

2008-07-25, Announcement and Position Paper of iAd GmbH & arivus GmbH

About iAd GmbH <http://www.iAd-de.com>

The main business activities of iAd GmbH are within the R&D area of automation- and communication-technology together with final testing of manufactured components, devices and system solutions. Most modern hard- and software modules are used in combination with the latest microprocessor technology. Solutions often end in dedicated ASICs (SoC).

Competence in communication, especially Power Line Communication PLC

In the early 1990's iAd started to develop its first PLC chip, based on the FSK principle. Key learnings were – what is known today in the industry – noises types, attenuation and signal interferences. As consequence iAd started to develop the first OFDM based PLC chip in the middle of the 1990's, and introduced into the market the Distribution Line Carrier DLC brand, especially for the utilities distribution sector. The first DLC- chip generation entered the market in 2000, 2007 iAd released the revised DLC-chipset consisting of a digital and an analogue chip. In parallel to all DLC related R&D activities iAd participated actively in several conferences, published several papers.

References

At the begin of the decade the German / European utilities market was not well prepared to enter into DLC solution, many trials were stopped much below clients expectations, generally the market refused the available DLC solutions. iAd refocused onto other industrial applications, communicating with DLC over AC and DC power lines (low and medium voltage) or even pipe lines. iAd received very positive resonance especially in safety related applications within the transportation branch. DLC technology is in daily use in RTU, modem and modem based technologies.

About arivus GmbH <http://www.arivus.eu>

Arivus GmbH is a start-up company which holds the exclusive rights of licenses of iAd's DLC patents, to market the developed products and solutions within the utilities and facilities world. Beside own manufactured products and components arivus partners with other companies providing AMM / AMI solutions or with meter manufactures to implement the DLC-chipset into their own devices. In June 2008 Baer Industrie-Elektronik GmbH (<http://www.baer-gmbh.com>) introduced an OFDM based modem into the utility market (Modemtag Frankfurt / Main), in spring 2008 ELGAMA-Elektronika Ltd. (<http://www.elgama.eu>) presented the first OFDM based static meter GAMA DLC-200 to Physikalisch Technische Bundesanstalt of Germany (PTB) and got meanwhile the appropriate MID certificate.

Performance Criteria

DLC communication is much more than only the single chipset: beside silicone you have to focus on essential solutions within the communication system software. Only a sound handshake between hardware and software ends in high performing availability and transmitted data rate. Quite often it is ignored how to handle commissioning, or re-arrangements in the grid. Automatic re-routing is mandatory. These aspects have been considered thoroughly for DLC technology to get an optimum solution.

Please find a comparison to the latest introduced chip of MAXIM (MAX2990ECB+).

How to read the comparison:

Column Compare indicates, if the feature is available and is supported by the system

- ,-,: Feature is not or only partially available within DLC-2B/2BA chipset
- ,0': Feature is identical or similar available within DLC-2B/2BA chipset
- ,+': Feature within DLC-2B/2BA chipset is more extensive or with higher performance

Features of MAX2990 (see abridged data sheet [MAX2990])	Com- pare	Features of DLC-2B, DLC-2BA (see flyer data sheet)
Combines the Physical Layer (PHY) and Media Access Controller (MAC)	0	Same solution
Integrated microcontroller and 8kB SRAM	0	Integrated Microcontroller and 128kB SRAM
32kB password-protected flash memory	-	External SPI Flash Memory (0.5 – 16 MB)
Maximum effective data rate in normal mode: 32kbps at 10kHz to 95kHz and 100kbps at 10kHz to 490kHz	+	9.6 to 576 (288 CENELEC) kbps
Complies with CENELEC A (10kHz to 95kHz) CENELEC B (95kHz to 120kHz) CENELEC C (120kHz to 140kHz) FCC (10kHz to 490kHz) ARIB (10kHz to 450kHz)	0 0 0 0 0	Same compliances
Includes Forward Error Correction (FEC) mechanism and CRC16	+	DLC chips uses 64-state convolutional coding and soft input viterbidecoding, CRC32; by this higher probability to identify errors and lower probability of false detection of packets in case of sync failures; Alternatively Reed-Solomon as 2nd FEC
Includes fast DES engine as the encryption/decryption coprocessor and CRC32	-	Today no real data coding available; However, data transmission with „data scrambling“
Jammer cancellation for FCC and ARIB	0	DLC chips uses special demodulation and strong FEC to compensate interferences, i.e. notches
User-configured start and end operating frequency	0	Bandwidth and carrier frequencies free to configure
Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) Channel Access Arbitration	0	Designed for channel access via TDMA/FDMA and SALA (slotted Aloha local acknowledgement). The CSMA/CA approach could be activated easily, however data throughput becomes worse
Automatic Repeat Request (ARQ) to enhance error detection and improve data reliability	0	ARQ-Mechanism is provided as software function
Supports SPI, I ² C, and UART interfaces	0	2 x SPI, CAN and 2 x UART; I ² C can be realized via port pins of the micro controller
Real-Time Clock (RTC)	+	RTC with extended resolution to 1/1024s
PWM Counters	0	3 PWMs available
Built-In test mode engine for identifying channel conditions	+	Chips have integrated test & diagnose function to display transfer function, noise spectrum, characteristics of impulse noise, ...)
BPSK-Modulation	+	DLC offers alternatively other, higher developed modulation (DQPSK, D8PSK, D2A8PSK) to achieve even higher data rates

Features of MAX2990 (see abridged data sheet [MAX2990])	Com- pare	Features of DLC-2B, DLC-2BA (see flyer data sheet)
Quantities: 1000-up, FOB USA Pricing starts at US \$8,50 No information No information	0 ? ?	Quantities: 1000-up, FOB Germany For successfully running a DLC device both digital and analogue chip are required as well as sufficient peripherals (transducers, coupling devices, filters, ...). DLC-2B (digital), DLC-2BA (analogue) and Peripherals we offer to competitive prices
No detailed information available	+ + + + + + + + +	Fast AGC with 84 dB dynamic in less than 100µs; High order band pass filters for out band disturber suppression; Blind channel equalization; support for precious time synchronization; support of SFN based ad hoc networking; support of fast broadcasts / multi-casts; support for redundant networks and roaming; Emulation board (PLM) available; Chipset approved in the field (REMPLI, industry); Third party products available based on these chipsets (ELGAMA, BAER); Chipset introduced and presented on IEEE Conference ISPLC, April 2005, Vancouver.

Since the market introduction of iAd's high speed narrow band OFDM DLC Chipset the leading edge is confirmed by the major players of the power line community. Beside Maxim also the Spanish PRIME project currently specifies criteria to design develop and produce an appropriate OFDM chip. iAd and arivus are still in the market, industrial references give evidence regarding performance criteria. We invite the market to learn and implement this forward-looking technology.

For further information please visit www.iAd-de.com and www.arivus.eu.