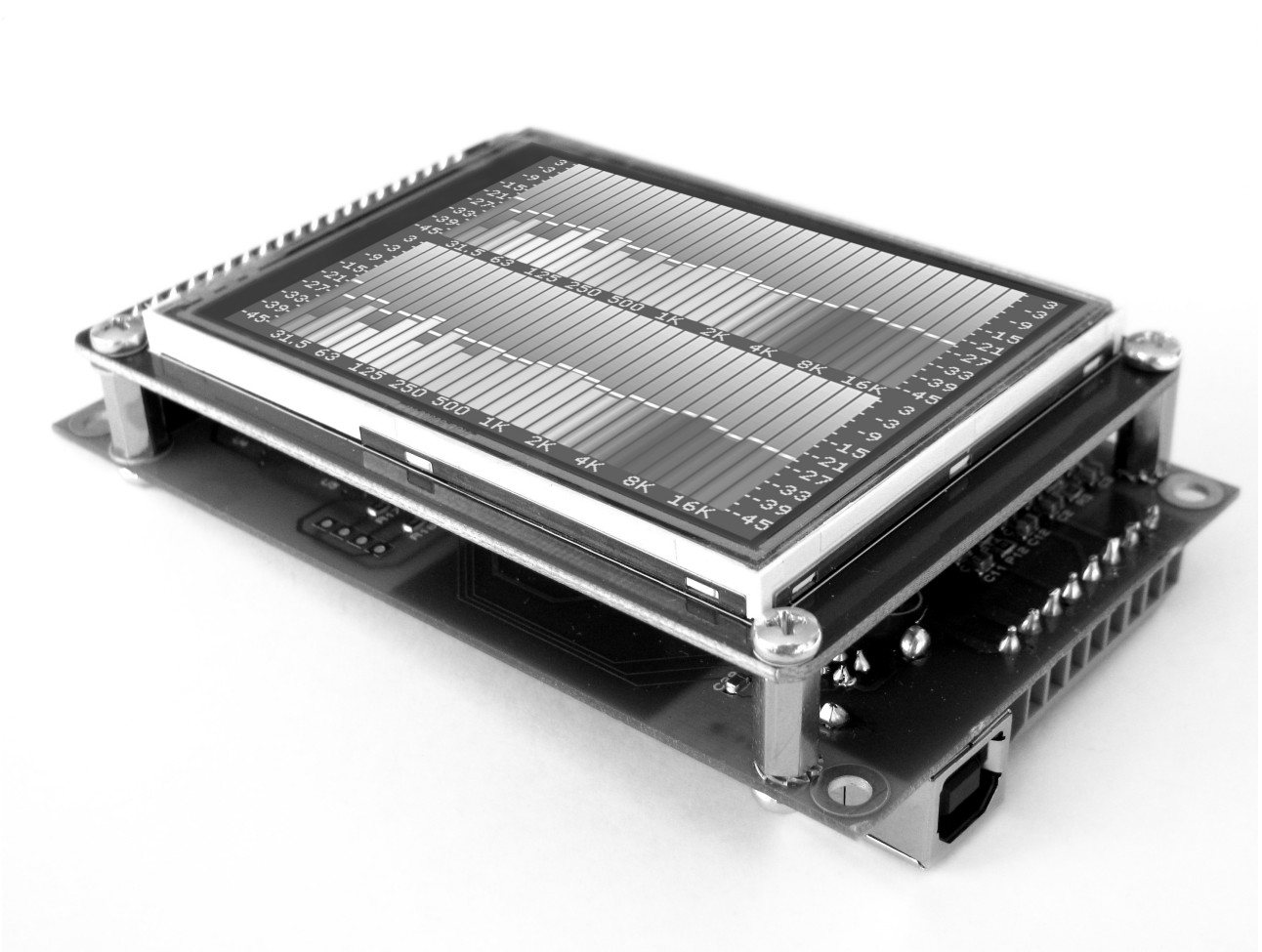sch-remote.com

EVOR04
Data Sheet

Color LCD touchscreen VU meter / Oscilloscope
Real time analyzer / Envelope / Goniometer

Features

- 3,5" TFT Color LCD display
- Touchscreen interface
- Wide range 5V to 24V power supply or powering trough USB
- 7 viewing modes: VU meter, 31 band real time spectrum, Oscilloscope, Envelope, Goniometer (X-Y plot), Analog VU meter, Frequency meter
- 2 displayed channels, each individually selectable from 2 inputs (total 4 inputs)
- 167 adjustable parameters
- 48 programmable presets
- 127 image slots for background and skins
- Adjustable 0dB reference in the range from 2,2 mVrms to 2 Vrms
- Wide bandwidth input signal 8 Hz - 22 kHz
- USB communication with a PC

Table of contents

Signal connectors

The module is equipped with four audio inputs with a software option to select individually between first and second input for left and right channel. Also, the first or second pair can be used as a differential source, while another free input is operating normally. A USB type B connector is available for various configurations through PC software.
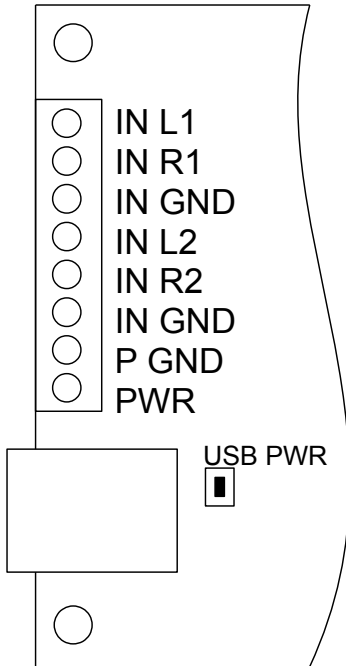

Figure 1: Connectors

Table 1: Connectors description

Connection	Description
IN L1	First audio input, left channel
IN R1	First audio input, right channel
IN GND (1)	Signal ground
IN L2	Second audio input, left channel
IN R2	Second audio input, right channel
IN GND (2)	Signal ground
P GND	Power ground
PWR	Power supply
USB	Powering the board / PC connection

Note: All other on board connection points are reserved for future expansion.

Power supply

On hardware revision 1.0 exist a "USB PWR" jumper. When it has a solder joint, a connection between PWR and USB 5V wires is made. The module can be powered trough PWR or USB connector, but not simultaneously from both. When jumper connection is removed, the module can be powered only from PWR connector and USB to be used only for data exchange.

IMPORTANT NOTE (only for hardware revision 1.0)

Never use PWR powering option when the USB PWR jumper is soldered. It can damage USB port of module or your PC.

With hardware revision 1.1, the "USB PWR" jumper is removed. Module can be powered by either the PWR and USB connectors within their allowed range (see Electrical characteristics) without any risk of damage or interference.

User pins - external control

Since firmware revision 1.2 is added extra control through external user pins. That include:
- Startup logo is held until U pin get low
- Startup logo is held until U pin get high
- Next and previous preset navigation trough buttons
- Next and previous preset navigation trough rotary encoder

User pins are placed at the back top side of the module, labeled from U0 to U7. Additionally, exist two ground pins with "G" label and two 3.3V power pins with "+" label.
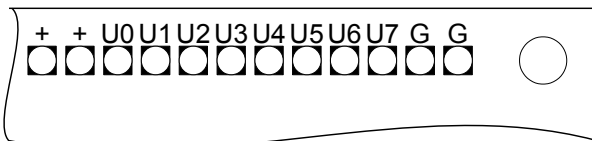
Figure 2: User Pins

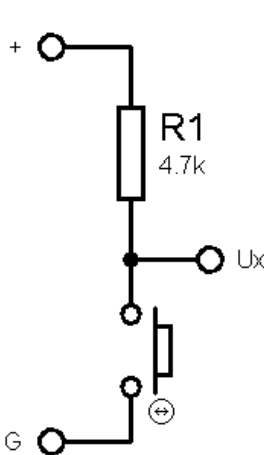Following circuits are suggested for interfacing the module:

Figure 4: Navigation through buttons

Figure 3: Navigation through rotary encoder

Note that exist two types of rotary encoders. The first type perform 4 phase changes per single rotation from one dent to others. The second type perform only one phase change per rotation. The module support only the first type.

Assignment of user pin to a function is made from VuRemote windows software (revision 1.2 and higher) trough "Features" dialog. All changes become active after module restart.
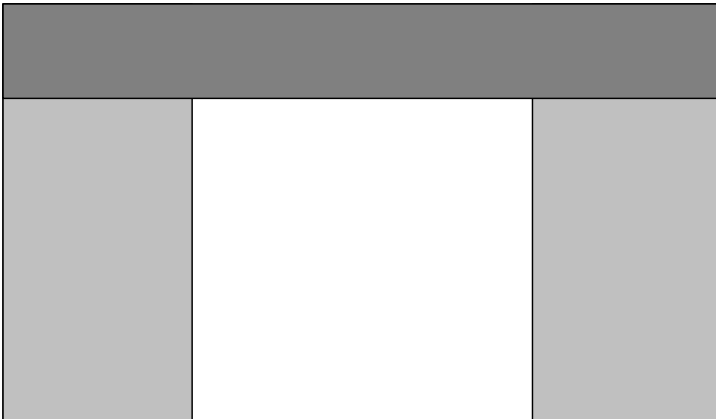
Touch screen menu interface

Figure 5: Touch screen active areas

All configurations and interactions with the module are made through its touch screen display. In normal mode, when a visual effect is displayed, there are 4 action zones. Touching left or right area toggles previous or next stored preset. Touch on top area shows a status bar with a preset name. Central zone touch brings the main menu. From it can be stored or load a preset from the list, change the active view effect and adjust primary view and signal options. List of configurable options available through the touch screen is given in Appendix A: List of parameters.

USB interface

The module is equipped with a USB communication interface. Using VuRemote windows software is possible to access all configurable options on the module. VuRemote provides the following features:

- adjust all effect and input parameters
- change used images
- store and load preset
- store and load configuration from a file
- full backup and restore
- take a snapshot of the screen

VuRemote is intended for initial setup and configuration. A note should be taken that it doesn't update its values automatically - a change of parameter from the module will not cause value update on VuRemote. By its full range adjustments is possible to make a configuration, where some dynamic ranges overlap or go out of the screen. That can cause flickering or other wrong displaying. The user should take care of not configuring the parameters in such abnormal conditions.
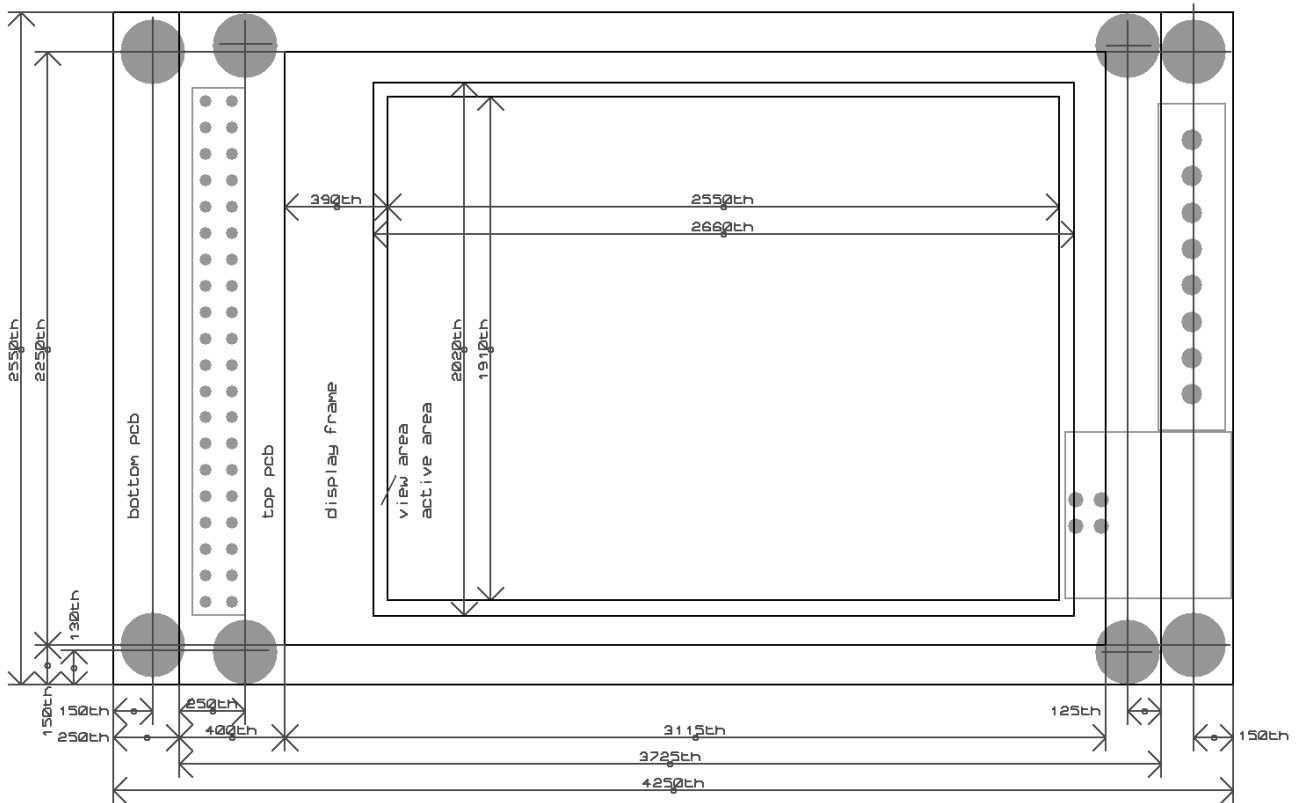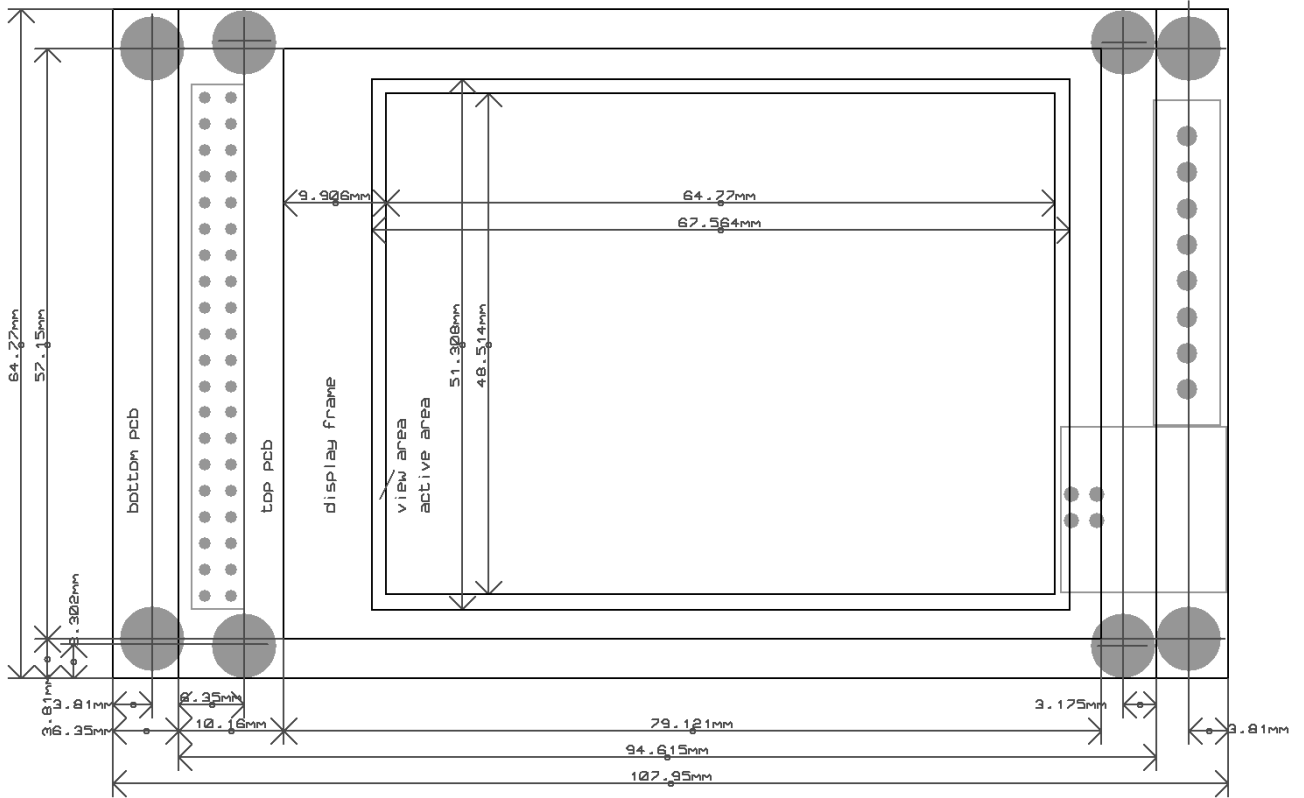
Electrical characteristics

DC characteristics

Symbol	Characteristic	Min	Typ	Max	Units
V_{DD}	Supply Voltage PWR connector USB connector	4,8 4,8		24,2 5,2	V V
I_{DD}	Operating current $V_{DD} = 5V$ $V_{DD} = 24V$		165 38	180 45	mA mA
V_{IN}	Input signal level	-2,7		2,7	V
V_{0REF}	0dB reference setup	0,00224 -53 -50,8		2 6 8,2	V_{RMS} dBv dBu
	Noise level $V_{0REF} = 6$ dBv $V_{0REF} = -23$ dBv $V_{0REF} = -53$ dBv		-85 -63 -34		dB dB dB
R_{IN}	Input impedance	33		38	kΩ
V_+	Output voltage on "+" pins	3,1	3,3	3,4	V
I_+	Maximum current sink from "+" pins			50	mA
$V_{U\ LOW}$	User pin input low voltage	0		0,6	V
$V_{U\ HIGH}$	User pin input high voltage	2,2		V_+	V

AC characteristics

Symbol	Characteristic	Min	Typ	Max	Units
F_{MIN}	Minimum input frequency		8		Hz
F_{MAX}	Maximum input frequency		22000		Hz

Mechanical characteristics

Overall module height: 30mm / 1180 th

Appendix A: List of parameters

View & Input Signal
- View Mode (Vu, Osc, Env, Spt, Gon)▲
- Ch. A input (L1, L2, Differential)▲
- Ch. B input (L1, L2, Differential)▲
- Differential source (L1-R1, L2-R2)▲
- Ch. A boost (0 dB, 13 dB, 20 dB, 29 dB)▲
- Ch. B boost (0 dB, 13 dB, 20 dB, 29 dB)▲
- Ch. A gain (-17,25 dB to 30 dB, 0,75 step)▲
- Ch. B gain (-17,25 dB to 30 dB, 0,75 step)▲
- Mixed signal (No Mix, Mix->A, Mix->B, Mix->A&B)▲
- Swap A and B (No swap, Swapped)▲
- Polarity invert (No inv, Inv A, Inv B, Inv A&B)▲

Oscillator Effect
- Samples per pixel▲
- Ch. A vertical position▲
- Ch. B vertical position▲
- Steps to display - keep older signals, useful for shadow effects
- Ch. A step delta - vertical shift of older signals
- Ch. B step delta - vertical shift of older signals
- Ch. A step scale - scaling of older signals
- Ch. B step scale - scaling of older signals
- Ch. A fill (No, Fill)▲
- Ch. B fill (No, Fill)▲
- Background color
- Background image
- Ch. A color
- Ch. A color at step 1 ... 15 - colors of older signals
- Ch. B color
- Ch. B color at step 1 ... 15 - colors of older signals

VU Meter Effect
- Ch. A vertical position
- Ch. B vertical position
- Ch. A horizontal position
- Ch. B horizontal position
- Ch. A vertical end
- Ch. B vertical end
- Ch. A horizontal end
- Ch. B horizontal end
- Peaks width▲
- Ch. A bar image
- Ch. B bar image
- Ch. A peak image
- Ch. B peak image
- Ch. A min level▲
- Ch. B min level▲
- Ch. A max level▲
- Ch. B max level▲
- Ch. A scale type (Log, Lin)▲
- Ch. B scale type (Log, Lin)▲
- Ch. A attack▲
- Ch. B attack▲
- Ch. A release▲
- Ch. B release▲
- Ch. A hold▲
- Ch. B hold▲
- Ch. A post hold release ▲
- Ch. B post hold release ▲
- Peak A attack▲
- Peak B attack▲
- Peak A release▲
- Peak B release▲
- Peak A hold▲
- Peak B hold▲
- Peak A post hold release▲
- Peak B post hold release▲
- Power mode▲ rev.1.1 - direct display of power by measuring voltage and current (see related app note EVOR04 Measure power)
- Ch. A bar color
- Ch. B bar color
- Ch. A peak color
- Ch. B peak color
- Ch. A tick color
- Ch. B tick color

- Ch. A label color
- Ch. B label color

Envelope Effect

- Samples per pixel▲
- Ch. A vertical position▲
- Ch. B vertical position▲
- Overlap fill (Mix, A on top, B on top)▲

Spectrum Effect

- Ch. A vertical position
- Ch. B vertical position
- Ch. A vertical end
- Ch. B vertical end
- Ch. A horizontal position
- Ch. B horizontal position
- Ch. A bar width
- Ch. B bar width
- Ch. A bar spacing
- Ch. B bar spacing
- Peaks width▲
- Low band high resolution (Disabled, Enabled)▲ - provide better channels separation in lower bands, that slower the update ratio
- Timing correction - should be set to actual refresh rate of the effect, need for timings parameters to point real times
- Ch. A min frequency▲
- Ch. B min frequency▲
- Ch. A max frequency▲
- Ch. B max frequency▲
- Ch. A min level▲
- Ch. B min level▲
- Ch. A max level▲
- Ch. B max level▲
- Ch. A attack▲
- Ch. B attack▲
- Ch. A release▲

Goniometer Effect

- Samples per frame▲
- Horizontal position
- Vertical position
- Show rulers (No, Yes)▲

Analog VU Meter Effect since firmware rev.1.1

- Ch. A horizontal position
- Ch. B horizontal position
- Ch. A vertical position
- Ch. B vertical position

- Background color
- Background image

- Background color
- Background image
- Ch. A color
- Ch. B color

- Ch. B release▲
- Ch. A hold▲
- Ch. B hold▲
- Ch. A post hold release▲
- Ch. B post hold release▲
- Peak A attack▲
- Peak B attack▲
- Peak A release▲
- Peak B release▲
- Peak A hold▲
- Peak B hold▲
- Peak A post hold release▲
- Peak B post hold release▲
- Ch. A bar color
- Ch. B bar color
- Ch. A peak color
- Ch. B peak color
- Ch. A tick color
- Ch. B tick color
- Ch. A label color
- Ch. B label color
- Background color
- Background image
- Ch. A bar image
- Ch. B bar image
- Ch. A peak image
- Ch. B peak image

- Background color
- Background image
- Color
- Ruler color

- Ch. A end radius
- Ch. B end radius
- Peak A end radius
- Peak B end radius

- Ch. A start radius
- Ch. B start radius
- Peak A start radius
- Peak B start radius
- A start type (Both - round; Ch. - flat, Peak - round; Ch. - round, Peak - flat; Both - flat)
- B start type (Both - round; Ch. - flat, Peak - round; Ch. - round, Peak - flat; Both - flat)
- Ch. A start angle
- Ch. B start angle
- Ch. A end angle
- Ch. B end angle
- Ch. A needle width▲
- Ch. B needle width▲
- Peak A needle width▲
- Peak B needle width▲
- Ch. A min level▲
- Ch. B min level▲
- Ch. A max level▲
- Ch. B max level▲
- Ch. A scale type (Log, Lin)▲
- Ch. B scale type (Log, Lin)▲
- Ch. A attack▲
- Ch. B attack▲
- Ch. A release▲
- Ch. B release▲

Frequency Effect since firmware rev.1.1

- Ch. A vertical position
- Ch. B vertical position
- Ch. A horizontal position
- Ch. B horizontal position
- Ch. A vertical end
- Ch. B vertical end
- Ch. A horizontal end
- Ch. B horizontal end
- Ch. A label vertical position
- Ch. B label vertical position
- Ch. A label horizontal position
- Ch. B label horizontal position
- Ch. A center frequency▲
- Ch. B center frequency▲
- Ch. A in tune range▲
- Ch. B in tune range▲

- Ch. A hold▲
- Ch. B hold▲
- Ch. A post hold release▲
- Ch. B post hold release▲
- Peak A attack▲
- Peak B attack▲
- Peak A release▲
- Peak B release▲
- Peak A hold▲
- Peak B hold▲
- Peak A post hold release▲
- Peak B post hold release▲
- Power mode▲- direct display of power by measuring voltage and current (see related app note EVOR04 Measure power)
- Ch. A needle color
- Ch. B needle color
- Peak A needle color
- Peak B needle color
- Ch. A tick color
- Ch. B tick color
- Ch. A label color
- Ch. B label color
- Background color
- Background image

- Ch. A display range▲
- Ch. B display range▲
- Ch. A tracking speed
- Ch. B tracking speed
- Digits update interval▲
- Ch. A bar color
- Ch. B bar color
- Ch. A label color
- Ch. B label color
- Ch. A label in tune color
- Ch. B label in tune color
- Background color
- Background image
- Ch. A bar image
- Ch. B bar image

All parameters with ▲ mark are accessible from module touch screen interface.

Appendix B: Parameters setup tips

Startup logo
If a 320x240 image is placed on slot 1, it will be used as startup logo. To disable it, leave the slot empty or place a different size image.

Buttons skin
Slot 127 is used for buttons and labels skin. In horizontal direction are a long button, short button, short label, long label. The different states of items are in the vertical direction: normal, pressed, checked (currently not used), disabled. The top 5 pixels of last single pixel width column have special meaning of colors:

> px 1. Background color
> px 2. Default text color
> px 3. Pushed button text color
> px 4. Checked button text color
> px 5. Disabled button text color

To take into account the new skin and colors the module needs a restart.

Transparent labels
Since firmware revision 1.1, using a color R=0, G=0, B=2 for a label or a tick, will make it transparent. That option is useful when the background image contains all labels and marks.

VuRemote - Color Helper
When is need to place gradient of colors overs several parameters, for example in Oscillator effect steps, the Color Helper dialog can be used. In left area check the parameters that need to get gradient fill. Order of clicking over them is important as they will be placed in that order when getting colors. In the right area select the color for the first item and for the last item. Clicking on Apply button, all checked parameters will get a color gradient between first and last color.

VuRemote - the update of parameters
Some of the image sizes used for skins depend on other parameters like position and size. To get actual requirements for image skin when such parameters are changed, press the recheck button next to the image parameter.
Avoid changing of a parameter from the module or load a preset from it while VuRemote is running, as it will not update the parameters in VuRemote and they will stay with their old values.

Appendix C: Attack - Hold - Release model

In VU meter and Spectrum effects are used dynamics functions with attack, release, hold and post hold release parameters. Here is described their analog model of operation.
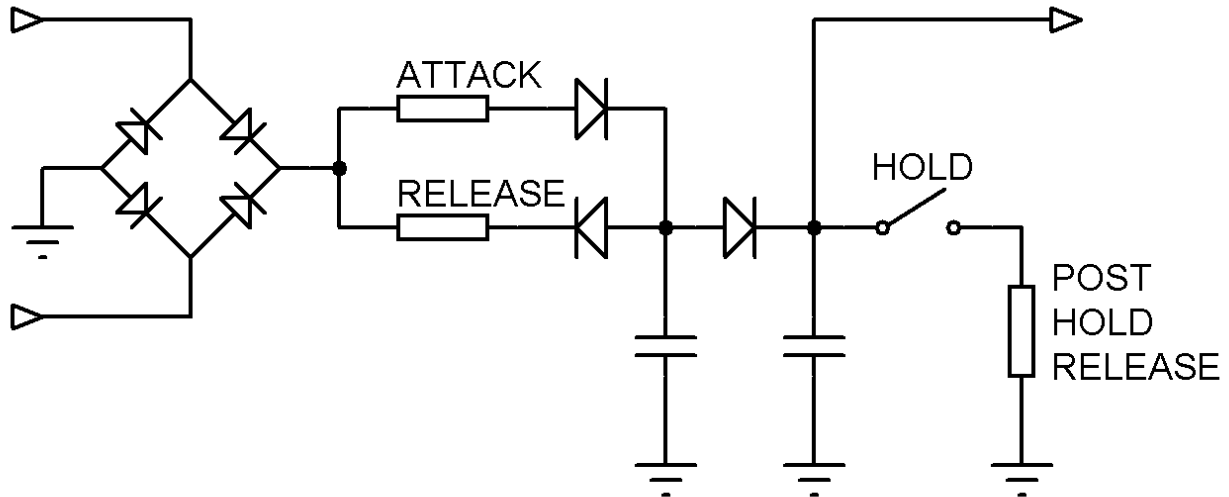

Figure 6: Attack - Hold - Release analog model
*Diodes are ideal
**Hold switch off time is reset every time when the left capacitor voltage is higher than the right capacitor voltage

Revision History

Rev. A January 2015
     Initial version

Rev.B February 2015
     Updated USB PWR jumper hardware changes
     Added Anv, Fcy effects. Power mode and transparent labels
     Added Parameter setup tips appendix

Rev.C October 2015
     Added "User pins" section

Rev.D February 2019
     Fixed mistakes in the text