



CAN FD light

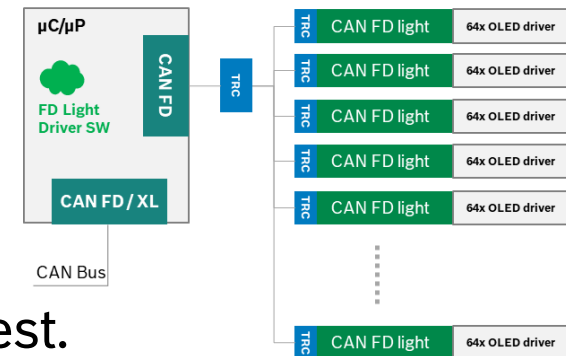
Robert Bosch GmbH, ME-IC/PRM-IP, 3rd of June 2024

CAN FD light

What is CAN FD light

■ CAN FD light: Commander responder architecture

- 1x Commander and multiple responder
- The CAN FD light commander controls the entire communication.
 - Sends data to the responder on the network and requests data from them.
- The CAN FD light responder answers to such a request.



Backlight:
64
dynamic
OLEDs
per
satellite

- Existing CAN FD / XL Controller as Commander
- Existing CAN Transceivers standalone or integrated
- New CAN FD light Driver SW
- New CAN FD light Responder (cost reduced)

■ Simplified protocol

- CAN FD light uses a subset of the CAN FD protocol
 - No arbitration and no error frames are needed

CAN FD light – Next Step in CAN Evolution

Lower system cost

Target / Motivation



Provide a low-cost CAN solution with respect to

- Price (Transceiver, Pins, Cabling, ...)
- Clock requirements
- MCU less receiver node
- Monolithic device integration:
 - Transceiver, CAN FD light responder, state machine + analog
- Standardization
- Preserve CAN properties:
- Robustness, long stubs, ...

What is CAN FD Light

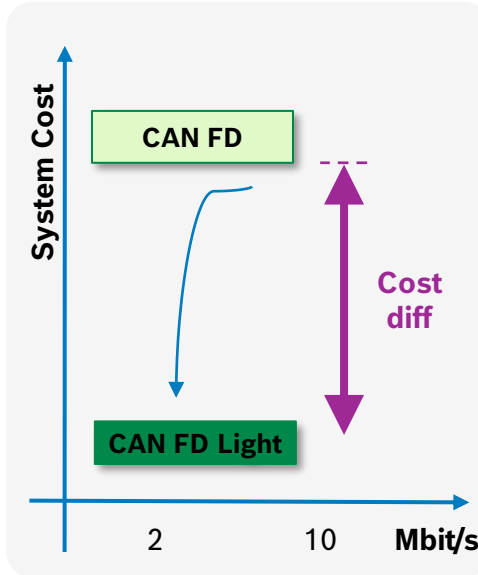
- Commander and responder architecture based on the CAN FD protocol

Compatibility of CAN FD and CAN FD Light enables ...



... incremental upgrade path

- ➔ larger acceptance (re-use of CAN FD knowhow, tools, ECUs)
- ➔ allow CAN FD and CAN FD Light on the same network



Key Success Factors

- 1) Lower System cost**
Save external crystal of **0.4\$** per CAN FD light node compared to CAN FD
- 2) MCU less Receiver node -> lower cost**
no firmware update, no maintenance
- 3) ISO Standard for CAN FD light responder**
ISO 11898-1:2024 Annex A released
- 4) Use standardized components**
No change need in HW for CAN FD light commander, transceiver, wiring harness, tools
- 5) Broad availability CAN FD light commander**
All μ C/ECU which support CAN FD/XL can be CAN FD light Commander
- 6) Broad availability CAN FD light responder**
Semiconductor manufacturer developing CAN FD light Responder
- 7) Up to 8Mbit/s**
Up to 2Mbit/s today w/ CAN FD/XL commander nodes and up to 8Mbit/s with tomorrows CAN FD/XL commander nodes

CAN FD light Concept Overview

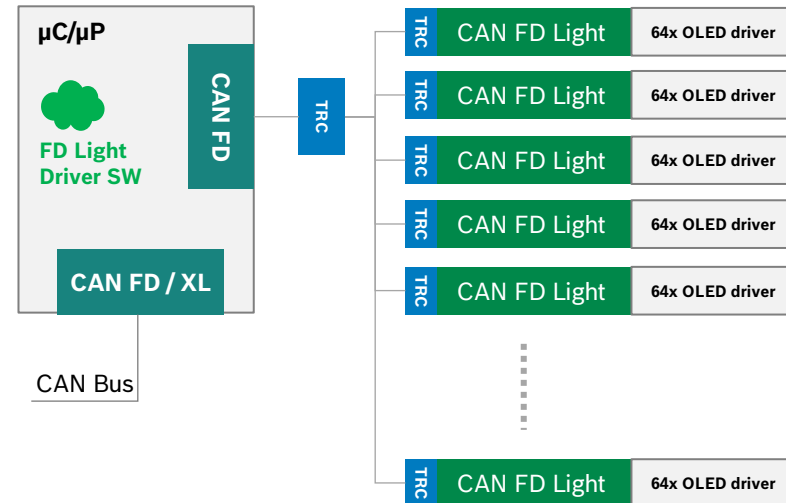
Single commander (master) – multi responder (slave) networks

COMMANDER (master)

- Standard CAN XL or CAN FD hardware controller [ISO11898-1:2024]
- Standard CAN/CAN FD Transceivers [ISO11898-2:2024]
- CAN FD Light driver software

RESPONDER (slave)

- Standard CAN FD light Responder [ISO 11898-1:2024 Annex A]
- Monolithic integration in sensor or actuator or AFE
- No ECU or software required
- Simplified CAN FD controller logic
- No costly crystal or ceramic resonator required
- Standard CAN/CAN SIC Transceivers [ISO11898-2:2024]
- ASIL A/B/D or QM

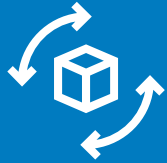


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CAN FD light

Communication principles



All communication initiated by master

- No arbitration or collision handling required
- High bandwidth utilization – no need to reserve bandwidth for high priority frames
- Addressing thru frame identifier (or first data field byte)



Support for Broadcast frames to address multiple actuators synchronously

- Single frame providing shared or individual information for multiple slaves at the same time
- No response from slave except of acknowledging



Support for Unicast frames – with or w/o response frame from slave

- Addressing individual slaves with dedicated control information or request for status/diagnosis response
- Well defined response time

CAN FD light

Build on proven CAN FD protocol

**CAN FD light ...
A CAN FD PROTOCOL
COMPATIBLE
COMMUNICATION**

01

CAN FD light is a cost-optimized sub-set of CAN FD

- Base identifier (11 bit) only
- FD Frames only (no Classical CAN Frame formats supported)
- BRS (Bit Rate Switch) = 0; same bit rate for the whole frame up to 8Mbit/s

02

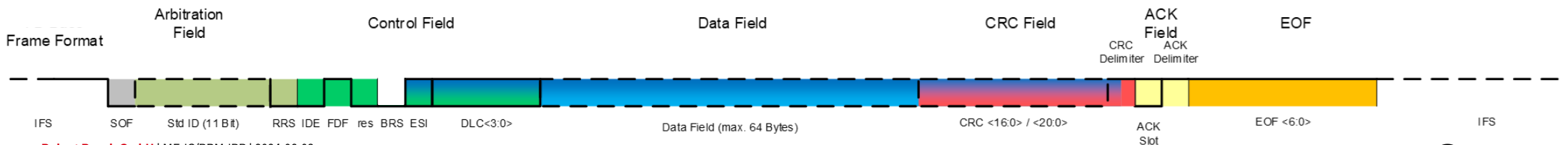
The CAN FD light protocol re-uses the CAN FD protocol frame format

- Data length code – defining up to 64 byte of payload
- CRC Field – frame integrity protection
- Acknowledgement

03

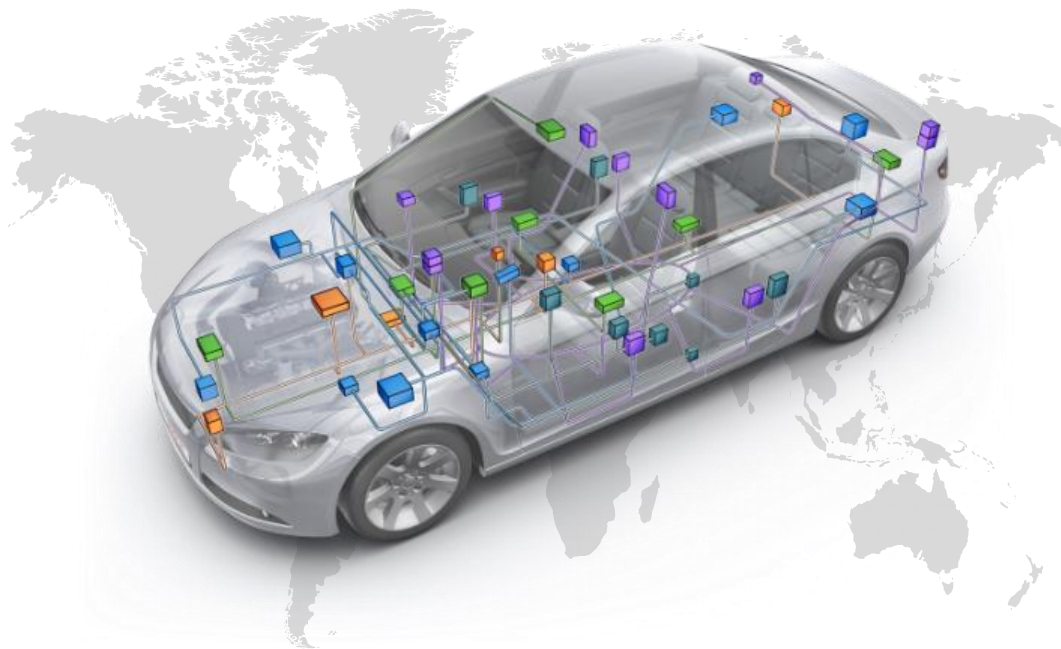
The CAN FD light protocol don't need

- No Arbitration – due to strict communication flow
- No Error Frames – clearly identified data flow, no advertising errors needed
- No bit monitoring – bits maybe shorter than transmitter loop delay



CAN FD light

Addressing new application domains with low cost I/F



Automotive Lighting Internal and External

- CAN FD light commander: controller in zone or domain controller
- CAN FD light responder: lighting controller with analog drivers
 - Headlight and taillight
 - Interior mood lighting

Battery management network

- CAN FD light commander: dedicated battery management controller or covered by zone or domain controller
- CAN FD light responder: battery cell controller with battery monitoring and balancing function

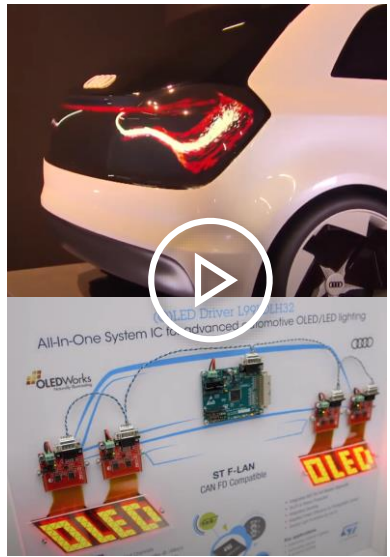
Body electronics

- Heating, ventilation, and air-conditioning (HVAC)
- Ultrasonic distance measurement
- Wiper
- Other Sensor / Actuator

CAN FD light

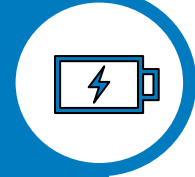
Addressing new application domains

USECASE EXAMPLE(S)



Automotive lighting

- Internal and external



Battery management network



Automotive body electronics



White Goods

- CAN FD light commander is the main control unit
 - Responder: motor control, analog, display,