

## Features

- Highly Integrated Digital Device for DAB Receivers (Eureka 147)
- Utilizes the ARM7TDMI® Core
  - High-performance 32-bit RISC Architecture
  - High-density 16-bit Instruction Set
  - Embedded ICE (In-Circuit Emulation)
- Utilizes TeakDSPCore™
  - 16-bit Fixed-point Digital Signal Processing Core
- HDAB OFDM Channel Demodulator and Decoder
  - Fully Integrated, Supports all DAB Functions and Modes
  - Full Data Rate of 1.8 Mbit Can Be Decoded
  - Automatic Mode Detection (AMD)
  - Digital AFC (Frequency Tolerance < 0.5 Hz for Mode I)
  - Digital AGC with a Wide Gain Control Range
  - Demodulation and Decoding of up to 64 UEP/EEP Sub-channels
- Audio Source Decoder (ASD) and Data Decoder (DD)
  - On-chip De-interleaver Memory for Full 1.8 Mbit/s Decoding Data Rate
  - PAD Extraction
  - Two Independent Data Packet Mode Decoder
- Integrated High-density SRAM Supporting Time and Frequency De-interleaving
- 10 Msps High-speed Low-power Pipelined ADC
  - Supports Wide IF Range of 2.048 MHz to 50 MHz
  - Complex Bandpass Filtering
  - Optional SAW Filter Equalization
- ARM7TDMI Core User Software Extension
  - Audio Player MP3 Support
- Large Variety of Interfaces
  - I<sup>2</sup>S/SPDIF, SFCO, SSO, RDI, RS-232, USART
  - USB V1.1 Full Speed
  - Two USARTs
  - CAN 2.0A and 2.0B
- Master/Slave SPI Interface
  - Two Dedicated Peripheral Data Controller (PDC) Channels
  - 8- to 16-bit Programmable Data Length
  - Four External Slave Chip Selects
- Programmable Watchdog Timer
- Power Management Controller (PMC)
  - CPU and Peripherals Can Be De-activated Individually
  - Simple But Comfortable Gearing and Clocking Unit
- 32 User Programmable I/O Lines (PIO)
- Low-power Consumption for Portable Applications (3.3V and 1.8V)
- Robust LQFP128 Package, BGA121 Package
- Very Low External Component Count



## DAB Digital Processing Device

ATR2740

## Summary

**NOTE:** This is a summary document. The complete document is available under NDA. For more information, please contact your local Atmel sales office.

4816FS-DAB-07/08



## 1. Description

The ATR2740 is a fully integrated processing unit which covers all DAB- (Eureka 147, ETS 300 401) related digital tasks like DAB OFDM demodulation and decoding, audio source decoding, data decoding, as well as time and frequency synchronization.

The device consists of a high-performance 32-bit RISC ARM7TDMI core, an additional TeakDSPCore, embedded memories, an analog-to-digital converter (ADC), as well as a DAB channel demodulator and decoder IP, and two independent audio source decoder engines. A large variety of interfaces, including USB, SPI, USART and RDI, are provided.

The ATR2740 baseband processor is controlled by a standard ARM7TDMI core, which is a very well-known controller. This allows the designers to work with standard tools, which results in reduced development costs and very fast time to market.

The ARM7TDMI core is designed to perform the DAB receiver tasks, MMI and further user software extensions such as MP3 decoding or data decoding.

The ATR2740 is manufactured using Atmel's high-density CMOS technology. By combining all functions on one SoC (System-on-Chip), including a wide range of peripheral functions on a monolithic chip, the ATR2740 provides a highly flexible and cost-effective solution for DAB applications.

The advanced Atmel technology and the architecture of the ATR2740 enable maximum performance at a very low current consumption.

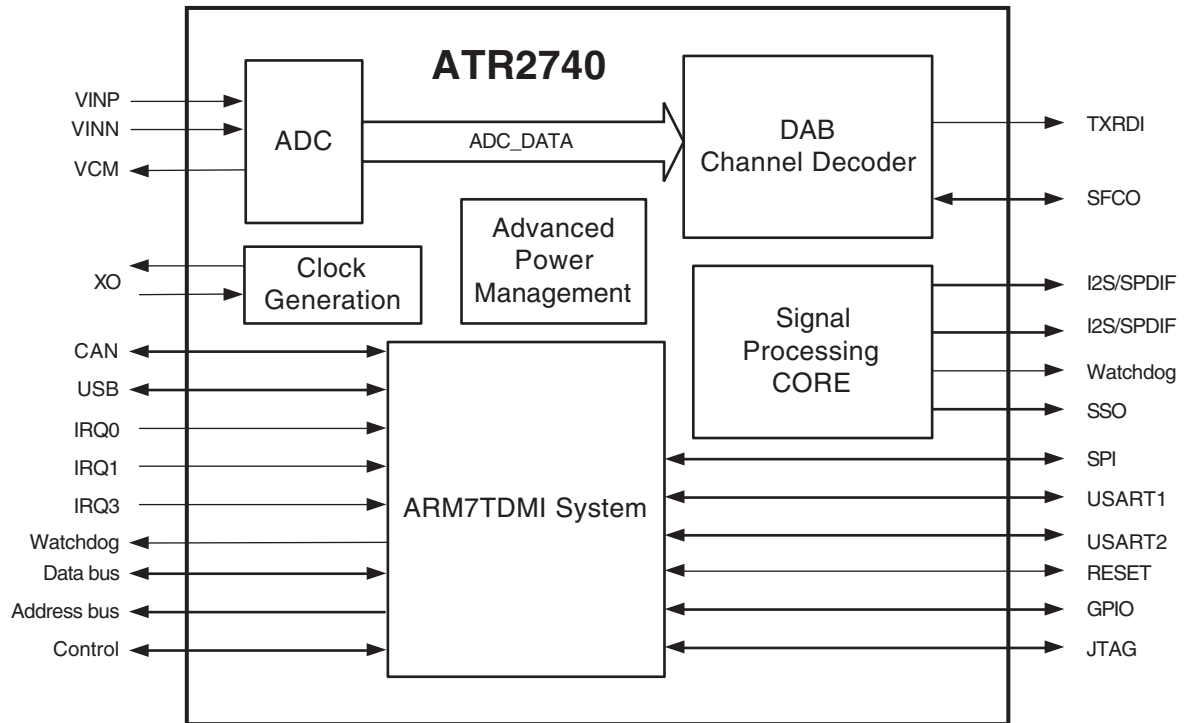
The wide flexibility offered by the ATR2740 is due to the large variety of interfaces supported. For control functions, UART, USB, and SPI are available. As data interfaces, an SSO, SFCO, US Band RDI, as well as two audio outputs (either I<sup>2</sup>S or SPDIF), are available.

Due to the high integration of the device, the external component count is as low as only two external parts; a simple crystal and a 16-MB flash memory are required to run the full DAB function. All RAM, such as interleaving or program memory, as well as the ADC are incorporated into the device. The part works perfectly together with Atmel's DAB front-end parts.

The processing power available with the ATR2740 is sufficient to enable the part to decode the full DAB data rate of 1.8 Mbits. In addition, there is still unused processing power available on the ARM7TDMI controller for customer software. It is easy to run a complete MP3 player without the need to add extra hardware to the device.

A complete set of tools for hardware and software, including documentation that allows easy design-in and a fast time to market, is available on request.

Figure 1-1. Block Diagram



## 2. Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameters	Symbol	Min.	Max.	Unit
Operating free air temperature range for LQFP128		-40	+85	°C
Operating free air temperature range for BGA121		-10	+70	°C
Storage temperature	$T_{Stg}$	-60	+150	°C
DC supply voltage	VDD18	-0.3	+1.95	V
	VDD33	-0.3	+3.6	V
	AVDD	-0.3	+3.6	V
DC input voltage		-0.3	+1.95	V

Notes: 1. The part may not survive if all maximums are applied simultaneously.

Electrostatic sensitive device.  
Observe precautions for handling.



## 3. DC Electrical Characteristics

Test conditions (if not otherwise specified):  $V_{CC} = +1.8V$ ,  $T_{amb} = +25^{\circ}C$

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
1.1	DC supply voltage			VDD18	1.65	1.8	1.95	V	D
1.2	Low-level input voltage	VDD18 = 1.65 to 1.95V		$V_{IL}$	-0.3		$+0.3 \times VDD18$	V	D
1.3	High-level input voltage	VDD18 = 1.65 to 1.95V		$V_{IH}$	$+0.7 \times VDD18$		VDD18 + 0.3	V	D
1.4	Low-level output voltage	$I_{OL} = 1.5 \text{ mA}$ VDD18 = 1.65V		$V_{OL}$			0.4	V	C
1.5	High-level output voltage	$I_{OH} = -1.5 \text{ mA}$ VDD18 = 1.65V		$V_{OH}$	1.2			V	C
1.11	Crystal oscillator frequency					24.576		MHz	D
1.12	Clock duty cycle				40		60	%	D
1.14	USB DC supply voltage	Full speed		VDD33	3	3.3	3.6	V	D
1.15	USB input low level			VILUSB			0.8	V	D
1.16	USB input high level			VIHUSB	2.0			V	D
1.17	USB differential input sensitivity			VDIUSB	0.2			V	D
1.18	USB differential input common mode range			VCMUSB	0.8		2.5	V	D

\*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

### 3. DC Electrical Characteristics (Continued)

Test conditions (if not otherwise specified):  $V_{CC} = +1.8V$ ,  $T_{amb} = +25^{\circ}C$

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
1.19	USB output low level			VOLUSB	0.0		0.3	V	D
1.20	USB output high level			VOHUSB	2.8		3.6	V	D
1.21	Transition rise time	Full speed		TFR	4		20	ns	D
1.22	Transition fall time	Full speed		TFE	4		20	ns	D
1.23	USB crystal oscillator frequency			FUSB		8		MHz	D
1.24	USB clock duty cycle				40		60	%	D
1.25	JTAG TCK frequency			FTCK	0.02		33	MHz	D

\*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

### 4. Electrical Characteristics on ADC/IF Input

Test conditions (if not otherwise specified):  $V_{CC} = +3.3V$ ,  $T_{amb} = +25^{\circ}C$

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
2.1	ADC DC supply voltage			AVDD	3	3.3	3.6	V	D
2.2	IF frequency range			FIF	2.048		50	MHz	D

\*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

### 5. DC Power Consumption

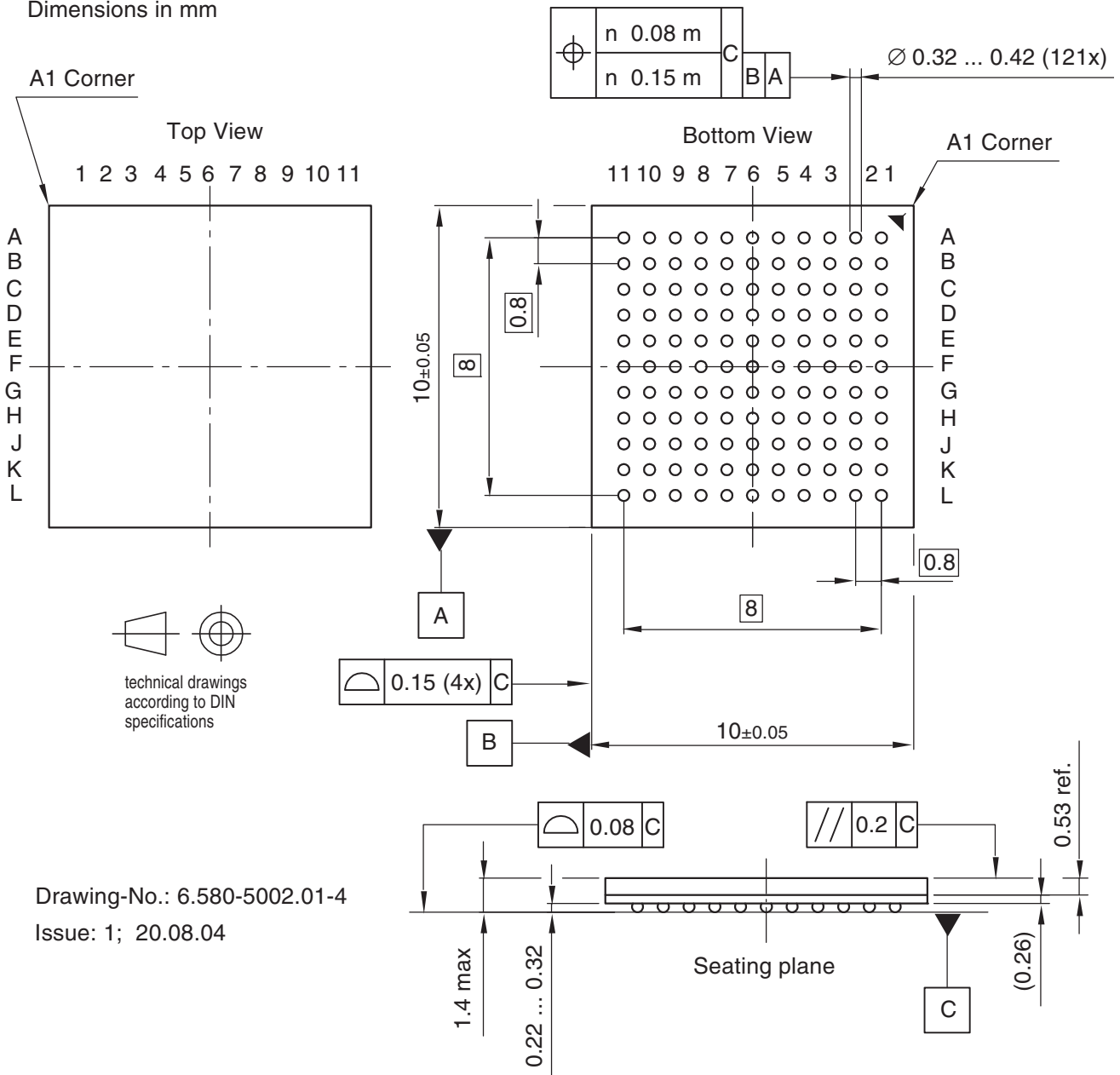
Test conditions (if not otherwise specified):  $V_{CC} = +1.8V$ ,  $T_{amb} = +25^{\circ}C$

Mode	Conditions	Typ.	Max.	Unit
<b>Core Power Consumption</b>				
DAB full	Decode of all MSC's and 1 audio sub-channel	80		mA



### 8. Package Information BGA121

Package: R-LFGBA 121\_A  
 Dimensions in mm



technical drawings according to DIN specifications

Drawing-No.: 6.580-5002.01-4  
 Issue: 1; 20.08.04

## 9. Revision History

Please note that the following page numbers referred to in this section refer to the specific revision mentioned, not to this document.

Revision No.	History
4816FS-DAB-06/08	<ul style="list-style-type: none"><li>• All pages and page 1: Preliminary deleted</li><li>• Page 1: Broadcast radio logo deleted</li><li>• Page 4-5: DC El. Char. Table: some changes</li><li>• Page 5: El. Char. on ADC/IF Input Table: some changes</li></ul>





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