

## FEATURES

- ARM7TDMI-S based SoC for GPS base band data processing of the data received from the GPS RF
- In standalone mode, booting can be selected either from external NOR flash or by external host downloading boot image through SPI interface or through SPI flash
- Internal SRAM of 2Mbits
- Support up-to two banks of 8Mbits external flash/SRAM memories
- Battery backed-up 4kbytes of internal memory for storing the ephemeris data for quick startup of GPS applications
- Battery backed-up counter (inside GPS core) and RTC (Real Time Clock) to keep time
- Automatic switching over to battery voltage when main power is not available and vice versa – controlled by logic external to the SoC
- Power-isolation logic between VDD [on/off] and VBAT [always-on] voltage islands
- Scalable system clock frequency to suit processing requirements
- Calibration for external clock with respect to the precise 1 second pulse from GPS with ~16.5ns accuracy
- Supports Level triggered and edge triggered interrupts
- Programmable clock output
- Three timers capable of running on external clock
- Clock gating to different subsystems, to save power
- Sleep mode – ARM runs on 32KHz clock
- Multiple SPI Chip select option via 6 GPIO lines

## PERIPHERALS

- GPS Correlator
- Bluetooth 2.0+EDR baseband
- USB 2.0 OTG with FULL SPEED support
- Two UART interfaces, with hardware flow control
- 16 bi-directional GPIOs
- Two Wire Interface (TWI)-I2C
- SPI
- SPORT
- CAN Controller
- Three Timers
- RTC [Wakeup/sleep] and Watchdog timers
- ETM7 provides CPU trace and debug support
- Boundary Scan
- JTAG and Multiplexed trace ports – 8-bit trace
- Timing block providing accurate clock calibrated by GPS at a precise 1Hz tick

## APPLICATIONS

- AST-230 provides a solid low cost platform for wide variety of applications, which involves GPS, Bluetooth, USB etc. It also provides a timing solution, which can provide highly precise clocks to any system, which require such clocks.
- The main segments where AST-230 is an ideal choice are
  - GPS and Navigation
  - Tracking and Fleet management
  - GPS solution of portable devices, which require low power solutions
  - Timing Solutions, where precise clocks are required
  - Automotive applications

### FUNCTIONAL BLOCK DIAGRAM

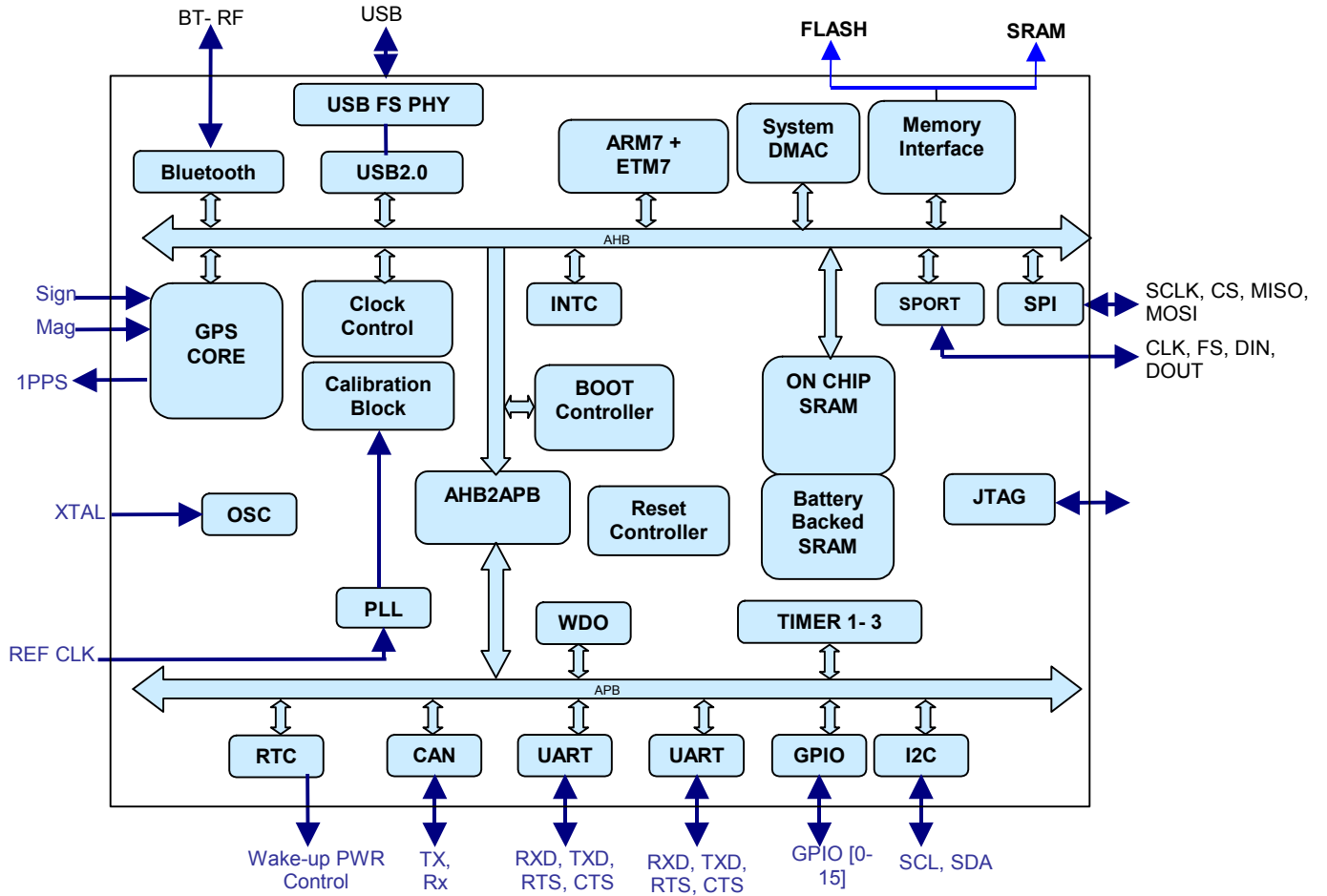


Figure 1: Block Diagram of AST-230

### SPECIFICATIONS

#### OPERATING CONDITIONS

Parameter	Conditions	Min	Nominal	Max	Units
Internal Supply Voltage		1.08	1.2	1.32	Volts
External Supply Voltage		2.7	3.0	3.3	Volts
32KHz OSC Supply Voltage		1.08	1.2	1.32	Volts
PLL Supply Voltage		1.08	1.2	1.32	Volts
USB Core Supply		1.08	1.2	1.32	Volts
USB IO Supply		3	3.2	3.3	Volts
High Level Input Voltage (VIH)		1.7		2.8	Volts
Low Level Input Voltage (VIL)		-0.3		+0.7	Volts
Junction Temperature (Tj)		-40	+25	+125	C
High Level output Voltage (VOH) @IOH 4Ma		1.7			Volts
Low Level output Voltage (VOL) @IOH 4mA				0.7	Volts
High Level output Current (IOH) @ VOH 1.7V		7.5	12.3	18.2	mA
High Level output Current (IOH) @ VOL 0.7V		5.8	9.3	12.9	mA

# AST-230

## Integrated GPS and Bluetooth Baseband Chip



### ELECTRICAL CHARACTERISTICS

Parameter	Test Conditions	Min	Typical	Max	Unit
High Level output Voltage (VOH) @IOH 4mA		1.7			Volts
Low Level output Voltage (VOL) @IOH 4mA				0.7	Volts
High Level output Current (IOH) @ VOH 1.7 V		7.5	12.3	18.2	mA
High Level output Current (IOH) @ VOL 0.7 V		5.8	9.3	12.9	mA
Input capacitance					pf
1) CLK_Ref			5		
2) SCLK			10		
3) SIGN , MAG ( GPS )			5		
4) SDIN, RFS, TFS			10		
5) SPORT			10		
Output capacitance			20		
1) PTTI ( GPS )			15		
2) Other GPS Ports			15		
3) BBC_INT_B			15		
4) SPORT ( ARM )			15		
5) SDOUT					

### ABSOLUTE MAXIMUM RATINGS

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.

Parameter	Rating
Internal Supply Voltage	1.32V
External I/O Supply voltage	3.3V
Input Voltage 1	-0.3 – 0.7
Input Voltage 2	1.7 – 2.8
Output Voltage Swing	0-3.3V
Load Capacitance	20pf
Storage temperature range	-65 to 150 C
Junction Temperature Under bias	-40C to 125C

### 196-BALL CSP\_BGA BALL ASSIGNMENT

Ball No	Signal Name
A1	GPIO0
A10	CLK_OUT2
A11	GPSINT_B
A12	BOOT_FLSH_ERR_1
A13	BOOT_FLSH_ERR_0
A14	CLK_EXT_CAL_DIV
A2	CIFBCK
A3	RIFTXO
A4	RIFCLK
A5	RIFMOD0
A6	RIFDATA
A7	RIFSIFEN
A8	CLK_EXT_CAL
A9	PTTI
B1	GPIO8
B10	EXT_TIMRCLK
B11	RESET_DSP_B
B12	BOOT_MODE_1
B13	BOOT_FLSH_ERR_VALID
B14	VDD_IO
B2	GPIO6
B3	GPIO1
B4	RIFRSTN
B5	RIFOSC
B6	RIFSIFCK
B7	RIFDATA1
B8	CIFFS
B9	MRESET_N
C1	GPIO14
C10	CLK_OUT3
C11	CMN_ERROR
C12	BOOT_MODE_0
C13	BBC_INT_B
C14	VDD_IO
C2	GPIO9
C3	GPIO7
C4	GPIO4
C5	GPIO2
C6	CIFSD
C7	RIFMOD1
C8	RIFSIFDO
C9	CLK_OUT1
D1	GPIO15
D10	CAL_1HZ
D11	LOCK_SEL
D12	VDD_IO
D13	SMC_ADDR_16
D14	SMC_ADDR_15
D2	GPIO10
D3	GPIO5
D4	GPIO3
D5	GPIO12
D6	RIFRFXO

D7	CIFDIN
D8	CLK_8KHZ
D9	CLK_EXT_CAL_OUT
E1	SIGN
E10	SMC_ADDR_17
E11	SMC_ADDR_18
E12	SMC_ADDR_19
E13	SMC_ADDR_11
E14	SMC_ADDR_10
E2	VSS_IO
E3	VSS_IO
E4	GPIO11
E5	GPIO13
E6	RIFDATA2
E7	RIFSIFDIN
E8	VSS
E9	VSS_IO
F1	MAG
F10	SMC_ADDR_12
F11	SMC_ADDR_13
F12	SMC_ADDR_14
F13	SMC_ADDR_9
F14	SMC_ADDR_8
F2	TEST_MODE3
F3	VSS_IO
F4	TEST_MODE2
F5	VDD_IO
F6	VSS_IO
F7	VSS_IO
F8	VSS
F9	VSS
G1	REF_CLK
G2	TEST_MODE1
G3	VDD
G4	VDD_POR
G5	CLK_IN2
G6	VSS
G7	VSS
G8	VSS
G9	CANC_RX
H1	SEL_CLK2
H10	SMC_ADDR_20
H11	SMC_ADDR_1
H12	SMC_ADDR_2
H13	SMC_ADDR_0

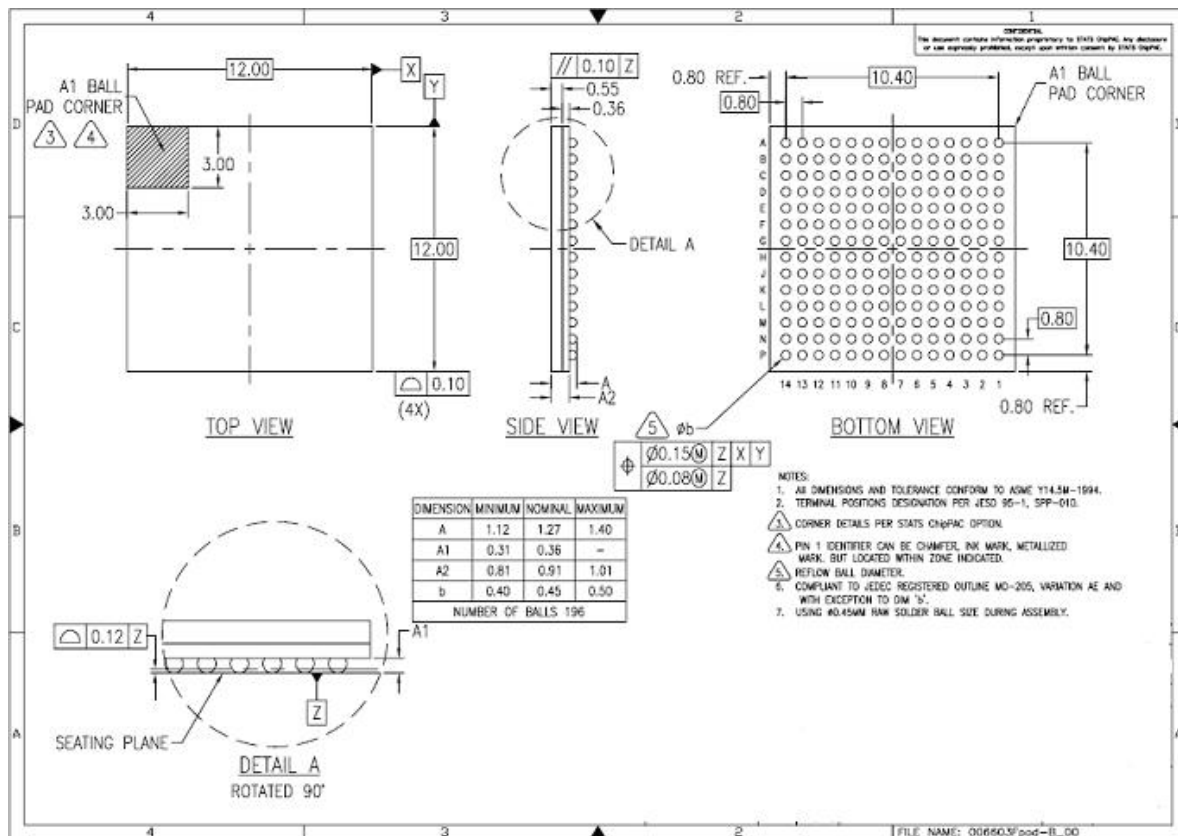
H14	SMC_WE_N
H2	TEST_MODE0
H3	U_VSS_POR
H4	U_VDD_PLL
H5	U_VSS_PLL
H6	U_VSS
H7	U_VDD_IO
H8	U_VDD_IO
H9	UART2_TXD
J1	TCK
J10	UART1_TXD
J11	UART1_CTS
J12	CANC_TX
J13	SMC_OE_N
J14	SMC_CS_N0
J2	TDO
J3	nTRST
J4	U_VDD
J5	U_VDD_VBATT3
J6	U_VDD_OSC
J7	U_VDD
J8	UART1_RXD
J9	SDA
K1	TDI
K10	UART2_RXD
K11	UART2_RTS
K12	UART1_RTS
K13	UART2_CTS
K14	SCL
K2	TMS
K3	U_VSS_VBATT3_IO
K4	WKUP_CTRL
K5	U_VDD_VBATT
K6	U_VDD
K7	U_VDD
K8	SMC_BLS_N1
K9	SMC_INT
L1	XOUT
L10	SMC_ADV_N
L11	SMC_DATA_9
L12	SMC_DATA_7
L13	SMC_DATA_3
L14	SMC_DATA_11
L2	U_VBATT3_IO
L3	U_VSS_OSC
L4	U_VDD_VBATT3
L5	U_VDD

L6	SMC_BLS_N0
L7	SMC_CRE
L8	SMC_FBCLK_IN
L9	SMC_BAA_N
M1	XIN
M10	U_VSS
M11	SMC_DATA_2
M12	SMC_DATA_5
M13	SMC_DATA_4
M14	SMC_DATA_10
M2	MISO
M3	SPI_CS
M4	SPORT_YADATA
M5	SPORT_XFS
M6	SPORT_XCLK
M7	USB_DISCHRGVBUS
M8	VBUS
M9	SMC_CLK_OUT1
N1	VDD_ISO_EN
N10	SMC_WAIT
N11	SMC_DATA_1
N12	SMC_DATA_12
N13	SMC_DATA_14
N14	SMC_DATA_15
N2	MOSI
N3	SPI_CLK
N4	SPORT_YBDATA
N5	SPORT_XADATA
N6	USB_DRVVBUS
N7	DM
N8	AVSS
N9	SMC_CLK_OUT0
P1	SPI_FLASH_CS
P10	SMC_SRAM_MW
P11	SMC_DATA_0
P12	SMC_DATA_6
P13	SMC_DATA_8
P14	SMC_DATA_13
P2	SPORT_YCLK
P3	SPORT_YFS
P4	SPORT_XBDATA
P5	SMC_CS_N1
P6	USB_CHRGVBUS
P7	AVDD
P8	DP
P9	CID

### OUTLINE DIMENSIONS

The Package is 12mm X 12mm. Dimensions in below

figure with 196-Ball CSP\_BGA (BC-289-2) are shown in millimeters.



### ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option	Operating Voltage (Nom)
AST-230	-40C to +85 °C	CSP-BGA - 0.8 mm pitch (196 balls), 12.0 mm x 12.0 mm x 1.2 mm	196 balls	1.2V(Internal), 3.0V I/O