input and output terminations are  $50\Omega$ . Inductor L1 provides DC power from  $V_{SUPPLY}$  and serves as an RF choke to maintain desired AC performance. The input capacitor C1 and output capacitor C2 are RF blocks that isolate DC current from adjacent circuits. Capacitor C3 is used as an RF bypass that minimizes noise from the supply.

In some applications, a feedback resistor R1 may be added in series with L1, as shown in Figure 22, for improved stability or to serve as a voltage drop for operation from higher supply voltages.

## Matching for RF Performance

The AGB3300 Gain Block amplifier can be used in many fixed wireless frequency bands, such as the 824-894 MHz U.S. cellular bands, the 1850-1990 MHz PCS band, the 880-960 MHz GSM band, the 2400-2500 MHz ISM band, and the 2500-2686 MHz MMDS band. Reactive matching circuits may be designed

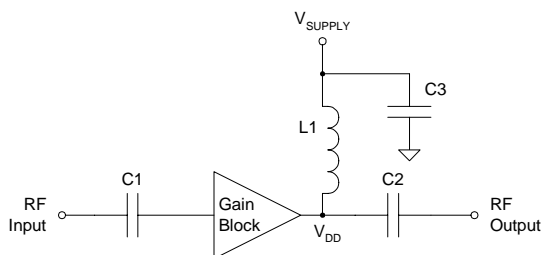


Figure 21: Unmatched Bias Circuit

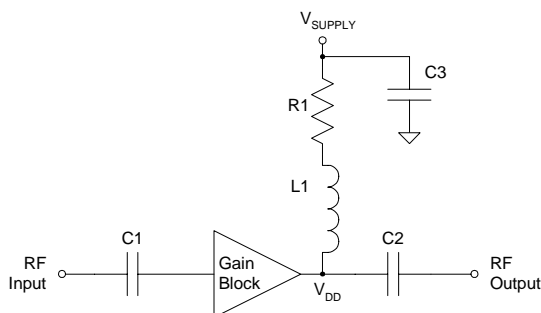


Figure 22: Bias Circuit with Optional Feedback / Voltage Drop Resistor

for both the input and output, in order to optimize the RF performance for a particular application. For example, gain, linearity (OIP3) and return loss may be improved over a particular frequency band of interest.

Recommended matching circuits for various applications, as well as wideband S-parameters to use in the simulation of custom designs, are included in this data sheet. For a particular application not addressed in the data sheet, please consult with an ANADIGICS Sales Representative or Application Engineer.

## Evaluation Boards

A versatile evaluation board that enables users to measure actual device performance has been developed for the AGB Series Gain Blocks. The generic layout allows the user to implement a wide variety of matching circuits, in order to assess performance for a particular application.

The evaluation board is 1.0" square, and is fabricated on 0.031" thick FR-4 material. Figures 23 and 24 show the via hole locations and the layout pattern on both sides of the evaluation board. The vias have a 0.010" diameter and are plated through.

To request an evaluation board, please contact an ANADIGICS Sales Representative or Application Engineer.

## ESD Sensitivity

Electrostatic discharges can cause permanent damage to this device. Electrostatic discharges accumulate on test equipment and the human body, and can discharge without detection. Although the AGB3300 has some internal ESD protection, proper precautions and handling are strongly recommended. Refer to the ANADIGICS application note on ESD precautions.

## S-Parameter Data

Table 8 depicts the raw Magnitude and Angle data for an unmatched AGB3300 over the 50 to 3000 MHz frequency range of operation. Data is shown in 100 MHz steps, with a characteristic impedance of 50 Ohms,  $V_{DD} = +5V$ , and at  $T_A = +25^\circ C$ .

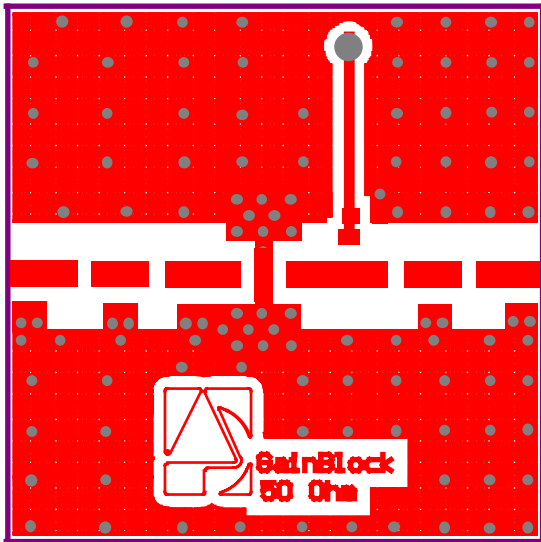


Figure 23: Evaluation Board - Front  
(not to scale)

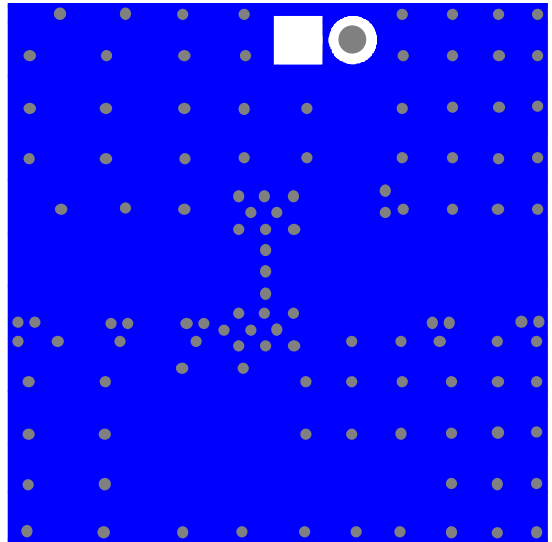
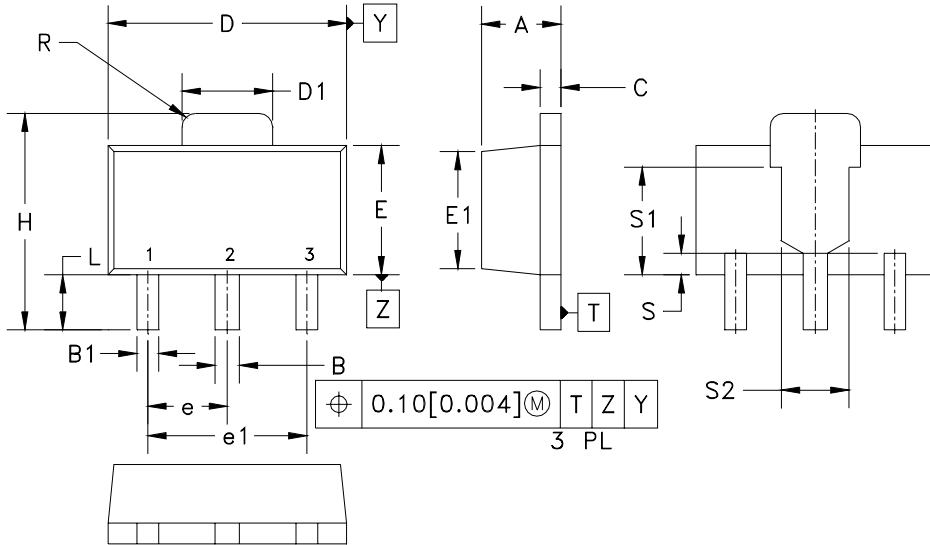


Figure 24: Evaluation Board - Back (X-ray)  
(not to scale)

Table 8: AGB3300 S-Parameters in Unmatched 50 Ohm Test Fixture

(T<sub>A</sub> = +25 °C, V<sub>DD</sub> = +5 VDC)

FREQ (MHz)	S11 (dB MAG)	S11 (ANG)	S21 (dB MAG)	S21 (ANG)	S12 (dB MAG)	S12 (ANG)	S22 (dB MAG)	S22 (ANG)	K Factor
50	-6.507	-12.154	14.964	176.966	-23.579	-3.305	-31.971	-85.979	1.220
100	-6.516	-21.537	14.938	165.739	-23.564	-5.944	-31.461	-93.498	1.221
200	-6.499	-37.572	14.848	151.75	-23.387	-10.36	-29.431	-106.651	1.207
300	-6.462	-56.814	14.678	135.918	-23.178	-16.337	-26.939	-123.756	1.194
400	-6.321	-75.224	14.466	120.64	-22.937	-22.557	-24.401	-139.597	1.172
500	-6.193	-90.589	14.25	107.667	-22.678	-28.753	-22.759	-149.93	1.151
600	-6.069	-108.151	13.984	92.666	-22.296	-35.997	-21.099	-165.124	1.121
700	-5.918	-125.263	13.707	78.515	-21.947	-43.455	-19.896	-175.768	1.093
800	-5.799	-138.915	13.394	66.311	-21.649	-50.872	-19.241	173.368	1.079
900	-5.673	-154.339	13.041	52.299	-21.261	-58.948	-18.584	160.892	1.059
1000	-5.536	-169.301	12.708	38.708	-21.075	-66.809	-17.833	148.221	1.051
1100	-5.445	178.252	12.392	27.223	-20.812	-75.068	-17.221	138.722	1.040
1200	-5.285	164.881	12.037	13.929	-20.56	-83.033	-16.652	128.112	1.026
1300	-5.19	151.443	11.685	1.033	-20.492	-92.649	-16.25	118.653	1.035
1400	-5.156	139.857	11.422	-10.447	-20.149	-100.693	-16.075	108.597	1.022
1500	-5.013	127.266	11.046	-23.162	-20.1	-109.435	-15.862	98.578	1.032
1600	-4.973	115.149	10.714	-35.782	-19.864	-120.033	-15.582	86.244	1.031
1700	-4.901	104.933	10.468	-46.033	-19.514	-126.161	-15.199	78.227	1.007
1800	-4.864	93.099	10.137	-58.549	-19.576	-135.294	-14.922	68.761	1.033
1900	-4.746	81.62	9.833	-70.871	-19.265	-145.479	-14.533	60.412	1.010
2000	-4.758	71.768	9.484	-80.859	-19.384	-152.04	-14.52	52.482	1.055
2100	-4.733	60.555	9.188	-93.112	-19.29	-163.395	-14.288	43.001	1.067
2200	-4.72	49.351	8.907	-104.888	-19.006	-171.556	-14.322	32.986	1.065
2300	-4.66	40.498	8.584	-115.301	-19.022	179.522	-13.985	24.914	1.084
2400	-4.661	29.484	8.432	-127.035	-18.507	171.397	-13.94	16.121	1.046
2500	-4.67	19.357	8.131	-137.912	-18.696	164.208	-13.689	7.138	1.091
2600	-4.626	10.28	7.875	-148.337	-18.497	154.449	-13.64	-0.294	1.090
2700	-4.665	-0.209	7.63	-159.328	-18.372	147.906	-13.403	-9.789	1.102
2800	-4.662	-10.192	7.261	-171.146	-18.689	136.067	-13.335	-18.904	1.178
2900	-4.596	-19.107	7.164	178.737	-17.696	127.671	-13.292	-27.542	1.067
3000	-4.666	-29.431	6.893	166.983	-17.839	118.77	-13.19	-37.144	1.119



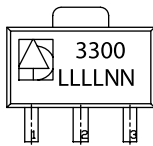
S <sub>W</sub> B <sub>Q</sub> L	MILLIMETERS		INCHES		NOTE
	MIN.	MAX.	MIN.	MAX.	
A	1.40	1.60	0.055	0.063	-
B	0.44	0.56	0.017	0.022	-
B1	0.36	0.48	0.014	0.019	3
C	0.35	0.44	0.014	0.017	-
D	4.40	4.60	0.173	0.181	-
D1	1.62	1.83	0.064	0.072	-
E	2.29	2.60	0.090	0.102	-
E1	2.13	2.29	0.084	0.090	4
e	1.50 BSC		0.059 BSC		-
e1	3.00 BSC		0.118 BSC		-
H	3.94	4.25	0.155	0.167	-
L	0.89	1.20	0.035	0.047	-
R	-	0.25	-	0.010	-
S	0.40 NOM.		0.016 NOM.		4
S1	2.03 NOM.		0.080 NOM.		4
S2	1.27 NOM.		0.050 NOM.		4

NOTES:

1. CONTROLLING DIMENSIONS: MILLIMETERS.
2. DIMENSIONS DO NOT INCLUDE END FLASH, MOLD FLASH OR MATERIAL PROTRUSIONS.
3. DIMENSION B1, 2 PLACES.
4. DIMENSIONS E1, S, S1 & S2 - REFERENCE ONLY.
5. REFERENCE JEDEC TO-243 (AA).

Figure 25: S24 Package Outline - SOT-89

TOP BRAND



NOTES:

1. ANADIGICS LOGO SIZE: X=0.040±0.010 Y=0.048±0.010
2. PART NUMBER: FOUR NUMERIC CHARACTERS
3. WAFER LOT NUMBER: LLLL=FOUR NUMERIC CHARACTERS  
NN= TWO ALPHABETIC CHARACTERS
4. TYPE : ELITE  
SIZE : 2-POINT  
COLOR : LASER

Figure 26: Branding Specification

NOTES

**AGB3300**

SUNSTAR微波光电 <http://www.rfoe.net/> TEL:0755-83396822 FAX:0755-83376182 E-MAIL:szss20@163.com

**NOTES**

NOTES

**ORDERING INFORMATION**

PART NUMBER	TEMPERATURE RANGE	PACKAGE DESCRIPTION	COMPONENT PACKAGING
AGB3300S24Q1	-40 to +85°C	SOT-89 Package	1,000 piece Tape and Reel

**ANADIGICS, Inc.**

141 Mount Bethel Road  
Warren, New Jersey 07059, U.S.A.

Tel: +1 (908) 668-5000

Fax: +1 (908) 668-5132

URL: <http://www.anadigics.com>

E-mail: [Mktg@anadigics.com](mailto:Mktg@anadigics.com)

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