



EasyCDR® - Tailored Solutions to Meet Your Specific Needs

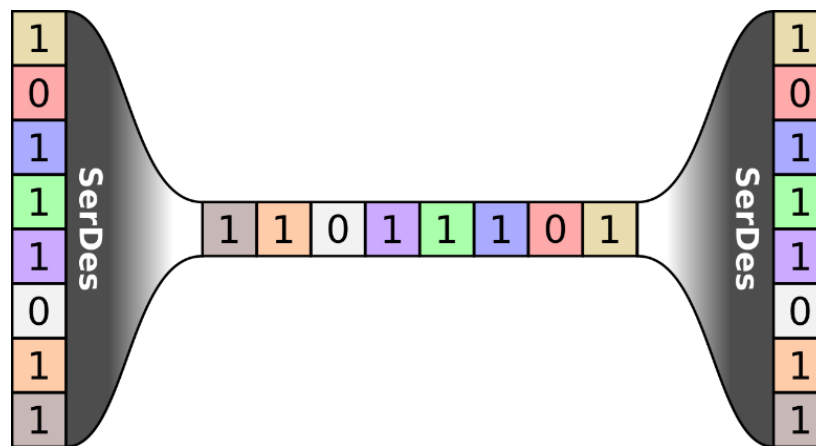
White Paper

WP1150-1.0E, 2023-10-31

1 Introduction to SerDes

SerDes, is a combination of the words Serializer and Deserializer. It enables the transfer of large amounts of information over coaxial or twisted-pair cables. In today's world, the demand for higher-speed data transfer is on the rise, and parallel data flows are unable to keep up. SerDes technology can be used with either 50ohm Coax or 100ohm Twisted pair interfaces. In some cases, it is possible to transmit power over coax (POC), which is ideal for powering cameras.

The key technology to enable data transfer in a single cable (copper or fiber) without a clock is Clock Data Recovery (CDR). When transmitting data to the cable, the data has been clocked out from the source, however, the clock signal is not sent out. Instead, the data stream has clock information indicated by data transition, called embedded clock. The key task is relying on the receiver end to recover the clock information by CDR technology. The general approach is to build a dedicated analog-based CDR system together with the transmit function to accomplish the entire SerDes function.

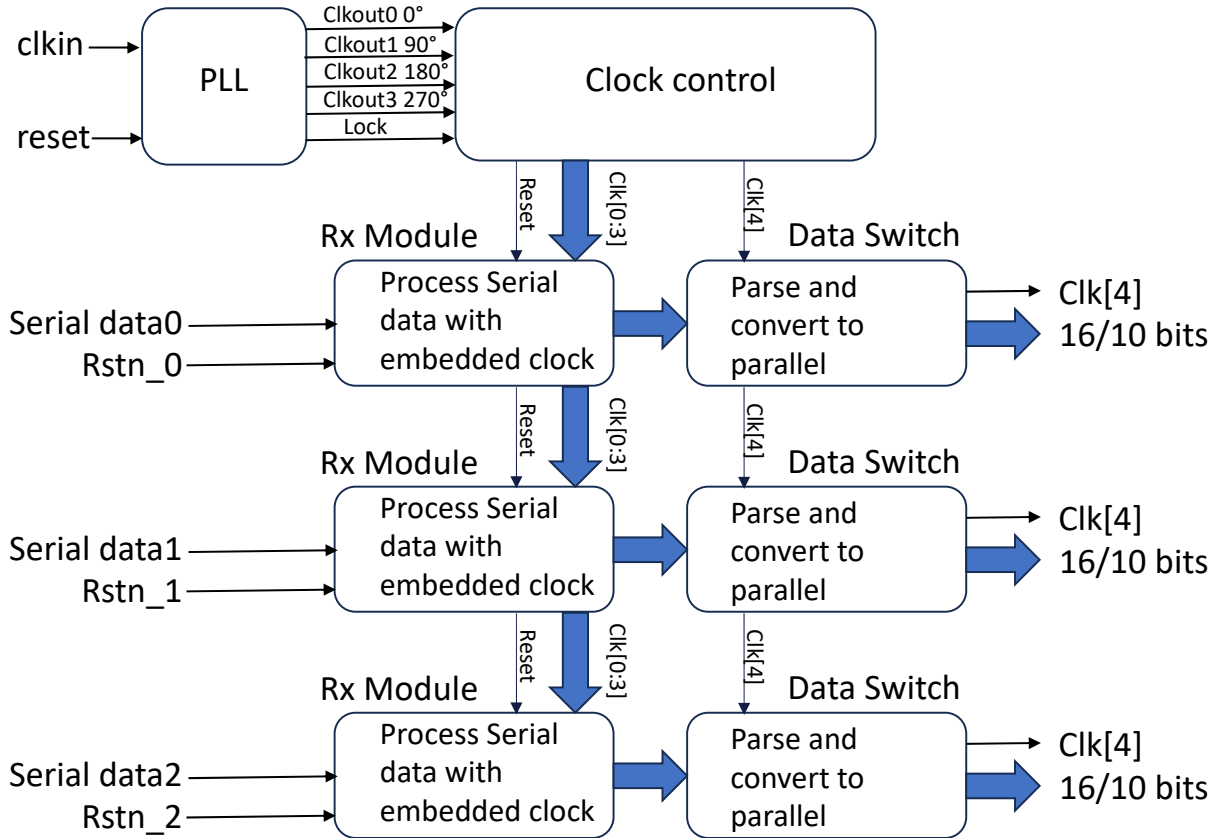


2 Gowin EasyCDR® based SerDes by GPIOs

Easy Clock Data Recovery (EasyCDR®) is a groundbreaking technology designed to simplify data reception processes while significantly reducing complexity, power consumption, and cost. In essence, GOWIN's new GW5A family incorporates an advanced I/O structure that can receive serial data with embedded clock signals. Our new Easy Clock Data Recovery (EasyCDR®) IP can de-serialize serial input data to output 10-bit or 16-bit parallel data plus the clock. This solution is entirely resident in the GPIOs and FPGA fabric, with no dedicated Analog SerDes involved.

GOWIN offers EasyCDR® capabilities in its 5A series chips, with impressive performance capabilities, up to 2.5Gbps. EasyCDR®'s simplicity and efficiency make it a superior alternative to analog SerDes solutions, which tend to be more power-consuming, complex, and costly.

Below is a diagram showing EasyCDR® working as an Rx function in SerDes.



3 EasyCDR® Solution Advantages

GOWIN's EasyCDR® solution stands out as a modern and efficient replacement for traditional analog Serdes solutions while the application speed requirement is under 2.5Gbps. Here are some key reasons why GOWIN's EasyCDR® is superior:

Versatility

The EasyCDR® solution is based on the general resources of the FPGA instead of dedicated analog Serdes block, which makes it flexible and versatile. It can be implemented on all Arora V devices regardless of the availability of high-speed transceivers. Users can easily implement SerDes protocols to adapt to many different situations. Making it a valuable addition to many modern electronic designs.

Cost and Power Effectiveness

The analog SerDes block is costly and consumes a lot of power. This is the reason only a few channel transceivers are available for each FPGA or with no SerDes at all. On the other hand, GPIOs are plentiful with less power and low cost to implement. EasyCDR® utilizes GPIOs and Logic resources of FPGAs, therefore, making it cost and power-effective.

Filling in Technological Advancement Gaps

In today's world, on one hand, leading-edge technology such as AI, smartphones, etc. drive the rapid advance of wafer process technology. On the other hand, technologies defined decades ago are still wildly used. For example, USB2.0 was introduced in the year 2000, and millions of such devices are still shipping now. The GPIO speed can easily

surpass its 480Mbps speed now. Making a new tape out of the latest technology to support such a low-speed protocol just does not make sense, however, it is a SerDes-based protocol that traditional FPGA GPIOs cannot support. The EasyCDR® technology filled in the missing gap.

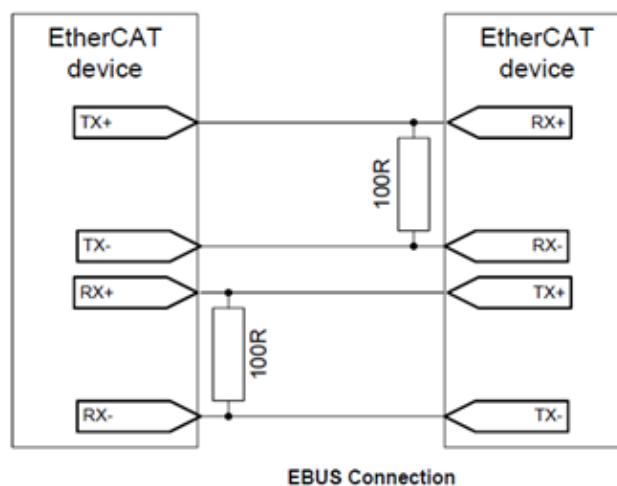
Greater Data Handling Capacity

It is important for us to extend the speed envelope to support more applications. EasyCDR®'s ability to handle up to 2.5 Gbps sets it apart from competitors. Many user cases can be satisfied with such speed already.

4 Application Examples

Industrial Field Bus Potential Applications

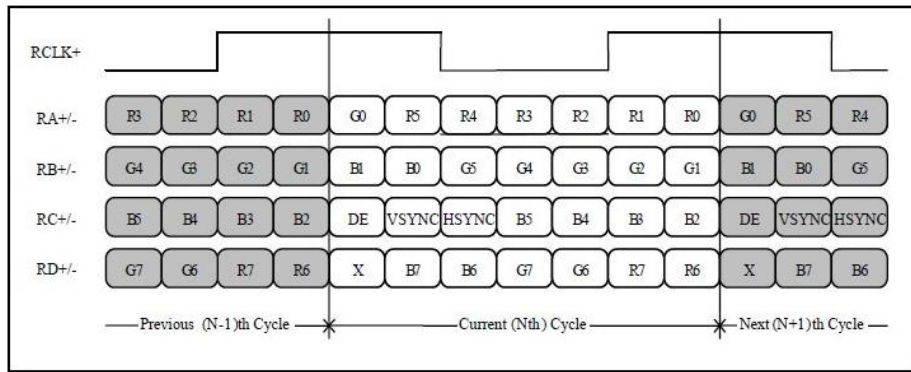
Industrial field bus applications are crucial in the industrial sector for digital communication between instruments, controllers, actuators, and field devices. GOWIN's EasyCDR® can find applications in field bus systems that handle data exchange between field control equipment and advanced control systems, including standards like PROFIBUS, PROFINET, SERCOS, Modbus, and EtherCAT.



EtherCAT, in particular, has evolved to support high data rates such as EtherCAT G (1 Gbit/s) and EtherCAT G10 (10 Gbit/s). EasyCDR® can play a vital role in handling such high-speed data conversion applications, providing a reliable and cost-effective solution.

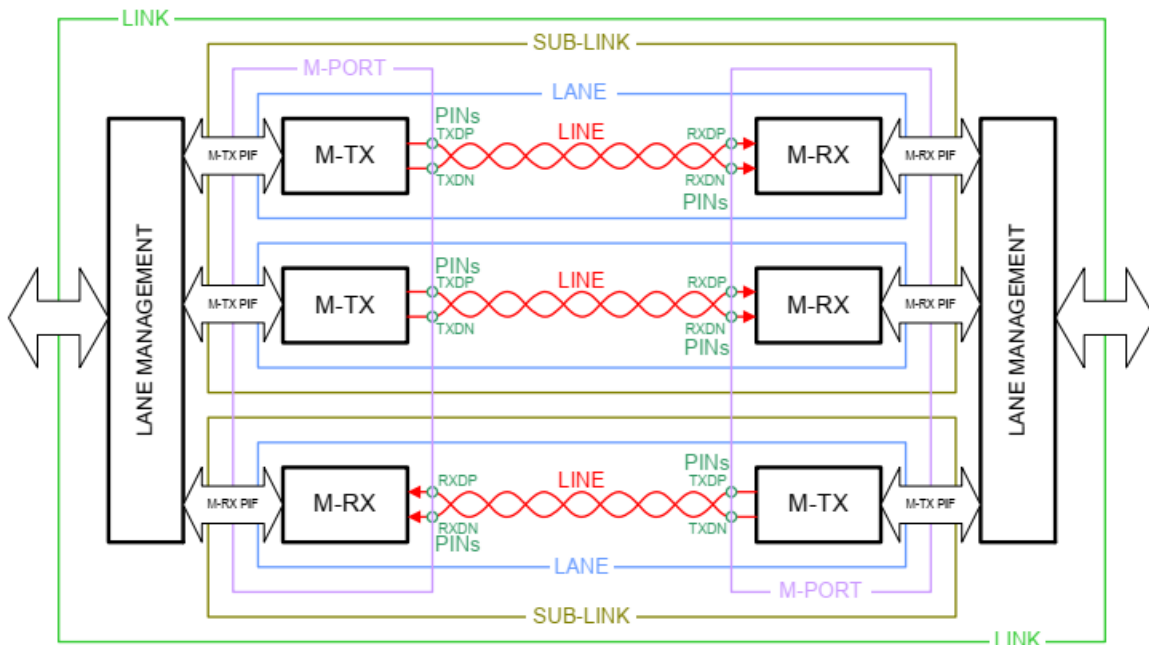
7:1 LVDS

7:1 LVDS is commonly used in the connection of LCD panel driving signals. While EasyCDR® can meet the data rate requirements, it requires data with transitions for synchronization. To address this, techniques like 8B10B encoding or scrambling may be necessary to ensure continuous transitions in the data. However, it's worth noting that the market for 7:1 LVDS interfaces is decreasing as interfaces with embedded clocks, like eDP and V-by-One, gain popularity.



MIPI M-PHY

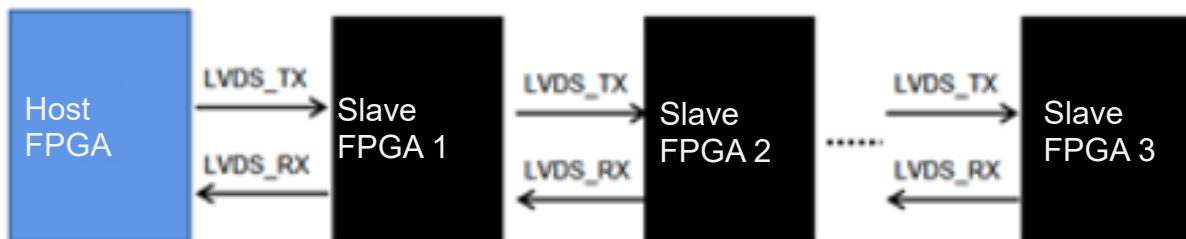
MIPI M-PHY uses PWM signals and EasyCDR®. Being edge-based, it can recover the clock effectively. It provides synchronization capabilities for MIPI M-PHY, ensuring reliable data reception even when the clock rate is three times that of the data rate.



M-PHY Lane Example

LVDS Bus Application

In LVDS bus applications, EasyCDR® simplifies connections by allowing data transmission without an additional clock signal. GOWIN's 5A and 5AR devices offer enhanced reception rates, extending up to 2 Gbps. This capability is crucial for meeting the increasing demands of higher data transfer requirements in industrial settings.



5 Conclusion

GOWIN's EasyCDR® represents a cutting-edge solution for data reception that outshines traditional analog SerDes options at available speed range. With technological advancements, higher data handling capacity, power/cost-effectiveness, and versatility, EasyCDR® offers a superior alternative for various applications, including industrial field buses, LVDS interfaces, and MIPI M-PHY. As industries continue to demand faster and more efficient data reception solutions, EasyCDR® stands ready to meet these challenges while simplifying the design and reducing costs for electronic systems.

Support and Feedback

Gowin Semiconductor provides customers with comprehensive technical support. If you have any questions, comments, or suggestions, please feel free to contact us directly using the information provided below.

Website: www.gowinsemi.com

E-mail: support@gowinsemi.com

Revision History

Date	Version	Description
2023/10/31	1.0E	Initial version published.

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