Galvanic isolated CAN FD repeater reference design

Texas Instruments has published an application note describing a two-port repeater using the company's CAN transceivers and an arbitration-logic.

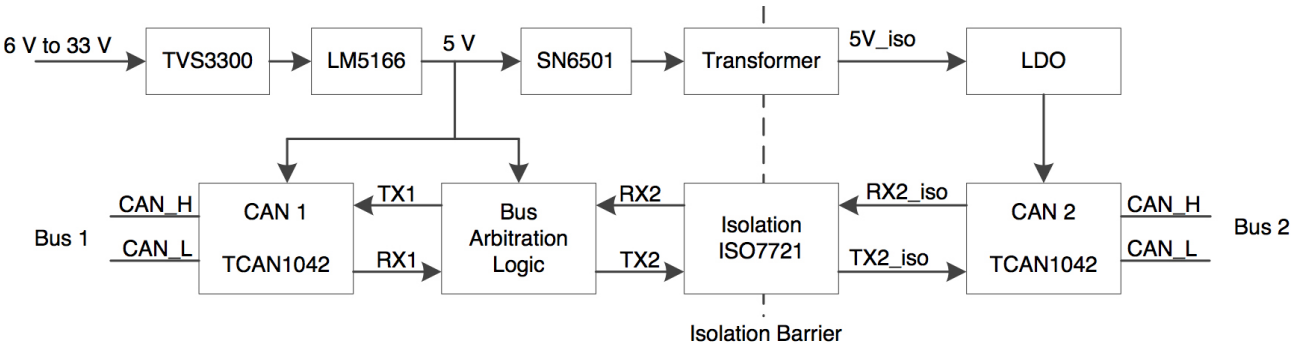


Figure 1: Block diagram of the isolated CAN FD repeater (Source: Texas Instruments)

This isolated CAN FD repeater reference design adds electrical isolation between two bus segments. The CAN FD frames on either bus segment side are repeated to the other side. The transceiver and arbitration logic in this reference design support bit rates up to 2 Mbit/s. The design is supplied by a wide range voltage supply between 5 V_{DC} to 33 V_{DC} and protected from high-power transients or lightning strikes by a flat-clamp surge protection device.

Adding bus isolation inside the CAN FD device protects against dangerous electrical transients and eliminates ground loops. When there is no internal isolation, then the device is exposed to some electrical challenges. However, isolation still can be added between non-isolated CAN FD devices by adding an isolated CAN FD repeater into the bus lines.

The proposed CAN FD repeater design consists of two TCAN 1042H transceivers. Between these two transceivers is an isolation barrier and an arbitration logic. The arbitration logic detects which of the two transceivers enter the dominant state first and prevents the loopback of the secondary transceiver side, which would stall the CAN FD network into dominant state otherwise.

Arbitration logic

The arbitration logic is needed to prevent both CAN FD networks to get stuck in dominant state due to the loopback function inside the CAN FD transceivers.

The arbitration logic detects, which of the two CAN FD ports is entering the dominant state first. Based on the detection of the first CAN FD side, the arbitration logic blocks the secondary CAN FD side from also asserting dominant state due to the loopback. Once the first CAN FD segment releases the dominant state the arbitration logic ▷

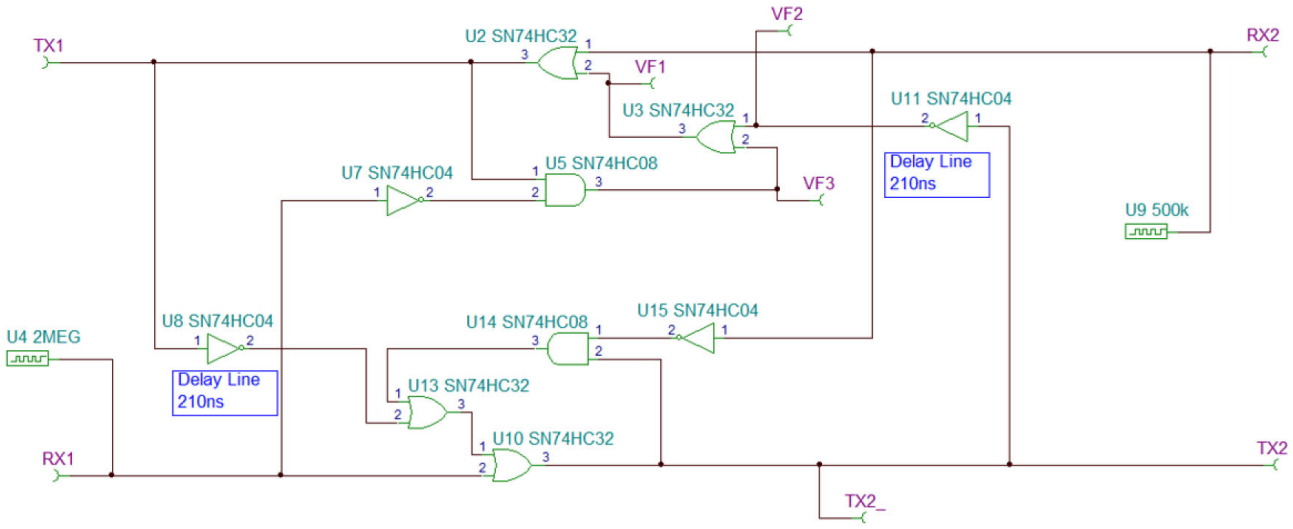


Figure 2: CAN FD arbitration logic circuit (Source: Texas Instruments)

CAN Newsletter Online: CAN FD transceiver

Electronica 2018

Transceivers with CAN FD and 70-V bus-fault protection

Texas Instruments (TI) has introduced two more CAN transceivers. They offer ±70-V_{DC} bus-fault protection and ±30-V common-mode voltage range.

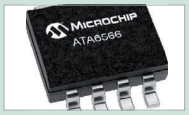
Read on

System Basis Chips

With CAN FD support

I nfineon Technologies is launching two System Basis Chip (SBC) families: Lite and Mid-Range+. They are compliant with ISO 11898-2:2016 and qualified for 5 Mbit/s.

Read on



CAN FD transceivers

Compliant to ISO 11898-2:2016

Microchip offers a series of transceiver chips, which are qualified for 5 Mbit/s respectively 2 Mbit/s. Some products support stand-by functionality.

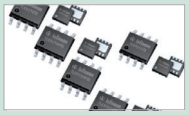
Read on

5-Mbit/s CAN FD chip

Stand-alone controller with on-chip transceiver

Texas Instruments (TI) has launched the TCAN 4550 stand-alone CAN FD protocol controller. On-chip is also a 5-Mbit/s qualified transceiver.

Read on

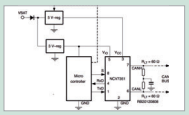


CAN FD transceiver

Features 5 Mbit/s

Infineon (Germany) has released the CAN FD TLE925x transceiver family. They comply with ISO 11898-2:2016.

Read on



CAN FD transceiver

Supports data rates up to 5 Mbit/s

ON Semiconductors has launched the NCV7351F transceiver, which complies with ISO 11898-2:2016. It is qualified for bit-rates up to 5 Mbit/s.

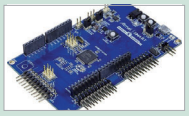
Read on

CAN FD transceiver

Bit-rates up to 2 Mbit/s and higher

Several chipmakers have qualified CAN high-speed transceivers for data-rates up to 2 Mbit/s. Transceiver supporting higher speeds (4 Mbit/s or 5 Mbit/s) are under development or have been pre-announced.

Read on



Embedded World 2018

Evaluation board with CAN FD transceiver

Microchip offers development boards for its ARM-based MCUs featuring CAN FD connectivity. The products are equipped with the company's CAN transceivers qualified for 5 Mbit/s.

Read on

CANgineFD_BT

CANgineFD_BT is a CAN / CAN FD to Bluetooth converter that gives access to CAN FD or CANopen FD networks using mobile devices.

The following firmware versions will be available from the 2nd quarter of 2019:

- **CANgineFD_BT:**
  a simple CAN / CAN FD converter that converts CAN / CAN FD messages into an ASCII stream and vice versa.
- **CANgineFD_BT CANopenIA:**
  offers an easy direct access to CANopen FD networks.

Based on the CANgineFD_BT, we offer customized firmware variants as well as hardware variants.

Features:

- CAN FD data bitrate up to 10 Mbit/s
- Bluetooth v2.1 + EDR, class 1, Serial Port Profile
- Power supply: 8 – 30 V

Benefit from more than 17 years of CAN experience.

ESS Embedded Systems Solutions GmbH

Industriestrasse 15
76829 Landau in der Pfalz
Phone: +49 6341 3487-0
Email: sales@cangine.com
www.cangine.com
www.essolutions.de

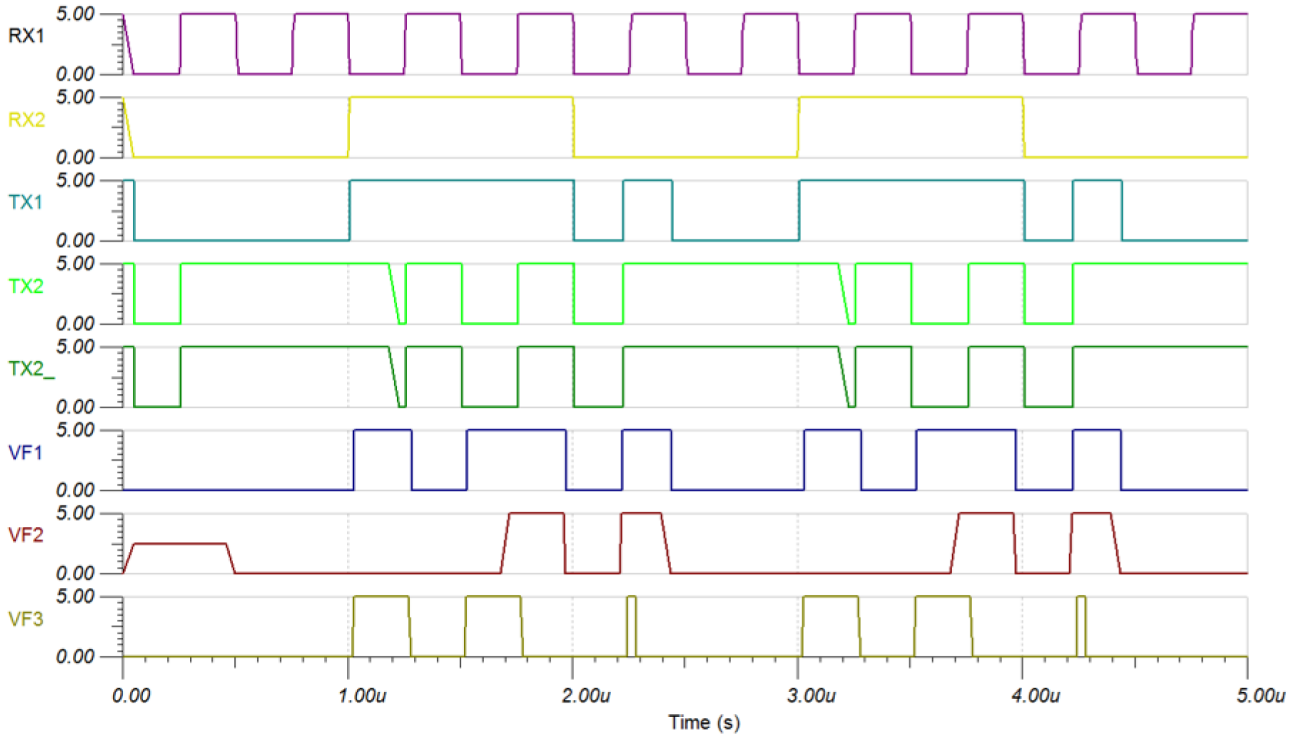


Figure 3: Arbitration logic simulation results (Source: Texas Instruments)

starts a time delay unit. After the time delay unit expires, the block of the secondary side is removed. The arbitration logic works in both directions.

The delay line unit has an asymmetric delay of the CAN FD line transition. This unit has a delay of 210 ns from dominant state to resistive state and no delay from resistive state to dominant state. The asymmetric delay of 210 ns is needed to support higher bit rates than 2 Mbit/s. Texas Instruments has simulated the arbitration logic. The simulation showed when both sides of the CAN FD interfaces get into a dominant state. Then the side that stays longer in the dominant state wins the bus arbitration, and the port that enters recessive state goes back to receive mode.

The stimulus on the left side is a 2-Mbit/s square wave signal and on the right side a slower 500-kHz square wave signal. Note that the stimulus is not CAN signal because they do not detect a dominant state and switch off driving the bus. The two stimuli are mainly used to test the initial arbitration of the arbitration logic. The secondary side (RX2) stays longer in the dominant state and therefore is in favor of the arbitration detection logic.

The capacitor is charged (VF4) during the transition from dominant state to resistive state (V_in). When the VF4 voltage reached the threshold, the time delay unit set V_out to recessive. As the time delay unit is asymmetric, there is no delay when V_in goes to dominant and V_out goes immediately dominant, too.

Galvanic isolation logic

Texas Instruments has chosen the ISO 7721 component for this reference design, because it supports two data lines, one in each direction. It isolates the two transceiver signals RX and TX between the two CAN FD segments. The component coming in an SOIC (D) package supports 3000 V of isolation. Note that if a higher isolation voltage is required, then the SOIC (DW) package must be used.

The chipmaker has tested the reference design. For the test two Beaglebone Black modules were used. They feature the TIDA-01406 compliant energy efficient and isolated CANopen interface. The test results are documented in [1]. ◀

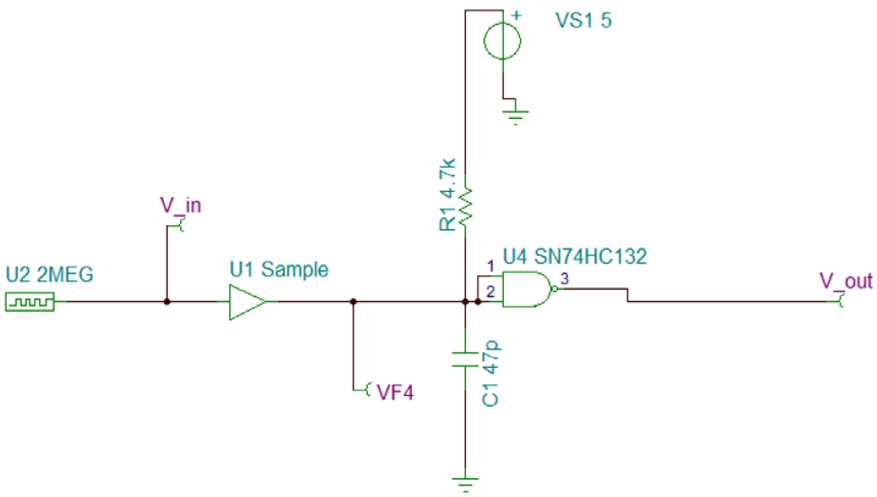


Figure 4: Delay logic circuit (Source: Texas Instruments)

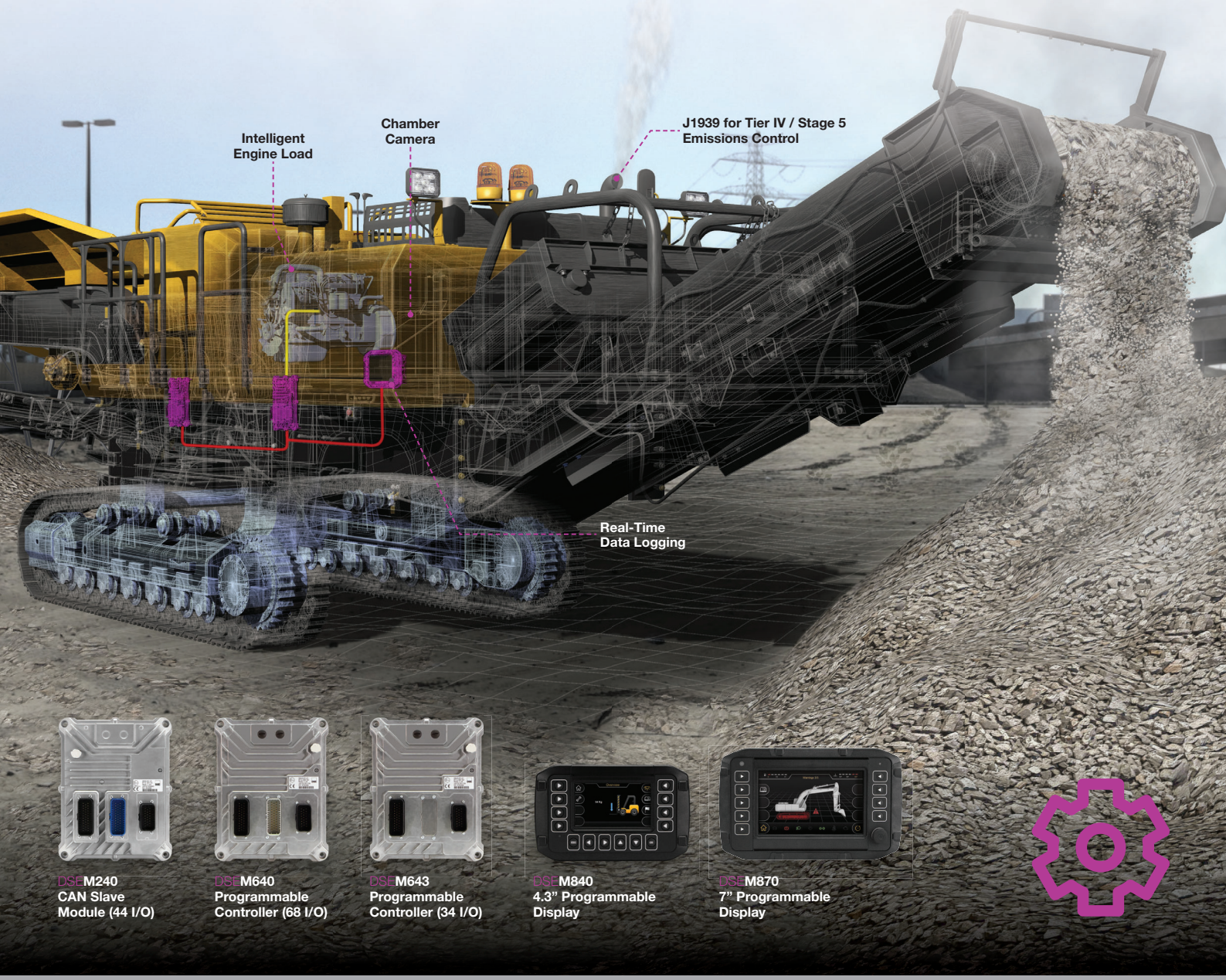
hz

Based on TIDA-01487 [1].

References

[1] TIDA-01487: Isolated CAN FD Repeater Reference Design; Texas Instruments, 2018.

COMPLETE STONE CRUSHER CONTROL SOLUTIONS.



DSEM240
CAN Slave Module (44 I/O)

DSEM640
Programmable Controller (68 I/O)

DSEM643
Programmable Controller (34 I/O)

DSEM840
4.3" Programmable Display

DSEM870
7" Programmable Display

DSEControl® M-Series

DSE has been delivering world-class control solutions to its customers for over 40-years. During this time the company has developed a reputation across the globe for its UK engineering and manufacturing excellence.

The **DSE M-Series** builds on this reputation. The innovative collection of programmable controllers & displays and CAN slave modules provide customers with complete stone crusher control solutions.

To learn more about **DSE M-Series** products, visit **www.deepseaelectronics.com**

DEEP SEA ELECTRONICS LTD
Highfield House, Hunmanby Industrial Estate Hunmanby, North Yorkshire, YO14 0PH, UK
TELEPHONE: +44 (0) 1723 890099

UKMADE