

# Glasswing<sup>®</sup>

## GW12-500-USR

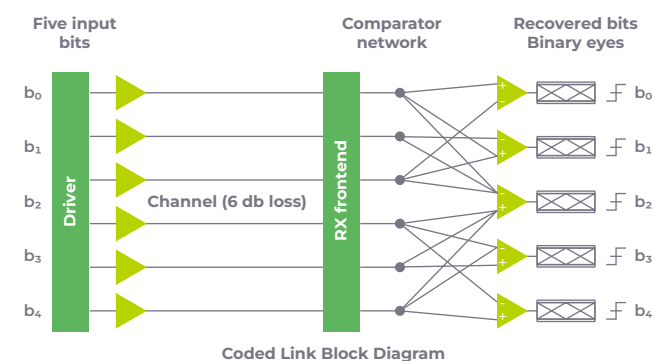
Ultra-short reach SerDes with 500 Gbit/s throughput

**The Glasswing family is a set of configurable PHY IPs designed and optimized for in-package applications that do not require a silicon interposer.**

GW12-500-USR provides 500 Gbit/s of full-duplex system bandwidth at a power consumption as low as 1 pJ/bit, through the use of CNRZ-5 Chord™ Signaling and a forwarded clock architecture. Glasswing IP may be deployed in multiple instances to provide efficient extended interfaces.

### Benefits

- ▶ 2x to 4x throughput at 50% or less energy consumption as compared to conventional SerDes over the same number of pins/wires
- ▶ High pin-efficiency and low power
- ▶ 208.3 Gbit/s full-duplex bandwidth per mm of die edge (500 Gbit/s for 2.4 mm of die edge)
- ▶ Supports up to 6 dB channel insertion loss at 12.5 GHz
- ▶ NRZ-like ISI and noise performance



### Technology

- ▶ GlobalFoundries® 12LP process
- ▶ 0.9V and 1.2V analog supplies
- ▶ 0.8V digital supply
- ▶ Junction temperature  $-40^{\circ}\text{C}$  to  $+110^{\circ}\text{C}$
- ▶ Standard flip chip technology with  $150\ \mu\text{m}$  bump pitch
- ▶ Tile-able layout to support high IO density

### Features

- ▶ MCM interface consisting of four 6-wire CNRZ-5 Chords, plus a shared forwarded clock (26 wires total per direction)
- ▶ No silicon interposer required due to standard  $150\ \mu\text{m}$  bump pitch
- ▶ Maximum throughput of 500 Gbit/s in each direction
- ▶ Line rate programmable from 12.5 to 25 GBd for a throughput of 62.5 to 125 Gbit/s per Chord
- ▶ Total throughput configurable by selecting number of active Chords
- ▶ TX and RX data buses consisting of five 32-bit data words (plus clock) for each Chord
- ▶ Simple word-based TX to RX interface, RX logic recovers data alignment
- ▶ DC-coupled link with no coding/framing requirements; light-weight scrambler in PMA Soft IP ensures sufficient data toggling
- ▶ Configuration and link start-up through APB (ARM Peripheral Bus) interface

- ▶ Internal TX to RX loopback for wafer/die level test
- ▶ Configurable Bolt-On PMA soft IP for ease of use:
  - Scrambler
  - Bit error injection
  - Single cycle FEC to decrease BER/increase link length
  - Including option to include PRBS to test impact on BER using FEC
  - Far-end loopback
- ▶ RX CTLE equalization for up to 6 dB channel loss at 12.5 GHz
- ▶ TX PLL with reference clock input frequency from 100 MHz to 312.5 MHz (25 MHz supported for Test)
- ▶ Supports JTAG boundary scan (1149.1) and scan test modes (Shift/Capture and Bypass)
- ▶ Integrated diagnostics: PRBS-15 and PRBS-31 pattern generation and verification, RX EyeScope
- ▶ DFT: at-speed BIST of analog plus stuck-at scan (Capture and At-Speed)
- ▶ ATPG support
- ▶ JEDEC JESD247 Multi-wire Multi-level Interface Specification compatible

## Applications

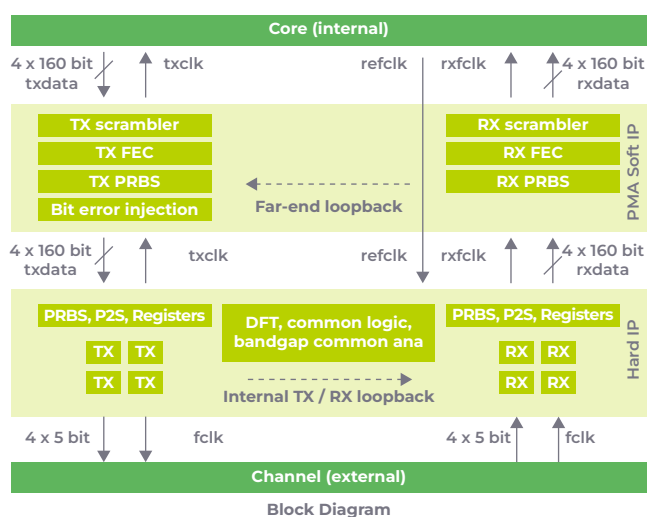
- ▶ Multi-chip modules and short reach interposes:
  - Packaging dies with dissimilar foundry processes
  - Packaging of smaller dies to increase yield
- ▶ High throughput data interfaces:
  - Efficient interface to off-board SerDes tiles
  - Interconnection of tiled CPUs or DSPs
  - Processor or switch to high bandwidth memory
  - Efficient interface to optics engines
  - Switch-to-switch links

## CNRZ-5 Coding

- ▶ Transmits 5 bits on 6 correlated wires:
  - Balanced code leads to low SSO noise at transmitter
  - Employs a reference-less receiver that is resilient to common-mode noise
  - Uses a receiver that has five comparators and no decoder
- ▶ Link has excellent signal integrity properties:
  - NRZ-like ISI properties
  - Scalable to much higher speeds and harder channels
  - NRZ-like EMI performance

## Deliverables

- ▶ Datasheet and application notes
- ▶ Hard IP standard integration views: LEF, LIB, SDC, GDSII, LVS netlist, ATPG netlist
- ▶ PMA Soft IP
- ▶ Verilog Hard IP customer model for system simulation: reference test bench
- ▶ Qualification report
- ▶ Package design and integration guidelines



For ordering or more information, contact [sales@kandou.com](mailto:sales@kandou.com)  
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