Controller area network (CAN): Teaching an old dog new tricks

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There is a saying that you cannot teach an old dog new tricks. While CAN is 25 years old, it continues to grow and gain new capabilities. It has been adapted into widely varying applications starting with its roots in simple automotive multiplexing to the current automotive networks, transportation, and industrial applications.

Within the CAN transceiver world there have been recent improvements to provide higher data rates and to bolster functional safety and redundancy within CAN networks. New transceivers have been developed, providing these features. With a focus on reducing transceiver loop time (propagation delay through the transceiver) and the impact of the network on the loop time, these transceivers provide higher data rates and improved timing margin while using the standard CAN protocol layers such as CANopen and DeviceNet. Figure 1 shows the transceiver loop delays from TXD to the bus and back to RXD.

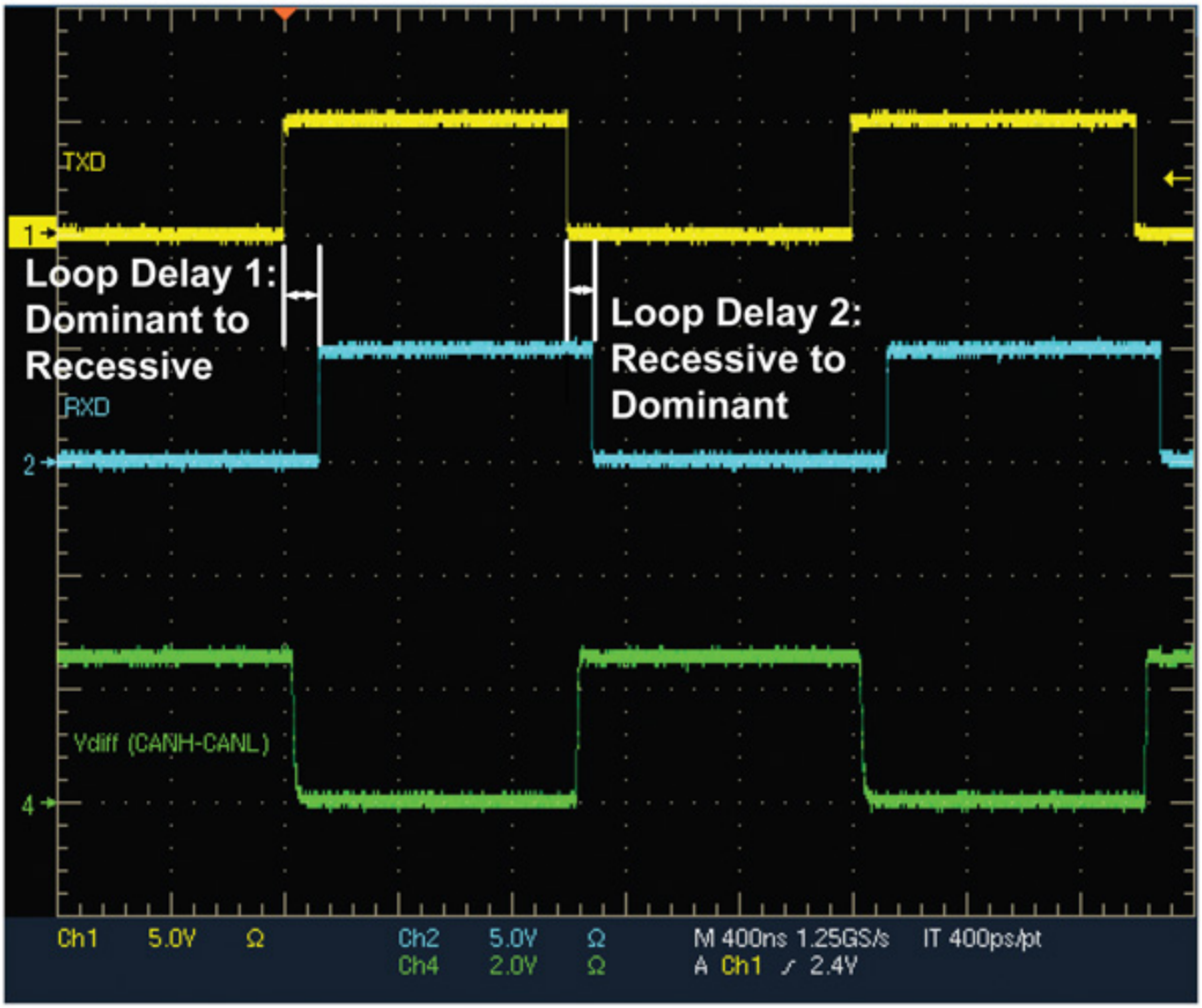

Figure 1. CAN transceiver loop delay.

At the CAN standards level, there are two proposals in development that further extend the capabilities of CAN: “CAN with Flexible Data-rate” (CAN FD) and “ISO11898 Part 6: High-speed medium access unit with selective wake-up functionality,” commonly known as partial networking.

CAN FD is being proposed by Bosch as a protocol extension that offers the option of a high bit-rate within the data field which should allow CAN to reach data rates in excess of 10 Mbps. Another key extension for the protocol in the current white paper is to allow the data frame to extend up to 64 bytes from the current 8 bytes limit. There is a provision for the controller to signal the FD frame to new transceivers developed for CAN FD, which should push data rates even higher. These changes allow CAN to be expanded for new and evolving applications while retaining the key advantages that have made CAN popular and easy to use: addressing and arbitration, robustness, error detection capabilities, flexibility, and low-cost bus topology.

As a method to save energy and reduce emissions in the automotive industry, the concepts of CAN with low power wake up and partial network are developing. High-

speed CAN transceivers with low-power wake up are based on ISO11989-5 which was introduced in 2005. These systems are now being widely used in advanced ways to put most idle systems (nodes) on a network to sleep when not needed and wake them only when necessary. The further refinement and advancement of this concept is currently under development in the ISO standards and is known as partial networking, or ISO11898-6.

References

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4) ISO11898 CAN standards: www.iso.org [4]

About the author

Being in the automotive and industrial semiconductor industry for more than 15 years, Scott Monroe currently is a systems architect for the Industrial Interface group at Texas Instruments. A graduate of Rose-Hulman Institute of Technology, Terre Haute, Indiana, Scott has delivered numerous papers at automotive conferences. Additionally, he has written several contributed articles ranging from microcontrollers and software in safety systems to automotive and industrial networking physical layers. Scott can be reached at: ti_scottmonroe@list.ti.com [5].

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