

## Features

- **General**
  - Serial ATA Rev.1.0a Compliant Gen1 Physical Layer
  - 150 MHz Frequency Synthesizer for ASIC Clock Generation
  - Built-in Transmission PLL Circuits
  - Parallel 10b interface
  - Optional 20-bit Transmit Data (Two 10-bit 8b/10b Encoded Characters)
  - Bi-directional TBC (Transmit Byte Clock)
  - 25 MHz Crystal Oscillator
  - Read/Write Serial Port Interface to Program Transmission and Receive Characteristics
  - Power Monitor for Glitch-free Power Off/On Cycles
  - Power Management Modes: PARTIAL, SLUMBER, STOP
  - Loop-back Test Modes
  - Device Status to Link Layer
  - Low-power Consumption, about 100 mW (Core, Typical)
  - Operates at 1.8V Supply Voltage
- **Transmitter**
  - Transmission Speed of 1.5 Gb/s Differential NRZ Serial Stream
  - Provides a 100Ω Matched Differential Termination at the Transmitter
  - Serialize 10-bit or 20-bit Parallel Input from Link Layer
  - Spread-spectrum Modulation for TX PLL Clock with +0/-0.5% Slow Frequency Variation Over a 33.33 μs Up/Down Triangular Wave Period
  - DC or AC Coupled to SATA Cable
  - Pre-emphasis Control Via Serport
- **Receiver**
  - 1.5 Gb/s Differential NRZ Serial Stream
  - 100Ω Matched Differential Termination at Receiver
  - Passive Equalization in Receive Input Buffer
  - Extract Data and Clock from Serial Stream
  - De-serialize Serial Stream into 10-bit or 20-bit Parallel Data
  - Detection of K28.5 Comma Character to Provide Word Aligned 10-bit or 20-bit Parallel Output
  - Squelch Detector
  - OOB Signal Detection for COMWAKE, COMINIT/COMRESET
  - DC or AC Coupled to SATA Cable
  - Built-in Clock Recovery PLL for De-serializer and Decoder Circuits
  - Accommodates Spread Spectrum Clocked Data in CDR (Clock & Data Recovery)

## Overview

The AT78C5081 is a stand-alone Serial ATA physical layer that is designed based on SATA Standard revision 1.0a. The parallel interface to the link layer is based on a 10-bit interface in both rising and falling edges of the clock. The device also accepts two 10-bit 8b/10b encoded transmit characters in parallel and latches them on the rising edge of TBC. The serialized data is transmitted onto the TXP/TXN differential outputs at a baud rate twenty times that of the TBC frequency. The device also samples serial data received on the RXP/RXN differential inputs, recovers the clock and data, de-serializes it into one or two 10-bit receive characters in parallel. The recovered clock is sent out at one twentieth of the incoming data rate. The receiver includes the squelch detector, out of band (OOB) signal detector, and is capable of detecting “Comma” characters. This transceiver contains on-chip PLLs circuitry for synthesis of the transmitting clock and extraction of the clock from the received serial stream. The transmit PLL is also responsible for link layer reference clock generation (ASIC\_CK). The circuit requires only one external component, the reference resistor. An additional on-chip serial port interface is employed to adjust the performance of certain blocks or to



## Serial ATA Physical Layer

## AT78C5081

## Summary

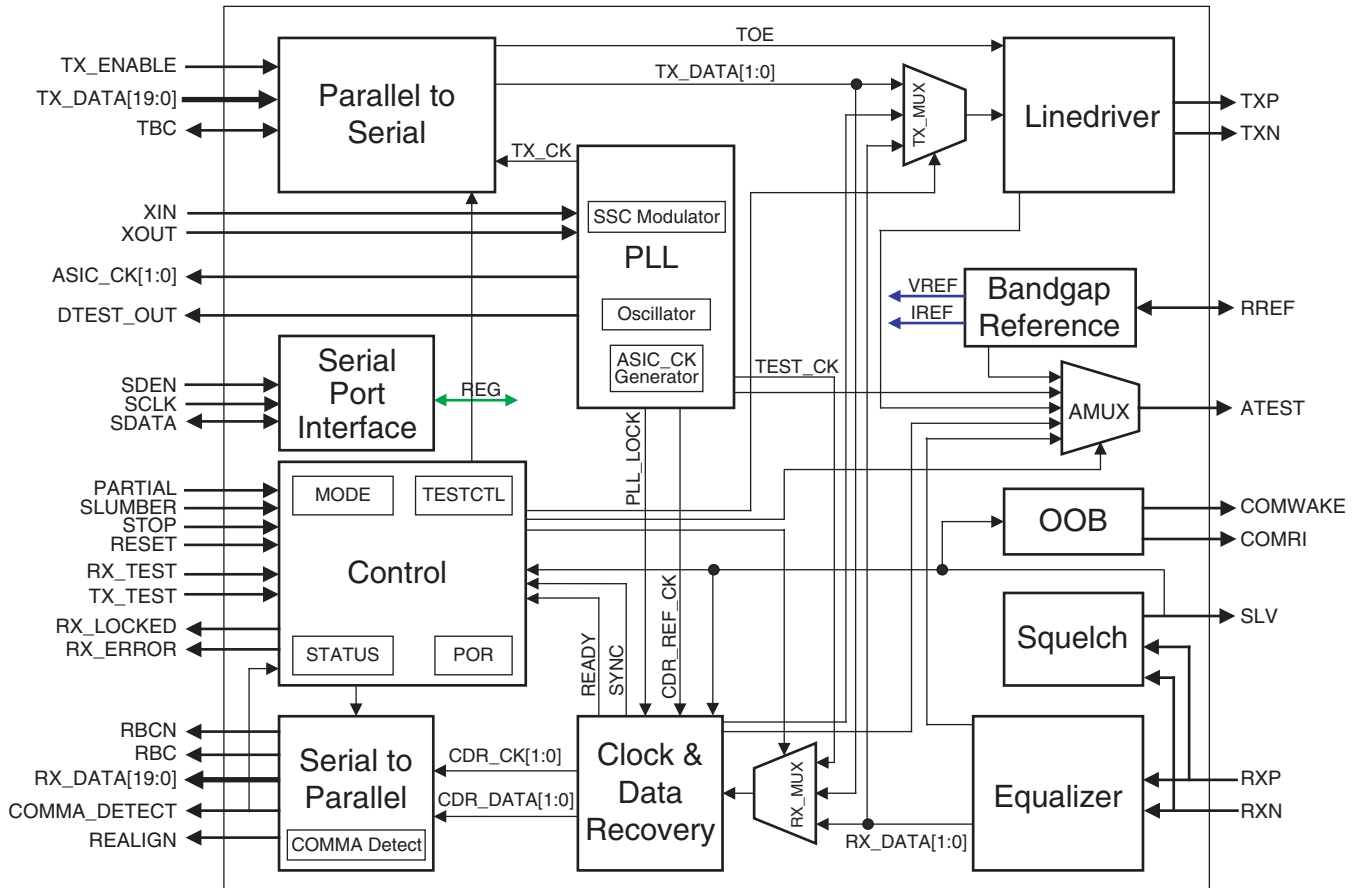
3527AS-NETST-10/04



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

configure the circuit in certain test modes. The PHY is transparent to SATA traffic and as a result does not perform scrambling/descrambling, encoding/decoding, or run time disparity check. It does not respond to SATA primitives.

## Block Diagram





## 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 Arsenalux 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](http://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 Are<sup>SM</sup> is the trademark of Atmel Corporation or its subsidiaries. Other terms and product names may be trademarks of others.



Printed on recycled paper.

3527AS-NETST-10/04