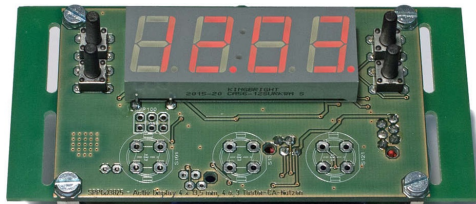


SPO1100.01

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

Datasheet

Version: Firmware 1.69-127



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DCF ps

Data Sheet Version 1.0.0 - Valid from 16.03.2017.

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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

The IC is designed for driving small to middle displays.

The power should come from a safe transformer (also protected transformer) or a corresponding low voltage power supply for the circuit.









Never use a higher voltage or direct mains voltage!

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

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 6 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 10 milliseconds to 99 seconds and 99 milliseconds, 1 second to 99 minutes and 59 seconds or 1 minute to 99 hours and 99 minutes.
 - 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
- It requires no additional IC's without voltage regulator.
- Low power consumption. Requires a power below 100 mW.

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.

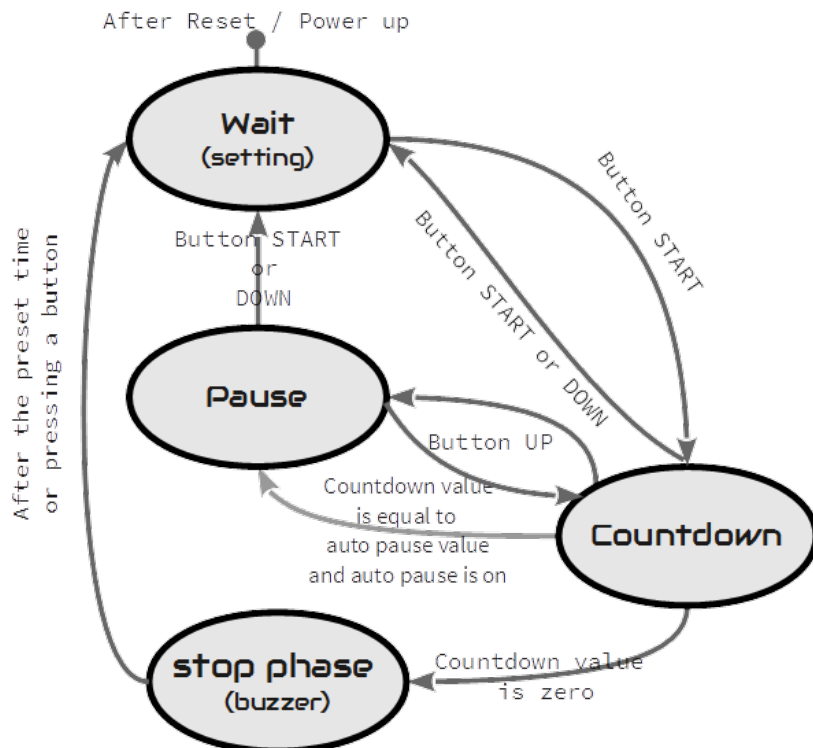


Abbildung 1: State diagram countdown mode

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.

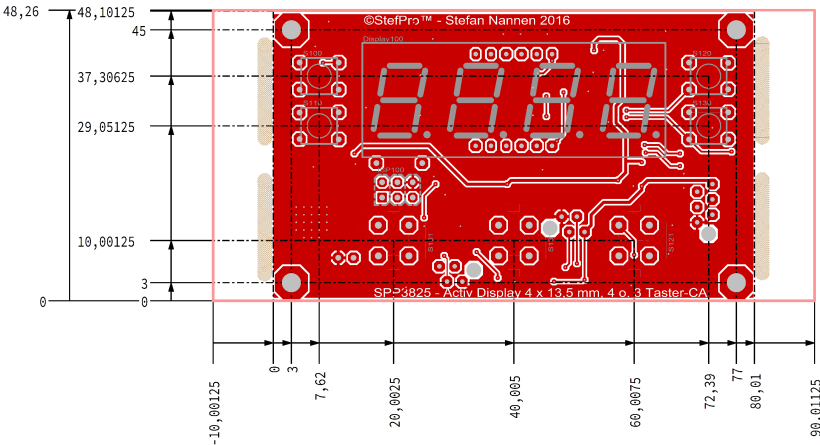
Stop phase (buzzer): In this state, the TiRe pin is reset to 0 (GND) and the buzzer pin is up for 3 seconds (or set time) or upto pressing the button Start to 0 (GND).

Technical data

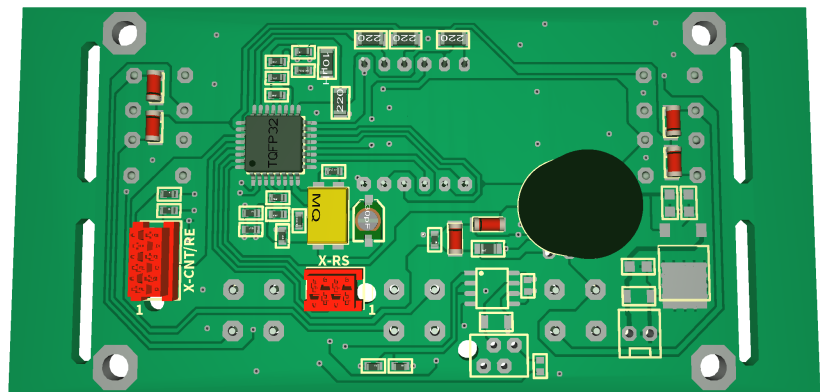
- Voltage (VCC): 3 V - 5 V
- Current: 20 mA (at 5 V)
- Power: approximately 100mW (at 5 volts)

Construction description

Installation of the module (Dimensions)



Connectors



 **DANGER**

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

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

Pin	Name	Direction	Function	Maximum
1	GND	Power		
2	Start	Digital input	Timer <u>start</u>	VCC
3	Stop	Digital input	Timer <u>stop</u>	VCC
4	TiRe	HighZ Output	<u>T</u> imer <u>R</u> elay	(+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

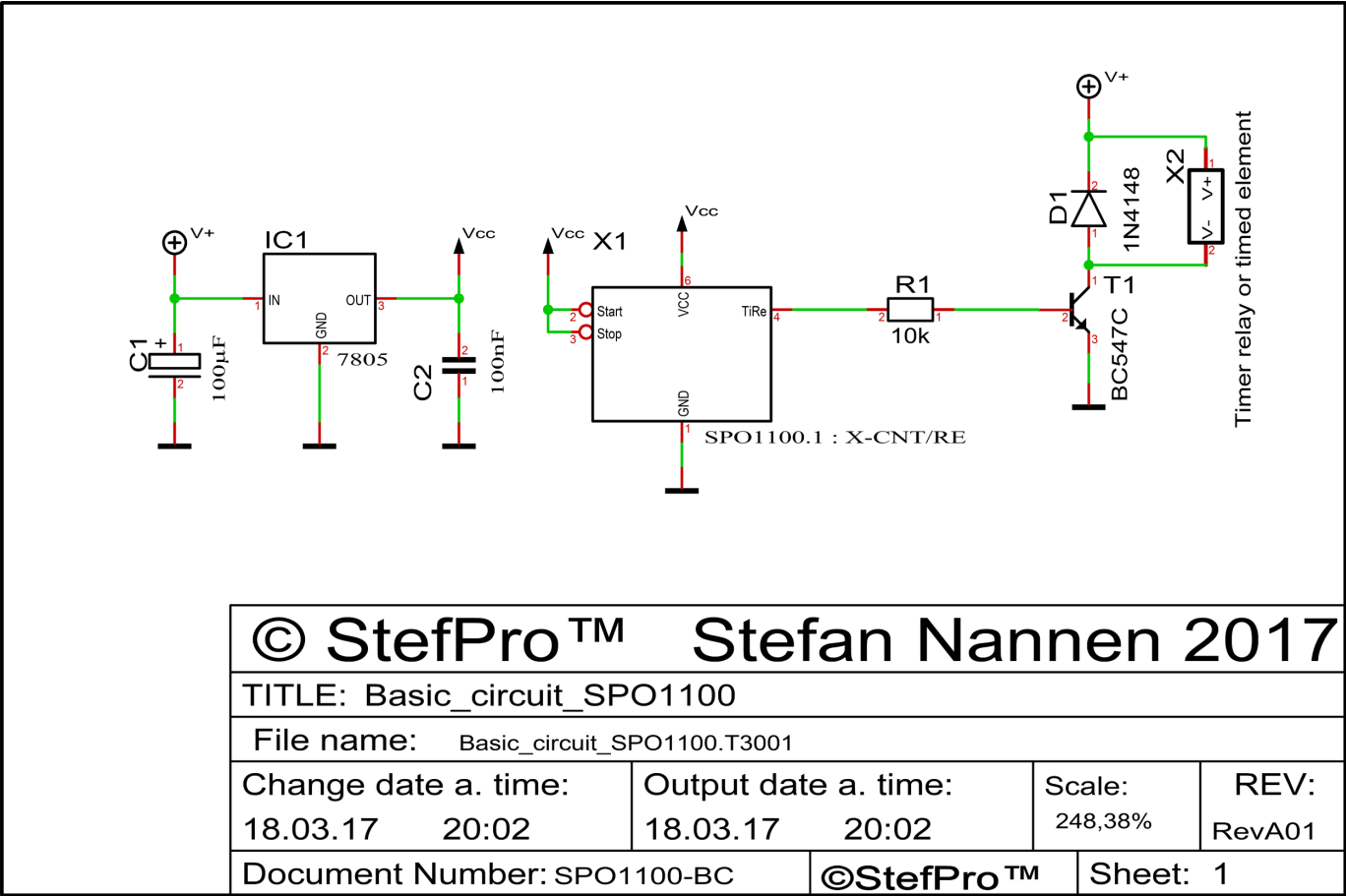


Figure 1: Basic circuit of SPO1100.01

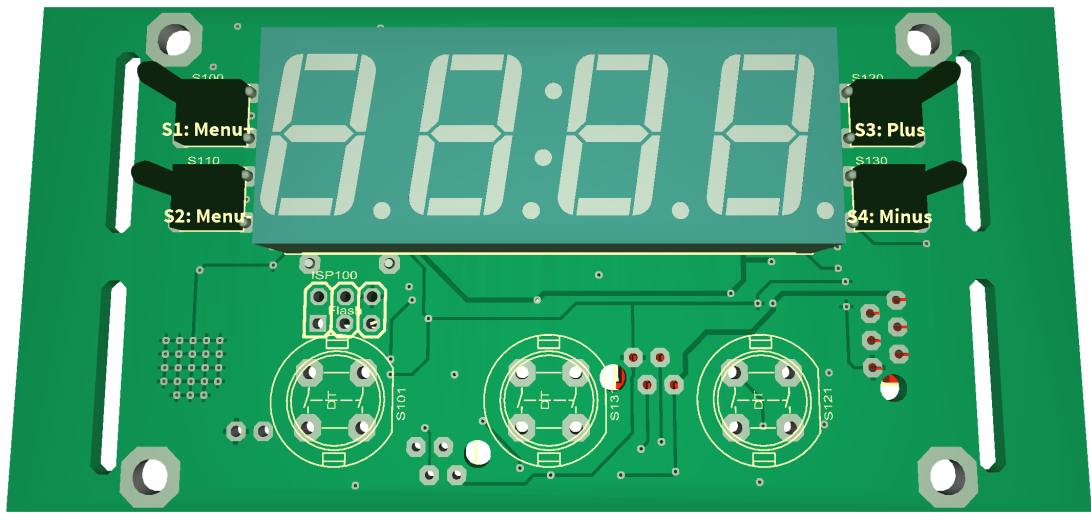
Properties of the components

Relais

In the basic circuit is shown how a relay or something like that can be connected. T1 used R1 as a series resistor, T1 is operated as an amplifier and also as an inverter. For T1 and R1, other components may be used. A direct connection of a coil or a load with more than 30mA is not recommended direct with the SPM1100 - SPM1102. D1 is idle, the diode when operating with coils. If the controller frequently triggers a reset or has other mistakes, instead of a transistor a optocoupler should be used. Internally, a 10k ohm resistor limits the output current, this is enough current for a BC547 or similar.

Button description

Overview of buttons



Button functions

Menu+	Opens the menu, next setting
Menu-	Opens the menu, previus setting
Plus	Function key, in general + or on
Minus	Function key, in general - or off

Menu

Level 1	Level 2
Using the Countdown Timer - Outside of menu↓	
Buzzer setting↓	
Auto pause↓	Enable auto pause →Set auto pause →Exit auto pause ↺
Display mode setting↓	
Info section↓	
IC number↓	
Firmware version↓	

↓: Next step in main menu.

→: Next step in sub menu.

↺: The submenu starts again.

Using the Countdown Timer - Outside of menu



- S1 is the start and stop button. If the countdown timer in the pause mode, the timer can be restart with this button.
- S3 is the plus key, it increments the time. If the countdown timer is running, this button paused the countdown.
- S4 is the minus key, it decrements the time. If the countdown timer is running, this button stops the countdown.

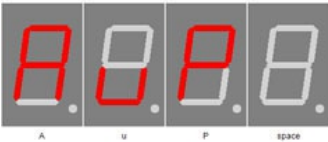
These buttons are available only when the menu is not open, otherwise the keys are used by the menu.

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

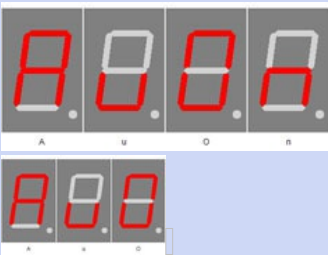
Auto pause



With + you enter the sub-menu auto pause.

Auto pause

Enable auto pause



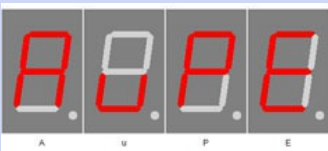
Enables the auto pause function.

Set auto pause



Sets the time for auto pause.

Exit auto pause



With + you exit the sub-menu auto pause.

Display mode setting



with key plus and minus display mode setting Select

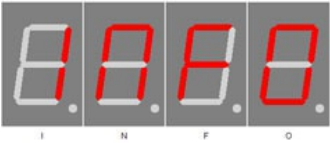
- C: Classic, buzzer beeps continuously
- S: Standard, the buzzer beeps with interruptions

Display Classic



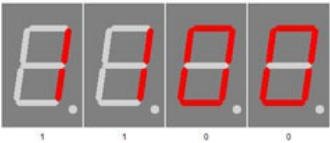
Display Standard

Info section



This indicates the start the information area

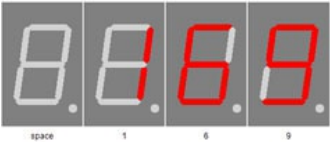
IC number



IC / device type

Chip number

Firmware version

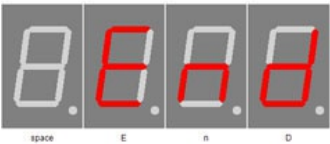


Firmware version

Example, it might be something else at this point.

Firmware version

Menu end



End of the menu, hide automatically after 2 seconds.

End

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.

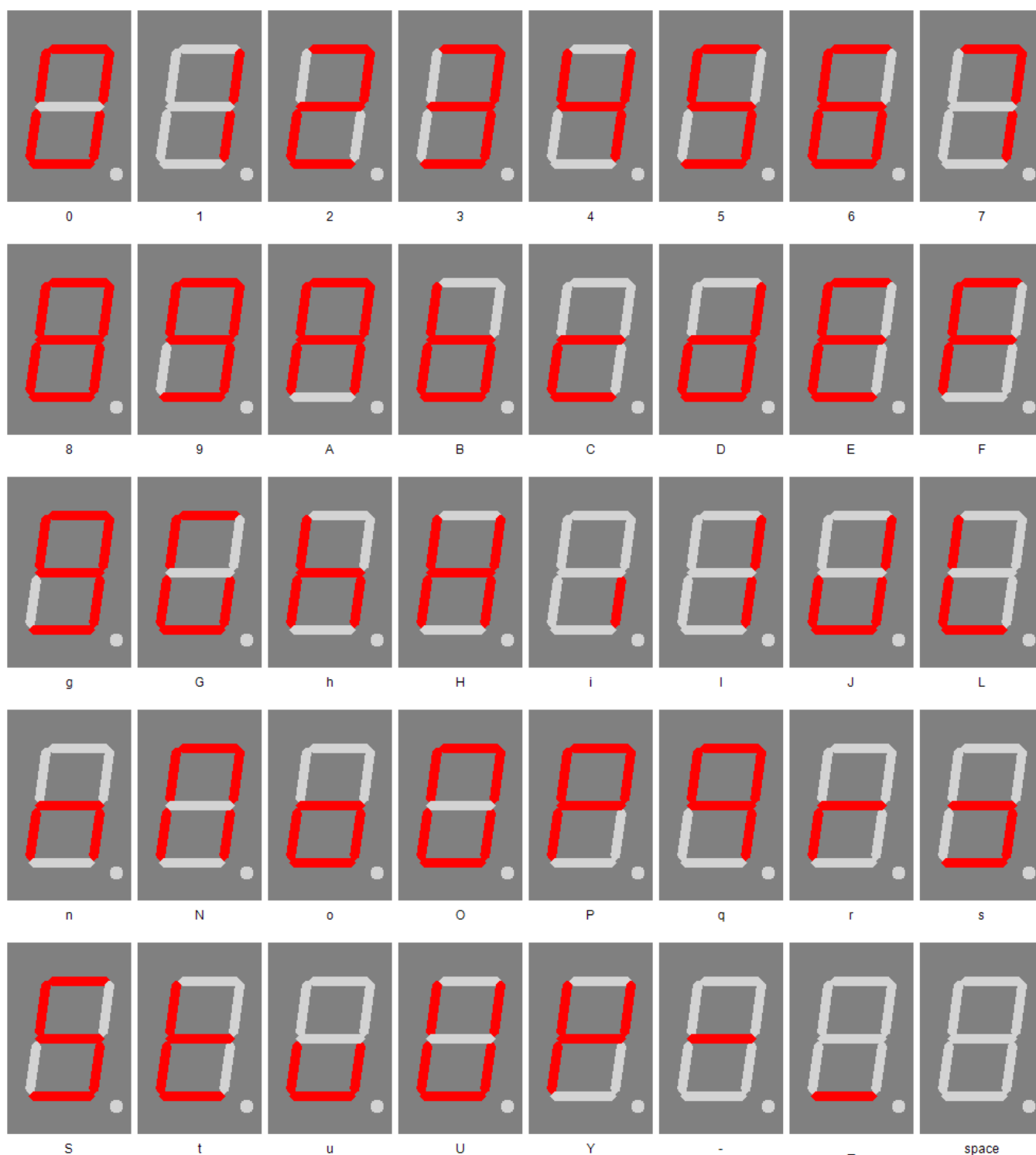
NOTICE

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

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 validated 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!
- The module complies with the requirements of protection class III.
- The "module" may NOT directly to line voltage (or voltage > maximum operating voltage) in any case! It can be fatal!
 - 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)

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.

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.

Copyright notice

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 both criminal 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
- Softwareentwicklung für Prozessoren

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