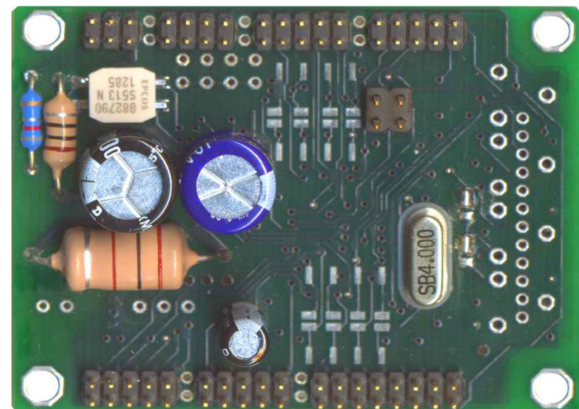


### General Description

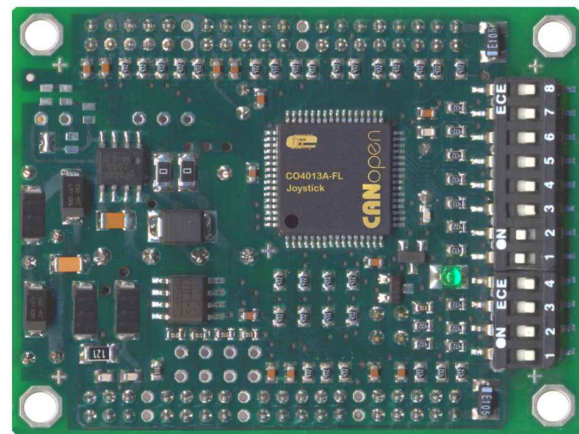
The JoBo4013 is a full feature, ready to use single board for joysticks, feet pedals and compatible units. There is no additional engineering of hard- and software required. The time to market for joystick products is reduced to a minimum.

The board is based on the high performance single chip controller CO4013A for CANopen Joysticks. There are several special features like freezing of joystick positions with function keys, zero point enlargement, potentiometer supervision for short circuits and break of cable.

All I/O signals of the CO4013, the power supply input and the CAN bus are wired to plugs. Flat cable or crimp connectors can be used to adapt the peripheral equipment of the joystick. All configurations, selection of operation modes and disabling of axis may be done via jumpers. CAN-ID, baud rate and bus termination can be set with DIP-switches. The JoBo4013 is not only suitable to new projects but also upgrades your existing joystick hardware to a modern CANopen version.



Top View



Bottom View

### Features

- Joystick board with controller CO4013
- 4 potentiometer inputs for 4 axis Joysticks
- Support for disabling of axis
- 4 input lines for memory function keys
- 8 input lines for axis direction indicators
- 8 input lines for function keys
- 4 output pins for LED's
- DIP switches for: CAN-ID and baud rate
- Pin headers for all signals
- According to CiA Draft Standards DS301 V4.0 and DS401 V2.0 Appendix A
- 2 Transmit- and 1 Receive PDOs
- Dynamic PDO mapping
- Variable PDO identifier
- All CANopen PDO transmission types: Synchronous, asynchronous, event driven, cyclic, acyclic and remote frame dependent, event timer and inhibit timer features
- Node guarding, Life guarding, Heartbeat
- Variable SYNC identifier
- Emergency messages
- Minimum boot up
- Baud rate up to 1MBit
- CAN Transceiver 80C251 (ISO11898)
- Wide power supply range 10V..35V DC
- Small form factor 60 x 45 x 18 mm
- Tested with CiA CANopen Conformance Test

### Ordering Information

All boards include the runtime licence for CO4013

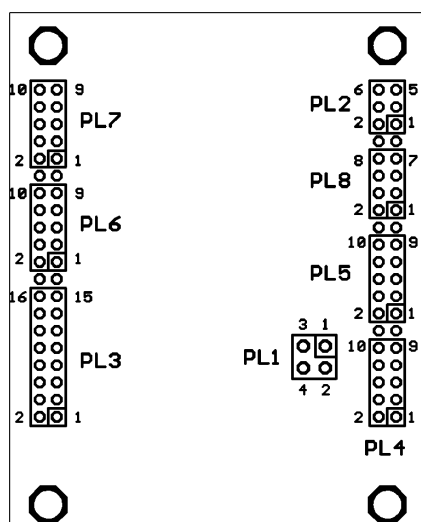
Part	Description
JOBO4013A	Full feature 4 Axis joystick board (0...+70 °C)
JOBO4013AO	4 Axis joystick board with (2kV) galvanic isolated power supply.
JOBO4013AE	4 Axis joystick board Extended temperature range (-40 .. +85°C)
JOBO4013AOE	4 Axis joystick board Extended temperature range and (2kV) galvanic isolated power supply. (-40 .. +85°C)
CO4013-EVA	Evaluation board Wall socket power supply incl.

Customer specific versions and firmware extensions available on request

The JoBo4013 data sheet is a description of module hardware. For functionality and CANopen details refer to the CO4031 chip data sheet.

### Connectors

The connectors are 2mm grid pin headers. So a connection via flat cable is as possible as an adaptation with crimped cable connectors.



### Firmware-Update-Connector (PL1)

Pin No.	Pin Name	Funktion
1	VCC	5V power supply output
2	RX	Receiver input of asynchronous interface
3	TX	Transmitter output of asynchronous interface
4	GND	Common ground

### CAN-Power-Connector (PL2)

Pin No.	Pin Name	Funktion
1, 3	GND	Common ground
2	CANH	H-Line of ISO 11898 CAN-Bus
4	CANL	L-Line of ISO 11898 CAN-Bus
5	PGND	Power input [-] = Primary ground (=Common ground for no galvanic isolated module version)
6	PVCC	Power input [+] 10..35V

### Digital-Input-Connector (PL3)

Pin No.	Pin Name	Funktion
1, 3, 5, 7, 9, 11, 13, 15	IN0 .. IN7	General purpose digital input active low (normally used with push buttons or switches)
2, 4, 6, 8, 10, 12, 14, 16	GND	Common ground

### Application-Connector (PL4)

Pin No.	Pin Name	Funktion
1, 3, 5	GND	Common ground
2	X-POSITIVE	Positive direction input of axis X or general purpose input
4	X- NEGATIVE	Negative direction input of axis X or general purpose input
6	X-MEM	Axis X memory input or general purpose digital input
7	VCC	5V power supply output
8	X-IN	Analog Input for axe X (Wiper of axis poti)
9	U0	U0 signal = VCC/2
10	X-0POS	Analog Zero-Position Input for axis X (Middle of axis poti)

### Application-Connector (PL5)

Pin No.	Pin Name	Funktion
1, 3, 5	GND	Common ground
2	Y-POSITIVE	Positive direction input of axis Y or general purpose input
4	Y- NEGATIVE	Negative direction input of axis Y or general purpose input
6	Y-MEM	Axis Y memory input or general purpose digital input
7	VCC	5V power supply output
8	Y-IN	Analog Input for axe Y (Wiper of axis poti)
9	U0	U0 signal = VCC/2
10	Y-0POS	Analog Zero-Position Input for axis Y (Middle of axis poti)

### Application-Connector (PL6)

Pin No.	Pin Name	Funktion
2, 4, 6	GND	Common ground
1	Z-POSITIVE	Positive direction input of axis Z or general purpose input
3	Z- NEGATIVE	Negative direction input of axis Z or general purpose input
5	Z-MEM	Axis Z memory input or general purpose digital input
7	Z-IN	Analog Input for axe Z (Wiper of axis poti)
8	VCC	5V power supply output
9	Z-0POS	Analog Zero-Position Input for axis Z (Middle of axis poti)
10	U0	U0 signal = VCC/2

### Application-Connector (PL7)

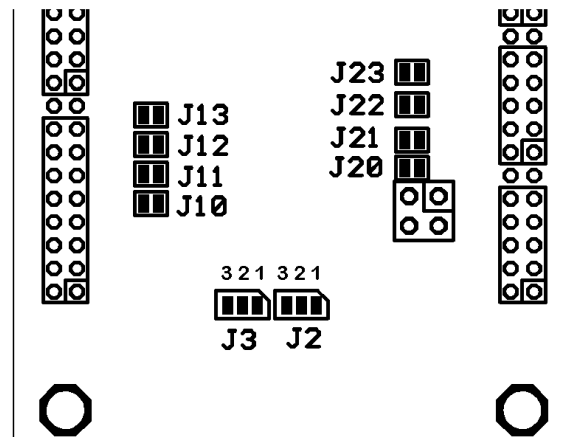
Pin No.	Pin Name	Funktion
2, 4, 6	GND	Common ground
1	W-POSITIVE	Positive direction input of axis W or general purpose input
3	W- NEGATIVE	Negative direction input of axis W or general purpose input
5	W-MEM	Axis Wmemory input or general purpose digital input
7	W-IN	Analog Input for axe W (Wiper of axis poti)
8	VCC	5V power supply output
9	W-0POS	Analog Zero-Position Input for axis W (Middle of axis poti)
10	U0	U0 signal = VCC/2

### Application-Connector (PL8)

Pin No.	Pin Name	Funktion
1, 3, 5, 7,	VCC	5V power supply output
2, 4, 6, 8	OUT0..OUT3	Memory-function-Indicator or general purpose output

### Jumper Settings

Top view:



### Jumper Description

Jumper	Pos.	Function
J2, J3	1-2	Normal operation mode (factory default setting)
	2-3	Firmware update mode
J10	closed	axis X .. W disabled
J11	closed	axis Y,Z,W disabled
J12	closed	axis Z,W disabled
J13	closed	axis W disabled

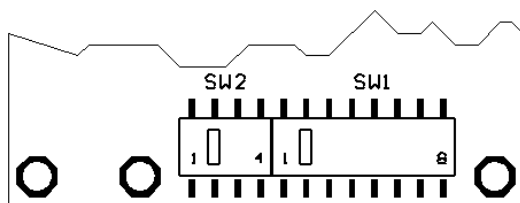
**Note:** To disable an axis without malfunction (short circuit) make sure, that the unused ..-IN (analog input) is open and no external potentiometer is connected to this channel before.

**Note:** The enabled axis must be in an ascending order. Do not disable an axis, if you want to use another axis with higher number. Disabling of an axis will cause disable of all axis with higher numbers automatically. (X=1, Y=2, Z=3, W=4) For example, if you disable axis 3 (pin Z-IN is connected to pin CFG0/LED), axis 4 (W-IN) will be disabled by default.

OFF = jumper open  
ON = Jumper closed

Jumper No. and CO4013 Pin				Mode	Description
J23	J22	J21	J20		
CF3	CF2	CF1	CF0		
OFF	OFF	OFF	OFF	0	Memory function with push button internal analog value freeze
OFF	OFF	OFF	ON	1	Memory function with push button no internal analog value freeze
OFF	OFF	ON	OFF	2	Memory function with switches internal analog value freeze
OFF	OFF	ON	ON	3	Memory function with switches no internal analog value freeze
OFF	ON	OFF	OFF	4	No memory function
OFF	ON	OFF	ON	5	reserved *1)
OFF	ON	ON	OFF	6	reserved *1)
OFF	ON	ON	ON	7	reserved *1)
0	x	X	X		reserved *1)

### DIP-Switch-Overview



Bottom View

### DIP-Switch SW1

DIP	Name	Funktion
1..7	ID0..ID6	Bit 0 .. Bit 6 of CAN Identifier
8	n.e.	No effect

DIP switch SW1							
Switch No. and CO4013 Pin							Function
7	6	5	4	3	2	1	
ID6	ID5	ID4	ID3	ID2	ID1	ID0	
X	X	X	X	X	X	X	Node ID
OFF	OFF	OFF	OFF	OFF	OFF	OFF	reserved
OFF	OFF	OFF	OFF	OFF	OFF	ON	Node ID = 1
OFF	OFF	OFF	OFF	OFF	ON	OFF	Node ID = 2
..	..	..	..	..	..	..	
ON	ON	ON	ON	ON	ON	OFF	Node ID = 126
ON	ON	ON	ON	ON	ON	ON	Node ID = 127

### DIP-Switch SW2

DIP	Name	Funktion
1	R	ON = CAN-Termination resistor = 120 Ohm OFF = No Termination
2..4	BD0..BD2	Bit 0 .. Bit 2 CAN baud rate

DIP switch SW2				
Switch Nr and CO4013 Pin				Function
1	2	3	4	
	BD0	BD1	BD2	
	X	X	X	Baud rate selection
	OFF	OFF	OFF	1 Mbit / sec
	ON	OFF	OFF	800 kbit / sec
	OFF	ON	OFF	500 kbit / sec
	ON	ON	OFF	250 kbit / sec
	OFF	OFF	ON	125 kbit / sec
	ON	OFF	ON	50 kbit / sec
	OFF	ON	ON	20 kbit / sec
	ON	ON	ON	10 kbit / sec
R				Bus-Termination
ON				Termination 120 Ohm
OFF				No termination

### Handling the Device

#### Power Supply

The power supply input is at pins PVCC (positive) and PGND (negative). The input voltage must be in a range of 10V to 35V DC. The device has also a protection diode for wrong input polarity.

**Note: A voltage higher then 35V can activate the ESD protection, which kills higher voltage peaks via short circuit. So a power supply with higher voltage can damage the device.**

#### Axis Disabling

The device offers 4 analog inputs for axes potentiometers. If less then 4 axes are used in application, the unused should be disabled via jumper J10 to J13. Refer to "CO4013" data sheet for details.

#### Line Break Detection

The line break detection is valid by using potentiometer with mid point tap. Therefore the mid point of the potentiometer must be connected to the corresponding channel X..W-0POS input.

If line break detection is not necessary or potentiometer without mid point tap are used, the detection can be disabled by connecting the X..W-0POS input to U0 Pin.

### Pin Description

#### FU, FU#: Firmware Update

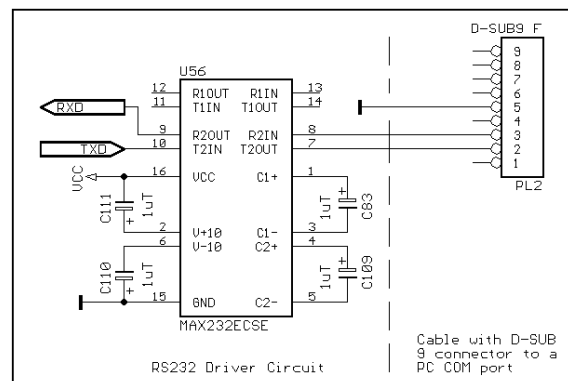
A jumper setting 2-3 at J2, J3 and a low level ID0 and ID1 during reset, activates the firmware update mode. In this case the pins RX and TX will be used for an asynchronous communication to a host computer.

Jumper / Pin Name	Position PL1-Pin	Normal operation	Firmware update
J2	Pos. 2-3	nc	low
J3	Pos. 2-3	nc	high
ID0	(SW1.0 on)	x	low
ID1	(SW1.1 on)	x	low
TX	3	nc	TXD (TTL)
RX	2	nc	RXD (TTL)

The update may be done with a COM-Port from a PC/Notebook and an in circuit update tool for the Fujitsu MB90F497 micro controller.

TX and RX are the transmitter and receiver pins of the asynchronous serial interface that is only used for the firmware update.

The pins TX and RX work 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.

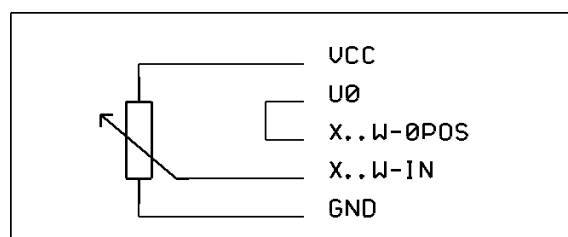


#### X-, Y-, Z-, W-IN: Analog Axis Position Input pins

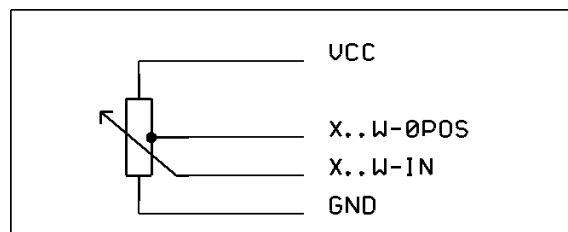
Analog Input pins for axis X .. W can be used for direct connection to axis potentiometer or other devices with analog output values (0..5V).

The axis position is a 10 bit analog value converted into a signed integer value and mapped into the corresponding object of the CANopen dictionary.

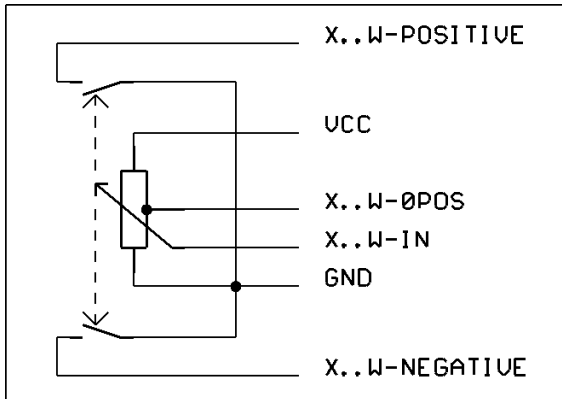
The axis zero position must give an input voltage of 2.5V .



Connection of potentiometers without mid point taps



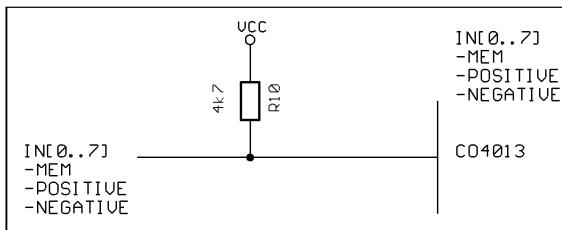
Connection of potentiometers with mid point taps



Connection of potentiometers with mid point taps and additional indication switches for moving direction

**IN0 .. IN7, -MEM, -POSITIVE, -NEGATIVE:  
General Purpose Inputs**

All general-purpose inputs are active low and have an on board pull up resistor. So it is easy to connect push buttons between the input and common ground.



INx, -POSITIVE, -NEGATIVE and -MEM are equivalent general-purpose inputs, witch are mapped to the object dictionary. (POSITIVE, NEGATIVE and MEM are only defined notations)

As an exception the MEM inputs offers a special function. Refer to chapter 'Operation Mode:' for details and functionality.

**CANH, CANL (CANTx, CANRx) 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.

The on board CAN transceiver allows directly connection to a two wire CAN bus associated to ISO11898. (Transfer speed up to 1 MBaud)

**OUT0 .. OUT3: General Purpose Outputs**

All outputs has an in line resistor with 1k ohm between controller and connector. So it is possible to connect a low current LED directly between VCC and the OUT pin. (anode to VCC, cathode to OUT)

If push buttons are not selected for memory function, the output pins OUT0 to OUT3 are general-purpose output pins, with an own receive PDO.

If push buttons are selected for memory function, the state of the output lines OUT0 to OUT3 (active low) represent the state of the internal memory function flip-flop:

- OUTx = low      memory function flip-flop is set.
- OUTx = high    memory function flip-flop is not set.

**EMC-Conditions**

For EMC shielding a metallic joystick housing or an additional shielding plate must be used. All external Signals (Power supply and CAN-Bus) has a 2,5 kV ESD-protection. But note that the internal protection of the Axis inputs and the digital I/O is not so high. So it is necessary to isolate the housing hermetical. Full isolated push buttons and switches must be used.

### Operation Mode: Memory Function, I/O

The memory function is selected with pins CF0, CF1 and CF2.

CF2	CF1	CF0	Configuration
2	1	0	Selected function
1	1	1	Mode-Type: CO4013A0 X-MEM .. W-MEM inputs (active low) for Push-Button Memory - Keys with internal analog input freezing feature. Push-Buttons are with Flip-Flop-Feature. Change of analog input voltage will not change Objects 6401 if Analog Input is frozen. OUT0 .. OUT3 are Diagnostic-LED output: 1 Analog Input released (not frozen) 0 Analog Input frozen (no change of Objects 6401)
1	1	0	Mode-Type: CO4013A1 X-MEM .. W-MEM inputs (active low) for Push-Button Memory - Keys without internal analog input freezing feature. Push-Buttons are with Flip-Flop-Feature. Change of analog input voltage will change Objects 6401 OUT0 .. OUT3 are Diagnostic-LED output: 1 Push-Button Flip-Flop is not set 0 Push-Button Flip-Flop is set Freezing of joystick position must be done by application
1	0	1	Mode-Type: CO4013A2 X-MEM .. W-MEM inputs for Switches (active low) as Memory - Keys with internal analog input freezing feature. Change of analog input voltage will not change Object 6401 if -MEM Input is low. OUT0 .. OUT3 are general purpose output pins
1	0	0	Mode-Type: CO4013A3 X-MEM .. W-MEM inputs for Switches (active low) as Memory - Keys without internal analog input freezing feature. Change of analog input voltage will change Object 6401 in any case. OUT0 .. OUT3 are general purpose output pins.
0	1	1	Mode-Type: CO4013A4 X-MEM .. W-MEM pins are used as general-purpose input pins IN8 to IN11. There is no memory function supported. Change of analog input voltage will change Object 6401 in any case. OUT0 .. OUT3 are general purpose output pins.
0	1	0	Reserved for future use
0	0	1	Reserved for future use
0	0	0	Reserved for future use

The function of Configuration Input line CF3 is reserved for future use.

CF3	Configuration
1	Normal operation mode
0	Reserved for future use

### Mapping I/O to Object Dictionary

#### I/O-Mapping in Mode 0

Memory Push Button with internal freeze

Operation mode 0	
CF 3 = 1 CF 2 = 1 CF1 = 1 CF0 = 1	
EDS-file: CO4013A0.EDS	
Memory function available (internal) with push button with internal analog value freeze (analog axis value Object 6401 will not change if memory flip-flop is set)	
16 direction- and general purpose digital input lines	
4 diagnostic LED output lines for freezing feature	
Data Mapping to Dictionary	
Index	Mapped I/O Signal bit/value
SubIndex	7 6 5 4 3 2 1 0
6000.01	0 0 0 0 W Z Y X
MEMORY- Input Or -Flip-Flop	-MEM (Flip-Flop)
6000.02	W- Z- Y- X- N P N P N P N P
Direction-Input	P POSITIVE input N NEGATIVE input (inverted input polarity)
6000.03	IN7 .. IN0
General-Purpose Input	
6401.01	X-Axis proportional value (16 bit)
6401.02	Y-Axis proportional value (16 bit)
6401.03	Z-Axis proportional value (16 bit)
6401.04	W-Axis proportional value (16 bit)
Default PDO Mapping	
PDO	Mapped Data
RPDO1	Not implemented
TPDO1	6000.01 Memory Input 6000.02 Direction Input 6000.03 General-Purpose Input
TPDO2	6401.01 X-Axis proportional value 6401.02 Y-Axis proportional value 6401.03 Z-Axis proportional value 6401.04 W-Axis proportional value

**I/O-Mapping in Mode 1**

Memory Push Button no internal freeze

Operation mode 1 CF 3 = 1 CF 2 = 1 CF1 = 1 CF0 = 0 EDS-file: CO4013A1.EDS Memory function available (by application) with push button no internal analog value freeze (change of analog axis value will change Object 0x6401) 16 direction- and general purpose digital input lines 4 diagnostic LED output lines for freezing feature								
Data Mapping to Dictionary								
Index. SubIndex	Mapped I/O Signal bit/value							
	7	6	5	4	3	2	1	0
6000.01 MEMORY- Input Or -Flip-Flop	0	0	0	0	W	Z	Y	X
					-MEM (Flip-Flop)			
6000.02 Direction-Input	W- N	W- P	Z- N	Z- P	Y- N	Y- P	X- N	X- P
	P POSITIVE input N NEGATIVE input (inverted input polarity)							
6000.03 General- Purpose Input	IN7 .. IN0							
6401.01	X-Axis proportional value (16 bit)							
6401.02	Y-Axis proportional value (16 bit)							
6401.03	Z-Axis proportional value (16 bit)							
6401.04	W-Axis proportional value (16 bit)							
Default PDO Mapping								
PDO	Mapped Data							
RPDO1	Not implemented							
TPDO1	6000.01 Memory Input 6000.02 Direction Input 6000.03 General-Purpose Input							
TPDO2	6401.01 X-Axis proportional value 6401.02 Y-Axis proportional value 6401.03 Z-Axis proportional value 6401.04 W-Axis proportional value							

**I/O-Mapping in Mode 2**

Memory Switch with internal freeze

Operation mode 2 CF 3 = 1 CF 2 = 1 CF1 = 0 CF0 = 1 EDS-file: CO4013A2.EDS Memory function available (internal) with switch with internal analog value freeze (analog axis value Object 6401 will not change if memory flip-flop is set) 16 direction- and general purpose digital input lines 4 general purpose output lines								
Data Mapping to Dictionary								
Index. SubIndex	Mapped I/O Signal bit/value							
	7	6	5	4	3	2	1	0
6000.01 MEMORY- Input Or -Flip-Flop	0	0	0	0	W	Z	Y	X
					-MEM (Flip-Flop)			
6000.02 Direction-Input	W- N	W- P	Z- N	Z- P	Y- N	Y- P	X- N	X- P
	P POSITIVE input N NEGATIVE input (inverted input polarity)							
6000.03 General- Purpose Input	IN7 .. IN0							
6200.01 General- Purpose Output	-	-	-	-	OUT3 .. OUT0			
6401.01	X-Axis proportional value (16 bit)							
6401.02	Y-Axis proportional value (16 bit)							
6401.03	Z-Axis proportional value (16 bit)							
6401.04	W-Axis proportional value (16 bit)							
Default PDO Mapping								
PDO	Mapped Data							
RPDO1	6200.01 General-Purpose Output							
TPDO1	6000.01 Memory Input 6000.02 Direction Input 6000.03 General-Purpose Input							
TPDO2	6401.01 X-Axis proportional value 6401.02 Y-Axis proportional value 6401.03 Z-Axis proportional value 6401.04 W-Axis proportional value							



**I/O-Mapping in Mode 3**

Memory Switch no internal freeze

Operation mode 3 CF 3 = 1 CF 2 = 1 CF1 = 0 CF0 = 0 EDS-file: CO4013A3.EDS Memory function available (by application) with switch no internal analog value freeze (change of analog axis value will change Object 0x6401) 16 direction- and general purpose digital input lines 4 general purpose output lines								
Data Mapping to Dictionary								
Index. SubIndex	Mapped I/O Signal bit/value							
	7	6	5	4	3	2	1	0
6000.01 MEMORY- Input Or -Flip-Flop	0	0	0	0	W	Z	Y	X
6000.02 Direction-Input	W- N	W- P	Z- N	Z- P	Y- N	Y- P	X- N	X- P
	-MEM (Flip-Flop) P POSITIVE input N NEGATIVE input (inverted input polarity)							
6000.03 General-Purpose Input	IN7 .. IN0							
6200.01 General-Purpose Output	-	-	-	-	OUT3 .. OUT0			
6401.01	X-Axis proportional value (16 bit)							
6401.02	Y-Axis proportional value (16 bit)							
6401.03	Z-Axis proportional value (16 bit)							
6401.04	W-Axis proportional value (16 bit)							
Default PDO Mapping								
PDO	Mapped Data							
RPDO1	6200.01 General-Purpose Output							
TPDO1	6000.01 Memory Input 6000.02 Direction Input 6000.03 General-Purpose Input							
TPDO2	6401.01 X-Axis proportional value 6401.02 Y-Axis proportional value 6401.03 Z-Axis proportional value 6401.04 W-Axis proportional value							

**I/O-Mapping in Mode 4**

No Memory function

Operation mode 4 CF 3 = 1 CF 2 = 0 CF1 = 1 CF0 = 1 EDS-file: CO4013A4.EDS No Memory function 20 direction- and general purpose digital input lines 4 general purpose output lines								
Data Mapping to Dictionary								
Index. SubIndex	Mapped I/O Signal bit/value							
	7	6	5	4	3	2	1	0
6000.01 MEMORY- Input Or -Flip-Flop	0	0	0	0	0	0	0	0
6000.02 Direction-Input	W- N	W- P	Z- N	Z- P	Y- N	Y- P	X- N	X- P
	P POSITIVE input N NEGATIVE input (*1)							
6000.03 General-Purpose Input	IN7 .. IN0 (*1)							
6000.04 General-Purpose Input	0	0	0	0	IN11 .. IN8 (*1)			
6200.01 General-Purpose Output	-	-	-	-	OUT3 .. OUT0 (*1)			
6401.01	X-Axis proportional value (16 bit)							
6401.02	Y-Axis proportional value (16 bit)							
6401.03	Z-Axis proportional value (16 bit)							
6401.04	W-Axis proportional value (16 bit)							
Default PDO Mapping								
PDO	Mapped Data							
RPDO1	6200.01 General-Purpose Output							
TPDO1	6000.01 Memory Input (forced to 0) 6000.02 Direction Input 6000.03 General-Purpose Input 6000.04 General-Purpose Input							
TPDO2	6401.01 X-Axis proportional value 6401.02 Y-Axis proportional value 6401.03 Z-Axis proportional value 6401.04 W-Axis proportional value							

\*1) Note: The CO4013 has inverted input/output pin polarity.

See CO4013 data sheet for details, object dictionary, chip functionality and further information.

### 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.

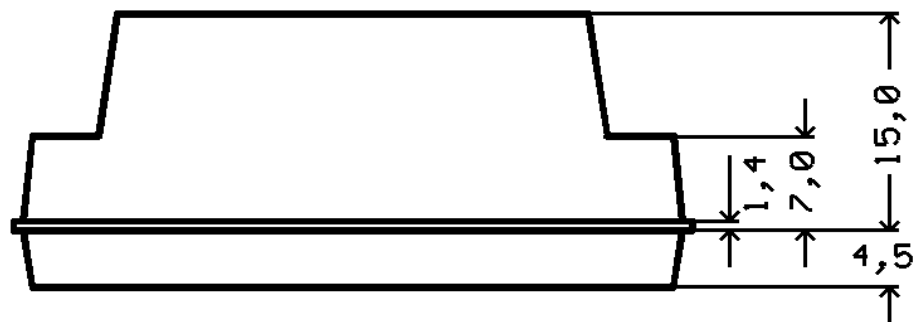
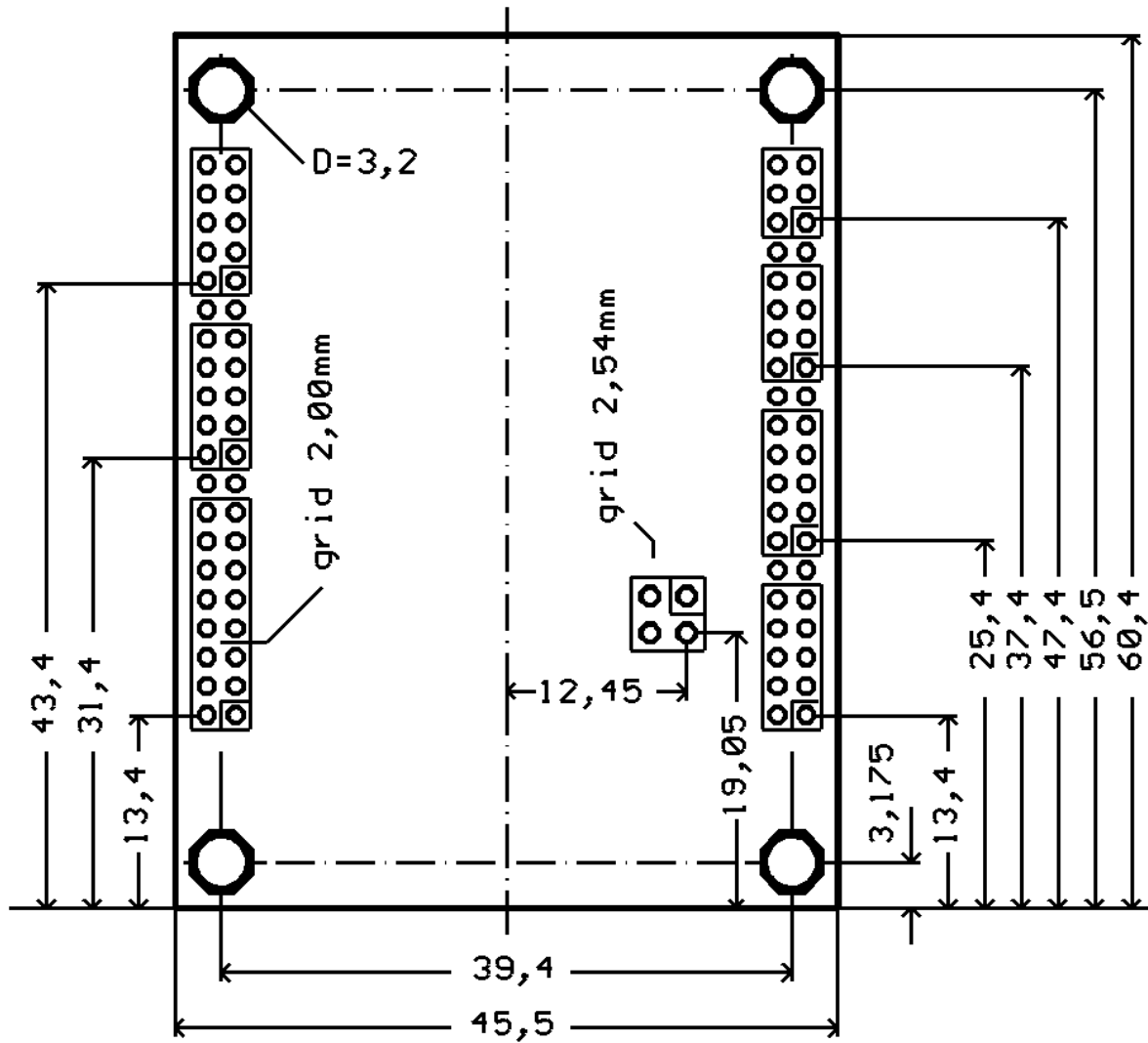
Parameter	Symbol	Rated Value		Units	Remarks
		Min.	Max.		
Power supply voltage	PVCC	0	36	V	
Analog power supply voltage	AVCC	0	VCC	V	VCC = +5V DC
Analog reference voltage	AVREF	0	VCC	V	
Input voltage	Vi	- 0.3	+ 6.0	V	Vi < VCC + 0.3V
Output voltage	Vo	- 0.3	+ 6.0	V	Vo < VCC + 0.3V
L level maximum output current	IOLMAX		15	mA	Time < 20 msec
L level maximum output current	IOL		4	mA	
H level maximum output current	IOHMAX		15	mA	Time < 20 msec
H level maximum output current	IOH		4	mA	
Maximum Power dissipation	P <sub>MAX</sub>		500	mW	
Operating temperature	T <sub>A</sub>	0	+70	°C	CO4013A, -AO
Operating temperature	T <sub>A</sub>	-40	+85	°C	CO4013AE, -AOE
Storing temperature	T <sub>A</sub>	-55	+150	°C	All
Galvanic isolation	Viso		2.0	kV	CO4013AO, -AOE

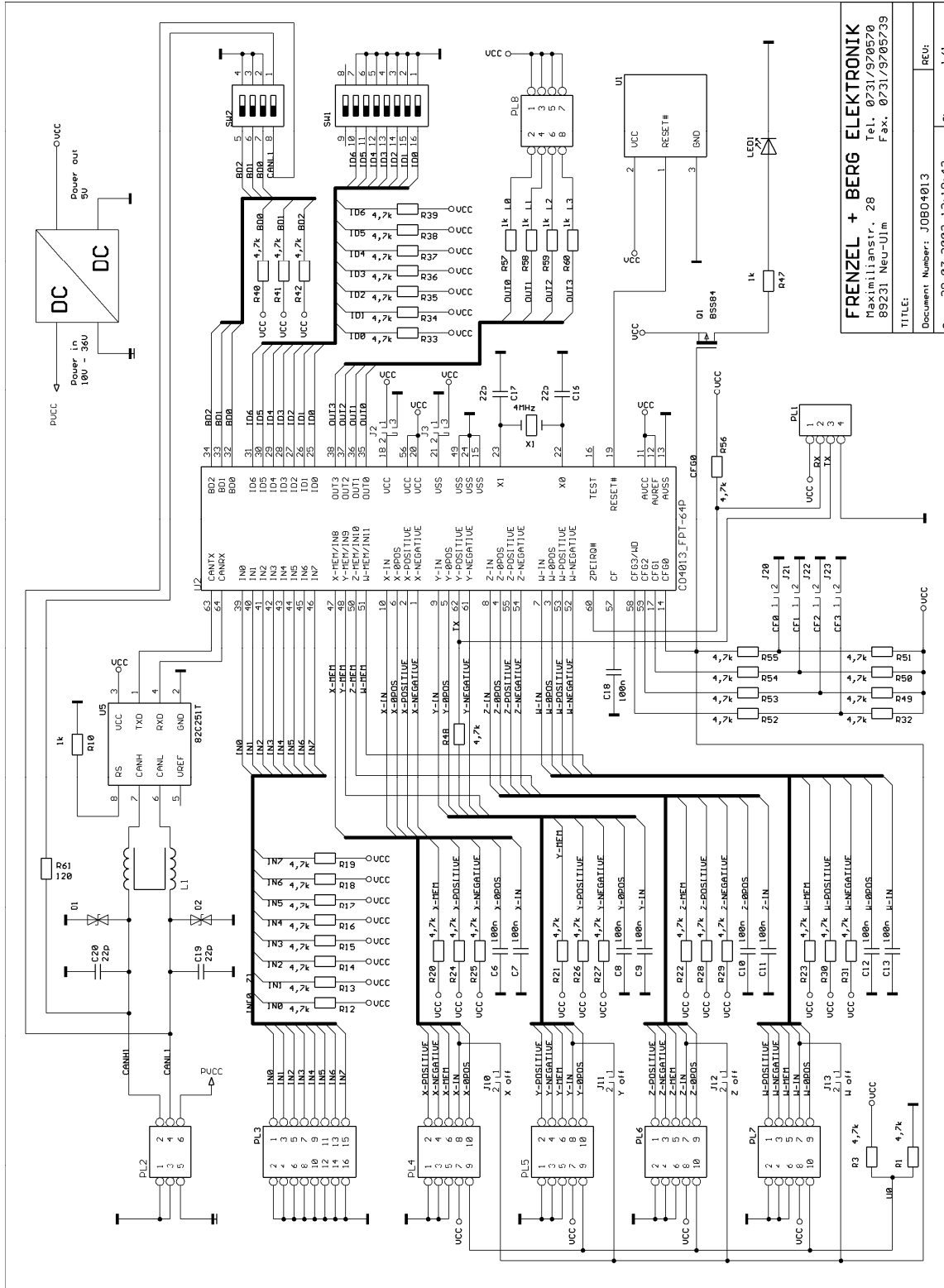
### Operation Conditions / Characteristics

Functional operation should be restricted to recommended operation conditions.

Parameter	Symbol	Rated Value			Units	Remarks
		Min.	Typ.	Max.		
Power supply voltage	PVCC	10		35	V	
Analog power supply voltage	AVCC		VCC	VCC	V	VCC = +5.0
Analog reference voltage	AVREF		VCC	VCC	V	VCC = +5.0
Power supply current	I <sub>CC</sub>			300	mA	All inputs V <sub>IL</sub> or V <sub>IH</sub> All outputs open
Input H voltage	V <sub>IH</sub>	0.8 * VCC		VCC + 0.3	V	
Input L voltage	V <sub>IL</sub>	VSS - 0.3		0.2 * VCC	V	VSS = 0, VCC = +5.0
Input Capacity			100		nF	
Input Impedance			100		kΩ	
Output H voltage	V <sub>OH</sub>	VCC - 0.5			V	I <sub>OH</sub> = -4.0 mA
Output L voltage	V <sub>OL</sub>			0.4	V	I <sub>OL</sub> = 4.0 mA
Input leakage current	I <sub>LKC</sub>	-5		5	uA	
Crystal frequency	f <sub>osc</sub>		4		MHz	
Reset pulse width	t <sub>res</sub>	10			us	
Power on rise time	t <sub>RESLH</sub>	0.05		30	ms	
Maximum CANopen Delay input pin to bus telegram	t <sub>DITB</sub>	0.05	1	2	ms	No additional bus distribution delay
Maximum CANopen Delay bus telegram to output pin	t <sub>DBTO</sub>	0.05	1	2	ms	
Watchdog trigger frequency	f <sub>WDT</sub>	0.5	1	2	kHz	Delayed max. 500 ms after reset
Maximum Power dissipation	P <sub>MAX</sub>			300	mW	
Operating temperature	T <sub>A</sub>	0		+70	°C	CO4013A, -AO
Operating temperature	T <sub>A</sub>	-40		+85	°C	CO4013AE, -AOE

Package Dimension JoBo4013A





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