CAN-PCIeMiniHS/402-4-FD
Half-Size PCI Express® Mini Card with 4 CAN FD Interfaces

Extremely small Variant in Half-Size PCIe Mini Form Factor
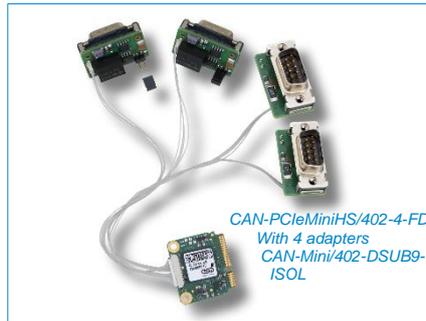
- 4 CAN FD interfaces with TTL level
- Bus mastering and local data management by FPGA
- PCIe® Mini interface according to Mini Card Electromechanical Spec. R1.2
- Supports MSI (Message Signalled Interrupts)
- Half-Size Mini Card (Type H2) form factor
- Cable for connecting up to 4 adapters included in the scope of delivery

Wide Range of OS Support and Advanced CAN Diagnostic

- Software drivers for Windows® and Linux® included
- Optional CAN layer 2 software drivers for real-time operating systems
- High resolution hardware timestamps

Adapter converts CAN-TTL Level Signals to CAN FD Signal Level

- Galvanic isolation of CAN interface
- Selectable CAN Termination
- DSUB9 connector
- Adapter variant with CAN SIC transceiver
- The adapters are not scope of delivery and can be ordered as required

CAN-PCIeMiniHS/402-4-FD
With 4 adapters
CAN-Mini/402-DSUB9-ISOL

Hardware Designs

The CAN-PCIeMiniHS/402-4-FD is an add-in half-size PCI Express Mini Card with four CAN FD interfaces with TTL level. The adapter cable is included in delivery. The CAN-PCIeMiniHS/402-4-FD-T variant is designed for use in the extended temperature range.

Adapter with galvanic Isolation

The CAN interfaces can be connected individually via the adapters CAN-Mini/402-DSUB9-ISOL. The adapter consists of a small adapter board, equipped with a physical CAN interface according to ISO11898-2, a jumper for selectable on-board CAN termination and a DSUB9 connector. The variant CAN-Mini/402-DSUB9-ISOL-SIC is identical but with CAN FD signal improvement capability (SIC).

CAN Data Management

The independent CAN nets are controlled by the ISO 16845:2004 certified esdACC (esd Advanced CAN Controller) implemented in the Altera FPGA. The FPGA supports bus mastering (first-party DMA) to transfer data to the host memory. This results in a reduction of overall latency on servicing I/O transactions, in particular at higher data rates and a reduced host CPU load.
Due to the usage of MSI (Message Signaled Interrupts) the CAN-PCIeMiniHS/402-4-FD can be operated for example in Hypervisor environments. The CAN-PCIeMiniHS/402-4-FD provides high resolution 64-bit hardware timestamps for CAN messages.

Software Support

Windows and Linux (NTCAN-API)
The CAN drivers for Windows and Linux are included in the scope of delivery.
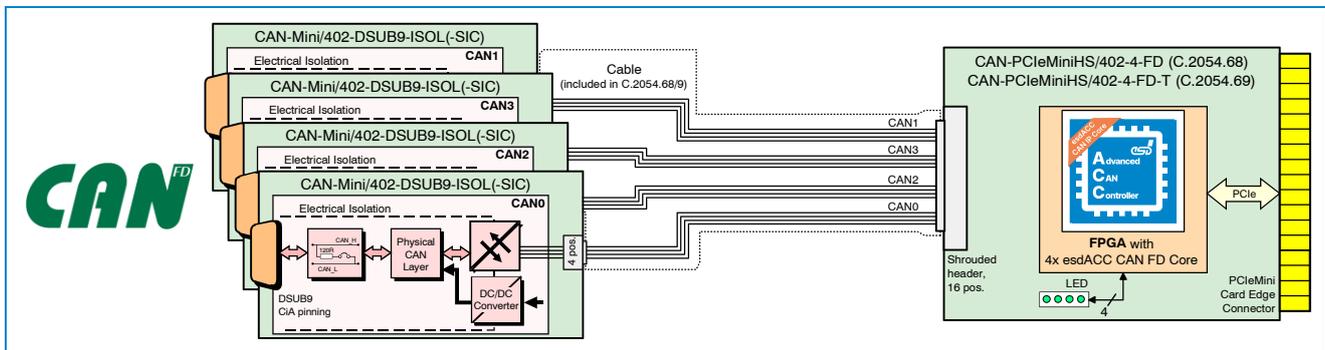
Real-time OS (NTCAN-API)
CAN drivers for QNX®, and RTX64®, VxWorks® and INtime® can be ordered separately. Others are available on request.

Higher Layer Protocols
(CAN Classic environment only)
Higher Layer Protocols are available for many operating systems (see order info):
- CANopen Manager- and Server-Stack
- J1939 Software Stack
- ARINC825 Software Stack

Technical Specifications:

PCI Express Mini Interface:

PCIe port	PCI Express Spec. R1.0a, Link width 1x
Form factor	According to PCI Express® Mini Card Electromechanical Specification, Revision 1.2, half size

CAN:

Interface	4 CAN FD interfaces (TTL level), Bit rates up to 8 Mbit/s,
CAN controller	esdACC in FPGA, according to ISO 11898-1
Cable	1-to-4 adapter cable 150mm
Adapter	CAN-Mini/402-DSUB9-ISOL with galvanic isolation, physical CAN layer according to ISO 11898-2 and selectable CAN termination, order separately, optionally with SIC transceiver

General:

Power supply	3.3 V: 4x CAN, I_{MAX} = 300 mA, I_{TYP} = 220 mA
Ambient temp.	Standard range: 0 °C ... +75 °C (C.2054.68) Extended range: -40 °C ... +85 °C (C.2054.69)
Rel. humidity	Max. 90 % (non-condensing)
Dimensions	Board: 30 mm x 27 mm, Adapter: 31,5 mm x 18 mm
Weight	Board: 10 g, Adapter: each 10 g
Connectors	PCIe: Mini PCIe card edge connector CAN: 1x shrouded header, 16-pos, (4x CAN FD TTL level) via adapters to up to 4x DSUB9 plugs (CAN FD)

Order Information:

Hardware		Order No.
CAN-PCIeMiniHS/402-4-FD	CAN Interface Card for Mini PCIe, 4x CAN FD (TTL level), incl. cable	C.2054.68
CAN-PCIeMiniHS/402-4-FD-T	As C.2054.68, but temperature range extended: -40 °C ... +85 °C	C.2054.69

Accessories		
CAN-Mini/402-DSUB9-ISOL	Adapter to DSUB9 plug, 1x CAN FD, galvanically isolated	C.2054.10
CAN-Mini/402-DSUB9-ISOL-SIC	Adapter with SIC transceiver	C.2054.11

Software Support [1]

CAN drivers for Windows/Linux are included in delivery free of charge.

Additional CAN object licenses including CD-ROM with CAN driver:

CAN-DRV-LCD QNX	Object License for QNX6, QNX7	C.1101.32
CAN-DRV-LCD RTX	Object License for RTX64	C.1101.35
CAN-DRV-LCD VxWorks	Object Lic. for VxWorks 6.x and newer	C.1101.55
CAN-DRV-LCD INtime	Object Licence for INtime 6 und 7	C.1101.65

Higher CAN layer protocols including CD-ROM for CAN Classic:

CANopen stacks for Windows/Linux, QNX, RTX or VxWorks	C.1101.xx
J1939 software stack for Windows or Linux	C.1130.xx
ARINC 825 stacks for Windows/Linux, QNX, RTX or VxWorks	C.1140.xx

1 For detailed information about driver availability for your operating system please contact our sales team.

CAN-PCIeMiniHS/402-4-FD
Driven by esdACC (Advanced CAN Controller)

Basic Product Features:

- CAN ISO 11898-1:2015 protocol compatibility
- Tested and certified acc. to ISO CAN Conformance Tests "ISO 16845:2004 Road vehicles - Controller area network (CAN) - Conformance test plan"
- 11-bit and 29-bit CAN IDs
- Supported bit rates
  CAN CC: CAN classic also known as CAN 2.0A/B supports bit rates from 10 kbit/s to 1 Mbit/s with a payload of up to 8 bytes per frame.

  CAN FD: CAN flexible data rate, supports bit rates from 10 kbit/s up to 8 Mbit/s with bit rate switch as well as a payload of up to 64 bytes per frame. It is fully backward compatible with CAN CC.
- Receive buffer (64 CAN messages)
- Complete access to CAN error counters
- Programmable error warning limit
- Error code capture register
- Error interrupt for each CAN bus error
- Arbitration lost interrupt with detailed bit position
- Disable Automatic Retransmission (DAR) (Single-shot transmission)
- Listen only mode (no acknowledge, no active error flags)
- Automatic bit rate detection (hardware supported bit rate detection)
- Self-reception mode (reception of 'own' messages)
- Busload measurement

Superior esdACC Features [1]:

- Operating system independently programmable via esd's NTCAN-API
- 32-bit register interface optimized for CAN needs
  - Easy to program
  - Transmission and reception of CAN frames with a minimum of register accesses
- RX and TX timestamping (64-bit wide, bit accurate, resolution may vary with input clock, in any case ≤ 62.5 ns, usually 12.5 ns)
  - Timestamping complies with the CiA 603 specification
  - On hardware with IRIG-B interfaces IRIG-B time is used for timestamping
- TX FIFO (16 CAN frames deep)
  - Providing the means to generate 100% busload even with non-real-time operating systems
  - Providing the means for real back-to-back transmission
- Timestamped Tx FIFO (16 CAN frames deep)
  - High priority
  - 64-bit timestamp
  - Bit time accuracy for CAN transmission
- Frame accurate abortion of transmissions with minimum delay
  - e.g. for driver timeouts
  - ISO11898-1:2015 conform
  - Aborted frames in FIFO won't be blocked by low priority TX

Superior esdACC Features (continued) [1]:

- Hardware timer to provide accurate software timeouts beyond operating system accuracy
- Bus mastering in RX direction takes the load off host CPU (needs bus master capable local bus to host interface)
- Optional different sources for timestamps (e.g. IRIG-B)
- Using FPGA technology provides the option to tailor any feature to any customer's needs, including optional integration with customer's FPGA content
- The esdACC IP core has been validated on Xilinx[TM] Spartan[TM] and Altera® Cyclone® FPGAs.

[1] Availability of the Superior esdACC Features depends on the operating system. Please contact our sales team for further information.

For further information on the esdACC IP Core please contact our sales team.