a

100 MHz – 2.7 GHz RF Gain Block

Preliminary Technical Data AD8353

FEATURES

Fixed gain of 20 dB

Operational Frequency to 100 MHz to 2.7GHz

Linear output power up to 8 dBm

Input/Output internally matched to 50 ohms

Temperature and power supply stable

Noise figure 5 dB

Power supply 3 V or 5 V

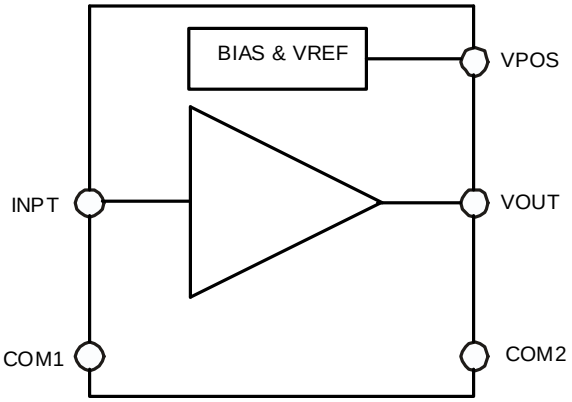
APPLICATIONS

VCO buffer amplifier

General Tx/Rx amplification

Power amplifier predriver

Low power antenna driver



PRODUCT DESCRIPTION

The AD8353 is a broadband, fixed-gain linear amplifier that operates at frequencies from 100 MHz up to 2.7 GHz. It is intended for use in a wide variety of wireless devices including cellular, broadband, CATV and LMDS/MMDS applications.

By taking advantage of Analog Devices' high performance complementary Si bipolar process, these gain blocks provide excellent stability over process, temperature and power supply. This amplifier is singled-ended and internally matched to 50 ohms with a return loss of greater than 15 dB over the full operating frequency range.

The AD8353 provides linear output power of nearly 9 dBm with 20 dB of gain at 900 MHz when biased at 3 V and an external RF choke is connected between the power supply and the output pin. The DC supply current is 42 mA. At 900 MHz, the output third order intercept (OIP3) is greater than 23 dBm, and is 19 dBm at 2.7 GHz.

The noise figure is 5.1 dB at 900 MHz. The reverse isolation (s_{12}) is -36 dB at 900 MHz and -30 dB at 2.7 GHz.

The part also operates with a 5 V power supply, in which case no external inductor is required. Under these conditions, the AD8353 delivers 8 dBm with 20 dB of gain at 900 MHz. The DC supply current is 42 mA. At 900 MHz, the OIP3 is greater than 22 dBm and is 19 dBm at 2.7 GHz. At 900 MHz the noise figure is 5.3 dB at 900 MHz and the reverse isolation (s_{12}) is –25 dB.

The AD8353 is fabricated on Analog Devices' proprietary, high performance 25 GHz Si complementary bipolar IC process. The AD8353 is available in a chip scale package which utilizes an exposed paddle for excellent thermal impedance and low impedance electrical connection to ground. It operates over a -40 to +85 °C temperature range.

An evaluation board is available.

Preliminary Rev. F 8/31/01

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 U.S.A.
Tel: 781/329-4700 World Wide Web Site: http://www.analog.com
Fax: 781/326-8703

AD8353-SPECIFICATIONS

(Unless otherwise noted, V_{POS} = 3V, T=27°C, 100 nH external inductor between VOUT and VPOS, Z_o = 50 Ω)

Parameters	Conditions	Min	Typ	Max	Units
OVERALL FUNCTION					
Frequency Range		0.1		2.7	GHz
Gain	f = 900 MHz		19.5		dB
	f = 1.9 GHz		17.5		dB
	f = 2.7 GHz		15.4		dB
	f = 900 MHz, -40 °C ≤ T_A ≤ 85 °C		19.5		dB
	f = 1.9 GHz, -40 °C ≤ T_A ≤ 85 °C		17.5		dB
	f = 2.7 GHz, -40 °C ≤ T_A ≤ 85 °C		15.4		dB
Gain Supply Sensitivity	V_{POS} ± 10%		0.18		dB/V
Reverse Isolation (s_{12})	f = 900 MHz		-36		dB
	f = 1.9 GHz		-35		dB
	f = 2.7 GHz		-30.7		dB
RF INPUT INTERFACE	Pin RFIN				
Input Return Loss	f = 900 MHz		24.8		dB
	f = 1.9 GHz		21		dB
	f = 2.7 GHz		15.4		dB
RF OUTPUT INTERFACE	Pin VOUT				
Output Compression Point	f = 900 MHz		9		dBm
	f = 1.9 GHz		8		dBm
	f = 2.7 GHz		7.2		dBm
	f = 900 MHz, -40 °C ≤ T_A ≤ 85 °C		TBD		dBm
	f = 1.9 GHz, -40 °C ≤ T_A ≤ 85 °C		TBD		dBm
	f = 2.7 GHz, -40 °C ≤ T_A ≤ 85 °C		TBD		dBm
Maximum Output Power	f = 900 MHz, saturated		6.5		dBm
Output Return Loss	f = 900 MHz	22.5	24.1		dB
	f = 1.9 GHz	16.8	17.4		dB
	f = 2.7 GHz	11.0	13.5		dB
DISTORTION/ NOISE					
Output Third Order Intercept	f = 900 MHz, Δf = 1 MHz, P_{IN} = −28 dBm		23.8		dBm
	f = 1.9 GHz, Δf = 1 MHz, P_{IN} = −28 dBm		20.8		dBm
	f = 2.7 GHz, Δf = 1 MHz, P_{IN} = −28 dBm		19.1		dBm
Output Second Order Intercept	f = 900 MHz, Δf = 1 MHz, P_{IN} = −28 dBm		23.8		dBm
	f = 1.9 GHz, Δf = 1 MHz, P_{IN} = −28 dBm		20.8		dBm
	f = 2.7 GHz, Δf = 1 MHz, P_{IN} = −28 dBm		19.1		dBm
Noise Figure	f = 900 MHz		5.1	5.2	dB
	f = 1.9 GHz		TBD		dB
	f = 2.7 GHz		6.7	TBD	dB
POWER INTERFACE	Pin VPOS				
Supply Voltage		2.7	3	3.3	V
Total Supply Current		37	42	46	mA
vs. Temperature	-40°C ≤ T_A ≤ 85°C	34		44	mA
Supply Voltage Sensitivity		TBD	15.3	TBD	mA/V
Temperature Sensitivity	-40°C ≤ T_A ≤ 85°C	TBD	64	TBD	µA/°C

Notes

1.

AD8353-SPECIFICATIONS

(Unless otherwise noted, V_{POS} = 5V, T=27°C, NO external inductor between VOUT and VPOS, Z_o = 50 Ω)

Parameters	Conditions	Min	Typ	Max	Units
OVERALL FUNCTION					
Frequency Range		0.1		2.7	GHz
Gain	f = 900 MHz		19.5		dB
	f = 1.9 GHz		17		dB
	f = 2.7 GHz		15.8		dB
Delta Gain	f = 900 MHz, -40 °C ≤ T_A ≤ 85 °C		19.5		dB
	f = 1.9 GHz, -40 °C ≤ T_A ≤ 85 °C		17		dB
	f = 2.7 GHz, -40 °C ≤ T_A ≤ 85 °C		15.8		dB
Gain Supply Sensitivity	V_{POS} ± 10%		0.18		dB/V
Reverse Isolation (s_{12})	f = 900 MHz		-32.9		dB
	f = 1.9 GHz		-36.6		dB
	f = 2.7 GHz		-38.9		dB
RF INPUT INTERFACE	Pin RFIN				
Maximum Linear Input Power	f = 900 MHz		TBD		dBm
Input Return Loss	f = 900 MHz		22.4		dB
	f = 1.9 GHz		17.9		dB
	f = 2.7 GHz		20.2		dB
RF OUTPUT INTERFACE	Pin VOUT				
Output Compression Point	f = 900 MHz, 1 dB compression	5.39	8.2		dBm
	f = 1.9 GHz		7.8		dBm
	f = 2.7 GHz		7		dBm
	f = 900 MHz, -40 °C ≤ T_A ≤ 85 °C		TBD		dBm
	f = 1.9 GHz, -40 °C ≤ T_A ≤ 85 °C		TBD		dBm
	f = 2.7 GHz, -40 °C ≤ T_A ≤ 85 °C		TBD		dBm
Maximum Output Power	f = 900 MHz, saturated		6.5		dBm
Output Return Loss	f = 900 MHz		34.3		dB
	f = 1.9 GHz		20.4		dB
	f = 2.7 GHz		14.3		dB
DISTORTION/ NOISE					
Output Third Order Intercept	f = 900 MHz, Δf = 1 MHz, P_{IN} = −28 dBm		22.9		dBm
	f = 1.9 GHz, Δf = 1 MHz, P_{IN} = −28 dBm		20.5		dBm
	f = 2.7 GHz, Δf = 1 MHz, P_{IN} = −28 dBm		19.1		dBm
Output Second Order Intercept	f = 900 MHz, Δf = 1 MHz, P_{IN} = −28 dBm		TBD		dBm
	f = 1.9 GHz, Δf = 1 MHz, P_{IN} = −28 dBm		TBD		dBm
	f = 2.7 GHz, Δf = 1 MHz, P_{IN} = −28 dBm		TBD		dBm
Noise Figure	f = 900 MHz		5.1	5.4	dB
	f = 1.9 GHz		TBD		
	f = 2.7 GHz		TBD	TBD	dB
POWER INTERFACE	Pin VPOS				
Supply Voltage		4.5	5	5.5	V
Total Supply Current		34	41	43	mA
vs. Temperature	-40°C ≤ T_A ≤ 85°C	38		44	mA
Supply Voltage Sensitivity		TBD	4.4	TBD	mA/V
Temperature Sensitivity	-40°C ≤ T_A ≤ 85°C	TBD	9	TBD	µA/°C

Notes

1.

ABSOLUTE MAXIMUM RATINGS*

Supply Voltage VPOS……...…...…… .5.5V
Input Power (re: 50 Ω)……..……..……+10 dBm
Equivalent Voltage …….700 mVRMS
Internal Power Dissipation …..……..TBD
θ_{JA} ……..…TBD °C/W
Maximum Junction Temperature ……..…+125 °C
Operating Temperature Range …...-40 °C to +85 °C
Storage Temperature Range …….-65 °C to +150 °C
Lead Temperature Range (Soldering 60 sec)..+300 °C

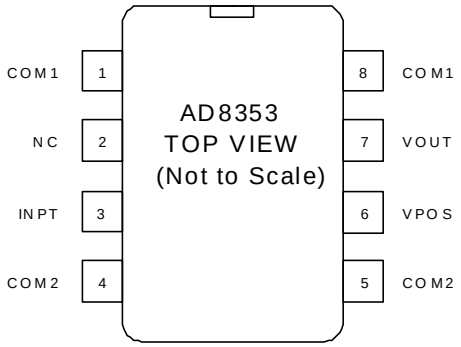
***Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.**

CAUTION
ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the AD8366 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy [>250 V HBM] electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

ORDERING GUIDE

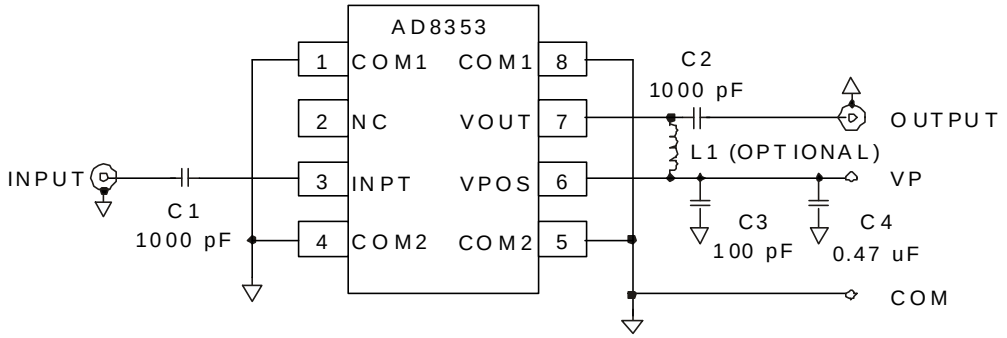
Model	Temp. Range	Package Description
AD8353ACP	-40 °C to +85 °C	Tube, 8-Lead micro_SOIC
AD8353ACP-REEL7		7" Tape and Reel
AD8353-EVAL		Evaluation Board

PIN CONFIGURATION



Pin Function Descriptions

Pin	Name	Description	Equivalent Circuit
1,8	COM1	Device Common. Connect to low impedance ground.	
2	INPT	RF Input Connection. Must be AC coupled.	Circuit A
3,4	COM2	Device Common. Connect to low impedance ground.	
5	VPOS	Positive Supply Voltage.	Circuit A
6	NC	No Connection.	
7	VOUT	RF Output Connection. Must be AC Coupled.	Circuit A



NOTE:
1. L1 = 100 nH, 0603

Figure 40. Evaluation Board Schematic

Evaluation Board

Figure 40. shows the schematic of the AD8353 evaluation board. Note that L1 is shown as an optional component, which is typically used to obtain maximum gain only when V_P = 3 V. The board is powered by a single supply in the range, +2.7 to +5.5V. The power supply is decoupled by a 0.47 µF and a 100 pF capacitor .

Table II Evaluation Board Configuration Options

Component	Function	Default Value
C1, C2	AC coupling capacitors	1000 pF, 0603
C3	High frequency bypass capacitor	100 pF, 0603
C4	Low frequency bypass capacitor	0.047 µF, 0603
L1	**Optional** RF choke, used to increase current through output stage when V_P = 3 V. Not recommended for use when V_P = 5 V.	100 nH, 0603