RF MICRO·DEVICES

Preliminary

RF6000-3

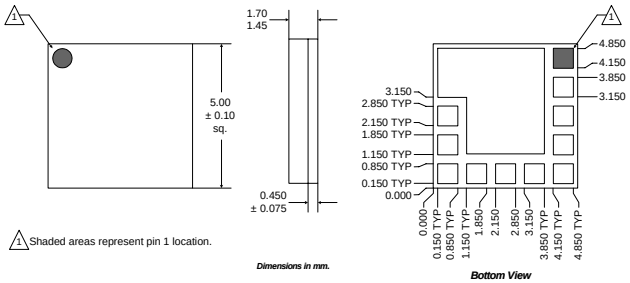
3V 1900MHZ LINEAR AMPLIFIER MODULE

Typical Applications

- 3V CDMA US-PCS Handsets
- 3V CDMA2000/1X PCS Handsets
- Spread-Spectrum Systems
- Designed for Compatibility with Qualcomm Chipsets

Product Description

The RF6000-3 is a high-power, high-efficiency linear amplifier IC targeting 3V handheld systems. The device is manufactured on a RF Micro Devices' advanced third generation Gallium Arsenide Heterojunction Bipolar Transistor (HBT) process, and has been designed for use as the final RF amplifier in dual-mode 3V CDMA handheld digital cellular equipment, spread-spectrum systems, and other applications in the 1850MHz to 1910MHz band. The RF6000-3 has a digital control line for low power application to reduce the current drain. The device is self-contained with 50Ω input and output that is matched to obtain optimum power, efficiency, and linearity characteristics. The module is an ultra-small 5mmx5mm land grid array with backside ground.



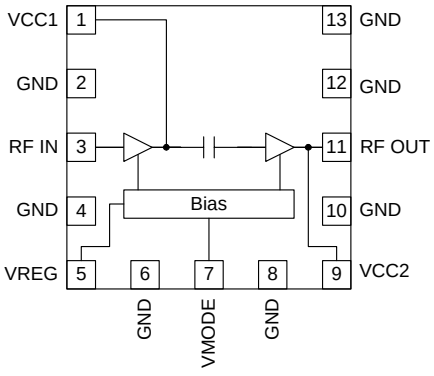
Optimum Technology Matching® Applied

- ☐ Si BJT
- ☑ GaAs HBT
- ☐ GaAs MESFET
- ☐ Si Bi-CMOS
- ☐ SiGe HBT
- ☐ Si CMOS
- ☐ InGaP/HBT
- ☐ GaN HEMT
- ☐ SiGe Bi-CMOS

Package Style: LGM (5mmx5mm)

Features

- Advanced 3rd Generation HBT Process
- Input/Output Internally Matched@50Ω
- 28dBm Linear Output Power
- -140dBm/Hz Receive Band Noise Power
- 40mA Idle Current (Low Power Mode)
- CDMA2000 Compatible



Functional Block Diagram

Ordering Information

RF6000-3	3V 1900MHz Linear Amplifier Module
RF6000-3 PCBA	Fully Assembled Evaluation Board

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Fax (336) 664 0454
http://www.rfmd.com

Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage (RF off)	+8.0	V_{DC}
Supply Voltage ($P_{OUT} \leq 28$dBm)	+5.2	V_{DC}
Control Voltage (V_{REG})	+4.2	V_{DC}
Mode Voltage (V_{MODE})	+3.5	V_{DC}
Input RF Power	+10	dBm
Operating Case Temperature	-30 to +110	℃
Storage Temperature	-30 to +150	℃

Caution! ESD sensitive device.

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
High Power State (V_{MODE} Low)					V_{CC}=3.4V, V_{REG}=2.85V, V_{MODE}=0V, P_{OUT}=28dBm, T_{AMB}=25°C, (unless otherwise specified)
Frequency Range	1850		1910	MHz	
Linear Gain		28		dB	
Second Harmonic		-45		dBc	
Third Harmonic		-55		dBc	
Maximum Linear Output Power	28.0	28.5		dBm	
Low Voltage Linear Output Power		27		dBm	V_{CC}=3.0V
Total Linear Efficiency		35		%	
Total Current, I_{CC}		525		mA	
Adjacent Channel Power Rejection		-49	-46	dBc	ACPR@1.25MHz, P_{OUT}=28dBm (IS-95).
		-60	-57	dBc	ACPR@2.25MHz, P_{OUT}=28dBm (IS-95).
Input VSWR		2:1			
Output VSWR			10:1		No damage.
			6:1		No oscillations. >-70dBc
Noise Power		-140		dBm/Hz	At 80MHz offset.
Low Power State (V_{MODE} High)					V_{CC}=3.4V, V_{REG}=2.85V, V_{MODE}=2.85V, P_{OUT}=16dBm, T_{AMB}=25°C, (unless otherwise specified)
Frequency Range	1850		1910	MHz	
Linear Gain		18		dB	
Second Harmonic		-38		dBc	
Third Harmonic		-50		dBc	
Maximum Linear Output Power	16	20		dBm	
Total Current, I_{CC}		135		mA	
Adjacent Channel Power Rejection		-50	-46	dBc	ACPR@1.25MHz. P_{OUT}=16dBm (IS-95).
		-63	-58	dBc	ACPR@2.25MHz. P_{OUT}=16dBm (IS-95).
Input VSWR		2:1			
Output VSWR			10:1		No damage.
			6:1		No oscillations. >-70dBc

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
DC Supply					
Supply Voltage	3.2	3.4	4.2	V	
Quiescent Current		110		mA	V_{MODE}=Low, V_{REG}=2.85V
		40		mA	V_{MODE}=High, V_{REG}=2.85V
V_{REG} Current		3		mA	
V_{MODE} Current		250		μA	
Turn On/Off Time			<40	μs	V_{REG} switch from low to high, I_{CC} to within 90% of final value, P_{OUT} within 1dB of the final value.
Total Current (Power Down)		5		μA	V_{REG}=Low, V_{MODE}=Low
V_{REG} "Low" Voltage	0		0.5	V	
V_{REG} "High" Voltage	2.8	2.85	2.9	V	
V_{MODE} "Low" Voltage	0		0.5	V	
V_{MODE} "High" Voltage	2.0		3.0	V	

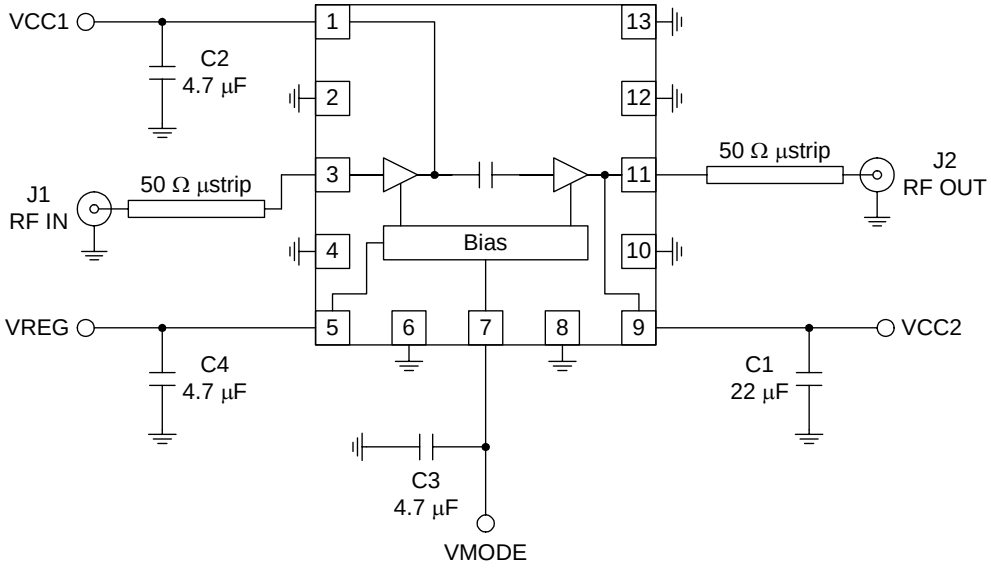
CDMA2000 Configuration Table

No.	Configuration	Peak-to-Average CCDF=1%	Relative Gains				Typical Maximum Output Power (dBm)
			PCH	DCCH	FCH	SCH	
1	DCCH 9600	5.4	-3.75	0			26.5
2	FCH 9600, SCH0 9600	4.5	-3.75		0	0	28.0
3	DCCH 9600, SCH0 9600	4.5	-3.75	0		0	28.0
4	FCH 9600, SCH0 19200	4.5	-6.25		-2.65	0	28.0
5	FCH 9600, SCH0 38400	4.3	-7.5		-5.125	0	28.0
6	DCCH 9600, SCH0 19200	4.1	-6.25	-2.65		0	28.0
7	RC1 (IS-95 Reference)	3.9					28.0
8	FCH 9600, SCH0 76800	3.9	-9.0		-7.875	0	28.0
9	DCCH 9600, SCH0 38400	3.9	-7.5	-5.125		0	28.0
10	DCCH 9600, SCH0 76800	3.6	-9.0	-7.875		0	28.0
11	FCH 9600	3.2	-3.75		0		28.0
12	FCH 1500	3.2	0		-5.875		28.0
13	FCH 2700	3.2	0		-2.75		28.0
14	FCH 4800	3.2	0		-0.25		28.0
15	Pilot Only	3.2	0				28.0

Pin	Function	Description	Interface Schematic
1	VCC1	First stage collector supply. A low frequency decoupling capacitor (e.g., 4.7μF) is required.	
2	GND	Ground connection. Connect to package base ground. For best performance, keep traces physically short and connect immediately to ground plane.	
3	RF IN	RF input internally matched to 50Ω. This input is internally AC-coupled.	
4	GND	Ground connection. Connect to package base ground. For best performance, keep traces physically short and connect immediately to ground plane.	
5	VREG	Regulated voltage supply for amplifier bias. In Power Down mode, both V_{REG} and V_{MODE} need to be LOW (<0.5V).	
6	GND	Ground connection. Connect to package base ground. For best performance, keep traces physically short and connect immediately to ground plane.	
7	VMODE	For nominal operation (High Power Mode), V_{MODE} is set LOW. When set HIGH, devices are turned off to improve efficiency.	
8	GND	Ground connection. Connect to package base ground. For best performance, keep traces physically short and connect immediately to ground plane.	
9	VCC2	Output stage collector supply. A low frequency decoupling capacitor (e.g., 22μF) is required.	
10	GND	Ground connection. Connect to package base ground. For best performance, keep traces physically short and connect immediately to ground plane.	
11	RF OUT	RF output internally matched to 50Ω. This output is internally AC-coupled.	
12	GND	Ground connection. Connect to package base ground. For best performance, keep traces physically short and connect immediately to ground plane.	
13	GND	Ground connection. Connect to package base ground. For best performance, keep traces physically short and connect immediately to ground plane.	
Pkg Base	GND	Ground connection. The backside of the package should be soldered to a top side ground pad which is connected to the ground plane with multiple vias. The pad should have a short thermal path to the ground plane.	

Evaluation Board Schematic

(Download Bill of Materials from www.rfmd.com.)



Evaluation Board Layout
Board Size 1.0” x 1.5”

Board Thickness 0.042”, Board Material RO4003, Ground plane at 0.020”, Multi-layer