EASY215 / EASY217

PLC DIP-Chip / enhanced CoDeSys runtime system

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General Description

The EASY21x 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.

8 digital inputs, 4 analog or digital inputs and 8 digital outputs with several special function are realized on the Chip. 2 input pairs may be used for direct connection to an encoder with tracks A and B.

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 function block diagram. CoDeSys produces native machine code for the EASY215/EASY217 based CPU.

The communication between the EASY21x and the CoDeSys programming tools, running on a PC, will be done by the RS232 interface. This allows online debugging, in circuit programming and visualization.

Costumer specific features are available on request.
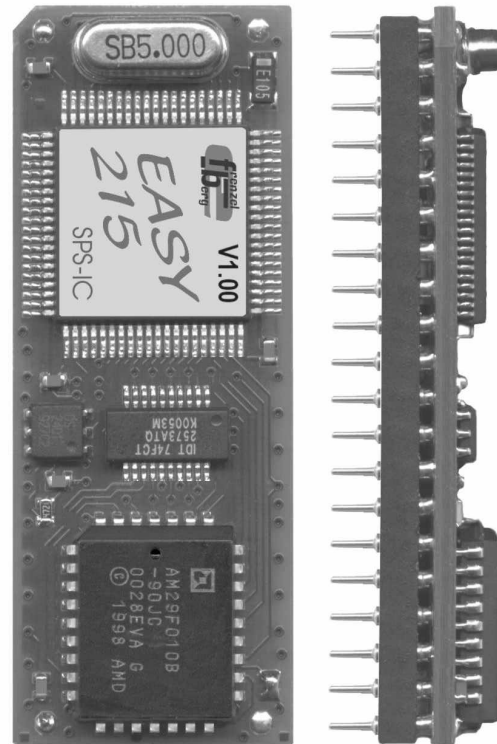
Features

- **PLC controller with integrated CANopen master (up to 8 slaves supported) or CANopen slave**
- **16 bit CPU kernel (Infineon C164)**
- **IEC 61131-3 programmable**
- **Memory Size EASY215:**
  16 kByte PLC application code memory
  32 kByte PLC application data memory
- **Memory Size EASY217:**
  48 kByte PLC application code memory
  16 kByte PLC application data memory
- **Cycle time 4ms/1000 commands**
- **8 digital inputs (TTL)**
- **4 digital (TTL) or analog (10 bit) inputs**
- **8 digital outputs (TTL)**
- **2 Encoder Interfaces for A/B-Encoder types**
- **Serial Programming and Visualizations interface (TTL-level)**
- **2 Interrupt input pins**
- **1 CAN bus according to ISO11898 transceiver 82C251**
- **Package DIL 40**

Ordering Information

EASY21x DIP-Chip

Part	Temp. Range	Package
EASY215	0 ^{o}C to 70 ^{o}C	DIL 40
EASY217	0 ^{o}C to 70 ^{o}C	DIL 40

Evaluations board (EASY215, EASY217)

Part	Description
EASY21x/23x-EVA/FCI	Evaluation board to use with EASY21x PLC DIP-Chip

CoDeSys programming tools

Part	Description
CoDeSys	Software development tool for IEC 61131 programming

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Pin Assignment


```
VCC    1        40   IN0.0 / AN0
FU#    2        39   IN0.1 / AN1
IO0    3        38   IN0.2 / AN2
IO1    4        37   IN0.3 / AN3
IO2    5        36   IN0.4
IO3    6        35   IN0.5
IO4    7        34   IN0.6
IO5    8        33   IN0.7
INT1   9        32   IN1.0 / EC2A
INT0   10       31   IN1.1 / EC2B
TXD    11       30   IN1.2 / EC1A
RXD    12       29   IN1.3 / EC1B
MRST   13       28   OUT0.7
MTSR   14       27   OUT0.6
SCLK   15       26   OUT0.5
CANH   16       25   OUT0.4
CANL   17       24   OUT0.3
RESET# 18       23   OUT0.2
GND    19       22   OUT0.1
GND    20       21   OUT0.0
```

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	SCLK	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 32	IN1.3 to IN1.0	Digital input (default)
	EC1B to AC2A	2 Encoder inputs with track A and B
33 to 36	IN0.7 to IN0.4	Digital input
33 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	IO0	Special function pin - SPICS Chip select for SPI
4, 5	IO1, IO2	Multi functional IO-Pins Reserved for future use
6	IO3	Special function pin - Stepper motor direction
7	IO4	Special function pin - Stepper motor clock - PWM
8	IO5	Special function pin - PWM
9 to 10	INT1 to INT0	Interrupt Input pins
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 EASY215 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 IN1.3: Input pins

The function of IN0.0 to IN0.3 and IN1.0 to In1.3 depends on setting of the selected hardware-configuration. IN0.4 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

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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.

IO0 to IO5: Multi functional I/O pins

The function of the general-purpose pins IO0 to IO5 is reserved for future use or user specific functions. The following feature are implemented or planned:

SPI bus:
The SPI bus uses the pins 13..15 for serial connection.
IO0   SPI chip select output.

Stepper motor interface:
IO3   stepper motor direction output. Indicates the stepper moving direction.
IO4   stepper motor clock. Outputs one clock signal for each step of the stepper motor.

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.
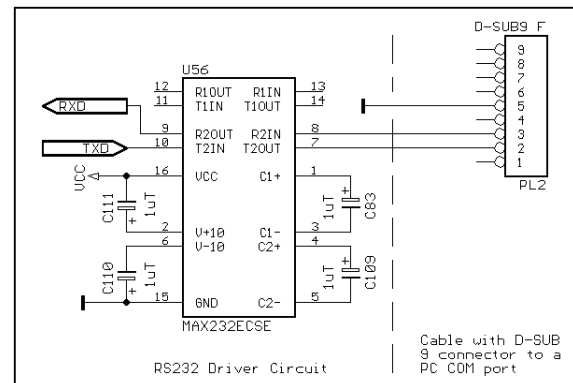
FU#: Firmware Update

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 EASY215. For the correctly connection to the PC/Notebook, see also the pin description of TXD, RXD in this Chapter.

Note: The actual firmware and the loader you can get from in the download aria of our website.

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 EASY21x and the CoDeSys development tool, running on a PC/Notebook.

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

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

The High-Speed Synchronous Serial Interface SSC provides flexible high-speed communication between the EASY21x 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 auto-nomous. The on-chip CAN module can receive and transmit standard frames with 11-bit identifier. It provides full CAN functionality. The CAN ground signal is connected to module ground.
The EASY21x is available with and also without the CAN transceiver.
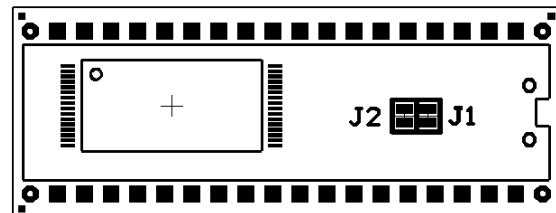
EASY21x without CAN transceiver:
The Version without the on board CAN transceiver provides a user specific (opto isolated) CAN driver circuit at the application. Therefore the Jumpers J1 and J2 have to be closed. In this condition the CANH pin is connected to signal CANRX and CANL to CANTX (TTL level).
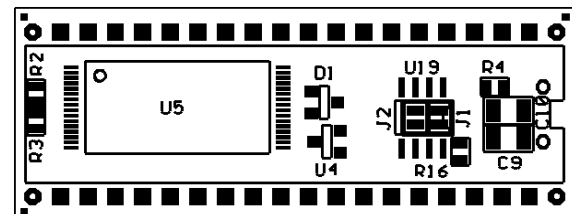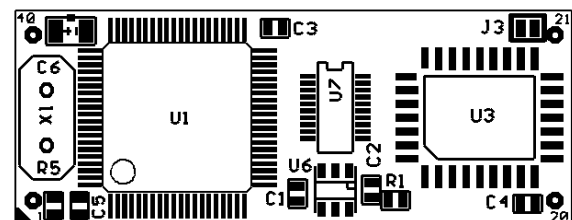
EASY21x with CAN transceiver:
With the on board CAN transceiver it is possible to connect the board directly to a two wire CAN bus associated to ISO11898.

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

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Handling the Device

Preventing latch up

The EASY21x 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 high impedance during reset.

Pull up/down resistors

The EASY21x 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 EASY21x on your PC/Notebook.
3) Setup the connection between CoDeSys and the EASY21x to 57600 Baud, 8 DataBits, no parity and one stop bit

Using EASY21x stand-alone:

4) For using EASY21x stand-alone with CoDeSys development tool, you must connect the asynchronous interface of EASY21x 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 EASY21x with EASY21x/23x-EVA-Board:

5) For using EASY21x on the EASY21x/23x Evaluation board with the CoDeSys development tool, you must connect the header PCOM3 of the evaluation board to a COM-port of the PC with a Null-Modem cable.

Null-Modem cable:

EASY21x/23 x-EVA (PCOM3)		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 EASY215-235-EVA.PDF'.

Using EASY21x with EASY20XEVA-Board:

6) For using EASY21x on the EASY20XEVA Evaluation board with the CoDeSys development tool, you must connect the header PL4 of the evaluation board to a COM-port of the PC with a Null-Modem cable.

Null-Modem cable:

EASY20x-EVA (PL4)		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 EASY20xEVA'.

Using EASY21x with your own application:

7) 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).

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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.
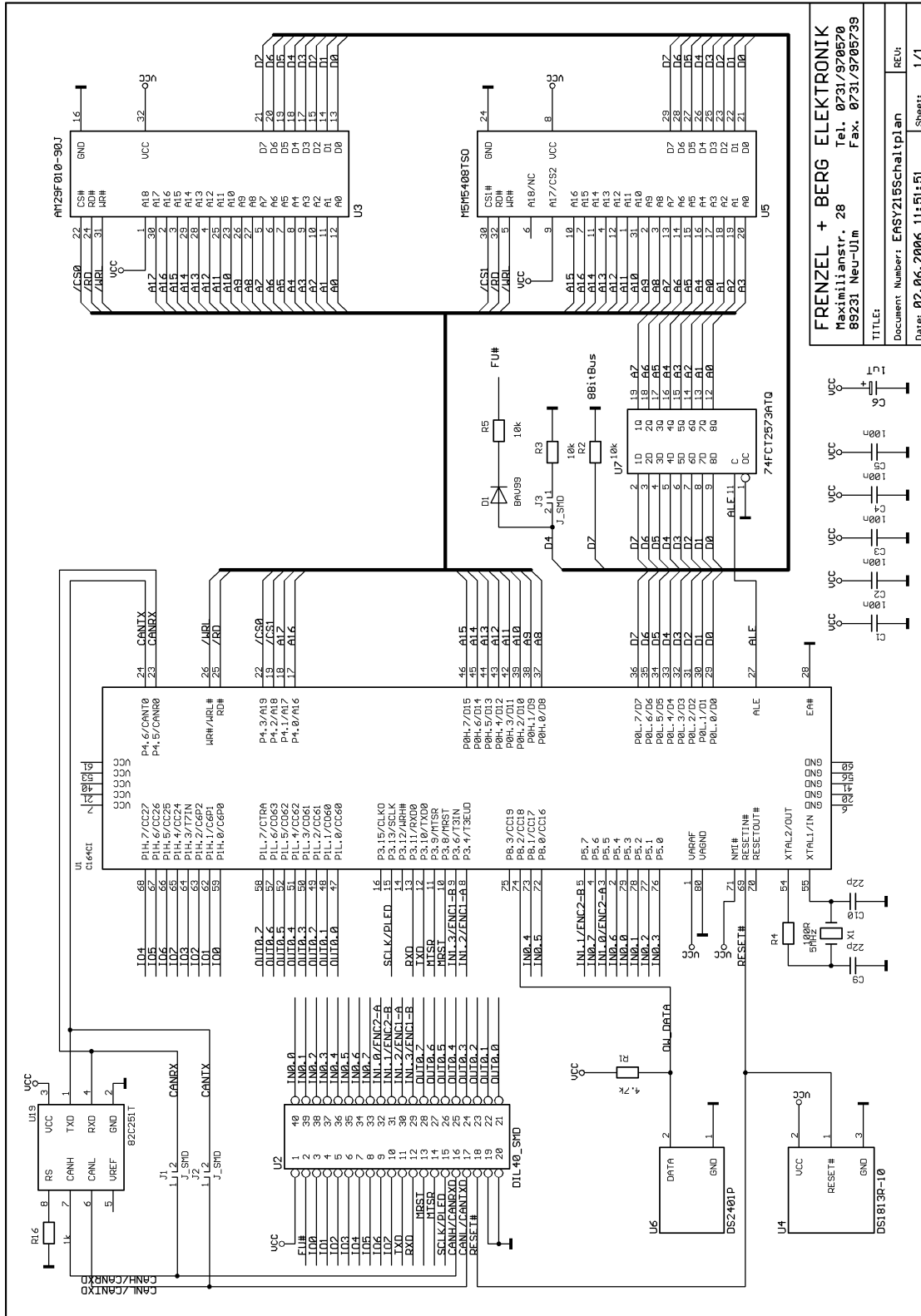
Parameter	Symbol	Rated Value		Units	Remarks
		Min.	Max.		
Power supply voltage	VCC	VSS – 0.3	VSS + 6.0	V	
Analog power supply voltage	AVCC	VCC	VCC	V	
Analog reference voltage	AVREF	VCC	VCC	V	
Input voltage	Vi	VSS – 0.3	VSS + 6.0	V	Vi < VCC + 0.3V
Output voltage	Vo	VSS – 0.3	VSS + 6.0	V	Vo < VCC + 0.3V
L level maximum output current	I_{OL}		1	mA	
H level maximum output current	I_{OH}		1	mA	
Maximum Power dissipation	P_{MAX}		500	mW	
Operating temperature	T_A	-40	+85	^{o}C	
	T_A	-40	+105	^{o}C	
Storing temperature	T_A	-55	+150	^{o}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	I_{OH} = -1 mA
Output L voltage	V_{OL}			0.4	V	I_{OL} = 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	^{o}C	
	T_A	-40		+105	^{o}C	
Serial Connection to CoDeSys	57600 Baud, 8 data bits, no parity, 1 stop bit					

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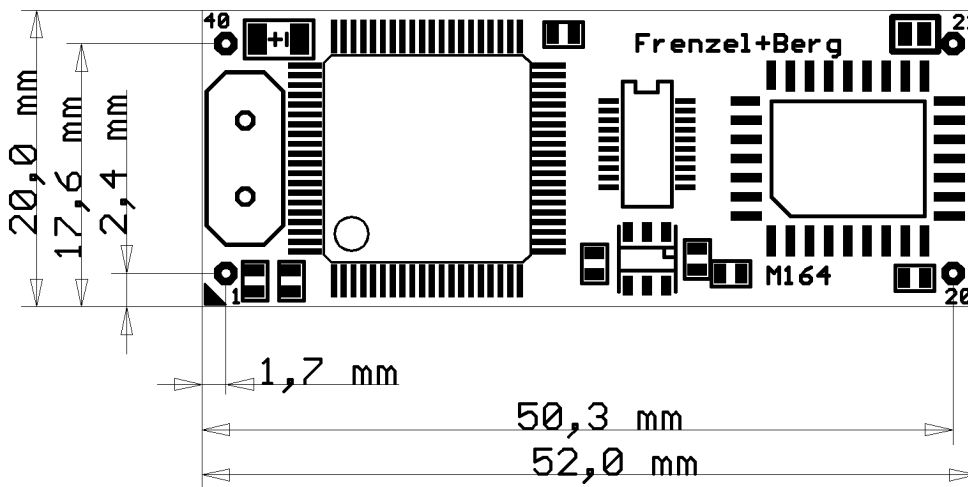Page 6 of 9

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Schematic

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Package Dimension

The package dimension of the the EASY215/217 (DIL-40) is 52,0 x 20,0 x 14,0 (L x W x H). Unit milimeters.

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