

CAN XL Adds High-Speed Option to CAN Ecosystem

Sponsored by Texas Instruments: A CAN XL transceiver boosts bus speed and message payload size in automotive, industrial, and robotic applications to fill the gap between CAN FD and Ethernet.

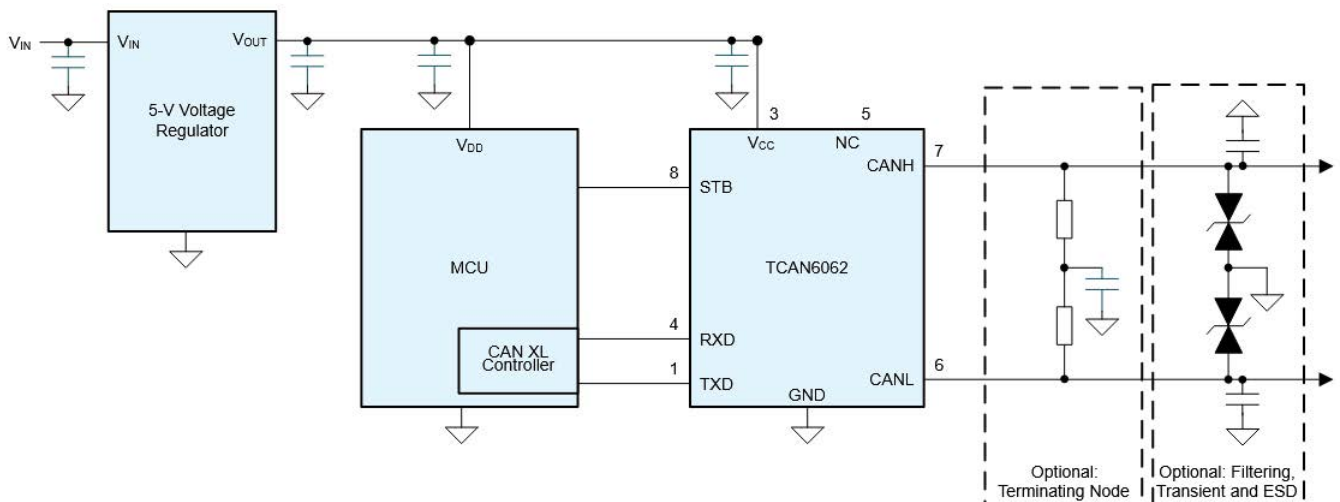
Developed four decades ago for use in the automotive industry, the Controller Area Network (CAN) bus is finding extensive use in vehicles as well as smart factories and autonomous humanoid robots. The latest version, [CAN XL \(for eXtended Length\)](#), can handle the data rates and payload sizes required for motion control, sensor fusion, and firmware updates. And it doesn't have the added overhead and complexity of an Ethernet network that complies with the time-sensitive networking (TSN) standards for deterministic, low-latency behavior.

CAN Background

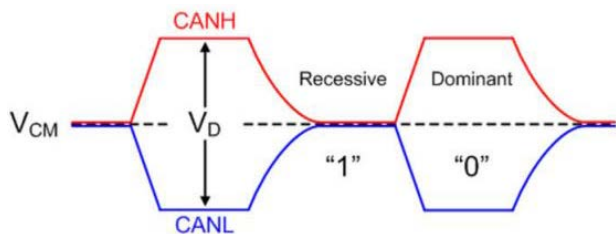
CAN was conceived in the early 1980s when engineers at Bosch were evaluating serial buses for use in passenger vehicles. Because existing buses proved unsuitable for automotive use, the engineers began development of a new bus technology.

In 1986, they presented what they called the Automotive Serial Controller Area Network at the Society of Automotive Engineers congress in Detroit, and the first CAN controller chip appeared in 1987. Although developed for the automotive industry, CAN soon showed promise for use in a variety of applications, ranging from elevators to textile manufacturing.¹

[CAN has evolved over the years, appearing as Classic CAN \(CAN CC\) and CAN Flexible Data-rate \(CAN FD\) before the arrival of CAN XL.](#) CAN CC supports an 8-byte data payload at rates to 1 Mb/s, while CAN FD supports a 64-byte payload with rates to 8 Mb/s. CAN XL supports data rates to 20 Mb/s and a payload up to 2,048 bytes, allowing a complex message to fit within a single frame. It results in higher efficiency through lower overhead per byte for large messages.



1. A CAN controller communicates with a CAN transceiver over TxD and RxD pins.



2. A voltage difference V_D between CANH and CANL indicates a logic 0.

CAN Operation Basics

As shown in *Figure 1*, a basic CAN application consists of a microcontroller unit (MCU) with an integrated CAN controller and a CAN transceiver — in this case, the new Texas Instruments TCAN6062 CAN XL transceiver. To send a message, the controller transmits the message data to the transceiver over the TxD (Transmit Data) pin. The transceiver in turn converts the single-ended message data from the controller into a differential signal, which it sends to other transceivers by way of the CANH and CANL differential pair.

The transceiver also monitors CANH and CANL to look for messages from other transceivers. It converts the messages to a single-ended form for transmission back to the controller via the RxD (Receive Data) pin.

To send a message from its TxD pin to other network nodes, the transceiver generates a differential waveform consisting of impedance-controlled dominant and recessive states, with the former indicating a logic 0 and the latter indicating a logic 1 (*Fig. 2*). If the bus is idle, CANH and CANL are in the recessive state, with both equaling the common-mode voltage V_{CM} .

When ready to send a message, the transceiver asserts a single dominant start-of-frame (SOF) bit, driving CANH high and CANL low. A binary identifier string unique to

the node follows the SOF. If multiple nodes simultaneously assert an SOF bit, the node whose identifier has the lowest binary value will maintain its assertion of the dominant state the longest, allowing it to take priority and begin sending its message. The message ends with a 7-bit end-of-frame (EOF) field, and another node can begin transmitting.

SIC and FAST Modes

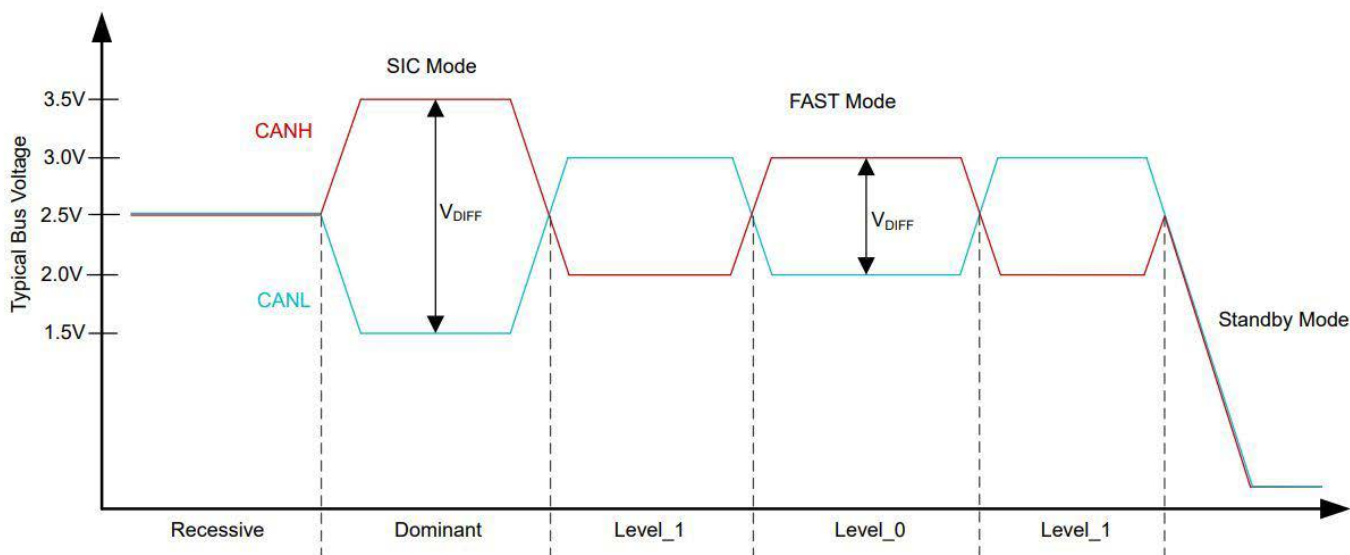
CAN FD and CAN XL can operate in a Signal Improvement Capable (SIC) mode, which will minimize signal ringing and glitches. SIC operation is useful for star topologies or mixed-node legacy networks with long unterminated stubs or otherwise poorly controlled impedances.

In addition to the SIC mode, CAN XL has a FAST mode that offers higher data rates on well-behaved networks. As shown in *Figure 3*, SIC mode retains the recessive and dominant states, while FAST mode employs a push-pull driver to swing both CANH and CANL signals about the common-mode voltage, although at a lower peak-to-peak amplitude than that of the SIC mode.

CAN XL Transceiver

[TI's TCAN6062 high-speed CAN XL transceiver \(Fig. 4\)](#) can operate in SIC and FAST modes, with the FAST transmit mode enabled by an H-bridge architecture to actively drive CANH and CANL logic states at 20-Mb/s rates. An out-of-bounds (OOB) comparator prevents a SIC mode receiver from misinterpreting FAST mode data. The device can fall back to supporting CAN and CAN FD operation.

The device's internal logic-translation capability configurable via a V_{IO} pin enables it to interface directly to 1.8-, 2.5-, 3.3-, or 5-V controllers. It also supports a low-power standby mode, from which it can be awakened via a standard-defined



3. SIC mode retains recessive and dominant states, while FAST mode employs a push-pull driver to actively swing both CANH and CANL signals.

wake-up pattern (WUP). Protection features include under-voltage protection (UVP) and thermal shutdown (TSD). The device is available in an 8-pin SOIC package.

TI also offers the TCAN-SOIC8-EVM universal evaluation module, which lets you experiment with the TCAN6062 or any other 8-pin CAN transceiver. A header provides easy access to all digital configuration and control signals.

Conclusion

CAN XL offers a new level of flexibility in your choice of cost, network speed, and message payload capacity. CAN FD will remain the optimal choice for cost-sensitive low-bandwidth control networks, while Ethernet will excel at

providing the high-speed backbone for bandwidth-intensive systems.

CAN XL hits the sweet spot between the two, serving applications that require more than what CAN FD offers but that don't require the added complexity of deterministic Ethernet/TSN. TI's universal evaluation module for CAN transceivers can help you zero in on the optimal solution for your application, and, if CAN XL is the best fit, the new TCAN6062 transceiver can help you get to market quickly.

Reference:

[1] ["History of CAN technology,"](#) CAN in Automation, 2026.

4. The TCAN6062 includes FAST and SIC modes as well as a low-power standby mode from which it can be awakened via a WUP.

