

### General Description

The CO4011B-BD and CO4012A-BD are CANopen remote I/O modules using the single chip controller CO4011 / CO4012. So this data sheet is an appendix of the CO4011 / CO4012 data sheet.

The CO4011B-BD and CO4012A-BD remote I/O modules are especially designed for automotive and industrial applications. The modules offer the complex implementation of the CANopen standards DS301 and DS401. They are suitable for simple low cost applications like sensor interfacing as well as for complex I/O systems.

The CO4011 provides up to 32 digital I/O lines, 0, 4 or 8 channels may be set for analog input operation with a resolution of 8 or 10 bit.

The CO4012A-BD provides up to 32 digital I/O lines. 8 channels may be set for analog input operation with a resolution of 10 bits.

To support output overload monitoring, a special interrupt input is provided.

Baudrates up to 1 MBit are supported. To minimize external interface recommendations all output pins have high current drive capability of 4 mA. For interfacing opto isolators no external drivers are required.



### Features

- According to CiA Draft Standards DS301 Version 4.0 and DS401 Version 2.0
- Baud rate up to 1MBit
- CAN bus ISO11898 transceiver 82C251
- Various I/O configurations
- Internal noise filtering for all input lines with individual setting for each channel
- Error interrupt input for output overload monitoring
- Output drivers with 4mA
- Watchdog output
- Temperature ranges up to -40 to 105 °C
- Package 60 pin module
- Dimensions (41mm x 31mm x 18mm)

### Applications

The boards are optimized for automotive and industrial applications such as:

- CANopen Remote I/O Modules
- CANopen Interface for keyboards and control panels
- Low Cost CANopen Interface for sensors like photoelectric reflex switches photo interrupters etc.
- Low Cost CANopen Interface for actors like pneumatic valves, warning panels etc.

### CANopen Features

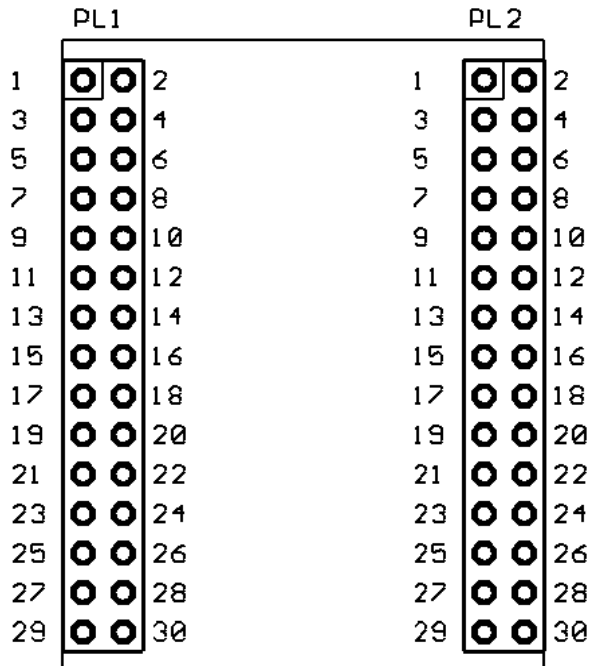
- 2 Transmit- and 1 Receive PDOs (configuration dependent)
- Dynamic PDO mapping
- Variable PDO identifier
- All CANopen specific PDO transmission types supported: synchronous, asynchronous, event driven, cyclic, acyclic and remote frame dependent.
- Event timer and inhibit timer features for all transmit PDOs.
- Storing and restoring of object dictionary to non-volatile memory
- Node guarding, Life guarding, Heartbeat
- Variable SYNC identifier
- Emergency messages
- Minimum boot up

### Ordering Information

#### CO4011B-BD, CO4012A-BD ( license included)

Part	Temp. Range	Package
CO4011B-BD	0 °C to 70 °C	60 Pin module
CO4011BE-BD	-40 °C to 85 °C	60 Pin module
CO4012A-BD	0 °C to 70 °C	60 Pin module
CO4012AE-BD	-40 °C to 85 °C	60 Pin module

### Pin Assignment



Top view (component side)

### Pin Listing CO4011

PL1		
Pin No.	Pin Name	Function
1	VSS	Ground
2	LED	4 mA limited output (anode) for a status LED
3	WD#	Watch dog out
8 to 19	IN11.. IN0	input pins
4 to 7	IO4 .. IO7	input/output pins
20	AVCC	Supply for A/D-Converter
21	AVREF	Reference Voltage for A/D-Converter
22	AVSS	Ground for A/D-Converter
23 to 25	BD2 .. BD0	Baud rate selection input
26 to 29	CF3 .. CF0	Configuration bits 0 to 3 for I/O setting
30	VCC	Power supply

### Pin Listing continued CO4011

PL2		
Pin No.	Pin Name	Function
1	VCC	Power supply
2	CANH	CAN high line
3	CANL	CAN low line
4	OLIRQ#	
5	RESET#	
6 to 9	IO3 .. IO0	input/output pins
10 to 21	OUT11 .. OUT0	output pins
22 to 28	ID6 .. ID0	Identifier selection input
29	FWUD#	Firmware Update
30	VSS	Ground

### Pin Listing CO4012

PL1		
Pin No.	Pin Name	Function
1	VSS	Ground
2	LED	4 mA limited output (anode) for a status LED
3	WD#	Watch dog out
4 to 19	IN15/OUT16.. IN0/OUT31	input/output pins
20	AVCC	Supply for A/D-Converter
21	AVREF	Reference Voltage for A/D-Converter
22	AVSS	Ground for A/D-Converter
23 to 25	BD2 .. BD0	Baud rate selection input
26 to 29	CF3 .. CF0	Configuration bits 0 to 3 for I/O setting
30	VCC	Power supply

PL2		
Pin No.	Pin Name	Function
1	VCC	Power supply
2	CANH	CAN high line
3	CANL	CAN low line
4	OLIRQ#	
5	RESET#	
6 to 21	IN16/OUT15 .. IN31/OUT0	input/output pins
22 to 28	ID6 .. ID0	Identifier selection input
29	FWUD#	Firmware Update
30	VSS	Ground

### Handling the Device

#### Preventing latch up

The CO4011 and CO4012 are CMOS devices and may suffer latch up under the following conditions:

- 1) A voltage higher than VCC or lower than VSS is applied to any pin.
- 2) Absolute maximum ratings are exceeded
- 3) AVCC power is provided before VCC supply

#### Handling unused input 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. Do not leave any ground or power pins open. Connect at least two ceramic capacitors of 100 nF and a tantalum capacitor of 1 uF between VCC and VSS as close as possible to the device.

#### Power Supply for A/D converter

The power supply for the A/D converter must not be turned on before the power supply VCC.

If the A/D converter is not used, connect the pins as follows: AVCC = VCC, AVSS = AVREF = VSS.

**Note! Make sure, that Jumper J5, J6 and J7 are open in this case!**

#### Pull up/down resistors

The CO4011/12A-BD does not support internal pull up/down resistors at the INx/OUTx pins. Use external components where needed.

### Pin Description

#### FWUD#: Firmware Update

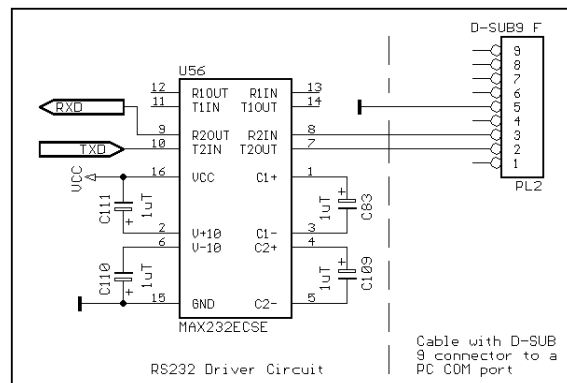
A low level during reset at this pin, and an ID0 and ID1 at low level, activate the firmware update mode. In this case the pins IN10/OUT21 and OLIRQ# will be used for an asynchronous communication.

Pin Name	Pin No.	Normal operation	Firmware update
FWUD#		high	low
ID0	PL2 / 28	x	low
ID1	PL2 / 27	x	low
IN10/OUT21	PL1 / 9	IN10/OUT21	TXD (TTL)
OLIRQ#	PL2 / 4	OLIRQ#	RXD (TTL)

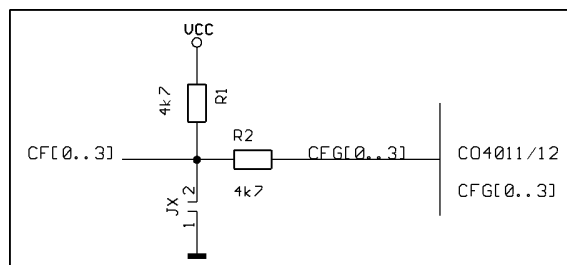
The update may be done with a COM-Port from a PC/Notebook and an in circuit update tool for the Fujitsu MB90F497 micro controller.

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

The pins TXD and RXD 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.



#### CF0 .. CF3: Configuration input pins

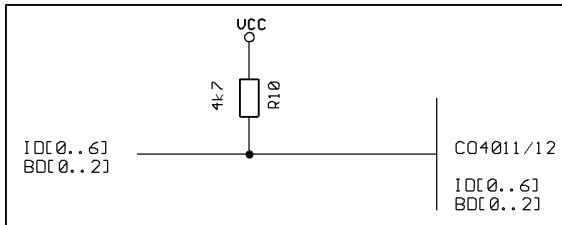


**Note: These pins have also jumper on board. To preventing malfunctions and short circuits check the jumper settings before using this pins.**

Set device configuration to preferred operation mode using CF0 to CF3. If you leave any configuration input unconnected make sure, that the correct configuration is set via the on board jumpers.

Refer to chapter 'Device Configuration' for details and functionality.

**ID0 .. ID6, BD0 .. BD2: Identifier and baud rate input pins**



Refer to chapter 'Device Configuration' 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. (Transfer speed up to 1 MBaud)

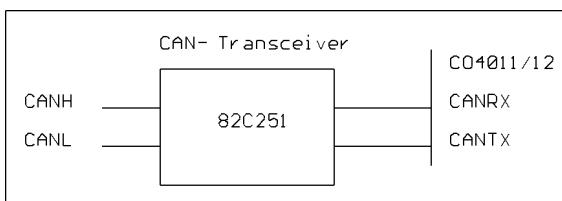
The on board CAN transceiver (82C251) can be used or not, depending on the setting of Jumper J8 and J9.

#### Without using the CAN transceiver:

In case without using the on board CAN transceiver, a user specific (opto isolated) CAN driver circuit may be realized on the application board. Therefore the Jumpers J8 and J9 have to be set to position 1-2.

In this condition the CANH pin is connected to signal CANRX and CANL to CANTX (TTL level).

#### With using the CAN transceiver:



By using the on board CAN transceiver it is possible to connect the board directly to a two wire CAN bus associated to ISO11898. Therefore the Jumpers J8 and J9 have to be set to position 2-3.

**Note:** It is not allowed to set the Jumper J8 or J9 in position 1-2-3 same times. This might cause permanent damage to the device.

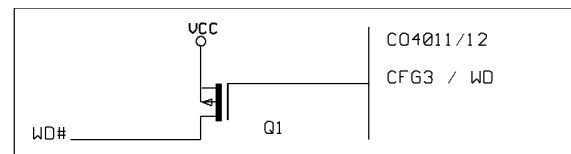
### RESET#: Reset input/output pin

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.

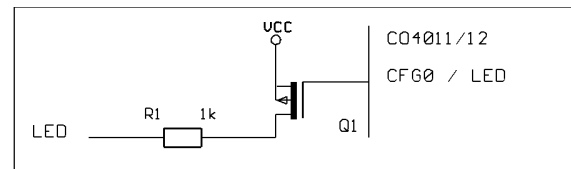
The reset pin may also be used as reset input. For a correct device reset by external components, provide a low level longer than 50 ms to the input RESET#.

**Note:** Do never drive a high level to the RESET# pin. This may cause permanent damage to the device. Use a push button or an open drain driver for this condition.

### WD: Watch dog output pin



### LED: Status LED output pin



## Device Configuration

The following sections describe the device configuration with meaning:

- 1: ViH logic high level
- 0: ViL logic low level

### CAN Identifier

The CAN Identifier will be set with Pins ID0 to ID6. This configuration pins use internal inverter. The ID is set as follows:

ID6	ID5	ID4	ID3	ID2	ID1	ID0	CAN-Identifier
1	1	1	1	1	1	1	Programmable ID
1	1	1	1	1	1	0	1 = 0x01
1	1	1	1	1	0	1	2 = 0x02
1	1	1	1	1	0	0	3 = 0x03
1	1	1	1	0	1	1	4 = 0x04
			....				....
1	0	0	0	0	0	0	63 = 0x3F
0	1	1	1	1	1	1	64 = 0x40
0	1	1	1	1	1	0	65 = 0x41
			....				....
0	0	0	0	0	1	0	125 = 0x7C
0	0	0	0	0	0	1	126 = 0x7E
0	0	0	0	0	0	0	127 = 0x7F

All Identifiers from 1 to 127 are valid settings. Identifier 0 is used to load the ID from object 2100.

### Baud rate

The baud rate configuration will be done with configuration inputs BD0 to BD2

BD2	BD1	BD0	CAN-Baud Rate / Bus length
1	1	1	1 Mbit/sec 25 m *1)
1	1	0	800 kbit/sec 50 m *1)
1	0	1	500 kbit/sec 100 m *2)
1	0	0	250 kbit/sec 250 m *2)
0	1	1	125 kbit/sec 500 m *3)
0	1	0	50 kbit/sec 1000 m *3)
0	0	1	20 kbit/sec 2500 m *3)
0	0	0	10 kbit/sec 5000 m *3)

- \*1) Calculation without optocouplers.  
For optocouplers bus length is reduced for about 4m per 10 nsec propagation delay of employed optocoupler type
  - \*2) Calculation with 40 nsec optocoupler propagation delay
  - \*3) Calculation with 100 nsec optocoupler propagation delay
- The calculation of the bus length is based on a line propagation delay of 5 nsec/m.

### Analog Input Selection CO4011B-BD

With configuration bits CF0 and CF1 the number and resolution of analog inputs are set.

CF 1	CF 0	Nr of analog channels	Resolution	Analog Inputs	Digital Inputs
1	1	0	-	-	IN0 to IN11
1	0	8	8 Bit *1)	IN0 to IN7	IN8 to IN11
0	1	4	10 Bit *2)	IN 0 to IN 3	IN4 to IN11
0	0		Reserved		

\*1) The analog inputs are mapped as unsigned 8 values into a single transmit PDO (TPDO2).

\*2) The analog inputs are mapped as signed 16 values into one transmit PDO (TPDO2).

If analog inputs are enabled, the corresponding input channels are not scanned for digital signals. The digital input signals for those channels are always set to 0 without taking care of the analog input level. If analog inputs are disabled (CF1 = 1, CF0 = 1) the analog input voltage of input IN0 to IN3 is not scanned.

Do not apply higher voltages than VCC and AVCC to any input pin. If the A/D converter is not used, connect the power supply pins as follows:  
AVCC = VCC, AVSS = AVREF = VSS.

### Configuration of IO-Port

Device pins IO0 to IO7 may be used as digital inputs or digital outputs. This selection must be done with CF2.

See also section "Mapping I/O to Object Dictionary" for additional information

CF2	I/O Port is used for
1	Digital Input
0	Digital Output

### Enable additional CAN features

With setting CF3 to 0 the following special features may be enabled:

- Easy Mapping of Objects to PDO

CF3	I/O Port is used for
1	Normal operation mode
0	Enable additional features.

These features might be incompatible with CANopen conformance Test.

## Operation Mode Selection CO4012A-BD

Configuration bits CF0 to CF1 select the I/O configuration of the CO4012 chip.

CF	Configuration
2 1 0	Pin functions
1 1 1	16 digital Input, 16 digital Output IN0/OUT31..IN15/OUT16: Input line 0..15 OUT0/IN31..OUT15/IN16: Output line 0..15
1 1 0	32 digital Input Lines IN0/OUT31..IN15/OUT16: Input line 0..15 OUT15/IN16..OUT0/IN31: Input line 16..31
1 0 1	32 digital Output Lines OUT0/IN31..OUT15/IN16 Output 0..15 IN15/OUT16..IN0/OUT31 Output 16..31
1 0 0	8 analog Input (10 bit resolution) IN0/OUT31..IN7/OUT24 Analog Input line 0..7
0 x x	Reserved for future use do not use this combination

Do not apply higher voltages than VCC and AVCC to any input pin. If the A/D converter is not used, connect the power supply pins as follows:  
AVCC = VCC, AVSS = AVREF = VSS.

### Enable additional CAN features

With setting CF3 to 0 the following special features may be enabled:

- Easy Mapping of Objects to PDO

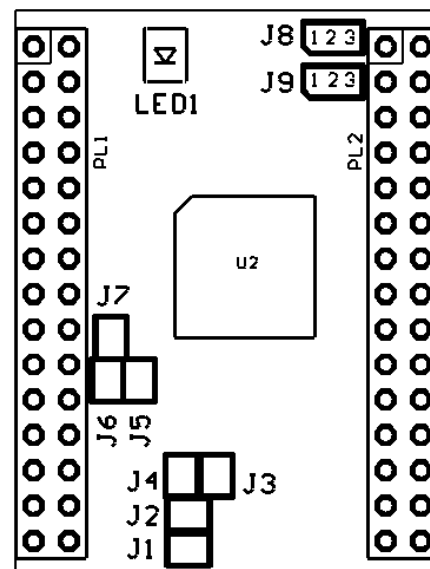
CF3	I/O Port is used for
1	Normal operation mode
0	Enable additional features.

**Note:** These features might be incompatible with CANopen conformance Test.

## Jumper-Setting

Jumper	Setting	Prescription
J1	open	CFG0 = 1 (or configured by the CF0 pin)
	closed	CFG0 = 0
J2	open	CFG1 = 1 (or configured by the CF1 pin)
	closed	CFG1 = 0
J3	open	CFG2 = 1 (or configured by the CF2 pin)
	closed	CFG2 = 0
J4	open	CFG3 = 1 (or configured by the CF3 pin)
	closed	CFG3 = 0
J5	open	AVSS set by pin
	closed	AVSS connected to Ground
J6	open	AVREF set by pin
	closed	AVREF connected to VCC
J7	open	AVCC set by pin
	closed	AVCC connected to VCC
J8	1-2	Signal CANTX on PL2A Pin 2
	3-2	Signal CANH on PL2A Pin 2
J9	1-2	Signal CANRX on PL2A Pin 3
	3-2	Signal CANL on PL2A Pin 3

**Note:** Most jumpers are alternative to module pins with the same functionality. To prevent malfunctions and short circuits leave the corresponding pin open if the corresponding jumper is used.



### Mapping I/O to Object Dictionary [4011]

The mapping of the I/O channels depends on the setting of configuration bits CF0 to CF2. All possible configurations are shown in individual tables. Select the table for your application according to I/O requirements.

Note for A/D converter the maximum resolution is 10 bit. Tables that show analog input with 16-bit mean, that dictionary entry is made as signed integer (16 bit wide).

### Summary of operation modes [4011]

The following table shows a summary of possible operation modes.

CF				Mode	Description
3	2	1	0		
1	1	1	1	0	20 digital In / 12 dig. Out
1	1	1	0	1 *2)	12 dig. In / 12 dig. Out. 8 analog In 8 bit
1	1	0	1	2	16 dig. In / 12 dig. Out. 4 analog In 16 bit
1	1	0	0	3	reserved *1)
1	0	1	1	4	12 digital In / 20 dig. Out
1	0	1	0	5 *2)	4 dig. In / 20 dig. Out. 8 analog In 8 bit
1	0	0	1	6	8 dig. In / 20 dig. Out. 4 analog In 16 bit
1	0	0	0	7	reserved *1)
0	x	x	X		reserved *1)

\*1) These modes are reserved for future use and must not be set. Selecting the reserved modes may cause improper operation of the device.

\*2) This modes have default PDO mapping which is not according to CiA standard DS401.

The selected operation mode may be read via object 2101h from the object dictionary.

**Note:**

**Setting of configuration must be fixed. The CO4011 scans the setting of CF0 to CF3 only during reset. Changing of configuration on the fly is not allowed and may cause improper operation of the device.**

**Note that configuration pins are input during reset but may be switched to output during operation. See Pin Description for additional information.**

### 20 digital in / 12 digital out [4011]

Operation mode 0 CF 2 = 1 CF1 = 1 CF0 = 1 EDS-file: CO4011B0.EDS							
Data Mapping to Dictionary							
Index. SubIndex	Mapped I/O Signal bit/value						
	7	6	5	4	3	2	1
6000.01	IN7 to IN0						
6000.02	IO3 to IO0			IN11 to IN8			
6000.03	-	-	-	-	IO7 to IO4		
6200.01	OUT7 to OUT0						
6200.02	-	-	-	-	OUT11 to 8		
6401.01	Conversion result IN0 (16 bit)						
6401.02	Conversion result IN1 (16 bit)						
6401.03	Conversion result IN2 (16 bit)						
6401.04	Conversion result IN3 (16 bit)						
Default PDO Mapping							
PDO	Mapped Data						
RPDO1	6200.01 digital output OUT0 to 7 6200.02 digital output OUT8 to 11						
TPDO1	6000.01 digital input IN0 to IN7 6000.02 digital input IN8 to IN11 6000.03 digital input IO0 to IO7						

I/O Port is used for digital Input.

### 12 digital in / 20 digital out [4011]

Operation mode 4 CF 2 = 0 CF1 = 1 CF0 = 1 EDS-file: CO4011B4.EDS							
Data Mapping to Dictionary							
Index. SubIndex	Mapped I/O Signal bit/value						
	7	6	5	4	3	2	1
6000.01	IN7 to IN0						
6000.02	-	-	-	-	IN11 to IN8		
6200.01	OUT7 to OUT0						
6200.02	IO3 to IO0			OUT11 to 8			
6200.03	-	-	-	-	IO7 to IO4		
6401.01	Conversion result IN0 (16 bit)						
6401.02	Conversion result IN1 (16 bit)						
6401.03	Conversion result IN2 (16 bit)						
6401.04	Conversion result IN3 (16 bit)						
Default PDO Mapping							
PDO	Mapped Data						
RPDO1	6200.01 digital output OUT0 to 7 6200.02 digital output OUT8 to 11 6200.03 digital output IO0 to IO7						
TPDO1	6000.01 digital input IN0 to IN7 6000.02 digital input IN8 to IN11						

### 16 dig. in / 12 dig. out / 4 ana. in 16 bit [4011]

Operation mode 2 CF 2 = 1 CF1 = 0 CF0 = 1 EDS-file: CO4011B2.EDS								
Data Mapping to Dictionary								
Index. SubIndex	Mapped I/O Signal bit/value							
	7	6	5	4	3	2	1	0
6000.01	IN11 to IN8				IN7 to IN4			
6000.02	IO7 to IO0 used as digital inputs							
6200.01	OUT7 to OUT0							
6200.02	-	-	-	-	OUT11 to 8			
6401.01	Conversion result IN0 (16 bit)							
6401.02	Conversion result IN1 (16 bit)							
6401.03	Conversion result IN2 (16 bit)							
6401.04	Conversion result IN3 (16 bit)							
Default PDO Mapping								
PDO	Mapped Data							
RPDO1	6200.01 digital output OUT0 to 7 6200.02 digital output OUT8 to 11							
TPDO1	6000.01 digital input IN4 to IN11 6000.02 digital input IO0 to IO7							
TPDO2	6401.01 analog input IN0 (16 bit) 6401.02 analog input IN1 (16 bit) 6401.03 analog input IN2 (16 bit) 6401.04 analog input IN3 (16 bit)							

### 12 dig. in / 12 dig. out / 8 ana. in 8 bit [4011]

Operation mode 1 CF 2 = 1 CF1 = 1 CF0 = 0 EDS-file: CO4011B1.EDS								
Data Mapping to Dictionary								
Index. SubIndex	Mapped I/O Signal bit/value							
	7	6	5	4	3	2	1	0
6000.01	IO3 to IO0				IN11 to IN8			
6000.02	-	-	-	-	IO7 to IO4			
6200.01	OUT7 to OUT0							
6200.02	-	-	-	-	OUT11 to 8			
6400.01	Conversion result IN0 (8 bit)							
...	....							
6400.08	Conversion result IN7 (8 bit)							
Default PDO Mapping								
PDO	Mapped Data							
RPDO1	6200.01 digital output OUT0 to 7 6200.02 digital output OUT8 to 11							
TPDO1	6000.01 digital inputs IN8 to IN11 6000.02 digital input IO0 to IO7							
TPDO2	6400.01 analog input IN0 (8 bit) 6400.02 analog input IN1 (8 bit) .... 6400.08 analog input IN7 (8 bit)							

### 8 dig. in / 20 dig. out / 4 ana. in 16 bit [4011]

Operation mode 6 CF 2 = 0 CF1 = 0 CF0 = 1 EDS-file: CO4011B6.EDS								
Data Mapping to Dictionary								
Index. SubIndex	Mapped I/O Signal bit/value							
	7	6	5	4	3	2	1	0
6000.01	IN11 to IN8				IN7 to IN4			
6200.01	OUT7 to OUT0							
6200.02	IO3 to IO0				OUT11 to 8			
6200.03	-	-	-	-	IO7 to IO4			
6401.01	Conversion result IN0 (16 bit)							
6401.02	Conversion result IN1 (16 bit)							
6401.03	Conversion result IN2 (16 bit)							
6401.04	Conversion result IN3 (16 bit)							
Default PDO Mapping								
PDO	Mapped Data							
RPDO1	6200.01 digital output OUT0 to 7 6200.02 digital output OUT8 to 11 6200.03 digital output IO0 to IO7							
TPDO1	6000.01 digital inputs IN4 to IN11							
TPDO2	6401.01 analog input IN0 (16 bit) 6401.02 analog input IN1 (16 bit) 6401.03 analog input IN2 (16 bit) 6401.04 analog input IN3 (16 bit)							

### 4 dig. in / 20 dig. out / 8 ana. in 8 bit [4011]

Operation mode 5 CF 2 = 0 CF1 = 1 CF0 = 0 EDS-file: CO4011B5.EDS								
Data Mapping to Dictionary								
Index. SubIndex	Mapped I/O Signal bit/value							
	7	6	5	4	3	2	1	0
6000.01	-	-	-	-	IN11 to IN8			
6200.01	OUT7 to OUT0							
6200.02	IO3 to IO0				OUT11 to 8			
6200.03	-	-	-	-	IO7 to IO4			
6400.01	Conversion result IN0 (8 bit)							
....	....							
6400.08	Conversion result IN7 (8 bit)							
Default PDO Mapping								
PDO	Mapped Data							
RPDO1	6200.01 digital output OUT0 to 7 6200.02 digital output byte 1 6200.03 digital output byte 2							
TPDO1	6000.01 digital inputs IN8 to IN11							
TPDO2	6400.01 analog input IN0 (8 bit) 6400.02 analog input IN1 (8 bit) .... 6400.08 analog input IN7 (8 bit)							



### Mapping I/O to Object Dictionary [4012]

The mapping of the I/O channels depends on the setting of configuration bits CF0 to CF2. All possible configurations are shown in individual tables. Select the table for your application according to I/O requirements.

Note for A/D converter the maximum resolution is 10 bit. Tables that show analog input with 16-bit mean, that dictionary entry is made as signed integer (16 bit wide).

### Summary of operation modes [4012]

The following table shows a summary of possible operation modes.

3	CF			Mode	Description
	2	1	0		
X	1	1	1	0	16 digital In / 16 dig. Out
X	1	1	0	1	32 digital In
X	1	0	1	2	32 digital Out
X	1	0	0	3	8 analog In 16 bit
X	0	x	X	4	Reserved *1)
	x	X	X		Reserved *1)

\*1) These modes are reserved for future use and must not be set. Selecting the reserved modes may cause improper operation of the device.

The selected operation mode may be read via object 2101h from the object dictionary.

#### Note:

**Setting of configuration must be fixed. The CO4012 scans the setting of CF0 to CF3 only during reset. Changing of configuration on the fly is not allowed and may cause improper operation of the device.**

**Note that configuration pins are input during reset but may be switched to output during operation. See Pin Description for additional information.**

### 16 digital in / 16 digital out [4012]

Operation mode 0								
CF 2 = 1 CF1 = 1 CF0 = 1								
EDS-file: CO4012A0.EDS								
Supported PDOs: 1 Transmit-PDO 1 Receive-PDO								
Data Mapping to Dictionary								
Index. SubIndex	Mapped I/O Signal bit/value							
	7	6	5	4	3	2	1	0
6000.01	IN7 to IN0							
6000.02	IN15 to IN8							
6200.01	OUT7 to OUT0							
6200.02	OUT15 to OUT8							
Default PDO Mapping								
PDO	Mapped Data							
RPDO1	6200.01 digital output OUT0 to 7 6200.02 digital output OUT8 to 15							
TPDO1	6000.01 digital input IN0 to IN7 6000.02 digital input IN8 to IN15							

### 32 digital in [4012]

Operation mode 1								
CF 2 = 1 CF1 = 1 CF0 = 0								
EDS-file: CO4012A1.EDS								
Supported PDOs: 1 Transmit-PDO								
Data Mapping to Dictionary								
Index. SubIndex	Mapped I/O Signal bit/value							
	7	6	5	4	3	2	1	0
6000.01	IN7 to IN0							
6000.02	IN15 to IN8							
6000.03	IN23 to IN16							
6000.04	IN31 to IN24							
Default PDO Mapping								
PDO	Mapped Data							
TPDO1	6000.01 digital input IN0 to IN7 6000.02 digital input IN8 to IN15 6000.03 digital input IN16 to IN23 6000.04 digital input IN24 to IN31							

### 32 digital Out [4012]

Operation mode 2 CF 2 = 1 CF1 = 0 CF0 = 1 EDS-file: CO4012A2.EDS Supported PDOs: 1 Receive-PDO	
Data Mapping to Dictionary	
Index. SubIndex	Mapped I/O Signal bit/value
	7   6   5   4   3   2   1   0
6200.01	OUT7 to OUT0
6200.02	OUT15 to OUT8
6200.03	OUT23 to OUT16
6200.04	OUT31 to OUT24
Default PDO Mapping	
PDO	Mapped Data
RPDO1	6200.01 digital out OUT0 to 7 6200.02 digital out OUT8 to 15 6200.03 digital out OUT16 to 23 6200.04 digital out OUT24 to 31

**Note :**

In operation mode 3 the first transmit PDO (TPDO1) is not implemented. The analog input objects are mapped to TPDO2 and TPDO3

### 8 analog In 16 bit [4012]

Operation mode 3 CF 2 = 1 CF1 = 0 CF0 = 0 EDS-file: CO4012A3.EDS Supported PDOs: 2 Transmit-PDOs (TPDO2 and TPDO3)	
Data Mapping to Dictionary	
Index. SubIndex	Mapped I/O Signal bit/value
	7   6   5   4   3   2   1   0
6401.01	Conversion result IN0 (16 bit)
6401.02	Conversion result IN1 (16 bit)
6401.03	Conversion result IN2 (16 bit)
6401.04	Conversion result IN3 (16 bit)
6401.05	Conversion result IN4 (16 bit)
6401.06	Conversion result IN5 (16 bit)
6401.07	Conversion result IN6 (16 bit)
6401.08	Conversion result IN7 (16 bit)
Default PDO Mapping	
PDO	Mapped Data
TPDO1	Not implemented !!
TPDO2	6401.01 analog input IN0 (16 bit) 6401.02 analog input IN1 (16 bit) 6401.03 analog input IN2 (16 bit) 6401.04 analog input IN3 (16 bit)
TPDO3	6401.05 analog input IN4 (16 bit) 6401.06 analog input IN5 (16 bit) 6401.07 analog input IN6 (16 bit) 6401.08 analog input IN7 (16 bit)

## 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.

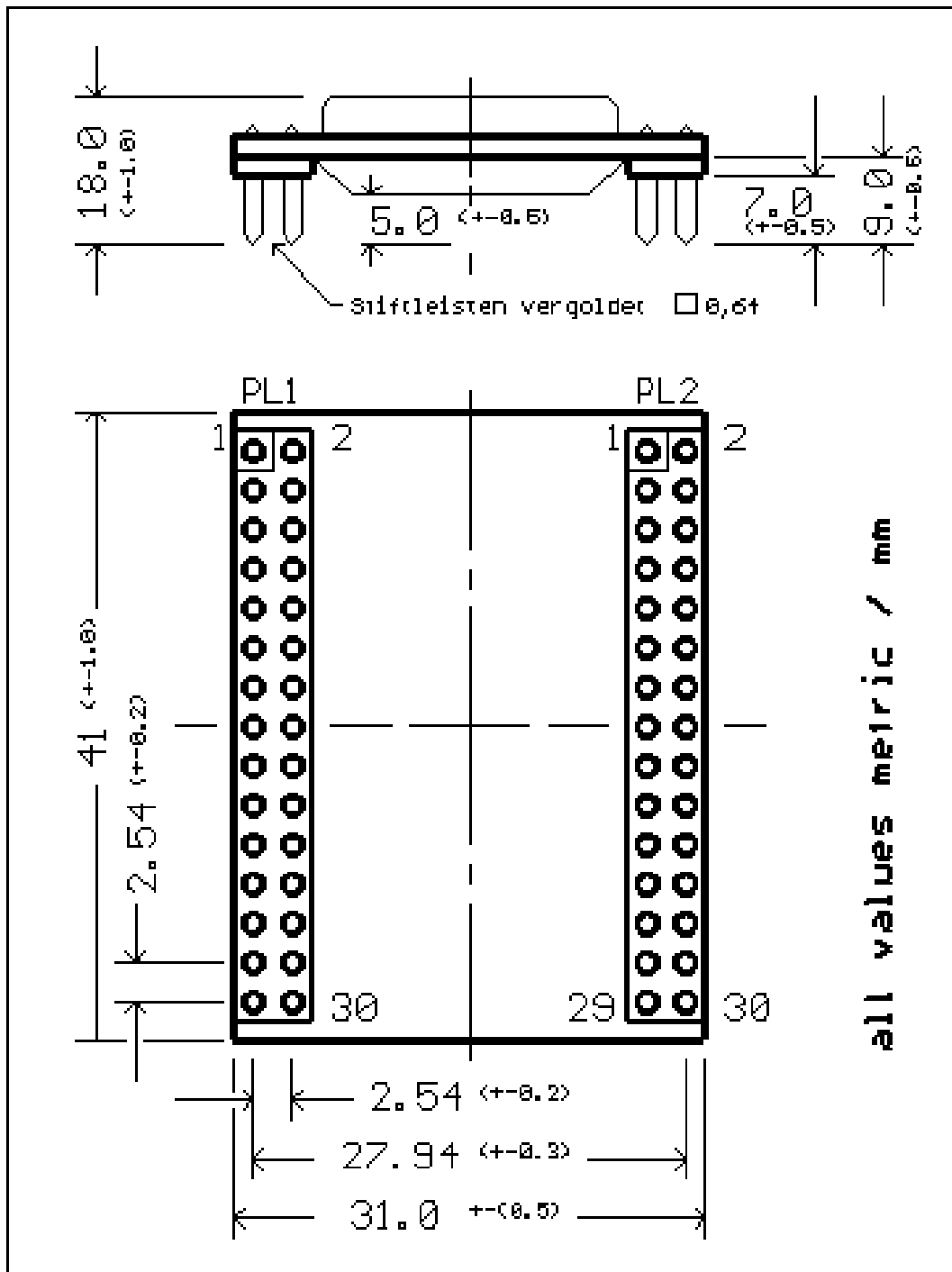
Parameter	Symbol	Rated Value		Units	Remarks
		Min.	Max.		
Power supply voltage	VCC	VSS – 0.3	VSS + 6.0	V	
Analog power supply voltage	AVCC	VSS – 0.3	VCC	V	
Analog reference voltage	AVREF	VSS – 0.3	VCC	V	
Input voltage	Vi	VSS – 0.3	VSS + 6.0	V	Vi < VCC + 0.3V
Output voltage	Vo	VSS – 0.3	VSS + 6.0	V	Vo < VCC + 0.3V
L level maximum output current	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>		800	mW	
Operating temperature	T <sub>A</sub>	0	+70	°C	CO401xA-BD
	T <sub>A</sub>	-40	+105	°C	CO401xAE-BD
Storing temperature	T <sub>A</sub>	-55	+150	°C	

## Recommended Operation Conditions and Characteristics

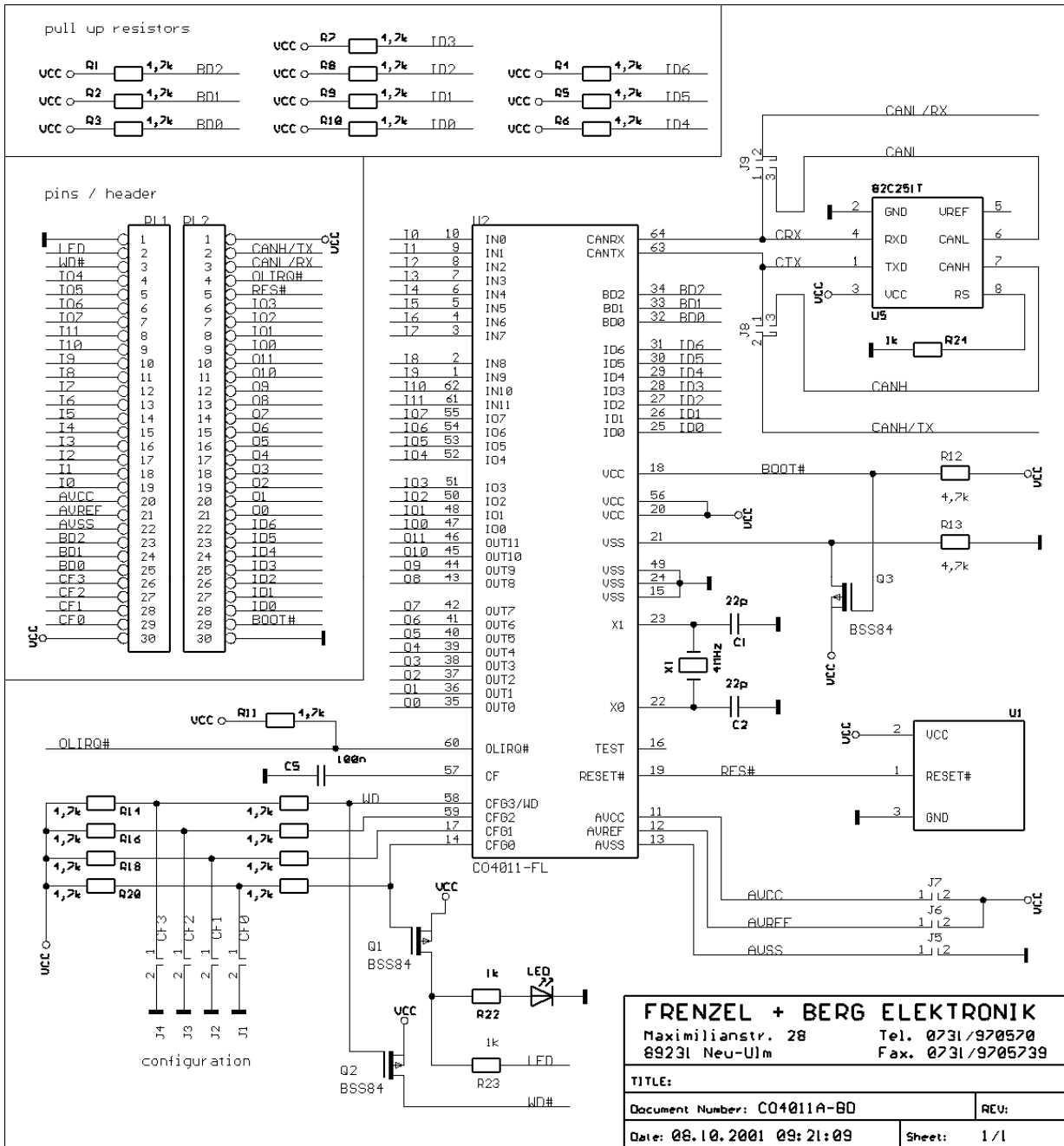
Functional operation should be restricted to recommended operation conditions.

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 <sub>CC</sub>		65	110	mA	All inputs V <sub>IL</sub> or V <sub>IH</sub> All outputs open CAN bus 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	
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	CO401xA-BD
	T <sub>A</sub>	-40		+105	°C	CO401xAE-BD

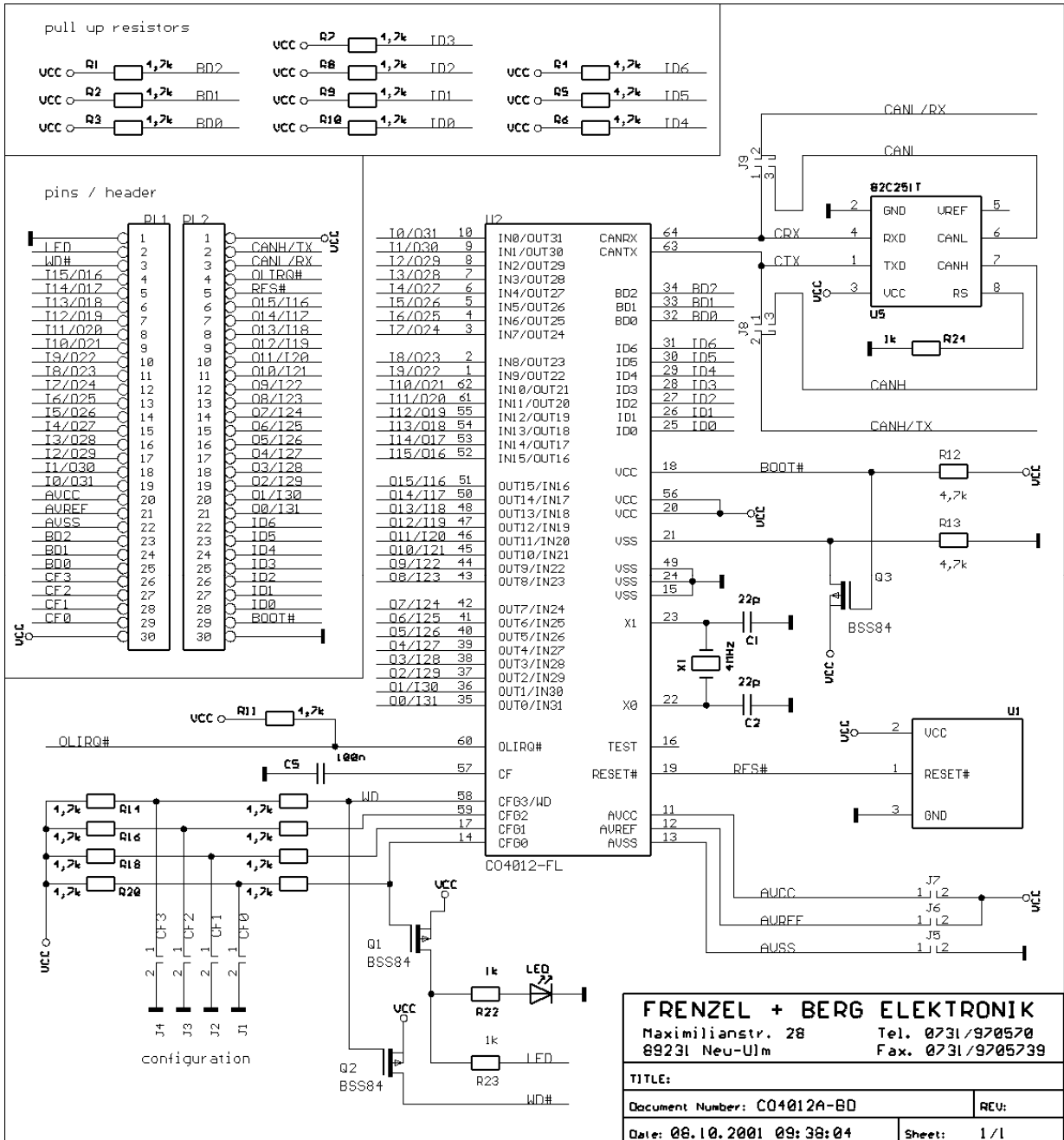
Package Dimension CO4012A



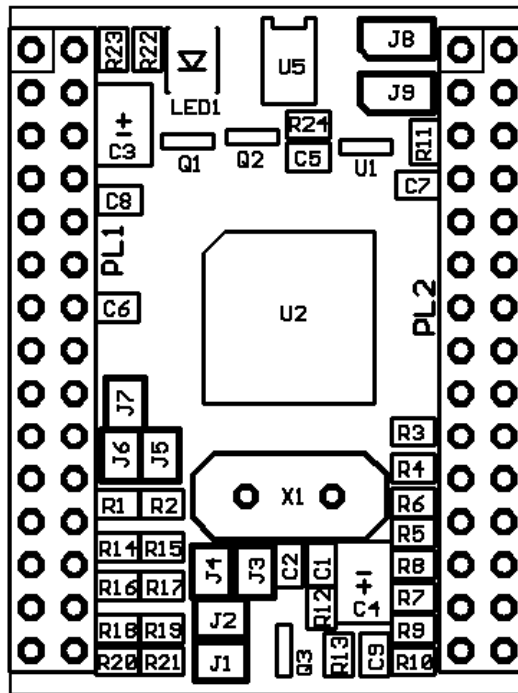
**Schematics CO4011**



### Schematics CO4012



### Placeplan CO4011/CO4012



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