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

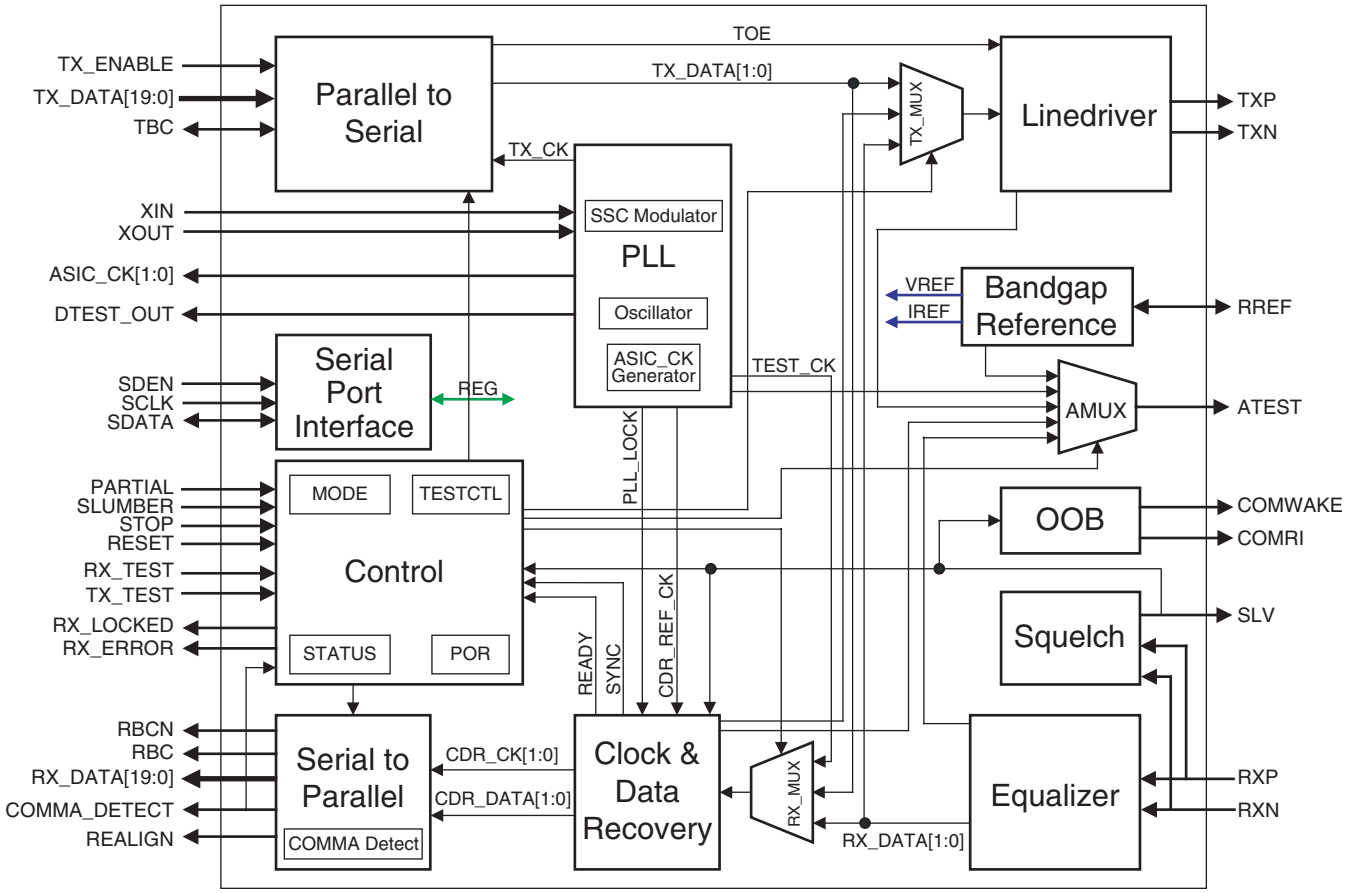
Summary

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 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

3527AS–NETST–10/04