



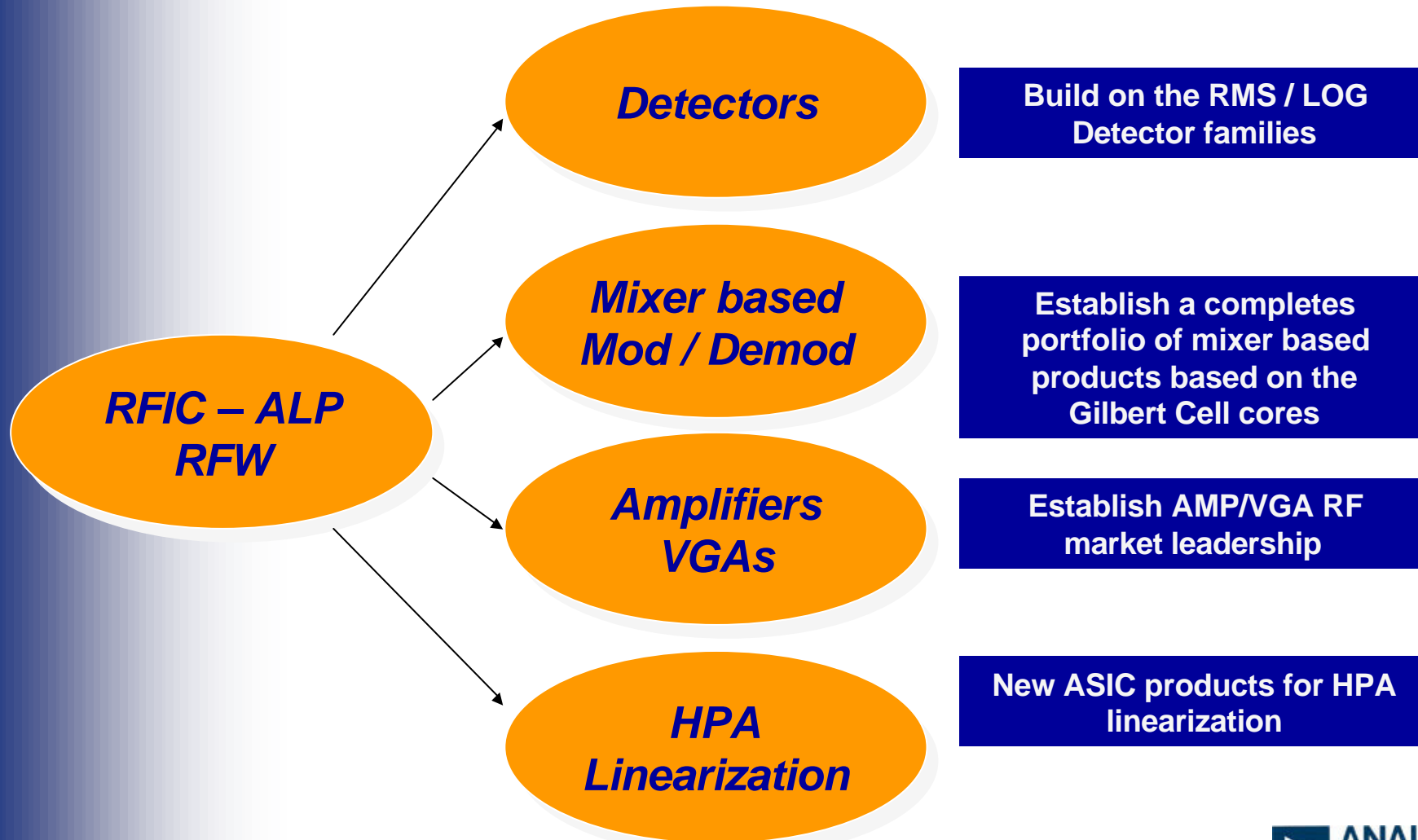
High Performance RF / IF Component Solutions



RF/IF Standard Products

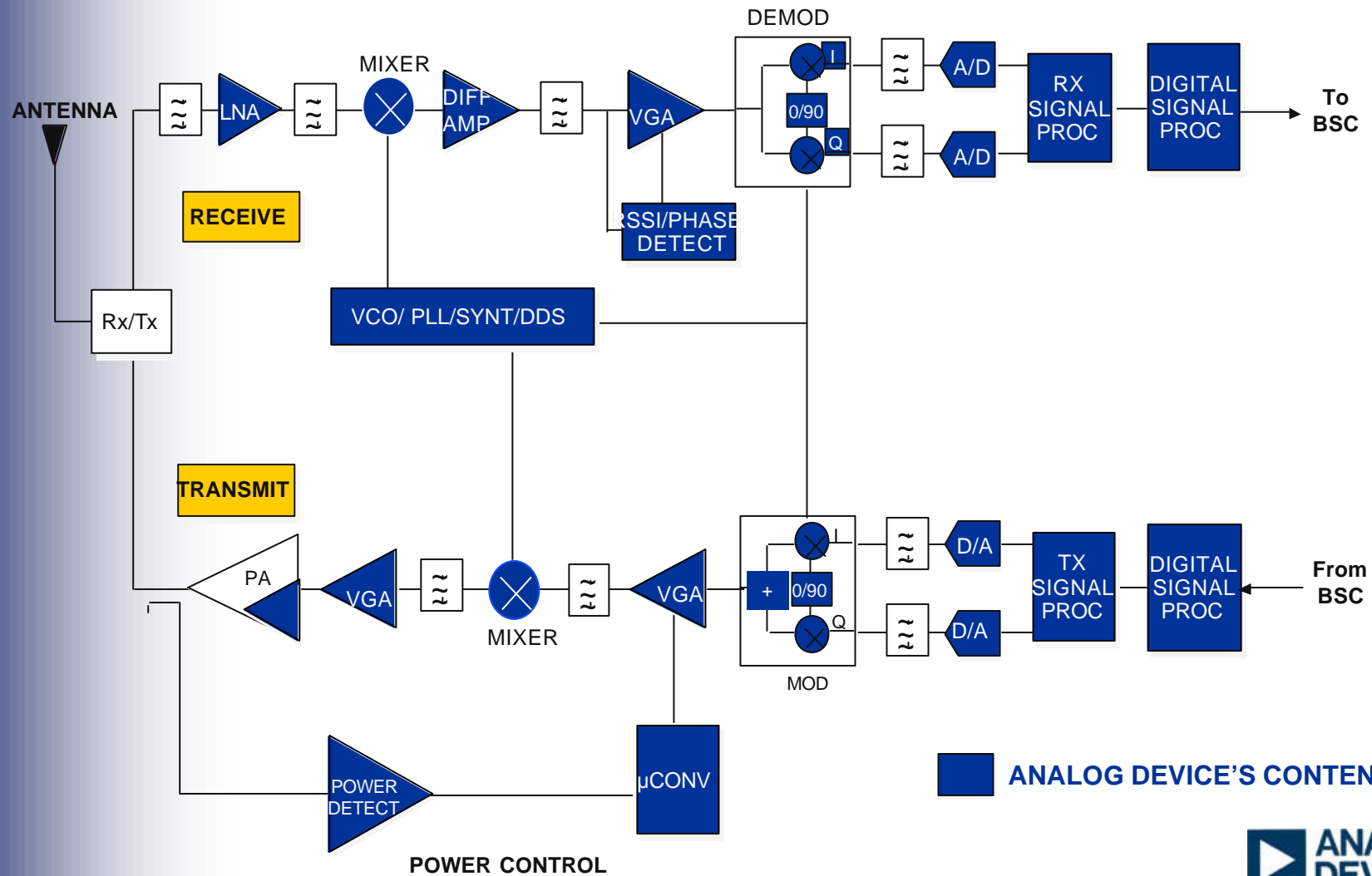


RF / IF Product Families



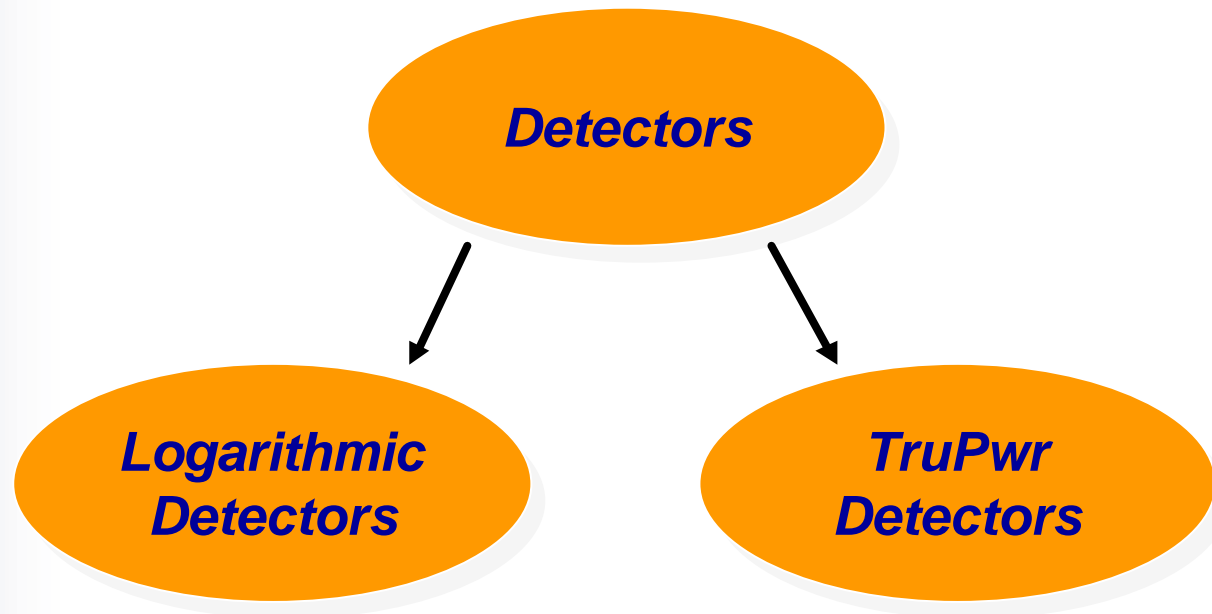


Classical Base-Station Transceiver





Detectors

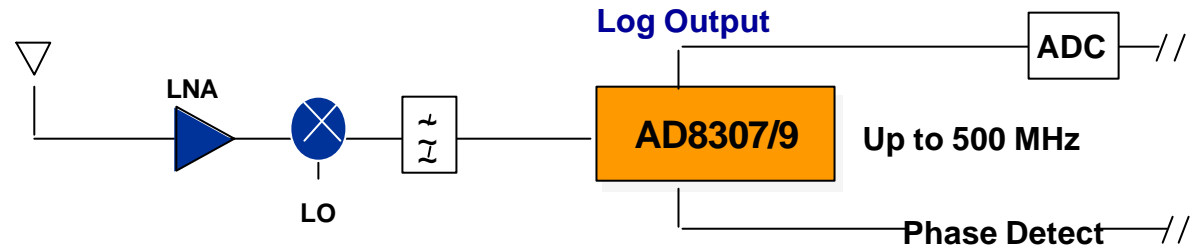


ADI offers the industry's broadest range RF / IF detectors

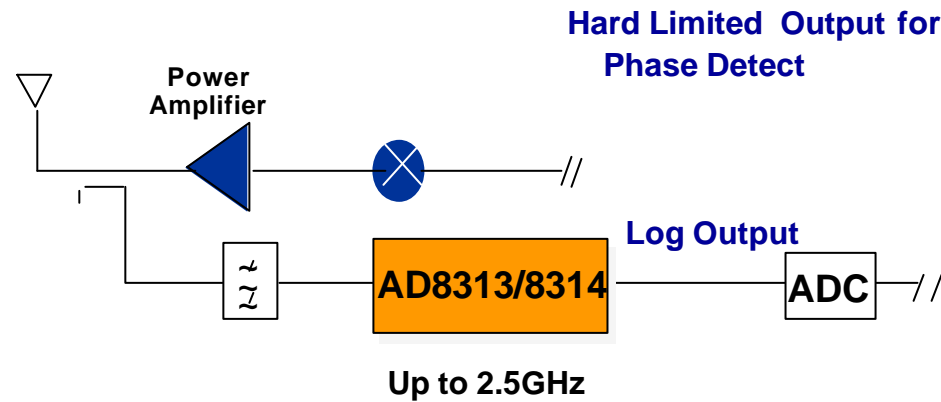


Log Amp Application Examples

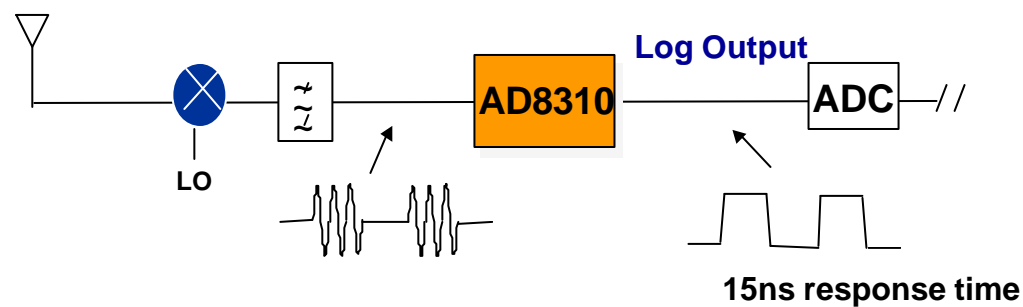
**RSSI &
Phase Detect**



**Transmit
Power Control**



**90dB Range
ASK
Demodulation**



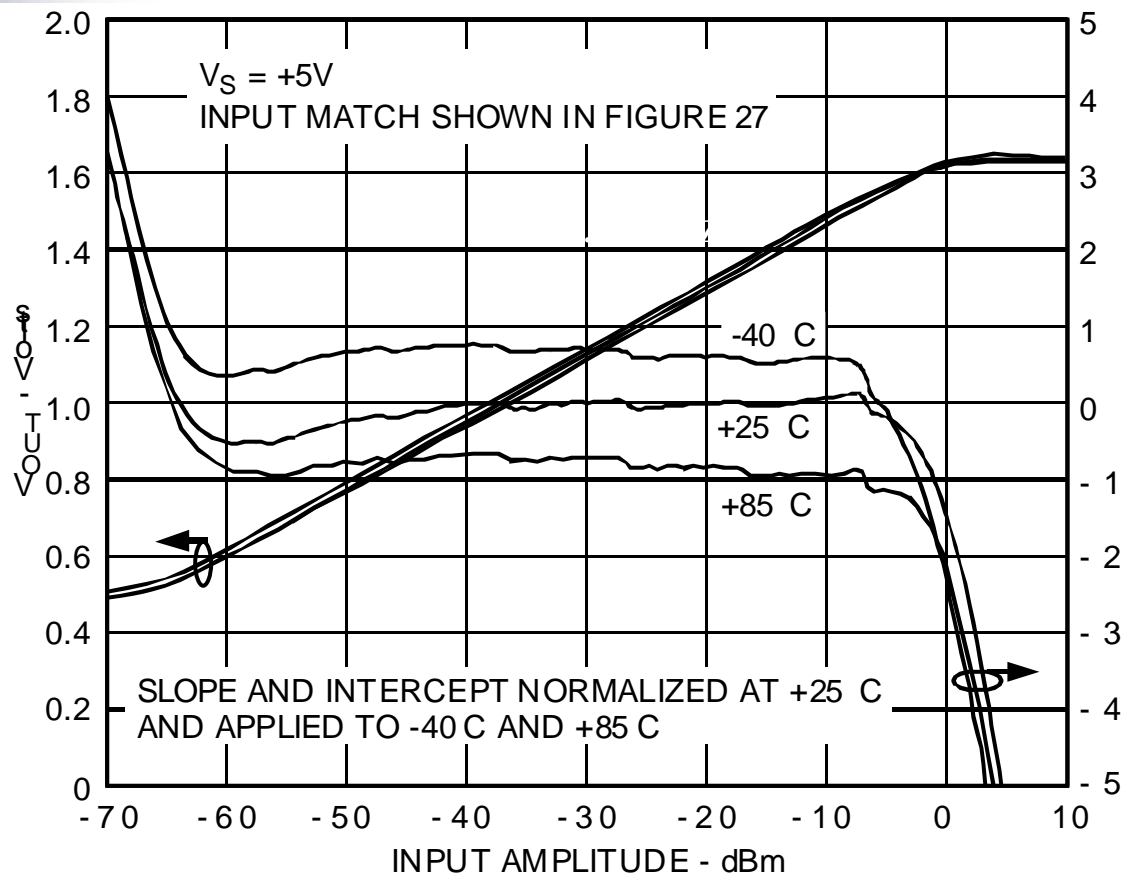


2nd Generation Log Amp Family

	AD8307	AD8310	AD8309	AD8313/4	AD8306
Frequency	500 MHz	500 MHz	500 MHz	2500 MHz	400 MHz
Dynamic Range	92 dB	92 dB	100 dB	70/45 dB	100 dB
Limiter?	No	No	Yes	No	Yes
Log Accuracy	+/-1 dB	+/-1 dB	+/-1 dB	+/-1 dB	+/-0.4 dB
Power Supply	3, 5V	3, 5V	3, 5V	3, 5V	3, 5V
Package	SO-8	Micro-SO8	TSSOP-16	Micro-SO8	SOIC-16, MIL
Unique Features	low cost	<i>vout, fast response</i>	limiter output	Direct RF	High accuracy



AD8313 - Dynamic Range 65dB at 900MHz

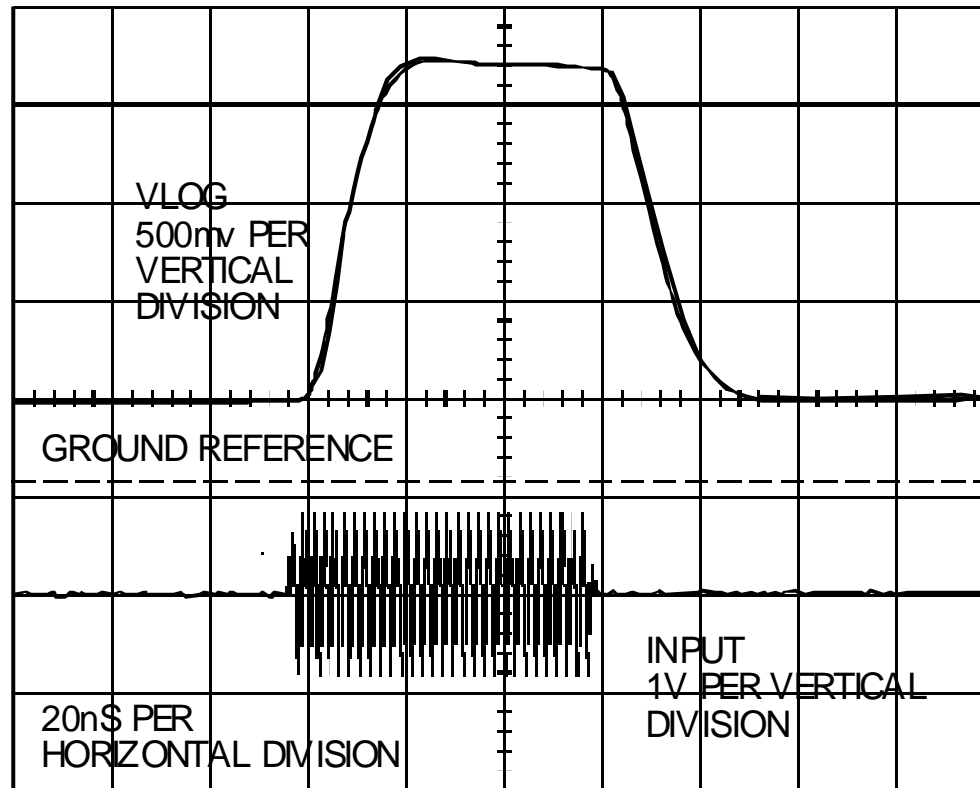


**Vout and Error
at 900 MHz**



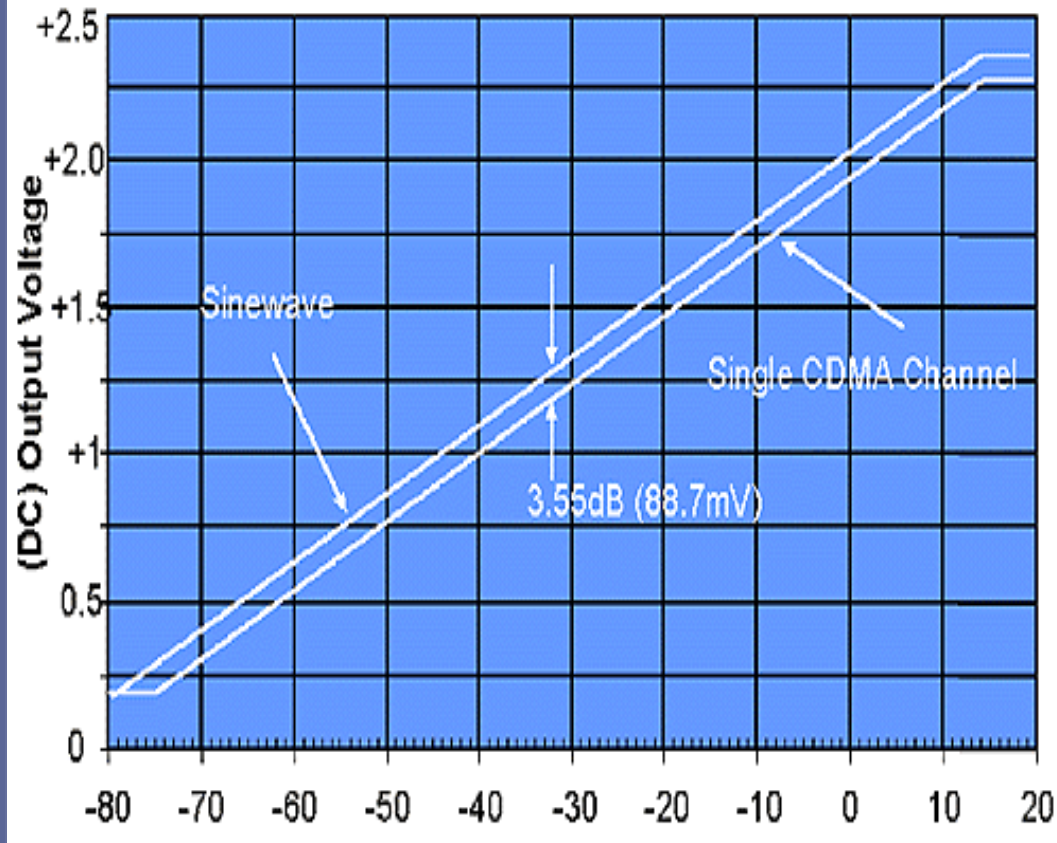
AD8310 Response to RF Burst

- 10-15 ns response time, comparable to AD640 and much lower cost





Crest Factor loading on Log Amps



Signal Type	Correction Factor (add to output reading)
Sine wave	0 dB
Square Wave or DC	-3.01 dB
Triangular Wave	+0.9 dB
GSM channel (all time slots on)	+0.55 dB
CDMA channel (Forward Link)	+3.55 dB
CDMA Channel (Reverse Link)	+0.5 dB
PDC channel (all time slots on)	+0.58 dB
Gaussian Noise	+2.51 dB

Shift varies with crest factor variations



TruPwrTM Detection Innovation

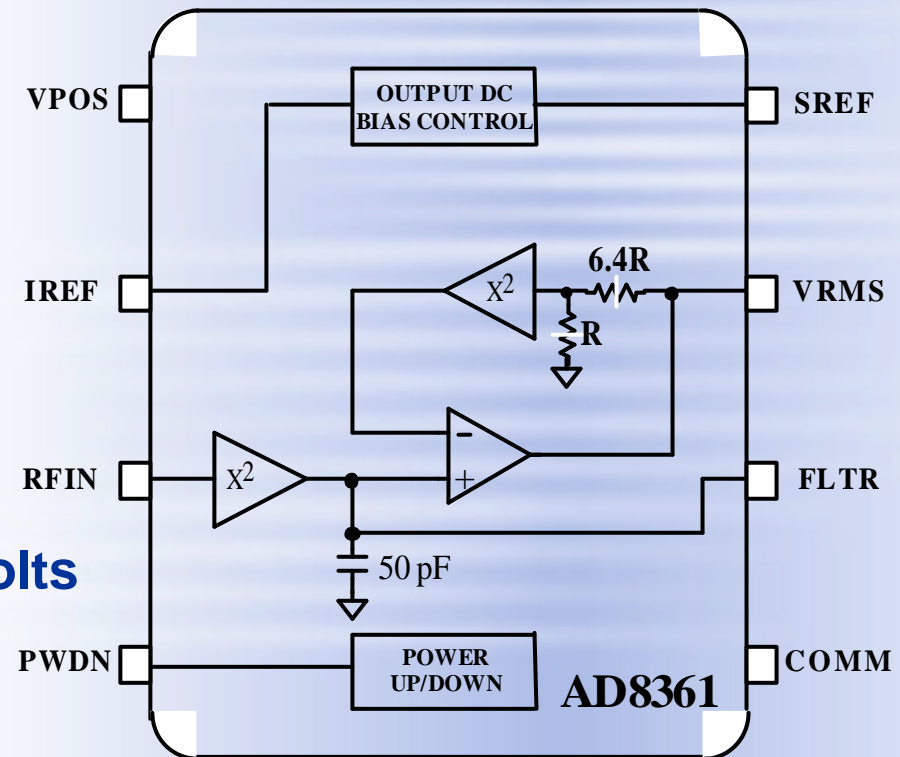
AD8361 RMS-to-DC at RF

Patent Pending Breakthrough

- Operation to 2.5 GHz
- 30dB Dynamic Range
- 0.3dB Accuracy for 15dB range over temperature
- Modulation Independent (GSM/CDMA/AMPS/..)
- Low Power single supply 3-5 Volts
- EDN product of year 2000

Now available in SOT-23-6

TruPwr



8 PIN MICRO-SO PACKAGE

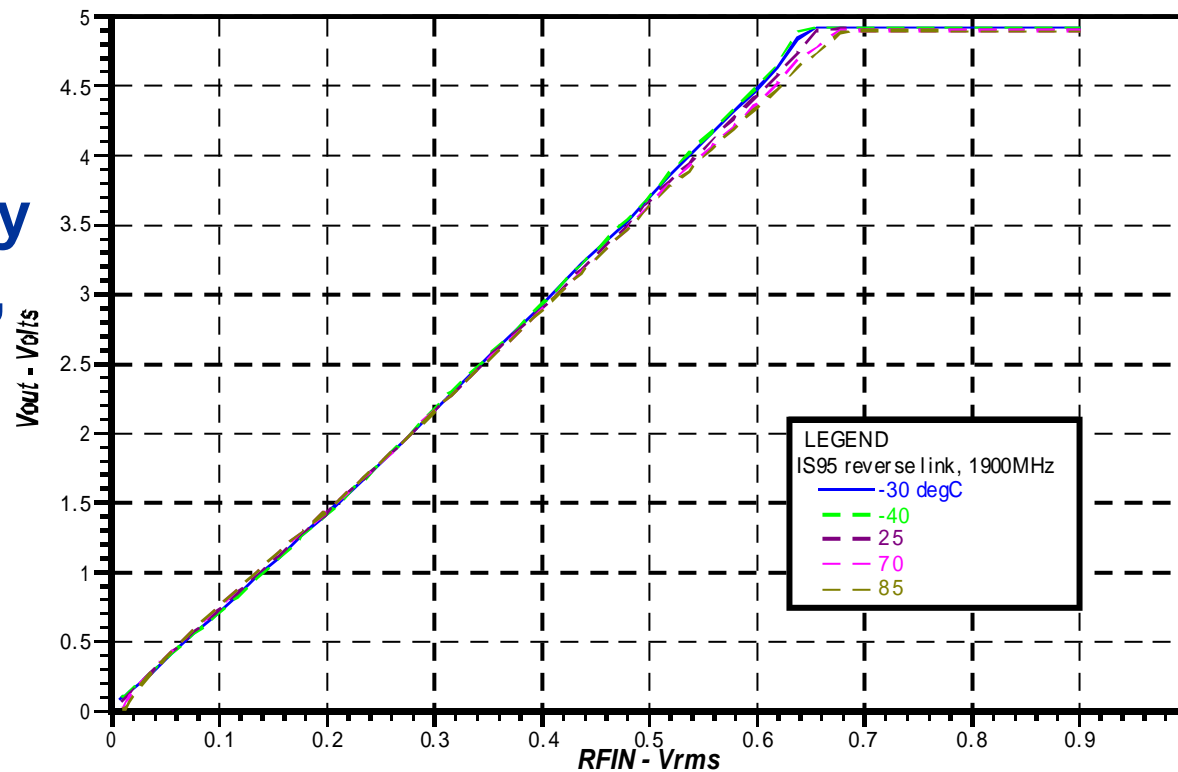




AD8361 Performance

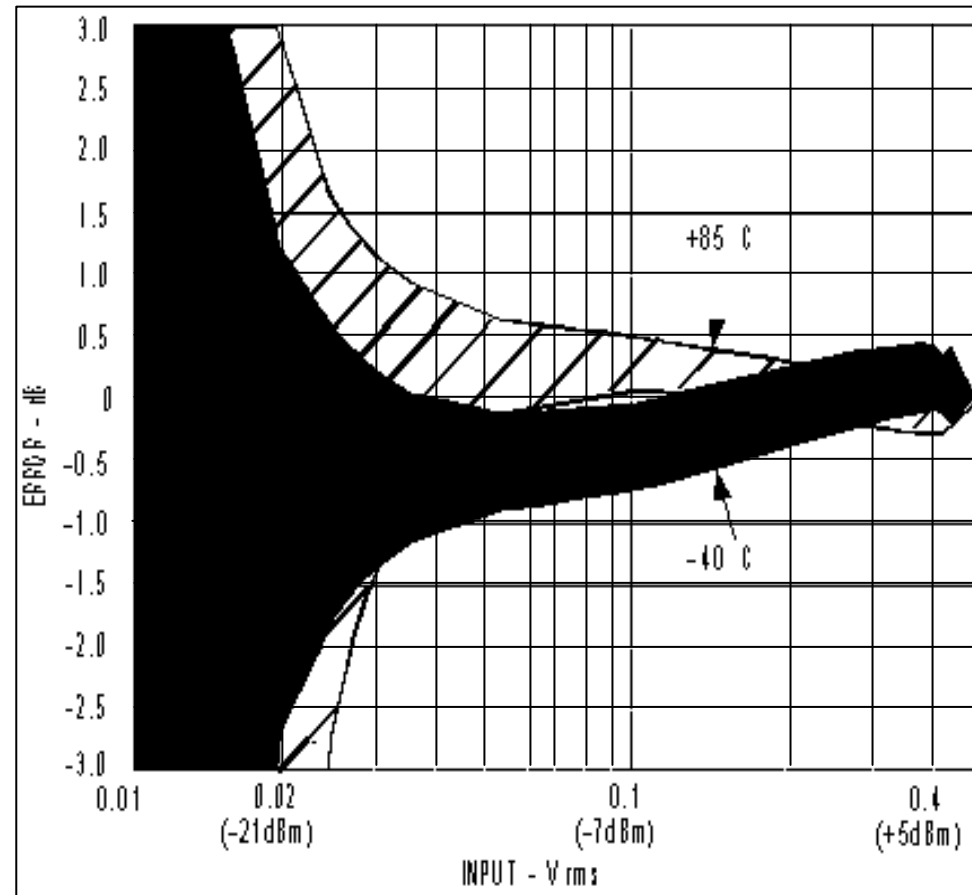
IS-95 Reverse Link over Temperature

- 0.3dB accuracy over top 14dB, over temp
- EDGE, CDMA, QAM Solution





AD8361 Accuracy over Temp at 1.9 GHz



±0.5 dB accuracy over top 14dB, over temp

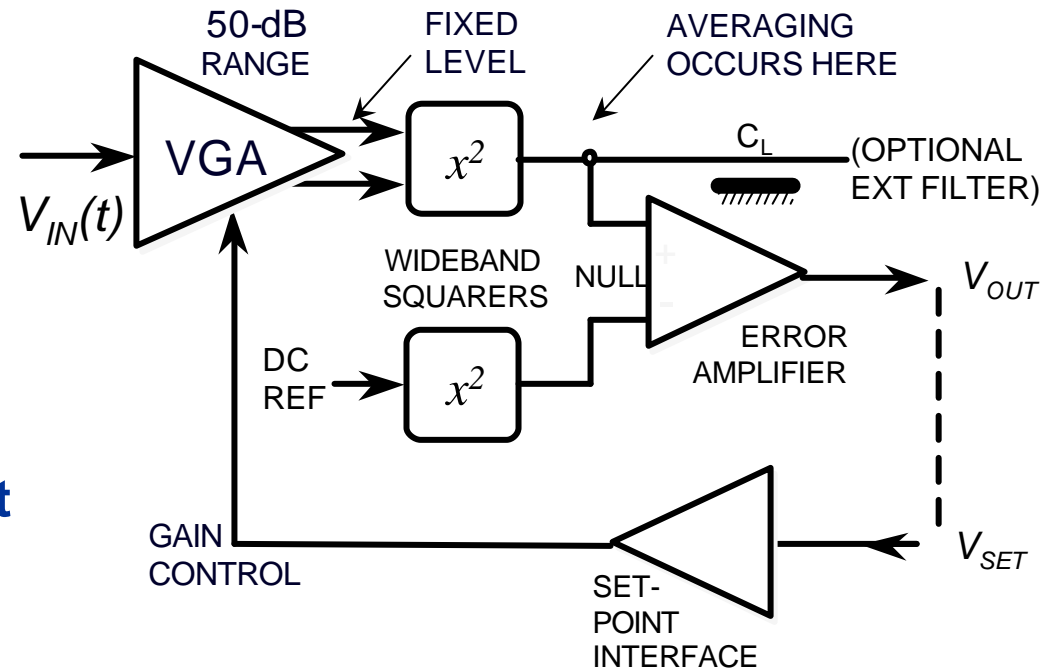


AD8362 50dB TruPwr Detector RMS-to-DC at RF

*Patent Pending
Breakthrough*

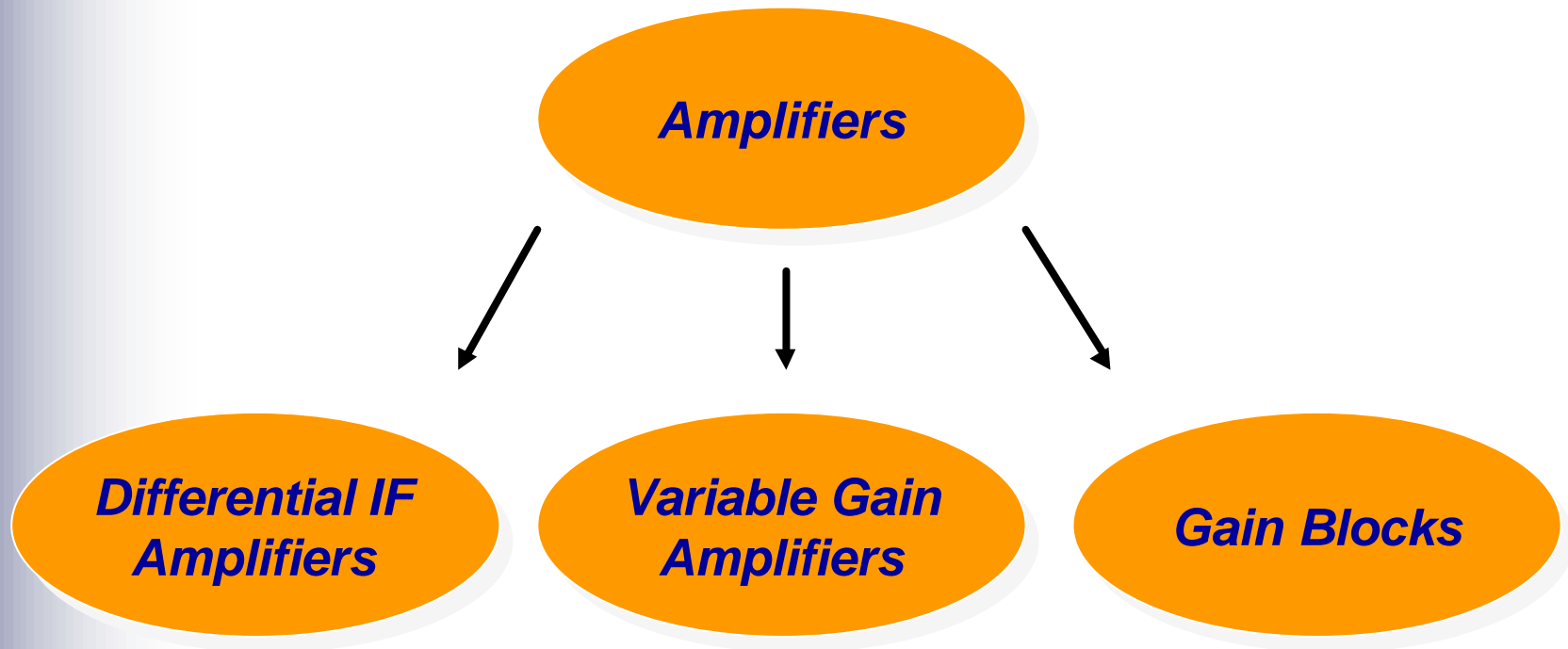
- **Features**

- Operation to 2.5 GHz
- 50dB Dynamic Range
- 1dB Accuracy
- Modulation Independent (GSM/CDMA/AMPS/..)
- TSSOP package
- In Design - Samples Sept01





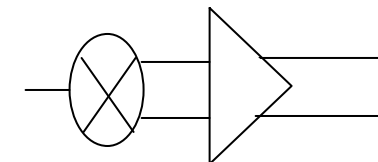
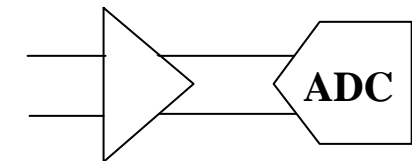
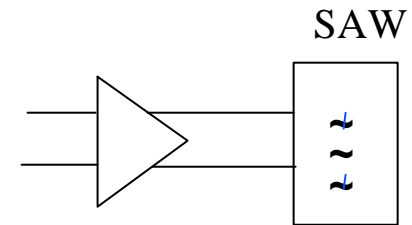
Amplifiers





AD8350 - Low Distortion 1 GHz Differential Amplifier

- **Why Differential at IF Frequencies?**
 - Higher CMRR
 - Lower Distortion (lower 2nd order harmonics)
- **Features**
 - Fixed Gain Options 15 & 20dB (5,10)
 - IP3 = +28dBm(250Mhz)
 - Noise figure 5.9dB (250MHz)
 - Flat response to 250MHz (-3dB cut off of 1GHz)
- **Applications**
 - General Purpose SAW buffer / ADC preamp
 - Single ended/differential conversion ccts
 - ADC driver (-80dBc @70MHz 1Kohm)



NEW u-SOIC SAMPLES AVAILABLE



AD8351- Low Distortion Amplifier for IF ADC Driving

- **Bandwidth 2GHz (-3dB)**
- **Resistor Programmable Gain 1-15dB**
- **Adjustable Output Common Mode Voltage**
- **Low Noise 3.2nV/√Hz**
- **Low Harmonic Distortion**
- **-92dBc @ 20MHz , -77dBc @ 100Mhz**
- **Single Supply Operation: 3 to 5 V**
- **Package 10-lead narrow body SOIC**

Applications

Differential ADC Driver 8-16bits

IF Sampling Receivers 12 bits 100MSPS

Single Ended to Differential Conversion



AD8367

LF-500MHz, 45-dB VGA

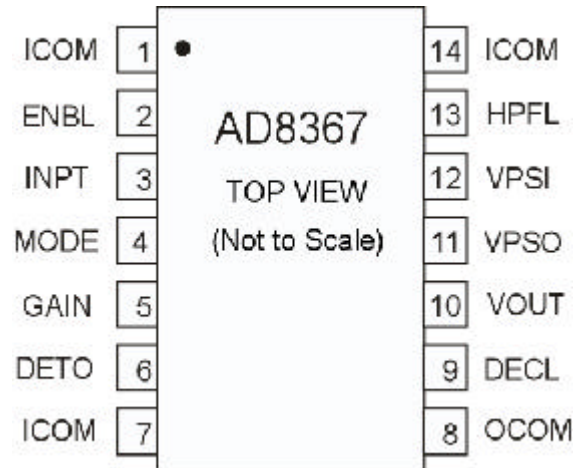
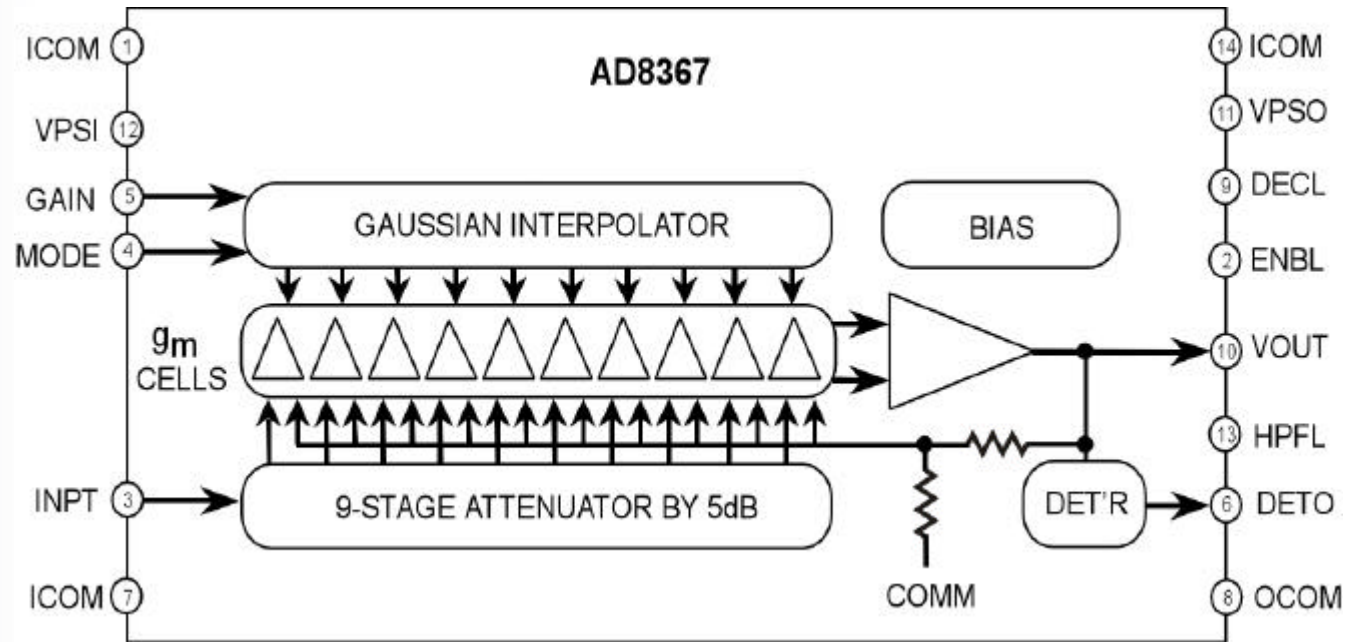
X-AMP

- Linear dB Gain Range: -2.5 to 42.5dB
- Bandwidth: 500MHz
- Gain conformance: +/-0.5dB
- Integrated RMS Detector
- Two Selectable Modes of Operation
 - VGA Mode / AGC Mode (RSSI, $V_{out}=500mV_{rms}$)
- OIP3: 29 dBm @ 50 MHz, $R_1=200\Omega$
- NF: 8 dB @ max gain, $R_s=200\Omega$
- Single-ended I/O (200 Ω Input Impedance)
- Single Supply Operation 2.7 – 5.5V, 20mA
- Power down capability



AD8367

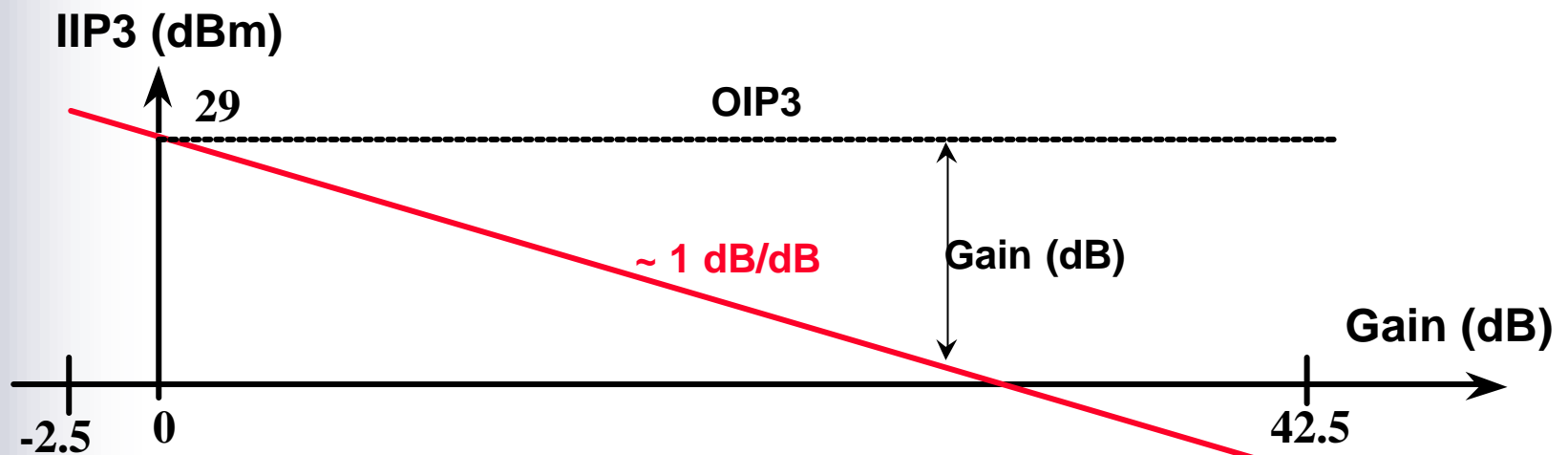
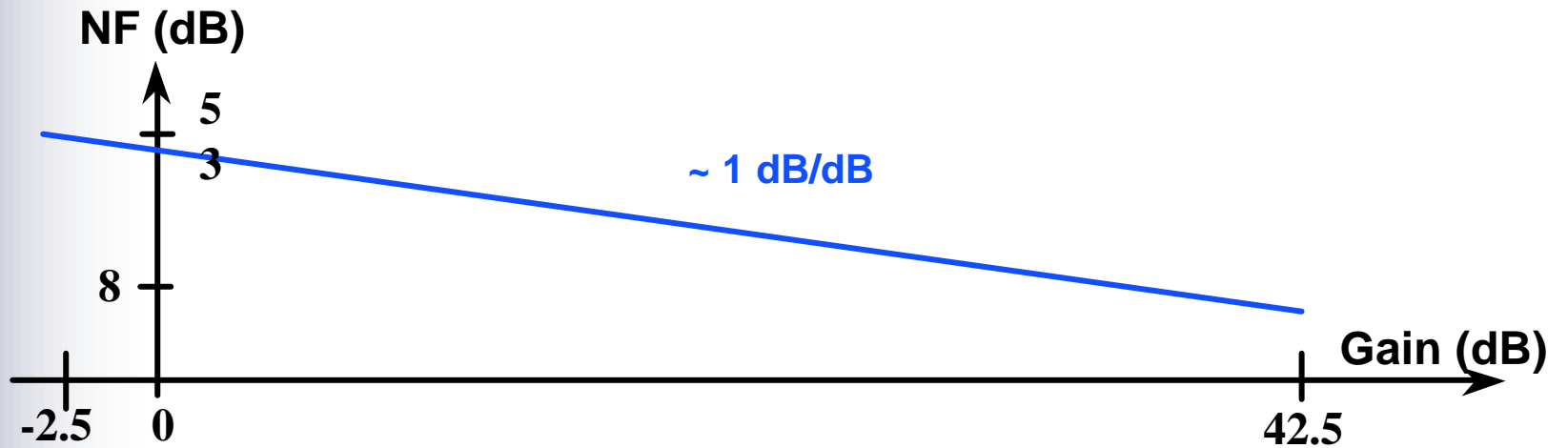
Block Diagram / Pin-out





AD8367

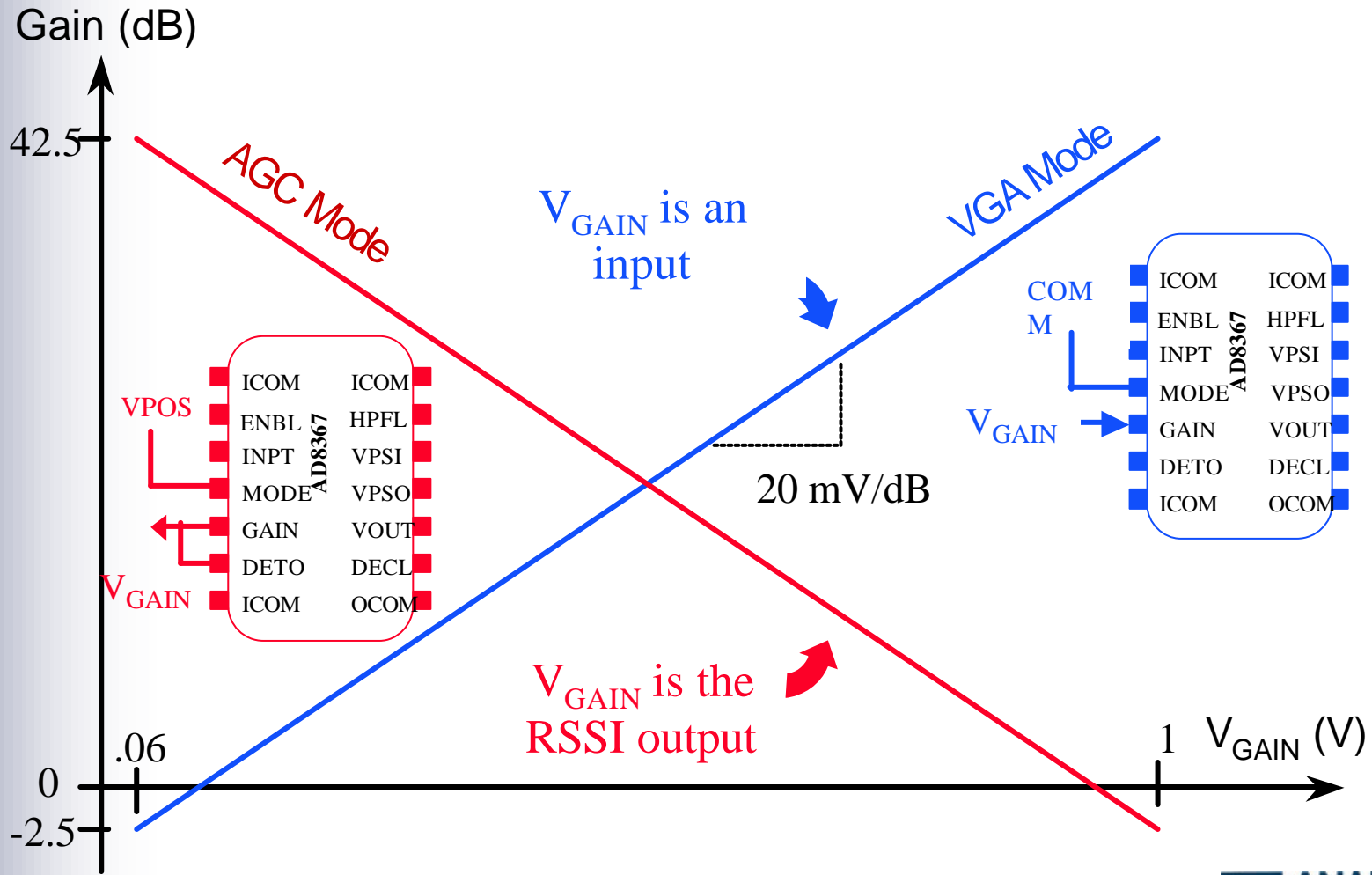
Noise Figure and Linearity





AD8367

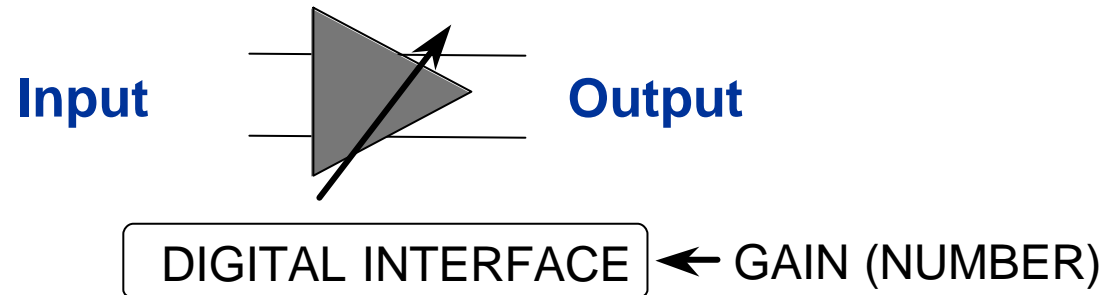
Modes of Operation





AD8369

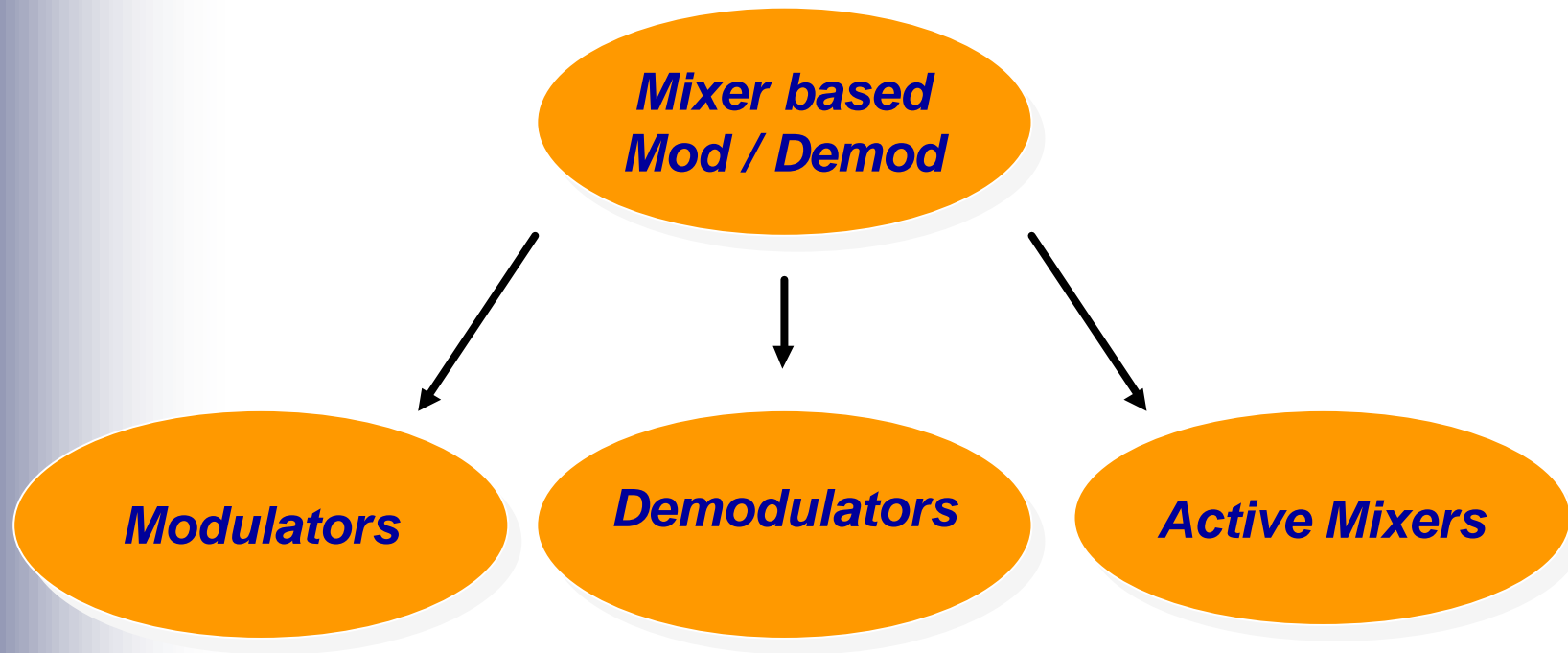
IF Digital Control VGA



- Linear dB Gain Range: -5 to 40dB
- 3 dB Step Size
- Bandwidth: 600MHz -3dB, 500MHz Gain flatness
- Two Tone IMD: 63dBc @ 150MHz 1Vp-p
- NF: 8dB @ max gain, $R_s=200\Omega$
- Differential I/O (200W Impedance)
- Single Supply Operation 2.7 – 5.5V, 25mA with Power Down
- Dual Mode Control Interface
 - ▣ 4-bit Serial or Parallel
 - ▣ Latch Enable Feature



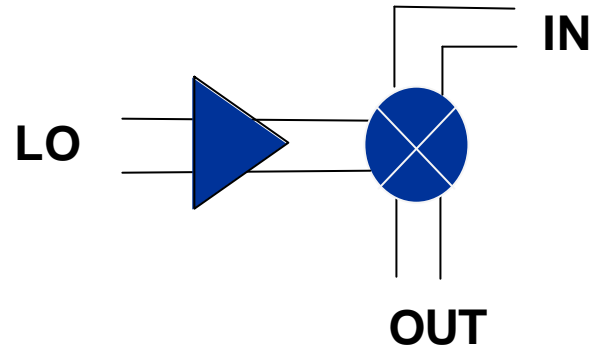
Mixers/Mod/Demod





AD8343

Broadband Low Distortion Mixer



- **Features (1900 MHz)**
 - Input IIP3 = 16.5 dBm
 - NF = 12dB
 - All ports broadband, DC-2500 MHz operation
 - Integrated LO driver (consumes 15mA)
 - General Purpose Up and Down Conversion
 - LO Drive = -10dBm
 - Conversion Gain = +7dB



AD8344 (RxMix)

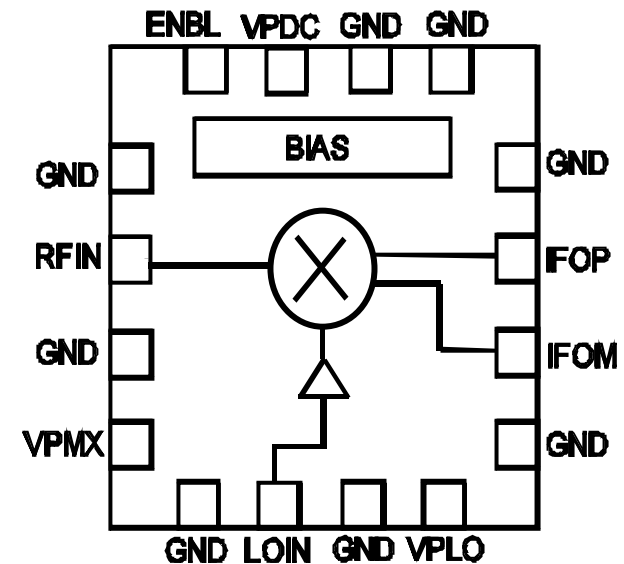
High Dynamic Range Active Mixer

Receive Mixer 800MHz – 2.7GHz

Samples 1Q02

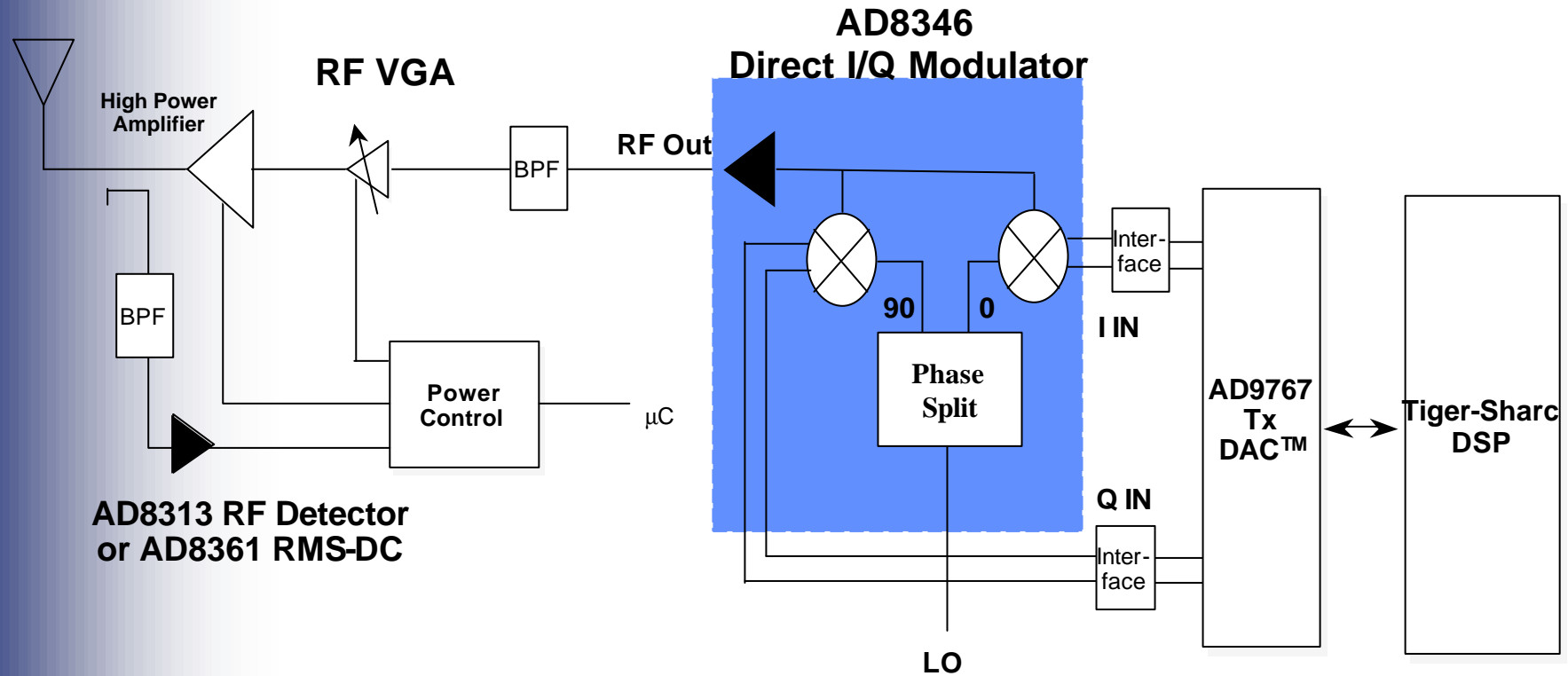
Features

- Bandwidth 800-2.7GHz
- NF 12dB
- IIP3 18dBm
- Conversion gain 6dB
- 50 ohm Lo and RF ports
- 3x3 CSP Package





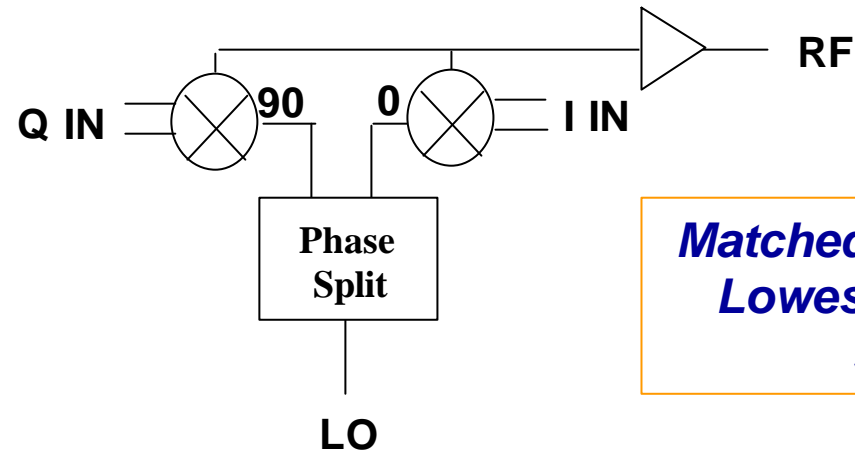
Wideband Direct Conversion Transmitter Solution





AD8346

2.5GHz Direct I/Q Modulator

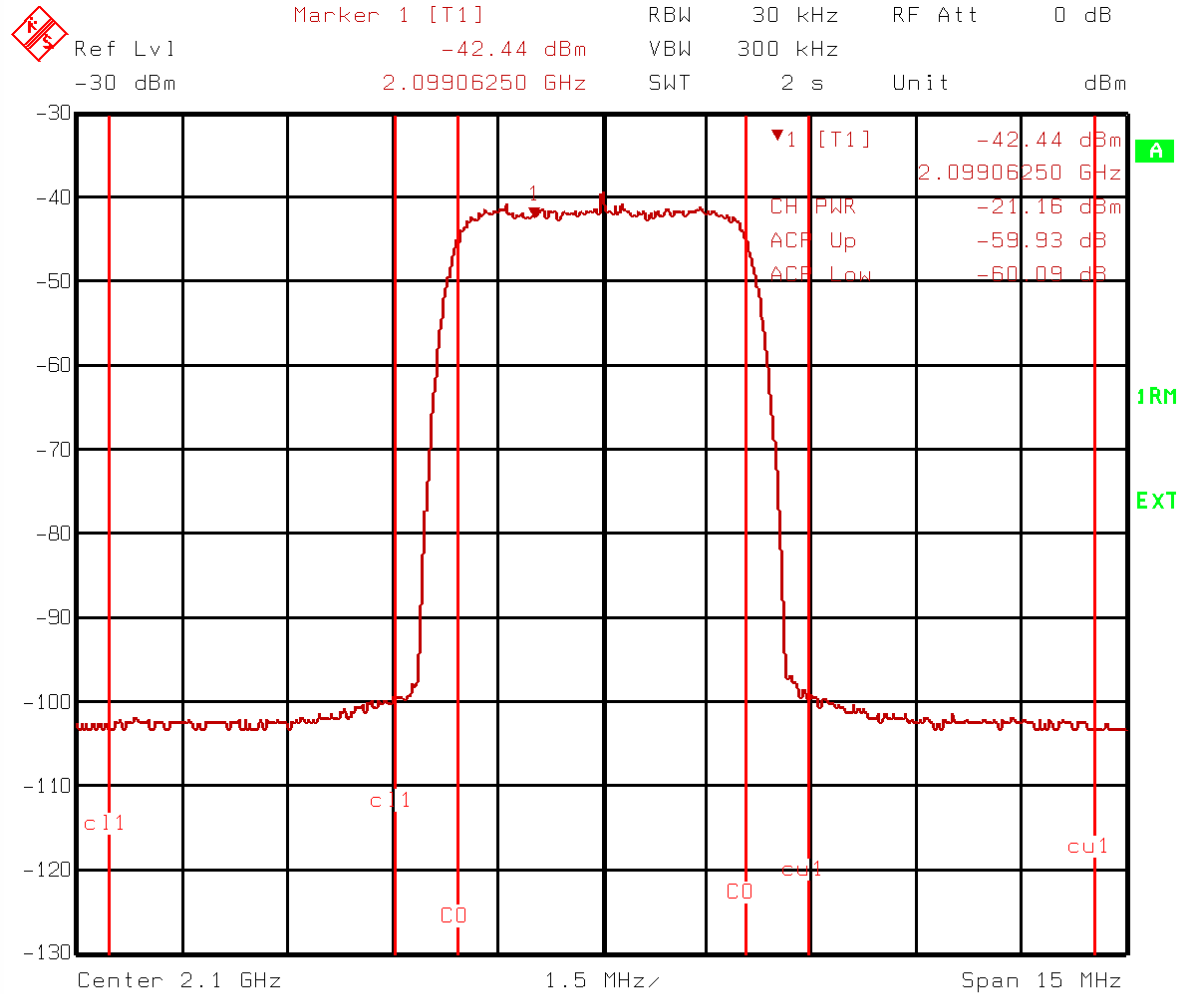


***Matched 50 ohm output
Lowest cost / power
solution***

- Direct I/Q to 800-2500 MHz
- DC-70 MHz I&Q Inputs
- 1 deg phase error / 0.2 dB amplitude balance
- -35dBc Sideband Suppression
- -42dBm LO Feedthrough
- -10 dBm Pout
- -147dBm/Hz Noise Floor



AD8346 W-CDMA Performance



-60dBc ACP

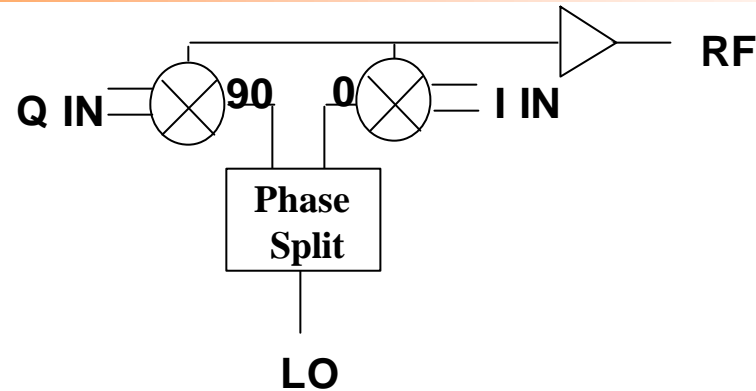
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AD8345

1GHz IF/RF - I/Q Modulator

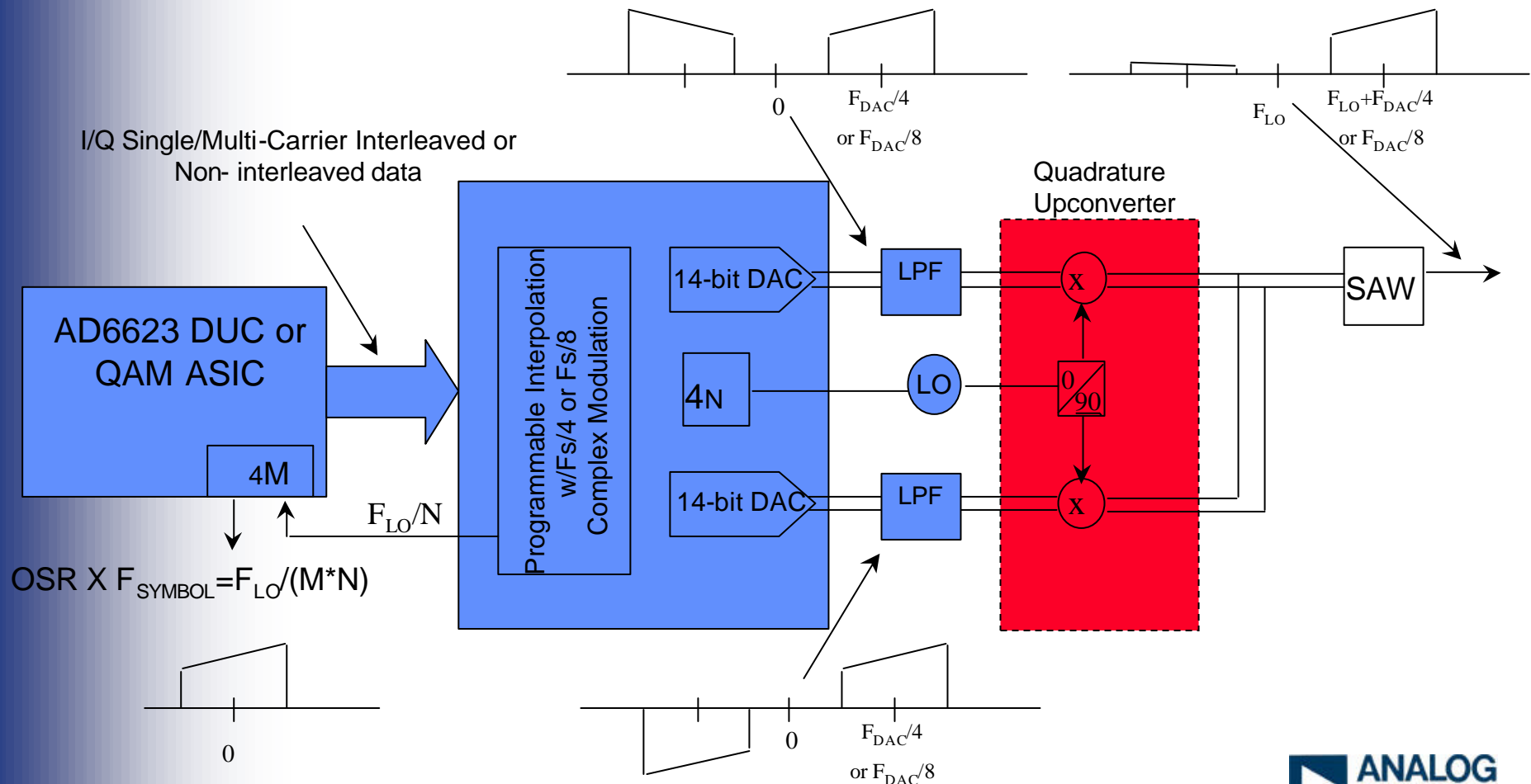


- Direct I/Q for 900MHz or IF 250-1000 MHz
- 1 deg Phase Error / 0.2dB Amplitude Balance
- -40dBc Sideband Suppression
- -155dBm/Hz Noise Floor
- 0dBm output power (50ohm)
- 16 lead TSSOP samples available (compatible AD8346)

Highest Performance Modulator for GSM(RF) / 3G(IF)



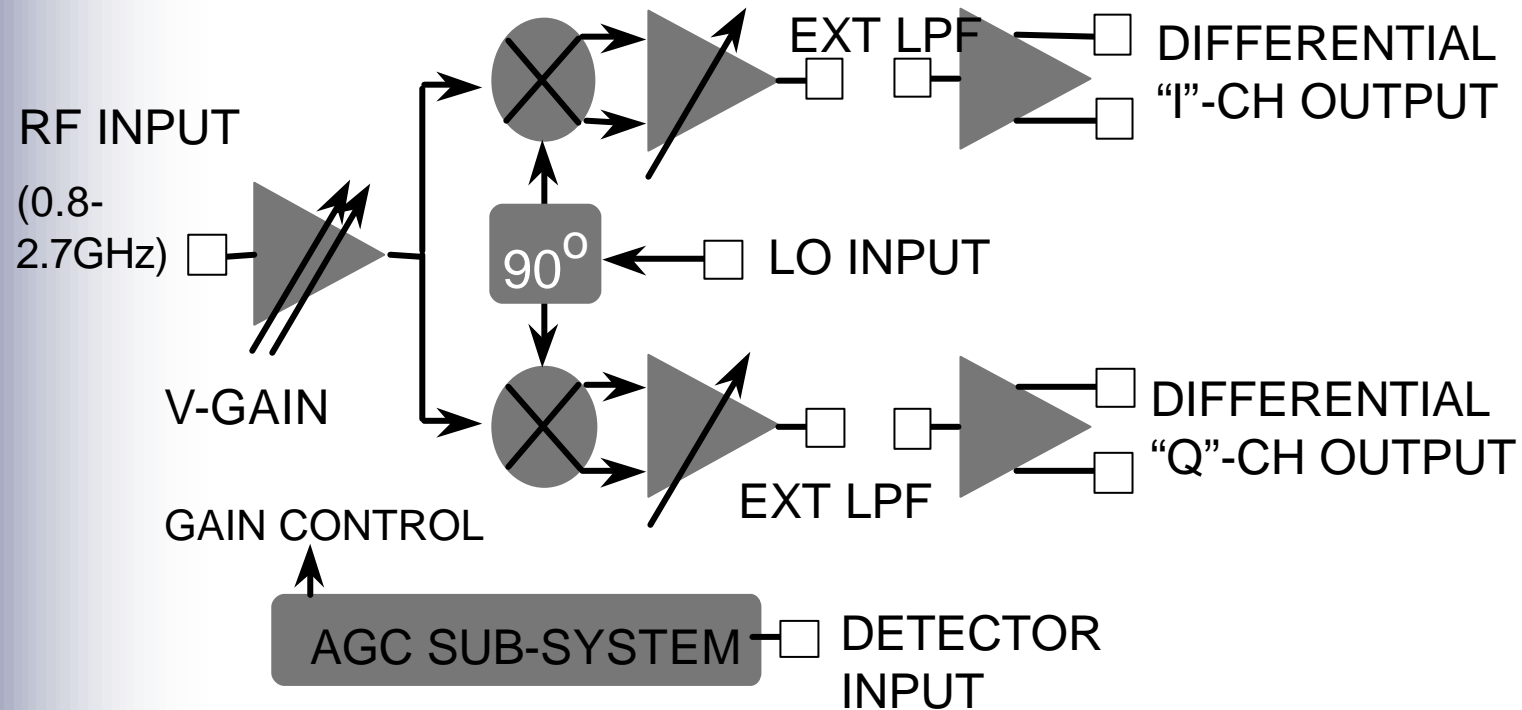
Image-Rejection W/SSB/LO Calibration for Single or Multi-Carrier Applications





AD8347

Direct I/Q Demodulator



RF / IF demodulator linear gain control with baseband output amplifiers



AD8347

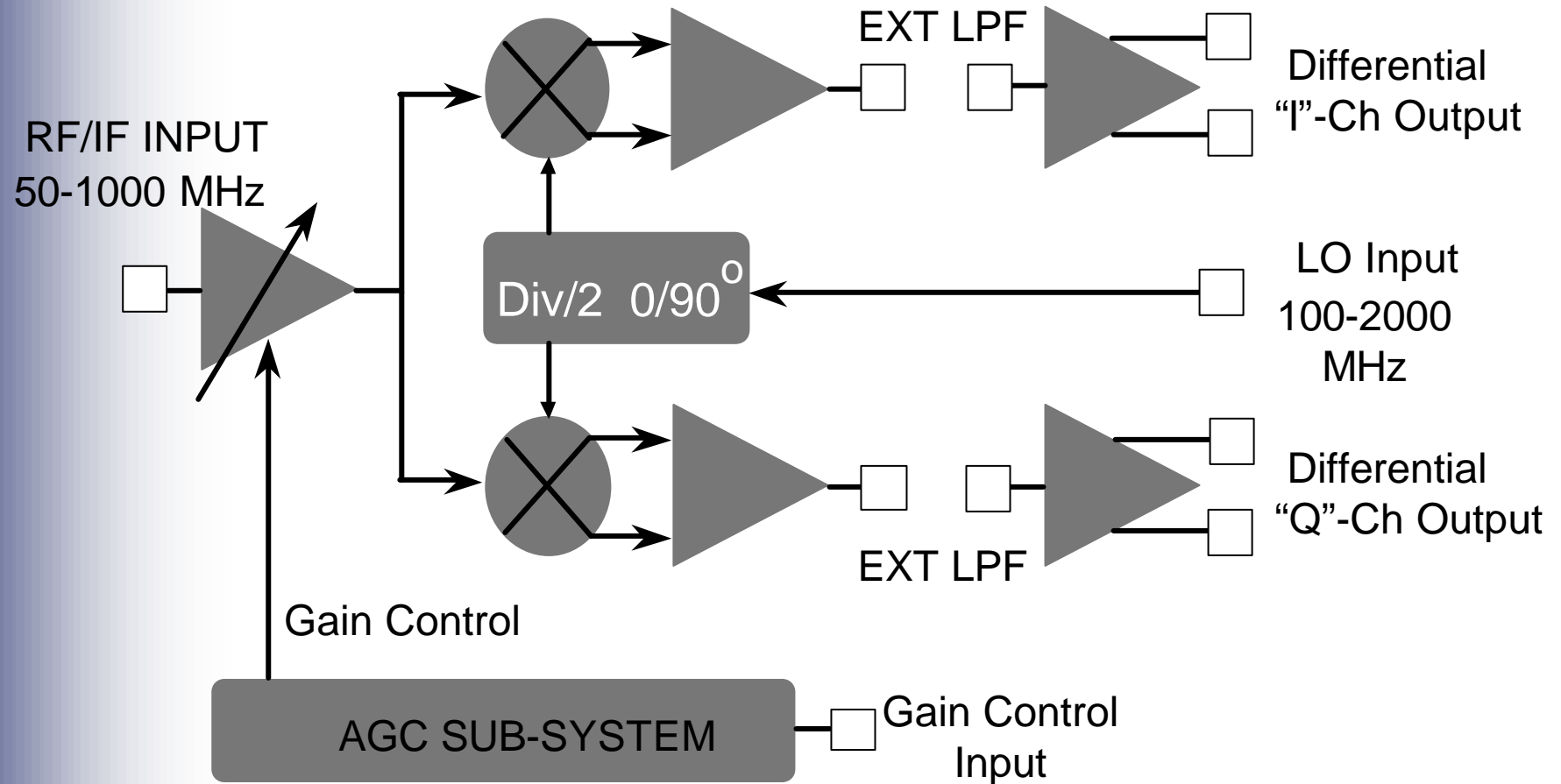
Direct I/Q Demodulator

- **Features**
 - **Direct I/Q Demod from 800-2700 MHz**
 - **65MHz demodulation bandwidth**
 - **65 dB RF Linear-in-dB AGC**
 - **Integrated base band level detectors**
 - **+12dBm IIP3 (min gain)**
 - **12 dB Noise Figure @ max gain**
 - **3 Deg Phase / 0.3dB Amplitude Accuracy**



AD8348

Direct I/Q Demodulator





AD8348

IF/RF Quadrature Demodulator

- **Features**
 - **Direct I/Q Demod from 50-1000 MHz**
 - **50MHz demodulation bandwidth**
 - **45 dB IF Linear-in-dB gain range**
 - **+20 dBm IIP3 (min gain)**
 - **10 dB Noise Figure (max gain)**
 - **2 Deg Phase / 0.3dB Amplitude Accuracy**
 - **Built-in offset nulling**

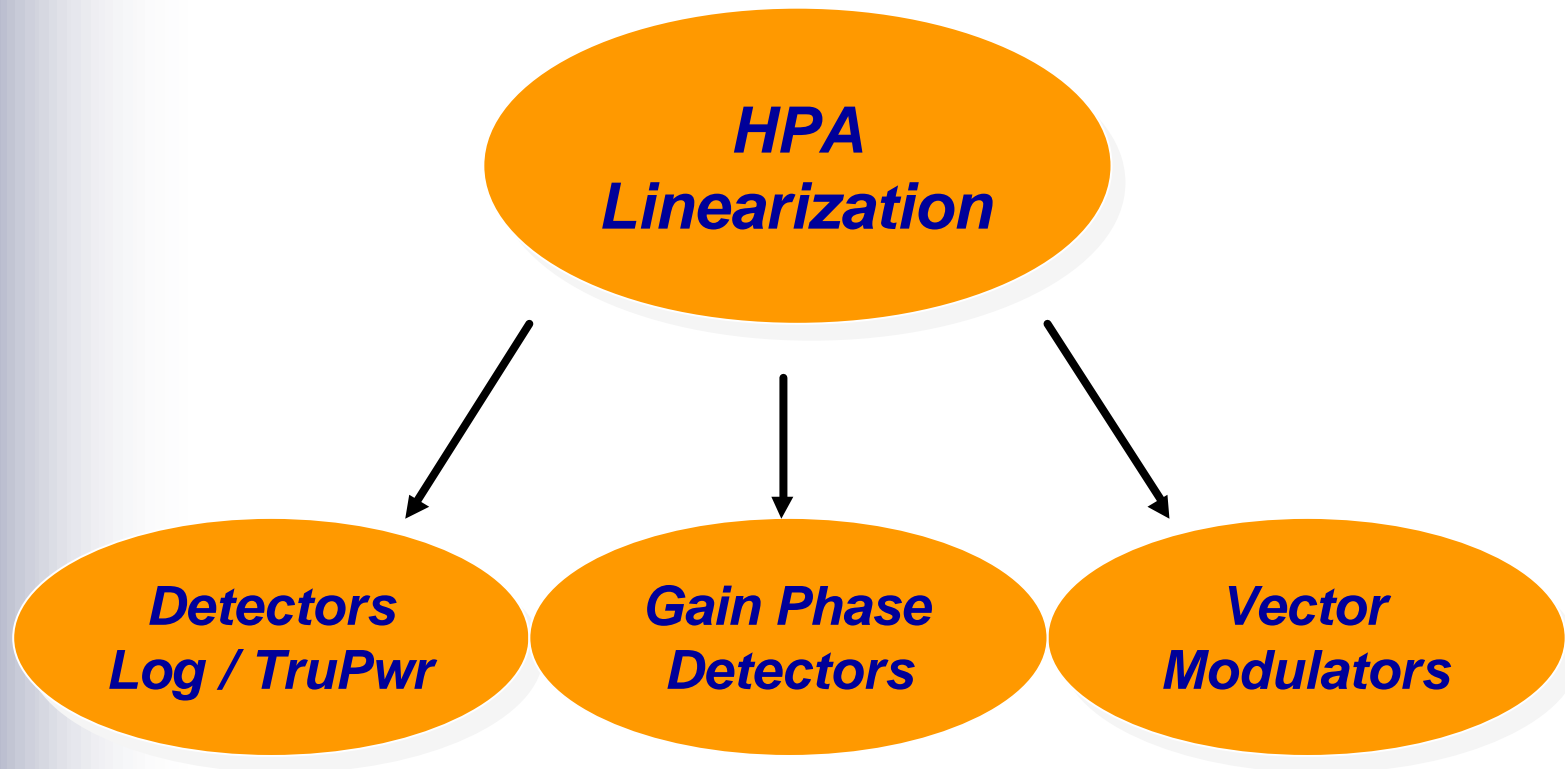


RF/IF QUADRATURE MODS / DEMODS

	AD8346	AD8345	AD8349	AD8347	AD8348
Function	RF Modulator	IF Modulator	3G Modulator	RF Demodulator	IF Demodulator
Frequency	800-2500 MHz	250-1000 MHz	800-2700 MHz	800-2700 MHz	50-1000 MHz
Key Features	1 ^o phase 0.2dB amp Balance	-155dBm/Hz Noise Floor 0dBm o/p	-155dBm/Hz Noise Floor 0dBm o/p	3 ^o phase 0.3dB amp balance	1 ^o phase 0.3dB amp balance
Power Supply	3 - 5V	3 - 5V	5V	3 - 5V	3 - 5V
Package	16-TSSOP	16-TSSOP	16-TSSOP	28-TSSOP	28-TSSOP
Sample Date	NOW	NOW	1Q02	NOW	1Q02
Release Date	Released	Released	4Q02	1Q02	4Q02



RF / IF Product Families

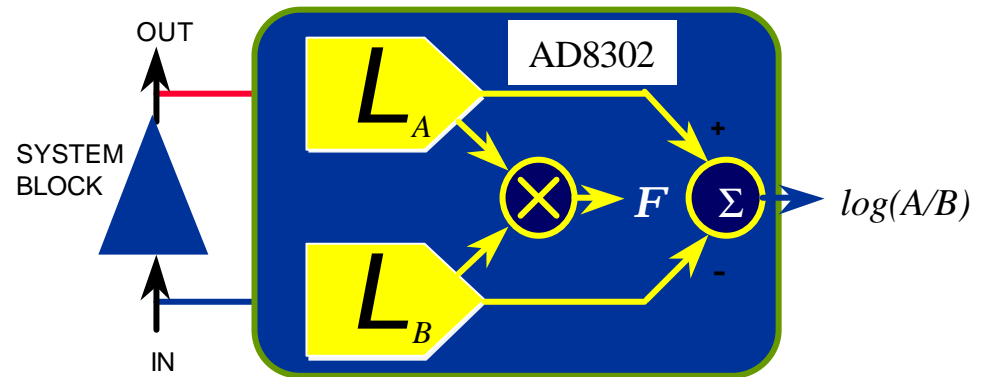




AD8302 RF Gain & Phase Detector For RF/IF Measurements

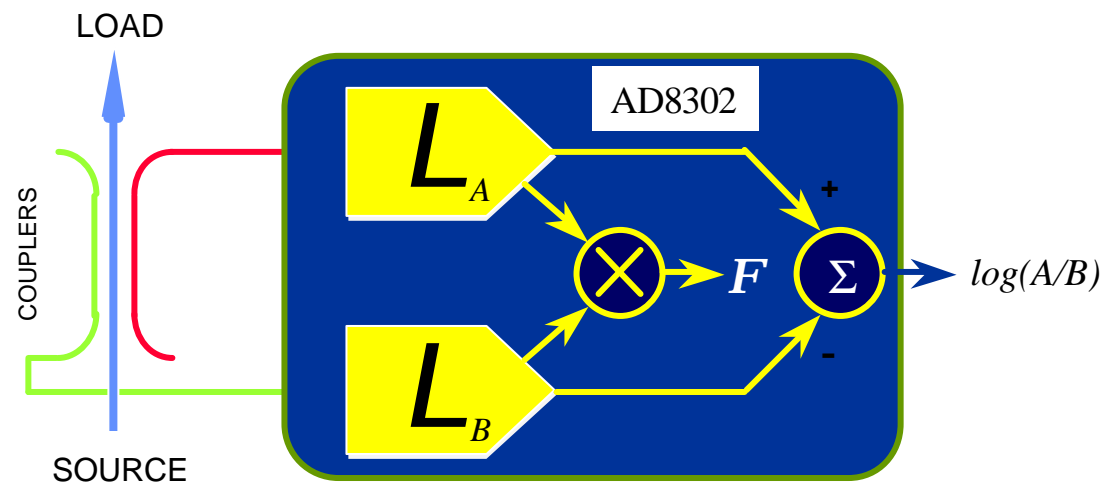
System Gain Calibration

- independent of the actual power levels
- system block can be a frequency converter



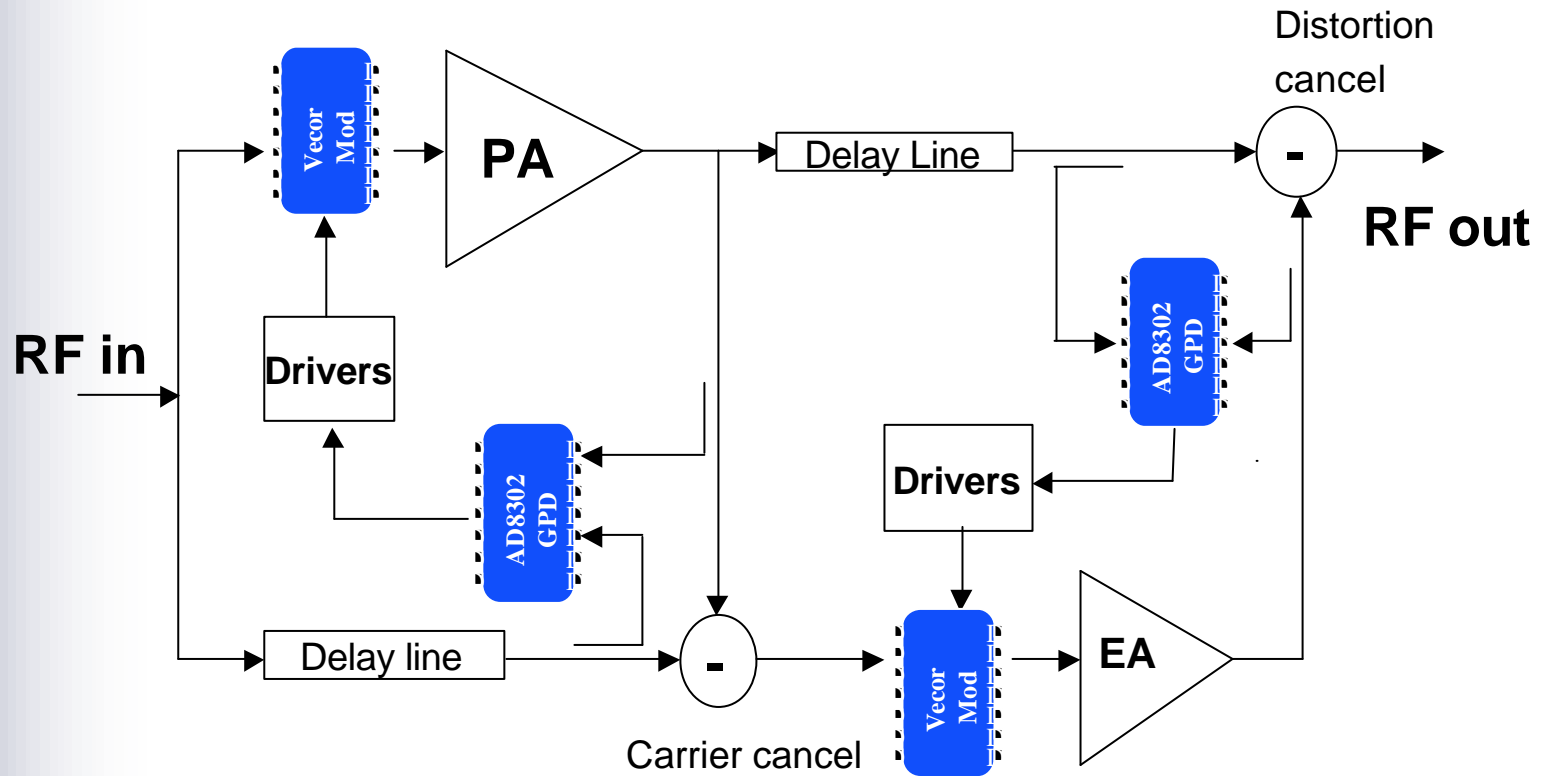
Measurement of RF return loss

- independent of power level



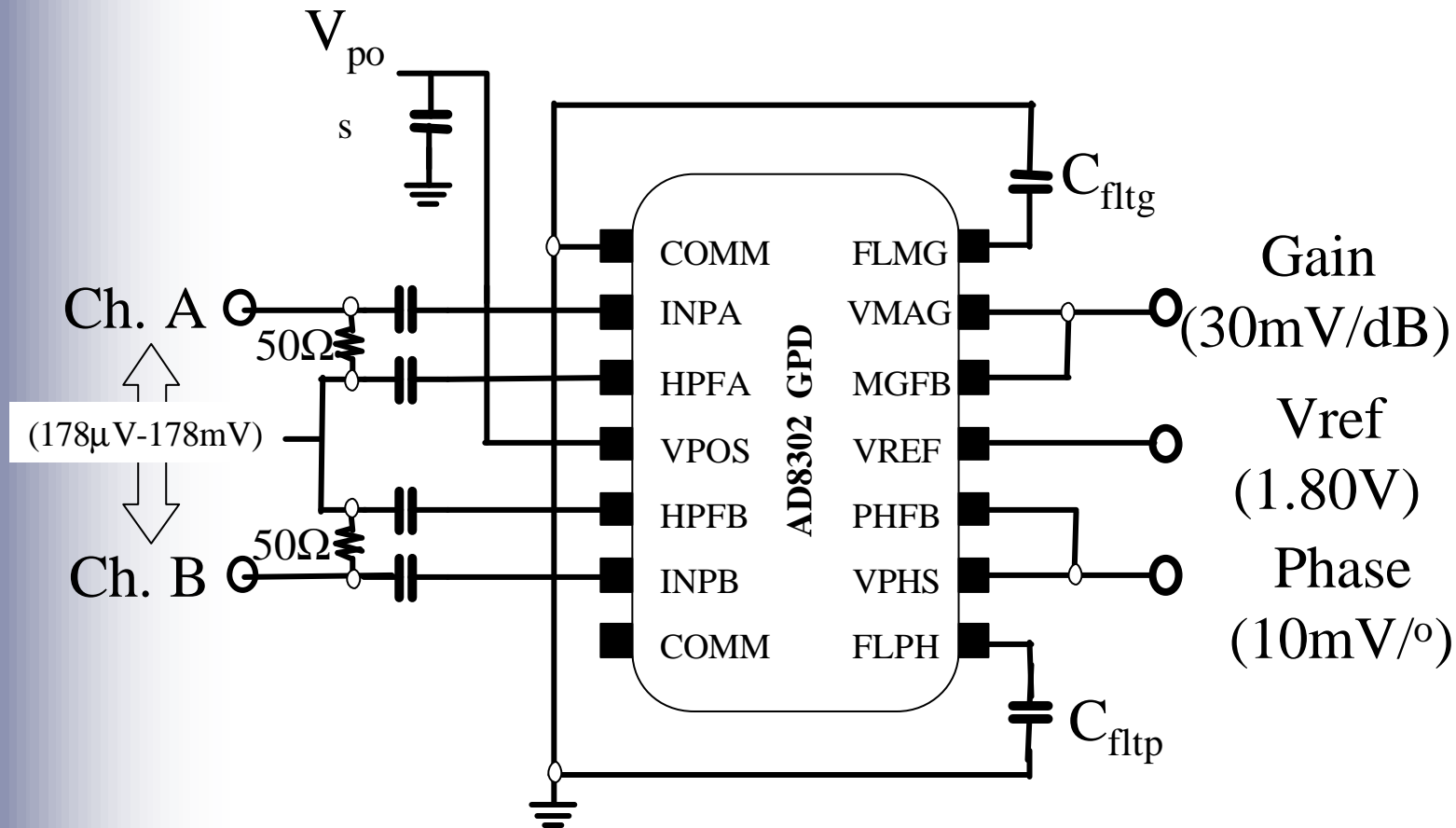


AD8302 RF Gain & Phase Detector Applications-PA Linearization





AD8302 Gain Phase Detector Measurement Mode

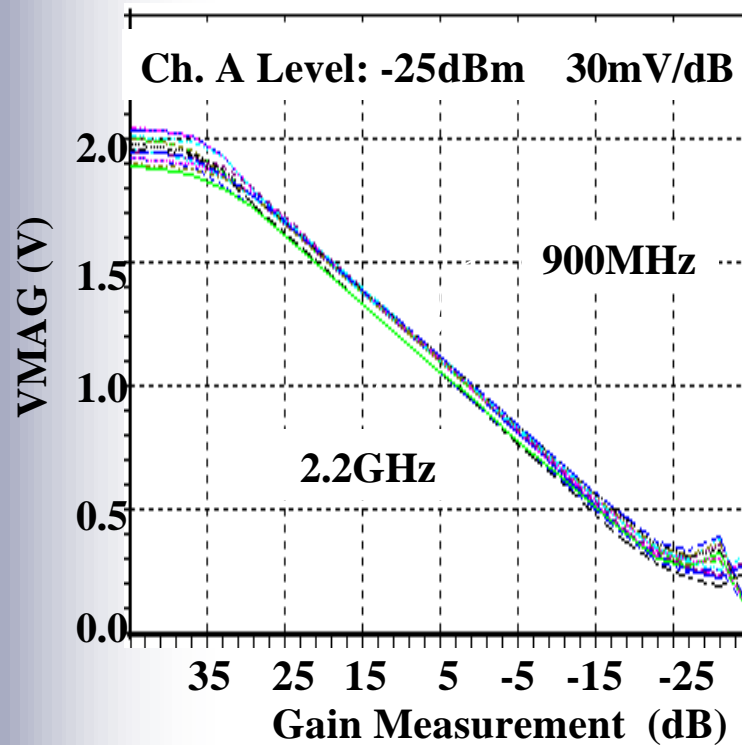




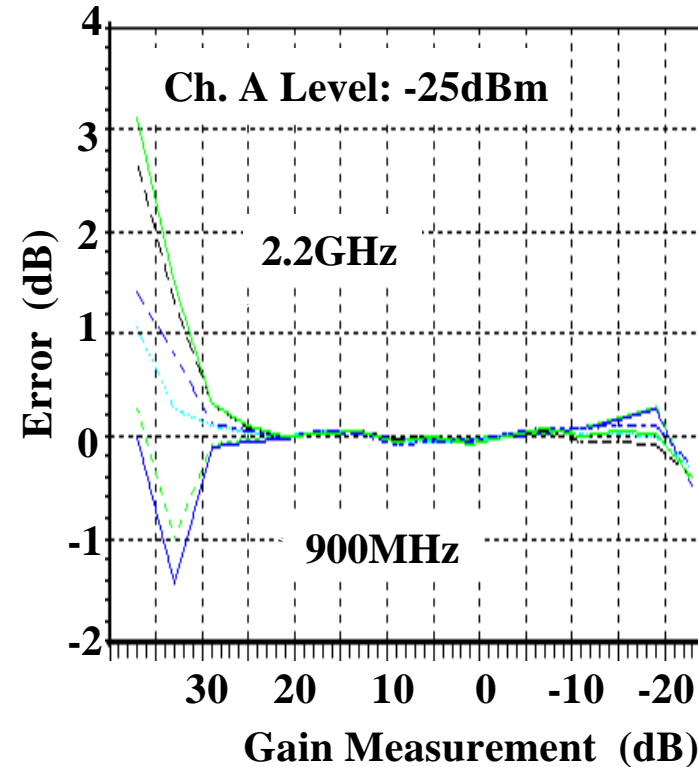
AD8302 Gain Phase Detector Gain Measurement Performance

$$VMAG = 600mV \log(V_a/V_b) + 900mV$$

Gain Response



Gain Error



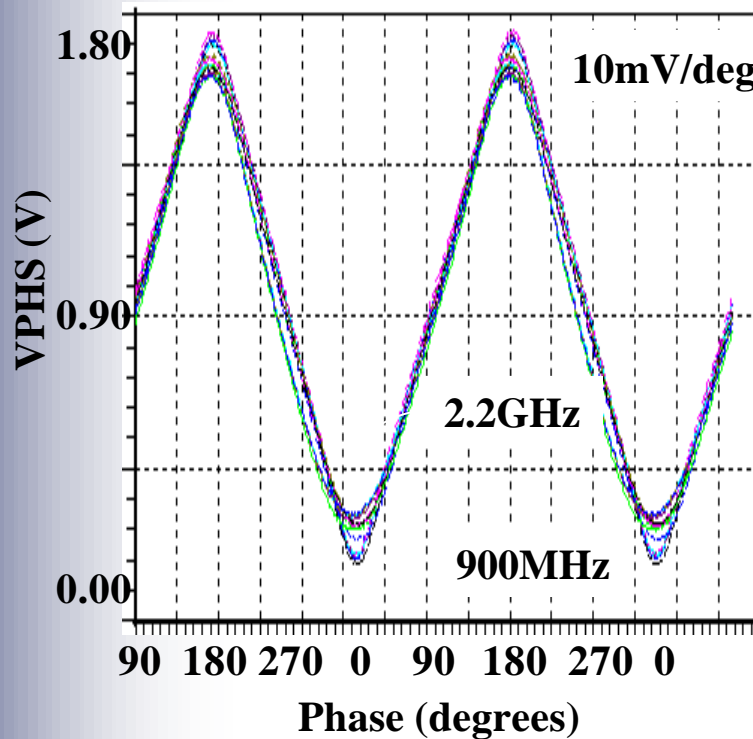
Gain measurement response maintains integrity beyond 2.2GHz with a precise slope of 30mV/dB while maintaining <0.2dB error over >40dB of gain range.



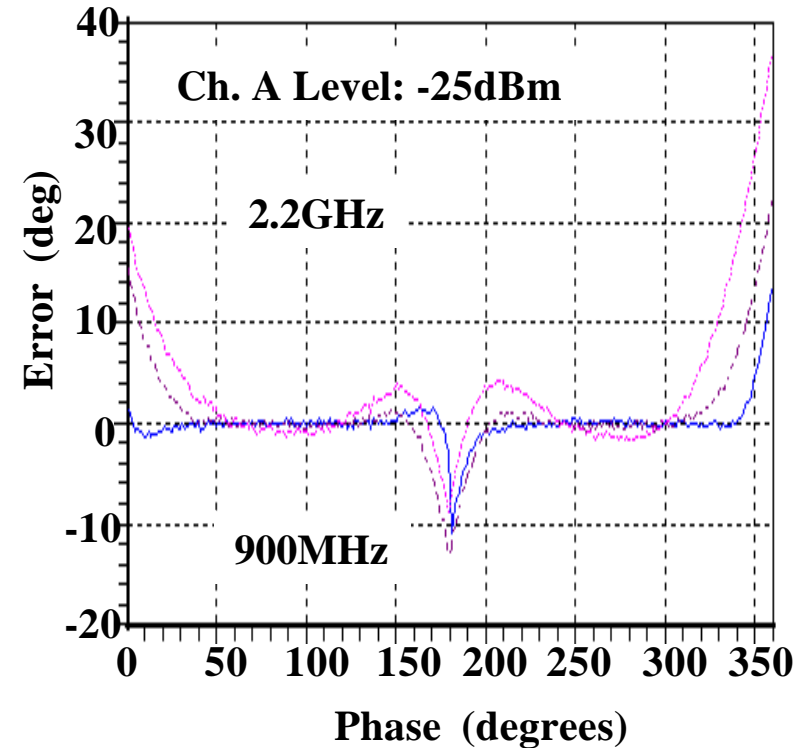
AD8302 Gain Phase Detector Phase Measurement Performance

$$V_{PHS} = 10mV (f_a - f_b - 90^\circ) + 900mV$$

Phase Difference Response



Phase Error



Phase measurement response shows a precise slope of 10mV/deg with a phase error <1 deg over the entire phase range