



## PRIME compliant Power Line Communications SoC

### SUMMARY DATASHEET

#### Features

- Core
  - ADD8051C3A enhanced 8051 core
  - Speedups up to x5 vs. standard 8051 microcontroller
- Modem
  - Power Line Carrier Modem for 50 and 60 Hz mains
  - 97-carrier OFDM PRIME compliant
  - Baud rate Selectable: 21400 to 128600 bps
  - Differential BPSK, QPSK, 8-PSK modulations
- Memories
  - 32Kbytes on-chip SRAM
  - Up to 256Kbytes external SRAM
- In-circuit serial flash programming
- Auto boot-loading program from serial flash
- Automatic Gain Control and signal amplitude tracking
- Embedded on-chip DMAs
- Automatic code encryption during boot loading
- Media Access Control
  - Viterbi decoding and CRC PRIME compliant
  - 128-bit AES encryption
  - Channel sensing and collision pre-detection
- Peripherals
  - Two 2-wire UARTs
  - Two SPI. SPI to serial flash and External RTC. Buffered SPI to external metering IC
  - Programmable Watchdog
  - Up to 14 I/O lines
- Package
  - 120-lead LQFP, 14 x 14 mm, pitch 0.4 mm
  - Pb-free and RoHS compliant
- Typical Applications
  - Automated Meter Reading (AMR) & Advanced Meter Management (AMM)
  - Street lighting
  - Home Automation

## Description

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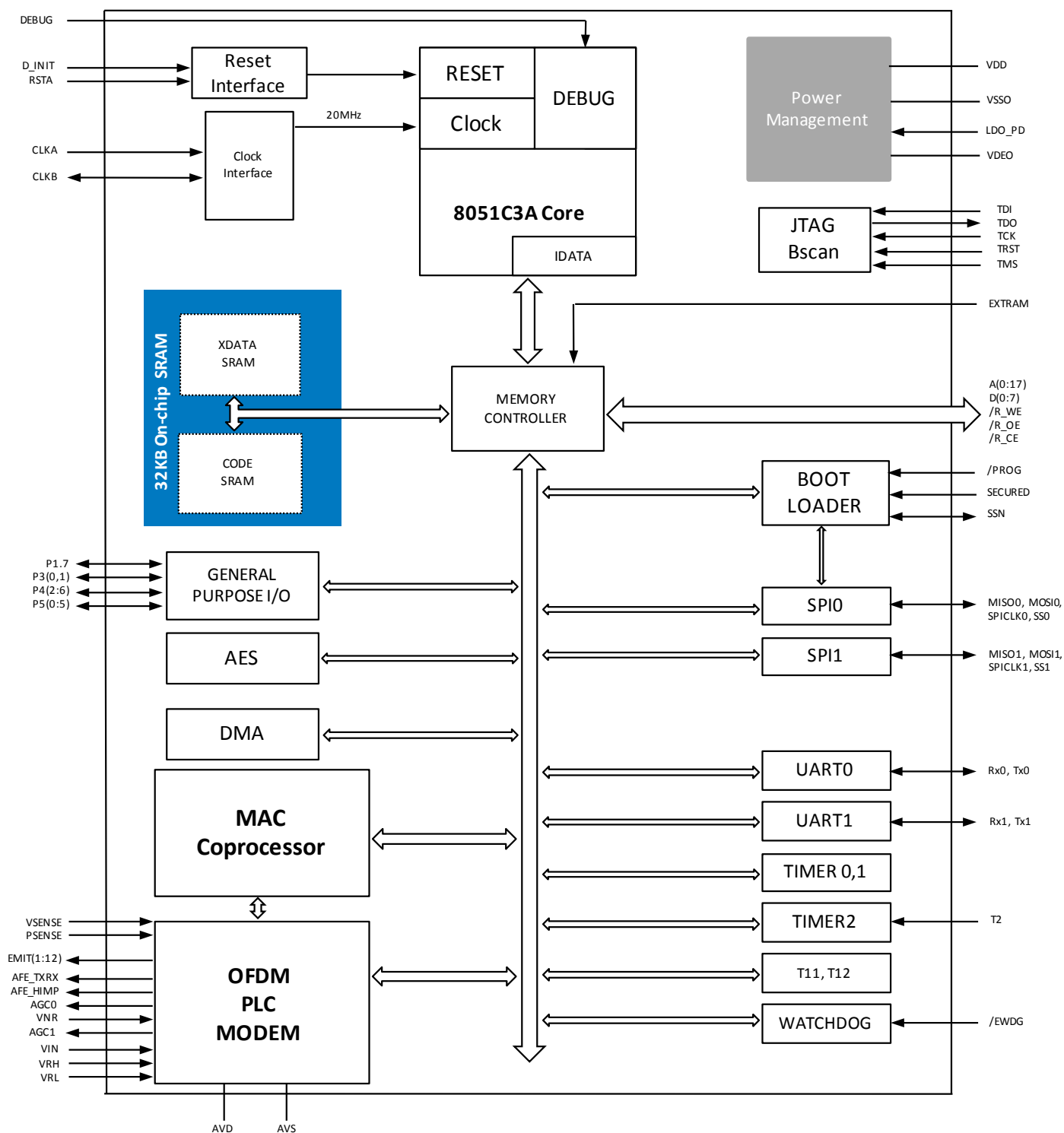
The ATPL210 is a Power Line Communications System on Chip, which implements a full PRIME compliant PLC modem. It includes an enhanced 8051 microcontroller (IP core ADD8051C3A), a Medium Access Controller (MAC) (IP core ADD1221) and a Modem circuit (IP core ADD1321) for power line medium using OFDM modulation compatible with PRIME specifications.

ATPL210 is oriented to high performance & robust AMR systems. The ATPL210 is designed to be used by meter manufacturers to provide a low cost and compact solution for AMR & AMM systems using narrow band power line communications.

This device has been developed to reduce CPU computational load in PLC systems running PRIME protocols. ATPL210 includes all necessary resources to be used as main controller in metering applications, and allows an external device to communicate according to PLC PRIME specifications.

## 1. Block Diagram

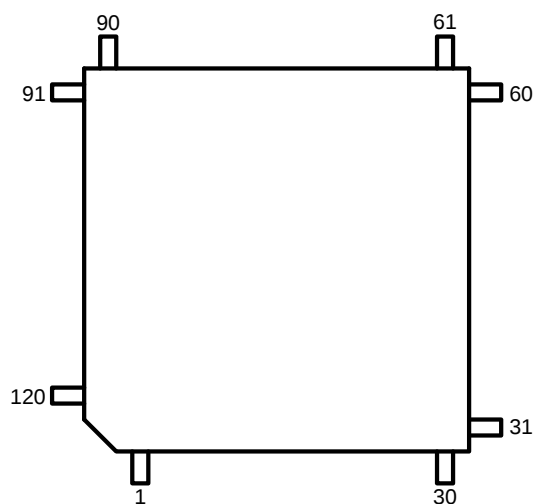
### Figure 1-1. ATPL210A 120-pin Block Diagram



## 2. Package and Pinout

### 2.1 120-Lead LQFP Package Outline

Figure 2-1. Orientation of the 120-Lead Package



## 2.2 120-Lead LQFP Pinout

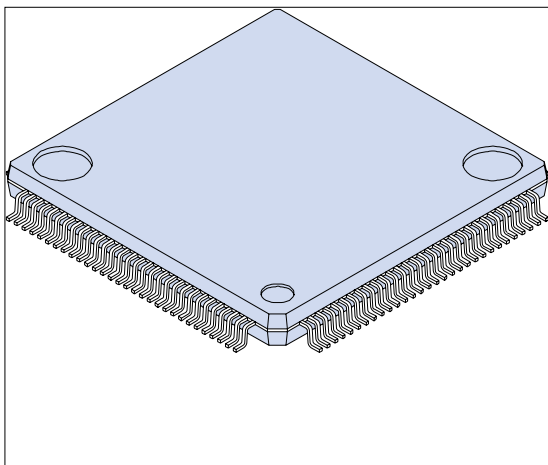
Table 2-1. ATPL210A 120-Lead LQFP pinout

|    |            |    |              |    |         |     |              |
|----|------------|----|--------------|----|---------|-----|--------------|
| 1  | A17        | 31 | P4.4/MOSI1   | 61 | TDI     | 91  | P5.4/RxD1    |
| 2  | A9         | 32 | P4.3/SPICLK1 | 62 | TMS     | 92  | P5.5/TxD1    |
| 3  | GND        | 33 | P4.2/SS1     | 63 | TDO     | 93  | NC           |
| 4  | VCC        | 34 | P3.0/RxD0    | 64 | GND     | 94  | P4.6/T2/AGC1 |
| 5  | /R_WE      | 35 | P3.1/TxD0    | 65 | GND     | 95  | AGC0         |
| 6  | D4         | 36 | VCC          | 66 | VCC     | 96  | GND          |
| 7  | D3         | 37 | GND          | 67 | TRST    | 97  | VCC          |
| 8  | D5         | 38 | EMIT.1       | 68 | TCK     | 98  | AVS2         |
| 9  | D2         | 39 | EMIT.2       | 69 | RSTA    | 99  | AVD2         |
| 10 | D6         | 40 | EMIT.3       | 70 | D_INIT  | 100 | AVS1         |
| 11 | D1         | 41 | EMIT.4       | 71 | GND     | 101 | AVD1         |
| 12 | D7         | 42 | VCC          | 72 | VCC     | 102 | VRH          |
| 13 | D0         | 43 | GND          | 73 | GND     | 103 | VIN          |
| 14 | VCC        | 44 | EMIT.5       | 74 | VDD     | 104 | VRL          |
| 15 | GND        | 45 | EMIT.6       | 75 | LDO_PD  | 105 | GND          |
| 16 | VDD        | 46 | EMIT.7       | 76 | VSS0    | 106 | VCC          |
| 17 | /R_OE      | 47 | EMIT.8       | 77 | VDE0    | 107 | P5.0/SS0     |
| 18 | /R_CE      | 48 | VCC          | 78 | VDE0    | 108 | P5.3/MISO0   |
| 19 | A8         | 49 | GND          | 79 | GND     | 109 | P5.2/MOSI0   |
| 20 | A0         | 50 | EMIT.9       | 80 | GND     | 110 | P5.1/SPICLK0 |
| 21 | A7         | 51 | EMIT.10      | 81 | VCC     | 111 | P1.7/SSN     |
| 22 | A1         | 52 | EMIT.11      | 82 | CLKEA   | 112 | A13          |
| 23 | A6         | 53 | EMIT.12      | 83 | GND     | 113 | A14          |
| 24 | A2         | 54 | VCC          | 84 | CLKEB   | 114 | GND          |
| 25 | A5         | 55 | GND          | 85 | VCC     | 115 | VCC          |
| 26 | GND        | 56 | AFE_HIMP     | 86 | /EWDG   | 116 | A12          |
| 27 | VCC        | 57 | AFE_TXRX     | 87 | DEBUG   | 117 | A15          |
| 28 | A3         | 58 | VSENSE       | 88 | EXTRAM  | 118 | A11          |
| 29 | A4         | 59 | PSENSE       | 89 | /PROG   | 119 | A16          |
| 30 | P4.5/MISO1 | 60 | VNR          | 90 | SECURED | 120 | A10          |

### 3. Mechanical Characteristics

Figure 3-1. 120-lead LQFP Package Mechanical Drawing

120-pin plastic LQFP



Lead pitch

0.40 mm

Package width ·  
package length

14.0 mm · 14.0 mm

Lead shape

Gullwing

Sealing method

Plastic mold

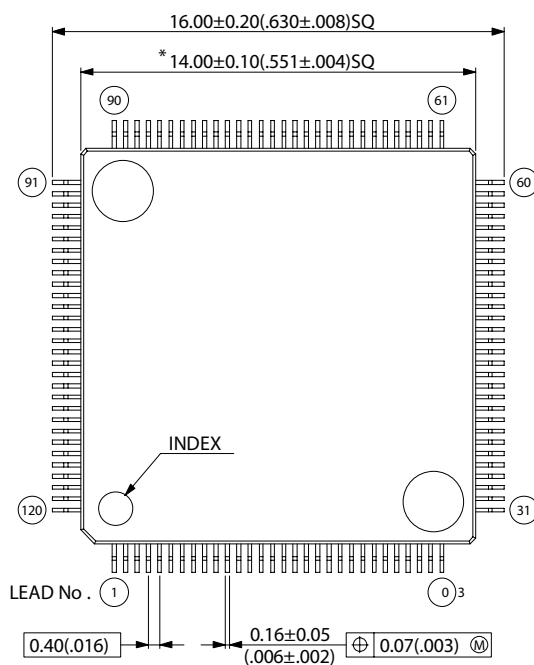
Mounting height

1.70 mm MAX

Code  
(Reference)

P-LFQFP120-14 · 14-0.4 0

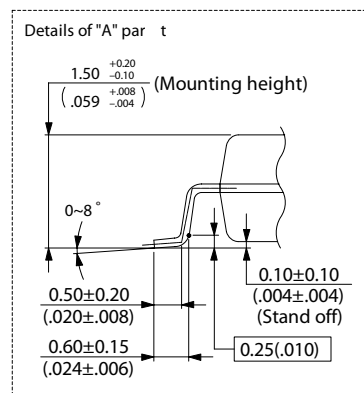
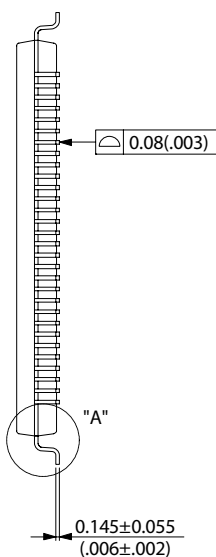
120-pin plastic LQFP



Note 1) \* : These dimensions do not include resin protrusion.

Note 2) Pins width and pins thickness include plating thickness.

Note 3) Pins width do not include tie bar cutting remainder.



Dimensions in mm (inches).  
Note: The values in parentheses are reference values.

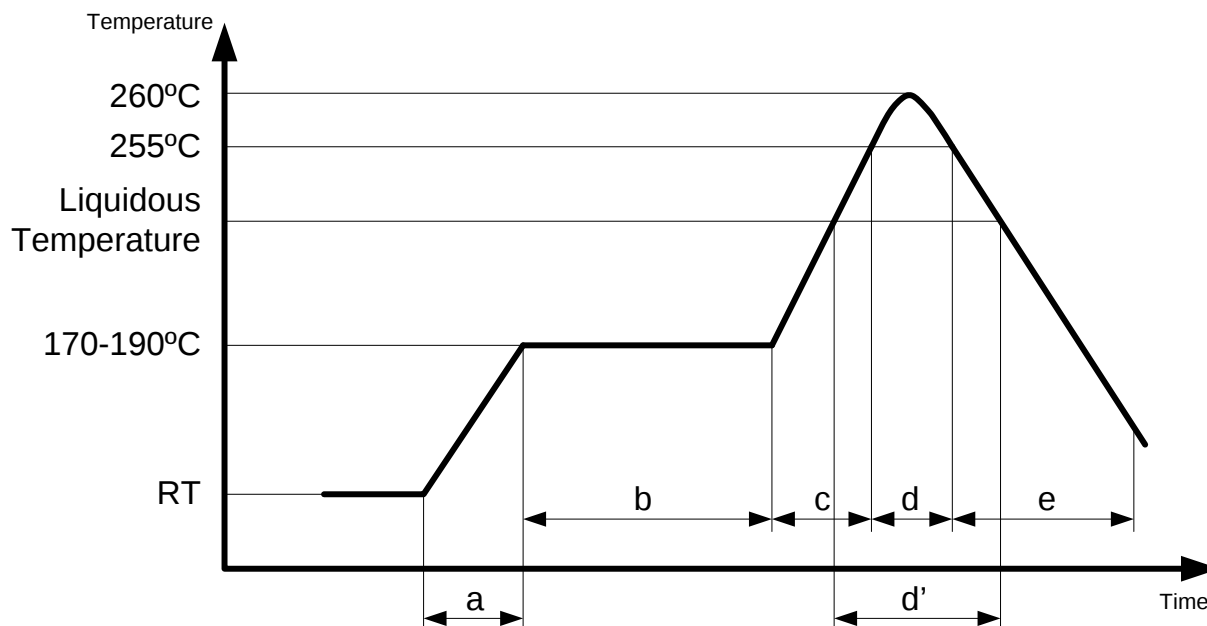
## 4. Recommended mounting conditions

### 4.1 Conditions of Standard Reflow

Table 4-1. Conditions of standard Reflow

| Items                | Contents                                                                                                         |                                                                                                                                       |
|----------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Method               | IR(Infrared Reflow)/Convection                                                                                   |                                                                                                                                       |
| Times                | 2                                                                                                                |                                                                                                                                       |
| Floor Life           | Before unpacking                                                                                                 | Please use within 2 years after production                                                                                            |
|                      | From unpacking to second reflow                                                                                  | Within 8 days                                                                                                                         |
|                      | In case over period of floor life                                                                                | Baking with 125°C +/- 3°C for 24hrs +2hrs/-0hrs is required. Then please use within 8 days. (please remember baking is up to 2 times) |
| Floor Life Condition | Between 5°C and 30°C and also below 70%RH required. (It is preferred lower humidity in the required temp range.) |                                                                                                                                       |

Figure 4-1. Temperature Profile



Note:

H rank: 260°C Max

**a:** Average ramp-up rate: 1°C/s to 4°C/s

**b:** Preheat & Soak: 170°C to 190°C, 60s to 180s

**c:** Average ramp-up rate: 1°C/s to 4°C

**d:** Peak temperature: 260°C Max, up to 255°C within 10s

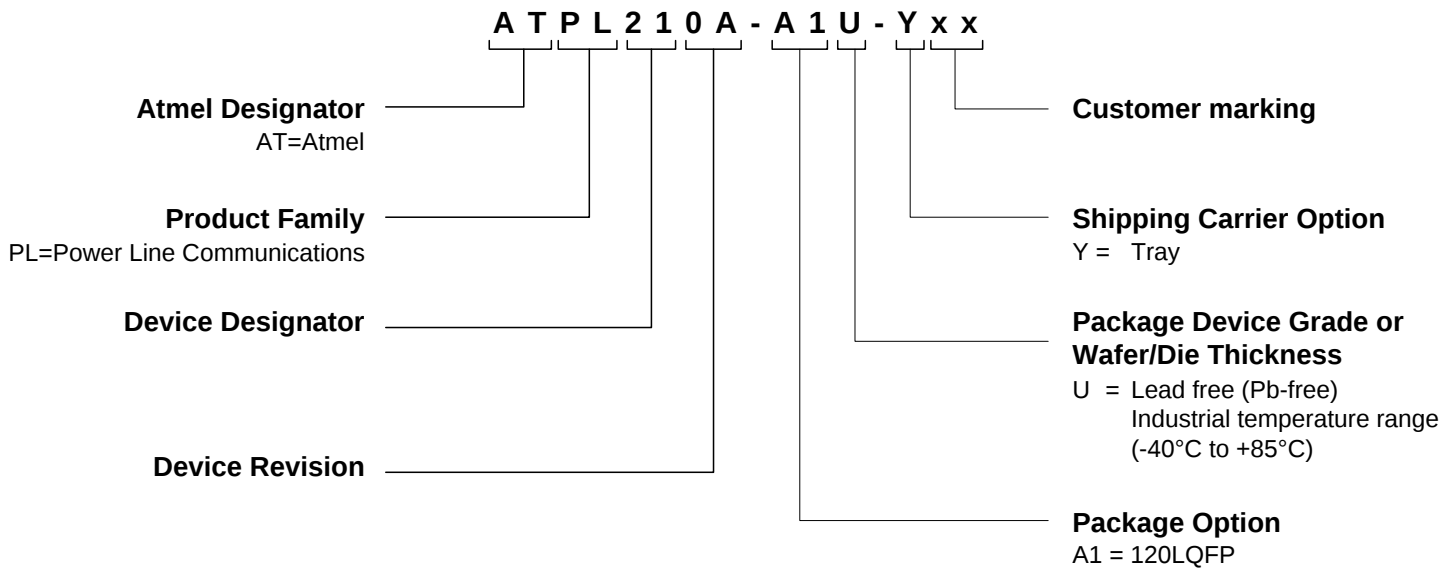
**d':** Liquidous temperature: Up to 230°C within 40s or  
Up to 225°C within 60s or  
Up to 220°C within 80s

**e:** Cooling: Natural cooling or forced cooling

## 5. Ordering Information

Table 5-1. Atmel ATPL210A Ordering Codes

| Atmel Ordering Code | Package  | Package Type | Temperature Range         |
|---------------------|----------|--------------|---------------------------|
| ATPL210A-A1U-Y      | 120 LQFP | Pb-Free      | Industrial (-40°C to 85°) |



## 6. Revision History

| Doc. Rev. | Date       | Comments        |
|-----------|------------|-----------------|
| 1.00      | 30/03/2012 | Initial release |



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