2020

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Everything is available

Building blocks

Transceiver and SBC
Micro-controller and IP core
Higher-layer protocol stack

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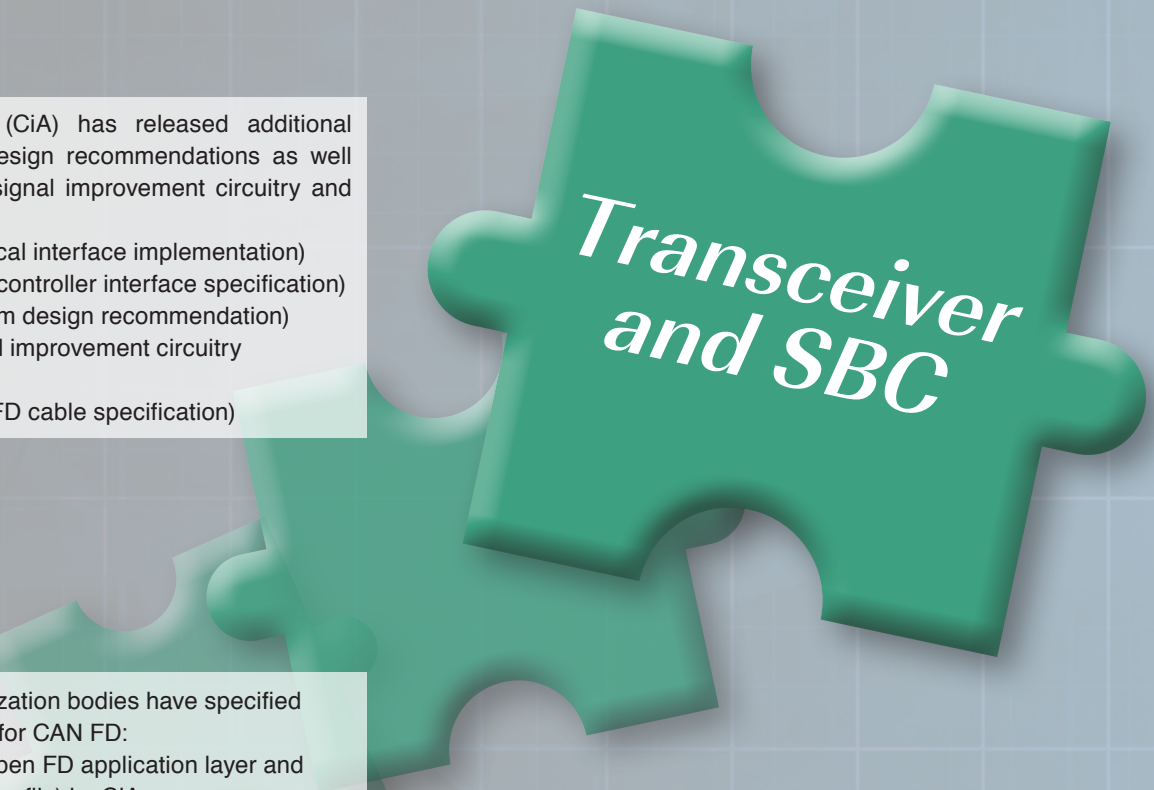
Standards and specifications

The necessary building blocks for CAN FD device design are available. This includes lower-layer hardware (transceiver and protocol controller) and higher-layer protocol software. Because these CAN FD building blocks are standardized, they provide interoperability and they are available from different sources.

The CAN FD data link layer supports as the Classical CAN protocol 11-bit and 29-bit identifiers. The data field has a length of up to 64 byte. The improved high-speed physical layer specifies parameters for 2-Mbit/s and 5-Mbit/s qualified transceivers.

CAN in Automation (CiA) has released additional device and system design recommendations as well as specifications for signal improvement circuitry and cables:

- CiA 601-1 (physical interface implementation)
- CiA 601-2 (CAN controller interface specification)
- CiA 601-3 (system design recommendation)
- CiA 601-4 (signal improvement circuitry specification)
- CiA 601-6 (CAN FD cable specification)



Additionally, standardization bodies have specified higher-layer protocols for CAN FD:

- CiA 1301 (CANopen FD application layer and communication profile) by CiA
- ISO 15765 series (transport and network layer as well as bit-timing)
- J1939-22 and J1939-17 (application layer and bit-timing) by SAE International
- XCP (extended calibration protocol) by ASAM

CAN FD semiconductors

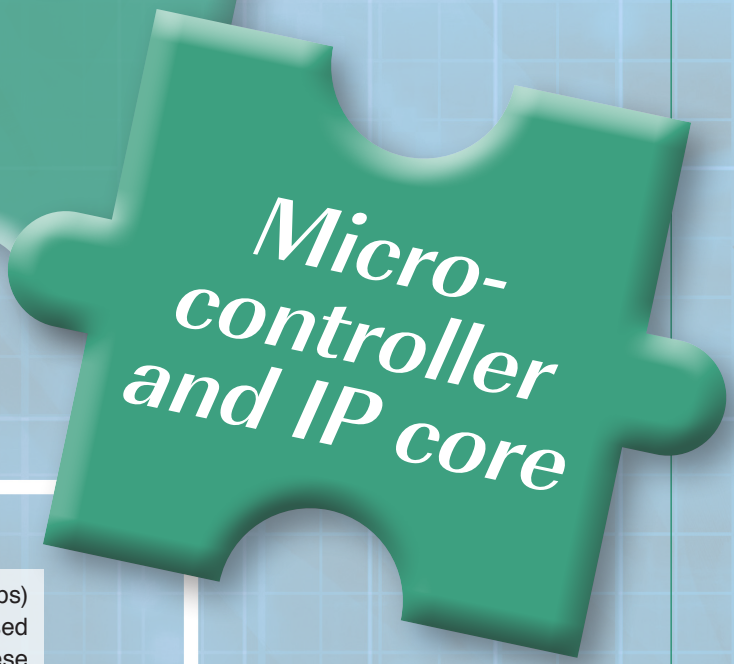
Designers of embedded devices with CAN FD connectivity need a protocol controller. Usually, the CAN FD protocol controller is integrated in micro-controllers. Nearly all suppliers of automotive-rated micro-controllers support CAN FD.

These micro-controllers are powerful. They provide multiple CAN FD ports and many other peripheral functions. However, these products are not suitable for simple devices such as sensors and I/O modules.

Now, the chipmakers offer also low-cost micro-controllers with limited functionality, which feature just one or two CAN FD ports. Additionally, there are stand-alone CAN FD protocol controllers available. They enable migrating existing devices to the new CAN-based data link layer.

For special-purpose applications, several suppliers provide CAN FD cores. These IP cores can be integrated in micro-controllers, ASICs (application-specific integrated circuits), and FPGAs (field-programmable gate arrays). They are used for CAN FD interfaces for tools with special-purpose functions. These cores are also suitable for deeply embedded applications such as backbone networks within modular devices, for example.

In ISO 11898-2:2016, there are two sets of parameters for transceivers standardized. The so-called 2-Mbit/s parameters enable bus-line topologies. The sophisticated transceivers featuring the 5-Mbit/s parameters give the designers more design freedom for networks running up to 2 Mbit/s. They are also suitable for point-to-point connections running up to 5 Mbit/s. Higher bit-rates are possible, when just “room” temperatures are required.



The chipmakers offer also SBCs (system base chips) with integrated transceiver functionality. They are used in automotive ECUs (electronic control units). All these components are available from different suppliers.

For applications requiring more freedom regarding the network topology, there are so-called SIC (signal improvement circuitry) transceivers available. Such components suppress the ringing caused by not optimized topologies. They are standardized in CiA 601-4. Of course, designers have to select carefully other components such as cables and connectors to achieve bit-rates of above 2 Mbit/s in networks with hybrid topologies.

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Software for CAN FD

In embedded networking, there is a trend to standardized higher-layer protocols. For CAN FD, CiA (CAN in Automation) has developed the CiA 1301 CANopen FD application layer and communication layer. Several companies provide CiA 1301 compliant protocol stacks.

Several software suppliers have implemented the ISO Transport Protocol as standardized in the ISO 15765 series as well as the XCP (Extended Calibration Protocol) specified by the nonprofit ASAM association. Both protocols are required especially by carmakers.

Other standardized higher-layer protocols for CAN FD networks such as J1939-22 (commercial vehicles) and Arinc (airborne) are still under development. Several parties will implement them, when the specifications are released.

The CAN Newsletter Online (www.can-newsletter.org) reports regularly about product launches. CiA's online publication chronicles the availability of CAN FD protocol controllers, transceivers, and higher-layer protocols suitable for CAN FD. Additionally, the CAN Newsletter magazine publishes quarterly technical background articles, application reports, and other technical in-depth articles about CAN FD. Links to CiA publications' article are provided in the monthly CAN Info Mail (CIM) email services, which you can subscribe. Just send an email to mail@can-cia.org.

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