Raytheon

RF Components

RMPA1959-108 - PCS 3V CDMA & CDMA2000-1X Power Amplifier Module

ADVANCED INFORMATION

Description

The RMPA1959-108 power amplifier module (PAM) is designed for CDMA and CDMA2000-1X personal communications system (PCS) applications. The 2 stage PAM is internally matched to 50 ohms to minimize the use of external components and features advanced DC power management to reduce current consumption during peak phone usage. High power-added efficiency and excellent linearity are achieved using Raytheon RF Components' InGaP Heterojunction Bipolar Transistor (HBT) technology.

Features

- Single positive-supply operation and power-down mode
- 38% CDMA efficiency at +28 dBm average output power
- Compact LCC package- 4.0 x 4.0 x 1.5 mm with industry standard pinout
- Internally matched to 50 ohms and DC blocked RF input/output.
- Meets CDMA2000-1XRTT performance requirements

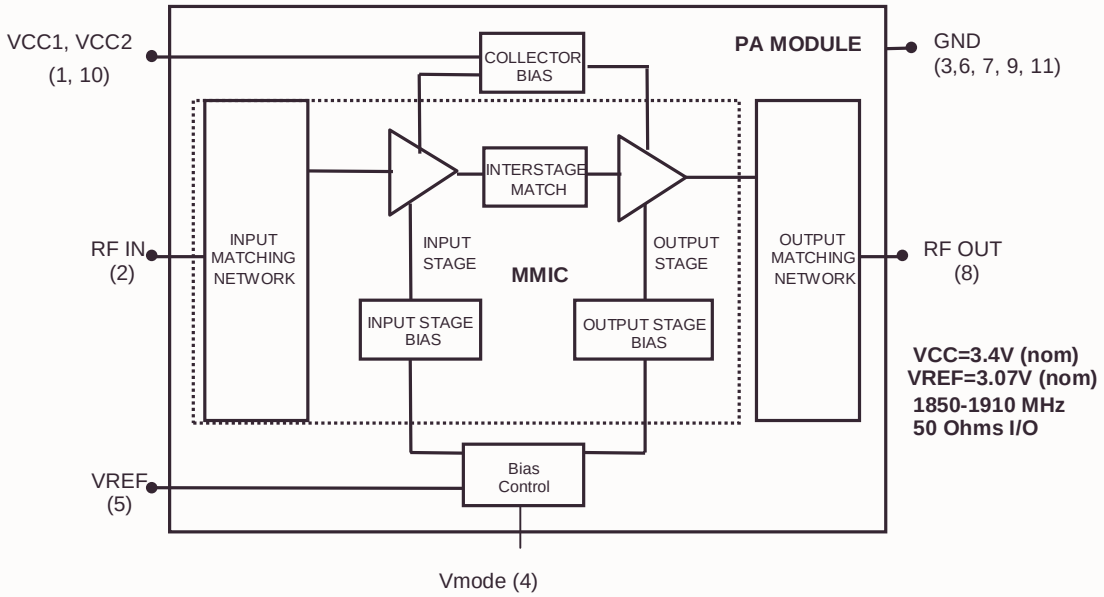
Absolute Ratings[1]

Parameter	Symbol	Min	Max	Units
Supply Voltages	Vcc1, Vcc2	0	5.0	V
Reference Voltage	Vref	2.7	5.0	V
Power Control Voltage	Vmode	0	3.0	V
RF Input Power	Pin	–	+5	dBm
Storage Temperature	Tstg	-55	+150	°C

Note:
1. No permanent damage with only one parameter set at extreme limit. Other parameters set to typical values.

Module Block Diagram

RMPA1959 US PCS CDMA Power Amplifier Module
Functional Block Diagram



Raytheon RF Components
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Andover, MA 01810

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Electrical Characteristics[1]

Parameter	Symbol	Condition	Min	Typical	Max	
Operating Frequency			1850		1910	MHz
CDMA MODE						
Gain	G	Po=0 dBm		27		dB
	Gp	Po=+28 dBm		25		dB
Max Linear Power Out	Po		28			dBm
Power-Added Efficiency	PAEd	Po=+28 dBm		38		%
Adjacent Channel Power Ratio	ACPR	Po=+28 dBm				
+/-1.25 MHz Offset	ACPR1	IS-95/98		-50		dBc
+/-1.25 MHz Offset	ACPR1	CDMA2000-1X		-48		dBc
+/-2.25 MHz Offset	ACPR2	IS-95/98		-56		dBc
	ACPR2	CDMA2000-1X		-58		dBc
General Characteristics						
Input VSWR	VSWR			2.0:1		
Noise Figure	NF			4		
Rx Band Noise Power	No			-139		dBm/Hz
Harmonic Suppression[4]		2fo, 3fo, 4fo			-30	dBc
Spurious Output[4]		5:1 Load VSWR[2]			-60	dBc
Case Operating Temp.	Tc		-30		85	°C
DC Characteristics						
Quiescent Current	Iccq	High Power Mode		80		mA
		Low Power Mode		40		mA
Vref Current	Iref	Vref=3.0V		5		mA
Power Shutdown Current[3]		Vref=0V		<1	10	uA

Notes:

1. All parameters met at Tc =+25°C, Vcc =+3.4V, f=1880 MHz and load VSWR ≤ 1.2:1.
2. All phase angles.
3. No applied RF signal.
4. Guaranteed by design

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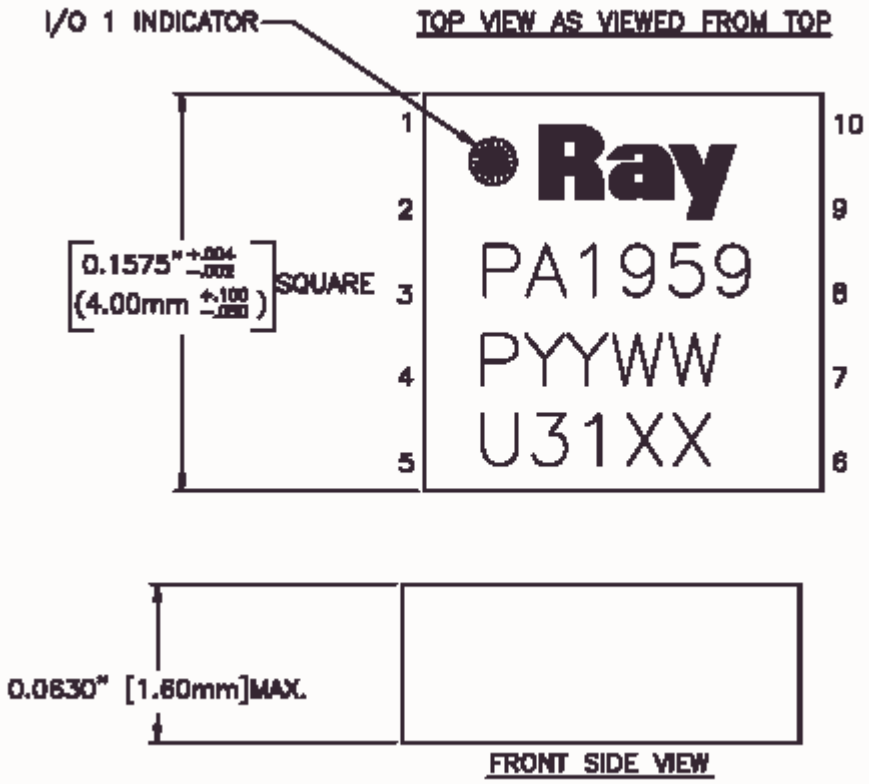
Package Outline



Package Pinout

Section	Signal Name	Description	Pin #
RF	RF In	RF Input to PA; DC blocked; 5 dBm maximum input	2
	RF Out	RF Output of PA; DC blocked	8
DC Power	Vcc1, Vcc2	DC Supplies of PA	1, 10
Ground	Gnd	Signal Ground	3, 6, 7, 9, 11
Control	Vmode	High Power/Low Power control	4
	Vref	reference Voltage	5

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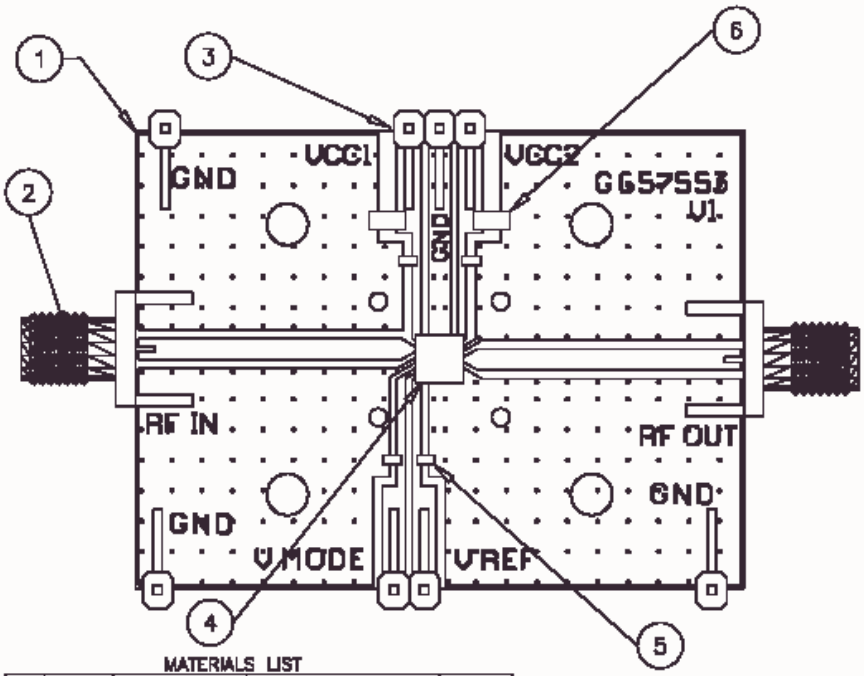
Evaluation Board Layout



MATERIALS LIST

QTY	ITEM NO.	PART NUMBER	DESCRIPTION	VENDOR
1	1	[illegible]	PC, BOARD	RAYTHEON
2	2	[illegible]	SMA CONNECTOR	JOHNSON
4	3	[illegible]	TERMINALS	3M
REF	4	[illegible]	ASSEMBLY, RMPA1959	RAYTHEON
4	5 (C1)	[illegible]	1000 pF CAPACITOR (0603)	MURATA
	5 (ALT)	[illegible]	1000 pF CAPACITOR (0603)	PANASONIC
2	6 (C2)	[illegible]	3.3 nF CAPACITOR (1206)	TDK
A/R	7	[illegible]	SOLDER PASTE	INDIUM CORP
A/R	8	[illegible]	SOLDER PASTE	INDIUM CORP

DC Turn-On Sequence

1) Vcc1=Vcc2=3.4V (typical)
2) Vref=3.0V (typical)
3) Vmode=2.0V (Pout <16 dBm), 0V (Pout>16dBm)

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Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Units
Supply Voltage	Vcc1, Vcc2	3.1	3.4	4.5	V
RF Input Power	Pin		0	+3	dBm
CDMA Output Power Range	Pout	-55		+28	dBm
Reference Voltage	Vref	2.95	3.0	3.05	V

Note: 1. RF input power for CDMA Pout = +28dBm.

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Application Information

CAUTION: THIS IS AN ESD SENSITIVE DEVICE.

- **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. The illustration below indicates the recommended soldering profile.

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◆ **Solder Joint Characteristics:** Proper operation of this device depends on a reliable void-free attachment of the heat sink 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.

Recommended Solder Reflow Profile