

# eMotionST5:3



## Final Specification

### Hardware Revision 02

This document might be changed without prior notice

Revision	0.2
Date	23.04.2018
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## 1. Revision History

Rev.	Date	Chapter	Description	by
0.1	20.09.2013	All	First draft	RM
0.2	23.04.2018	3 / 4.2 / 7.14 / 8.1	More Details to Jumpersetting for PNL_VCC	RM

## 2. General Description

The eMotionST5:3 is an advanced TFT-LCD controller board to connect LCDs standard VGA, DVI, and DisplayPort sources. The eMotionST5:3 is especially designed for use in low height applications. The height of components incl. pcb is below 9mm. All necessary timings and voltages to support the connected display are generated on the eMotionST5:3.

## 3. Features

<b>Scaler</b>	STMicroelectronics STDP6036
<b>Input resolution</b>	Up to WUXGA (1920x1200@60Hz)
<b>Output resolution</b>	VGA up to WUXGA
<b>Colors</b>	16.7M
<b>Power Supply</b>	Single power supply +12V / +24V DC
<b>Operating temperature</b>	0 ...60 °C
<b>Inputs</b>	VGA, DVI, DisplayPort 1.1a
<b>Panel voltage</b>	3.3V, 5.0V, 12.0V (selectable with jumpers, for 12.0V see chap. 4.2)
<b>LVDS output</b>	JEIDA or VESA mapping selectable by panel file
<b>Backlight support</b>	Analog & PWM dimming
<b>Power safe mode</b>	VESA DPMS compatible
<b>DDC CI</b>	Support of DDC / CI
<b>Remote Control</b>	RS232 remote control
<b>Software update</b>	- RS232 - Smart ISP - VGA-input using VGA to DDC adapter

## 4. Electrical Specification of inputs and outputs

### 4.1 Power Supply voltage

The eMotionST5:3 can handle 12V or 24V DC input voltage. The board is designed for a single power supply. All other supply voltages are generated on the eMotionST5:3. If the input supply voltage is used for backlight supply (2x3 multi-pin connector X201 positions 1-3 and 2-4) then the input voltage of the board must fit with the backlight supply voltage.

An additional SMPS on the eMotionST5:3 is used to generate +12V supply voltage for the backlight inverter. Therefore the jumper X201 (2x3 multi-pin connector) has to be placed in positions 3-5 and 4-6. In this position the max. backlight current is limited to 3A.

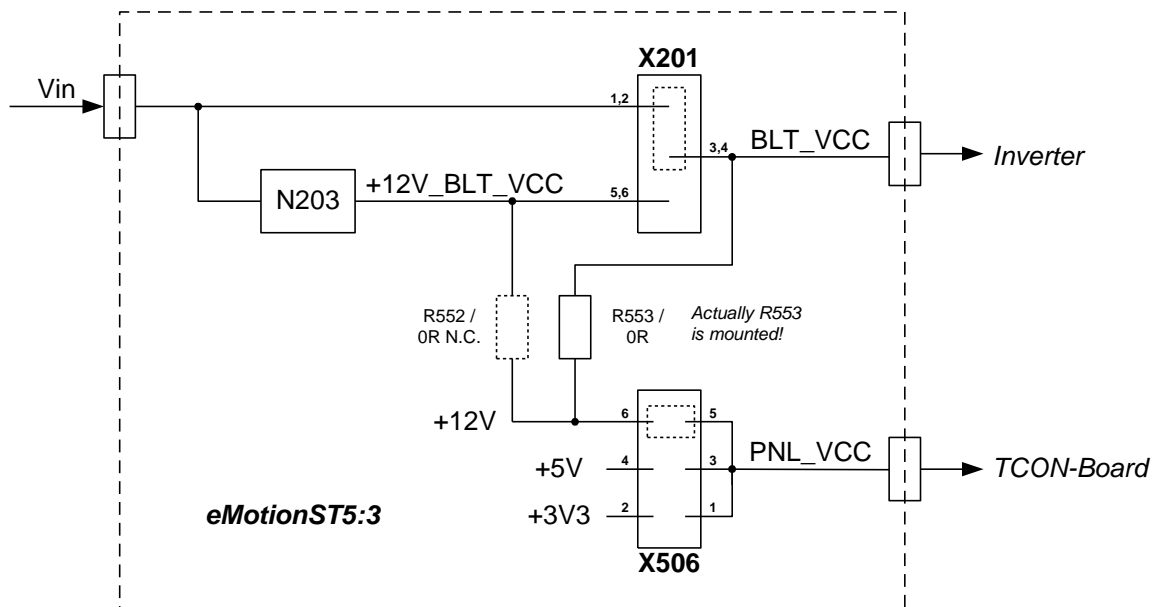
Supply voltage	Nominal value	Regulation	Ripple & noise	Comment
+12V	+12.0V	+/-10%	0.3V	
+24V	+24.0V	+/-10%	0.3V	

### 4.2 Panel supply voltage

The panel supply voltage is generated on the eMotionST5:3. The eMotionST5:3 can generate 3.3V, 5.0V or 12.0V panel supply voltage. The max current is limited to 2.0A. The panel supply voltage can be selected with jumper X506.

Note: to generate +12.0V as panel supply it is necessary to know the input voltage  $V_{in}$  and the voltage for the backlight inverter (input voltage  $V_{in}$  can be +12V or +24V, voltage for backlight-inverter BLT\_VCC can be +12V, +12V...+24V [wide range inverter] or +24V)

Interconnections on eMotionST5:3 between  $V_{in}$ , backlight supply voltage and panel supply voltage:



With the version 12006976 of eMotionST5:3 (R553 is mounted) not all combinations of  $V_{in}$ , backlight inverter voltage and panel supply voltage can be realised! In case of  $V_{in}=+24V$  and backlight inverter voltage  $=+12V...+24V$  or  $+24V$  a hardware modification is necessary (see table below).

**But in most applications the version 12006976 can be used!**

**V<sub>in</sub> = +12V**

V-TCON↓ / BLT_VCC→	12V	24V	12V ... 24V
+3V3	X201: 1-3 / 2-4 X506: 1-2	X201: X506:	X201: 1-3 / 2-4 X506: 1-2
+5V	X201: 1-3 / 2-4 X506: 3-4	X201: <div style="border: 1px solid blue; padding: 2px; display: inline-block; color: red; font-weight: bold;">Not possible</div>	X201: 1-3 / 2-4 X506: 3-4
+12V	X201: 1-3 / 2-4 X506: 5-6 <b>R553 must be OR, R552 N.C.!</b>	X201: X506:	X201: 1-3 / 2-4 X506: 5-6 <b>R553 must be OR, R552 N.C.!</b>

**V<sub>in</sub> = +24V**

V-TCON↓ / BLT_VCC→	12V	24V	12V ... 24V
+3V3	X201: 5-3 / 6-4 X506: 1-2	X201: 1-3 / 2-4 X506: 1-2	X201: 1-3 / 2-4 X506: 1-2
+5V	X201: 5-3 / 6-4 X506: 3-4	X201: 1-3 / 2-4 X506: 3-4	X201: 1-3 / 2-4 X506: 3-4
+12V	X201: 5-3 / 6-4 X506: 5-6	X201: 1-3 / 2-4 X506: 5-6 <b>Mount R552 with OR! Remove R553</b>	X201: 1-3 / 2-4 X506: 5-6 <b>Mount R552 with OR! Remove R553</b>

General:

Panel supply voltage	Nominal value	Regulation	max Current	Comment
+ 3.3V	+3.3V	+/-5%	2.0 A	Jumpersettings see table above
+ 5.0V	+5.0V	+/-5%	2.0 A	Jumpersettings see table above
+12.0V	+12.0V	+/-5%	2.0 A	Jumpersettings see table above

### 4.3 LVDS

PARAMETER	MIN	TYP	MAX	UNIT	Remark
Differential Output Voltage	300	500	700	mV	
Common Mode Voltage		1.25		V	
Clock Frequency			100 90	MHz	Single Channel Dual Channel
Bits per Color	6		8	bit	6/8bit selectable in panel file

## 4.4 Backlight

The backlight supply voltage can be selected by the plugging 2 jumpers onto X201. Both jumpers must be set on the same side of the connector. In positions 1-3 and 2-4 the backlight supply voltage is equal the input voltage of the board. The max. backlight current is limited to 4A.

In position 3-5 and 4-6 the backlight supply voltage is generated by a 12V SMPS on the board (do only use it with 24V board supply voltage). Using this configuration, the max. backlight current is limited to 3A.

Signal	Description
V dimm A	Analog dimming voltage 0 to 5.0V / 0 to 3.3V selectable with jumper X502 (1-3 or 3-5)
V dimm PWM	3,3V / 5.0V level selectable with jumper X502 (1-3 or 3-5)
Enable	3,3V / 5,0V level selectable with jumper X502 (4-6 or 2-4), polarity selectable with jumper X503
VCC	Operating voltage of the backlight. <b>2x3 multi-pin connector X201 positions 1-3 and 2-4:</b> The backlight voltage is the same as board supply voltage Max current is limited to 4A. <b>2x3 multi-pin connector X201 positions 3-5 and 4-6:</b> The backlight voltage is set to +12V. Use it only with +24V board supply voltage. The max backlight current is limited to 3A.

## 4.5 DVI input

TMDS receiver compliant with DDWG DVI 1.0 specification

PARAMETER	MIN	TYP	MAX	UNIT	Remark
Differential Input Voltage	150		1200	mV	
Input Common Mode Voltage	-300		-37	mV	
Input Clockfrequency	20		165	MHz	

## 4.6 DisplayPort Input

DisplayPort 1.1a compliant receiver. 4-lane DisplayPort input

PARAMETER	MIN	TYP	MAX	UNIT	Remark
Peak-to-peak input differential voltage	0.12		1.4	V <sub>pp</sub>	
Rx DC Common Mode Voltage	0		V <sub>cc</sub>	V	
R <sub>t</sub> Termination Resistance	45	50	55	Ω	

## 4.7 VGA input

PARAMETER	MIN	TYP	MAX	UNIT	Remark
Conversion rate	10		205	MHz	
ADC resolution	8		10	bit	Up to 165MHz sample rate 10 bits per color are used, up to 205MHz sample rate 8 bits per color are used
Input levelrange	0,64	0,7	0,9	V <sub>pp</sub>	at 75R
Band width	9		290	MHz	
SOG level		0,3		V	at 75R



## 5. Qualifications

### 5.1 Environmental conditions

Parameter	Min	Max
Operating Temperature	0°C	+60°C
Storage Temperature	-20°C	+80°C
Relative humidity		80%
Tolerable air-pressure	708 hPa (approx. Altitude 2000m)	

### 5.2 EMI Standards

		Criteria
EMI/EMC:	EN55022-B (appendix A1:2007 from Oct., 1 <sup>st</sup> 2011 on)	D
ESD:	EN61000-4-2 contact discharge 4kV EN61000-4-2 air discharge 8kV	B
Radiated RF (80-1000MHz):	EN61000-4-3 (20V/m 80% modulation level from 80 – 1000MHz)	A
Conducted disturbances induced by RF fields:	EN61000-4-6 (10Veff, AM 80%, 1kHz from 150kHz – 80MHz)	A
Radiated RF:	EN50204:1995; 900MHz, 20V/m, pulse 50%	A

Note: To ensure that the board meets the standard mentioned above, an adequate shielding cover must be added. Alternatively the housing of the monitor must act as shielding cover (e.g. aluminium enclosure).

EMI / EMC: designed to meet

### 5.3 Safety

- EN60950-1:Latest edition
- Designed to meet UL60950-1

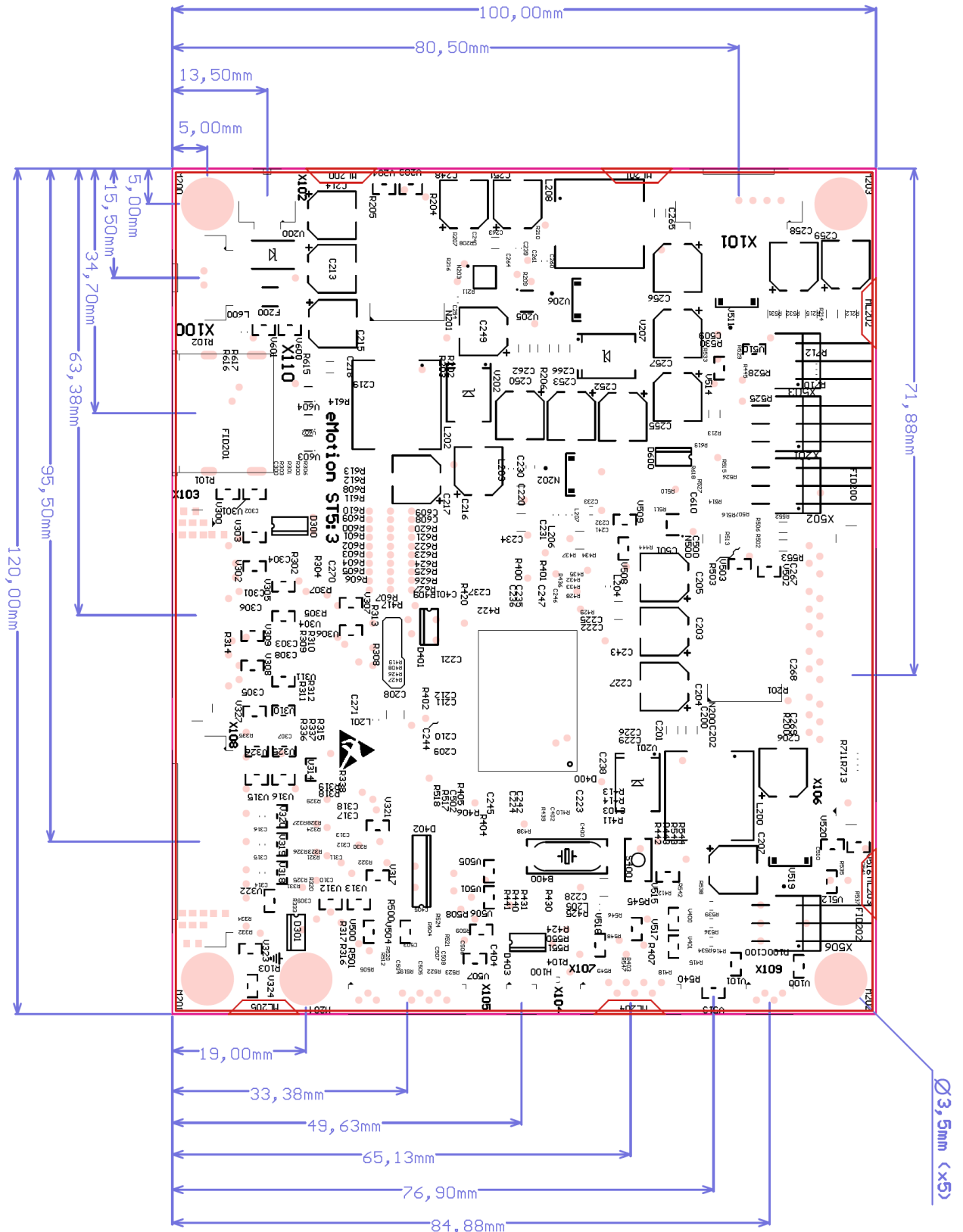
### 5.4 Shock and Vibration

#### MECHANICAL STRESS

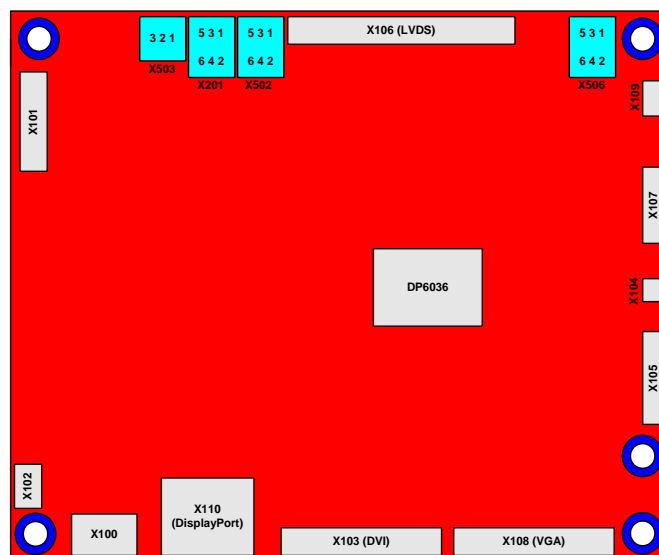
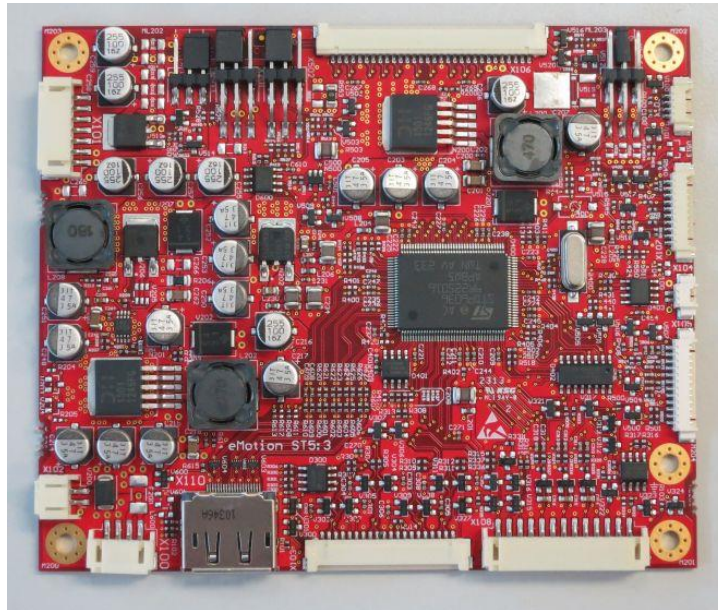
Shock:	20G, 11ms, half sine (x/y direction)
	15G, 11ms, half sine (z direction)
Vibration:	1.2G, 10 – 55Hz, sinus
Sweep:	1 minute/octave
Amplitude:	0.35mmp-p (x-direction)
	0.35mmp-p (y direction)
	0.175mmp-p (z-direction)
Time :	30 minutes
Standard:	Conform to EN60605

## 6. Outline dimensions

Dimensions: 120mm (L) x 100 mm (W) x 9mm (H)



## 7. Overview of Connectors and Jumpers



Item	Description	Remarks
X100	Power	JST S4B-PH
X101	Backlight-Supply	JST S7B-PH
X102	Power (Second Power In/-Out)	JST S2B-PH
X103	DVI input	Hirose DF14-20P-1.25H
X104	+5V-Out (Touch-Controller)	Molex 53261-0271
X105	Keyboard	Molex 53261-1271
X106	LVDS Dual link output	Hirose DF14-30P-1.25H
X107	GPIOs	Molex 53261-1071
X108	VGA input	JST S13B-PH
X109	RS232	Molex 53261-0471
X110	DisplayPort input	DisplayPort connector
X201	Multi-pin connector BLT_VCC	2x3pin, 2.54mm pitch, right angle, SMT
X502	Multi-pin connector BLT_PWM/-EN	2x3pin, 2.54mm pitch, right angle, SMT
X503	Multi-pin connector BLT_EN-polarity	1x3pin, 2.54mm pitch, right angle, SMT
X506	Multi-pin connector TCON_POWER	2x3pin, 2.54mm pitch, right angle, SMT

## 7.1 Power Input Connector

Connector: X100 – JST S4B-PH-SM4-TB

Pin No.	Signal	Description
1	GND	Ground
2	GND	Ground
3	+12V / +24V DC	VCC / max 2A per pin
4	+12V / +24V DC	VCC / max 2A per pin

Connector: X102 - JST S2B-PH-SM4-TB

Pin No.	Signal	Description
1	GND	Ground
2	+12V / +24V DC	VCC / max 2A per pin

## 7.2 Inverter / Backlight

Connector: X101 - JST S7B-PH-SM4-TB

Pin No.	Signal	Description
1	V dimm A	Analog dimming voltage Signal level is selectable with jumper on X502 (1-3 or 3-5)
2	V dimm PWM	PWM dimming output Signal level is selectable with jumper on X502 (1-3 or 3-5)
3	Enable	ON/OFF Signal level is selectable with jumper on X502 (2-4 or 4-6) Polarity is selectable with jumper on X503
4	VCC	Operating voltage +12V / +24V; / max 2A per pin VCC is selectable with jumpers on X201. Both jumpers must be set on the same side of X201!
5	VCC	Operating voltage +12V / +24V; / max 2A per pin VCC is selectable with jumpers on X201. Both jumpers must be set on the same side of X201!
6	GND	Ground
7	GND	Ground

## 7.3 DVI Input Connector

Connector: X103 - Hirose DF14-20P-1.25H

Pin No.	Signal	Description
1	GND	Ground
2	TMDS DATA2+	TMDS DATA2 Differential positive signal
3	TMDS DATA2-	TMDS DATA2 Differential negative signal
4	GND	Ground
5	DDC Clock	Clock DDC Interface
6	DDC Data	Data DDC Interface
7	GND	Ground
8	TMDS DATA1+	TMDS DATA1 Differential positive signal
9	TMDS DATA1-	TMDS DATA1 Differential negative signal
10	GND	Ground
11	+5V Power	+5V for EDID (un-powered monitor)
12	GND	Ground
13	HPD	Hot Plug Detect
14	NC	Not connected

15	TMDS DATA0+	TMDS DATA0 Differential positive signal
16	TMDS DATA0-	TMDS DATA0 Differential negative signal
17	GND	Ground
18	TMDS CLOCK+	TMDS Clock Differential positive signal
19	TMDS CLOCK-	TMDS Clock Differential negative signal
20	GND	Ground

## 7.4 +5V-Out

Connector: X104 – MOLEX 53261-0271

Pin No.	Signal	Description
1	+5V	+5V output (touchcontroller)
2	GND	Ground

## 7.5 Keyboard Connector

Connector: X105 – Molex 53261-1271

Pin No.	Signal	Description
1	LED1	LED Green
2	LED2	LED RED
3	IR /n.c.	IR remote / not connected
4	+5V	
5	GND	Ground
6	SW3	Button3 (UP)
7	SW2	Button2 (DOWN)
8	SW4	Button4 (SELECT)
9	SW6	Button6 (POWER)
10	SW1	Button1 (MENU)
11	SW5	Button5 (for special use only)
12	GND	Ground

## 7.6 LVDS Output

Connector: X106 - Hirose DF14-30P-1.25H

Pin No.	Signal	Description
1	VCC	Panel VCC *
2	VCC	Panel VCC*
3	VCC	Panel VCC*
4	VCC	Panel VCC*
5	GND	Ground
6	3.3V	3.3V permanent for LVDS select
7	GND	Ground
8	TX3+0	TX3 odd positive
9	TX3-0	TX3 odd negative
10	TXCLK+0	Clock odd positive
11	TXCLK-0	Clock odd negative
12	TX2+0	TX2 odd positive
13	TX2-0	TX2 odd negative
14	GND	Ground
15	TX1+0	TX1 odd positive

16	TX1-O	TX1 odd negative
17	TX0+O	TX0 odd positive
18	TX0-O	TX0 odd negative
19	GND	Ground
20	TX3+E	TX3 even positive
21	TX3-E	TX3 even negative
22	TXCLK+E	Clock even positive
23	TXCLK-E	Clock even negative
24	TX2+E	TX2 even positive
25	TX2-E	TX2 even negative
26	GND	Ground
27	TX1+E	TX1 even positive
28	TX1-E	TX1 even negative
29	TX0+E	TX0 even positive
30	TX0-E	TX0 even negative

\* Note: Pin1, 2, 3, 4: Output voltage 3.3V / 5.0V / 12.0V - selectable with jumpers on X506

## 7.7 GPIO Connector

Connector: X107 – Molex 53261-1071

Pin No.	Signal	Description
1	3.3V	3.3V (max 200mA)
2	5.0V	5.0V (max 200mA)
3	FAN PWM	PWM signal for FAN speed
4	FAN Tacho	Tacho-Signal
5	FAN VCC	
6	GPIO34	GPIO from STDP6036 (LVTTL)
7	GPIO45	GPIO from STDP6036 (LVTTL)
8	SCL	I2C SCL (5V level)
9	SDA	I2C SDA (5V level)
10	GND	Ground

Signals on the GPIO connector are not used at the moment. Reserved for custom options!

## 7.8 VGA Input Connector

Connector: X108 – JST S13B-PH-SM4-TB

Pin No.	Signal	Description
1	HSYNC	Horizontal Sync
2	GND	Ground
3	VSYNC	Vertical Sync
4	VGA 5V	+5V DC
5	Blue	Blue analog input
6	GND	Ground
7	Green	Green analog input
8	GND	Ground
9	Red	Red analog input
10	GND	Ground
11	SCL	Serial Clock Line for DDC
12	SDA	Serial Data Line for DDC
13	CAB	Cable detect

## 7.9 RS232 Connector

Connector: X109 – MOLEX 53261-0471

Pin No.	Signal	Description
1	3.3V	3.3V (max 200mA)
2	TxD	Transmit Data (LVTTTL)
3	RxD	Receive Data (LVTTTL)
4	GND	Ground

## 7.10 DisplayPort Input Connector

Connector: X110 – MOLEX 47272-0001

Pin No.	Signal	Description
1	ML_L3N	Main Link Ch. 3 Differential Input negative
2	GND	Ground
3	ML_L3P	Main Link Ch. 3 Differential Input positive
4	ML_L2N	Main Link Ch. 2 Differential Input negative
5	GND	Ground
6	ML_L2P	Main Link Ch. 2 Differential Input positive
7	ML_L1N	Main Link Ch. 1 Differential Input negative
8	GND	Ground
9	ML_LN1P	Main Link Ch. 1 Differential Input positive
10	ML_LN0N	Main Link Ch. 0 Differential Input negative
11	GND	Ground
12	ML_LN0P	Main Link Ch. 0 Differential Input positive
13	Config 1	Config Pin1, connect to GND with 1M
14	Config 2	Config Pin2, connect to GND with 1M
15	AUXP	Auxiliary Ch. Differential Input positive
16	GND	Ground
17	AUXN	Auxiliary Ch. Differential Input negative
18	HPD	Hot Plug Detect
19	POR	Connected to Ground
20	PO	Not Connected to internal circuits

## 7.11 BLT\_VCC select

Connector: X201 – W+P 3131-13-006-50

Pin No.	Signal	Description
1	+V_IN_Fused	VCC (+12V / +24V DC)
2	+V_IN_Fused	VCC (+12V / +24V DC)
3	BLT_VCC	Is connected to X201-1 or X201-5
4	BLT_VCC	Is connected to X201-2 or X201-6
5	+12V_BLT_VCC	+12V
6	+12V_BLT_VCC	+12V

## 7.12 BLT\_PWM, BLT\_EN level select

Connector: X502 – W+P 3131-13-006-50

Pin No.	Signal	Description
1	+5V	+5V
2	+5V	+5V
3	BLT_VCC	BLT_PWM voltage select, connected to X502-1 or X502-5
4	BLT_VCC	BLT_EN voltage select, connected to X502-1 or X502-5
5	+3V3	+3V3DVDD
6	+3V3	+3V3DVDD

## 7.13 BLT\_EN polarity select

Connector: X503 – W+P 3131-13-003-50

Pin No.	Signal	Description
1	BLT_EN_INT	Active HIGH signal for backlight enable
2	BLT_EN	BLT_EN signal, connected to X503-1 or X503-3
3	#BLT_EN_INT	Active LOW signal for backlight enable

## 7.14 TCON\_POWER\_VOLTAGE select

Connector: X506 – W+P 3131-13-006-50

Pin No.	Signal	Description
1	TCON_POWER_VOLTAGE	If +3V3 TCON-supply is necessary connect to X506-6
2	3V3	+3V3
3	TCON_POWER_VOLTAGE	If +5V TCON-supply is necessary connect to X506-6
4	+5V	+5V
5	TCON_POWER_VOLTAGE	If +12V TCON-supply is necessary connect to X506-6*
6	+12V	BLT_VCC*

Only 1 jumper can be set von X506, otherwise switching regulators could be destroyed!

\*: for details in case of TCON\_POWER\_VOLTAGE should be +12V see chapter 4.2!



## 8. Jumper settings and configuration

WARNING! Do not change the jumper settings and configuration of the board! Changing the jumpers and configuration may cause fatal damage to the board and to the connected display or cause malfunction.

### 8.1. Panel supply voltage (X506)

The supply voltage of the panel can be selected with the Jumper X506.

Note: Do only use one jumper cab at the same time. Combinations of jumper cabs are not allowed.

Panel Voltage	X506		
	1-2	3-4	5-6
3.3V	closed	open	open
5.0V	open	closed	open
12.0V	open	open	closed

Table 1: Panel power supply

\*: for details in case of Panel Voltage should be +12V see chapter 4.2!

### 8.2. Backlight Power Supply (X201)

Select the backlight supply voltage with jumpers on connector X201

**Note: Both jumper cabs on X201 must be set on the same side!**

X201	Backlight supply voltage (X101 Pin4 and Pin5)	Comment
3-5 4-6	+12V / max 3A	Use this setting if the input voltage of the board does not match the backlight supply voltage.
1-3 2-4	Equal to board supply voltage / max 4A	This setting should be used if the input voltage of the board matches with the backlight supply voltage. The max backlight current is limited to 4A.

### 8.3. Backlight Dimming (X502)

The range of the analog dimming voltage and the signal high level of the digital PWM dimming signal can be selected with a jumper on connector X502.

X502	Analog Dimming (X101 Pin1)	Digital Dimming (X101 Pin 2)
1-3	0V – 5.0V	High level: 5.0V
3-5	0V - 3.3V	High level 3.3V

Note: Signal polarity can be changed in the panel file.

### 8.4. Backlight Enable Signal (X502, X503)

Select the level of the backlight enable signal (X101 Pin3) with a jumper on connector X502.

X502	Backlight enable signal (X101 Pin3)
2-4	High level 5.0V
4-6	High level 3.3V

Select the polarity of the enable signal with jumper on connector X503.

X503	Backlight enable signal polarity (X101 Pin3)
1-2	High active
2-3	Low active

## 8.5. Panel file configuration

The panel timing is defined in a panel file. To modify the panel file you have to use the Data Modul BoardProgrammer.exe.

The board is shipped out with the correct panel and inverter configuration.

## 9. OSD (On Screen Display)

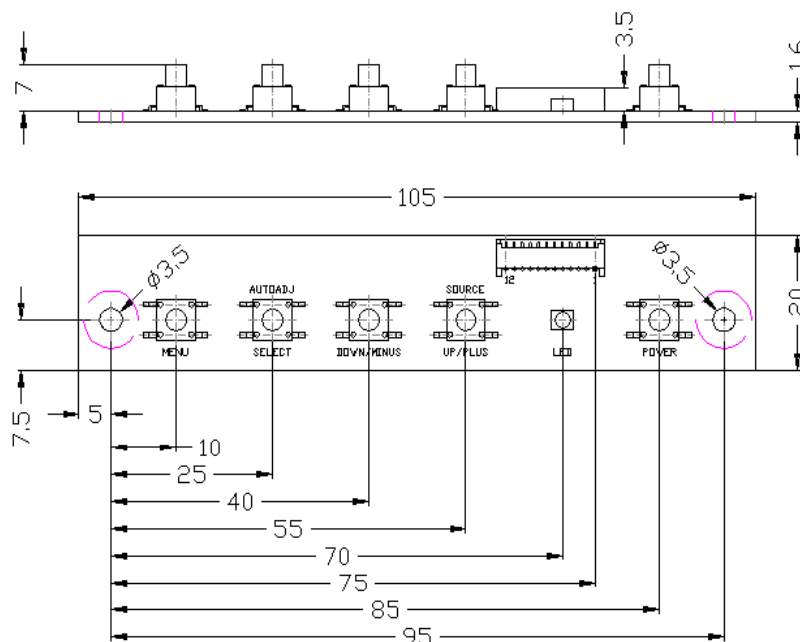
The eMotionST5:3 can operate with an external OSD board (optional item).

Generally the OSD offers the user various possibilities of customizing the appearance of the TFT display. By using the OSD board, brightness, contrast, input selection, OSD appearance and much more can be adjusted easily.

The eMotionST5:3 supports a 5 button OSD. Other customized OSDs (4button/6button) may be realized upon request.

### 9.1. Mechanical dimensions OSD board (CU70008, incl. input cable)

OSD connector CN112: Molex 53015-1210



## 9.2. Operation & buttons

Item	Description
Menu	Enter OSD main menu Leave sub menu Leave OSD main menu
Select	Navigate down in menu
Down / Minus	Navigate left in main menu Decrease value
Up / Plus	Navigate up in main menu Increase value
Power	Turn power on/off
2 color LED	RED / GREEN

## 9.3. Hotkeys

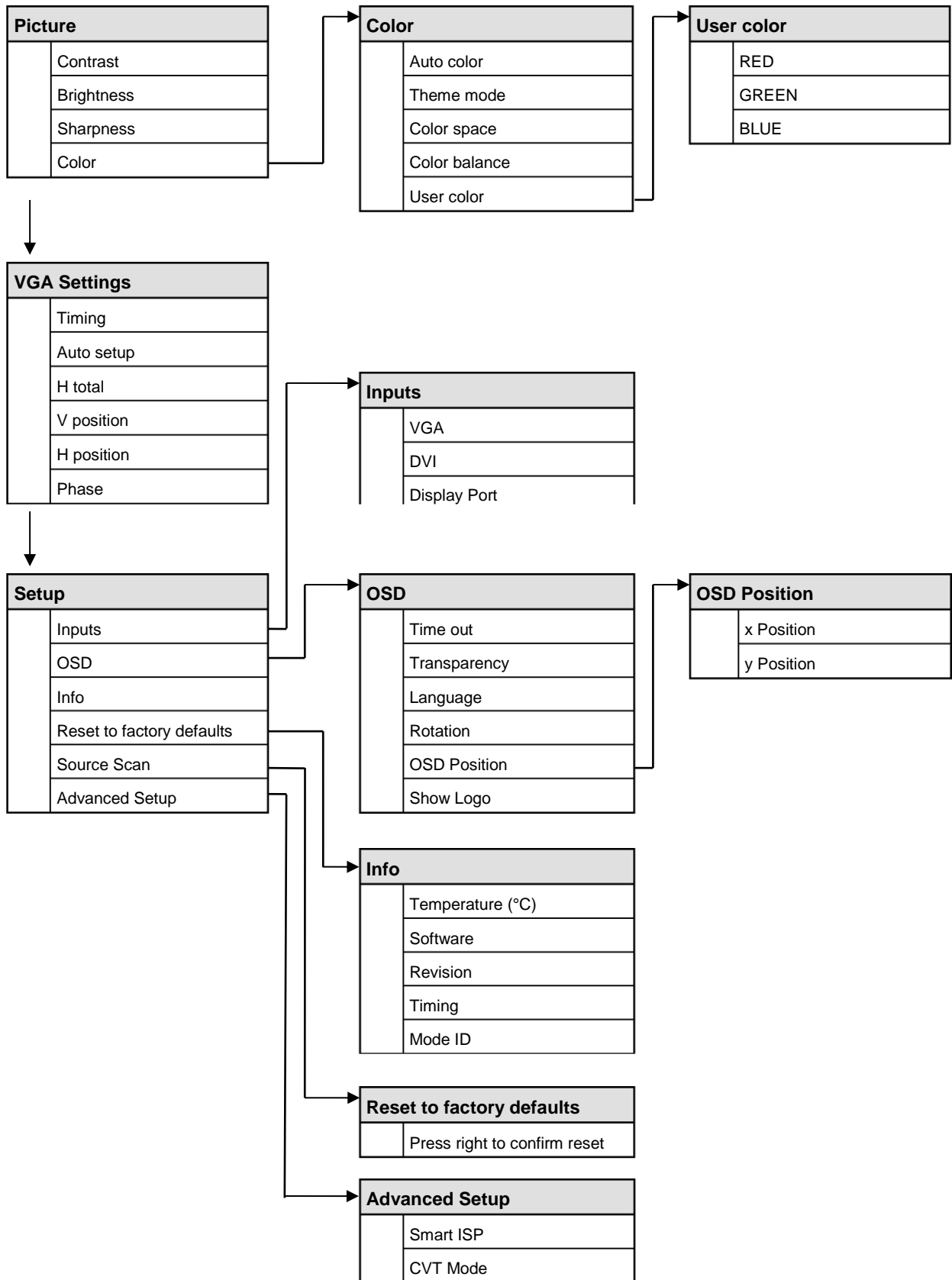
The OSD offers hot key functions. To access these functions the user must not open the OSD via <Menu>. The hotkey functions offer a direct access to the equivalent function.

Button	Direct access
Up / Plus	Source select, switch to next input source
Down / Minus	Brightness
Select	Auto adjust

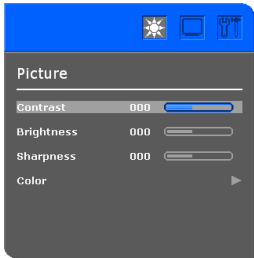
## 9.4. OSD Status LED

Condition	Description
Amber flashing	Stand by (searching input)
Green flashing	Searching display mode (source)
GreenON	OK (displaying signal)
LED OFF	Power off

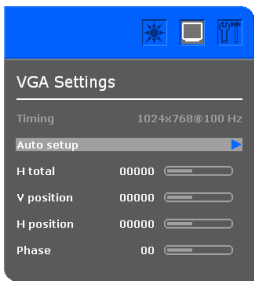
## 9.5. OSD Structure




### 9.5.1 Picture Menu

	Picture	Contrast
		Brightness
		Sharpness
		Color

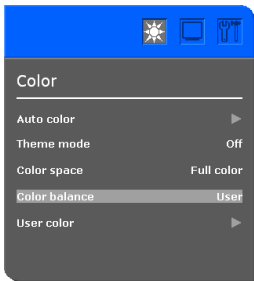
### 9.5.2 VGA Settings Menu

	VGA Settings	Timing
		Auto setup
		H total
		V position
		H position
		Phase


### 9.5.3 Setup Menu

	Setup	Inputs
		OSD
		Info
		Reset to factory defaults
		Source scan
		Advanced Setup

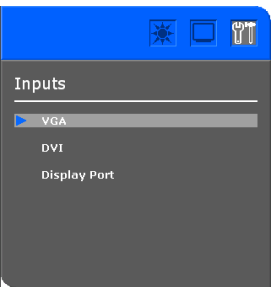
### 9.5.4 Color Menu

	Color	Auto color
		Theme mode
		Color space
		Color balance
		User color


### 9.5.5 User Color Menu

	User color	RED
		GREEN
		BLUE

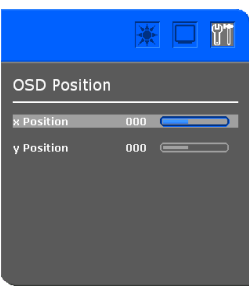
### 9.5.6 Inputs Menu

	Inputs	VGA
		DVI
		DisplayPort

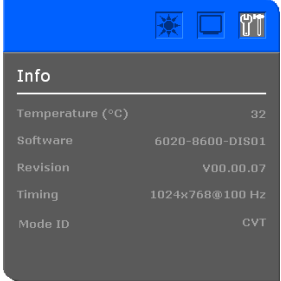
### 9.5.7 OSD Menu

	OSD	Time out
		Transparency
		Language
		Rotation
		OSD Position
		Show logo

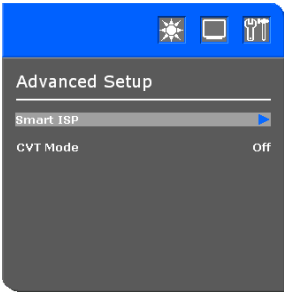
### 9.5.8 OSD Position Menu

	OSD Position	x Position
		y Position

### 9.5.9 Info Menu

	Info	Temperature (°C)
		Software
		Revision
		Timing
		Mode ID

### 9.5.10 Advanced Setup Menu

	Advanced Setup	Smart ISP
		CVT Mode

## 10. Serial Control RS232

The eMotionST5:3 can be controlled by a serial command set using the RS232. For using the RS232 a level converter from LVTTTL to RS232 level must be used. Detailed information about the RS232 protocol are provided on request!

## 11. DDC/CI Interface

The eMotionST5:3 can be controlled by DDC/CI. Detailed information are provided on request!

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