RMPA1955-99

3V Tri-Band GSM/GPRS Power Amplifier Module

ADVANCED INFORMATION

Description

The RMPA1955-99 is a Tri-band GSM/GPRS Power Amplifier (PA) Module which uses Raytheon's InGaP Heterojunction Bipolar Transistor (HBT) PA MMICs and a CMOS control circuit. The fully integrated lead-less chip carrier module incorporates a band select switch, Analog power control, and is internally input and output matched.

Features

- 50 ohms internally input and output matched
- High Efficiency: GSM = 55%, DCS/PCS = 50%
- Compact LCC Package: 11.6 x 9.1 x 1.7mm
- On board band select and output power control
- GPRS Class 10 capable

Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Supply DC Voltage (under no RF)	$V_{SUP1,2}$	+6.5	V
Power Control Voltage	V_{PC}	+3	V
Band Select Voltage	V_{BS}	+3	V
RF Input Power	Pin	+15	dBm
Case Operating Temperature	Tc	-40 to +85	°C
Storage Temperature	Tstg	-55 to +150	°C
Duty Cycle at Max Power		25	%

Electrical Characteristics[1]

Parameter	Min	Typ	Max	Unit
Frequency - GSM	880		915	MHz
Frequency - DCS	1710		1785	MHz
Frequency- PCS	1850		1910	MHz
Input Power-GSM		8		dBm
Input Power-DCS/PCS		8		dBm
Power Out-GSM[2]	34.5	35.0		dBm
Power Out-DCS[2]	31.9	32.5		dBm
Power Out-PCS[2]		31.9		dBm
PAE-GSM[2]	50	55		%
PAE-DCS/PCS[2]	42	50		%
Isolation[6]		-35		dBm
Input VSWR (50Ω)		2.0:1		---

Parameter	Min	Typ	Max	Unit
Harmonics (2fo to 7fo)		-35		dBc
Noise Floor GSM[4]		-84		dBm
Noise Floor DCS[4]		-76		dB
Leakage Current[3]		10		µA
Control Voltage (V_{PC})	0.1		1.9	V
Control Current (I_{PC})		1		mA
Band Select (V_{BS})				
GSM	0		0.5	V
DCS/PCS	2.0		2.8	V
Load mismatch VSWR[5] (no damage)		10:1		---
Supply Voltage (Vcc)	2.8	3.5	5.0	V

Notes:

1. Pulsed operation with pulse width=1154µs, duty cycle=25%. 50 ohm system. Vcc=3.5 V, Ta=+25°C.
2. Vcc = 3.5V, V_{PC}= 1.9V, Pin = 6 dBm
3. Vcc = 3.5V, V_{PC}= 0V, V_{BS} = 0V
4. Pin = 6 dBm, BW = 100 kHz, F_0 = +/- 20 MHz.
5. Vcc=4.0V
6. Vcc = 3.5V, V_{PC}= 0.1V, Pin= 6 dBm

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

Raytheon RF Components
362 Lowell Street
Andover, MA 01810

RMPA1955-99
3V Tri-Band GSM/GPRS Power Amplifier Module

ADVANCED INFORMATION

Application Information

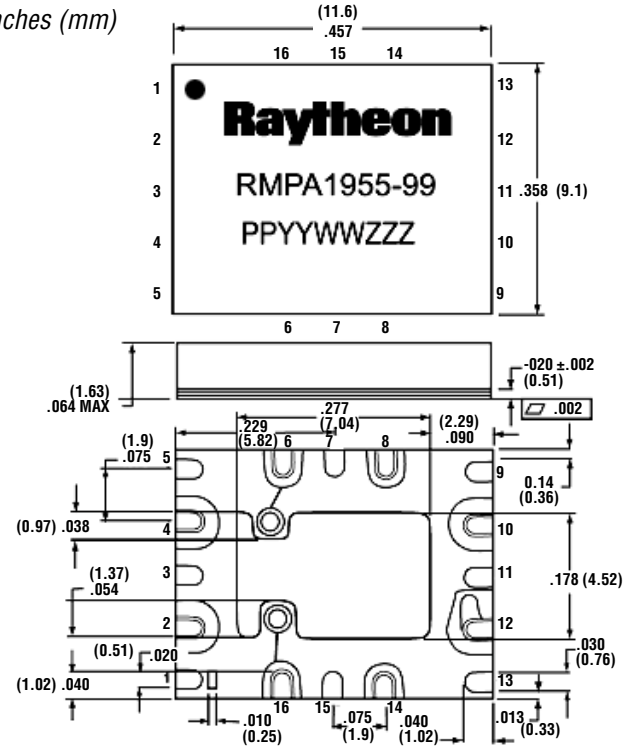
CAUTION: THIS IS AN ESD SENSITIVE DEVICE.

The following describes a procedure for evaluating the RMPA1955-99, a Tri-Band GSM/GPRS power amplifier module, in a Leadless package, designed for use in Cellular and Personal Communication Systems (PCS). The package outline and the pin designations are shown in Figure 1. The functional block diagram of the packaged product is provided in Figure 2. It should be noted that RMPA1955-99 requires very minimal external passive components for DC bias and no external components for RF matching circuits. Figure 3 shows a typical layout of an evaluation board. The module contains a custom ASIC which controls biasing, Band select and Power control functions. The following designations should be noted:

(1) Pin designations are as shown on Figure 1.
(2) V_{SUP1} =V_{SUP2} are the supply voltage pins.
(3) V_{BS} is the Band select voltage.
(4) V_{PC} is the Power control voltage.

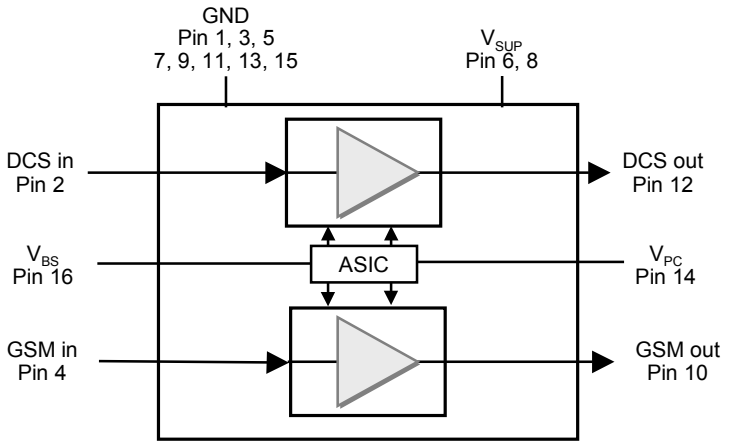
Figure 1 Package Outline and Pin Designations

Dimensions in inches (mm)



Pin #	Description
1	GND
2	DCS IN
3	GND
4	GSM IN
5	GND
6	V_{SUP1}
7	GND
8	V_{SUP2}
9	GND
10	GSM OUT
11	GND
12	DCS OUT
13	GND
14	V_{PC}
15	GND
16	V_{BS}

Figure 2 Functional Block Diagram



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

Test Procedure
for the evaluation board

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.

Set V_{PC}=0V, V_{BS}=0V.

Step 3: Apply supply voltages of +3.5 V to the board terminals V_{SUP}= V_{SUP1} =V_{SUP2} .

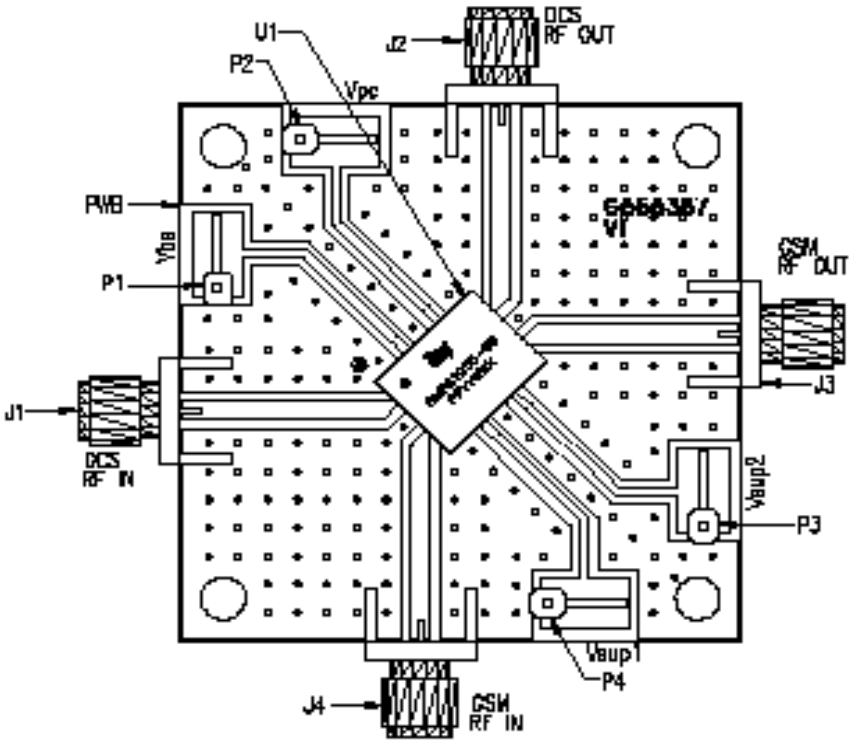
Step 4: To test at GSM band, set V_{BS}=0V. To test at DCS/PCS band, set V_{BS}=2V

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: Increase VPC for maximum output power condition.

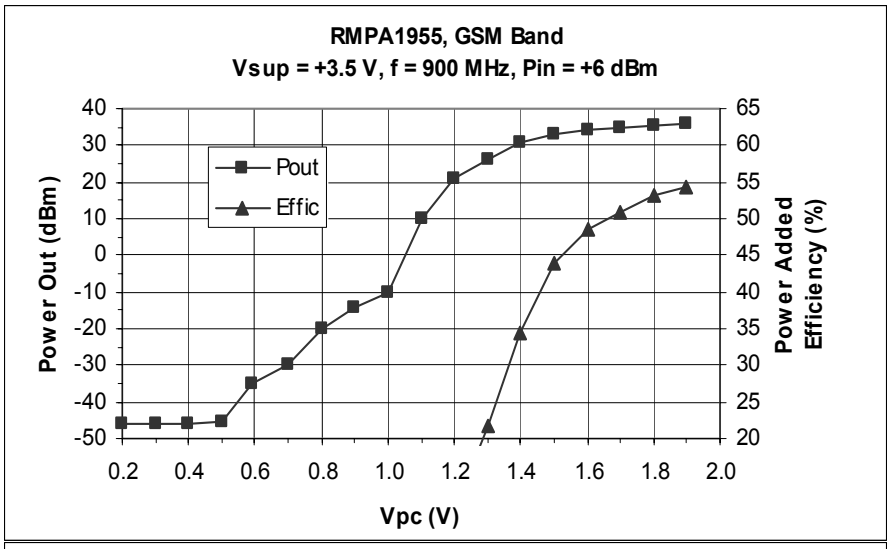
Step 7: Follow turn-off sequence of:
(i) Turn down and off V_{PC}.
(i) Turn off RF Input Power.
(iii) Turn down V_{BS} to 0V.
(iii) Turn down and off supply voltages V_{SUP}= V_{SUP1} =V_{SUP2}.

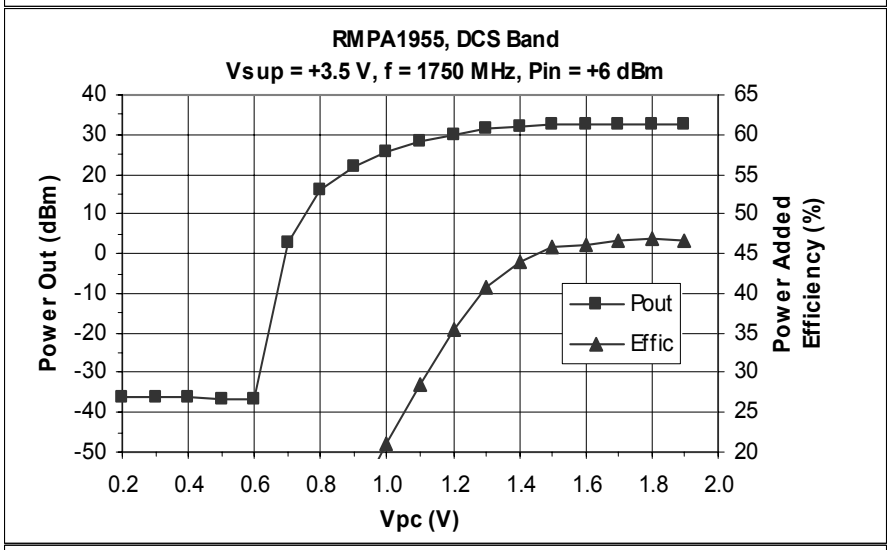
Figure 3
Layout of Test Evaluation Board

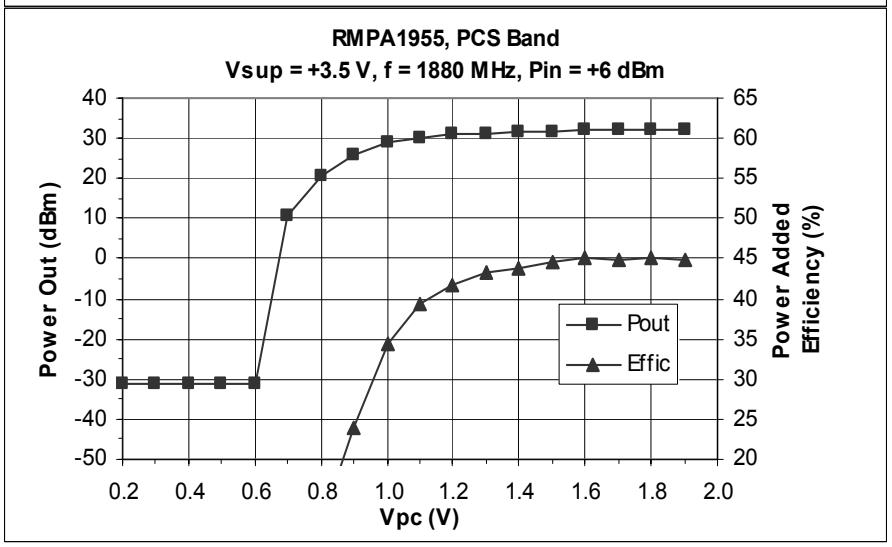


Characteristic performance data and specifications are subject to change without notice.

Performance Data





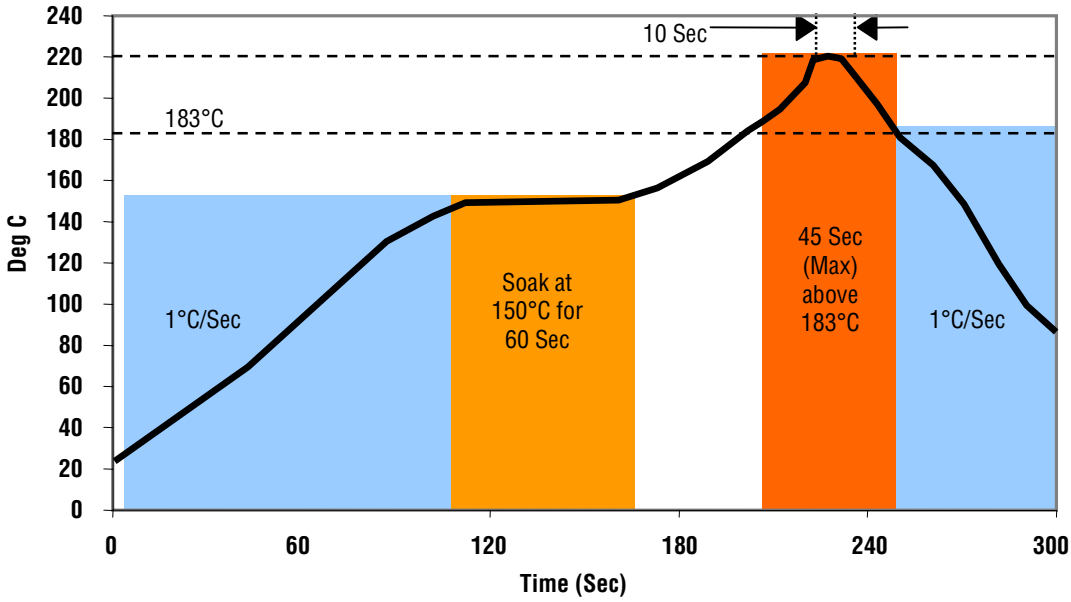


Characteristic performance data and specifications are subject to change without notice.

Application Information

- **Precautions to Avoid Permanent Device Damage:**
  - **Cleanliness:** Observe proper handling procedures to ensure clean devices and PCBs. Devices should remain in their original packaging until component placement to ensure no contamination or damage to RF, DC & ground contact areas.
  - **Device Cleaning:** Standard board cleaning techniques should not present device problems provided that the boards are properly dried to remove solvents or water residues.
  - **Static Sensitivity:** Follow ESD precautions to protect against ESD damage:
    - A properly grounded static-dissipative surface on which to place devices.
    - Static-dissipative floor or mat.
    - A properly grounded conductive wrist strap for each person to wear while handling devices.
  - **General Handling:** Handle the package on the top with a vacuum collet or along the edges with a sharp pair of bent tweezers. Avoiding damaging the RF, DC, & ground contacts on the package bottom. Do not apply excessive pressure to the top of the lid.
  - **Device Storage:** Devices are supplied in heat-sealed, moisture-barrier bags. In this condition, devices are protected and require no special storage conditions. Once the sealed bag has been opened, devices should be stored in a dry nitrogen environment.
- **Device Usage:** Raytheon recommends the following procedures prior to assembly.
  - Dry-bake devices at 125°C for 24 hours minimum. Note: The shipping trays cannot withstand 125°C baking temperature.
  - Assemble the dry-baked devices within 7 days of removal from the oven.
  - During the 7-day period, the devices must be stored in an environment of less than 60% relative humidity and a maximum temperature of 30°C
  - If the 7-day period or the environmental conditions have been exceeded, then the dry-bake procedure must be repeated.
- **Solder Materials & Temperature Profile:** Reflow soldering is the preferred method of SMT attachment. Hand soldering is not recommended.
  - **Reflow Profile**
    - Ramp-up: During this stage the solvents are evaporated from the solder paste. Care should be taken to prevent rapid oxidation (or paste slump) and solder bursts caused by violent solvent out-gassing. A typical heating rate is 1- 2°C/sec.
    - Pre-heat/soak: The soak temperature stage serves two purposes; the flux is activated and the board and devices achieve a uniform temperature. The recommended soak condition is: 120-150 seconds at 150°C.
    - Reflow Zone: If the temperature is too high, then devices may be damaged by mechanical stress due to thermal mismatch or there may be problems due to excessive solder oxidation. Excessive time at temperature can enhance the formation of inter-metallic compounds at the lead/board interface and may lead to early mechanical failure of the joint. Reflow must occur prior to the flux being completely driven off. The duration of peak reflow temperature should not exceed 10 seconds. Maximum soldering temperatures should be in the range 215-220°C, with a maximum limit of 225°C.
    - Cooling Zone: Steep thermal gradients may give rise to excessive thermal shock. However, rapid cooling promotes a finer grain structure and a more crack-resistant solder joint. Figure 1 indicates the recommended soldering profile.
- **Solder Joint Characteristics:** Proper operation of this device depends on a reliable void-free attachment of the heatsink to the PWB. The solder joint should be 95% void-free and be a consistent thickness.
- **Rework Considerations:** Rework of a device attached to a board is limited to reflow of the solder with a heat gun. The device should not be subjected to more than 225°C and reflow solder in the molten state for more than 5 seconds. No more than 2 rework operations should be performed.

Figure 4
Recommended Solder Reflow Profile



Raytheon

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

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

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

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

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

Spain
BFI Optilas
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