



High-Speed Automobile Communication Based On CAN-FD Controller

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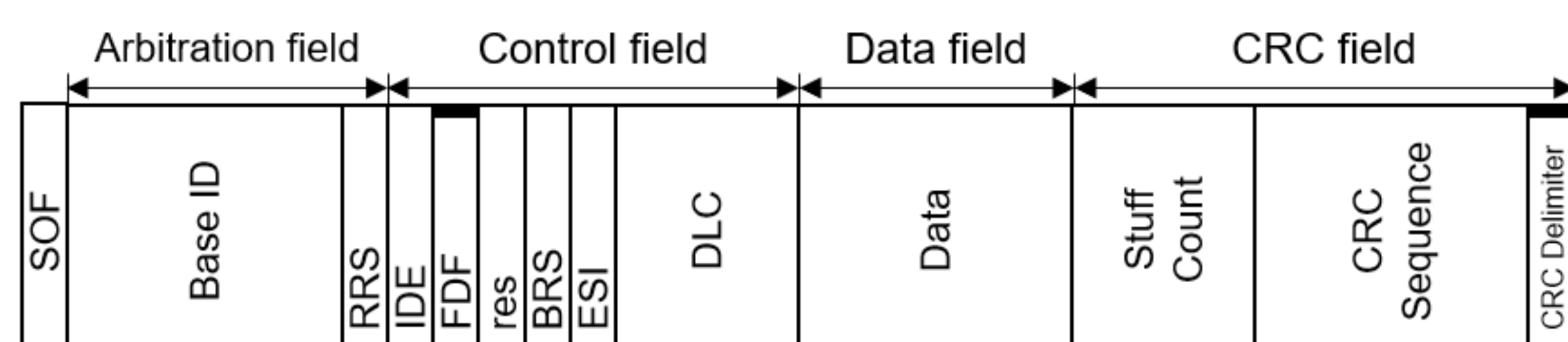
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Abstract

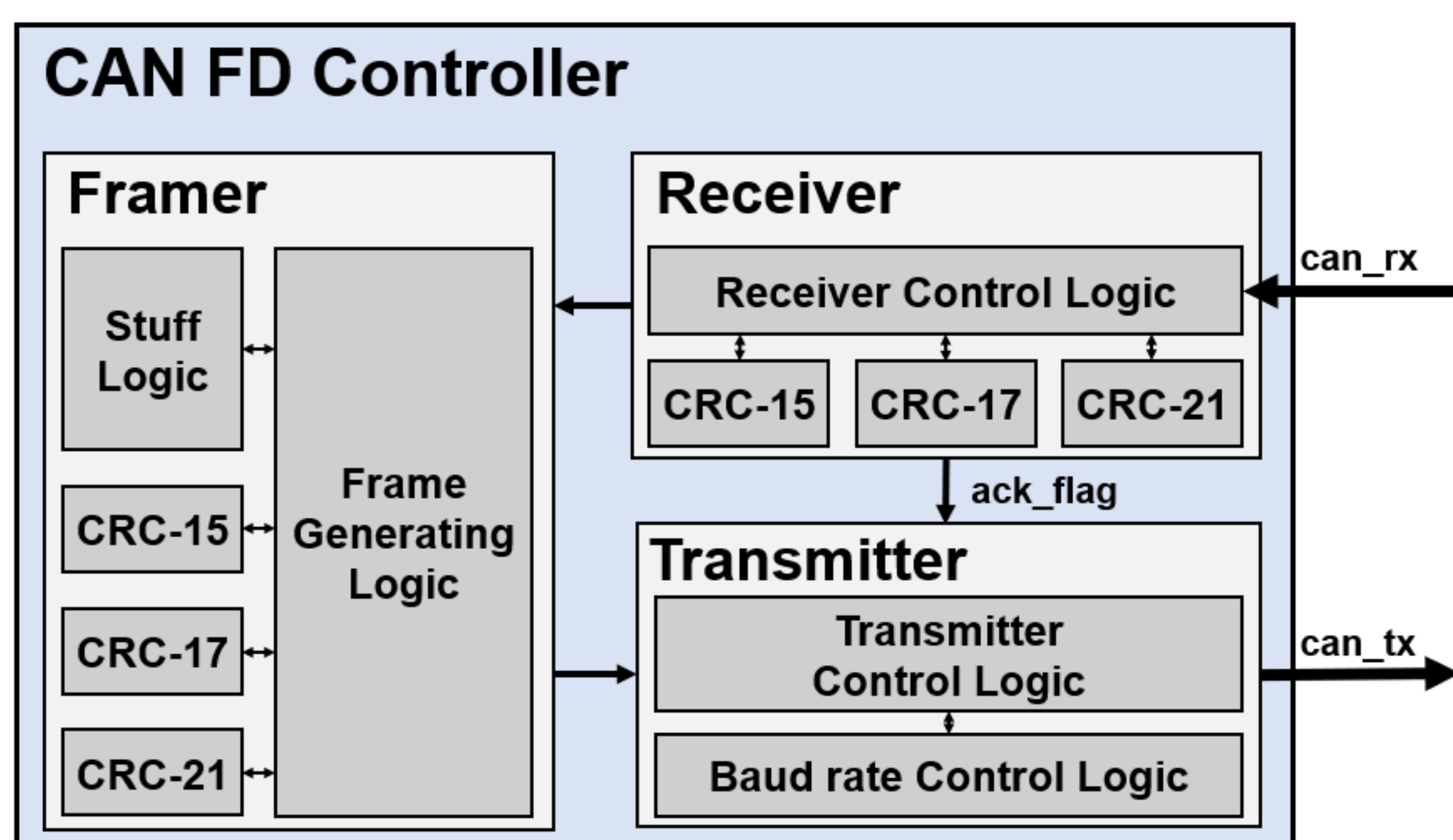
In this paper, we propose the Controller Area Network Flexible Data (CAN-FD) Controller for high-speed automobile communication. As the number of ECU are increasing for the enhanced functions of automobiles, CAN-FD Controller that communicate with high-speed is needed. Our design has the 8 Mbps bandwidth at data phase, and comply with ISO-11898 standard. We implemented the design on FPGA and verified the functions by using the CANoe. Also, we fabricated the CAN-FD Controller with TSMC 0.18um CMOS technology. Our design operates in 3.3 V / 50 Mhz frequency.

Experiment

CAN-FD Controller can transmits the complete CAN frame and receives the frame from the CAN bus. Our CAN-FD Controller has 8 Mbps bandwidth at data phase and compatible with CBFF, CEFF, FBFF, and FEFF. The CAN-FD Controller consists of receiver, framer, and transmitter module. The receiver receives the frame from the CAN bus and detects any error from the frame. The framer module generates a CAN frame based on the frame information from the user. The transmitter transmits the frame which generated by framer module. The CAN-FD Controller comply with the ISO-11898 standard and verified by simulation.



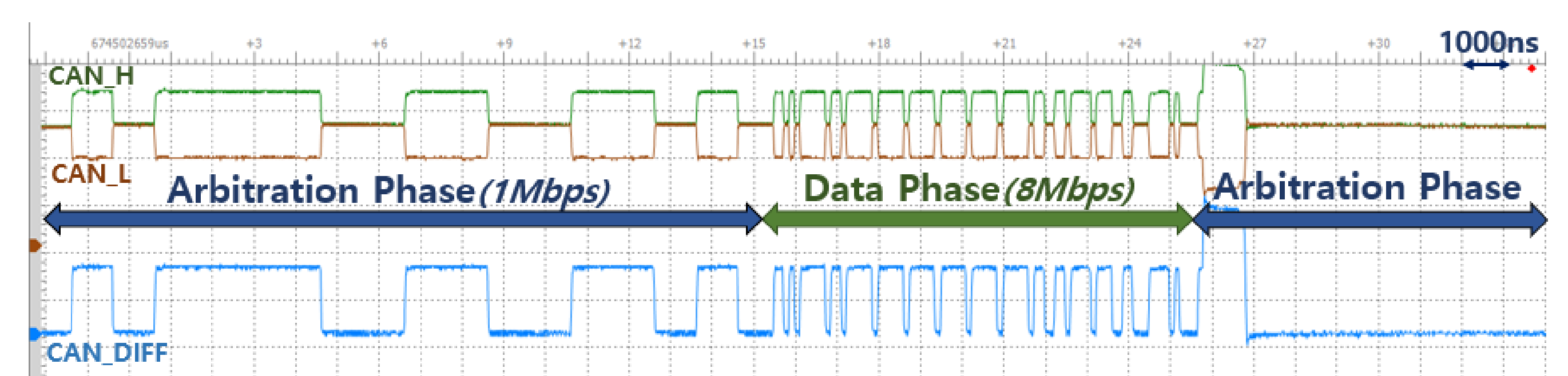
[CAN FD frame]



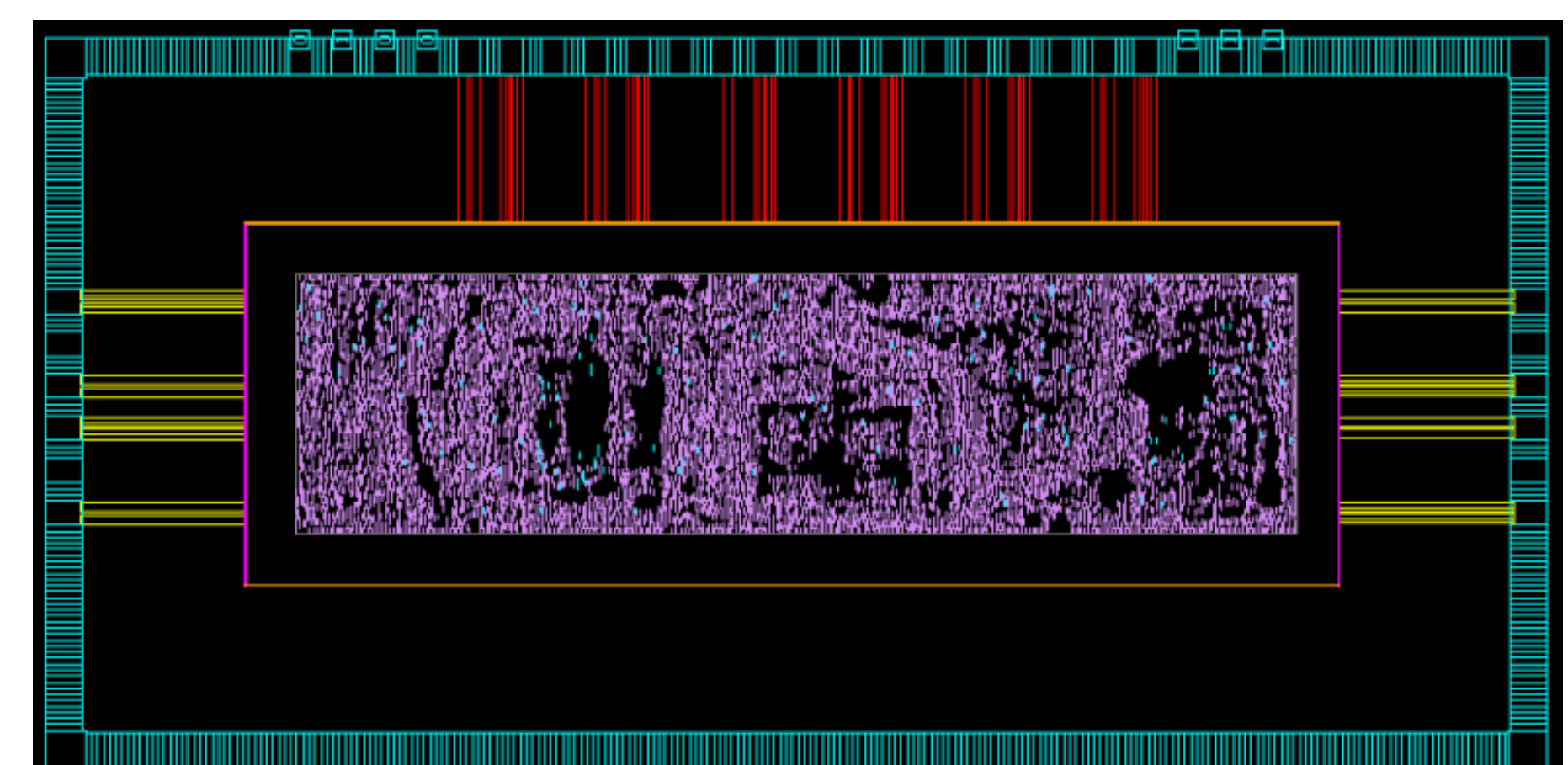
[Block diagram of CAN FD Controller]

Implementation

We implemented the CAN-FD Controller on an FPGA after we simulated the controller. The functions of the CAN-FD Controller is verified by using the CANoe software and hardware scope. As bit rate switching is possible, data phase in the CAN frame has up to 8 Mbps. We implemented in the case of CBFF, CEFF, FBFF, and FEFF, and whole CAN frames are checked for real CAN bus. We fabricated the CAN-FD Controller with TSMC 0.18um CMOS technology. Our CAN-FD Controller is designed for 3.3 V and 50 Mhz frequency.



[Verification results by using the CANoe]



[Chip layout of CAN FD Controller]

Conclusion

- As the number of ECU are increasing, we designed the CAN-FD Controller that communicate with high-speed.
- We verified the feasibility of the CAN-FD Controller by implementing on an FPGA and checking the functions with CANoe and hardware scope.
- For the future work, we plan to design the In-Vehicle Network Controller that contains other communication protocols.

Acknowledge

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