

RMBA19500-58

PCS 2 Watt Linear GaAs MMIC

Power Amplifier

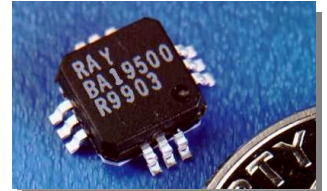
ADVANCED INFORMATION

Description

The RMBA19500 is a high power, highly linear Power Amplifier. The circuit uses Raytheon's pHEMT process. It has been designed for use as a driver stage for PCS base stations, or as the output stage for Micro- and Pico-Cell base stations. The amplifier has been optimized for high linearity requirements for CDMA operation. The device is matched for 50 ohms input impedance.

Features

- ◆ 2 Watt Linear output power at 38 dBc ACPR1 for CDMA operation
- ◆ Small Signal Gain of 30 dB
- ◆ Small outline SMD package



Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Drain Supply Voltage ¹	V _D	+10	Volts
Gate Supply Voltage	V _G	-5	Volts
RF Input Power (from 50 Ω source)	P _{RF}	+5	dBm
Operating Case Temperature Range	T _C	-30 to +85	°C
Storage Temperature Range	T _S	-40 to +100	°C

Electrical Characteristics
(50 Ohm System, VD = 7V, T = 25°C)

Parameter	Min	Typ	Max	Unit
Frequency Range	1930		1990	MHz
Gain (small signal) Over 1930-1990 MHz		30		dB
Gain variation: Over frequency range		+/-1		dB
Over temperature range		+/- 1.5		dB
Noise Figure		6		dB
Linear output power: for CDMA ²	33			dBm
Saturated output power ³		38		dBm

Parameter	Min	Typ	Max	Unit
OIP3 ⁴		40.5		dBm
PAE (CDMA modulation @2W) ²		20		%
Input VSWR (50 Ω)		2:1		
Drain Voltage (VD)		7		Volts
Gate Voltages		-3		Volts
Quiescent current (I _{D01,2} , I _{D03}) ⁵		180, 445		mA
Thermal Resistance (Channel to Case) Rjc		11		°C/W

Typical Performance Data

- ◆ 38 dBc ACPR1 at 885 KHz offset for 1.23 Mbps Forward Link at POUT = 33 dBm; PAE = 20% (9 Channel Forward - Pilot, Paging, Traffic and Sync.)
 - ◆ > 30 dBc ACPR1 and > 48 dBc ACPR2 at 30 KHz and 60 KHz offsets for 48.6 Kbps NADC TDMA at POUT = 34 dBm; PAE = 27%
 - ◆ > 30 dBc and > 60 dBc emissions at 200 KHz and 400 KHz offsets for 270 Kbps GSM at POUT = 34 dBm; PAE = 27%
- For above conditions refer to Note 3.
* Voltage Rail = 7 volts

Notes:

1. Only under quiescent conditions - no RF applied.
2. 9 Channel Forward Link QPSK Source; 1.23 Mbps modulation rate. ACPR1 measured at 885 KHz offset at a value ≥ 38 dBc. CDMA Waveform measured using the ratio of the average power within the 1.23 MHz channel and within a 30 kHz bandwidth at an 885 MHz offset.
3. Single tone at Band center.
4. Two tones: 1.25 MHz apart at Bandcenter; bias optimized.
5. Quiescent currents can be adjusted to optimize the linearity of the amplifier for differing operation. Default biasing is optimized for CDMA (Ref Note 2). Gate voltages are to be adjusted to achieve these quiescent currents.

Characteristic performance data and specifications are subject to change without notice.

RMBA19500-58

PCS 2 Watt Linear GaAs MMIC Power Amplifier

Application Information

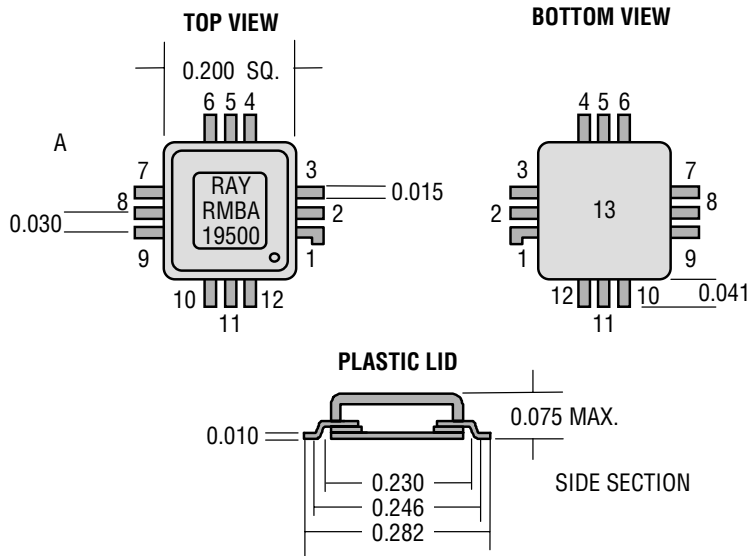
CAUTION: THIS IS AN ESD SENSITIVE DEVICE.

The following describes a procedure for evaluating the RMBA19500-58, a monolithic high efficiency power amplifier, in a surface mount package, designed for use as a driver stage for PCS Base station or as the final output stage for Micro- and Pico-Cell base stations. Figure 1 shows the package outline and the pin designations. Figure 2 shows the functional block diagram of the packaged product. It should be noted that RMBA19500-58 requires external passive components for DC bias and RF output matching circuits. A recommended schematic circuit is shown in Figure 3. The gate biases for the three stages of the amplifier may be set by simple resistive voltage dividers. Figure 4 shows a typical layout of an evaluation board, corresponding to the schematic circuits of figure 3. The following designations should be noted:

- (1) Pin designations are as shown in figure 2.
 - (2) Vg1, Vg2 and Vg3 are the Gate Voltages (negative) applied at the pins of the package
 - (3) Vgg1, Vgg2 and Vgg3 are the negative supply voltages at the evaluation board terminals (Vg1 and Vg2 are tied together)
 - (4) Vd1, Vd2 and Vd3 are the Drain Voltages (positive) applied at the pins of the package
 - (5) Vdd is the positive supply voltage at the evaluation board terminal (Vd1, Vd2 and Vd3 are tied together)
- Note: The base of the package must be soldered on to a heat sink for proper operation.

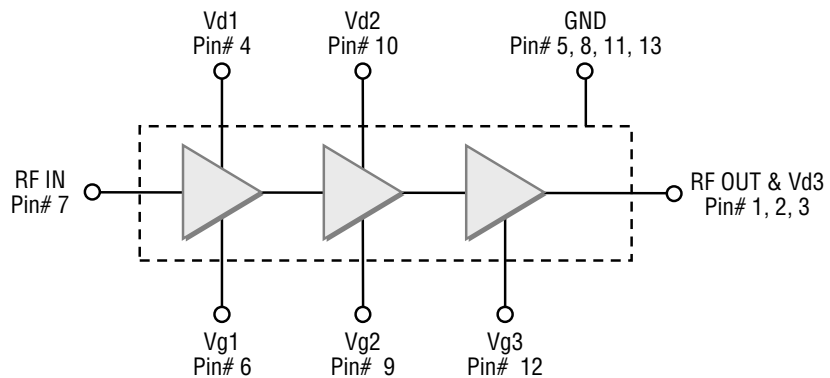
Figure 1
12 Lead Plastic Air Cavity Package with Integral Heat Sink

Dimensions in inches



Pin #	Description
1	RF Out & Vd3
2	RF Out & Vd3
3	RF Out & Vd3
4	VD1
5	GND
6	VG1
7	RF In
8	GND
9	VG2
10	VD2
11	GND
12	VG3
13	GND

Figure 2
Functional Block Diagram of Packaged Product



Characteristic performance data and specifications are subject to change without notice.

RMBA19500-58

PCS 2 Watt Linear GaAs MMIC Power Amplifier

Figure 3
Schematic of Application Circuit showing external components

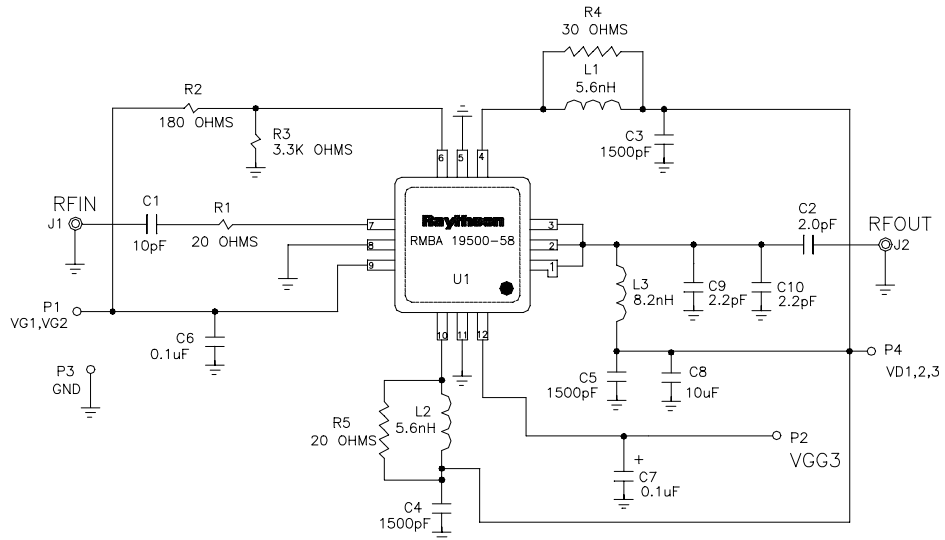
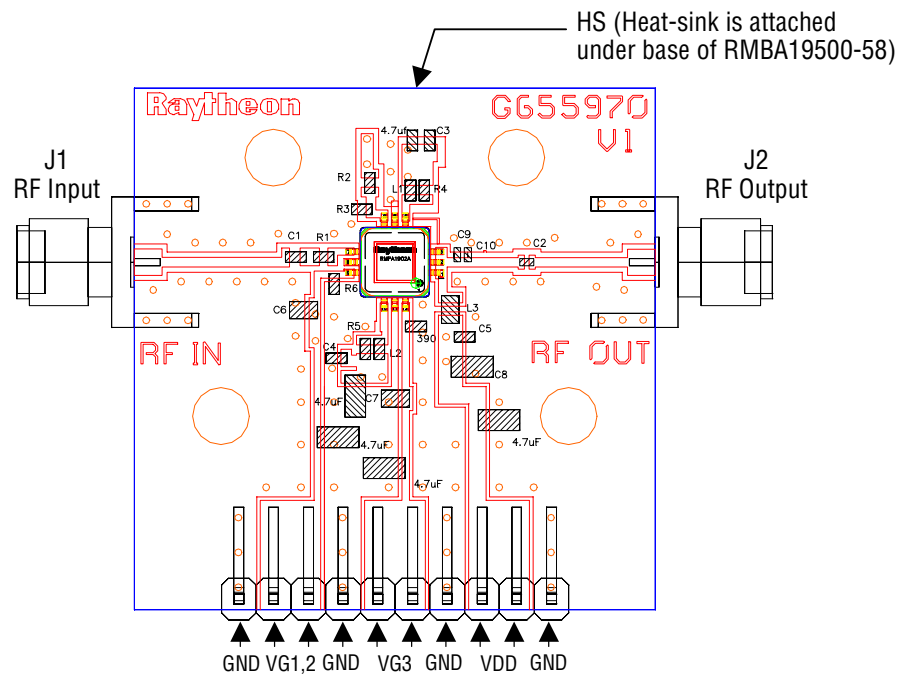


Figure 4
Layout of Test Evaluation Board (RMBA19500-58-TB)



Characteristic performance data and specifications are subject to change without notice.

RMBA19500-58

PCS 2 Watt Linear GaAs MMIC

Power Amplifier

Test Procedure
for the evaluation board
(RMBA19500-58-TB)

CAUTION: LOSS OF GATE VOLTAGES (VG1, VG2, VG3) WHILE CORRESPONDING DRAIN VOLTAGES (Vdd) ARE PRESENT CAN DAMAGE THE AMPLIFIER.

The following sequence must be followed to properly test the amplifier. (It is necessary to add a fan to provide air cooling across the heat sink of RMBA19500.)

- Step 1:** Turn off RF input power.
- Step 2:** Use GND terminal of the evaluation board for the ground of the DC supplies. Set Vgg1, Vgg2 and Vgg3 to -3V (pinch-off).
- Step 3:** Slowly apply drain supply voltages of +7 V to the board terminal Vdd ensuring that there is no short.
- Step 4:** Adjust Vgg12 down from -3V until the drain current (with no RF applied) increases to Idq12 as per supplied result sheet. Then adjust Vgg3 until the total drain current becomes equal to the sum of Idq12 and Idq3.
- Step 5:** After the bias condition is established, RF input signal may now be applied at the appropriate frequency band and appropriate power level.
- Step 6:** Follow turn-off sequence of:
 - (i) Turn off RF Input Power
 - (ii) Turn down and off drain voltage Vdd.
 - (iii) Turn down and off gate voltages Vgg1, Vgg2 and Vgg3.

Parts List
for Test Evaluation Board
(RMBA19500-58-TB,
G654188/G654942)

Part	Value	Size (EIA)	Vendor(s)
L1, L2	5.6 nH	.06" x .03"	Toko (LL1608-F5N6)
L3	8.2 nH	.08" x .05"	Coilcraft (0805HT-8N2TKBC)
C1	10 pF	.06" x .03"	Murata (GRM39COG100J050AD)
C2	2.2 pF	.06" x .03"	Murata (GRM39COG2R2J050BD)
C3, C4, C5	1500 pF	.06" x .03"	Murata (GRM39Y5V152Z50V)
C10, C9	2.2 pF	.06" x .03"	Murata (GRM39COG2R2J050BD)
C8	10.0 uF	.12"x.06"	TDK (CC1206JX5R106M)
C6,C7	0.1uF		Murata (GRM39Y5V104Z)
R1-R5	20 Ohms	.06"x .03"	IMS (RCI-0603-20R0J)
R2	180 Ohms	.06"x .03"	IMS (RCI-0603-1800J)
R3	3.3K Ohms	.06"x .03"	IMS (RCI-0603-3301J)
R4	30 Ohms	.06"x .03"	IMS (RCI-0603-30R0J)
U1	RMBA19500-58	.31" x .41	Raytheon, G654466/G653367
HS	Heatsink		Raytheon, G655548
P1-P5	Terminals		Samtec (TSW-102-09-T-S-RE)
J1, J2	SMA Connectors		E.F. Johnson (142-0701-841)
Board	FR4		Raytheon Dwg# G654187/G654941

Recommendations
for Heat-Sinking the
RMBA19500-58

PWB must be prepared with a heat sink, made of a highly conductive (electrical and thermal) material such as copper or aluminum with necessary surface plating, attached to the backside of PWB where the package is to be mounted on the front side. A small pedestal in the heat sink should protrude through a hole in the PWB where the package bottom is directly soldered. Use Sn/Pb (67/37) solder (or Sn/Pn/Ag 62/36/2 solder) at 220°C for 20 seconds or less. The package bottom should be firmly soldered to the pedestal while the pins are soldered to the respective pads on the front side of PWR without causing any stress on the pins. To accomplish stress free mounting, the top surface of the pedestal should be made flush with the top surface of PWB. Remove flux completely if used for soldering.

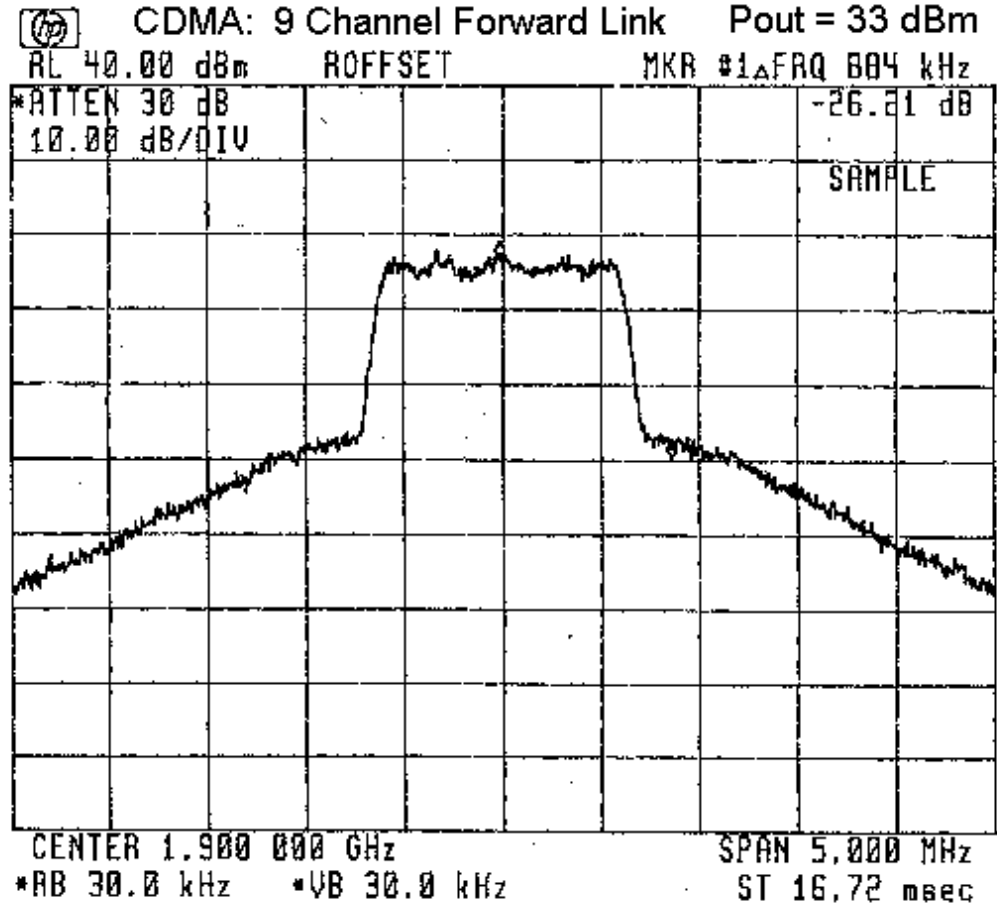
Characteristic performance data and specifications are subject to change without notice.

RMBA19500-58

PCS 2 Watt Linear GaAs MMIC Power Amplifier

ADVANCED INFORMATION

Performance Data



Characteristic performance data and specifications are subject to change without notice.

Worldwide Sales Representatives

North America

D&L Technical Sales
6139 S. Rural Road, #102
Tempe, AZ 85283
480-730-9553
fax: 480-730-9647
Nicholas Delvecchio, Jr.
dlarizona@aol.com

Hi-Peak Technical Sales
P.O. Box 6067
Amherst, NH 03031
866-230-5453
fax: 603-672-9228
sales@hi-peak.com

Spartech South
2115 Palm Bay Road, NE,
Suite 4
Palm Bay, FL 32904
321-727-8045
fax: 321-727-8086
Jim Morris
jim@spartech-south.com

TEQ Sales, Inc.
920 Davis Road, Suite 304
Elgin, IL 60123
847-742-3767
fax: 847-742-3947
Dennis Culpepper
dculpepper@teqsales.com

Cantec Representatives
8 Strathearn Ave, No. 18
Brampton, Ontario
Canada L6T 4L9
905-791-5922
fax: 905-791-7940
Dave Batten
cantec-ott@cantec-o.net

Steward Technology
6990 Village Pkwy #206
Dublin, CA 94568
925-833-7978
fax: 925-560-6522
John Steward
johnsteward1@msn.com

Europe

Sangus OY
Lunkintie 21,
90460 Oulunsalo
Finland
358-8-8251-100
fax: 358-8-8251-110
Juha Virtala
juha.virtala@sangus.fi

Sangus AB
Berghamnvgen 68
Box 5004
S-165 10 Hasselby
Sweden
Ronny Gustafson
468-0-380210
fax: 468-0-3720954

Globes Elektronik & Co.
Klarastrabe 12
74072 Heilbronn
Germany
49-7131-7810-0
fax: 49-7131-7810-20
Ulrich Blievernicht
hfwelt@globes.de

MTI Engineering Ltd.
Afek Industrial Park
Hamelacha 11
New Industrial Area
Rosh Hayin 48091
Israel
972-3-902-5555
fax: 972-3-902-5556
Adi Peleg
adi_p@mti-group.co.il

Sirces srl
Via C. Boncompagni, 3B
20139 Milano
Italy
3902-57404785
fax: 3902-57409243
Nicola Iacovino
nicola.iacovino@sirces.it

Asia

ITX Corporation
2-5, Kasumigaseki
3-Chome
Chiyoda-Ku
Tokyo 100-6014 Japan
81-3-4288-7073
fax: 81-3-4288-7243
Maekawa Ryosuke
maekawa.ryosuke@
itx-corp.co.jp

Sea Union
9F-1, Building A, No 19-3
San-Chung Road
Nankang Software Park
Taiwan, ROC
Taipei 115
02-2655-3989
fax: 02-2655-3918
Murphy Su
murphy@seaunionweb.com.tw

Worldwide Distribution

Headquarters
6321 San Ignacio Drive
San Jose, CA 95119
408-360-4073
fax: 408-281-8802
Art Herbig
art.herbig@avnet.com

Belgium and Luxembourg
Cipalstraat
2440 GEEL
Belgium
32 14 570670
fax: 32 14 570679
sales.be@bfiophtilas.avnet.com

United Kingdom
Burnt Ash Road
Aylesford, Kent
England
ME207XB
44 1622882467
fax: 44 1622882469
rfsales.uk@
bfiophtilas.avnet.com

France
4 Allee du Cantal
Evry, Cedex
France
33 16079 5900
fax: 33 16079 8903
sales.fr@
bfiophtilas.avnet.com

Holland
Chr. Huygensweg 17
2400 AJ ALPHEN AAN DEN
RIJN
The Netherlands
31 172 446060
fax: 33 172 443414
sales.nl@
bfiophtilas.avnet.com

Spain
C/Isobel Colbrand, 6 - 4a
28050 Madrid
Spain
34 913588611
fax: 34 913589271
sales.es@
bfiophtilas.avnet.com

Sales Office Headquarters

United States (East Coast)
Raytheon
362 Lowell Street
Andover, MA 01810
978-684-8628
fax: 978-684-8646
Walter Shelmet
wshelmet@
rrfc.raytheon.com

United States (West Coast)
Raytheon
362 Lowell Street
Andover, MA 01810
978-684-8919
fax: 978-684-8646
Rob Sinclair
robert_w_sinclair@
rrfc.raytheon.com

Europe
Raytheon
AM Teckenberg 53
40883 Ratingen
Germany
49-2102-706-155
fax: 49-2102-706-156
Peter Hales
peter_j_hales@
raytheon.com

Asia
Raytheon
Room 601, Gook Je Ctr. Bldg
191 Hangang Ro 2-GA
Yongsan-Gu, Seoul,
Korea 140-702
82-2-796-5797
fax: 82-2-796-5790
T.G. Lee
tg_lee@
rrfc.raytheon.com

Customer Support

978-684-8900

fax: 978-684-5452

customer_support@rrfc.raytheon.com