

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)
 - 128-kByte Program and Data RAM
- Utilizes TeakDSPCore®
 - 16-bit Fixed-point Digital Signal Processing Core
 - High-performance Dual MAC Architecture
 - 75 MHz Single Clock Design
- DAB OFDM Channel Demodulator and Decoder
 - Fully Integrated, Supports all DAB Functions and Modes
 - Full Data Rate of 1.8 Mbit Can Be Decoded
 - Proven Time and Frequency Synchronization with a Wide-range Parameter Set
 - 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
 - Support of Dynamic Multiplex Reconfiguration (DMR) without Mute State
 - Digital Zero-symbol Detection (FSYNCH Generation)
- Audio Source Decoder (ASD) and Data Decoder (DD)
 - On-chip De-interleaver Memory for Full 1.8 Mbit/s Decoding Data Rate
 - Programmable Fader
 - Programmable DRC
 - 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 MPEG3 Support
- Large Variety of Interfaces
 - I2S/SPDIF, SFCO, SSO, RDI, RS-232, USART
 - USB 2.0 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
- Simple Memory Concept, Only One External Flash Required
- 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 (3.3 V and 1.8 V)
- Robust LQFP128 Package, BGA121 Package
- Very Low External Component Count



DAB Digital Processing Device

ATR2740

Summary

Preliminary

Electrostatic sensitive device.
Observe precautions for handling.



Rev. 4816BS–DAB–11/04



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

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 and time, as well as 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 is 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.

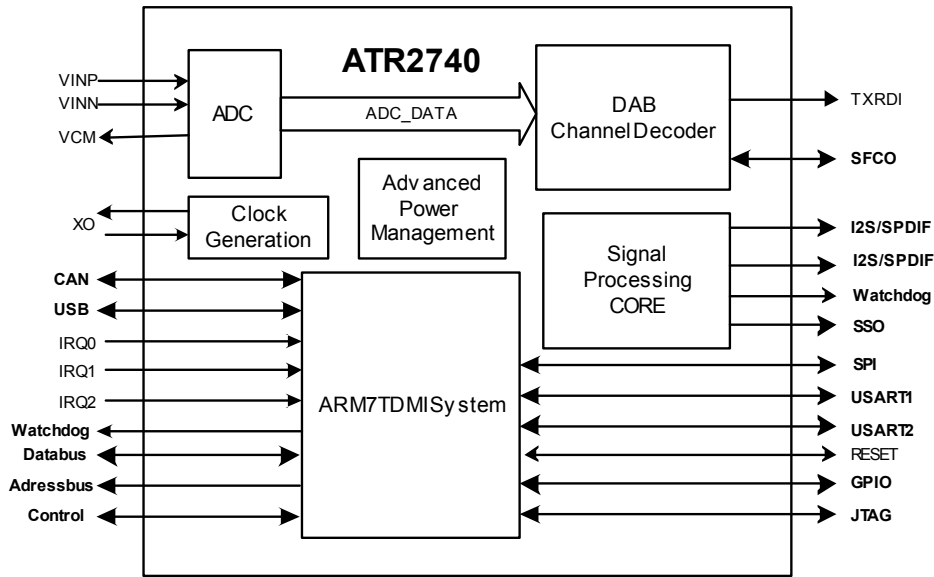
The wide flexibility offered by the ATR2740 is due to the large variety of interfaces supported. For control functions, UART, USB, and SPI are available. As data interface an SSO, SFCO, US Band RDI interfaces as well as two audio output (either I2S or SPDIF) are available.

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. Block Diagram



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.

DC Electrical Characteristics

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

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
1.1	DC supply voltage			VDD18	1.65	1.8	1.95	V	
1.2	Low-level input voltage	VDD18 = 1.65 to 1.95 V		V_{IL}	-0.3		$+0.3 \times VDD18$	V	
1.3	High-level input voltage	VDD18 = 1.65 to 1.95 V		V_{IH}	$+0.7 \times VDD18$		VDD18 + 0.3	V	
1.4	Low-level output voltage	$I_{OL} = 0.3\text{ mA}$ VDD18 = 1.65 V		V_{OL}			0.1	V	

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

DC Electrical Characteristics (Continued)

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

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
1.5	High-level output voltage	$I_{OH} = 0.3\text{ mA}$ $V_{DD18} = 1.65\text{ V}$		V_{OH}	$V_{DD18} - 0.1$			V	
1.12	Crystal oscillator frequency					24.576		MHz	
1.13	Clock duty cycle				40		60	%	
1.15	USB DC supply voltage	Full speed		V_{DD33}	3	3.3	3.6	V	
1.16	USB input low level			V_{ILUSB}			0.8	V	
1.17	USB input high level			V_{IHUSB}	2.0			V	
1.18	USB differential input sensitivity			V_{DIUSB}	0.2			V	
1.19	USB differential input common mode range			V_{CMUSB}	0.8		2.5	V	
1.20	USB output low level			V_{OLUSB}	0.0		0.3	V	
1.21	USB output high level			V_{OHUSB}	2.8		3.6	V	
1.22	Transition rise time	Full speed		TFR	4		20	ns	
1.23	Transition fall time	Full speed		TFE	4		20	ns	
1.24	USB crystal oscillator frequency			FUSB	4	8	9	MHz	
1.25	USB clock duty cycle				40		60	%	
1.26	JTAG TCK frequency			FTCK	0.02		33	MHz	

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

Electrical Characteristics on ADC/IF Input

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

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

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

DC Power Consumption

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

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

Ordering Information

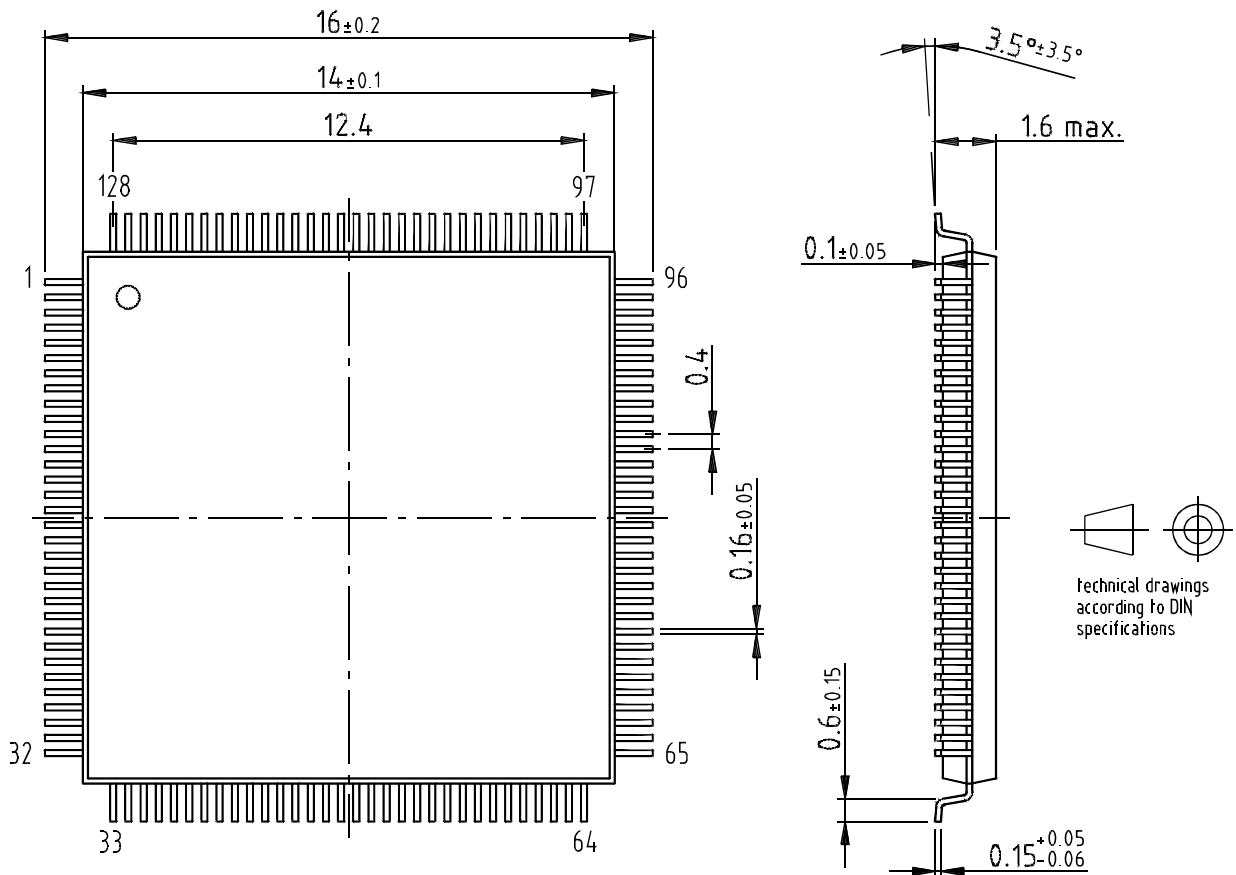
Extended Type Number	Package	Remarks
ATR2740-RQHH	LQFP128	16 mm × 16 mm, 0.40 mm pitch, lead free
ATR2740-7GHG	BGA121	10 mm × 10 mm, 0.80 mm pitch, lead free

Package Information LQFP128

Package: LQFP 128

(acc. JEDEC OUTLINE No. MS-026)

Dimensions in mm



Drawing-No.: 6.543-5103.01-4

Issue: 1; 15.09.03



Atmel Corporation

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 487-2600

Regional Headquarters

Europe

Atmel Sarl
Route des Arsenaux 41
Case Postale 80
CH-1705 Fribourg
Switzerland
Tel: (41) 26-426-5555
Fax: (41) 26-426-5500

Asia

Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimshatsui
East Kowloon
Hong Kong
Tel: (852) 2721-9778
Fax: (852) 2722-1369

Japan

9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

Atmel Operations

Memory

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

Microcontrollers

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

La Chantrerie
BP 70602
44306 Nantes Cedex 3, France
Tel: (33) 2-40-18-18-18
Fax: (33) 2-40-18-19-60

ASIC/ASSP/Smart Cards

Zone Industrielle
13106 Rousset Cedex, France
Tel: (33) 4-42-53-60-00
Fax: (33) 4-42-53-60-01

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

Scottish Enterprise Technology Park
Maxwell Building
East Kilbride G75 0QR, Scotland
Tel: (44) 1355-803-000
Fax: (44) 1355-242-743

RF/Automotive

Theresienstrasse 2
Postfach 3535
74025 Heilbronn, Germany
Tel: (49) 71-31-67-0
Fax: (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

Biometrics/Imaging/Hi-Rel MPU/ High Speed Converters/RF Datacom

Avenue de Rochepleine
BP 123
38521 Saint-Egreve Cedex, France
Tel: (33) 4-76-58-30-00
Fax: (33) 4-76-58-34-80

Literature Requests

www.atmel.com/literature

Disclaimer: The information in this document is provided in connection with Atmel products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of Atmel products. **EXCEPT AS SET FORTH IN ATMEL'S TERMS AND CONDITIONS OF SALE LOCATED ON ATMEL'S WEB SITE, ATMEL ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL ATMEL BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF ATMEL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.** Atmel makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. Atmel does not make any commitment to update the information contained herein. Atmel's products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life.

© Atmel Corporation 2004. All rights reserved. Atmel®, logo and combinations thereof, are registered trademarks, and Everywhere You AreSM are the trademarks of Atmel Corporation or its subsidiaries.

ARM7TDMI® is a registered trademark of ARM Ltd.

TeakDSPCore® is a registered trademark of Ceva Inc.

Other terms and product names may be trademarks of others.



Printed on recycled paper.

4816BS-DAB-11/04