CANopen Library Driver Packages

Overview

The *CANopen Driver Packages* (DP) provide access to the hardware of the *CANopen Library* of ***port***. The Driver Packages are the keys for the usage of the target system independent of CANopen Library. They are designed for target systems with and without operation systems.

Description

The *CANopen Driver Packages* provide all necessary functions for

- initialization of the hardware
- controlling the CAN Controller
- message filtering
- message buffering and
- provision of a timer period

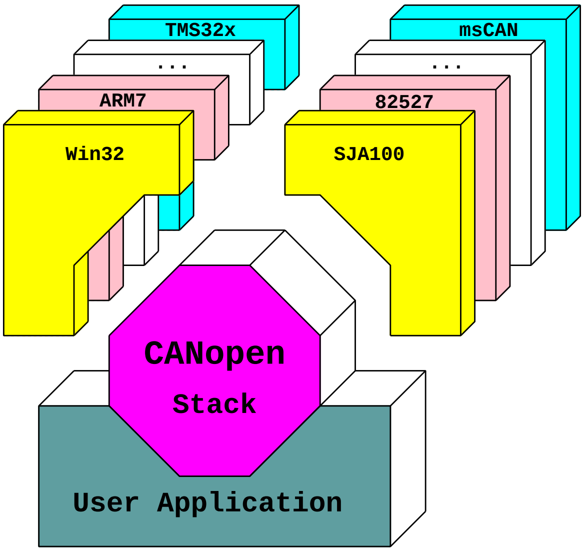
by means of a well defined interface. A *CANopen Driver Package* is comprised from a CPU- *(DP/CPU)*, a CAN- *(DP/CAN)* and where applicable a driver for an operating system *(DP/OS)*. These drivers can be used in any combination.

The following table shows hardware combinations of CPU and CAN drivers that are often used by our customers.

	microcontroller family																
CAN Controller	Microcontroller independant ANSI-C driver	8051 Family	Infineon C505	Atmel T89c51	Atmel AVR	Infineon C16xCy	Infineon XC16x	Intel 80x86	Microchip dsPIC	PowerPC	Fujitsu 16Lx	Fujitsu 16FX	TMS320Cxx	Renesas M16C	Freescale 56F8XXX	ARM 7/9	F HC08/HCS12
Integrated CAN			●	●	●	●	●		●	●	●	●	●	●	●	●	●
SJA1000	●	●	●	●	●	●	●	●		●	●	●	●	●		●	
Intel 82527/CC770	●	●	●			●	●	●		●			●	●			
TouCAN/FlexCan	●									●					●		
CANary	●	●		●	●												
msCAN	●									●					●		●
Bosch C_CAN	●	●										●				●	
Infineon TwinCAN/MultiCAN	●					●	●										
Microchip ECAN	●								●								
Microchip MCP2515	●						●	●	●	●				●		●	

All drivers are available as documented ANSI-C source code. This allows easy and quick adoption to system specific hardware and trouble-free compilation with all ANSI-C compliant ANSI-C compilers.

The comprehensive documentation ensures that the driver can be easily ported to another hardware platform by the user.



Configuration possibilities

The driver provides access to the CAN controller by several means:

- Memory Mapped Mode
(addressing the CAN controller via the address space of the CPU)
- I/O Mapped Mode
(addressing the CAN controller via the I/O address space of the CPU)
- Latched Mode
(addressing the CAN controller via address latches)

The used access method for accessing the CAN controller register depends heavily on the used hardware and can be adopted by means of access macros.

The driver for the FullCAN controller types provide the usage of

- FullCAN-Mode
filtering CAN messages in hardware for all channels available (1 channel for sending or receiving)
- FullCAN mode with 1 transmit channel
one transmit channel for all transmit messages
all other channels are configured as receiving channels using the hardware filter
- BasicCAN mode
1 transmit channel for all CAN messages
1 receiving channel for all CAN messages

The last two modes provide the possibility to use devices with FullCAN controller, that support more CAN objects as are provided from the hardware of the CAN controller.

Many drivers do contain code for

- step by step initial operation of the driver
- quick error detection
- extensions that have been added due to customer requests
- 29 Bit extented CAN Frames, besides the 11 Bit Base-Frame format

that can be enabled via appropriate compiler defines.

Besides the drivers for processors with multiple CAN controller there are several other drivers that support configuration for multi-line usage with the *CANopen Library*. Thus there is a wide range of drivers that can be used for multi-line devices.

Please note that there are possible hardware constraints especially with older CAN controller.

Configuration of the driver is done with the *CANopen Design Tool*, which is enclosed to the *CANopen Library* as light version.

Resources

All drivers normally transmit and receive interrupt driven and therefore require the integration into the interrupt system of the device. It also can be used in polling mode for special-purpose applications.
The time base for the *CANopen Library* can either be provided by the *CANopen Library* itself by using a timer or the timer interrupt function is called cyclically by another system timer.

Order Information

The *CANopen Driver Packages* are available as:

- reviewed hardware/system driver (DP 0565/xx) for typical hardware configurations
- freely selectable hardware driver CAN controller combinations (DP/CPU 0566/xx, DP/CAN 0567/xx)

We recommend the purchase order of pre-configured driver packages that in addition to the CPU and CAN driver contain ready to use examples. These have been prepared with project files for the compilers and configurations we use.

For application of the *CANopen Library* with operating systems like Windows™ or LINUX™ ***port*** provides drivers for active and passive PC cards, parallel dongles, PCMCIA cards, USB interface and external Ethernet to CAN converter *(EtherCAN)*.

Predefined Driver Packages

Order Code	Name of System
0565/06	**DP C505C** microMODUL-505C/plain (*Phytec*) (on Request/8051 + 82527)[1]
0565/05	**DP C515C** miniMODUL-515C/plain (*Phytec*) (on Request/8051 + 82527)[1]
0565/03	**DP C167CS** for miniMODUL-167C/plain (*Phytec*) (C166 + 82527)[1]
0565/34	**DP Infineon XC164CS** (XC166 + TwinCAN)
0565/56	**DP Infineon XMC4500** (XMC4500 + MultiCAN)
0565/69	**DP Infineon XE164** (XE166 + MultiCAN)
0565/10	**DP Atmel T89C51CC01/02/03** (8051 + CANary)
0565/35	**DP Atmel AT90CAN32/128** (AVR + CANary)
0565/47	**DP Atmel AT91SAM7A3/SAM7X(C)** (ARM7 with internal CAN)
0565/83	**DP Atmel AT91SAM9263** (32-bit AVR with internal CAN)
0565/94	**DP Atmel AT32UC3CO512** (32-bit AVR with internal CAN)
0565/112	**DP Atmel ATSAM4E** (32-bit ARM Cortex-M4 with internal CAN)
0565/115	**DP Atmel ATSAM4E-µC/OS** (32-bit ARM Cortex-M4 with internal CAN) under µC/OS
0565/25	**DP STMicroelectronics STR730** (with C_CAN)
0565/79	**DP STMicroelectronics STR911** (with C_CAN)
0565/117	**DP STMicroelectronics STM32F0x** (with bxCAN)
0565/72	**DP STMicroelectronics STM32F10x** (with bxCAN)
0565/107	**DP STMicroelectronics STM32F107** (with bxCAN)
0565/98	**DP STMicroelectronics STM32F2xx** (with bxCAN)
0565/110	**DP STMicroelectronics STM32F3xx** (with bxCAN)
0565/106	**DP STMicroelectronics STM32F4xx** (with bxCAN)
0565/33	**DP SiLabs C8051F040** (8051 + C_CAN)
0565/80	**DP SiLabs C8051F50x** (8051 + C_CAN)
0565/07	**DP Freescale HCS12(X)** for MC9S12(X) family (HCS12(X) + msCAN)

Order Code	Name of System
0565/67	**DP Freescale MC56F8037** (56800E + msCAN)
0565/08	**DP Freescale DSP56F807** (DSP56800 + msCAN)
0565/38	**DP Freescale MPC565/566** (MPC5xx + TouCAN)[1]
0565/36	**DP Coldfire 5282/5223** (with internal FlexCAN)[1]
0565/48	**DP Freescale MC56F8323** (56800E + FlexCAN)[1]
0565/118	**DP Freescale MC56F827xx** (MSCAN)[1]
0565/30	**DP Spansion MB90F543** (with internal Spansion CAN)
0565/66	**DP Spansion MB96F348** (with C_CAN)
0565/78	**DP Spansion MB91F467** (with C_CAN)
0565/109	**DP Spansion MB9BF524K** (with C_CAN)
0565/31	**DP TI TMS320LF2407** (TMS320 + internal CAN)
0565/32	**DP TI TMS320F2808/2812** (TMS320 + eCAN)
0565/57	**DP TI TMS320F28335** (TMS320 + eCAN)
0565/26	**DP TI TMS470R1B1M** (ARM7 with HECC)
0565/101	**DP TI Sitara AM335x** (ARM Cortex A8 with DCAN)
0565/103	**DP TI Concerto FM28M35X** (ARM Cortex M3 with DCAN)
0565/19	**DP Microchip dsPIC33F256** (dsPIC33F with ECAN)
0565/28	**DP Microchip PIC24H** (PIC24H with ECAN)
0565/37	**DP Microchip dsPIC30F6011/12/13/14** (dsPIC30F60xx with CAN)
0565/99	**DP Microchip PIC32MX** (PIC32MX795 with ECAN)
0565/43	**DP Microchip PIC18F2680** (PIC18F2x8x with ECAN™)
0565/44	**DP Microchip MCP2515** (with SPI-Interface,example for XC164)
0565/95	**DP NXP LPC1768** (with internal CAN)
0565/39	**DP NXP LPC2129** (with internal CAN)
0565/85	**DP NXP LPC2368** (with internal CAN)
0565/74	**DP NXP LPC2468** (with internal CAN)
0565/46	**DP Beck IPC@Chip 1x3** (with internal CAN)
0565/49	**DP RENESAS PD70F3231** (V850/ES-FE2 with aFCAN)[1]

Order Code	Name of System
0565/55	**DP RENESAS PD70F3577** (V850/E2-FG4L with aFCAN)[1]
0565/65	**DP RENESAS PD70F3377** (V850/ES-Fx3 with aFCAN)[1]
0565/93	**DP RENESAS PD70F3476** (V850/E-SJ3 with aFCAN)[1]
0565/113	**DP RENESAS PD70F4022** (V850E2/ML4 with FCAN)[1]
0565/21	**DP RENESAS M16C29** (with internal CAN)
0565/22	**DP RENESAS M32C/87** (with internal CAN)
0565/59	**DP RENESAS RL78F13** (with internal CAN)
0565/96	**DP RENESAS RX63N** (with internal CAN)
0565/108	**DP RENESAS RX62N** (with internal CAN)
0565/114	**DP RENESAS R-IN32M3** (with FCN-CAN)
0565/116	**DP RENESAS RX64M** (with internal CAN)
0565/119	**DP RENESAS RL78F14** (with internal CAN)
0565/73	**DP Luminary LM3S2965** (Cortex-M3 with C_CAN)
0565/92	**DP Luminary LM3S5B91** (Cortex-M3 with C_CAN)
0565/24	**DP netX** (with internal CAN)
0565/13	**DP CPC-Windows™** CPC CANopen driver for Windows™ (*EMS Wünsche*) e.g. useable for passive CPC-PCI card, CPC-USB Interface
0565/15	**DP Peak-light Windows™** CANopen driver for PCAN-light (*PEAK-Service GmbH*), (on request)
0565/29	**DP Arcom Boards Windows™-CE** with AIM104-CAN-Module
0565/50	**DP can4linux** CANopen driver for can4linux compatible hardware under LINUX™
0565/14	**DP CPC-Linux** CPC CANopen driver for LINUX™, (*EMS Wünsche*) useable for passive CPC-PCI card, CPC-USB Interface
0565/51	**DP CAN232 Linux** Lawicel CAN232 driver for LINUX™
0565/52	**DP CAN232 Windows™** Lawicel CAN232 driver for Windows™
0565/53	**DP SocketCAN** SocketCAN driver for LINUX™
0565/63	**DP Kvaser** CANopen driver for Windows™ useable for cards with Kvaser Interface

Order Code	Name of System
0565/75	**DP Kvaser/Kontron** Kvaser CANlib on Kontron Board for Windows™-CE
0565/70	**DP horch LINUX™** CANopen driver communicate with the standard horch server by using TCP/IP
0565/84	**DP horch Windows™** CANopen driver communicate with the standard horch server by using TCP/IP
0565/87	**DP SCIOPTA** with FlexCAN
0565/88	**DP CAN-IP von Xilinx** XPS CAN - Xilinx Part Number EF-DI-CAN-XC-SITE and Xilinx Microblace v7.20.c operating system Micrium µC/OS-II
0565/90	**DP generic** hardware independent CANopen driver for own driver adaptations

Adaptable Drivers *CAN driver*

Order Code	CAN controller type
0566/01	**DP/CAN Philips SJA1000**
0566/03	**DP/CAN Intel 82527**[1]
0566/04	**DP/CAN Siemens SAE 80C90/91** (on request)
0566/06	**DP/CAN Freescale TouCAN**[1]
0566/07	**DP/CAN Freescale msCAN** msCAN8, msCAN12, msCAN12/2
0566/08	**DP/CAN Spansion CAN** (16LX serie)
0566/09	**DP/CAN Atmel CANary**
0566/11	**DP/CAN Mitsubishi M16C/6N**
0566/13	**DP/CAN TI eCAN** (e.g. TMS320F28xx serie)
0566/14	**DP/CAN Bosch C_CAN** (e.g. Silabs C8051F040, Spansion MB91xxx, ST STR730)
0566/15	**DP/CAN Infineon TwinCAN**
0566/16	**DP/CAN Freescale FlexCAN**[1]
0566/19	**DP/CAN Philips LPC21xx**
0566/20	**DP/CAN Microchip MCP2515**
0566/22	**DP/CAN Atmel AT91SAM7A3/SAM7X(C)**
0566/23	**DP/CAN NEC aFCAN**[1]
0566/24	**DP/CAN TI HECC** (e.g. TMS470 serie)

CPU driver

Order Code	CPU type
0567/01	**DP/CPU Freescale MC683xx** (on request)
0567/02	**DP/CPU Freescale MC680x0** (on request)
0567/05	**DP/CPU Infineon C16x**
0567/06	**DP/CPU TI TMS320F2000**
0567/07	**DP/CPU Spansion MB90F54x,49x**
0567/08	**DP/CPU Freescale MPC823e**
0567/09	**DP/CPU Atmel T89C51CC0x**
0567/10	**DP/CPU Dallas 80C390/400** (on request)
0567/11	**DP/CPU Mitsubishi M16C/6N**
0567/12	**DP/CPU Freescale DSP 56F800**
0567/13	**DP/CPU Freescale HCS12(X)(X)**
0567/14	**DP/CPU SiLabs 8051**
0567/16	**DP/CPU Infineon XC166**
0567/17	**DP/CPU MicroChip dsPIC30F60xx**
0567/18	**DP/CPU Atmel AT91SAM7A2**
0567/19	**DP/CPU Philips LPC21xx**
0567/20	**DP/CPU Freescale Coldfire**
0567/21	**DP/CPU Atmel AVR AT90CAN128**
0567/22	**DP/CPU Microchip PIC18F2x8x**
0567/23	**DP/CPU Atmel AT91SAM7A3**
0567/24	**DP/CPU Freescale 56800E**
0567/25	**DP/CPU NEC PD70F3231**
0567/26	**DP/CPU TI TMS470B1M**
0567/27	**DP/CPU Microchip dsPIC33F**
0567/28	**DP/CPU Microchip PIC24H**

The supported number of drivers is constantly extended. If it happens to happen that your hardware is not yet listed we would be happy to provide support for developing your own driver for the *CANopen Library*.

[1] hardware dependent deviations from standard functionality