RF3160

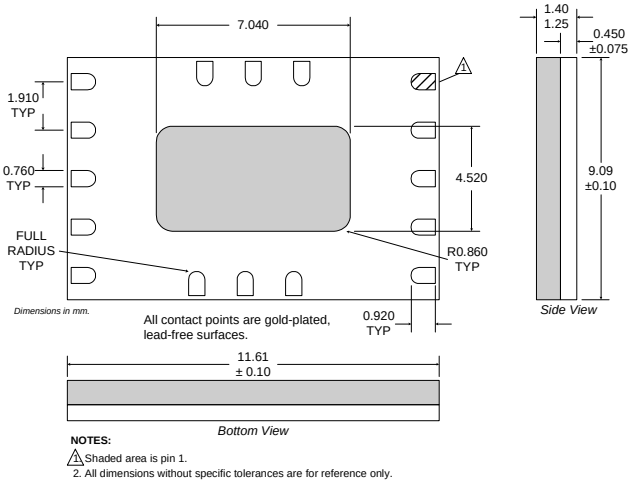
DUAL-BAND GSM/DCS
POWER AMP MODULE

Typical Applications

- 3V Dual-Band GSM/DCS Handsets
- Commercial and Consumer Systems
- Portable Battery-Powered Equipment
- GPRS Compatible
- GSM, E-GSM and DCS Products

Product Description

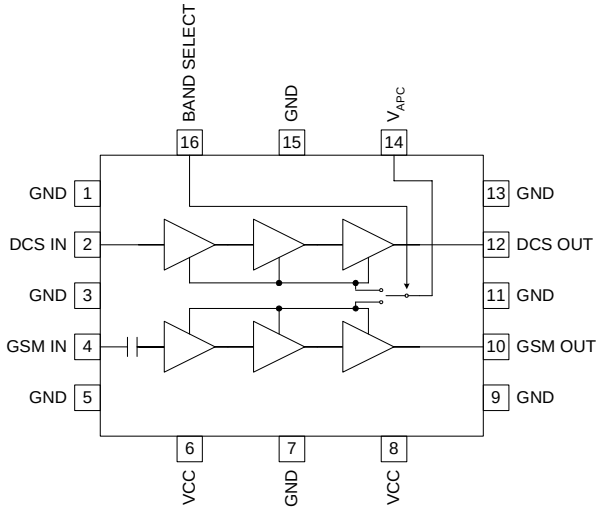
The RF3160 is a high-power, high-efficiency power amplifier module. The device is self-contained with 50Ω input and output terminals. The device is manufactured on an advanced Gallium Arsenide Heterojunction Bipolar Transistor (HBT) process, and has been designed for use as the final RF amplifier in GSM/DCS handheld digital cellular equipment and other applications in the 880MHz to 915MHz and 1710MHz to 1785MHz bands. On-board power control provides over 70dB of control range with an analog voltage input, and provides power down with a logic "low" for standby operation. The device is packaged in an ultra-small (9mmx11mm) LCC, minimizing the required board space.



Package Style: Module (9mmx11mm)

Optimum Technology Matching® Applied

- ☐ Si BJT
- ☑ GaAs HBT
- ☐ GaAs MESFET
- ☐ Si Bi-CMOS
- ☐ SiGe HBT
- ☑ Si CMOS



Functional Block Diagram

Features

- Single 2.8V to 5.0V Supply Voltage
- +35.0dBm GSM Output Power at 3.2V
- +32.5dBm DCS Output Power at 3.2V
- 55% GSM and 50% DCS Efficiency
- Internal Band Select

Ordering Information

RF3160	Dual-Band GSM/DCS Power Amp Module
RF3160 PCBA	Fully Assembled Evaluation Board

RF Micro Devices, Inc.
7625 Thorndike Road
Greensboro, NC 27409, USA
Tel (336) 664 1233
Fax (336) 664 0454
http://www.rfmd.com

Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage	-0.5 to +5.0	V_{DC}
Power Control Voltage ($V_{APC1,2}$)	-0.5 to +3.0	V
DC Supply Current	2400	mA
Input RF Power	+15	dBm
Duty Cycle at Max Power	50	%
Output Load VSWR	6:1	
Operating Case Temperature	-30 to +85	°C
Storage Temperature	-30 to +85	°C

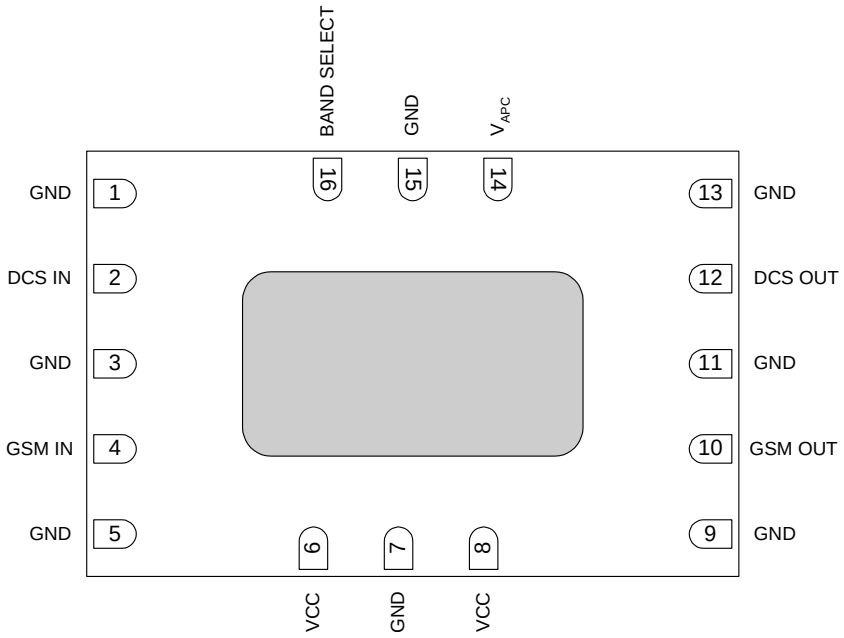
Caution! ESD sensitive device.

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall (GSM Mode)					Temp=+25°C, V_{CC}=3.2V, V_{APCGSM}=1.9V, P_{IN}=6dBm, Freq=880MHz to 915MHz, 25% Duty Cycle, Pulse Width=1154µs
Operating Frequency Range		880 to 915		MHz	
Maximum Output Power	34.5	35.0		dBm	Temp = 25°C, V_{CC}=3.2V, V_{APCGSM} =1.9V
PAE Efficiency	50	55		%	At $P_{OUT,MAX}$, V_{CC}=3.2V
Input Power for Max Output	+6	+8	+10	dBm	
Output Noise Power			-72	dBm	RBW=100kHz, 925MHz to 935MHz, P_{OUT}≥34.5dBm
			-84	dBm	RBW=100kHz, 935MHz to 960MHz, P_{OUT}≥34.5dBm
Forward Isolation			-40	dBm	V_{APCGSM}=0.1V, P_{IN}=-5dBm
Cross-Band Isolation			-15	dBm	P_{OUT}≥34.5dBm
Second Harmonic			-7	dBm	5dBm<P_{OUT}≤34.5dBm
Third Harmonic			-7	dBm	
All Other Non-Harmonic Spurious			-7	dBm	
Input Impedance		50		Ω	
Input VSWR			3:1		
Output Load VSWR (Stability)	6:1				Spurious<-36dBm, V_{APCGSM}=0.1V to 1.9V, RBW=3MHz
Output Load VSWR (Ruggedness)	10:1				P_{IN}=6dBm, P_{OUT}≤34.5dBm, V_{CC}=4.6V, Z_S=50Ω
Output Load Impedance		50		Ω	Load impedance presented at RF OUT pad
Power Control V_{APC1}					
Power Control “ON”	1.8		1.9	V	Max. P_{OUT}
Power Control “OFF”	0.1	0.5		V	Min. P_{OUT}
Power Control Range	60			dB	$V_{APC1,2}$=0.1V to 1.9V
Gain Control Slope		100		dB/V	P_{OUT}=-10dBm to 34.5dBm
APC Input Capacitance			10	pF	DC to 2MHz
APC Input Current			1	mA	V_{APC}=1.9V
			10	µA	V_{APC}=0V
Turn On/Off Time			2	µS	V_{APC}=0V to 1.9V
Band Select	0		0.5	V	GSM
	2		2.8	V	DCS
Overall Power Supply					
Power Supply Voltage	2.8	3.2	5.0	V	Specifications
	2.9		4.7	V	Nominal operating limits, P_{OUT}≤+34.5dBm
Power Supply Current		2		A	DC Current at $P_{OUT,MAX}$
			30	µA	$V_{APC1,2}$=0.1V. No RF input power.

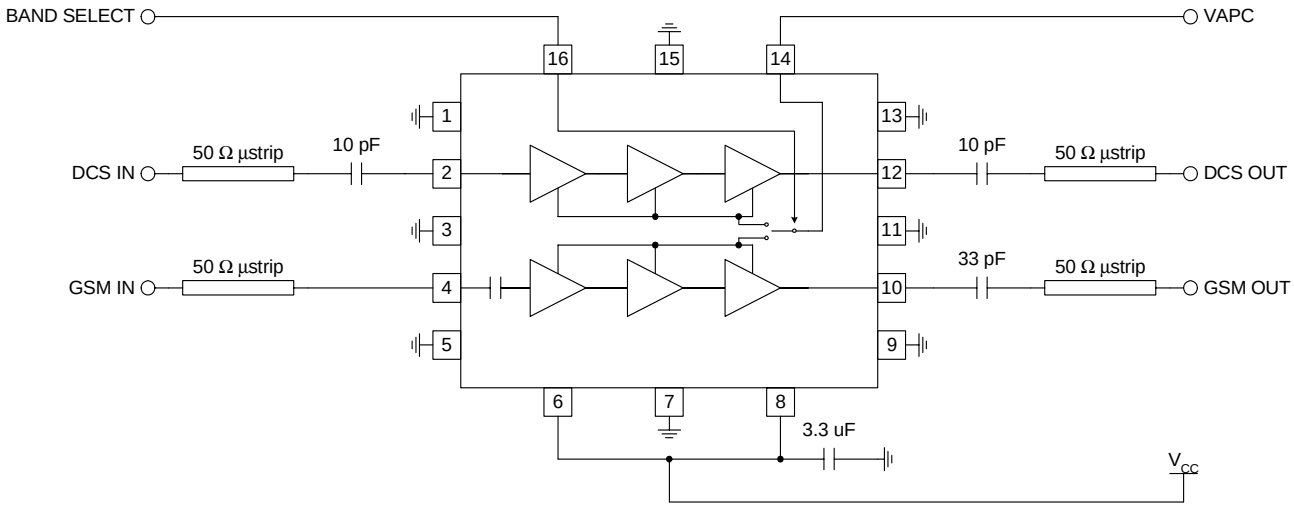
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall (DCS Mode)					Temp=25°C, V_{CC}=3.2V, V_{APCDCS}=1.9V, P_{IN}=6dBm, Freq=1710MHz to 1785MHz, 25% Duty Cycle, pulse width=1154µs
Operating Frequency Range		1710 to 1785		MHz	
Maximum Output Power	31.9	32.5		dBm	Temp=25°C, V_{CC}=3.2V, V_{APCDCS}=1.9V, 1710MHz to 1785MHz
PAE Efficiency	42	50		%	At $P_{OUT,MAX}$, V_{CC}=3.2V, 1710MHz to 1785MHz
Recommended Input Power Range	+6	+8	+10	dBm	
Output Noise Power		-80	-76	dBm	RBW=100kHz, 1805MHz to 1880MHz, $P_{OUT} \geq$ 32.5dBm, V_{CC}=3.2V
Forward Isolation			-48	dBm	V_{APCDCS}=0.1V, P_{IN}=-5dBm
Second Harmonic			-7	dBm	0dBm<$P_{OUT}\leq$32.5dBm
Third Harmonic			-7	dBm	
All Other Non-Harmonic Spurious			-7	dBm	
Input Impedance		50		Ω	
Input VSWR			3:1		
Output Load VSWR (Stability)	6:1				Spurious<-36dBm, V_{APCDCS}=0.1V to 1.9V, RBW=3MHz
Output Load VSWR (Ruggedness)	10:1				P_{IN}=6dBm, $P_{OUT}\leq$31.9dBm, V_{CC}=4.6V, Z_S=50Ω
Output Load Impedance		50		Ω	Load impedance presented at RF OUT pin
Power Control V_{APC2}					
Power Control “ON”	1.8		1.9	V	Max. P_{OUT}
Power Control “OFF”	0.1	0.5		V	Min. P_{OUT}
Power Control Range	60			dB	$V_{APC1,2}$=0.1V to 1.9V
Gain Control Slope		100		dB/V	P_{OUT}=-10dBm to +32.5dBm
APC Input Capacitance			10	pF	DC to 2MHz
APC Input Current			1	mA	V_{APC}=1.9V
			10	µA	V_{APC}=0V
Turn On/Off TIme			100	ns	V_{APC}=0to1.9V
Overall Power Supply					
Power Supply Voltage		3.2		V	Specifications
	2.9		4.7	V	Nominal operating limits, $P_{OUT}\leq$+32.5dBm
Power Supply Current		1.3		A	DC Current at $P_{OUT,MAX}$
			30	µA	$V_{APC1,2}$=0.1V. No RF input power.

Pin	Function	Description	Interface Schematic
1	GND	Connects to module backside ground.	
2	DCS IN	RF input to the DCS band. This is a 50Ω input, external DC-blocking capacitor required. See application schematic.	
3	GND	Connects to module backside ground.	
4	GSM IN	RF input to the GSM band. This is a 50Ω input. No external DC-blocking capacitor required. See application schematic.	
5	GND	Connects to module backside ground.	
6	VCC	Power supply for stages 1 and 2 of both the GSM and DCS power amplifiers. External low frequency bypassing capacitor required. See application schematic.	
7	GND	Connects to module backside ground.	
8	VCC	Power supply for output stages of both the GSM and DCS power amplifiers. External low frequency bypassing capacitor required. See application schematic.	
9	GND	Connects to module backside ground.	
10	GSM OUT	RF output for the GSM band. This is a 50Ω output. External DC-blocking capacitor required. See application schematic.	
11	GND	Connects to module backside ground.	
12	DCS OUT	RF output for the DCS band. This is a 50Ω output. External DC-blocking capacitor required. See application schematic.	
13	GND	Connects to module backside ground.	
14	VAPC	Single input analog power control voltage for the GSM and DCS band.	
15	GND	Connects to module backside ground.	
16	BAND SELECT	Logic low (GSM enable) or logic high (DCS enable) provides single IO band selection.	
Pkg Base	GND	Module backside ground.	

Pin Out
Top View



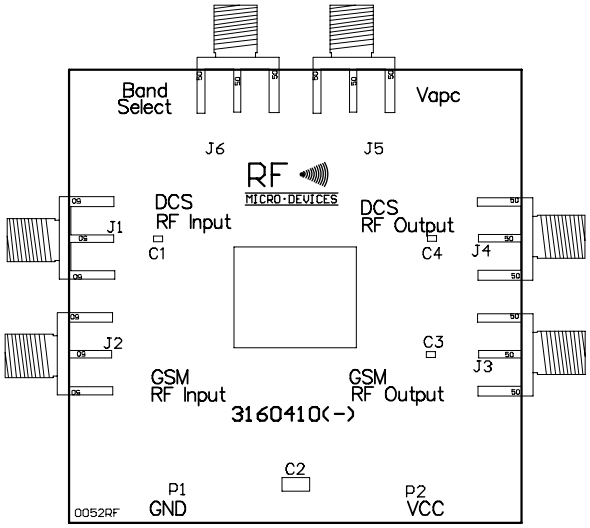
Application Schematic



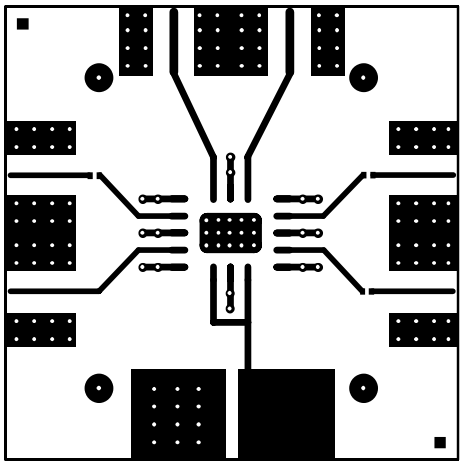
Evaluation Board Layout
Board Size 2.0” x 2.0”

Board Thickness 0.032”, Board Material FR-4, Multi-Layer

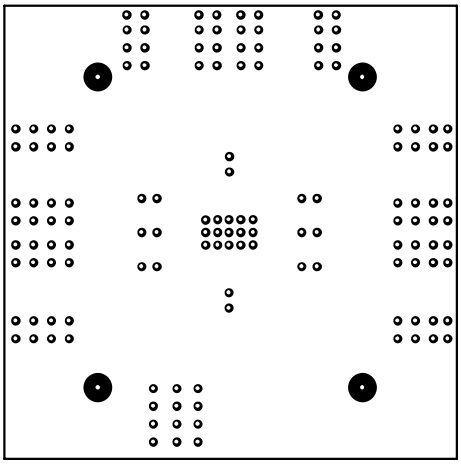
Assembly



Top



Inner 1



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