

RMPA1902A-58

PCS GaAs MMIC Power Amplifier

Description

The RMPA1902-58 is a monolithic high efficiency power amplifier for PCS CDMA personal communication system applications. The MMIC requires off-chip matching. The amplifier circuit design is a single ended configuration that utilizes harmonic tuning for increased power added efficiency and linearity. The device uses Raytheon's Pseudomorphic High Electron Mobility Transistor (pHEMT) process.

Features

- ◆ Positive supply voltage of 3.5 V, nominal
- ◆ Efficiency of 36%, typical, for CDMA average power out of 29 dBm
- ◆ Small outline quad package



Absolute Maximum Ratings⁴

Parameter	Symbol	Value	Unit
Positive DC Voltage	Vd1, Vd2, Vd3	+ 9	Volts
Negative DC Voltage	Vg1, Vg2, Vg3	- 6	Volts
Simultaneous (Vd-Vg)	Vdg	+12	Volts
RF Input Power (from 50-Ohm source)	P _{IN}	+10	dBm
Operating Case Temperature	T _C	-30 to +90	°C
Storage Temperature Range	T _{Stg}	-35 to +110	°C
Thermal Resistance (Channel to case)	R _{jc}	+18	°C/W

Electrical Characteristics¹

Parameter	Min	Typ	Max	Unit
Frequency Range	1850		1910	MHz
Gain (Small Signal)		30		dB
Gain Variation vs Temp		-0.02		dB/°C
Noise Power (1930-1990 MHz) (All Power Levels)			-137	dBm/Hz
Input VSWR (50Ω)			2.0:1	---
Stability (All spurious) ²			-70	dBc
Harmonics (P _o ≤ 29 dBm) 2fo, 3fo, 4fo		-40		dBc

Parameter	Min	Typ	Max	Unit
Power Out	29			dBm
Efficiency at P _{out} = 29 dBm		36		%
ACPR (Offset ≤ ± 1.25 MHz) ³		49		dBc
Noise Figure (over temp.)			5.5	dB
Quiescent Current			135	mA
V _{dd}		3.5		Volts
V _{gg} (<4 mA) ⁴	-2.0		-0.3	Volts
Case Operating Temp	-40		+85	°C

Notes:

1. Specifications are valid for V_{dd} = 3.5V, load = 50 Ω, and T_c = 25°C as measured in Raytheon's test fixture unless otherwise stated.
2. Source/Load VSWR ≤ 3:1 (All Angles, -50 dBm < P_o < 29 dBm) or Load VSWR ≈ 20:1 (Out of Band, All Angles, T_c = -30 to +90°C).
3. P_o ≤ 29.0 dBm at V_{dd} = 3.5V; CDMA Waveform measured using the ratio of the average power within the 1.23 MHz channel and within a 30 kHz bandwidth at a 1.25 MHz offset.
4. V_{gg} adjusted for quiescent current. I_{dq1+2} = 50 +/- 1 mA, I_{dq3} = 85 +/- 2 mA

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

RMPA1902A-58

PCS GaAs MMIC Power Amplifier

Application Information

CAUTION: THIS IS AN ESD SENSITIVE DEVICE.

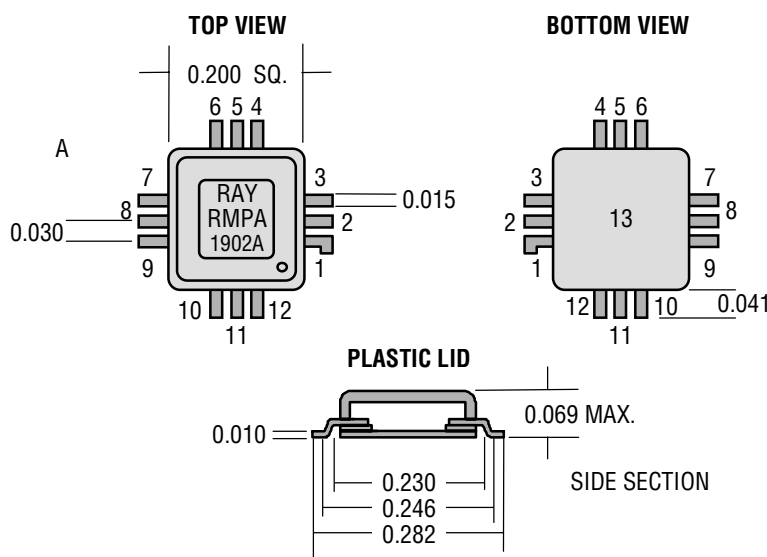
The following describes a procedure for evaluating the RMPA1902-58, a monolithic high efficiency power amplifier, in a surface mount package, designed for use in Personal Communication Systems (PCS) utilizing Code Division Multiple Access (CDMA). Figure 1 shows the package outline and the pin designations. Figure 2 shows the functional block diagram of the packaged product. It should be noted that RMPA1902-58 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 and Vg2 are the Gate Voltages (negative) applied at the pins of the package
- (3) Vgg1 and Vgg2 are the negative supply voltages at the evaluation board terminals
Note: The 3 terminals of Vgg1, Vgg2 and Vgg3 may be tied together.
- (4) Vd1 and Vd2 are the Drain Voltages (positive) applied at the pins of the package
- (5) Vdd1 and Vdd2 are the positive supply voltages at the evaluation board terminals
Note: The 2 terminals of Vdd1 and Vdd2 may be tied together.

The base of the package must be soldered on to a heat sink for proper operation.

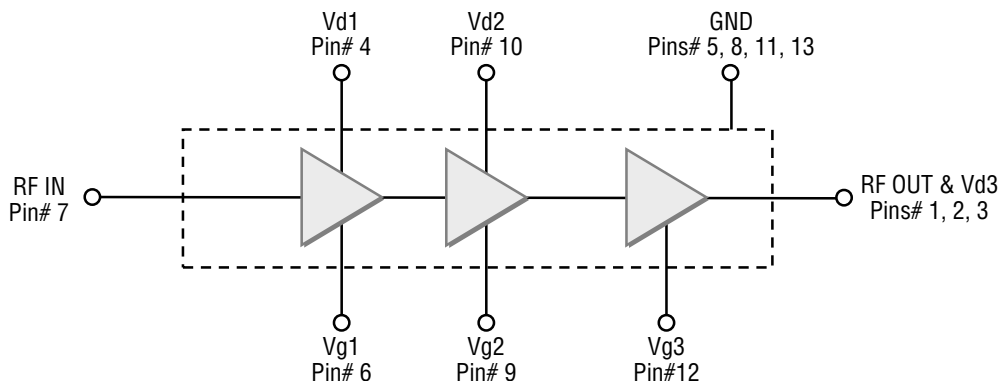
Figure 1
Package Outline and Pin Designations

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 Input
8	GND
9	VG2
10	VD2
11	GND
12	VG3
13	GND

Figure 2
Functional Block Diagram of Packaged Product

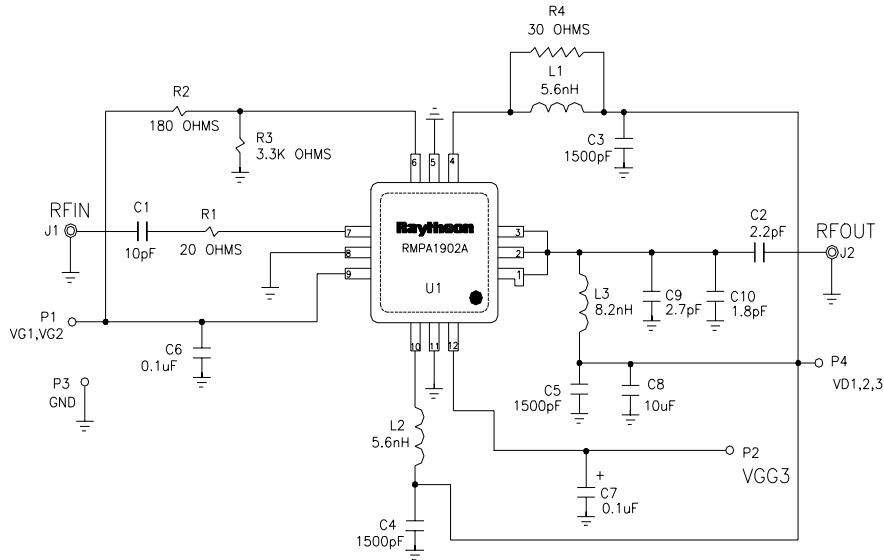


Characteristic performance data and specifications are subject to change without notice.

RMPA1902A-58

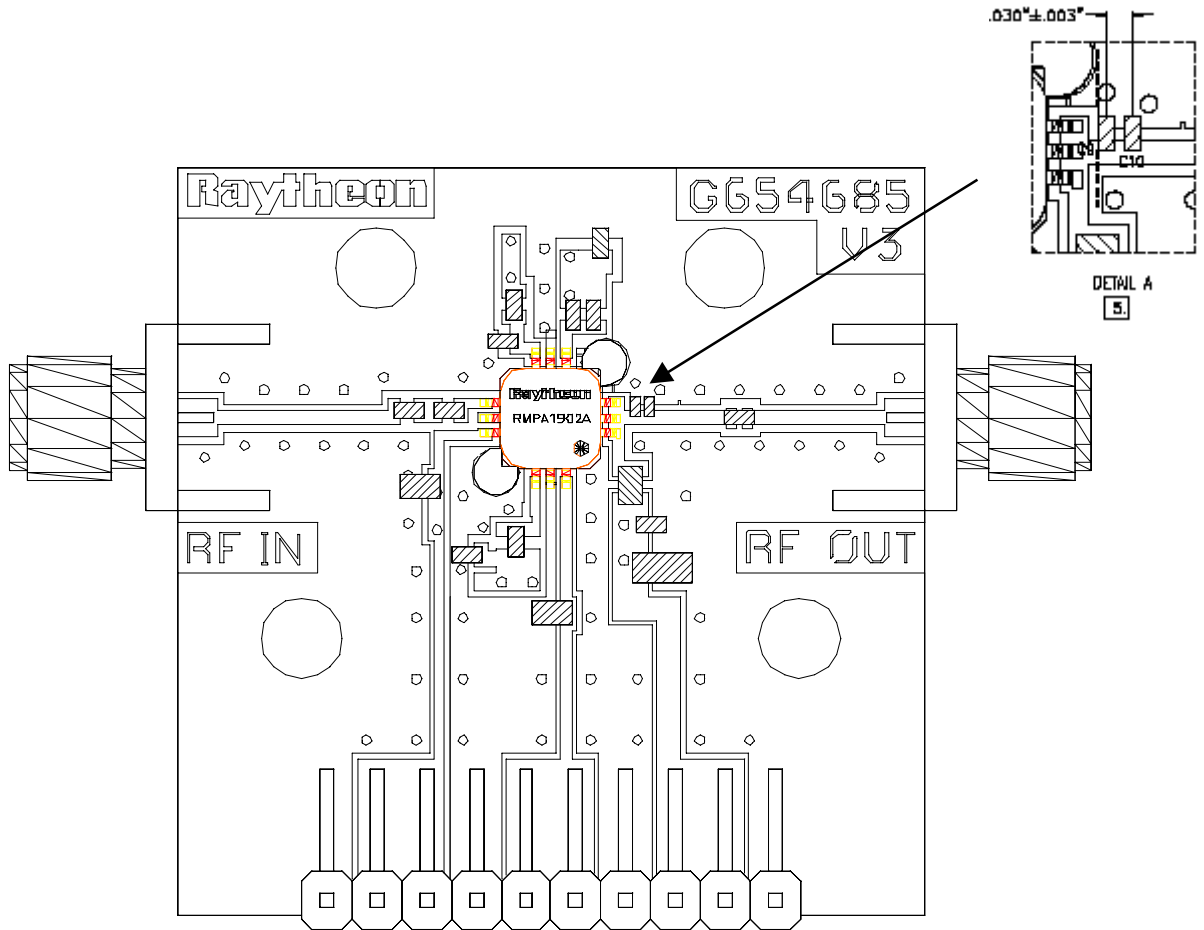
PCS GaAs MMIC Power Amplifier

Figure 3
Schematic of Application Circuit showing external components



MATERIAL LIST				
QTY	ITEM NO.	PART NUMBER	DESCRIPTION	DESC.
2	①	TOKO LL1608-F3M6	5.6NH MULTILAYER CHP INDU	L1,L2
1	②	COLCRAFT 0903H-1807HC	8.2NH WIREWOUND CHP INDU	L3
1	③	MURATA ELECTRONICS GRM32C2G100J050A0	100PF COG CAPACITOR	C1
1	④	MURATA ELECTRONICS GRM32C2G2J050A0	2.2PF COG CAPACITOR	C2
3	⑤	MURATA ELECTRONICS GRM32C2G2J050A0	1500PF COG CAPACITOR	C3,C4,C5
1	⑥	MURATA ELECTRONICS GRM32C2G2J050A0	2.2PF COG CAPACITOR	C9
1	⑦	TDK CC1206A45R100M	10UF CAPACITOR	C8
2	⑧	MURATA ELECTRONICS GRM32C2G2J050A0	0.1UF CAPACITOR	CG,C7
1	⑨	INDUM CORP. IMS-0603-30R0U	30 OHM CHP RESISTOR	R4
1	⑩	INDUM CORP. IMS-0603-30R0U	30 OHM CHP RESISTOR	R1
1	⑪	INDUM CORP. IMS-0603-180U	180 OHM CHP RESISTOR	R2
1	⑫	INDUM CORP. IMS-0603-180U	180 OHM CHP RESISTOR	R3
1	⑬	MURATA ELECTRONICS GRM32C2G2J050A0	1500PF CAPACITOR	C10
2	⑭	JOHNSON COMPONENTS 142-0701-B41	BRASS SMA PC MOUNT	J1,J2
1/4	⑮	RAYTHEON 026667	SINGLE ROW RIGHT ANGLE PIN HEADER, GOLD FLASH	PH-PA
1	⑯	RAYTHEON 026667	RMPA1902A-58 POWER AMPLIFIER ASSEMBLY	U1
1	⑰	RAYTHEON 026668_V3	PRINTED WIRING BOARD	PWB
A/R	⑱	INDUM CORP. SML3	SOLDER PASTE	
2	⑲	RAYTHEON 0263750-1	PICK	PUL,P12
A/R	⑳	INDUM CORP. S-208	5 MIN. EPOXY ADHESIVE	
A/R	㉑	INDUM CORP. INMOLLOY #290	SOLDER	

Figure 4
Layout of Test Evaluation Board (RMPA1902-58-TB)



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

RMPA1902A-58

PCS GaAs MMIC Power Amplifier

Test Procedure
for the
evaluation board
(RMPA1902-58-TB)

CAUTION: LOSS OF GATE VOLTAGES (VG1, VG2, VG3) WHILE CORRESPONDING DRAIN VOLTAGES (VD1, VD2, VD3) ARE PRESENT MAY DAMAGE THE AMPLIFIER.

The following sequence must be followed to properly test the amplifier:

- Step 1:** Turn off RF input power.
- Step 2:** Use GND terminal of the evaluation board for the ground of the DC supplies.
Slowly apply gate supply voltages of typical -2.0 V to the board terminals
 $V_{gg}=V_{gg1}=V_{gg2}=V_{gg3}$
- Step 3:** Slowly apply drain supply voltages of +3.5 V to the board terminals $V_{dd}=V_{dd1}=V_{dd2}=V_{dd}$. Adjust V_{gg} to set the total quiescent current (with no RF applied) I_{dq} to nominal 135 mA. [Gate supply voltages (V_{gg} i.e. V_{gg1} , V_{gg2} , V_{gg3}) may be adjusted, only if quiescent current (I_{dq1} to I_{dq3}) values desired are different from those noted on the data summary supplied with product samples]
- Step 4:** After the bias condition is established, RF input signal may now be applied at the appropriate frequency band and appropriate power level.
- Step 5:** Follow turn-off sequence of:
(i) Turn off RF Input Power
(ii) Turn down and off drain voltages
 $V_{dd}=V_{dd1}=V_{dd2}=V_{dd3}$
(iii) Turn down and off gate voltages
 $V_{gg}=V_{gg1}=V_{gg2}=V_{gg3}$

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.
Afeq 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@bfioptilas.avnet.com

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

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

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

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