

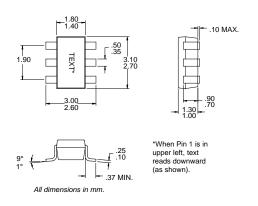
PCS/CELLULAR TDMA/CDMA/W-CDMA LINEAR VARIABLE GAIN AMPLIFIER

RF2377

Typical Applications

- CDMA PCS/Cellular Handsets
- TDMA PCS/Cellular Handsets
- Product Description

The RF2377 is a linear variable gain amplifier suitable for use in TDMA and CDMA systems in the cellular or PCS band and for W-CDMA systems. The features of this device include linear gain control, high gain, and high linearity. The IC is manufactured on an advanced Gallium Arsenide Heterojunction Bipolar Transistor (GaAs HBT) process and is featured in an industry-standard miniature 6-lead plastic SOT package.





W-CDMA Handsets

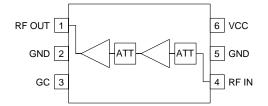
Features

- 50dB Linear Gain Control Range
- 24dB Maximum Gain
- Single 2.7V to 3.3V Supply
- 45mA Supply Current
- High Linearity

Ordering Information				
RF2377 PCS/Cellular TDMA/CDMA/W-CDMA Linear Vari- able Gain Amplifier				
RF2377-410 PCBAFully Assembled Evaluation Board, PCS RF2377-411 PCBAFully Assembled Evaluation Board, W-CDMA				
RF Micro Devices, Inc. 7625 Thorndike Road Greensboro, NC 27409, USA	Tel (336) 664 1233 Fax (336) 664 0454 http://www.rfmd.com			

Optimum Technology Matching® Applied

🗌 Si BJT	🗹 GaAs HBT	GaAs MESFET
🗌 Si Bi-CMOS	SiGe HBT	Si CMOS

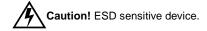


Functional Block Diagram

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Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage	0 to +5.0	V _{DC}
DC Current	100	mA
Operating Ambient Temperature	-20 to +85	°C
Storage Temperature	-40 to +150	°C



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Min. Typ. Max. Vcc=2.8V, Vgc=2.0V, T=25 °C Usable Frequency Range Linear Gain Control Range Gain Control Slope 50 600 to 2200 MHz Vcc=2.8V, Vgc=2.0V, T=25 °C Operating Frequency Maximum Small Signal Gain 22 24 27 dB Vcc=2.8V, Vgc=2.0V, T=25 °C Operating Frequency Maximum Small Signal Gain 22 2.4 27 dB Vcc=2.8V, Vgc=2.0V, T=25 °C Maximum Small Signal Gain 22 2.4 27 dB Vcc=2.8V, Vgc=2.0V, T=25 °C Maximum Small Signal Gain 22 2.4 27 dB Vcc=2.8V, Vgc=2.0V, T=25 °C Maximum Small Signal Gain 22 2.4 27 dB Maximum gain Maximum Small Signal Gain 22 2.4 27 dB Maximum gain Rejection -61 -57 dBc TDMA modulation; Pour=+8dBm Vcc=2.8V, Vgc=2.0V, T=25 °C Operating Frequency 1880 MHz dB Maximum gain Maximum gain Noise Figure 7 dB Maximum Gain Vcc=2.0V, T=25 °C Vcc=2.0V, T=25 °C	Demonster	Specification			11		
Usable Frequency Range Linear Gain Control Range Gain Control Slope800 to 2200MHz dBLinear Gain Control Range Gain Control Slope70dB/VTDMA Operating Frequency Maximum Small Signal Gain222427dBTDWA Maximum Small Signal Gain222427dBNoise Figure Rejection+23+26dBmMaximum gain TDMA modulation; Pourt=+8dBmNoise Figure Maximum Average Output Power Rejection-61-57dBcTDMA modulation; 	Parameter	Min. Typ. Max.		Max.	Unit	Condition	
Linear Gain Control Range Gain Control Stope 70 dB V_{CC} =2.8V, V _{GC} =2.0V, T=25°C V_{CC} =2.8V, T=25°C	Overall					V _{CC} =2.8V, V _{GC} =2.0V, T=25°C	
Gain Control Slope70dBAVTDMA Operating Frequency1880MHzMaximum Small Signal Gain Ioput VSWR222427dBOutput IP3+23+26dBmMaximum gainNoise Figure7dBMaximum Average Output Power Rejection	Usable Frequency Range		800 to 2200		MHz		
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	•				42	Over entire gain control range	
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Maximum Small Signal Gain Input VSWR222427dBInput VSWR1.5:12.5:1Over entire gain control rangeOutput IP3+23+26dBmMaximum Average Output Power+11dBmAdjacent Channel Power Rejection-53dBcM-CDMA-53dBcW-CDMA-53dBcW-CDMA1920 to 1980MHzSmall Signal Gain20222427dBNoise Figure1.5:12.5:1Operating Frequency1920 to 1980MHzSmall Signal Gain2022244BNoise Figure4Maximum Linear Output Power Rejection1.5:125:234dBMaximum Linear Output Power Rejection-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-42dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard-43dBard	-		1880		MH7		
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		22		27			
Output IP3 Noise Figure+23+26 7dBmdBmMaximum gain CDMA modulation; V _{CC} =3.0V, maximum gain setting, ACPR cC=3.0V. For P _{IN} >-16dBm, adjustment of P _{IN} is required to maintain ACPR performance over gain control range.Adjacent Channel Power Rejection-53dBcCDMA modulation; V _{CC} =3.0V. For P _{IN} >-16dBm, adjustment of P _{IN} is required to maintain ACPR performance over gain control range. For P _{IN} -16dBm, adjustment of P _{IN} is required to maintain ACPR performance over gain control range.W-CDMA Operating Frequency Small Signal Gain1920 to 1980 20MHz 22V _{CC} =2.0V 4V _{GC} =2.0VInput VSWR Output IP3 Noise Figure1.5:1 422.5:1 44Over entire gain control rangeMaximum Linear Output Power Rejection4 485 448dBm 46Maximum gain Maximum gain Maximum Linear Output Power RejectionAdjacent Channel Power Rejection-43dBcW-CDMA modulation; V _{GC} =2.0V, P _{IN} <-17 dBm	0	22			uD	Over entire gain control range	
Noise Figure Maximum Average Output Power Rejection7dBMaximum gain CDMA modulation; V _{CC} =3.0V, maximum gain setting, ACPR CDMA modulation; V _{CC} =3.0V. For P _{IN} >-16 dBm, adjustment of P _{IN} is required to maintain ACPR performance over gain control range. For P _{INS} -16 dBm, adjustment of P _{IN} is required to maintain ACPR performance over gain control range. For P _{INS} -16 dBm, ACPR performance over gain control range.W-CDMA Operating Frequency Small Signal Gain1920 to 1980 20MHz 22V _{CC} =2.8V, T=25°COperating Frequency Small Signal Gain1920 to 1980 -33MHz -32V _{GC} =2.0V -33Input VSWR Output IP3 Noise Figure1.5:1 -322.5:1 -34Over entire gain control rangeMaximum Linear Output Power Rejection456dB -43Maximum gain -43Maximum Linear Output Power Rejection-43-46dBc -43W-CDMA modulation; V _{GC} =1.0V,		1.23	-	2.0.1	dBm	Over entire gain control lange	
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Adjacent Channel Power Rejection-53-53dBcgain setting, $ACPR \le 52 dBc.$ CDMA modulation; $V_{CC} = 3.0 V.$ For $P_{ N} > -16 dBm, adjustment of P_{ N} is requiredto maintain ACPR performance over gaincontrol range. For P_{ N} \le -16 dBm, ACPR performance over gaincontrol range. For P_{ N} \le -16 dBm, ACPR performance is maintained over entire gain con-trol range.W-CDMA1920 to 1980MHzOperating Frequency1920 to 1980MHzSmall Signal Gain202224dBV_{CC}=2.8V, T=25°C-33-32-31dBInput VSWR1.5:12.5:1Over entire gain control rangeOutput IP3+22+24dBmNoise Figure456dBMaximum Linear Output PowerRejection+8+9dBmAdjacent Channel PowerRejection-43dBcW-CDMA modulation; V_{GC} = 2.0V,P_{ N} < -12 dBm$	5					5	
Adjacent Channel Power Rejection-53-53dBcCDMA modulation; $V_{CC}=3.0V$. For $P_{IN}>-16dBm, adjustment of P_{IN} is requiredto maintain ACPR performance over gaincontrol range. For P_{IN}>-16dBm, ACPR per-formance is maintained over entire gain control range.W-CDMA1920 to 1980MHzOperating Frequency1920 to 1980MHzSmall Signal Gain202224dBV_{GC}=2.0V-33-32-31dBV_{GC}=0.3VInput VSWR1.5:12.5:1Over entire gain control rangeOutput IP3+22+24dBmNoise Figure456dBMaximum Linear Output PowerRejection+8+9dBmAdjacent Channel PowerRejection-48-46dBcW-CDMA ACPR-43dBcW-CDMA modulation; V_{GC}=1.0V,$	Maximum Average Output Fower		T 11		ubiii		
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W-CDMAImage: Note that the problem of th	Rejection					to maintain ACPR performance over gain	
W-CDMAtrol range.Operating Frequency1920 to 1980MHzSmall Signal Gain202224dB -33 -32 -31 dB $V_{GC}=2.0V$ Input VSWR1.5:12.5:1Over entire gain control rangeOutput IP3 $+22$ $+24$ dBmNoise Figure456dBMaximum Linear Output Power $+8$ $+9$ dBmAdjacent Channel Power -48 -46 dBcW-CDMA modulation; V _{GC} =2.0V,PIN<						control range. For P _{IN} ≤-16dBm, ACPR per-	
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						V _{CC} =2.8 V, 1=25 C	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Small Signal Gain	-					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		-33	-32	-31	dB	V _{GC} =0.3V	
Noise Figure 4 5 6 dB Maximum gain Maximum Linear Output Power +8 +9 dB Minimum gain Adjacent Channel Power +8 +9 dB W-CDMA ACPR -46dBc, V _{GC} =2.0V Rejection -48 -46 dBc W-CDMA modulation; V _{GC} =2.0V, P _{IN} <-12 dBm	Input VSWR		1.5:1	2.5:1		Over entire gain control range	
32 32.5 34 dB Minimum gain Maximum Linear Output Power +8 +9 dBm W-CDMA ACPR<-46 dBc, V _{GC} =2.0V Adjacent Channel Power -48 -46 dBc W-CDMA modulation; V _{GC} =2.0V, P _{IN} <-12 dBm	Output IP3	+22	+24		dBm		
Maximum Linear Output Power +8 +9 dBm W-CDMA ACPR<-46dBc, V _{GC} =2.0V Adjacent Channel Power -48 -46 dBc W-CDMA modulation; V _{GC} =2.0V, P _{IN} <-12 dBm	Noise Figure	4	5	6	dB	Maximum gain	
Adjacent Channel Power -48 -46 dBc W-CDMA modulation; V _{GC} =2.0 V, P _{IN} <-12 dBm		32	32.5	34	dB	Minimum gain	
Rejection -43 dBc P _{IN} <-12 dBm	Maximum Linear Output Power	+8	+9		dBm	W-CDMA ACPR<-46dBc, V _{GC} =2.0V	
Rejection -43 dBc P _{IN} <-12 dBm	Adjacent Channel Power		-48	-46	dBc	W-CDMA modulation; V _{GC} =2.0V,	
-43 dBc W-CDMA modulation; Over entire gain con- trol range, P _{IN} <-17 dBm -43 dBc W-CDMA modulation; V _{GC} =1.0 V,	Rejection					P _{IN} <-12dBm	
-43 dBc W-CDMA modulation; V_{GC} =1.0V,				-43	dBc		
				-43	dBc		
						P _{IN} <-14dBm	

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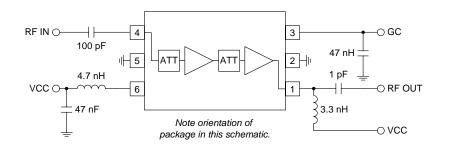
RF2377

Parameter		Specification		Unit	Condition	
Farameter	Min.	Тур.	Max.	Unit	Condition	
Power Supply					T=25°C	
Supply Voltage		2.8		V	Specifications	
		2.7 to 3.3		V	Operating range	
Gain Control Voltage		0 to 2.0		V		
Supply Current	40	45	60	mA	V _{CC} =2.8V, V _{GC} =2.0V	
		56		mA	V _{CC} =2.8V, V _{GC} =2.0V V _{CC} =3.0V, V _{GC} =2.0V	
			20	mA	V _{CC} =2.8V, V _{GC} =0.4V	
V _{GC} Current			1.5	mA		

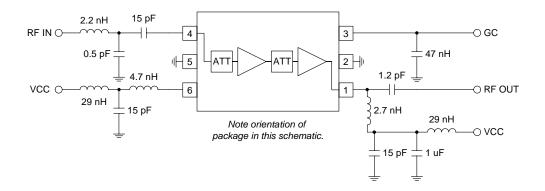
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Pin	Function	Description	Interface Schematic
1	RF OUT	RF output pin. This pin is DC coupled and requires V_{CC} through a bias inductor sized accordingly to provide a high pass transformation with a series capacitor.	
2	GND	Ground connection. Keep traces physically short and connect immedi- ately to ground plane for best performance.	
3	GC	Analog gain control pin. This pin controls the gain of the IC. Minimum gain occurs at V_{GC} <0.4V and maximum gain is achieved with V_{GC} =2.0V. 50dB of linear gain control with little variation of input P _{1dB} is available.	
4	RF IN	RF input pin. This pin is DC coupled.	
5	GND	Ground connection. Keep traces physically short and connect immedi- ately to ground plane for best performance.	
6	VCC	Power supply. This pin should be connected to a regulated supply and requires a bypass capacitor. Voltage is supplied through this pin to the first stage collector; this voltage also controls the bias. Gain may be tuned by adjusting the value of the feed inductor.	

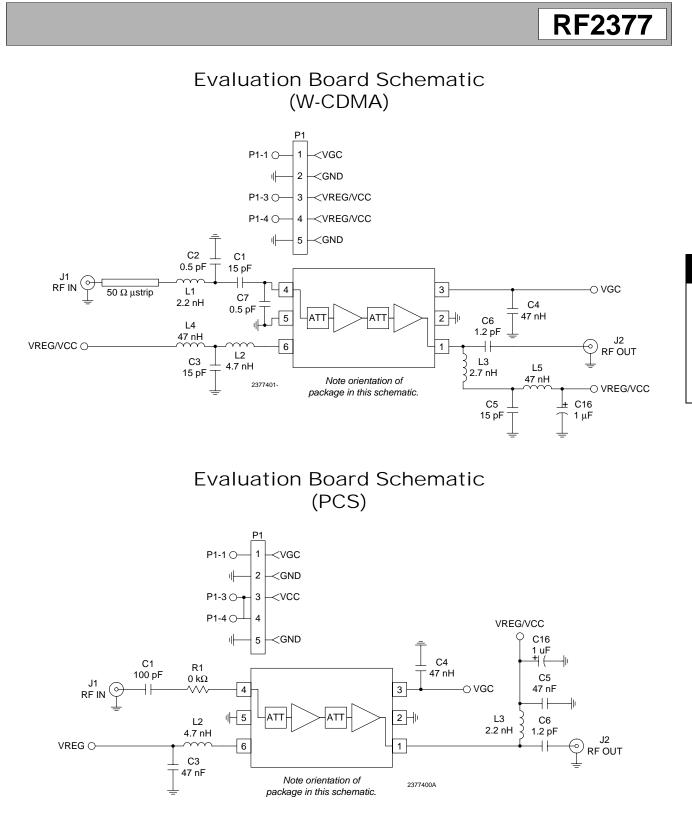
Application Schematic



W-CDMA Application Schematic



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RF2377

Evaluation Board Layout (PCS) Board Size 2.0" x 2.0" Board Thickness 0.028", Board Material FR-4

