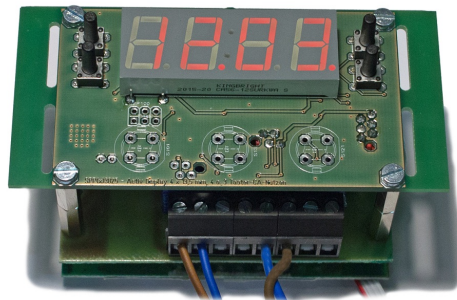


SPO1100.11

Countdown timer module
14mm 7 segment LED display and 4 buttons
Based on PCB SPP3825.1 + SPP1515.1

Datasheet

Version: Firmware 1.71-130



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Data Sheet Version 1.0.0 - Valid from 20.11.2017.

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Safety

Follow the manual



The module is only safe in operation if all instructions are read in this datasheet.

General understanding of safety

By the module there are no hazard under normal use.

Intended Use

This module is intended for mains voltage of minimum 220 V, AC and maximum 240 V, AC.









Use always the module in a protective housing, when mains voltage is applied!

Concealed Hazards



DANGER

following hazards may arise in case of wrong construction of the circuit and wrong handling of module:

-  With the direct connection to mains, it's a dangerous voltage on the module and other components, use a safety transformer!
-  Reverse polarity and overloading the module may cause in smoke. This smoke possibly contains toxic substances which must not be inhaled! Ventilate the room.
-   Reverse polarity or overload of the module can cause a hot surface on the IC or other component in the circuit.
 - There is a risk of burning when touching.
 - And flammable materials, for example Paper, can come in fire.
-  Spalling of parts on reverse polarity or overloading of the module.
-  Wear during the initial commissioning eye protection.
-  The pins of the components can be pointed and sharp even after installation! Therefore, this may cause in sores in case of incorrect handling.
-  Use always passing a ESD bracelet to avoid electric charges! The module can be damaged if handling without an earthing tape and housing!

Modifications of the example circuit

The successfully built device may be damaged. Therefore check as appropriate all housing part and lines for damage. This applies in particular to parts of the directly (for example power cord and power supply) or indirectly come into contact with mains voltage.

Application and function description

Function description

This countdown timer is completely constructed and calibrated as a module. You can integrate this module directly into your device.

An additional module with power supply and relay is also present. The relay can be used to switch a load which needs mains voltage.

The time can be read and adjusted via the display.

The module has as heart an IC of the family SPM110X.

The IC SPM110X ... is a digital mono-flop IC with display and buttons for setup. It has a buzzer output for Sound notification that the time has expired and an output for switching a load via relay, transistor, etc..

The IC is a programmed microcontroller of the AVR family by Atmel. The circuit can be used for different purposes, because the target file is free for download, the circuit can be arbitrarily Modified.

This IC has the standard **OnChip display technology** and is suitable for small displays. These can be connected directly to the IC and require only 4 additional resistors.

This IC has a bootloader, which allows you to update the IC firmware. This means that you will always remain at the current state of the Firmware for the IC, without further costs.

Functions

- Adjustable digital timer ranges from 1 second to 99 minutes and 59 seconds.
 - The set time is stored in the internal EEPROM
 - Easy to start, with just one button press
 - Pause function interrupts the countdown
 - Signal sounds after the time, for a preset time or upto press the button start-stop.
 - An output for switching loads, relays, solid relays or similar. After inverting transistor BC547C 100mA output load (or similar type).
 - This IC has the Classic Screen display and the new default view, the differences are seen to www.stefpro.biz as gif video.
- Extra Menu button to change the settings easily or press 1 second the Start/Stop button.
- LED test, at power up all the LEDs turned on for 1 second in order to facilitate the quality control.
- A switchable output, technical data see "Technical data".

Application

- For second exact exposure of PCBs, screen printing templates ...
- Precisely timed Baking of plastics
- Timed bonding
- Timed flow control

Functional states

The START button is to press for the state start and stop.

With button DOWN in state "Setting Wait" the time can be lowered in seconds. In state "Pause" the countdown can be stopped by this key.

With button UP in state "Setting Wait" the time can be increased in seconds. In state "start" and "pause" this key functions as start / pause button.

The functional states can be seen in Figure 1.

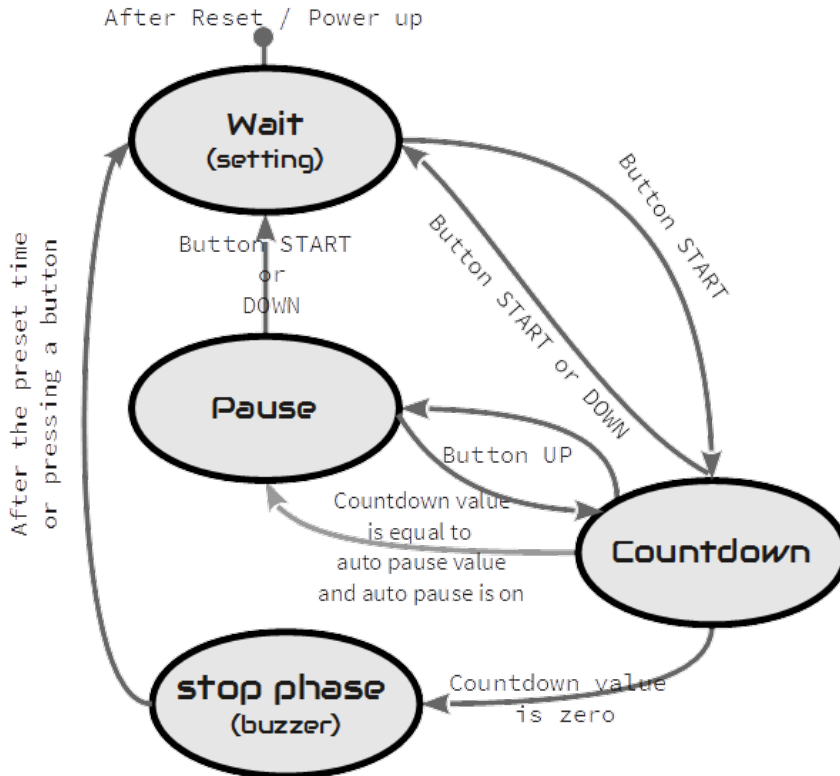


Abbildung 1: State diagram countdown mode

After reset / power up: Entry point after the reset and initialization.

Wait (setting): Setting the time is available, the time displayed on the screen is used as the next count down time. The Pin TiRe has a 0 (GND) at the output.

Countdown: In this operation, the time counted down in seconds and the decimal point (/SEGD) flashes every second. Pin the TiRe has a 1 at the output so VCC potential.

Pause: The countdown is interrupted and the whole display flashes. Pin TiRe has a 0 (GND) at the output.

Stop phase (buzzer): In this state, the TiRe pin is reset to 0 (GND) and the buzzer pin is up for 3 seconds (or set time) or upto pressing the button Start to 0 (GND).

Technical data

- Minimum input and switchable voltage (V-IN min): 220 V, AC
- Normal input and switchable voltage (V-IN): 230 V, AC
- Maximum input and switchable voltage (V-IN max): 240 V, AC
- Own consumption of current: approximately 0.01 (at 230 volts)
- Own consumption of power: approximately 1.7W (at 230 volts)
- Maximum switchable power: 900W (at 230 volts)
- Maximum fuse power: 4A mtr. 240 V, AC

Construction description

Installation of the modules (Dimensions)

SPP3825.1

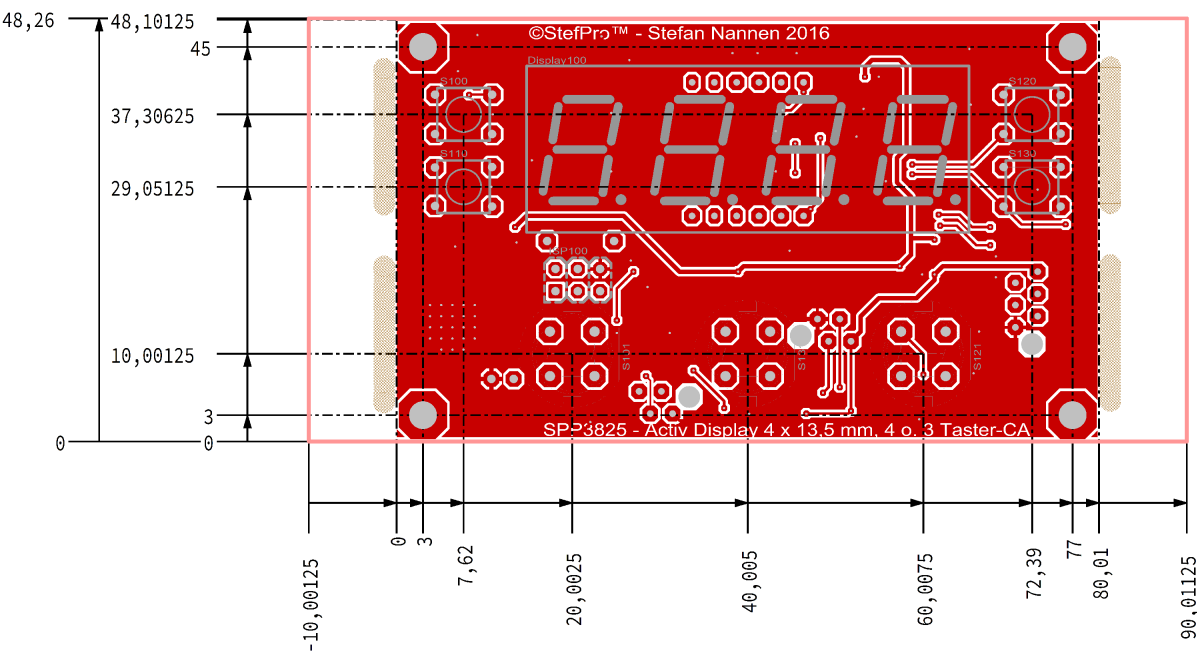


Figure 1:Installation (Dimensions) description for module SPP3825.1

NOTICE

Mains separation

This module is galvanically isolated from mains by the transformer on the 2nd module, this must not be changed.

SPP1515.1

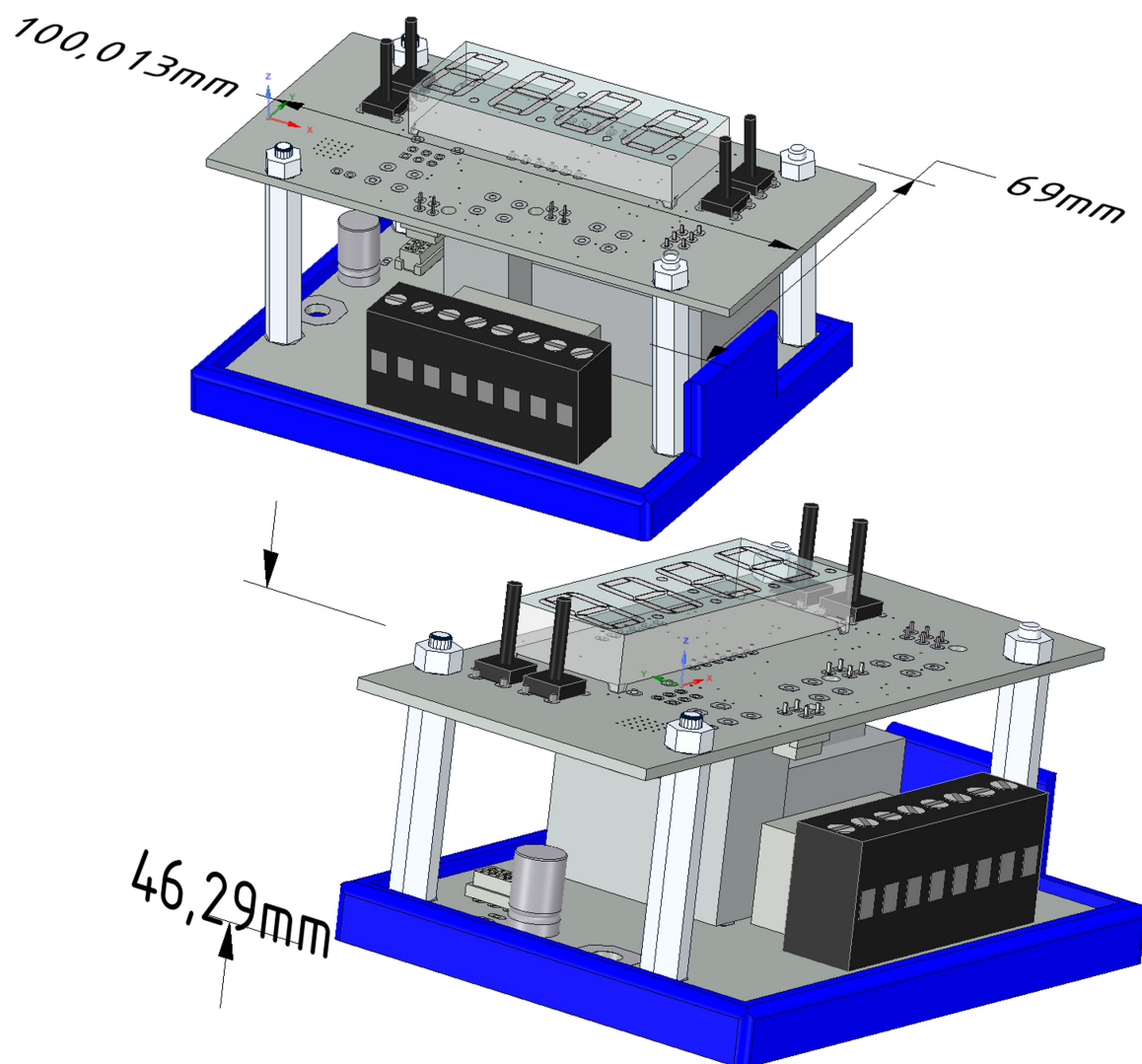


Figure 2: Installation (Dimensions) description for module SPP1515.1

The dimensions, which can be seen in the figures above, are the maximum dimensions including the lower protective plate and at the top of the 7 segment displays.

Wire the device with fuse and switch as shown in the example above. The stranded wire should have a minimum of 0.75 mm^2 and all components such as switches, fuse / fuse holder and mains cable must be approved for $[[\text{MAX_VOLTAGE}]]$ volts AC and best carry a VDE mark. It's about your own safety, therefore, the assembly is allowed only by qualified personnel with appropriate training. Maintain a reasonable PE wiring of all metal parts which may come into contact in the event of a fault with the mains voltage and can be touched by the user at the same time!

All components must be rated for the power!

Note VDE0100!



Inductance

If you connect an inductive load, you may need an additional installing a protective circuit to protect the relay.

Connectors

SPP3825.1

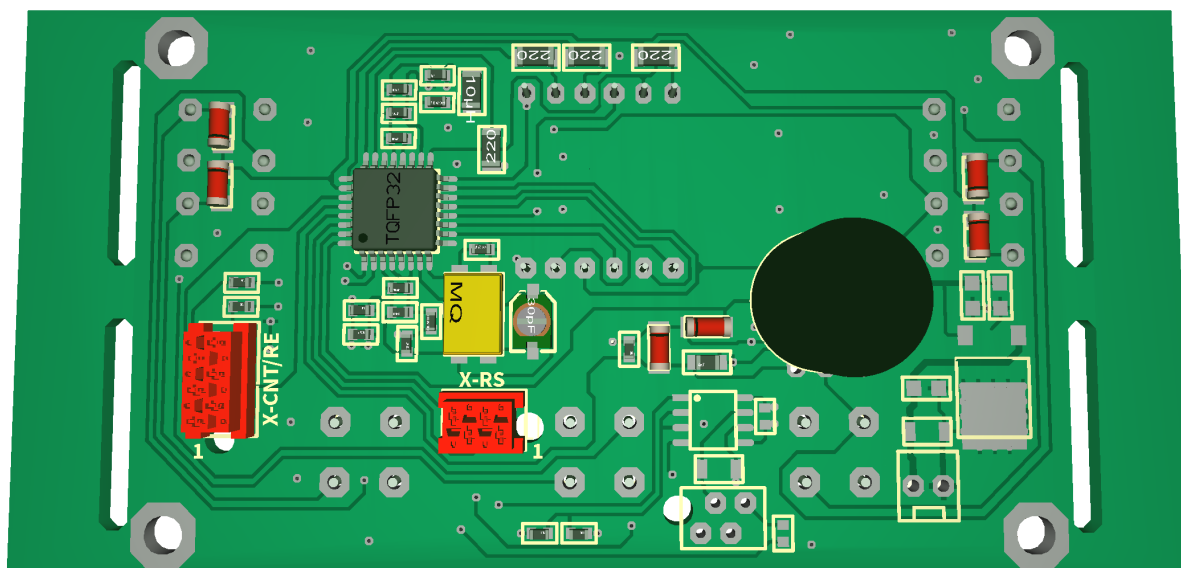


Figure 3: Connector description for module SPP3825.1



NOTICE

Volatage

No plug on this module may be connected to mains voltage or a voltage higher than 5 volts!

SPP1515.1

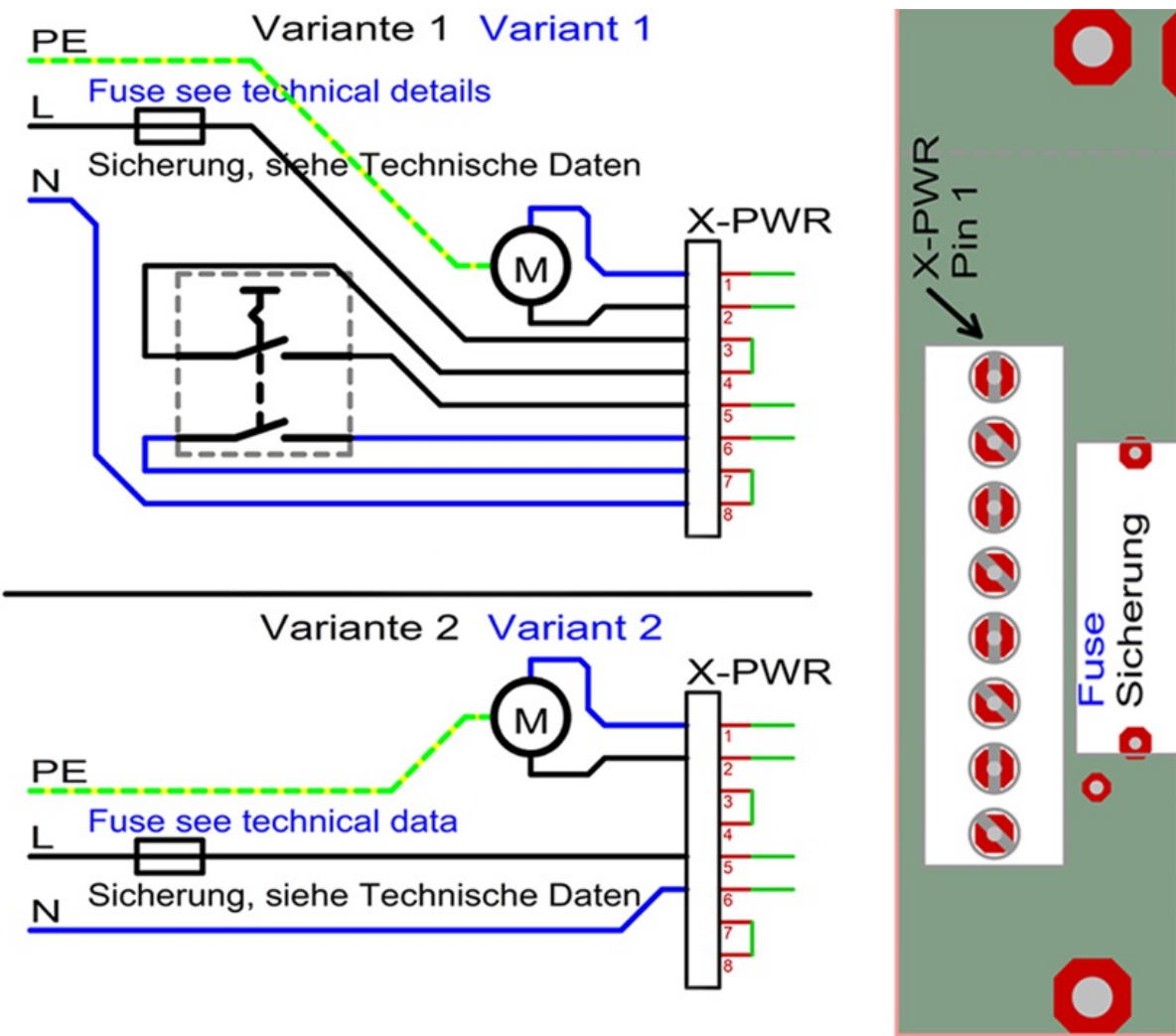


Figure 4:Connector description for module SPP1515.1

At these screw terminals is the mains voltage input for the module and for the switchable load, which can be connected also to these screw terminals.Two terminals each are bridged and can be used for connection.It is not permissible to place the protective conductor on the screw terminals or to use bridged screw terminals for this.

At least L must be protected by a fuse. The maximum values for the fuse can be found in the technical data.

There are 2 variants for connection, one with and one without switch. If the variant without switch is selected, then the module / device should be disconnected from the mains,as long as it is not used.

Note VDE0100!

DANGER

Make sure that you have connected all signals correctly. There is no overload and polarity protection!

X-PWR : PWR Power input and output : Screw terminals 8 pole

Pin	Name	Direction	Function	Maximum
1	Output N	Output	Output zur Last	240 V, AC, 4A
2	Output L	Output	Output zur Last	240 V, AC, 4A
3	Bridged to 4			
4	Bridged to 3			
5	Supply input L	Power	Power supply input of the module	240 V, AC, 4A
6	Supply input N	Power	Power supply input of the module	240 V, AC, 4A
7	Bridged to 8			
8	Bridged to 7			

DANGER

Never connect together bridged screw terminals with L and N!

X-CNT/RE : COUNTER / RELAYS : Micro-Match 6 poles

Pin	Name	Direction	Function	Maximum
1	GND	Power		
2	$\overline{\text{Start}}$	Digital input	Timer <u>start</u>	VCC
3	$\overline{\text{Stop}}$	Digital input	Timer <u>stop</u>	VCC
4	TiRe	HighZ Output	<u>Timer</u> Relay	(+0,7V) VCC
5	N.C.		Do not connect	VCC
6	VCC	Power		When used as the voltage supply input of the module: 3 V - 5 V DC, 30mA Otherwise : VCC DC, 30mA

X-RS UART : SERIAL : Micro-Match 4 Polig

Pin	Name	Direction	Function	Maximum
1	GND	Power		
2	RXD	Digital input	<u>R</u> eceive	VCC
3	TXD	Digital output	<u>T</u> ransmit	VCC
4	VCC	Power		When used as the voltage supply input of the module: 3 V - 5 V DC, 30mA Otherwise : VCC DC, 30mA

Signal description

VCC

Operating voltage (3 V - 5 V)

GND

Ground

Start

This pin starts the countdown timer.

Stop

This pin stops the countdown timer.

TiRe

Output for the time relay, it has to reinforce to switch a relay with a transistor (for example BC547C).

Operating mode	State	Comment
----------------	-------	---------

"Setting Wait"	0 (GND)	
----------------	-----------	--

"Countdown"	1 (VCC)	
-------------	-----------	--

"Pause"	0 (GND)	
---------	-----------	--

"Stop phase"	0 (GND)	
--------------	-----------	--

Basic circuit

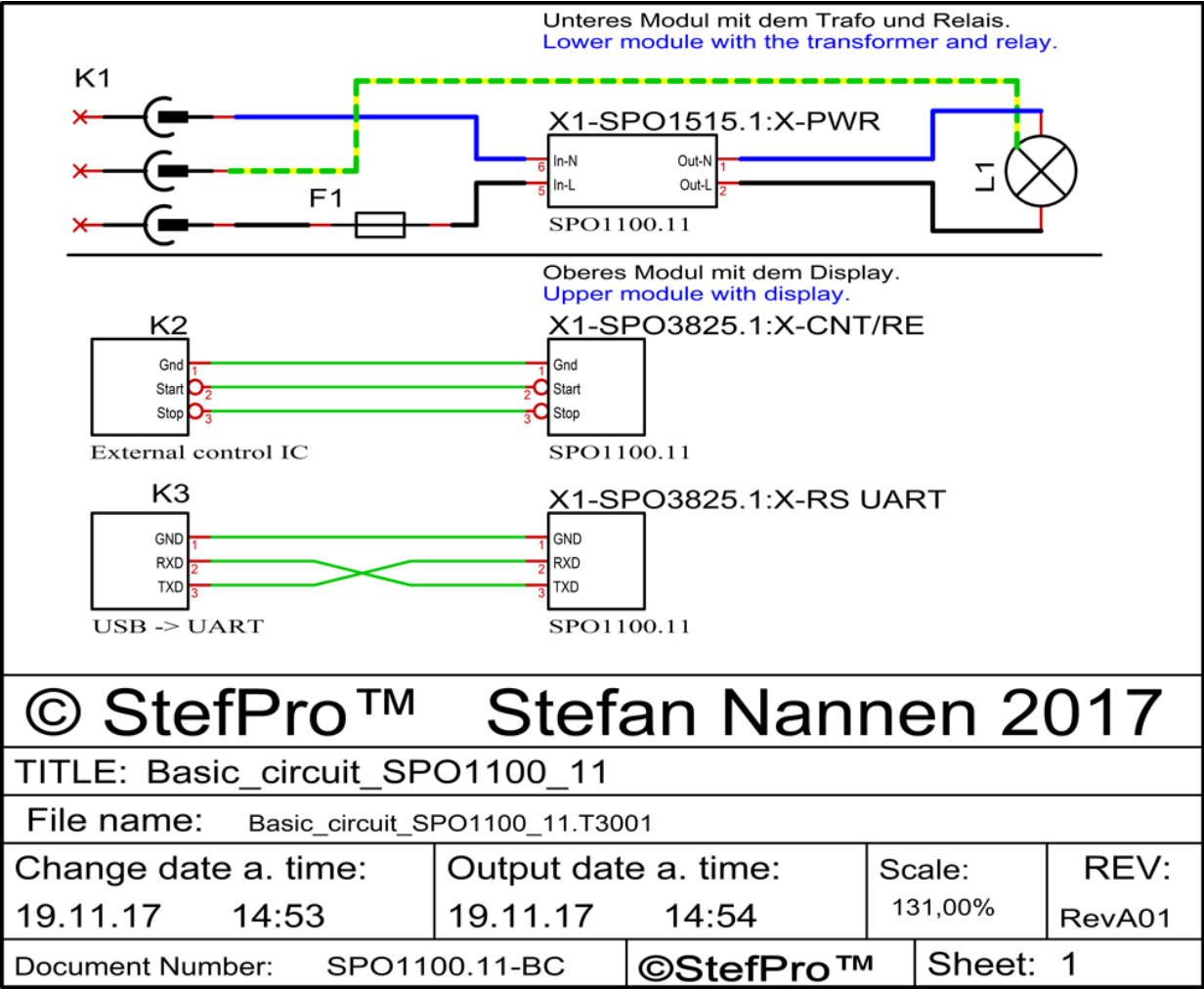
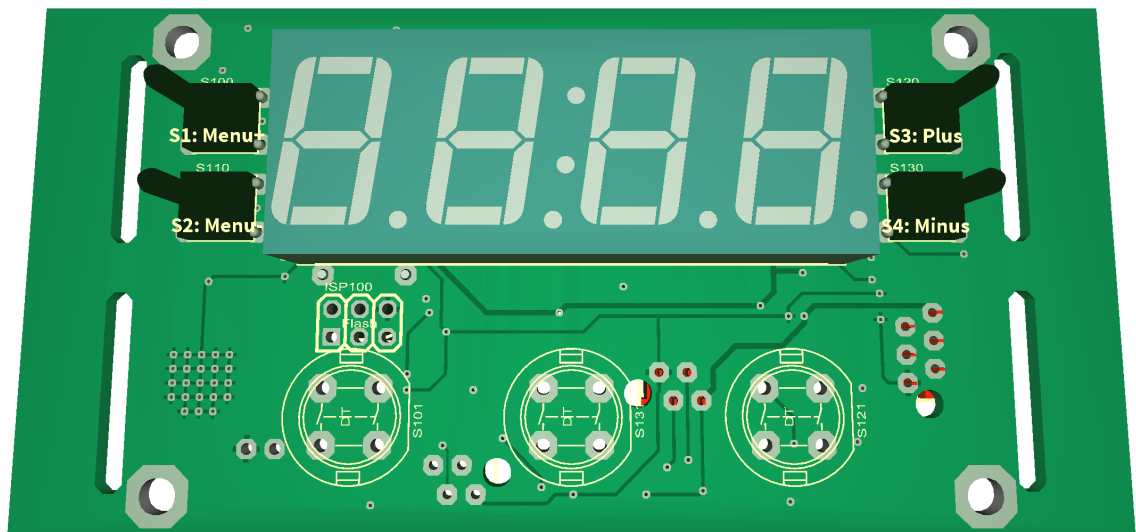


Figure 1: Basic circuit of SPO1100.11

Properties of the components

Button description

Overview of buttons



Menu

Level 1	Level 2
<div>⏏</div>	
Buzzer setting⏏	
Auto pause⏏	Enable auto pause ⏏Set auto pause ⏏Exit auto pause ⏏
Count direction⏏	
Display mode setting⏏	
Info section⏏	
IC number⏏	
Firmware version⏏	

⏏: Next step in main menu.

⏏: Next step in sub menu.

⏏: The submenu starts again.



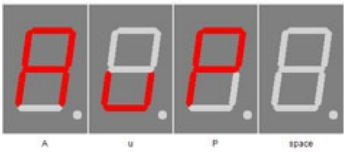
MISSING: MENU_CODE_L1_START_NORMAL

Buzzer setting



With the button plus and minus the buzzer settings can be select.0: No tone
1: 3 seconds after the counter ends
2: 9 seconds after the counter ends
3: infinitely until keystroke after the counter ends

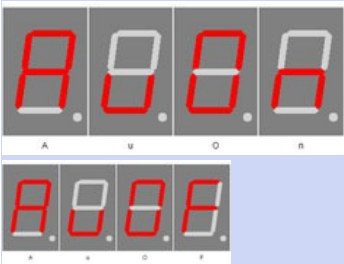
Auto pause



Auto pause

With + you enter the sub-menu auto pause.

Enable auto pause



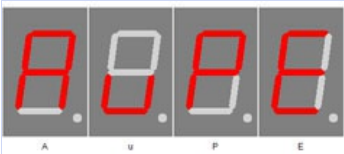
Enables the auto pause function.

Set auto pause



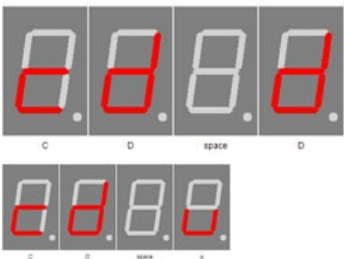
Sets the time for auto pause.

Exit auto pause



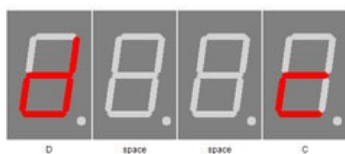
With + you exit the sub-menu auto pause.

Count direction



With plus key is counted up and with minus key down.
The direction does not change if the timer is already started, this take over until a restart.

Display mode setting



Display Classic

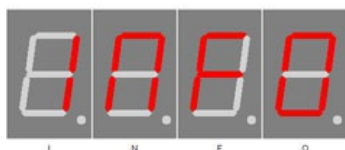


Display Standard

With keys plus and minus display mode setting Select

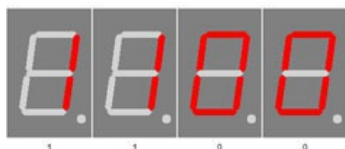
- C: Classic, buzzer beeps continuously
- S: Standard, the buzzer beeps with interruptions

Info section



This indicates the start the information area

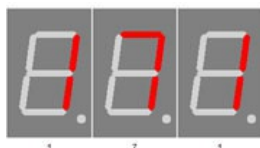
IC number



Chip number

IC / device type

Firmware version



Firmware version

Firmware version

Example, it might be something else at this point.

Menu end



End

End of the menu, hide automatically after 2 seconds.

Attachment

Bootloader handling

Start the IC/module/device in bootloader mode

1. Switch off the IC/module/device.
2. Connect the UART adapter (USB → 3.3 volts or 5 volts UART or RS232 → 3.3 volts or 5 volts UART).
"RXD on X-RS UART" → UART adapter TXD and "TXD on X-RS UART" → UART adapter RXD.
3. Press the button S1, power up the IC/module/device with voltage and do not release this button until you hear a short BEEP. The display is off.
4. Now you can connect to the firmware upload tool.

**WARNING**

Wrong UART level

If an incorrect voltage level (for example directly RS232, $\hat{A}\pm 12$ Volt) is used, the UART adapter or the IC/module/device can be damaged or destroyed. In the worst case, overheating and fire may occur!

NOTICE

Defect firmware

Defect firmware can be detected as follows: Every second a short BEEP.]]

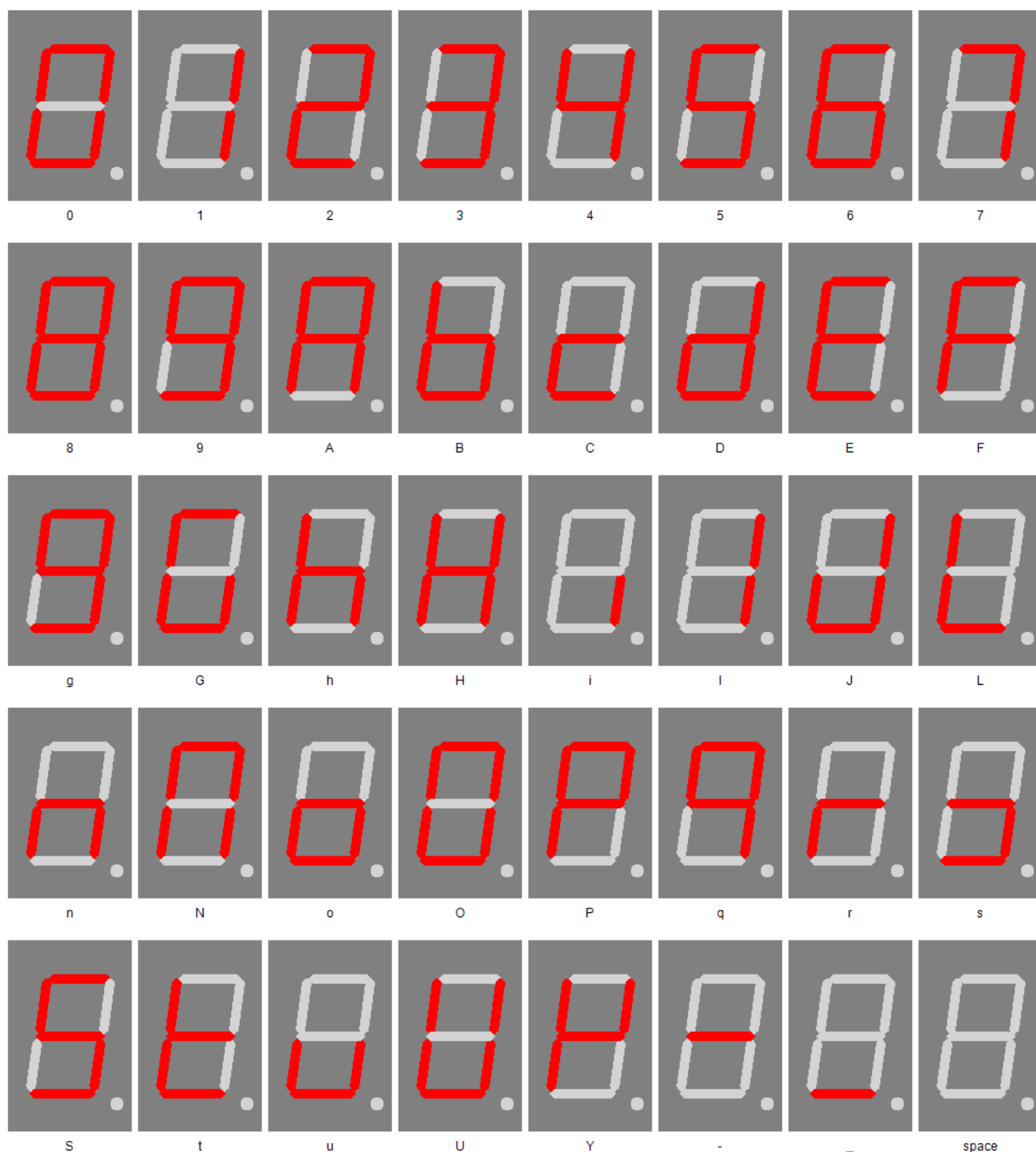
Use the Firmware Upload Tool to upload an update

1. Download the latest upload tool from www.stefpro.biz: [SP Firmware UP](#)
2. Start the tool
3. Select the COM port.
4. Press the "Load" button and select a firmware which you have previously downloaded from SP Firmware UP
5. Now press the "Connect" button, the data from the IC / Module / device will be read and the compatibility of the new firmware with the IC / module / device will be checked
6. If an upload is possible, you can now press the "Upload Firmware" button. The upload starts and should not be interrupted.

[[NOTICE:Firmware upload interruption: If the firmware upload is interrupted or uploaded an inappropriate firmware, so there is a broken firmware, the IC can be operated only in bootloader mode.

7 segment characters

The symbolism of each character:



Change log

Safety

20.03.2017 - 1.0.3 - ADD
Add ESD note

Set day

Change log - 7 segment characters

23.04.2017 - 1.0.4 - ERROR

Bugfix wrong title, this sets the day not the month.

Liability, warranty and copyright notice

Definitions

- "Module": A PCB which is delivered without housing and is intended for installation.
- "Manufacturer of the whole device": The manufacturer of the whole device, the natural or legal person is mounted a device which can be made to function without special knowledge. E.G. Simple connection to the network via a euro, safety plug or by connecting to a power supply.

Liability

- Although the information contained in this document has been checked very carefully for accuracy and completeness, for errors and omissions can not be held liable. StefPro reserves the right to any time change any portion of the described hardware and software features.
- StefPro provides only specific "module" which is intended for installation. The "Manufacturer of the whole device" obliges to compliance to the relevant valid VDE, CE and EMC regulations. StefPro has verifies compliance with the requirements for this module random. Because the installation is not performed by StefPro, must additional inspection after installation of the modules by the "Manufacturer of the whole device".
- There is no liability for damages incurred directly by or in the application of the "module", as well as for damage caused by chemical or electrochemical effects of water or generally from abnormal environmental conditions.
- "Modules" by StefPro may not be used in critical equipment. At disregard exclusively the responsibility of "Manufacturer of the whole device."

These include:

- medical devices for implanting or life obtained.
 - Critical equipment for space, aerospace and traffic.
 - Other important life components or systems, where an error is fatal.
- All devices developed with a "Modules" by StefPro must be the responsibility of the "Manufacturer of the whole device" sufficiently tested to detect any defects.

Safety Notes

- Since the built module is operated with an electrical voltage, the valid VDE regulations are complied with.
- Components and modules do not belong in the hands of children!
- Circuits with mains voltages or higher than low voltage (AC voltage = 50 V and DC voltage = 120 V) may only be installed by qualified personnel in a suitable housing. There should be a protection against contact with parts under voltage be guaranteed, as well as dust, moisture and fire protection. See VDE standard 0100.
- The module complies with **NO** requirements of protection class or only the **not** allowed protection class 0 on delivery.
 - Whenever it is that safe operation is no longer possible, the module / device must be taken out of service and secured against inadvertent operation. This assumption is justified,
 - when the module / device has visible damage,
 - when the module / device has loose parts
 - when the module / device no longer works
 - after prolonged storage under unfavorable conditions (eg outdoors or in moist environments)
- The built circuit may be not exposed to high temperatures, vibration, extreme iron / metal dust, moisture, high voltages or similar. Unless you build the modules in an enclosure that is designed for these extreme cases!
- The use in places where inflammable or corrosive gas, vapors or dust is prohibited, unless you adjust the device for this purpose.
- A fuse must be installed in the leads of the mains against short circuits. On short circuits, the device must be disconnected from the mains, RISK OF FIRE!
- The circuit is to be taken necessarily in the following cases from the mains:
 - Before cleaning
 - Before connecting or service work
 - if the circuit is unattended
 - during thunderstorms or other immediate dangers
- The outdoor installation is only with appropriate housing which are impervious to humidity.
- Electrical circuits should only be cleaned with a brush. Never use aggressive cleaning chemicals or other chemical solvents, as this may damage the circuit.
- Watch for correct voltage and connection of the "module" Voltage and / or connection mistakes are beyond our control. Thus we can not assume any liability for damages arising out of it.

Intended operation

- The used electrical parts and components are designed for a temperature between 0 °C ... +45 °C, so the device may only be operated and stored in this temperature range. During transport, the temperature may be between -10 °C ... + 50 °C.
- If condensation has formed during transport or storage, the modules must be acclimatized for approx. 2 hours before commissioning.
- It must not be operated in an increased dust, high humidity, explosion risk or aggressive chemical exposure.
- Ensure proper operation and connection. Operating and/or connection errors are outside our area. Unfortunately, we can not accept any liability

for damages resulting of this.

- The improper operation of this module may result in damage of this module, personal injury or property damage.
- The safety instructions must be observed!
- The manufacturer is not responsible for all personal injury and property damage caused by improper operation.

**Danger to life when operating without housing!**

This module is delivered WITHOUT housings and required mains voltage for operation! The buyer and / or operator of this module is obliged this module to assemble, before first use, in a secure housing! This must be assembled with at least IP30 and wiring according to prior norms / technology! StefPro doesn't accepts liability for damage caused by the use of this module, which would be avoided by using an appropriate housing!

Warranty

- StefPro warranty only for the Modules and their firmware. The warranty is exclusively limited for the replacement of the IC within the warranty period for obvious defects in the hardware, and programming error.
- Warranty does not extend the warranty period or starts a new period again.
- Additional or deviating claims are excluded, especially claims for damages arising out of the product for damage. This will not affect claims based on inalienable rules under the product liability law.

Copyrightnotice

The circuit and the firmware on the Modules by StefPro is Copyrighted. Unauthorized reproduction or distribution of Modules with this program or any portion of it. This is pursued bothcriminal and civil law, and may result in severe penalties and compensation for damages.

Disposal information

Do not dispose devices in household garbage!

This modules or devices comply with the EU directive on electronic and electrical equipment (WEEE regulation) and therefore may not be disposed of with household waste. Dispose of the device over your local collection center for electronic equipment!



WEEE-Reg.-Nr.:

DE 58929072 (StefPro UG (haftungsbeschränkt) & Co. KG)

DE 78089358 (StefPro Einzelunternehmen bis zum 01.01.2015)

Impress

StefPro™ UG (haftungsbeschränkt) & Co. KG
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