



V2 Smart Link Hardware Data Sheet

24/03/2012

Smart Link Hardware Data Sheet

A. Features

The primary function of the SmartLink is to relay data messages from the Vehicle Detection Sensors (VDS) to the SmartRep Database System, via Zigbee, 3G cellular and internet connections. Messages are received from the sensors via an on-board digital radio chipset, stored until polled by the remote database, then sent on via 3G cellular modem.

SmartLinks without cellular modems can pass messages between themselves using the mesh-network capability of Zigbee radio. The co-ordinator or such a group of SmartLinks is the SmartLink Concentrator, which always has a 3G modem. Hence messages get passed from SmartLink to SmartLink via Zigbee, until they get to the Concentrator, when the message is passed to the database.

Messages from the database are passed in reverse order.

1. Multi-function

The board can play different roles in the system by putting different firmware and add-on modules to the board.

- VDS zone controller
- VDS remote master
- Car counter

The following add-on modules can be on board at the same time:

- X1 RF module
- X1 ZigBee module
- X1 3G modem or GPS module
- X1 RS232 module to sign
- X1 RS232 module to PC or other device

2. Remote firmware upgrade

Firmware can be up grade over the air.

3. Remote turn off

The controller can be turned off over the air by master or SMS messages, and sleep for a period of time set by master software.

All modules can be turned on/off individually to save battery.

4. Real time clock

Precise on board real time clock put time stamps on messages, the real time clock can be calibrated by master or GSM base station or internet.

5. Large memory

The 256K bytes on board memory (F-RAM) can keep more than 10,000 eye messages.

6. Remote and local un-contact reset

Can be reset master software or with a magnet outside the box, and give a feed back with a beep.

7. Dual power

The controller can be powered by mains or solar panel. The smart battery 3-Stage charger use MPPT (Maximum Peak Power Tracking) technology to get the maximum power from solar panel. The DC/DC convertor provides high efficiency and battery protection. Wrong wiring protection with self-recover functions on both terminals.

8. Unique serial number

A read only unique serial number on each board. This can be used as the device MAC address and production and stock trace controls purpose.

9. Remote reporting

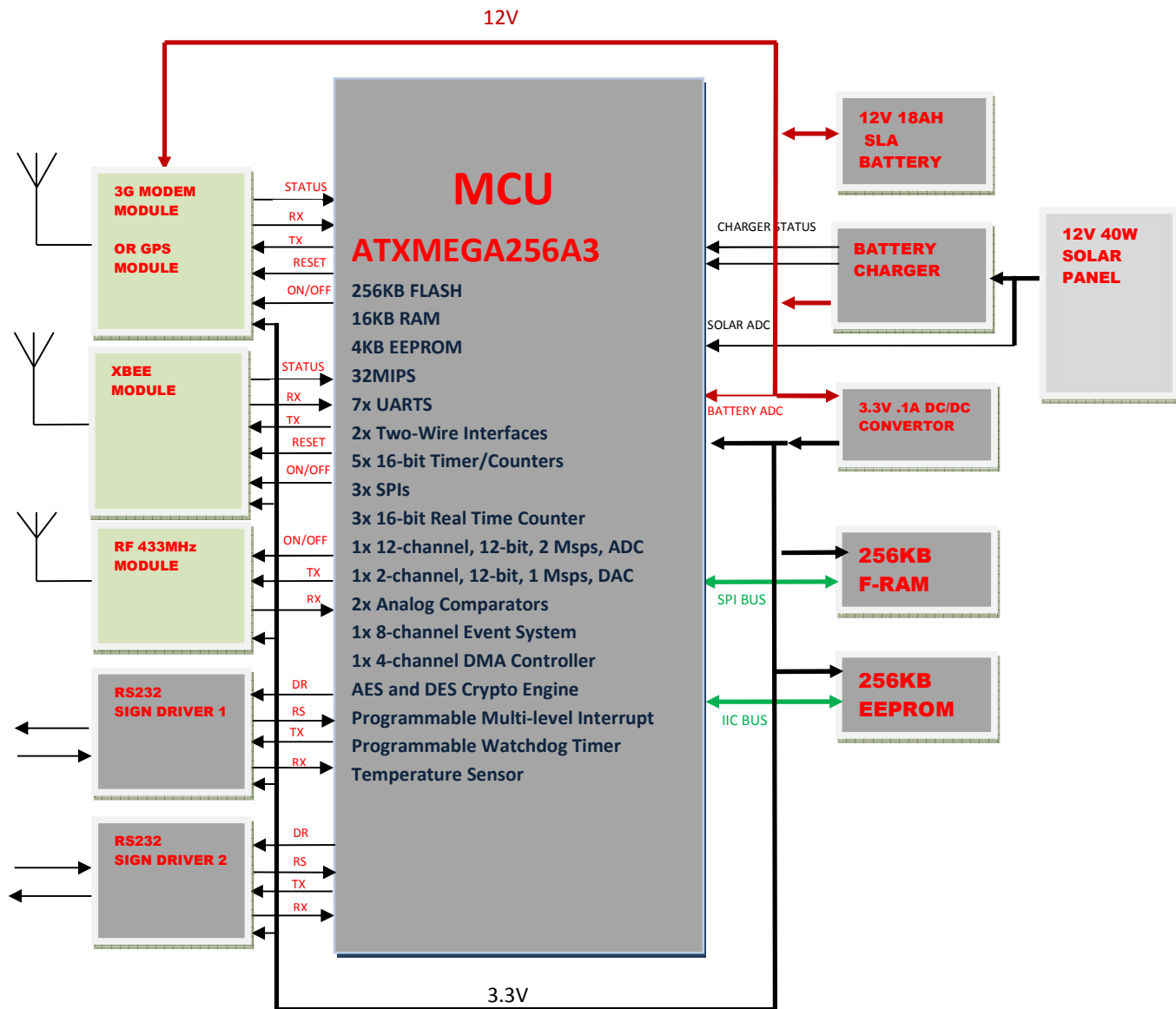
The following messages can be reported to master:

- Battery voltage
- Solar panel voltage
- Battery charger status
- Battery charging time in a day
- Temperature
- RF status(GPRS network status, signal strength, EBR (error bit rate); signal strength from eyes)
- Current time on board
- Board serials number
- Hardware Version number
- Firmware version number
- Last reset cause
- Operation time from last reset

10. Status indications

- system status can be indicated by LED
- ZBee network status LED
- 3G modem network status LED
- Buzzer

B. Block Diagram



C. Electrical Characteristics

1. ATXMEGA256A3 MCU

- 32MIPS@32MHz system clock
- Non-volatile Program and Data Memories
 - 256K Bytes of In-System Self-programmable Flash program memory (10,000 Write/Erase)
 - 4K Bytes data EEPROM(100,000 Write/Erase)
 - 16K Bytes SRAM
 - Read only unique serial number
- Peripheral Features
 - Four-channel DMA Controller with support for external requests
 - Eight-channel Event System
 - Five 16-bit Timer/Counters
 - Five USARTs
 - Two Two-Wire Interfaces with dual address match (I2C and SMBus compatible)
 - Two SPIs (Serial Peripheral Interfaces) peripherals
 - AES and DES Crypto Engine
 - 16-bit Real Time Counter with Separate Oscillator(20ppm)
 - One Twelve-channel, 12-bit, 2 Msps Analog to Digital Converter
 - Integrated Temperature Sensor
 - One Two-channel, 12-bit, 1 Msps Digital to Analog Converter
 - Two Analog Comparators with Window compare function
 - External Interrupts on all General Purpose I/O pins
 - Programmable Watchdog Timer with Separate On-chip Ultra Low Power Oscillator
- Special Microcontroller Features
 - Power-on Reset and Programmable Brown-out Detection
 - Internal and External Clock Options with PLL
 - Programmable Multi-level Interrupt Controller
 - Sleep Modes: Idle, Power-down, Standby, Power-save, Extended Standby
 - Advanced Programming, Test and Debugging Interfaces
- PDI (Program and Debug Interface) for programming, test and debugging

2. On board memories

- 128K Bytes two wire EEPROM(1,000,000 Write/Erase)
- 256K Bytes SPI F-RAM (nonvolatile memory)

3. Real time clock

- +20ppm @all operation temperature range

4. Eye message receiving (RXB1 module)

Rx frequency: 433.92MHz
Rx sensitivity: -100dBm
RF Data Rate: 1200 bps
Antenna connector type: SMA 50ohms

Range from eye (approximately): 50m

Agency Approvals:

5. Two-way communication module (module TBD, Silab or Ti chipset)

Rx frequency: 433.92MHz

Tx power: +10dBm

Rx sensitivity: -121dBm

RF Data Rate: 2.4kbps

Antenna connector type: SMA 50ohms

Range from eye (approximately): 50m

Agency Approvals: TBD

6. ZigBee communication

- Zigbee router mode
- Operating Frequency Band: ISM 2.4 GHz
- Number of Channels: 16 Direct Sequence Channels
- Rx sensitivity: -96dBm
- Tx power: Xbee module +3dBm (Xbee Pro module +18dBm)
- RF Data Rate: 250,000 bps
- Antenna: on board antenna or RPSMA connector 50ohms
- Range (approximately): Indoor/Urban 40 m, Outdoor RF line-of-sight Range 120 m
- Agency Approvals: Europe (CE): Europe (CE); United States (FCC Part 15.247): OUR-XBEE2; Industry Canada (IC): 4214A-XBEE2

7. GPRS communication (can be upgrade to 3GPP)

- Quad-band EGSM 850 / 900 / 1800 / 1900 MHz
- GPRS data class 10 (16 - 24 kbps upload / 32 - 48 kbps download)
- TCP/IP stack: TCP,IP, UDP,SMTP,FTP
- SMS: point-to-point, text and PUD mode, cell broadcast
- Firmware update over the air
- Output power
 - Class 4 (2W) @ 850 / 900 MHz
 - Class 1 (1W) @ 1800 / 1900 MHz
- Sensitivity:
 - 107 dBm (typ.) @ 850 / 900 MHz
 - 106 dBm (typ.) @ 1800 / 1900 MHz
- Agency Approvals:
 - Europe Fully type approved conforming with R&TTE directive
 - CE, FCC, IC, GCF, PTCRB, Anatel (for Order-No. 3 990 250 659 and 3 990 250 658 only)

8. Battery charger (not used on mains-powered models)

12V/12AH SLA(Sealed Lead-Acid) battery and 20W solar panel with 3-Stage charger with MPPT (Maximum Peak Power Tracking) function.

- Charging current=2A
- MPPT voltage=17.5V
- Fast Charge Mode
2A charge current with C/10 terminate monitoring. When Charge Current Falls to 0.15A (C/10 at 7.2V) charger switches to 6.75V Float Charge Mode.
- Float Charge Mode
Float charge to maintain the battery in full stage;
Charger will re-initiates 7.2V Fast Charge Mode if battery voltage falls below 6.6V.
- Trickle Charge Mode
To protect the battery, trickle charges at 0.15A if battery a bad battery (voltage is below 5V) is connected, or temperature is out of the battery safe charging range.

9. DC/DC power supply

- Efficiency
75%@RX mode
80%@TX mode
- Under-voltage lockout
To protect the battery, the controller shuts down at 12.4V and turns on at 10V.
- Reverse connection protection for both battery and solar panel
If battery or solar panel connected in a wrong way, the self resettable fuse is protects the system and the battery. And it recover after the wrong connection is removed, there is no need for fuse replacement.

10.Power

- Board supply voltage: DC 12.4 TO 16V (System turn on at 12.4V, turn off at 10V)
- Solar panel supply voltage: 17.5-25V
- Current consumption(@6V SLA battery):
 - GPRS module + RXC1 433MHz receive module:12mA Max(GPRS off mode)
 - GPRS module + RXC1 433MHz receive module:180mA Max(GPRS TX mode)
 - GPRS module + XBee module:210mA Max(GPRS TX mode)
 - GPRS module + XBee PRO module:320mA Max(GPRS TX mode + ZBee TX mode)

D. Environment

- Operating: Temperature - 15°C to +50°C, Relative Humidity 95%

E. Storage: -20°C to +85°C, Relative Humidity 99%



F. REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.0	Preview data sheet release	24/02/2012
1.0	Data sheet release	12/04/2012