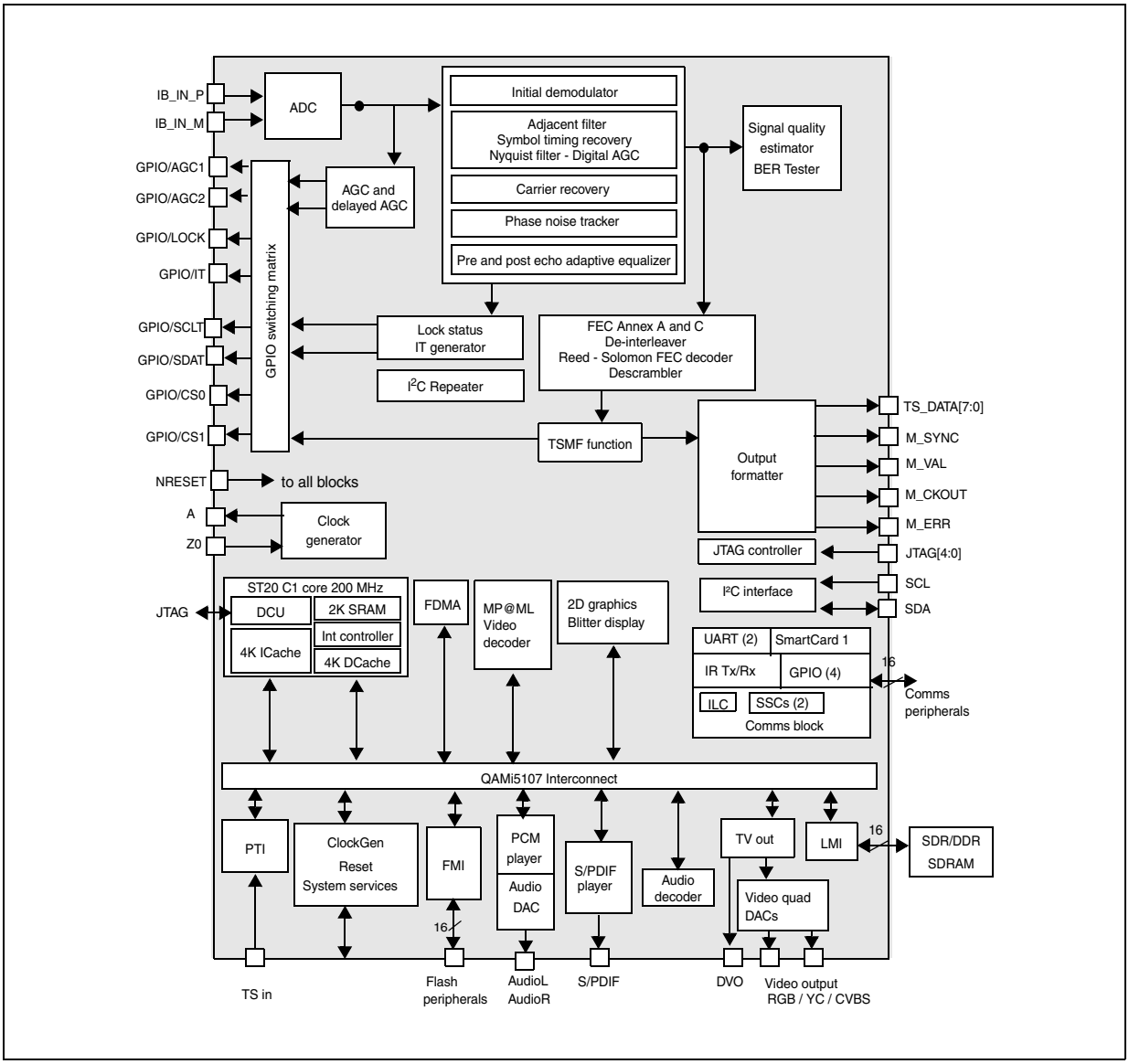
QAMi5107

Low-cost QAM demodulator and MPEG2 decoder SOC for set-top boxes

Data Brief

Features

- ITU-T J.83 A/C, DVB-C, TSMF compliant
- Full video and audio decoding features
- Comprehensive on-chip peripherals
- Advanced security ready, compatible with latest CA requirements.



1 Description

The QAMi5107 provides an integrated demodulator/decoder solution for digital cable receivers for compressed video, sound and data services. A QAM (quadrature amplitude modulation) demodulator and FEC performs IF to MPEG-2 block processing of QAM carriers. The demodulated stream is then processed by video and audio decoders.

The device implements a fully unified SDR SDRAM based memory architecture that integrates the Omega2 video decoder cell together with a blitter engine and a multichannel DMA controller to provide enhanced performance for graphics and real-time stream transfers. Transfer of data such as pixmaps, audio streams, stills and PES can be performed efficiently using the QAMi5107 DMA.

A true-color mode provides OSD graphics allowing the display of RGB16 formats: RGB565, ARGB1555 and ARGB4444. This directly supports up to 65,536 colors in a region. Alpha blending by region or by pixel is available for mixing with video and background layers. The above feature set, guarantees a smooth user interface and high performance for demanding middlewares such as MHP™.

The QAMi5107 is the first single chip cable STB IC to combine a very low cost solution with advanced security features. DVB and ICAM descramblers together with a smart card interface ensure that all the major conditional access systems can be supported.

1.1 QAM Demodulator features

- Decodes ITU-T J.83-Annexes A/C and DVB-C bit streams
- Processes Japanese transport stream multiplex frame (TSMF)
- High-performance integrated A/D converter suitable for direct IF architecture in all QAM (quadrature amplitude modulation) modes
- Supports 16, 32, 64, 128 and 256 point constellations
- Very low power consumption
- Full digital demodulation
- Variable symbol rates
- Front derotator for better low symbol rate performance and relaxed tuner constraints
- Integrated matched filtering
- Robust integrated adaptive pre and post equalizer
- On-chip FEC A/C with ability to bypass individual blocks
- 10 programmable GPIO
- Two AGC outputs suitable for delayed AGC applications (sigma-delta outputs)
- Integrated signal quality monitors, plus lock indicator and interrupt function mapped to GPIO pin
- Improved signal acquisition
- System clock generated on-chip from quartz crystal
- Low frequency crystal operations 4, 16, 25 - 30 MHz
- 4 I²C addresses
- Easy control and monitoring via 2-wire fast I^2C bus

- Additional I^2C bus (I^2C repeater) dedicated to tuner control for minimum tuner disturbance
- Programmable clock derived from system clock and available for external use
- Parallel and serial output interfaces, with DVB common interface support
- On chip voltage regulator
- CMOS technology, 1.0 V operation

1.2 Decoder features

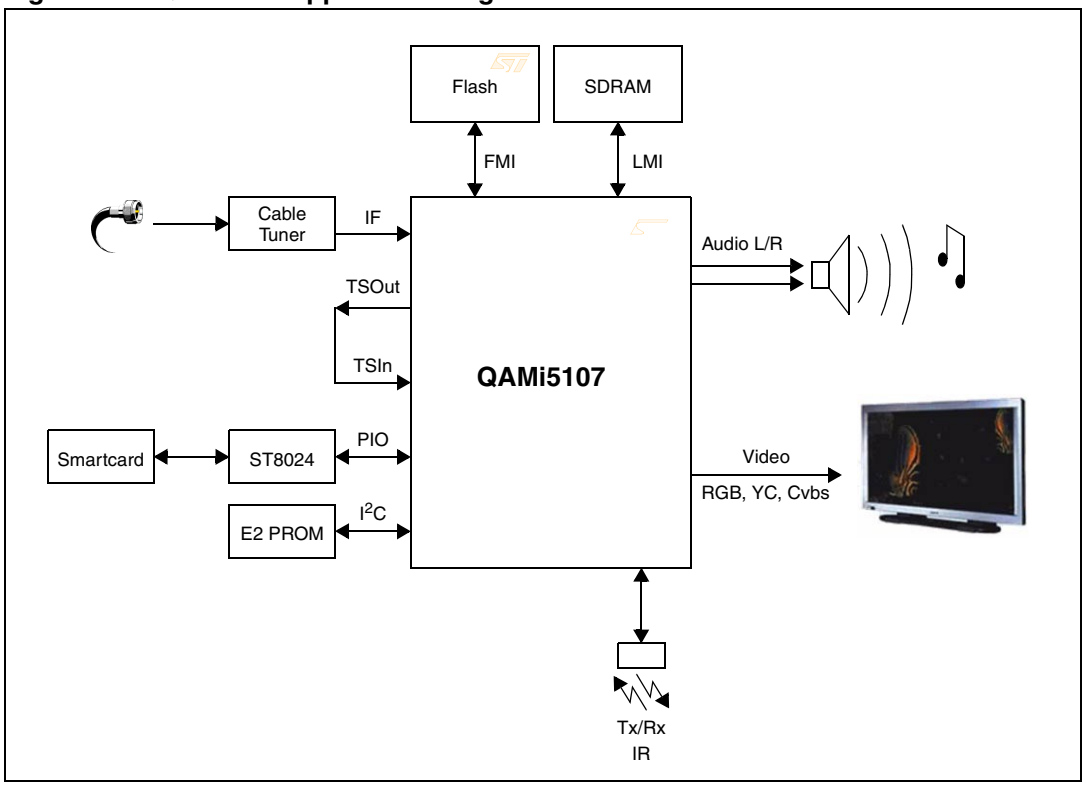
- Enhanced ST20 32-bit VL-RISC CPU
  - 200-MHz, single cycle cache, 4-Kbyte instruction cache, 4-Kbyte data cache, 2-Kbyte SRAM
- Unified memory interface
  - Up to 166 MHz,16-bit wide SDRAM interface and 133 MHz DDR interface
- Programmable flash memory interface
  - 4 separately configurable banks, 8/16-bits wide
  - SRAM, peripheral, flash, SFlash™ support
  - Support for low cost DVB-CI
- Programmable transport interfaces (PTI)
  - single transport stream input
  - support for DVB transport streams
  - integrated DVB, ICAM descramblers
- MPEG2 MP@ML video decoder
  - Fully programmable horizontal and vertical SRCs
- Graphics/display
  - 3 display planes
  - 8 bpp CLUT graphics, 256 x 30 bits (AYCbCr) CLUT entries, 16 bpp true color graphics, RGB565, ARGB1555, ARGB4444 formats. Link list control
  - Alpha blending, antialiasing, antiflutter, antiflicker filters
  - 2-D paced blitter engine with fill function
  - Blitter based display compositor
  - Digital video output: compliant with CCIR 601/CCIR 656.
- PAL/NTSC/SECAM encoder
  - RGB, CVBS, Y/C and YUV outputs with four 10-bit DACs outputs. RGB/CVBS or YUV/CVBS or YC/CVBS
  - Encoding of CGMS, Teletext, WSS, VPS, closed caption
- Audio subsystem
  - MPEG-1 layers I/II decoding
  - Simultaneous MPEG audio decode and output of Dolby streams on S/PDIF
  - IEC958/IEC1937 digital audio output interface
  - Integrated stereo audio DAC system
- Central DMA controller

- On-chip peripherals
  - 2 ASCs (UARTs) with Tx and Rx FIFOs
  - 3 banks of 8-bit and 1 bank of 7-bit parallel I/O
  - 1 smartcard interface and clock generator
  - 2 SSCs for I²C /SPI master/slave interfaces
  - Infrared transmitter/receiver
  - Integrated VCXO
  - Low-power / RTC / watchdog controller
- JTAG/TAP interface

2 Applications

The QAMi5107 is targeted at worldwide cable markets that use ITU-T J83 Annexes A/C or DVB-C specifications. It provides a single chip solution for the following functions: QAM demodulation, FEC, transport, descrambling, MPEG a/v decoding, CPU, graphics and peripherals. Few external components are required to realize a complete STB solution resulting in very low BOM cost. The QAMi5107 is perfectly suited for digital conversion of existing analog networks as well as providing advanced security enhancements and system cost down for designs currently using the QAMi5516 and STx5105/STx5107.

Figure 1. QAMi5107 application diagram - low-cost Cable STB



3 Revision history

Table 1. Document revision history

Date	Revision	Changes
20-Dec-2006	1	Initial release.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com