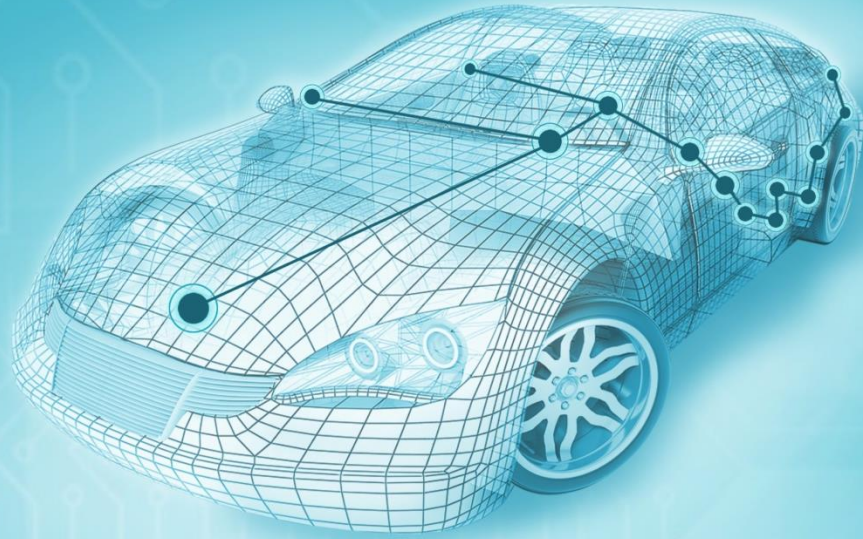


Implementing CAN and CAN FD using the TCAN4550-Q1 System Basis Chip (SBC)

Wes Ray // Transceivers

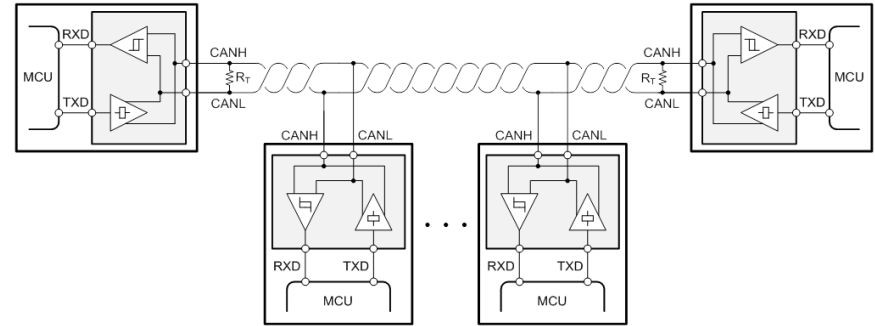


Agenda

- Defining CAN and CAN FD
- Configuring CAN versus CAN FD
- Implementing CAN with the TCAN4550-Q1 SBC
- Upgrading to CAN FD with the TCAN4550-Q1 SBC
- Port expanding CAN & CAN FD with the TCAN4550-Q1 SBC

What is Controller Area Network (CAN)?

- The CAN standard defines both a protocol and a physical layer for asynchronous, serial communication in multi-point bus applications
- Each node consists of a CAN transceiver and CAN controller (MCU).
- Communication occurs over a differential bus at up to 1 Mbps (for classical CAN) or higher (for flexible data rate)

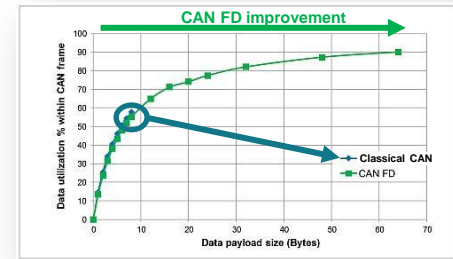


What is CAN Flexible Data (FD) Rate?

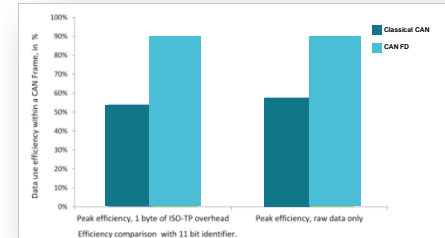
CAN FD is a communications protocol that builds on the original CAN bus standard (Classical CAN) to meet the increased bandwidth and data-rate flexibility requirements of in-vehicle networks

Benefits and challenges of CAN FD:

- **Increased bus efficiency:** 5-Mbps maximum data rate and support for payloads up to 64 bytes
- **Compatibility with Classical CAN:** Does not require new connectors or cables but does require an updated processor with CAN FD controller(s) and associated CAN FD transceiver
- **Transition limited by available solutions:** Current multi-chip solutions require added cost and increase board space

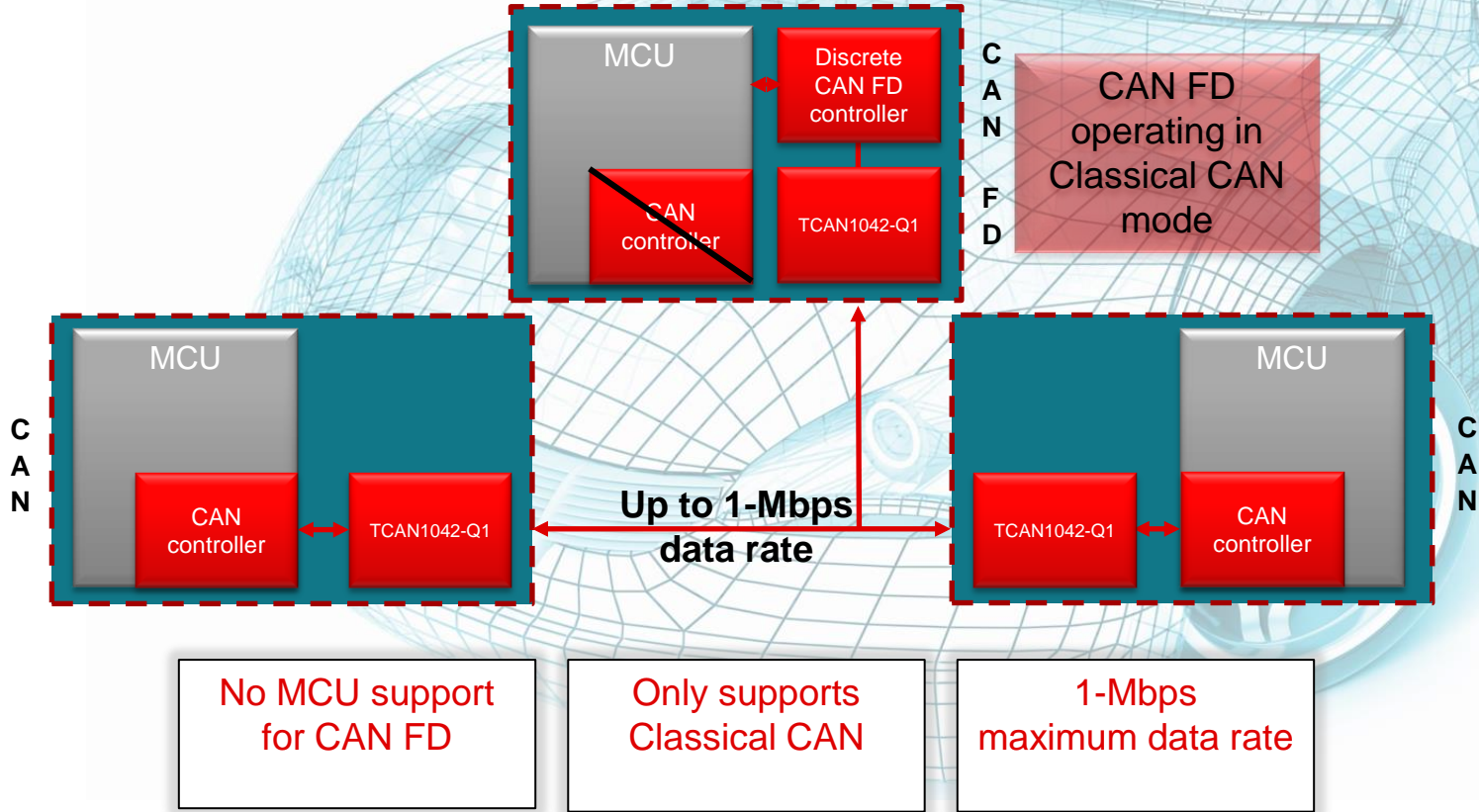


5x increase in data rate
8x increase in data payload

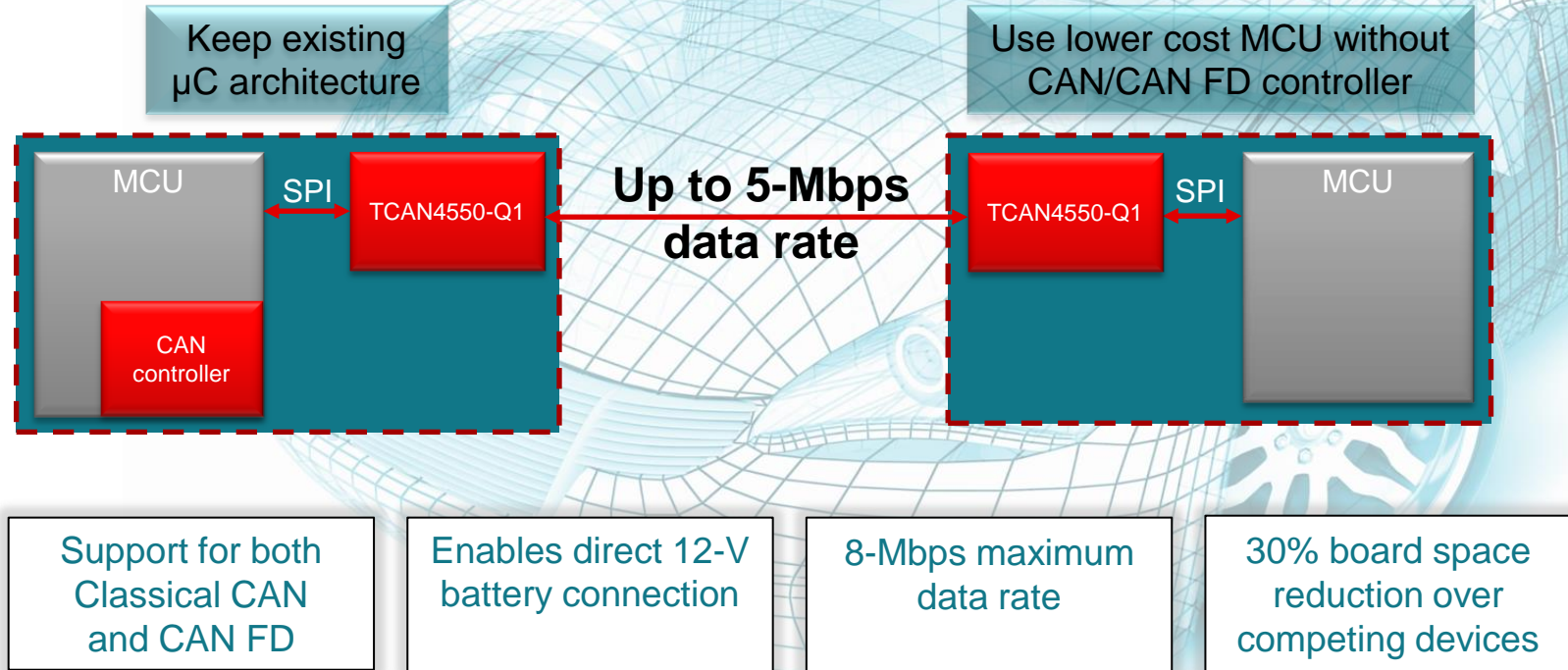


Classical CAN/CAN FD bus: current configuration

(simplified)



CAN FD bus upgrade with the TCAN4550-Q1 (simplified)



CAN FD bus expansion with the TCAN4550-Q1 (simplified)



Easily add additional CAN/ CAN FD buses

Limited number of CAN FD controllers in MCU

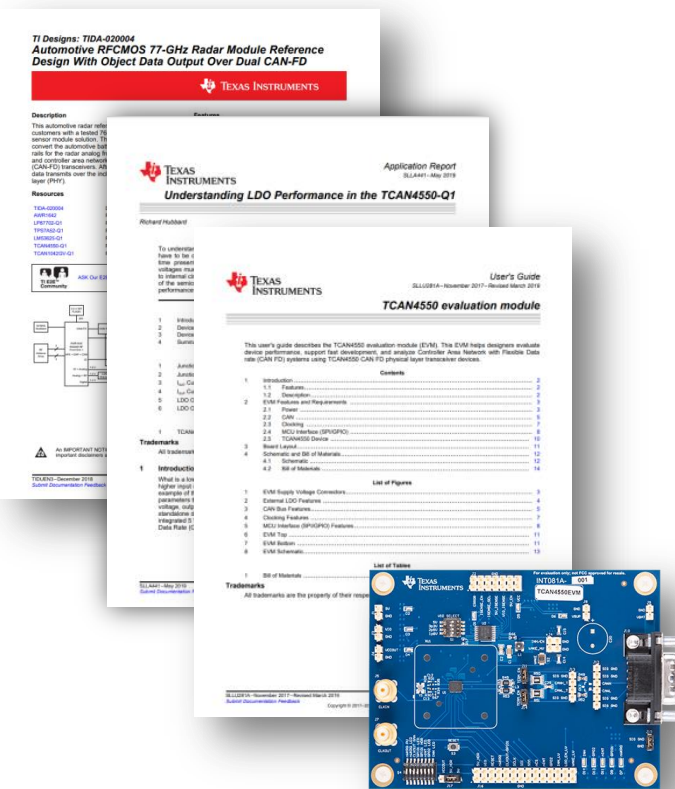
Multiple buses can be controlled by a single MCU

Bus expansion possibilities for Classical CAN

Key takeaways

- The TCAN4550-Q1 SBC can implement CAN
 - used for MCUs without classical CAN
 - used for port/bus expansion
- The TCAN4550-Q1 can implement CAN FD
 - only a slight configuration needed to enable CAN FD versus classical CAN
 - used for MCUs with no CAN FD
 - used for port/bus expansion
- The TCAN4550-Q1 is a single, integrated solution to fit a variety of needs
 - integrated features simplify system design
 - available for both automotive and industrial applications

TCAN4550-Q1 tools and support



TCAN4550-Q1 resources:

- View the [TCAN4550-Q1](#) on TI.com
- Download the [TCAN4550-Q1 datasheet](#)
- Easily evaluate this device and its CAN FD support with the [TCAN4550-Q1 evaluation module](#)
- Jumpstart designs of size-optimized automotive radar modules with the [Automotive RFCMOS 77GHz radar module reference design with object data output over dual CAN FD](#)
- Learn more about LDO performance in the TCAN4550-Q1 with this [application note](#)
- Explore our [growing portfolio of SBCs](#) for CAN, CAN FD and LIN transceivers

Thank you

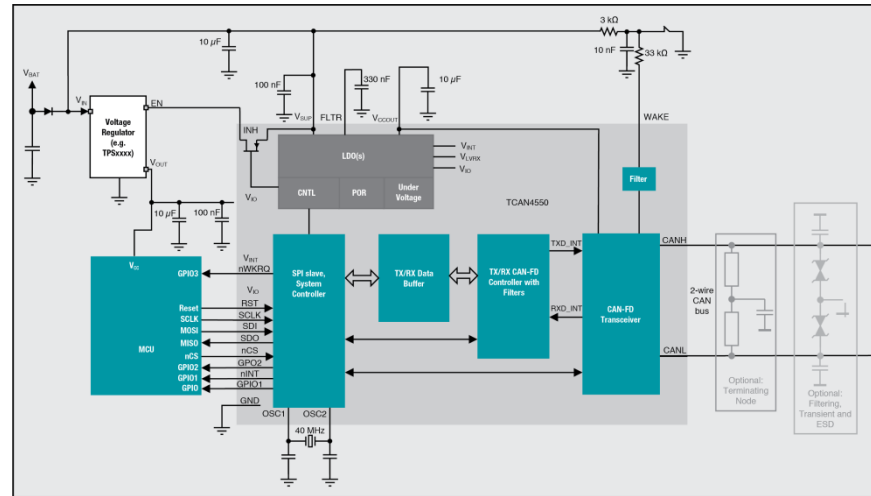
TCAN4550-Q1: First system basis chip with integrated CAN FD controller and transceiver

Innovative SBC utilizes the Serial Peripheral Interface (SPI) bus of almost any microcontroller to upgrade to or add CAN FD interfaces with limited system changes

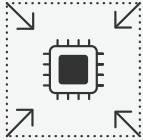
CAN FD bus upgrade: Utilize existing processor or move to a lower cost solution

CAN FD bus expansion: Single-chip solution to expand CAN FD buses

Small footprint: 4.5-mm-by-3.5-mm 20-pin QFN enables upgrade and expansion in a small package



Benefits and features of the TCAN4550-Q1



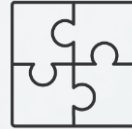
Single-chip solution for CAN/CAN FD upgrade and expansion

Allows designers to quickly and easily add or expand CAN/CAN FD



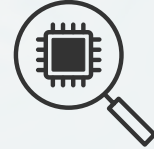
Exceeds maximum CAN FD data rate

Supports data rates up to 8 Mbps, surpassing the 5-Mbps maximum data rate of CAN FD



Integrated feature set for increased design flexibility

Includes a 70mA low-dropout regulator, watchdog timer, failsafe modes and support for 3.3 and 5-V I/Os



Smaller package size for reduced board space

Consumes less board space than standard CAN transceiver (SOIC) package

TI's CAN, LIN & SBC transceiver interface portfolio

Automotive CAN Transceivers

- High-immunity and low-emissions AEC-Q100 CAN transceivers
- Full support of CAN FD up to 5 Mbps

System Basis Chips (SBC)

- Multi-function AEC-Q100 SBCs
- Integrating CAN, CAN FD and LIN transceivers with LDOs
- Rich feature sets for increased design flexibility

Automotive LIN Transceivers

- High-immunity, low-emissions, AEC-Q100, single-wire robust communication transceivers for low-speed, short-distance automotive applications
- Multi-channel devices available

3.3-V CAN Transceivers

- Industry-leading 3.3-V VCC CAN transceivers
- Interoperable with 5-V mixed networks
- Provides a lower voltage and lower system cost alternative to 5-V transceivers

5-V CAN Transceivers

- CAN/CAN FD transceivers
- Standard packaging
- Robust 5-V VCC CAN transceivers with up to ± 70 -V bus fault protection and up to ± 30 -V of common-mode voltage

Isolated CAN Transceivers

- 2.5-kVrms and 5-kVrms galvanically isolated CAN transceivers
- Supporting signaling rates up to 5 Mbps and ± 70 -V bus fault protection