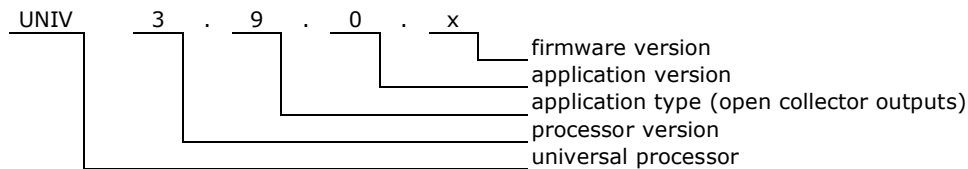


1. Features

- Controller of 10 isolated NPN open collector outputs with clamp diodes
- Module is able to drive inductive loads (eg. relay coils) and suppress the kick-back voltage through the internal free-wheeling diodes
- Maximum collector voltage: 24V
- Maximum collector current of single transistor: 500mA
- Bus voltage: 7-24V
- Maximum current consumption from the bus 15mA@7V
- For DIN rail mounting
- Dimensions 90x58x53 mm (3 mod)
- Operating of module depends on firmware uploaded into it.
- Schematic and PCB design can be downloaded from hapcan.com site



2. Application version



3. Technical data

Bus side

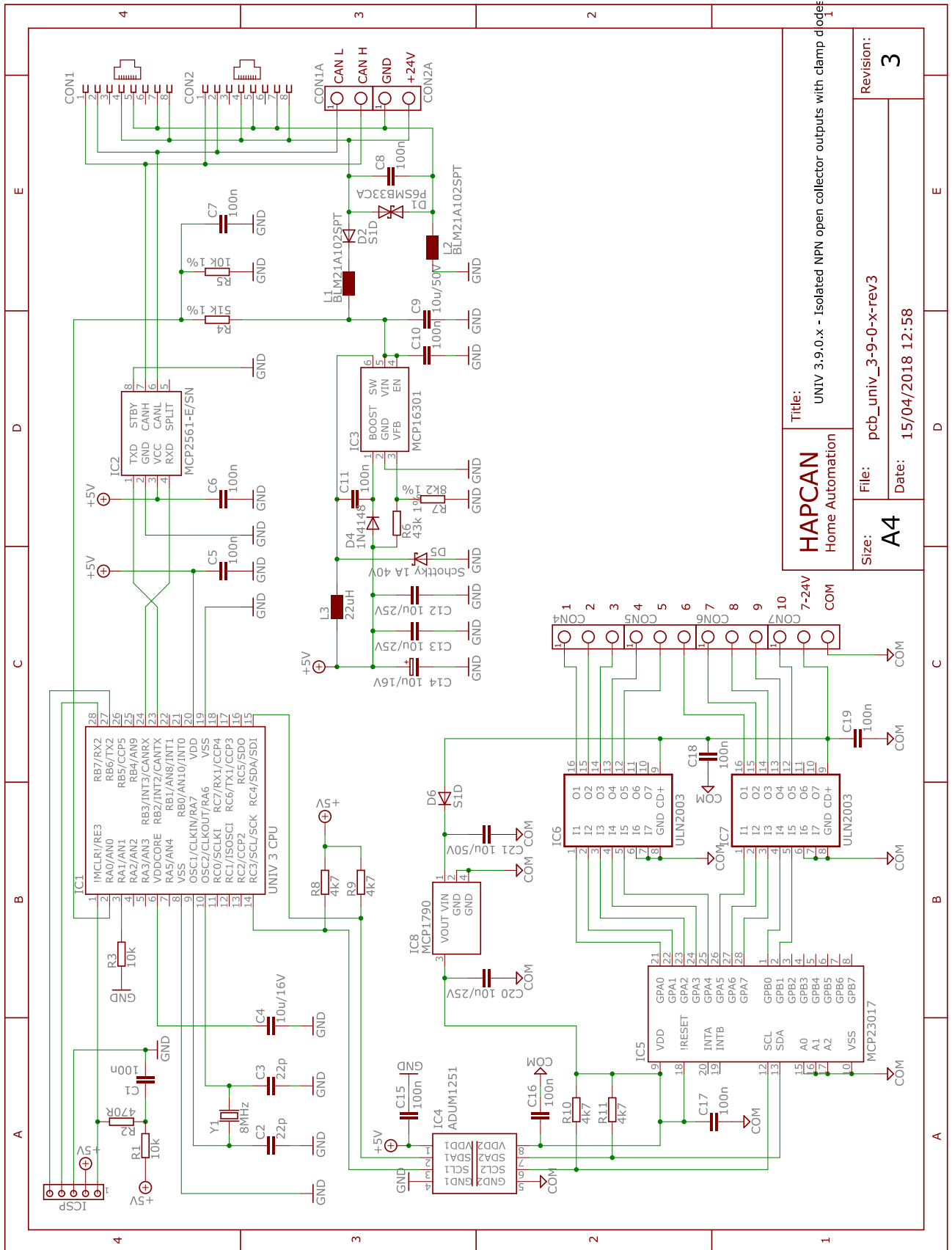
Parameter	Symbol	Value	Unit
Power supply voltage	U_S	7-24	V DC
Current consumption	I_S	15@7V 6@24V	mA
Maximum current consumption (when all outputs are on)	I_{SMAX}	15@7V 6@24V	mA
Bus connector type		2x RJ45	

Transistors side

Parameter	Symbol	Value	Unit
Nominal power supply of transistor side	U_{OC}	7-24	V DC
Nominal supply current of transistor side	I_Q	17	mA
Maximum single transistor current	I_{OCMAX}	500	mA
Insulation test voltage (1min)	U_{IOTM}	2500	V AC
Connector type		Terminal Blocks (solid wire 1.5mm ² , stranded 1.5mm ² , stranded with ferrule 1mm ²)	

4. Hardware

4.1. Schematic



HAPCAN
Home Automation

Title: UNIV 3.9.0.x - Isolated NPN open collector outputs with clamp diodes

File: pcb_univ_3-9-0-x-rev3

Date: 15/04/2018 12:58

Revision: **3**

Size: **A4**

Figure 1. Schematic of UNIV 3.9.0.x module

4.2. Wiring

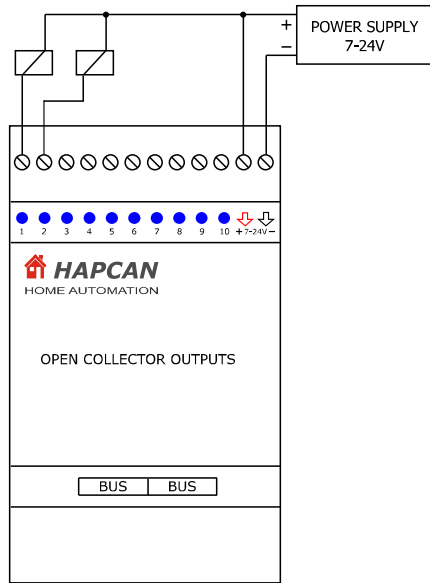


Figure 2. Module wiring with relays

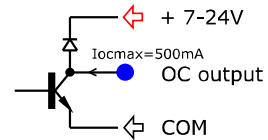


Figure 3. Internal wiring of single transistor

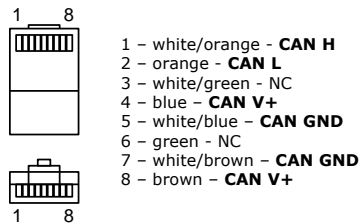
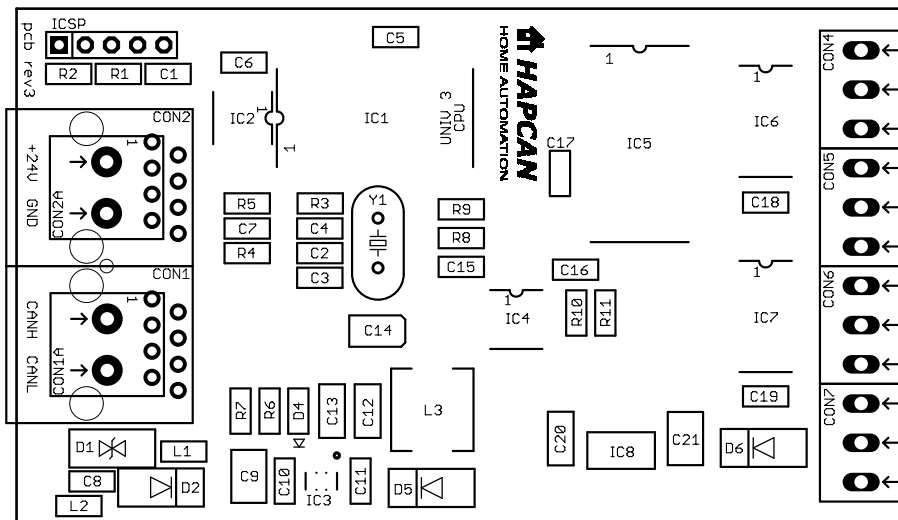


Figure 4. RJ45 bus connector wiring.

Note that if module is first or last on the bus, the terminator (resistor 120 Ohm) must be plugged into one of BUS ports.

4.3. PCB assembly schematic

- Printed circuit board *PCB UNIV 3.9.0.x* for UNIV 3.9.0.x module
- PCB dimensions: 50mm x 86.5mm

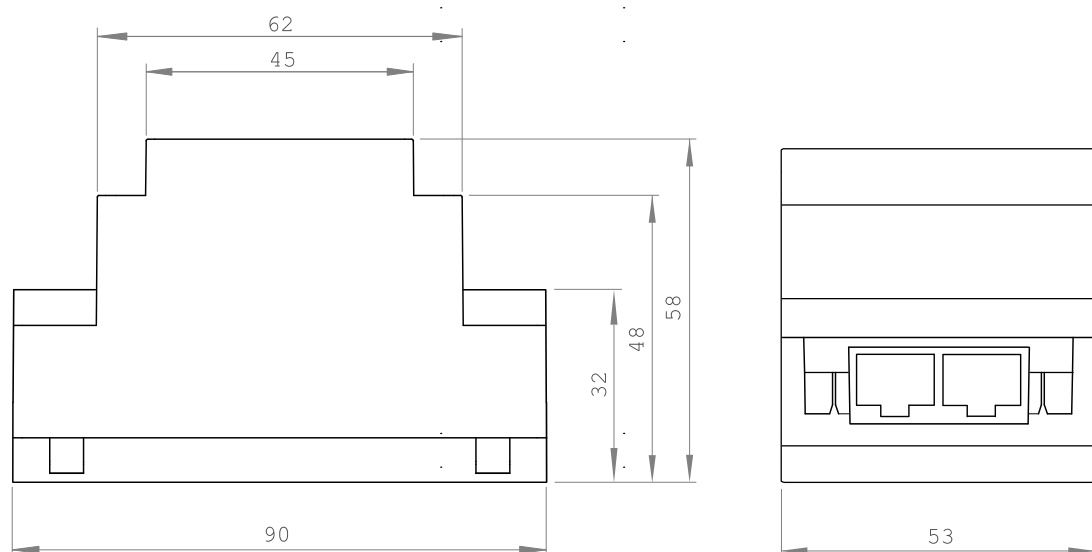


4.4. Components

Designator	Quantity	Type	Footprint	Description
C1, C5, C6, C7, C8, C10, C11, C15, C16, C17, C18, C19	12	100nF/50V ±10%	0805	Ceramic capacitor
C2, C3	2	22pF/50V ±10%	0805	Ceramic capacitor
C4	1	10uF/16V ±10% X5R	0805	Ceramic capacitor
C9, C21	2	10uF/50V ±10%	1206, 1210	Ceramic capacitor
C12, C13, C20	3	10uF/25V ±10%	1206	Ceramic capacitor
C14	1	10uF/16V ±10%	SMA, SMB	Tantalum capacitor
R1, R3	2	10k	0805	Resistor
R2	1	470 Ohm	0805	Resistor
R4	1	51k 1%	0805	Resistor
R5	1	10k 1%	0805	Resistor
R6	1	43k1 1%	0805	Resistor
R7	1	8k2 1%	0805	Resistor
R8, R9, R10, R11	4	4k7	0805	Rezystor
L1, L2	2	BLM21A102SPT	0805	Choke, Murata
L3	1	DER0705-22	7.6mm x7.6mm	Choke, Ferrocore
Y1	1	8MHz	HC49-S	Crystal oscillator
D1	1	P6SMB33CA	DO-214	Transil diode
D2, D6	2	S1D	DO-214	Rectifying diode
D4	1	1N4148	0805	Rectifying diode
D5	1	MBRS140T3G	DO-214	Shottky diode
IC1	1	UNIV 3 CPU	SOIC-28	HAPCAN processor
IC2	1	MCP2561-E/SN	SOIC-8	CAN transceiver, Microchip
IC3	1	MCP16301T-I/CHY	SOT-23-6	DC/DC converter, Microchip
IC4	1	ADUM1251ARZ	SOIC-8	I2C isolator, Analog Devices
IC5	1	MCP23017-E/SO	SOIC-28	IO expander, Microchip
IC6, IC7	2	ULN2003	SOIC-16	Driver
IC8	1	MCP1790-5002EDB	SOT-223	Voltage regulator, Microchip
CON1, CON2	2	95501-2881	8pin RJ45	RJ45 connector, Molex
CON4-7	1	STZ1550/12G-3.81-V-GN BUZ1700/12-3.81-GN	raster 3,81mm	Detachable terminal connector HARTMANN

4.5. Enclosure

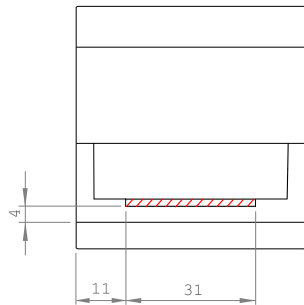
- Gainta D3MG enclosure (3 module wide)
- Dimensions: 90mm x 58mm x 53mm



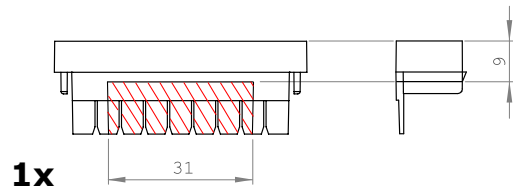
4.6. Mechanical processing

Striped parts must be removed.

BODY

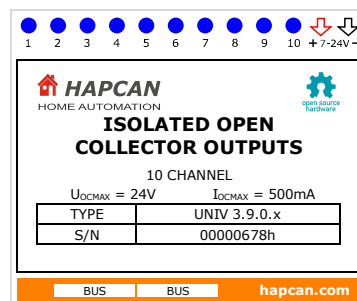


TERMINAL GUARDS



4.7. Label

Editable label version is available at hapcan.com website.



5. Commissioning

5.1. CPU voltage measurement

After verifying the correctness and quality of the soldering, the bus voltage should be connected while measuring the processor voltage. To do this, connect a voltmeter to pins 2 and 3 of the ICSP connector. Processor supply voltage should be about 5V.

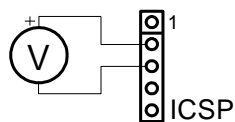


Figure 4. CPU voltage measurement

5.2. Checking the CPU clock

Proper operation of the CPU can be checked by temporarily connecting the LED to pins 3 and 5 of the ICSP connector. When device is powered, the LED should light up four times in the sequence 1 second on - 1 second off - 1 second on. The LED lights up only once for 50ms, if the processor is in programming mode.

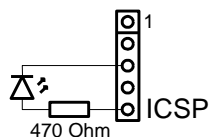


Figure 5. Checking the CPU clock

5.3. Firmware uploading

The device requires a firmware uploading for proper operation. It can be done with HAPCAN Programmer software. Both, firmware and HAPCAN Programmer can be downloaded from hapcan.com website.

6. License



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7. Document version

File	Hardware Revision	Description	Date
univ_3-9-0-x_a.pdf	rev3	Initial version	April 2018