

General Description

The EASY219 is an all round high performance DIP-Chip PLC based on the Infineon C164 controller. It covers the powerful PLC runtime system CoDeSys and a CANopen master or slave in one device. This gives an optimized platform for realizing OEM control systems. The small form factor allows the module to be easily inserted into standard DIL40 sockets as well as into target hardware.

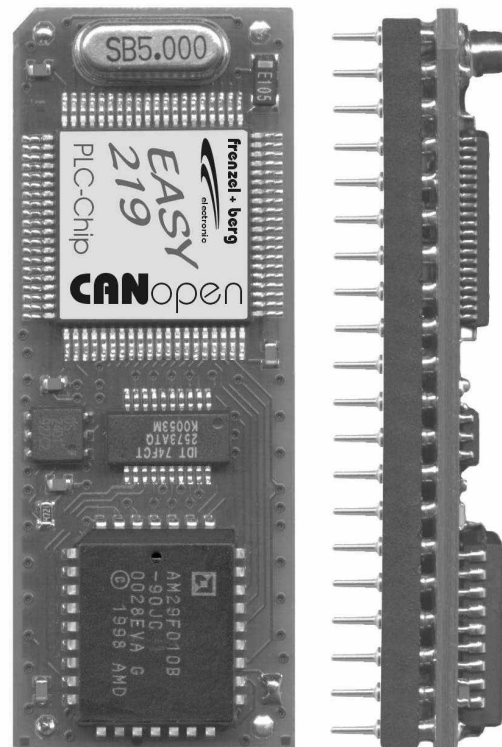
8 digital inputs, 4 analog or digital inputs and 8 digital outputs with several special function are realized on the Chip. 1 input pairs may be used for direct connection to an encoder with tracks A and B.

An on board CAN transceiver allows direct connection to a CAN bus line according ISO11898.

The implemented PLC runtime system is the (3S) CoDeSys. It is one of the most powerful IEC 61131-3 programming tools for controllers' applications for Windows. All five languages of this standard are supported, plus a graphic editor for freehand FBD (function block diagram). CoDeSys produces native machine code for the EASY219 based CPU.

The communication between the EASY219 and the CoDeSys programming tools, running on a PC, will be done by the RS232 interface. This allows online debugging, and in circuit programming. Visualization is also possible using this connection.

Customer specific features are available on request.



Features

- **PLC controller with integrated CANopen master (up to 8 slaves supported) or CANopen slave**
- **16 bit CPU kernel (Infineon C164)**
- **IEC 61131-3 programmable**
- **48 kByte PLC application code memory**
- **16 kByte PLC application data memory**
- **Cycle time 4ms/1000 commands**
- **8 digital inputs (TTL)**
- **+32 digital inputs (TTL) optional**
- **4 digital (TTL) or analog (10 bit) inputs**
- **8 digital outputs (TTL)**
- **+32 digital outputs (TTL) optional**
- **1 Encoder Interfaces for A/B-Encoder types**
- **Serial Programming and Visualizations interface (TTL-level)**
- **2 Interrupt input pins**
- **CAN bus ISO11898 transceiver 82C251**
- **Temperature range 0°-70° (other on request)**
- **Package DIL 40**

Ordering Information

EASY219 DIP-Chip

Part	Temp. Range	Package
EASY219	0 °C to 70 °C	DIL 40

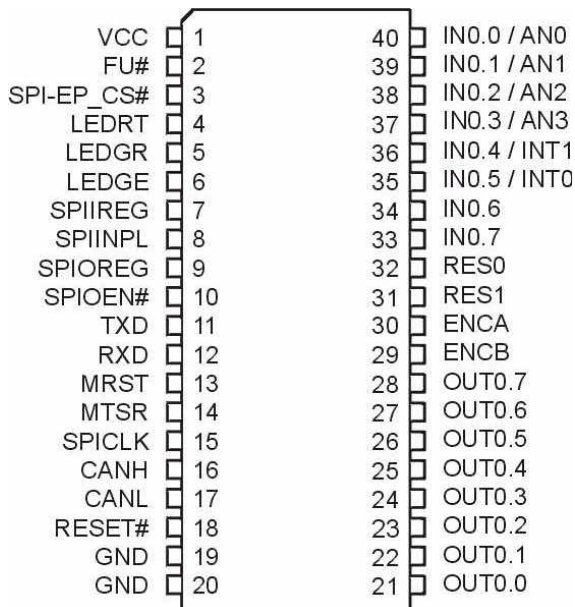
Evaluations board (EASY219)

Part	Description
EASY219-DemoBoard	Evaluation board to use with EASY219 PLC DIP-Chip

CoDeSys programming tools

Part	Description
CoDeSys	Software development tool for IEC 61131 programming

Pin Assignment



Pin No.	Pin Name	Funktion
13	MRST	Master receive / Slave transmit of the SPI bus
14	MTSR	Master transmit / Slave receive of the SPI bus
15	SPICLK	Shift clock (receiver input / master output) of the SPI bus
16	CANH	Receiver input of CAN driver
17	CANL	Transmitter output of CAN module
18	RESET#	Reset in-/output (low active)
19,20	GND	Ground
21 to 28	OUT0.0 to OUT0.7	Digital output
29 to 30	ENCB to ENCA	Encoder inputs with track A and B
31 to 32	RES1 to RES0	reserved
33 to 34	IN0.7 to IN0.6	Digital input
35 to 36	IN0.5 to IN0.4	Digital input
	INT0 to INT1	Interrupt input
37 to 40	IN0.3 to IN0.0	Digital input (default)
	AN3 to AN0	Analog input (10-bit resolution)

Pin Listing

Pin No.	Pin Name	Funktion
1	VCC	+5V Power
2	FU#	Firmware Update (low active)
3	SPI-EP_CS#	Special function pin - SPI-EP_CS# Chip select for external SPI EEPROM
4 to 6	LEDRT, LEDGR, LEDGE	LED-Outputs - RT: SPS_ERROR - GR: SPS_STATUS - GE: User Led
7	SPIIREG	Special function pin - input signal from shift register
8	SPIINPL	Special function pin - parallel load signal to shift register
9	SPIOREG	Special function pin - output signal to shift register
10	SPIOEN#	Special function pin - enable signal to shift register
11	TXD	Transmitter output TXD of the programming or visualization interface (firmware update)
12	RXD	Receiver input RXD of the programming or visualization interface (firmware update)

Pin Description

All Pins of the device in exception Power and CAN-Pins, works with 5V logic levels. The ranges of the analog inputs are also 0V to +5V. All ground signals are connected to module ground.

All input / output pins are high impedance during reset. The EASY219 does not support internal pull up/down resistors. Use external components where needed. All digital input pins have Schmitt trigger characteristics. See chapter "Typical Applications" for additional information.

IN0.0 to IN0.7: Input pins (low active)

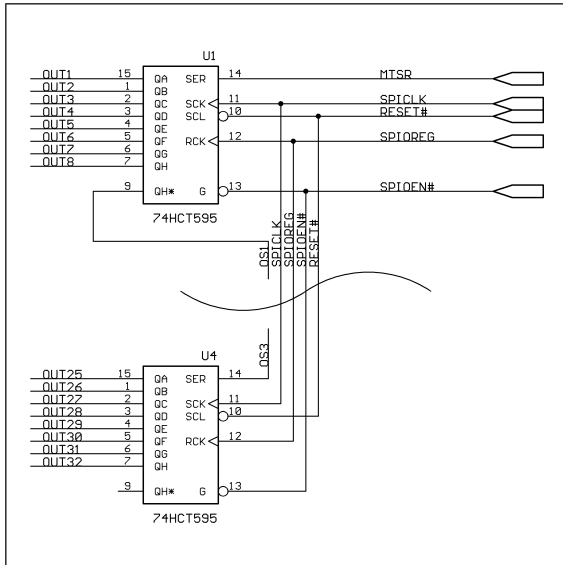
The function of IN0.0 to IN0.7 depends on setting of the selected hardware-configuration. IN0.6 to In0.7 are always digital inputs. All digital inputs use internal Schmitt trigger circuits. See also chapter "Hardware Configuration" for details.

OUT0.0 to OUT0.7: Digital output pins

Output pins of the PLC (high active; reset: tri-state)

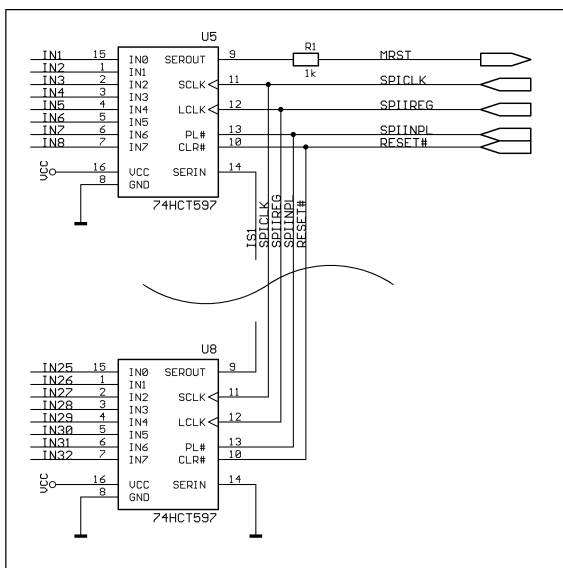
+32 digital outputs (optional; high active)

The 32 digital outputs can be realized with 4 shift registers 74HCT595 (outputs high active; reset: tri-state). If you need these 32 digital outputs, you have to connect the following signals MTSR, SPICLK, RESET#, SPIOREG and SPIOEN# like it is shown by the followed figure.



+32 digital inputs (optional; low active)

The 32 digital inputs can be realized with 4 shift registers 74HCT597. If you need these 32 digital inputs, you have to connect the following signals MRST, SPICLK, RESET#, SPIREG and SPIINPL like it is shown by the followed figure.



INT0 to INT1: Interrupt input pins

The Interrupt Input pins enable interrupt processing from within IEC61131 applications. They may be configured for rising and/or falling edge.

RESET#: Reset input/output pin

The on board reset chip does the power up reset. It pulls the RESET# line low. So it is possible to reset external components during power up using this signal.

The reset pin can also be used as reset input. For a correct device reset by external components, provide a low level longer than 50 ms to the input RESET#.

Note: Do never drive a high level to the RESET#. Use an open drain driver for this condition.

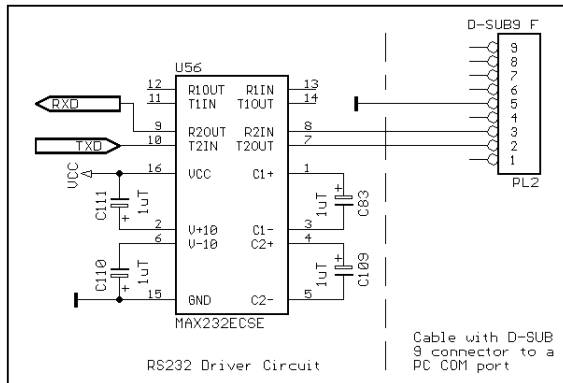
FU#: Firmware Update

A low level during the reset at this pin (or Jumper J3 is closed) activates the boots trap mode of the device. In boots trap mode, the TXD and RXD pins are the transmitter and receiver pins of the asynchronous serial interface which is also used for the in circuit firmware update. For normal operation, the FU# pin must be not connected or pulled to a high level (VCC). Make sure, that J3 is also open during reset for normal operation.

The update may be done with a COM-Port from a PC/Notebook and an update tool (FLASHJET) from the manufacturer of EASY219. For the correctly connection to the PC/Notebook, see also the pin description of TXD, RXD in this Chapter.

TXD, RXD: Programming Interface

TXD and RXD is the transmitter and receiver pins of the asynchronous serial interface that is fixed used for the software development, visualization or firmware update. The pin TXD and RXD works with 5V TTL-level. So if you need a connection to a PC COM-Port, you have to add a RS232 driver circuit like it is shown by the followed figure.



Software Developing Mode (normal operation): The Interface provides serial communication between the EASY219 and the CoDeSys development tool, running on a PC/Notebook.

Firmware Update: See pin description 'FU#: Firmware update' in this chapter for details.

MRST, MTSR, SCLK: High-Speed Synchronous Serial Interface

The High-Speed Synchronous Serial Interface SSC provides flexible high-speed communication between the EASY219 and other devices like microcontrollers, I/O-Chips, ADU/DAU's and more. The SSC supports full-duplex and half-duplex communication up to 5 MBaud. The serial clock signal can be generated by the SSC itself (master mode) or be received from an external master (slave mode). This allows communication with SPI compatible devices.

Note: This is a general description of the possibilities using the interface. The functions, which were realised in the device, must be given by the manufacturers firmware. User specific functions can be realized in order. See chapter "Hardware Configuration" for the implemented standard function.

CANH, CANL CAN Interface

The CAN Bus with its associated protocol allows communication between a number of stations which are connected to this bus with high efficiency. (Transfer speed up to 1 MBaud) The integrated CAN Module handles the transmission and reception of CAN frames in accordance with the CAN specification V2.0 part B (active) completely autonomous. The on-chip CAN module can receive and transmit standard frames with 11-bit identifiers as well as extended frames with 29-bit identifiers. It provides full CAN functionality. The CAN ground signal is connected to module ground. The EASY219 is available with and also without the CAN transceiver.

EASY219 without CAN transceiver:

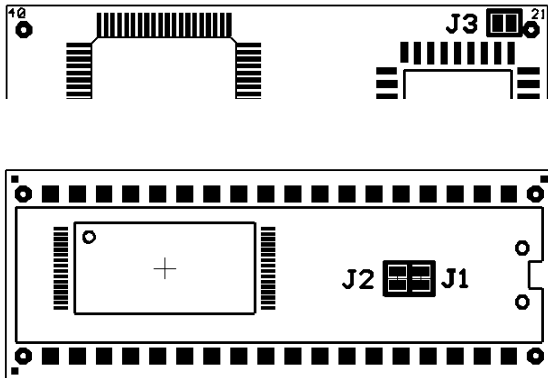
The Version without the on board CAN transceiver provides a user specific (opto isolated) CAN driver circuit at the application. Therefore the Jumpers J1 and J2 have to be closed. In this condition the CANH pin is connected to signal CANRX and CANL to CANTX (TTL level).

EASY219 with CAN transceiver:

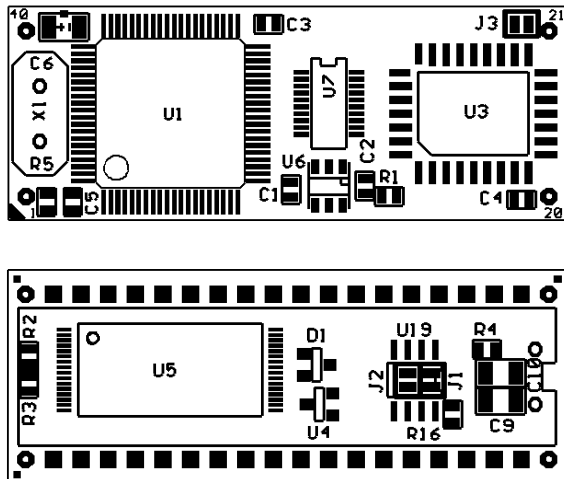
With the on board CAN transceiver it is possible to connect the board directly to a two wire CAN bus associated to ISO11898.

Note: It is not allowed to close Jumper J1 or J2 if a CAN transceiver is on board. This might cause permanent damage to the device.

Jumper-Plan



Place-Plan



Handling the Device

Preventing latch up

The EASY219 is a CMOS device and may suffer latch up under the following conditions:

- 1) A voltage higher than VCC or lower than GND is applied to any pin.
- 2) Absolute maximum ratings are exceeded

Handling of unused Pins

Do not leave unused input pins open. This might cause malfunction of the device.

Power Supply Pins

Make sure that all ground and power supply pins are connected to the same potential. Connect at least two ceramic capacitors of 100 nF and a tantalium capacitor of 1 µF between VCC and GND as close as possible to the device.

Output pins

All input pins are high impedance. All output pins for digital signals have a push/pull driver while PLC is running. But they are also high impedance during reset.

Pull up/down resistors

The EASY219 does not support internal pull up/down resistors. Use external components where needed.

Preparing Development Environment

For software development and software test, it is most powerful, if the CoDeSys is connected to the destination hardware via COM-port. Debugging, Tracing and more then can be done online. For such an environment, the following points must be done before.

- 1) Installing CoDeSys development tool on your PC/Notebook.
- 2) Installing hardware configuration library for EASY219 on your PC/Notebook.
- 3) Setup the connection between CoDeSys and the EASY219 to 57600 Baud, 8 DataBits, no parity and one stop bit

Using EASY219 stand-alone:

- 4) For using EASY219 stand-alone with CoDeSys development tool, you must connect the asynchronous interface of EASY219 to a COM-port of the PC. Therefore you have to use a RS232 driver adapter circuit as shown at the pin-description RXD, TXD. In addition with a 5V power supply, connected to the Pins VCC and GND, the development environment is ready to start.

Using EASY219 with EASY219-Demoboard:

- 5) For using EASY219 on the EASY219-Demoboard with the CoDeSys development tool, you must connect the header X1 of the EASY219-Demoboard to a COM-port of the PC with a Null-Modem cable.

Null-Modem cable:

EASY219-Demoboard (X1)		PC COM-port (D-SUB 9)	PC COM-port (D-SUB 25)
Pin 2	-	Pin 3	Pin 2
Pin 3	-	Pin 2	Pin 3
Pin 5	-	Pin 5	Pin 7

A RS232 line driver is on the evaluation board. After the asynchronous interface is connected, the power supply of the evaluation board may be plugged in. The development environment then is ready to start.

For details of the evaluation board, refer to 'Users Manual EASY219-Demoboard.pdf'.

Using EASY219 with your own application:

- 6) If you need the in-circuit programming in your application, you have to realize a RS232 driver circuit on your application hardware or you must use a driver adapter. (See the pin description 'RXD, TXD' for an example).

Absolute Maximum Ratings

Stresses greater than those listed parameters may cause permanent damage to the device. Functional operation should be restricted to recommended operation conditions. Exposure to absolute maximum rating conditions for extended times may affect reliability.

Parameter	Symbol	Rated Value		Units	Remarks
		Min.	Max.		
Power supply voltage	VCC	VSS – 0.3	VSS + 6.0	V	
Analog power supply voltage	AVCC	VCC	VCC	V	
Analog reference voltage	AVREF	VCC	VCC	V	
Input voltage	Vi	VSS – 0.3	VSS + 6.0	V	Vi < VCC + 0.3V
Output voltage	Vo	VSS – 0.3	VSS + 6.0	V	Vo < VCC + 0.3V
L level maximum output current	IoL		1	mA	
H level maximum output current	IoH		1	mA	
Maximum Power dissipation	P _{MAX}		500	mW	
Operating temperature	T _A	-40	+85	°C	
	T _A	-40	+105	°C	
Storing temperature	T _A	-55	+150	°C	
Serial Connection to CoDeSys	57600 Baud, 8 data bits, no parity, 1 stop bit				

Recommended Operation Conditions and Characteristics

Functional operation should be restricted to recommended operation conditions.

Parameter	Symbol	Rated Value			Units	Remarks
		Min.	Typ.	Max.		
Power supply voltage	VCC	4.5	5.0	5.5	V	
Analog power supply voltage	AVCC			VCC	V	
Analog reference voltage	AVREF			VCC	V	
Power supply current	I _{cc}		35	50	mA	All inputs V _{IL} or V _{IH} All outputs open
Input H voltage	V _{IH}	0.8 * VCC		VCC + 0.3	V	
Input L voltage	V _{IL}	VSS – 0.3		0.2 * VCC	V	
Output H voltage	V _{OH}	VCC – 0.5			V	IoH = -1 mA
Output L voltage	V _{OL}			0.4	V	IoL = 1 mA
Input leakage current	I _{LKC}	-5		5	uA	
Crystal frequency	f _{osc}		5		MHz	
Reset pulse width	t _{res}	10			us	
Power on rise time	t _{RESLH}	0.05		30	ms	
Maximum Power dissipation	P _{MAX}			500	mW	
Operating temperature	T _A	-40		+85	°C	
	T _A	-40		+105	°C	
Serial Connection to CoDeSys	57600 Baud, 8 data bits, no parity, 1 stop bit					

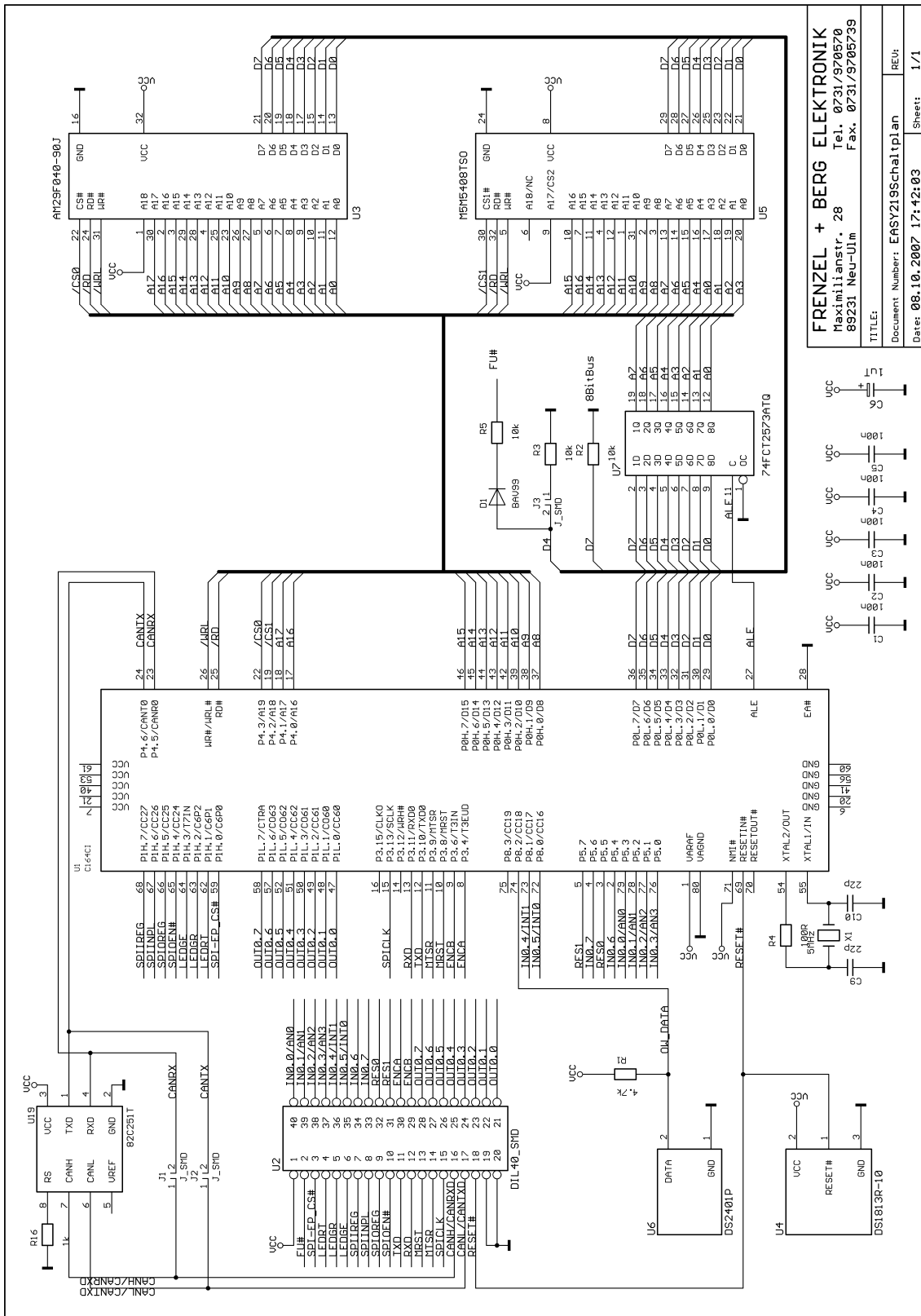
EASY219 / IEC 61131 + CANopen Master / Slave

PLC DIP-Chip / enhanced CoDeSys runtime system

frenzel + berg



Schematic

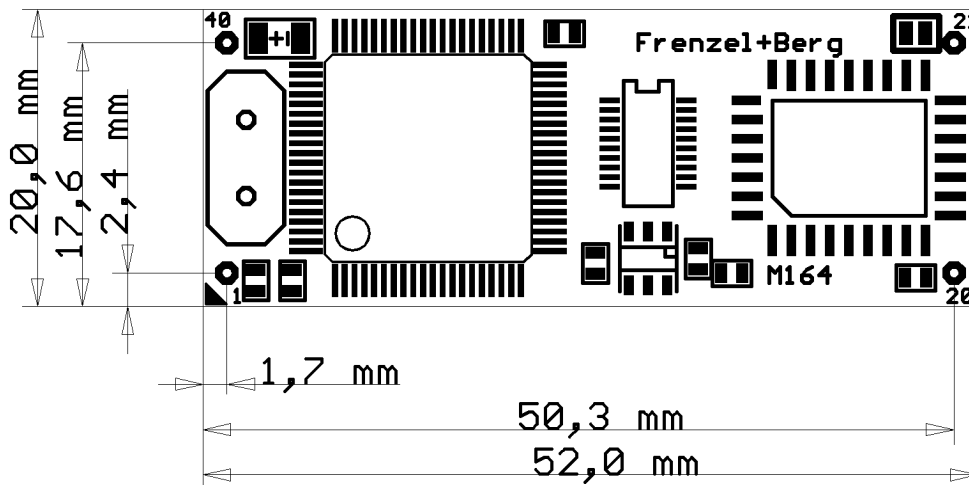


FRENZEL + BERG ELEKTRONIK
 Maximilianstr. 28
 89231 Neu-Ulm
 Tel. 0731/970570
 Fax. 0731/9705739

TITLE:
 Document Number: EASY219Schaltplan
 Date: 08.10.2007 17:42:03
 Sheet: 1/1

Package Dimension

The package dimension of the the EASY219 (DIL-40) is 52,0 x 20,0 x 14,0 (L x W x H). Unit millimeters.



General Description	1
Features	1
Ordering Information	1
Pin Assignment	2
Pin Listing	2
Pin Description	2
IN0.0 to IN0.7: Input pins	2
OUT0.0 to OUT0.7: Digital output pins	2
+32 digital outputs (optional).....	3
+32 digital inputs (optional).....	3
INT0 to INT1: Interrupt input pins.....	3
RESET#: Reset input/output pin	3
FU#: Firmware Update	3
TXD, RXD: Programming Interface.....	4
MRST, MTSR, SCLK: High-Speed Synchronous Serial Interface	4
CANH, CANL CAN Interface.....	4
Jumper-Plan	5
Place-Plan	5
Handling the Device	5
Preventing latch up	5
Handling of unused Pins	5
Power Supply Pins.....	5
Output pins	5
Pull up/down resistors.....	5
Preparing Development Environment	5
Absolute Maximum Ratings	7
Recommended Operation Conditions and Characteristics	7
Schematic	9
Package Dimension	10