



# CDMA/FM TRANSMIT AGC AMPLIFIER AS3801

## Key Features

- Supports dual mode operation.
- 45dB to +40db gain control guaranteed.
- High OIP3 of 15dBm @ max. gain @ -51dBm input power.
- Single 3.6V supply.
- Temperature and supply stabilized.
- Power down feature.
- 100MHz to 300MHz operation.
- Silicon BiCMOS process.
- Miniature surface mount 16 pin, 150 mil SSOP package.

## Compatibility

The AS3801 is designed to be functionally or/and pin compatible to the following products:

- RF9909 (RF Micro Devices), pin compat.
- Q5505 (Qualcomm), pin compat.
- CXA3002N (Sony)

## General Description

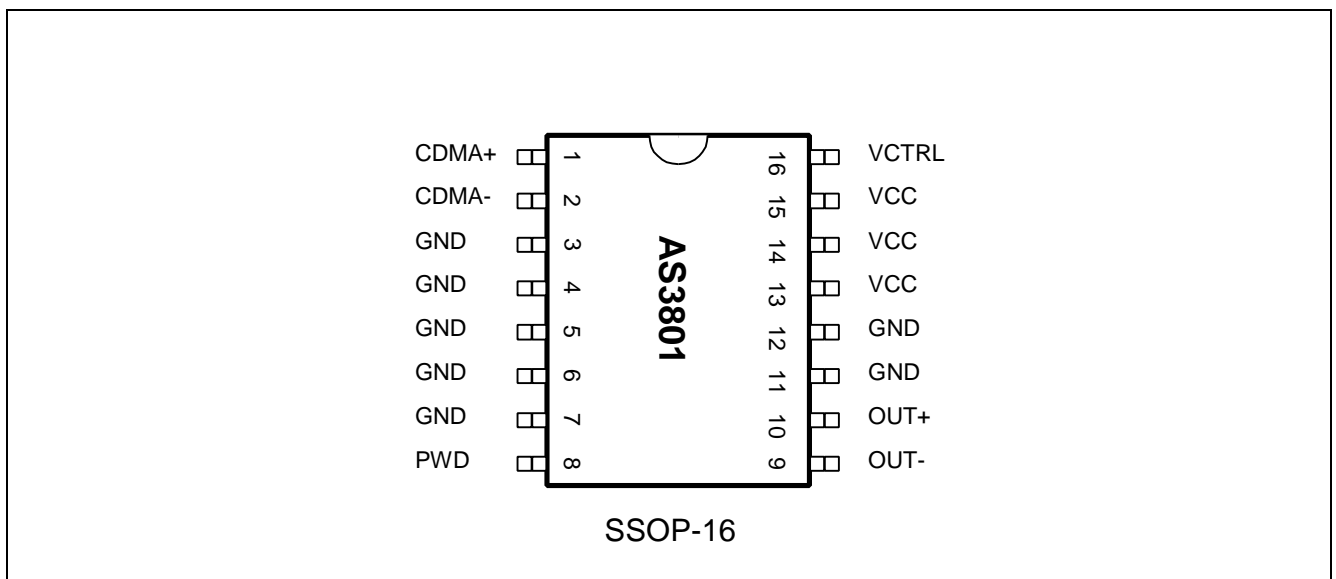
The AS3801 is a gain controlled amplifier designed for the transmit section of dual mode CDMA/FDM, TDMA/FDM or FM/FDM cellular phones.

Key specifications like gain range, noise figure, IP3, temperature range and other specifications are designed to be in line with the IS-95 standard for CDMA cellular communications.

The circuit is designed for narrow band IF applications but can also be used in wideband applications.

## Applications

- Digital cellular systems with transmission methods: CDMA/FDM, TDMA/FDM, FM/FDM and TDMA/TDD.
- Examples: IS-95 CDMA, IS-54 DAMPS, AMPS, PWT.
- Cordless phones analog / digital.
- General purpose linear IF amp's.
- WLL / WLAN.



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**Absolut Maximum Ratings (non operating)**

Symbol	Parameter	min	max	Unit	Note
VDD	Positive Supply Voltage	-0.5	7	V	
GND	Analog Ground	0	0	V	
Vin	Voltage at every Input Pin	Gnd-0.5	VDD+0.5	V	
Iin	Input Current (into any pin except supply pins and except low leakage pin)	-40	40	mA	
Iin_15	Input Current into Low Leakage Pin	-25	25	mA	
H	Humidity Noncondensing				1)
ESD	Electrostatic Discharge		1000	V	2)
Tstg	Storage Temperature	-55	125	deg C	
Tlead	Lead Temperature		260	deg C	3)

## Notes:

- 1) Defined DIN 40040 cond. F.
- 2) HBM: R=1.5kOhm, C=100pF.  
Open collector outputs have less ESD protection because the protection diode to the positive supply cannot be implemented (The output swing is higher than Vpos.+0.7V).
- 3) 260 deg C for 10 sec (Reflow and wave soldering), 360 deg C for 3 sec (Manual soldering).

The above figures conform to CMOS standard for low leakage application.

**Recommended Operating Conditions**

Symbol	Parameter	min	typ	max	Unit	Note
VDD	Positive Supply Voltage		3.6		V	1)
GND	Analog Ground	0	0	0	V	
Idd	Supply Current		18	21	mA	2)
Tamb	Ambient Temperature Range, Operating Range	-30		+80	deg C	

## Notes:

- 1)  $3.6V \pm 5\%$ .
- 2) Measured at pin VDD, see test schematic, no signal.

## TX AGC Electrical Characteristics

Parameter	min	typ	max	Unit	Note
Frequency Range		100-300		MHz	$f_{-3dB}=300\text{MHz}$
Maximum Gain	40			dB	$V_G=3\text{V}$
Minimum Gain			-45	dB	$V_G=0.2\text{V}$
Noise Figure		6.8		dB	max. Gain
Output IP3		15		dBm	max. Gain 1)
Gain Variation (in +/-630 kHz bandwidth, centered at 130MHz)		+/-0.05		dB	
Gain Slope Linearity (over any 6dB segment)		+/- 3		dB	-32 to +72 deg.C
Gain Control Voltage Range		0.2-3		V	0.2V min. Gain 3.0V max. Gain ref. to GND
Gain Control Input Impedance		16		k $\Omega$	
Current Consumption		18	20	mA	
Input Resistance		1k diff.		$\Omega$	
Output Impedance		1k diff.		$\Omega$	Open Collector 1k $\Omega$ diff. outside (500 $\Omega$ eff.)
Power Down Mode					2)

## Notes:

Specifications referred to 130MHz.

1) Two tone measurement is used.

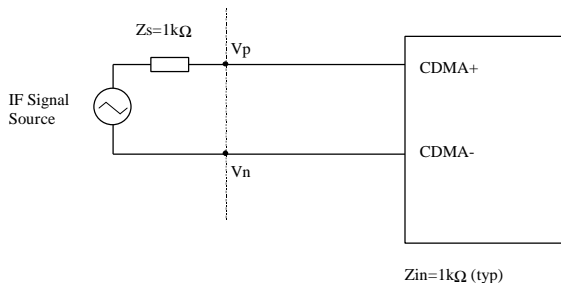
$f_1=131\text{MHz}$ ;  $f_2=132\text{MHz}$ ; Input power is -51dBm.

2) High=Active, Low=Power save, Input impedance  $\geq 16\text{k}\Omega$ .

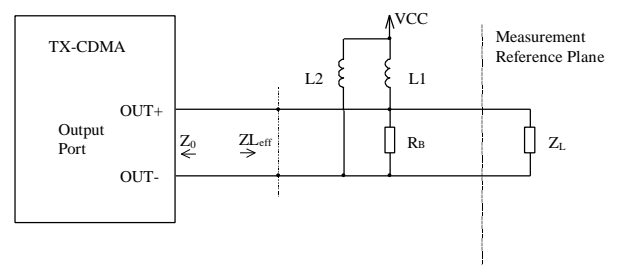
Pin Description

Pin#	Symbol	Function
1	CDMA+	CDMA Positive Differential Input
2	CDMA-	CDMA Negative Differential Input
3	GND	Analog Ground
4	GND	Analog Ground
5	GND	Analog Ground
6	GND	Analog Ground
7	GND	Analog Ground
8	PWD	Power down, CMOS Input $V_{P\text{WD-RX}} \geq 3.4\text{V}$ , RX-AGC Active $V_{P\text{WD-RX}} \leq 0.5\text{V}$ , RX-AGC Off
9	OUT-	Analog Differential Output
10	OUT+	Analog Differential Output
11	GND	Analog Ground
12	GND	Analog Ground
13	VCC	VCC Power Supply
14	VCC	VCC Power Supply
15	VCC	VCC Power Supply
16	VCTRL	Analog Control Input VCTRL=0.2V, Low Gain Rail; VCTRL=3V, High Gain Rail

Definition of CDMA Source Impedance,  $Z_S$ , and AS3801 Input Impedance  $Z_{IN}$

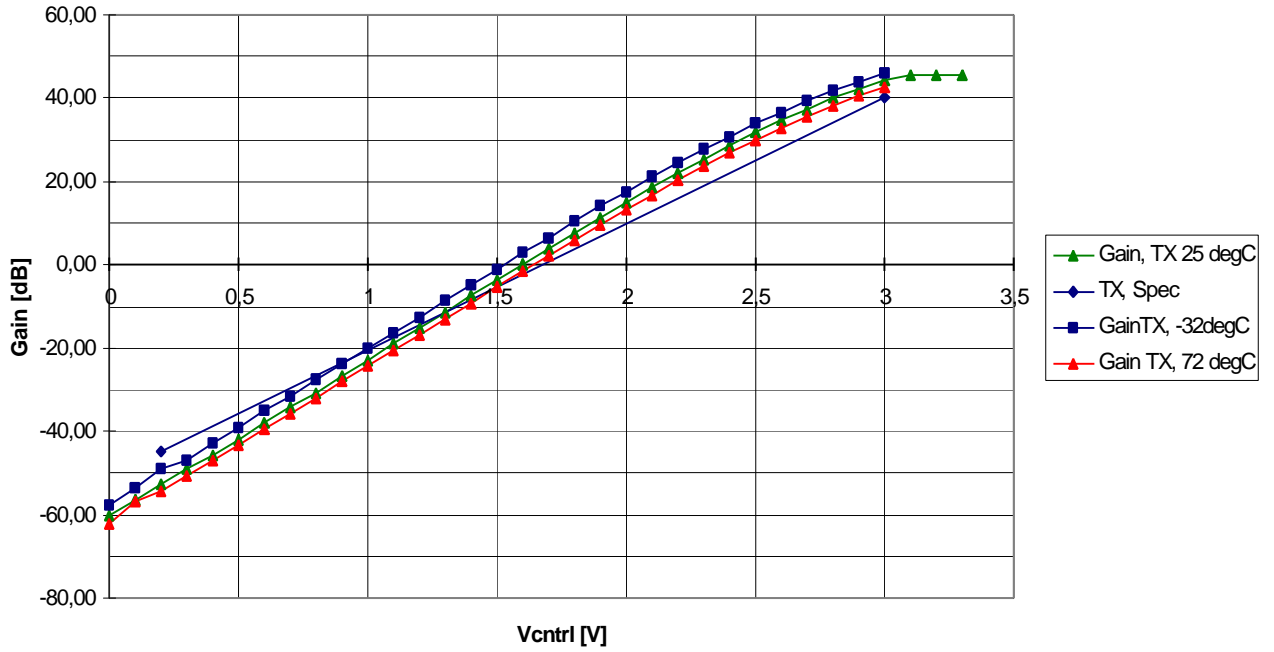


Definition of Load Impedance,  $Z_L$ , and AS3801 Output Impedance  $Z_O$



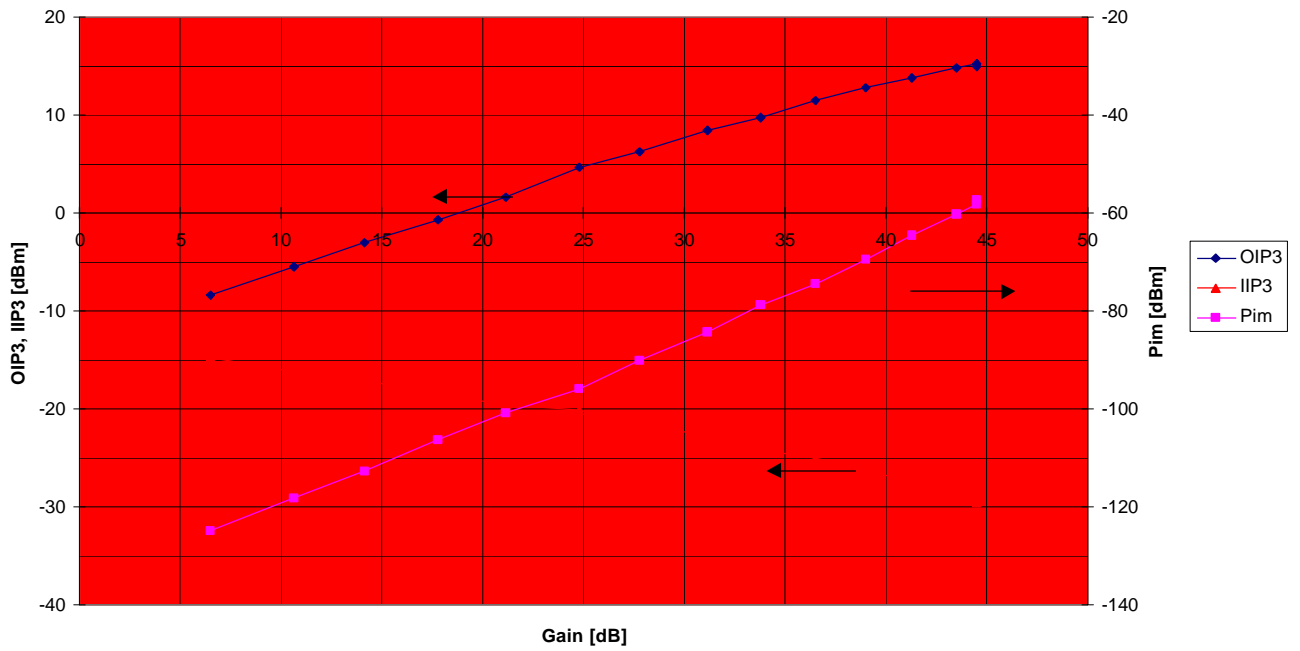
- TX-CDMA Output Port Impedance  $Z_O > 10\text{k}\Omega$
- Load Impedance  $Z_L = 1\text{k}\Omega$
- Bias Resistor  $R = 1\text{k}\Omega$
- Bias Inductors  $L_1 = L_2 = \text{Choke}$
- Effective Load  $\omega \cdot L \gg R_B$   
 $Z_{Leff} = 500\Omega$

Transfer Characteristic

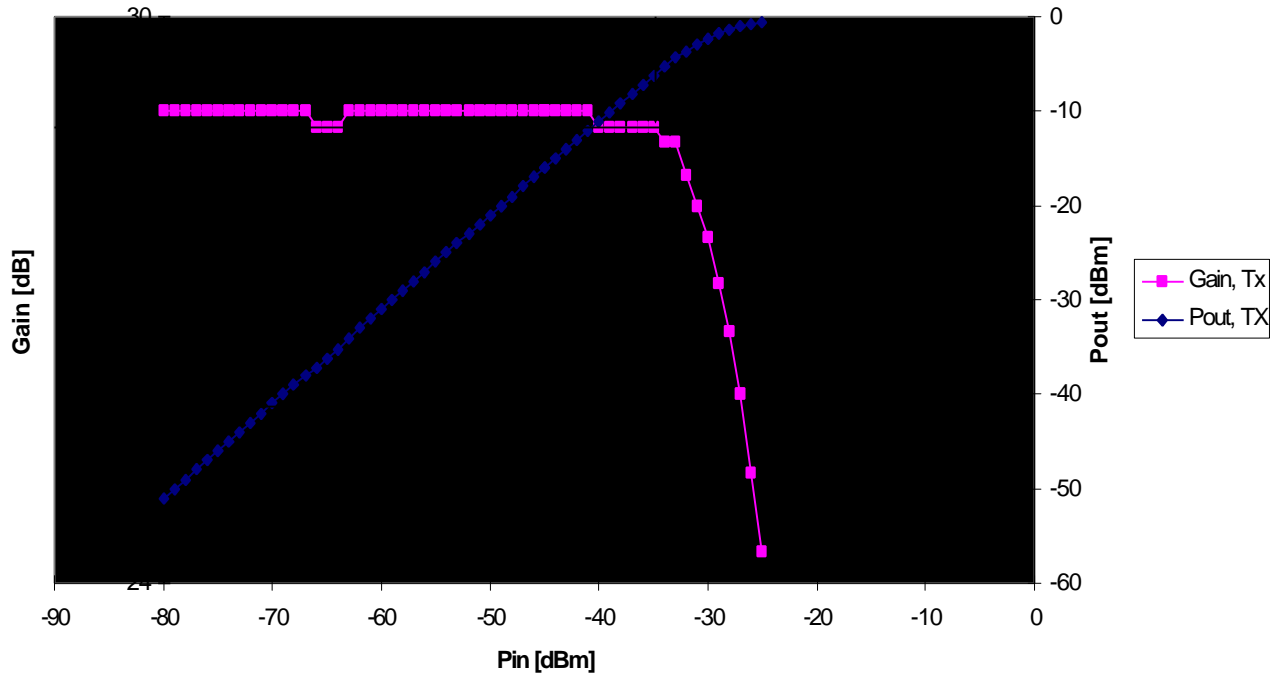


Intermodulation Performance

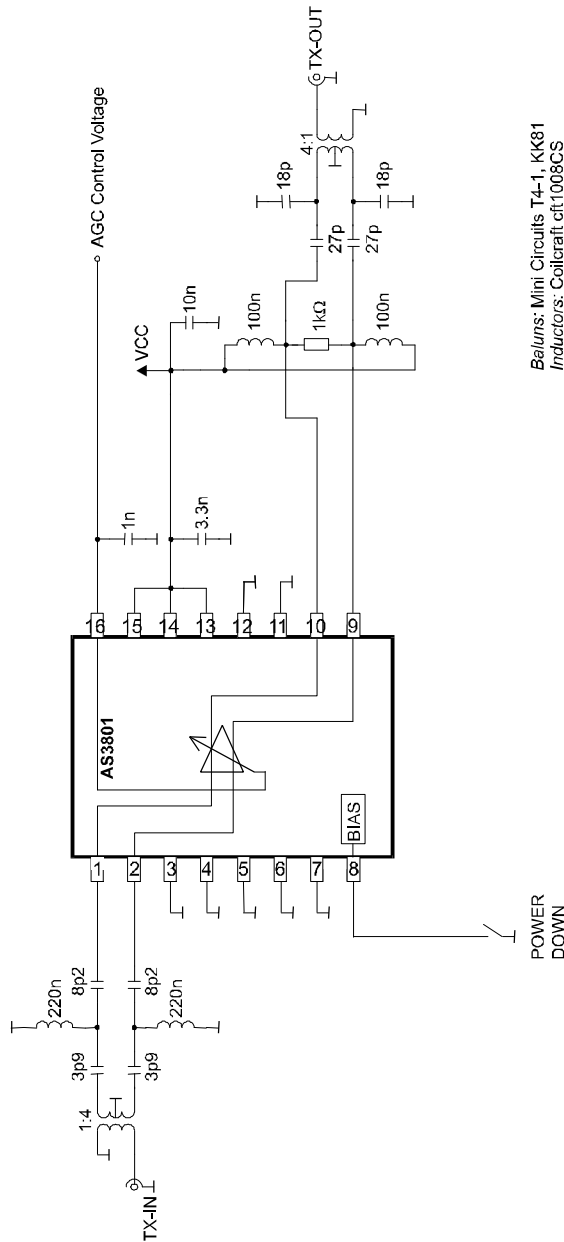
IIP3, TX AGC, 130 MHz, Vdd= 3.6V, Pin = -51 dBm



Compression Behaviour



Typical Application @ 130MHz



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