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DESCRIPTION

The SSI 32P4915A is a high performance BiCMOS read channel IC that provides all of the functions needed to implement an entire Partial Response Class 4 (PR4) read channel for zoned recording hard disk drive systems with data rates from 60 to 180 Mbit/s. Functional blocks include AGC, programmable filter, adaptive transversal filter, Viterbi qualifier, 8,9 GCR ENDEC, data synchronizer, time base generator, and 4-burst servo. Programmable functions such as data rate, filter cutoff, filter boost, etc. are controlled by writing to the serial port registers so no external component changes are required to change zones. The part requires a single +5 V power supply. The SSI 32P4915A utilizes an advanced BiCMOS process technology along with advanced circuit design techniques which result in high performance devices with low power consumption.

FEATURES

GENERAL

- Register programmable data rates from 60 to 180 Mbit/s
- Sampled data read channel with Viterbi qualification
- Programmable filter for PR4 equalization
- Five tap transversal filter with adaptive PR4 equalization
- 8/9 GCR ENDEC
- Data Scrambler/Descrambler
- Presetable precoder state
- Programmable write precompensation
- Low operating power (1.25 W typical at 5 V)
- Register programmable power management (<5 mW power down mode)
- 4-bit nibble and byte wide bi-directional NRZ data interfaces
- 8-bit direct write mode automatically configured for $RCLK = VCO/8$
- Serial interface port for access to internal program storage registers
- Single power supply (5 V \pm 10%)
- Small footprint 100-Lead TQFP, 100-Lead FTQFP
- Power Management under register bit control

(continued)

BLOCK DIAGRAM

The block diagram illustrates the internal architecture of the AD9080, a 10-bit, 100-MSPS, 1.25-V CMOS ADC/DAC. The diagram is organized into several main functional blocks:

- Input Section:** Includes input multiplexers (TPC, TPE, TPA, TPB, TPV) and a programmable low-pass filter (LPF) with a 5-bit DAC and a 10-bit ADC.
- Core Processing:** Features a sample-and-hold circuit, a 5-bit DAC, a 10-bit ADC, and a digital-to-analog converter (DAC).
- Control and Timing:** Includes a control logic block, a clock generator, and a timing control section with a 10-bit DAC and a 10-bit ADC.
- Power and Grounding:** Shows various power and ground pins, including VDD, VSS, and AGND.
- Pin List:** A detailed list of pins is provided on the right side of the diagram, including VDD, VSS, AGND, and various control and data pins.

The diagram is a high-level representation of the device's internal structure, showing the flow of data and control signals between the various components.

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PRML Read Channel with PR4, 8/9 ENDEC, 4-burst Servo

FEATURES (continued)

AUTOMATIC GAIN CONTROL

- Dual mode AGC, analog during acquisition, sampled during data reads
- Separate AGC level storage pins for data and servo
- Dual rate attack and decay charge pump for rapid AGC recovery (analog)
- Programmable, symmetric, charge pump currents for data reads (sampled)
- Charge pump currents track programmable data rate during data reads (sampled)
- Low drift AGC hold circuitry
- Low-Z circuitry at AGC input provides for rapid external coupling capacitor recovery
- AGC Amplifier squelch during Low-Z
- Wide bandwidth, precision full-wave rectifier
- Programmable AGC controls
 - Separate external input pins for AGC hold, fast recovery, and Low-Z controlor
 - Internal Low-Z and fast decay timing for rapid transient recovery and AGC acquisition. Timing set with external resistors (2). Ultra fast decay current set with external resistor. AGC input impedance vs LOWZ = 5:1.
- 2-bit DAC to control AGC voltage in servo mode between 1.1 and 1.4 V

FILTER/EQUALIZER

- Programmable, 7-pole, continuous time filter provides:
 - Channel filter and pulse slimming equalization for equalization to PR4

- Programmable cutoff frequency from 5 to 50.6 MHz
- Programmable boost/equalization of 0 to 12.5 dB
- Programmable “zeros” equalization provides time asymmetry compensation
- ± 0.5 ns group delay variation from $0.3 f_c$ to f_c , with $f_c = 50.6$ MHz
- Minimizes size and power
- Low-Z switch at filter output for fast offset recovery
- No external coupling capacitors required
- DC offset compensation provided at filter output
- Five tap transversal filter for fine equalization to PR4
 - Self adapting inner taps (symmetric)
 - Programmable outer taps (symmetric, 4 bits)
- Equalization hold input
- “Zeros” channel quality output
- Amplitude asymmetry factor output

PULSE QUALIFICATION

- Sampled Viterbi qualification of signal equalized to PR4
- Register programmable window or hysteresis pulse qualifier for servo reads
- Selectable RDS pulse width and polarity for servo gray code reads

TIME BASE GENERATOR

- Less than 1% frequency resolution
- Up to 202.5 MHz frequency output
- Independent M and N divide-by registers
- No active external components required

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FEATURES (continued)

DATA SEPARATOR

- Fully integrated data separator includes data synchronizer and 8,9 GCR ENDEC
- Register programmable to 180 Mbit/s operation
- Fast acquisition, sampled data phase lock loop
- Decision directed clock recovery from data samples
- Adaptive clock recovery thresholds
- Programmable damping ratio for data synchronizer PLL is constant for all data rates
- Data scrambler/descrambler to reduce fixed pattern effects
- 4-bit nibble and byte wide NRZ data interfaces
- Time base tracking, programmable write precompensation
- Differential PECL write data output
- Integrated sync byte detection, single byte or dual ("or" type)
- Semi-auto training and sync byte generation available for single sync byte operation
- Surface defect scan mode

SERVO

- 4-burst servo capture with A, B, C, D outputs
- Internal hold capacitors
- "Soft Landing" charge pump architecture
- Separate, automatically selected, registers for servo f_c , boost, and threshold
- Programmable charge pump current
- Wide bandwidth, precision full-wave rectifier
- Programmable selection of normal or differentiated filter output to servo capture block
- Programmable AGC gain in servo mode (2 bits)
- Full wave rectifier observation point