

The SATURN circuit is designed for use in dual band dual mode mobile phones (CDMA/AMPS). The circuit is designed to be compatible with digital baseband and mixed signal circuit chips from Mitel (Planet Chipset) and Qualcomm (MSM2 and BBA). A wideband AGC amplifier allows the input of CDMA or AMPS signal paths with a range power management control options.

FEATURES

- Selectable IF input buffers with characteristic impedance suitable for interface to IF CDMA and FM SAW filter outputs
- AGC amplifiers with -45 to +50dB of variable gain, fully compensated for temperature variation
- IQ demodulator with accurately defined output DC level and low DC offsets
- LO operating at twice frequency with high accuracy quadrature generation
- Sophisticated power management control operation
- Overload indicator

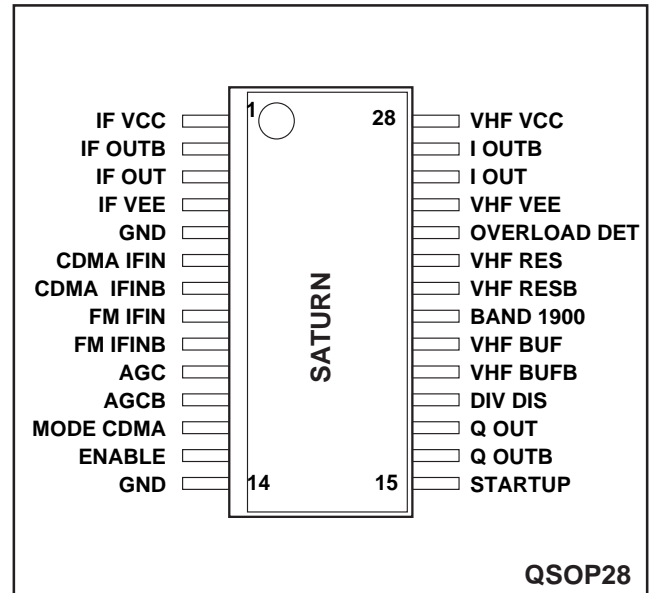


Figure.1 Pin connections - top view

ORDERING INFORMATION

SATURN/KG/QP1S

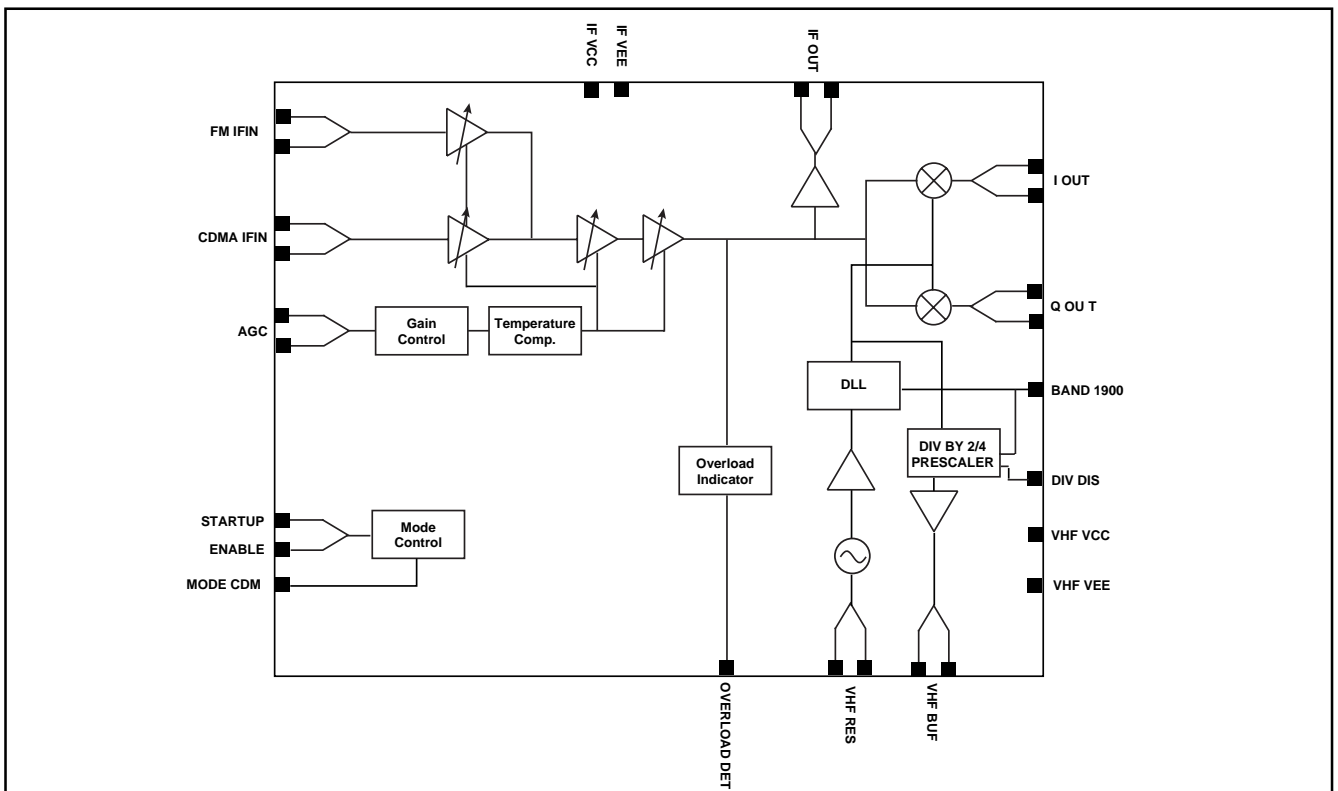


Figure 2. Block diagram

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PIN DESCRIPTION

Pin No	Pin Name	Description
1	IF VCC	Supply for IF inputs and AGC blocks
2	IF OUTB	Post AGC IF output
3	IF OUT	Post AGC IF output
4	IF VEE	Ground for IF inputs and AGC blocks
5	GND	Substrate ground
6	CDMA IFIN	Post SAW IF input (CDMA)
7	CDMA IFINB	Post SAW IF input (CDMA)
8	FM IFIN	Post SAW IF input (FM)
9	FM IFINB	Post SAW IF inputs (FM) (AC ground)
10	AGC	AGC control for IF section
11	AGCB	AGC control for IF sections (AC ground)
12	MODE CDMA	CDMA/FM mode select
13	ENABLE	Power up AGC sections of device
14	GND	Substrate Ground
15	STARTUP	Power up Oscillator, DLL and Mixer sections of the device
16	Q OUTB	Q channel baseband output
17	Q OUT	Q channel baseband output
18	DIV DIS	Disable divide by 2 prescaler mode
19	VHF BUFB	VHF oscillator buffered output for synthesiser
20	VHF BUF	VHF oscillator buffered output for synthesiser
21	BAND 1900	VHF oscillator tuning band select input
22	VHF RESB	VHF VCO resonator
23	VHF RES	VHF VCO resonator
24	OVERLOAD DET	Overload detector output
25	VHF VEE	Ground for VHF VCO and DLL blocks
26	I OUT	I channel baseband output
27	I OUTB	I channel baseband output
28	VHF VCC	Supply for VHF and DLL blocks

ELECTRICAL CHARACTERISTICS (Mode Control)

Description	ENABLE	STARTUP	MODE CDMA	BAND 1900	Comments
Standby Mode	0	0	X	X	All circuits powered down except logic inputs
Startup Mode	0	1	X	1	For high band IF (210.38MHz)
	0	1	X	0	For low band IF (85.38MHz) Turns on VCO circuits, DLL quadrature generation, prescaler and IQ demodulator. All other circuits remain powered down
CDMA mode	1	1	1	1	For high band IF (210.38MHz)
	1	1	1	0	For low band IF (85.38MHz) All circuits operational except for IF output buffer, CDMA input stage selected.

ELECTRICAL CHARACTERISTICS (Mode Control) continued

Description	ENABLE	STARTUP	MODE CDMA	BAND 1900	Comments
FM Mode	1	1	0	0	All circuits operational except for IF output buffer, FM input stage selected.
NOT ALLOWED	1	1	0	1	This will not be tested or guaranteed.
CDMA IF AGC only mode	1	0	1	X	Demodulator and LO generation circuitry powered down. IF output buffer enabled
FM IF AGC only mode	1	0	0	X	Demodulator and LO generation circuitry powered down. IF output buffer enabled.

X = Don't Care

N.B. STARTUP mode is provided to allow VCO/DLL/prescalers to stabilise before signal path is activated. This is a power-saving feature since the signal path is redundant during this period. If this feature is not required, the ENABLE and STARTUP control pins can be shorted together so that all circuitry is activated at the same time.

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ELECTRICAL CHARACTERISTICS (DC specification)

$T_{AMB} = -30^{\circ}\text{C}$ to $+70^{\circ}\text{C}$, $V_{CC} = +2.7$ to $+3.6\text{V}$. These characteristics are guaranteed by either production test or design. They apply within the specified ambient temperature and supply voltage ranges unless otherwise stated.

Characteristic	Value			Units	Conditions
	Min	Typ	Max		
General					
Supply Voltage	2.7	3.0	3.6	V	All Vcc Pins
Operating temperature	-30	27	70	$^{\circ}\text{C}$	Ambient
Current Consumption					
Standby Mode		0.03	0.1	mA	
Startup Mode		8	13	mA	
CDMA Mode		14	23	mA	
FM Mode		14	23	mA	
CDMA AGC only Mode,		8	13	mA	
FM AGC only Mode,		11	18	mA	
Mode Control Logic					
CMOS input logic high, V_{IH}	$V_{CC} - 0.5$		$V_{CC} + 0.1$	V	All logic inputs
CMOS input logic low, V_{IL}	-0.1		0.5	V	All logic inputs
CMOS input high current, I_{IH}	-10		10	μA	All logic inputs
CMOS input low current, I_{IL}	-10		10	μA	All logic inputs
Switching time between any two Modes		3		ms	
AGC Control	0.1		2.6	V	
AGC Input impedance		100		$\text{k}\Omega$	
DC Common Mode voltages					
I OUT, I OUTB (CDMA Mode)		$V_{CC} - 0.7$		V	
I OUTB, Q OUTB					
I OUT, Q OUT (FM Mode)		$V_{CC} - 0.7$		V	
I OUTB, Q OUTB					

ELECTRICAL CHARACTERISTICS (AC specification)

$T_{AMB} = -30^{\circ}\text{C}$ to $+70^{\circ}\text{C}$, $V_{CC} = +2.7$ to $+3.6\text{V}$. These characteristics are guaranteed by either production test or design. They apply within the specified ambient temperature and supply voltage ranges unless otherwise stated.

Characteristic	Value			Units	Conditions
	Min	Typ	Max		
CDMA AGC					
Max Voltage Gain to demodulator output	48			dB	To demodulator outputs
Min Voltage Gain to demodulator output			-48	dB	To demodulator outputs
Max Voltage Gain to IF buffer output	50			dB	To IF buffer outputs (IF AGC only mode)
Min Voltage Gain to IF buffer output			-51	dB	To IF buffer outputs (IF AGC only mode)
AGC control Max	2.6			V	Gain = Gain max
AGC control Min			0.1	V	Gain = Gain min
Gain slope		40		dB/V	
Gain slope linearity	20		60	dB/V	Over gain control range
Gain temperature stability	-2		2	dB	
Channel gain variation @ 210.38MHz	-0.1		0.1	dB	Within channel bandwidth
$NF_{Gainmax}$		5.5	6.5	dB	R_s (500 Ω)
Input V1dB _{Gainmin}	104			dB μ V	Minimum gain
	-13			dBm	Power (500 Ω)
IIP3 _{Gainmin}	114			dB μ V	Minimum gain
	-3			dBm	Power (500 Ω)
Input impedance		500		Ω	With addition of external shunt across IF inputs
IF Frequency	50		250	MHz	
CDMA to Amps isolation	30			dB	

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ELECTRICAL CHARACTERISTICS (AC specification) Continued

$T_{AMB} = -30^{\circ}\text{C}$ to $+70^{\circ}\text{C}$, $V_{CC} = +2.7$ to $+3.6\text{V}$. These characteristics are guaranteed by either production test or design. They apply within the specified ambient temperature and supply voltage ranges unless otherwise stated.

Characteristic	Value			Units	Conditions
	Min	Typ	Max		
FM AGC					
Max Voltage Gain to demodulator output	52			dB	To demodulator outputs
Min Voltage Gain to demodulator output			-47	dB	To demodulator outputs
Max Voltage Gain to IF buffer output	54			dB	To IF buffer outputs (IF AGC only mode)
Min Voltage Gain to IF buffer output			-45	dB	To IF buffer outputs (IF AGC only mode)
AGC control Max	2.6			V	Gain = Gain max
AGC control Min			0.1	V	Gain = Gain min
Gain slope		40		dB/V	
Gain slope linearity	20		60	dB/V	Over gain control range
Gain temperature stability	-2		2	dB	For any gain setting
$NF_{Gainmax}$			6	dB	850 Ω source
Input $V_{1dB_{Gainmin}}$	102			dB μ V	Minimum gain
	-17			dBm	Power, 850 Ω
$IIP3_{Gainmin}$	112			dB μ V	Minimum gain
	-7			dBm	Power, 850 Ω
Input Impedance		850		Ω	With addition of external shunt across IF inputs
IF Frequency	50		250	MHz	
VHF Local Oscillator					
Quadrature generation					
LO input Frequency	100		500	MHz	Actual LO frequency is half of this
IQ phase accuracy		2		deg	
VCO Phase noise		-100	-98	dBc/Hz	@ 30kHz, post div. 2 Hiband mode Minimum tank Q=15
VCO Noise floor			-130	dBc/Hz	@ >3MHz, post div. 2 pk-pk differential
VCO buffer output	350			mV	pk-pk single ended
VCO buffer output impedance			20	Ω	Differential

ELECTRICAL CHARACTERISTICS (AC specification) Continued

$T_{AMB} = -30^{\circ}\text{C}$ to $+70^{\circ}\text{C}$, $V_{CC} = +2.7$ to $+3.6\text{V}$. These characteristics are guaranteed by either production test or design. They apply within the specified ambient temperature and supply voltage ranges unless otherwise stated.

Characteristic	Value			Units	Conditions
	Min	Typ	Max		
Demodulator Output					I OUT, I OUTB, Q OUT, Q OUTB
I/Q Gain matching		0.25		dB	
I/Q Phase matching		2		deg	
Output impedance		4		k Ω	Differential
Baseband Bandwidth		50		MHz	Defined by on-chip first order low-pass filter
Output IP3	124			dB μ V	= 1.58Vrms
Baseband differential DC offset			3.5	mV	
Overload Detect					Referred to baseband outputs
CDMA Mode		104		dB μ V	
FM Mode		106		dB μ V	

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