Atmel ATPL100A

FSK Power Line Communications SoC

SUMMARY DATASHEET

Features

- Core
  - ADD8051C3A enhanced 8051 core
  - Speedups up to x5 vs. standard 8051 microcontroller
- 128Kbytes internal SRAM
- In-circuit serial flash programming
- Auto boot-loading program from serial flash
- Media Access Control
  - Convolutional and block (FEC) channel coding, Viterbi decoding
  - Hardware CRC error detection and FEC error correction
  - By-pass mode to support earlier no-MAC FSK modem software
- Modem
  - Power Line Carrier Modem for 50 and 60 Hz mains
  - 8 Programmable Carrier Frequencies from 60 to 132.5KHz
  - Baud rate Selectable: 600 to 4800 bps
  - Half Duplex communication
  - Receiver Sensitivity: Up to 44dBµVrms
- Peripherals
  - Three 2-wire UARTs
  - Two SPI. SPI to serial flash and External RTC. Buffered SPI to external metering IC
  - Programmable Watchdog
  - Quad dimmer in/out
  - 24x8/28x4 segments LCD driver
  - Up to 20 I/O lines
- Package
  - 144-lead LQFP, 16 x 16 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

The ATPL100A is a Power Line Communications System on Chip. It implements a full PLC node using FSK modulations and includes a hardwired Medium Access Controller (ADD1210). It has been developed to reduce the CPU computational load in PLC systems. Thus, the microcontroller is free to be used in the applications tasks.

MAC functional capabilities of ATPL100A (performed in ADD1210 Medium Access Controller) involve the construction of message packets, adding convolutional or FEC (Forward Error Correction) codes to bytes and FCS (Frame Check Sequence) to packets. In reception, the MAC provides frame detection and Viterbi decoding or FCS and FEC correction.

ATPL100A MAC design is versatile and allows users to create a wide range of datagram structures. The MAC can be set in a bypass mode allowing direct connection between the microcontroller and the modem to support old FSK software that doesn't include the MAC.

ATPL100A PLC modem (ADD1310) can use a single power supply of 3.3V and a few external components. It supports several Analog Front End (AFE) configurations suitable for Automatic Meter Reading (AMR) or Home Automation. It can replace the traditional analog PLC modem and can use the same software libraries or a simplified version if the hardwired MAC is used.

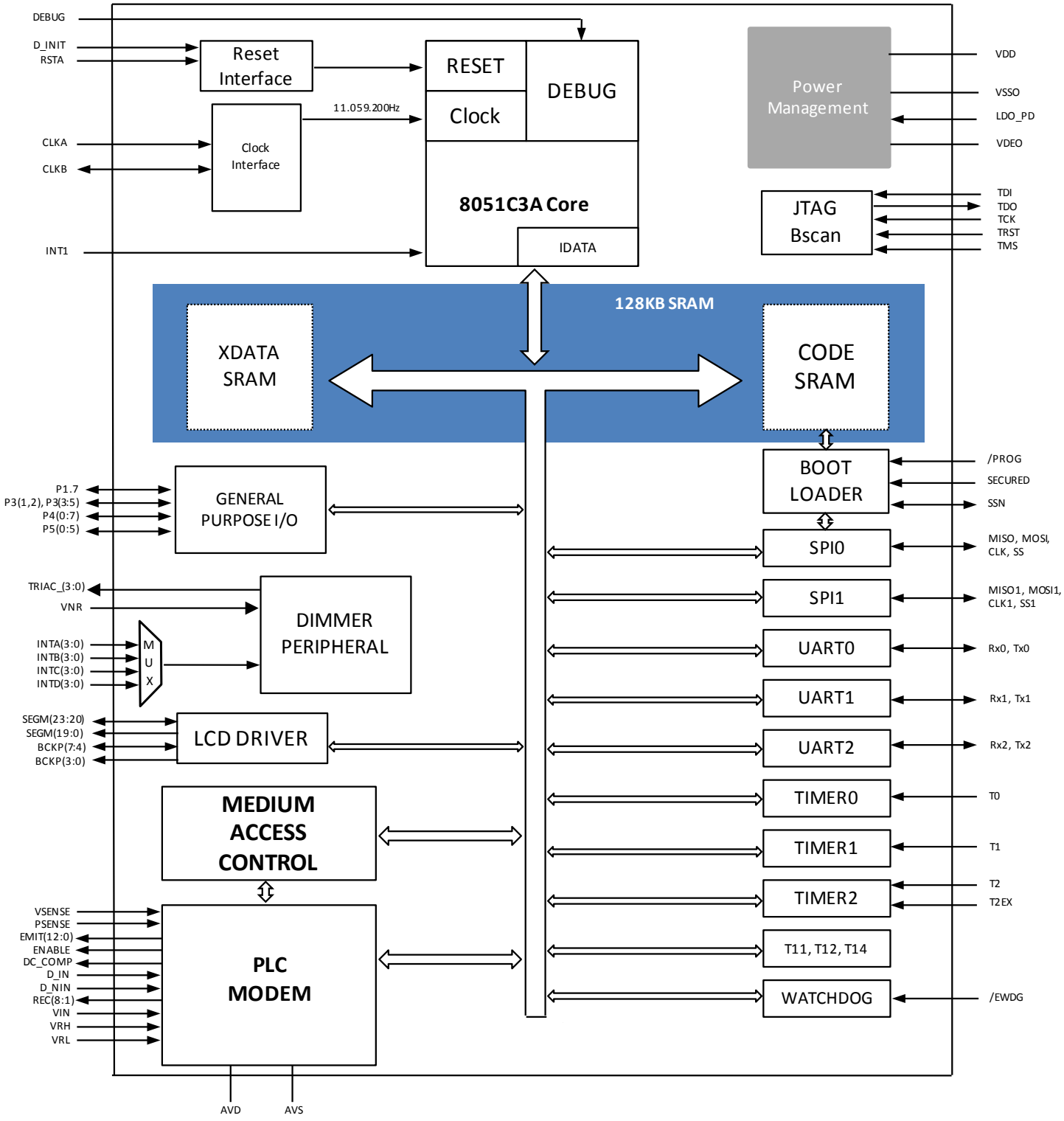
ATPL100A core (ADD8051C3A) includes all features of the standard 8051, with an average speed up x5 and some additional features.

The microcontroller includes some specific peripherals as a 4 input / 4 output dimmer for power regulation (phase angle control), also being able to generate a PWM (Pulse-Width Modulation) control.

A flash program loader allows to store the microcontroller program in a standard SPI serial flash memory and to execute it from internal SRAM. In the start-up process the program is uploaded from serial flash to the internal 128Kbytes of SRAM before start execution, after start-up the free space in the serial flash can be used to store application data. ATPL100A includes an encryption engine for code protection. Using a larger flash, several programs can be stored at the same time and the microcontroller can switch from one program to another, this feature could be used to reprogram the SoC using PLC downloading.

1. Block Diagram

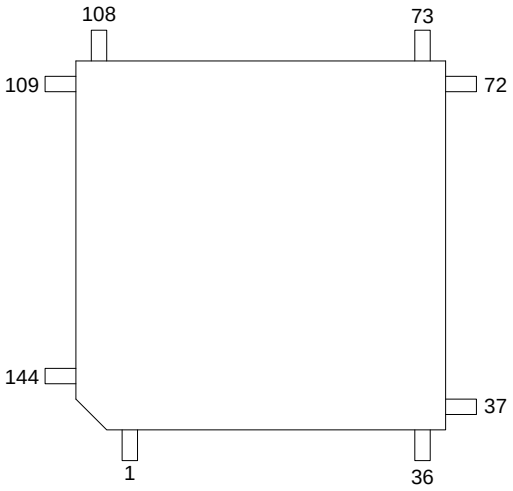
Figure 1-1. ATPL100A 144-pin Block Diagram



2. Package and Pinout

2.1 144-Lead LQFP Package Outline

Figure 2-1. Orientation of the 144-Lead Package



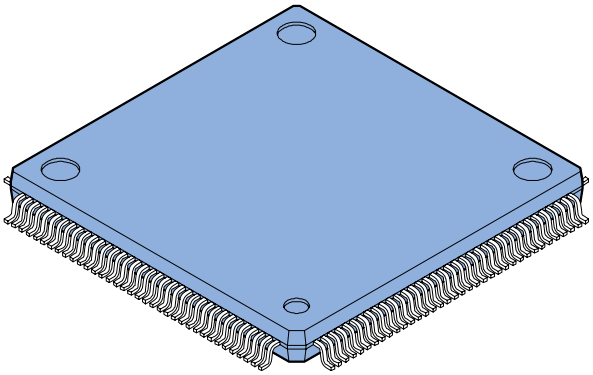
2.2 144-Lead LQFP Pinout

Table 2-1. ATPL100A 144-Lead LQFP pinout

1	P3.3/INT1	37	TRIAC_0	73	P4.0/RXD2	109	BCKP_3
2	VCC	38	P5.5/TXD1/INTA1	74	VCC	110	BCKP_2
3	GND	39	P5.4/RXD1/INTA0	75	GND	111	BCKP_1
4	GND	40	P4.7/T2EX/INTA3	76	SEGM_23/INTC3	112	BCKP_0
5	GND	41	P4.6/T2/INTA2	77	SEGM_22/INTC2	113	GND
6	TDI	42	P1.7/SSN	78	SEGM_21/INTC1	114	DC_COMP
7	TDO	43	VCC	79	SEGM_20/INTC0	115	VCC
8	TCK	44	GND	80	SEGM_19	116	ENABLE
9	TMS	45	EMIT.0	81	SEGM_18	117	GND
10	TRST	46	EMIT.1	82	SEGM_17	118	DNIN
11	D_INIT	47	EMIT.2	83	SEGM_16	119	DIN
12	RSTA	48	VCC	84	SEGM_15	120	REC_1
13	/PROG	49	GND	85	SEGM_14	121	REC_2
14	SECURED	50	EMIT.3	86	SEGM_13	122	REC_3
15	/EWDG	51	EMIT.4	87	SEGM_12	123	REC_4
16	DEBUG	52	EMIT.5	88	SEGM_11	124	REC_5
17	VCC	53	EMIT.6	89	VDD	125	REC_6
18	CLKEB	54	VCC	90	VCC	126	REC_7
19	GND	55	GND	91	GND	127	REC_8
20	CLKEA	56	EMIT.7	92	SEGM_10	128	VCC
21	VCC	57	EMIT.8	93	SEGM_9	129	GND
22	GND	58	EMIT.9	94	SEGM_8	130	VRL
23	GND	59	EMIT.10	95	SEGM_7	131	VIN
24	VDEO	60	VCC	96	SEGM_6	132	VRH
25	VDEO	61	GND	97	SEGM_5	133	AVD1
26	VSSO	62	EMIT.11	98	SEGM_4	134	AVS1
27	LDO_PD	63	EMIT.12	99	SEGM_3	135	AVD2
28	VDD	64	VCC	100	SEGM_2	136	AVS2
29	GND	65	GND	101	SEGM_1	137	VCC
30	VCC	66	P3.1/TXD0	102	SEGM_0	138	GND
31	VSENSE	67	P3.0/RXD0	103	VCC	139	P5.3/MISO0
32	PSENSE	68	P4.5/MISO1/INTB3	104	GND	140	P5.2/MOSI0
33	VNR	69	P4.4/MOSI1/INTB2	105	BCKP_7/SEGM_27/INTD3	141	P5.1/SPICLK0
34	TRIAC_3	70	P4.3/SPICLK1/INTB1	106	BCKP_6/SEGM_26/INTD2	142	P5.0/SS0
35	TRIAC_2	71	P4.2/SS1/INTB0	107	BCKP_5/SEGM_25/INTD1	143	P3.5/T1
36	TRIAC_1	72	P4.1/TXD2	108	BCKP_4/SEGM_24/INTD0	144	P3.4/T0

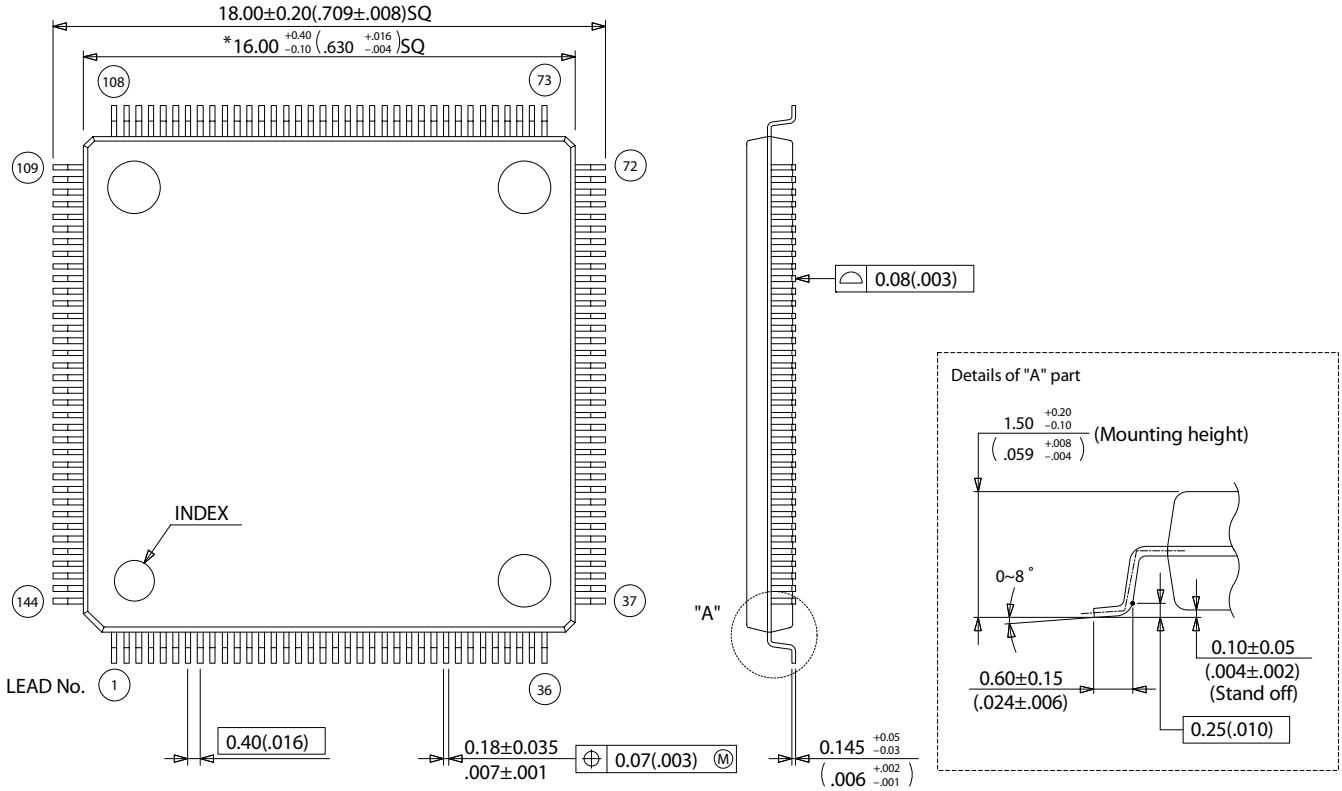
3. Mechanical Characteristics

Figure 3-1. 144-lead LQFP Package Mechanical Drawing



Lead pitch	0.40 mm
Package width · package length	16.0 · 16.0 mm
Lead shape	Gullwing
Sealing method	Plastic mold
Mounting height	1.70 mm MAX
Weight	0.88 g

Note 1) * : These dimensions include resin protrusion.
Resin protrusion is +0.25(.010)Max(each side).
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.

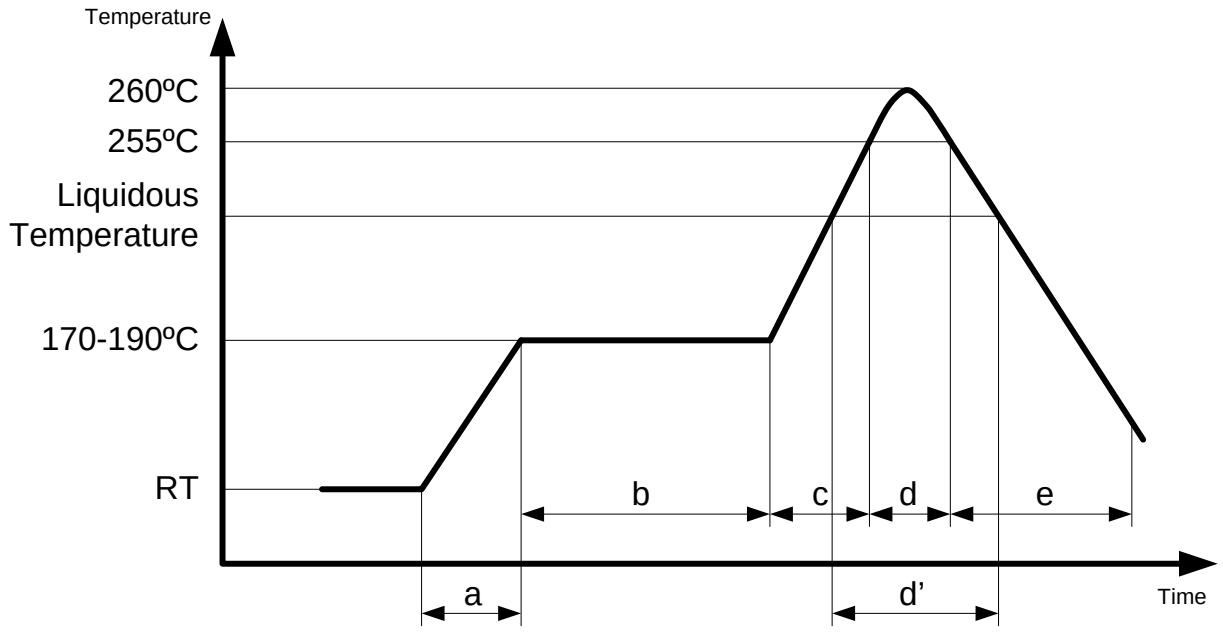
4. Recommended mounting conditions

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 125ºC +/- 3ºC for 24hrs +2hrs/-0hrs is required. Then please use within 8 days. (please remember baking is up to 2 times)
Floor Life Condition	Between 5ºC and 30ºC and also below 70%RH required. (It is preferred lower humidity in the required temp range.)	

Figure 4-1. Temperature Profile



Note: H rank: 260ºC Max

a: Average ramp-up rate: 1ºC/s to 4ºC/s

b: Preheat & Soak: 170ºC to 190ºC, 60s to 180s

c: Average ramp-up rate: 1ºC/s to 4ºC

d: Peak temperature: 260ºC Max, up to 255ºC within 10s

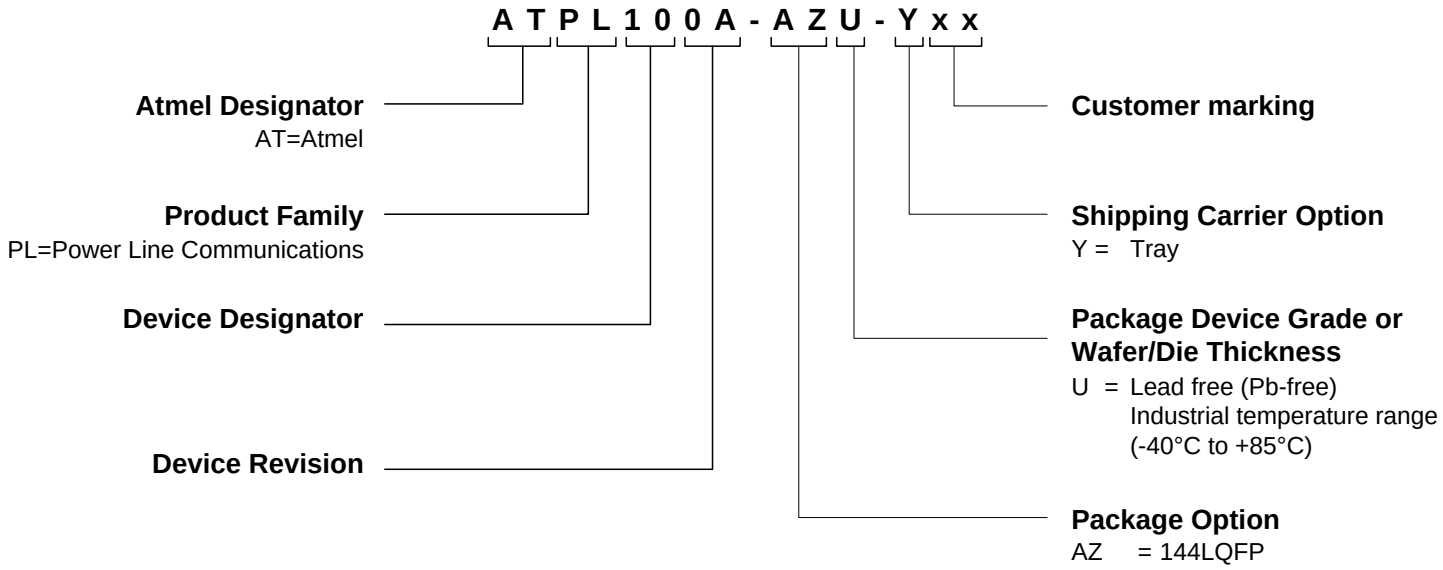
d': Liquidous temperature: Up to 230ºC within 40s or
Up to 225ºC within 60s or
Up to 220ºC within 80s

e: Cooling: Natural cooling or forced cooling

5. Ordering Information

Table 5-1. Atmel ATPL100A Ordering Codes

Atmel Ordering Code	Package	Package Type	Temperature Range
ATPL100A-AZU-Y	144 LQFP	Pb-Free	Industrial (-40ºC to 85º)



6. Revision History

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

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