

Oncore™ GPS Chip Mixed Mode RF and Digital Monolithic GPS Sensor

MG2000

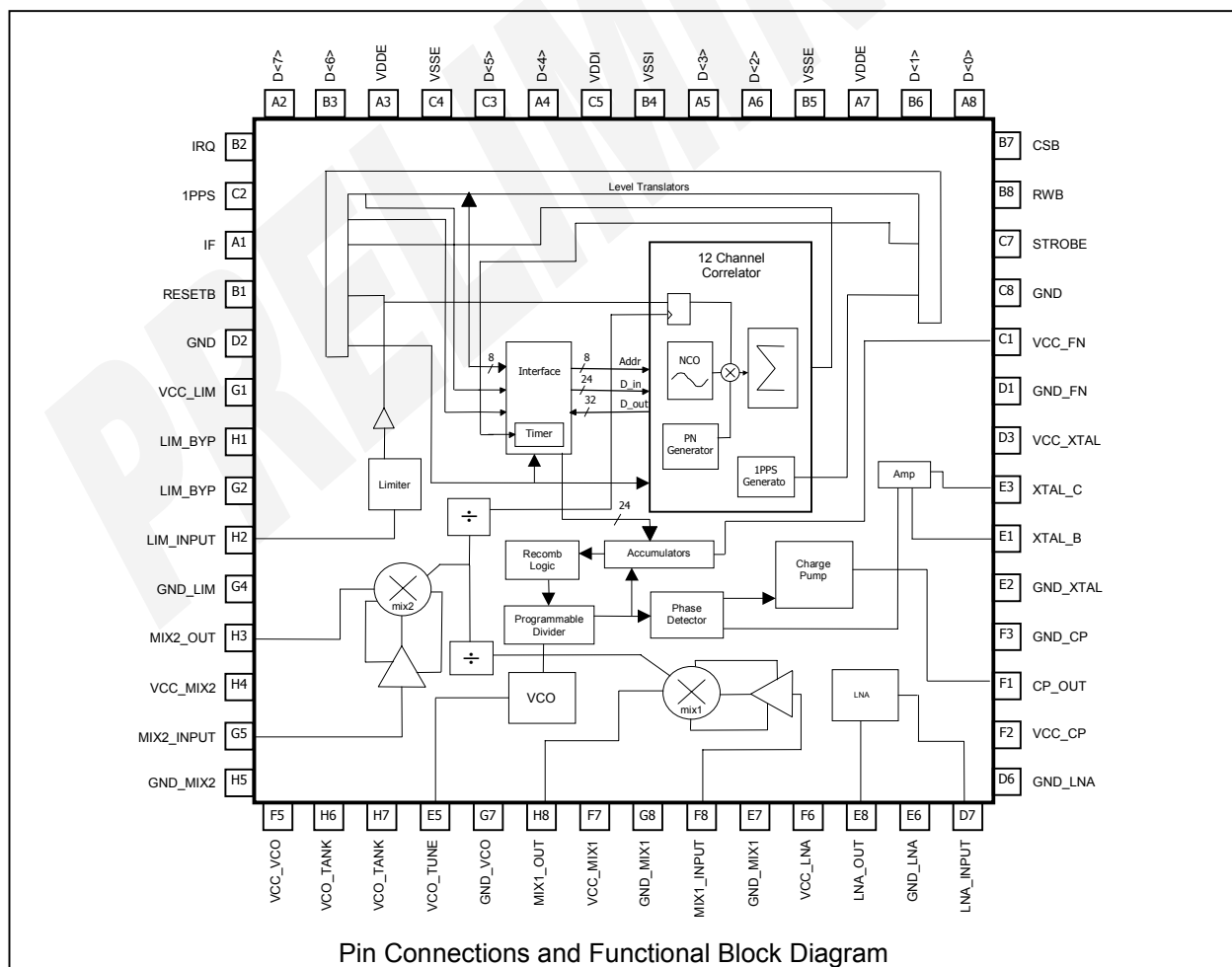
The Oncore™ GPS Chip integrated circuit was specifically designed for low power, cost effective host-based GPS applications. Measuring only 8x8 mm, the Oncore GPS Chip monolithic GPS sensor design includes a fully integrated main VCO and a multi-mode synthesizer that significantly reduce external component count and total system cost. The Oncore GPS Chip combines Motorola's proven dual down-conversion RF architecture and a 12-channel digital correlator using a 0.25μm BiCMOS Silicon Germanium process for superior on-chip interference mitigation and reduced power consumption.



**0.8 mm Pitch
64-pin BGA**

Oncore GPS Chip features include:

- Mixed mode GPS RF down-converter and 12-channel digital correlator
- Host microprocessor independent architecture
- Fully integrated main VCO
- On-chip multi-mode synthesizer and LNA
- 65 mW typical power consumption at 16.367 MHz reference frequency with power moding capabilities for further power reduction
- 8x8 mm low profile 64-pin BGA package



Maximum Ratings

Rating	Symbol	Value	Unit
Operating Ambient Temperature Range	T_A	-40 to 105	°C
Storage Temperature Range	T_{stg}	-55 to 150	°C
ESD		2K	V

ELECTRICAL CHARACTERISTICS

Microprocessor Interface & Correlator

Characteristic	Min	Typ	Max	Unit
Input High Voltage	0.8*VDDE	-	VDDE+0.3	Vdc
Input Low Voltage	-0.3	-	0.2*VDDE	Vdc
Input Leakage Current	-1.0	-	1.0	μA
Output High Voltage	VDDE-0.2	-	-	Vdc
Output Low Voltage	-	-	0.2	Vdc
Pin Capacitance	-	5.0	-	pF

Power Supply

Characteristic	Min	Typ	Max	Unit
Analog Supply Voltage ¹	2.7	3.0	3.6	Vdc
Analog Supply Current (16.8 MHz) ^{1,2}	-	26.19	-	mA
Analog Supply Current (16.367 MHz) ^{1,2}	-	19.3	-	mA
Analog Supply Current (Quiescent) ^{1,2}	-	0.5	-	μA
External Supply Voltage (VDDE)	2.7	3.0	3.6	Vdc
External Supply Current (16.8 MHz)	-	0.1	-	mA
External Supply Current (16.367 MHz)	-	0.1	-	mA
External Supply Current (Quiescent)	-	0.5	2.0	μA
Internal Supply Voltage (VDDI)	1.8	2.0	2.2	Vdc
Internal Supply Current (16.8 MHz)	-	3.8	-	mA
Internal Supply Current (16.367 MHz)	-	3.2	-	mA
Internal Supply Current (Quiescent)	-	0.5	2.0	μA

1. VCC_FN, VCC_XTAL, VCC_CP, VCC_LIM, VCC_MIX1, VCC_MIX2, VCC_LNA, VCC_VCO
2. VCC_FN + VCC_XTAL + VCC_CP + VCC_LIM + VCC_MIX1 + VCC_MIX2 + VCC_LNA + VCC_VCO

Mixer 1

Characteristic	Min	Typ	Max	Unit
Power Conversion Gain	-	18	-	dB
Input Return Loss	-	-15	-	dB
Noise Figure (SSB)	-	10	-	dB
LO Leakage (to any pin)	-	-35	-	dBm
Input 1dB Compression Point	-	-38	-	dBm
Input Third Order Intercept Point	-	-31	-	dBm
Gain Variation (-40 to 105 °C)	-	±1	-	dB
Output Impedance	-	150	-	Ω

Mixer 2

Characteristic	Min	Typ	Max	Unit
Power Conversion Gain	-	31.5	-	dB
Noise Figure (SSB)	-	10	-	dB
LO Leakage (to any pin)	-	-35	-	dBm
Input 1dB Compression Point	-	-48	-	dBm
Input Third Order Intercept Point	-	-40	-	dBm
Gain Variation (-40 to 105 °C)	-	±2	-	dB
Input Impedance	-	460	-	Ω
Output Impedance	-	80	-	Ω

Limiter

Characteristic	Min	Typ	Max	Unit
Frequency	-	4	25	MHz
Voltage Gain	60	65	70	dB
Input Impedance	-	300	-	Ω
Input Signal Level	4	10	30	mV

VCO

Characteristic	Min	Typ	Max	Unit
Frequency Tuning Range	1.564	-	1.662	GHz
Voltage Control Range	0.5	-	2.5	Vdc
VCO Gain Constant (Vtune @ 1.4 V, F _{se} [2:0] = 100 _b)	-	64	-	MHz/V

Charge Pump

Characteristic	Min	Typ	Max	Unit
Up Current Pulse Magnitude	-	191.5	-	μA
Up Current Pulse Percent Change vs. Temperature	-	1.6	-	% typical
Down Current Pulse Magnitude	-	291.5	-	μA
Down Current Pulse Percent Change vs. Temperature	-	1.8	-	% typical

Crystal Oscillator / Buffer

Characteristic	Min	Typ	Max	Unit
Input Reference Signal Frequency (F_{ref})	12	16.367	28	MHz
Input Reference Signal Amplitude	-	850	-	mVpp
F_{ref} Input Impedance (real part)	-	1900	-	Ω
Voltage Gain	-	18	-	dB

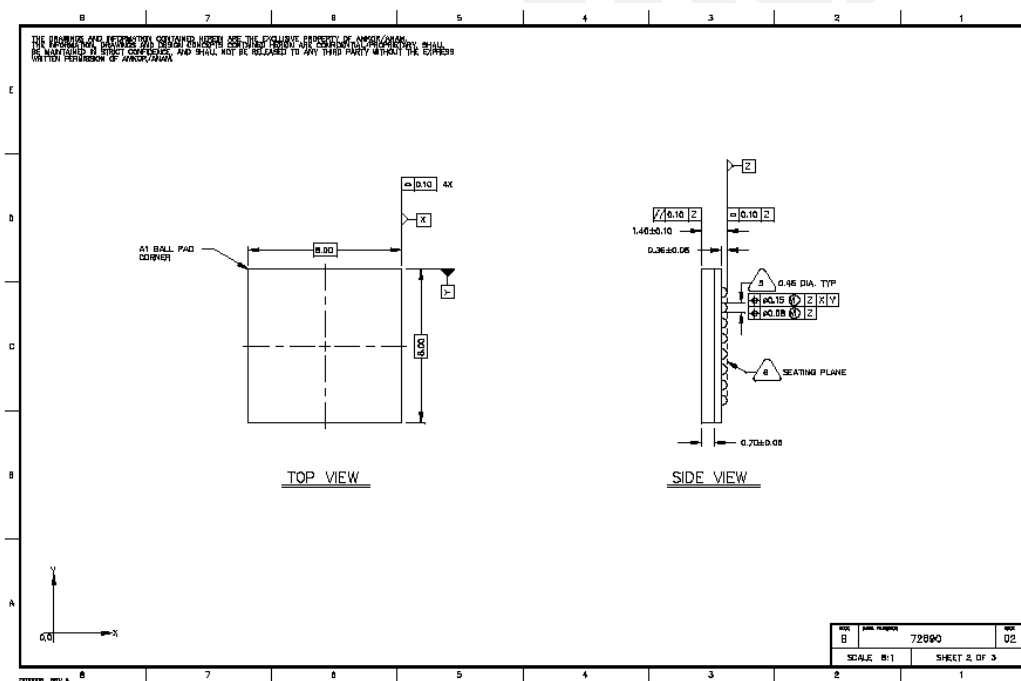
Low Noise Amplifier

Characteristic	Min	Typ	Max	Unit
Power Gain	-	15	-	dB
Input Return Loss	-	-9	-	dB
Reverse Isolation	-	25	-	dB
Output Return Loss	-	-9	-	dB
Noise Figure	-	2.9	-	dB
Input 1dB Compression Point	-	-14	-	dBm
Input Third Order Intercept Point	-	-7	-	dBm
Gain Variation (-40 to 105 °C)	-	±1	-	dB

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SEMICONDUCTOR TECHNICAL DATA

Ball	Pin Name	Description
A2	D<7>	Data Bus
B3	D<6>	Data Bus
A3	VDDE	External Digital Supply
C4	VSSE	External Digital Ground
C3	D<5>	Data Bus
A4	D<4>	Data Bus
C5	VDDI	Internal Digital Supply
B4	VSSI	Internal Digital Ground
A5	D<3>	Data Bus
A6	D<2>	Data Bus
B5	VSSE	External Digital Ground
A7	VDDE	External Digital Supply
B6	D<1>	Data Bus
A8	D<0>	Data Bus
B7	CSB	Chip Select
B8	RWB	Read/ Write
C7	STROBE	Timing Strobe
C8	GND	Analog Ground
D6	GND_LNA	LNA Ground
D7	LNA_INPUT	LNA Input
E6	GND_LNA	LNA Ground
E8	LNA_OUT	LNA Output
F6	VCC_LNA	LNA VCC Supply
E7	GND_MIX1	1 st Mixer Ground
F8	MIX1_INPUT	1 st Mixer Input
G8	GND_MIX1	1 st Mixer Ground
F7	VCC_MIX1	1 st Mixer VCC Supply
H8	MIX1_OUT	1 st Mixer Output
G7	GND_VCO	VCO Ground
E5	VCO_TUNE	VCO Tuning Voltage Input
H7	VCO_TANK	External Tank Circuit
H6	VCO_TANK	External Tank Circuit
F5	VCC_VCO	VCO VCC Supply
H5	GND_MIX2	2 nd Mixer Ground
G5	MIX2_INPUT	2 nd Mixer Input
H4	VCC_MIX2	2 nd Mixer VCC Supply
H3	MIX2_OUT	2 nd Mixer Output
G4	GND_LIM	Limiter Ground
H2	LIM_INPUT	Limiter Input
G2	LIM_BYP	Limiter Bypass
H1	LIM_BYP	Limiter Bypass
G1	VCC_LIM	Limiter VCC Supply
F2	VCC_CP	Charge Pump VCC Supply
F1	CP_OUT	Charge Pump Output
F3	GND_CP	Charge Pump Ground
E2	GND_XTAL	XTAL Ground
E1	XTAL_B	XTAL Oscillator Base
E3	XTAL_C	XTAL Oscillator Collector
D3	VCC_XTAL	XTAL VCC Supply
D1	GND_FN	Synthesizer Ground
C1	VCC_FN	Synthesizer VCC Supply
D2	GND	Analog Ground
B1	RESETB	Reset
A1	IF	IF Input/Output
C2	1PPS	One Pulse Per Second Output
B2	IRQ	Interrupt Output
	NC	C6, D4, D5, D8, E4, F4, G3, G6



Contact Information

Additional information about the Oncore GPS Chip is available at **www.oncore.motorola.com**, or by contacting Motorola in the following regions:

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