DATA MODUL

eMotion NT5:3

Product Specification

This document might be changed without prior notice

12036010 – eMotion NT5:3 LCD-Controller board

Revision: 003

Date: 2024-03-28

Revision History

Rev.	Date	Author	Modifications
000	05.04.2019	R. Muhler	Initial revision
001	22.07.2020	R. Muhler	Chapter 5.2: EMI standards actualized
002	24.02.2023	R. Muhler	Chapter 4.1: Block diagram corrected
003	28.03.2024	R. Muhler	Update in several chapters

Change History (Optional)

Table of contents

1. Preamble

1.1. *Purpose of this document*

In this document the technical parameters, the electrical connections and the mechanical dimensions of the DATA MODUL LCD-controller-board eMotionNT5:3 are described. The eMotionNT5:3 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 eMotionNT5:3.

1.2. *Abbreviations*

I²C	INTER-IC
I²S	INTER-IC-SOUND
EMI	ELECTRO MAGNETIC INTERFERENCE
EMC	ELECTRO MAGNETIC COMPATIBILITY
EN	EUROPEAN NORM
ESD	ELECTRO STATIC DISCHARGE
UL	UNDERWRITER LAB
PCB	PRINTED CIRCUIT BOARD
SMT	SURFACE MOUNT TECHNOLOGY
ROHS	RESTRICTION FOR THE USE OF HAZARDOUS SUBSTANCES
NC	NOT CONNECTED
T.B.D.	TO BE DEFINED
LVDS	LOW VOLTAGE DIFFERENTIAL SIGNALING
TMDS	TRANSITION MINIMIZED DIFFERENTIAL SIGNALING
DVI	DIGITAL VIDEO INTERFACE
DP	DISPLAY PORT
EDP	EMBEDDED DISPLAY PORT
OSD	ON SCREEN DISPLAY
DPMS	DISPLAY POWER MANAGEMENT SIGNALING
VESA	VIDEO ELECTRONICS STANDARDS ASSOCIATION
DDC / CI	DISPLAY DATA CHANNEL / COMMAND INFERFACE
VGA	VIDEO GRAPHICS ARRAY
UXGA	ULTRA EXTENDED GRAPHICS ARRAY
USB	UNIVERSAL SERIAL BUS
VBO / VX1	V-BY-ONE (VIDEO BY ONE)

2. Product description

2.1. *Functionally description of the product*

Based on the latest design of highly integrated LCD controller NT68862, the eMotionNT5:3 board is able to control panels from VGA up to WUXGA. The eMotionNT5:3 can drive panels with LVDS.

The eMotionNT5:3 graphic controller board can be connected to input signals coming from DP-, HDMI- and VGA-sources.

The board can be controlled by a 5-key OSD keyboard, by RS232 and IR-controller, it is compatible with VESA DPMS, DDC2B, DDC/ CI.

2.2. *Special Features*

- DP 1.2 compliant input (HBR)
- HDMI 1.4 (digital 165MHz)
- VGA (analoge 205MHz)
- Up to WUXGA with 170MHz to the panel (8bit)
- 10-bit color processing
- Single power supply +12V / +24V DC
- Built in power on/off sequencing controller for panel power as well as for backlight
- Support of 3.3V, 5.0V, 12.0V* panel voltage and 12V/ 24V* backlight voltage
- Built in DC/DC-regulator for up to 12V - 3A backlight current
- Analog & PWM dimming support for backlight
- Remote control by RS232 or DDC/CI or 5 button board
- Multilingual OSD
- Panel file in separate EEPROM (option)
- height of components incl. pcb is below 9mm
- onboard temperature sensor
- I2S-Audio out

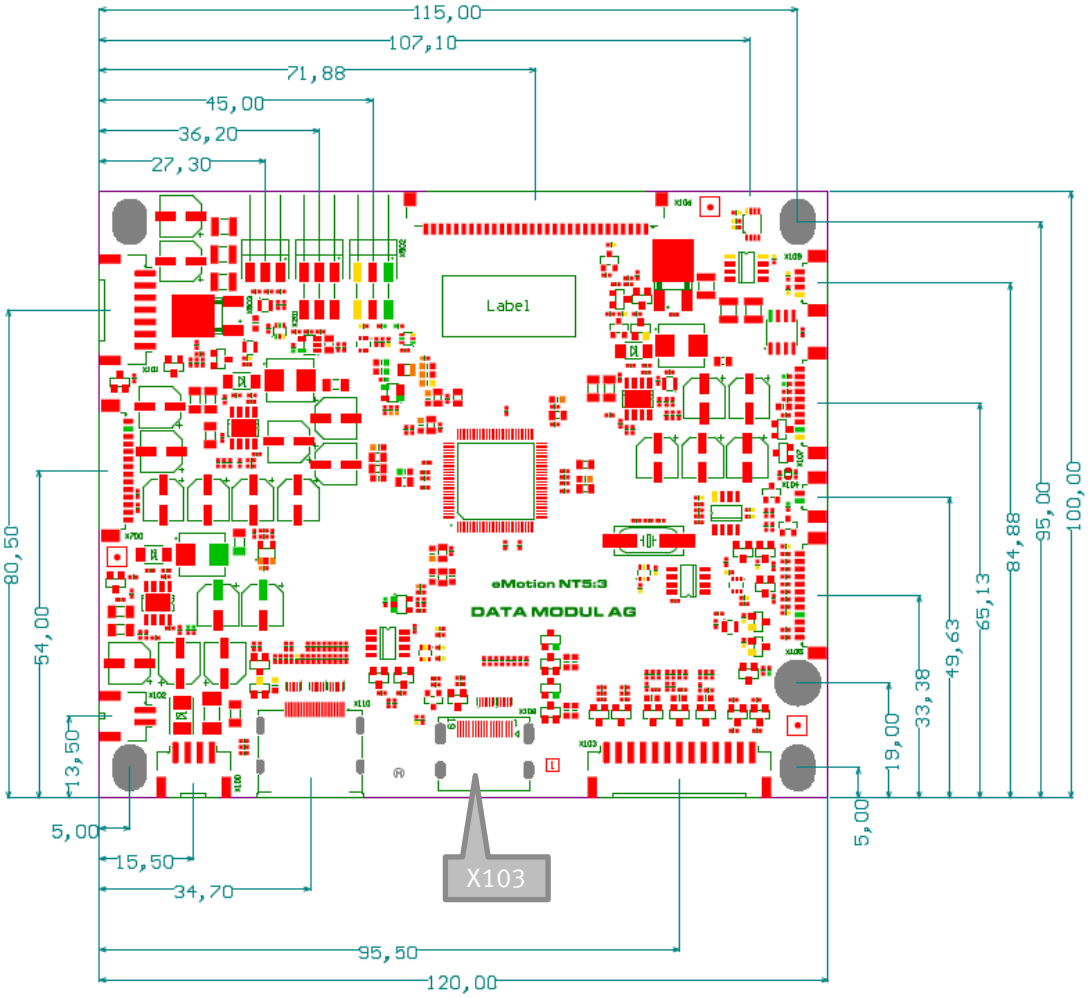
*: 12V panel voltage and 24V backlight voltage are only available if input voltage is 24V!

3. PCB description

3.1. *Dimensions of eMotionNT5:3*

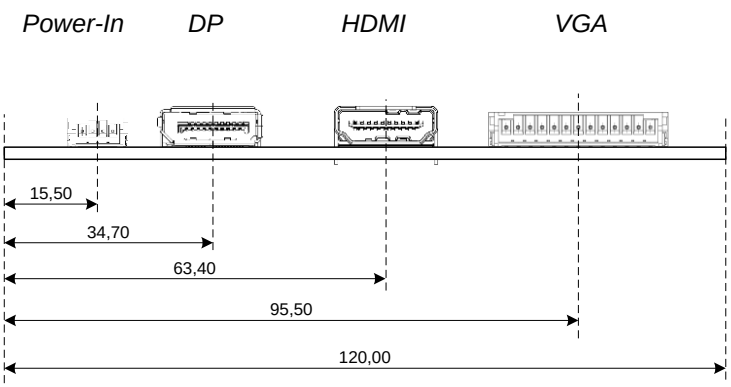
Dimensions: 120 mm (L) x 100 mm (W) x 9 mm (H). Mounting holes diameter: 5 x 3.5mm

(Remark: The dimensions of eMotionNT5:3 are the same as eMotionST5:3. Most of the connectors will have the same position as on the eMotionST5:3. Exception: X103 is now implemented as HDMI-connector)

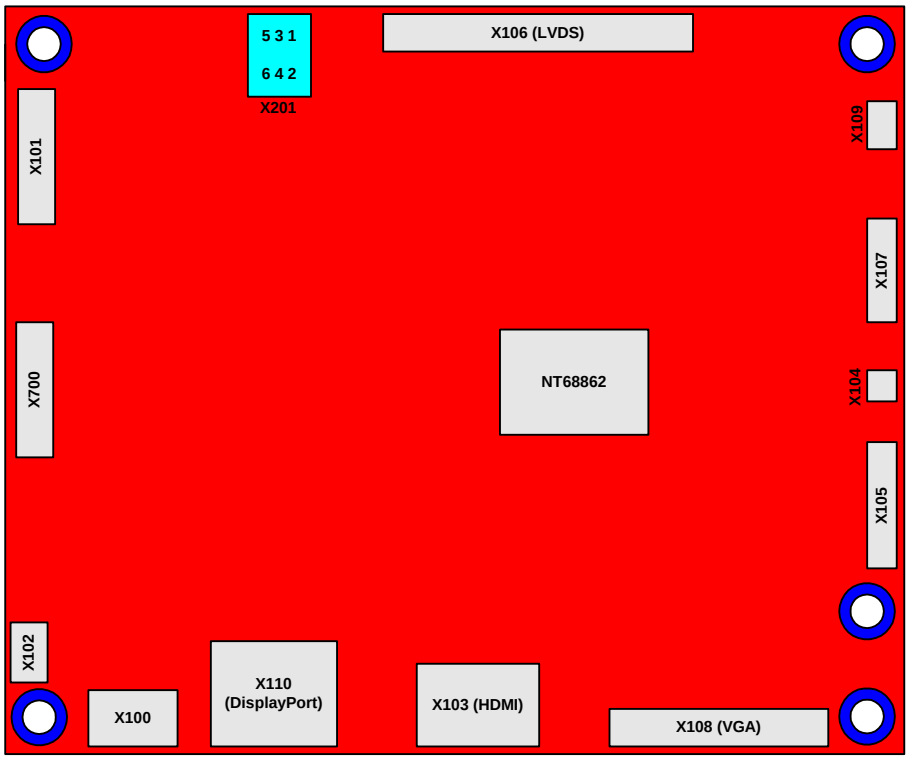


All dimensions can be found in DATA MODUL file-Nr.: *12036012_Rev001_PcbComposite.PDF*

3.2. *Connector Panel*



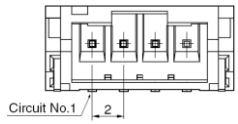
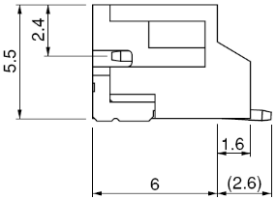
3.3. *Connector overview*



Item	Description	Remarks
X100	Power In	4pin, right angle
X101	Backlight connector	7pin, right angle
X102	Power In	2pin, right angle
X103	HDMI input	19pin HDMI-connector without flange, female
X105	OSD-keyboard connector	12pin, right angle, Molex 53015-1210
X106	LVDS Dual link output	Hirose DF14-30P-1.25H
X107	GPIO connector	10pin multi functions connector (53261-1071) (I²C lines, FAN-supply and -signals, GPIOs)
X108	VGA input	13 pin, right angle (No D-Sub!)
X109	RS232 connector	4pin, right angle, RS232 LVTTL Signal (MOLEX 53261-0471)
X110	DP input	20pin DisplayPort connector without flange
X201	Jumper block for Backlight supply voltage	6pin double row connector, right angle Note: both jumper cabs X800 and X801 must be set on same side of X201
X700	I2S-Audio Connector	14 pin connector, right angle, Molex 53261-1471, to digital audio board

3.4. *Input voltage connector, X100*

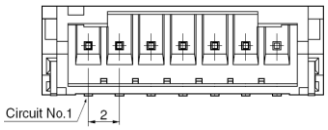
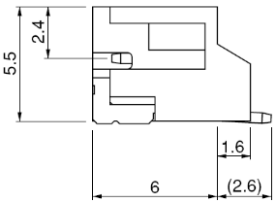
Type JST: S4B-PH-SM4-TB, SMT, Side entry type, RM 2.0mm; or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Front-View	1	GND	I/O	GND / 2A*
	2	GND	I/O	GND / 2A*
 Side-View	3	+V_IN	I	+Vin: +12V/2A* or +24V/2A*
	4	+V_IN	I	+Vin: +12V/2A* or +24V/2A*

*: 4A is max current capability of connector. Real input current depends on connected display and backlight inverter!

3.5. *Backlight Supply Voltage and Control connector, X101*

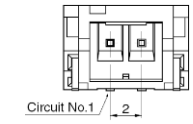
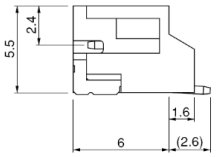
Type JST: S7B-PH-SM4-TB, SMT, Side entry type, RM 2.0mm; or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	BLT.ADIM	O	Analog dimming voltage
 Front-View	2	BLT.PWM	O	PWM diming output*
	3	BLT.EN	O	ON/OFF **
	4	BLT_VCC*	O	Operating voltage +12V / +24V
 Side View	5	BLT_VCC*	O	Operating voltage +12V / +24V
	6	GND	I/O	Ground
	7	GND	I/O	Ground

* Note: BLT_VCC is selectable with the jumpers on X201. For details see chapter 3.14 and 4.5!

3.6. *Input voltage connector, X102*

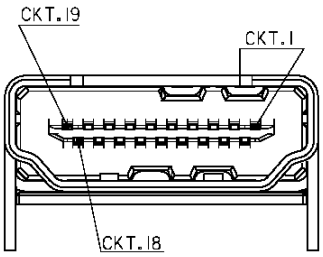
Type JST: S2B-PH-SM4-TB, SMT, Side entry type, RM 2.0mm; or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Front-View  Side View	1	GND	I/O	GND / 2A*
	2	+V_IN	I	+12V/2A or +24V/2A*

*: 2A is max current capability of connector. Real input current depends on connected display and backlight inverter!

3.7. *HDMI input connector, X103*

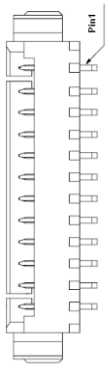
Type Nexus 3600HFR; MOLEX: 47151-0001; or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Front-View	1	TX2_P	In	TMDS Data2+
	2	GND		TMDS Data2 Shield
	3	TX2_N	In	TMDS Data2-
	4	TX1_P	In	TMDS Data1+
	5	GND		TMDS Data1 Shield
	6	TX1_N	In	TMDS Data1-
	7	TX0_P	In	TMDS Data0+
	8	GND		TMDS Data0 Shield
	9	TX0_N	In	TMDS Data0-
	10	TXC_P	In	TMDS Data-Clock+
	11	DET	In	Detect pin for cable connection
	12	TXC_N	In	TMDS Data-Clock-
	13	NC		No internal Connection
	14	NC		No internal Connection
	15	DDC_SCL	In	I2C-Clock, +5V level
	16	DDC_SDA	I/O	I2C-Data, +5V level
	17	GND		DDC/CEC-GND
	18	HDMI_5V	In	+5V Power / max. 20mA*
	19	HPD	Out	Hot Plug Detect Signal

*: +5V Power is delivered from signal source (e.g. PC), it is only used for EDID- and Hot-Plug circuit.

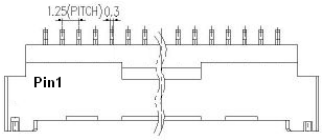
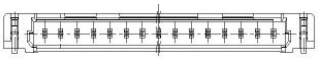
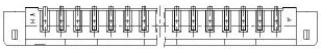
3.8. *OSD-Keyboard-Connector, X105*

Type MOLEX: 53261-1271, SMT Side entry type, 12pin, pitch 1.25mm; or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Top-View	1	OSD.LED1	O	LED Green
	2	OSD.LED2	O	LED RED
	3	OSD.IR	I	IR remote
	4	+5V	O	5V / max. 20mA
	5	GND	I/O	Ground
	6	OSD.SW3	I	Button3 (UP)
	7	OSD.SW2	I	Button2 (DOWN)
	8	OSD.SW4	I	Button4 (SELECT)
	9	OSD.SW6	I	Button6 (POWER)
	10	OSD.SW1	I	Button1 (MENU)
	11	OSD.SW5	I	Button5 (SPECIAL)
	12	GND	I/O	Ground

3.9. *LVDS-output connector, X106*

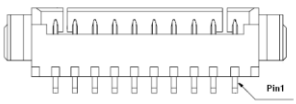
Type Hirose: DF14-30P-1.25H; YEONHO: 12507WR-30; SMT Side entry type, 30 pin, RM 1.25mm or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Top-View	1	Panel VCC	O	Panel VCC *
	2	Panel VCC	O	Panel VCC*
	3	Panel VCC	O	Panel VCC*
	4	Panel VCC	O	Panel VCC*
	5	GND	I/O	GROUND
	6	Reverse_Scan#	O	Digital out (3V3 or 0V), e.g. for LVDS-select
	7	GND	I/O	Ground
	8	LVDS.TXA3_P	O	TX3 even positive
	9	LVDS.TXA3_N	O	TX3 even negative
	10	LVDS.TCLKA_P	O	Clock even positive
 Front-View	11	LVDS.TCLKA_N	O	Clock even negative
	12	LVDS.TXA2_P	O	TX2 even positive
	13	LVDS.TXA2_N	O	TX2 even negative
	14	GND	I/0	Ground
	15	LVDS.TXA1_P	O	TX1 even positive
	16	LVDS.TXA1_N	O	TX1 even negative
	17	LVDS.TXA0_P	O	TX0 even positive
 Rear-View	18	LVDS.TXA0_N	O	TX0 even negative
	19	GND	I/O	Ground
	20	LVDS.TXB3_P	O	TX3 odd positive
	21	LVDS.TXB3_N	O	TX3 odd negative
	22	LVDS.TCLKB_P	O	Clock odd positive
	23	LVDS.TCLKB_N	O	Clock odd negative
	24	LVDS.TXB2_P	O	TX2 odd positive
	25	LVDS.TXB2_N	O	TX2 odd negative
	26	GND	I/O	Ground
	27	LVDS.TXB1_P	O	TX1 odd positive
	28	LVDS.TXB1_N	O	TX1 odd negative
	29	LVDS.TXB0_P	O	TX0 odd positive
	30	LVDS.TXBO_N	O	TX0 odd negative

* Note: Pin1, 2, 3, 4: Output voltage 3.3V or 5.0V or 12.0V – selected by firmware. For details about current consumption on Panel VCC see chapter 4.4.

3.10. *GPIO connector, X107*

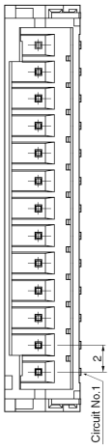
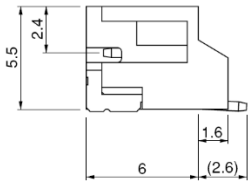
Type MOLEX: 53261-1071; YEONHO: 12505WR-10; SMT Side entry type, 10 pin, RM 1.25mm or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Top-View	1	+3V3_DVDD	O	3.3V / max. 50mA
	2	+5V	O	5V / max. 100mA
	3	Fan_PWM	O	Fan speed control (5V-Level)
	4	GPIO3	I/O	GPIO (connected to I²C-I/O-Expander D905)
	5	Fan_Vcc	I/O	Fan operating voltage (= +V_IN)*
	6	GPIO1	I/O	GPIO (connected to I²C-I/O-Expander D905)
	7	GPIO2	O	GPIO (connected to I²C-I/O-Expander D905)
	8	I2C_EXT.SCL	I/O	I²C SCL (5V-Level)
	9	I2C_EXT.SDA	I/O	I²C SDA (5V-Level)
	10	GND	I/O	Ground

*: max. load on pin 5 should be 1A

3.11. *VGA input connector, X108*

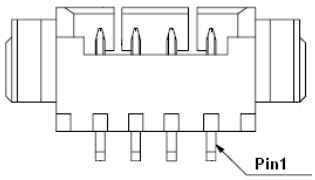
Type JST S13B-PH-SM4-TB, SMT, Side entry type, RM 2.0mm; or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Front-View	1	VGA_IN.HSync	I	Horizontal Sync
	2	GND	I/O	Ground
	3	VGA_IN.VSync	I	Vertical Sync
	4	VGA_5V	I	+5V_DC*
	5	VGA_IN.Blue	I	Blue analog input
	6	GND	I/O	GND
	7	VGA_IN.Green	I	Green analog input
	8	GND	I/O	GND
	9	VGA_IN.Red	I	Red analog input
	10	GND	I/O	GND
	11	VGA_I2C.SCL	I	DDC SCL
	12	VGA_I2C.SDA	I/O	DDC SDA
	13	VGA_IN.DET	I	Detect pin for cable connection
 Side-View				

*: +5V_VGA Power is delivered from signal source (e.g. PC), it is only used for EDID-circuit. Max. current is 20mA

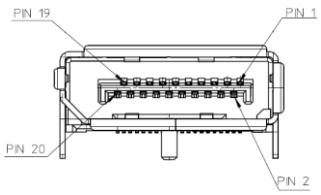
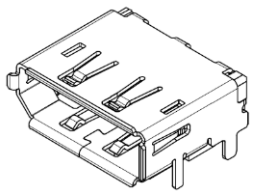
3.12. *RS232-connector, X109*

Type MOLEX: 53261-0471, SMT Side entry type, 4 pin, RM 1.25mm; or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Top-View	1	+3V3_DVDD	O	+3V3 / max. 20mA
	2	UART.TX	O	Transmit Data (LVTTL)
	3	UART.RX	I	Receive Data (LVTTL)
	4	GND	I/O	Ground

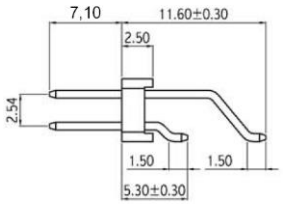
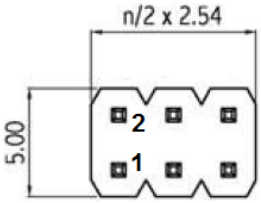
3.13. *Display-Port input connector, X110*

Type W+P: 8470-2-2-1-80-TR; MOLEX: 47272-0001; or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Front-View 	1	DP_IN.L3_N	I	Main Link Ch. 3 Differential Input negative
	2	GND	I/O	Ground
	3	DP_IN.L3_P	I	Main Link Ch. 3 Differential Input positive
	4	DP_IN.L2_N	I	Main Link Ch. 2 Differential Input negative
	5	GND	I/O	Ground
	6	DP_IN.L2_P	I	Main Link Ch. 2 Differential Input positive
	7	DP_IN.L1_N	I	Main Link Ch. 1 Differential Input negative
	8	GND	I/O	Ground
	9	DP_IN.L1_P	I	Main Link Ch. 1 Differential Input positive
	10	DP_IN.L0_N	I	Main Link Ch. 0 Differential Input negative
	11	GND	I/O	Ground
	12	DP_IN.L0_P	I	Main Link Ch. 0 Differential Input positive
	13	DP_IN.CONFIG1	O	Config Pin1, connected to GND with 1M
	14	DP_IN.CONFIG2	O	Config Pin2, connected to GND with 1M
	15	DP_IN.AUX_P	I	Auxiliary Ch. Differential Input positive
	16	DP_IN.DET	I/O	Detect pin for cable connection
	17	DP_IN.AUX_N	I	Auxiliary Ch. Differential Input negative
	18	DP_IN.HPD	I/O	Hot Plug Detect
	19	DP_IN.RTN	I/O	Connected to Ground with 0R
	20	N.C.		Not Connected to internal circuits

3.14. *BLT_VCC-Select, X201*

Type W+P: 3131-13-006-50; or equivalent

Pin arrangement	Pin	Signal	I/O	Description
  Side- and Front-View	1	V_IN_Fused		Input-Voltage
	2	V_IN_Fused		Input-Voltage
	3	BLT_VCC		Voltage for BL-Inverter*
	4	BLT_VCC		Voltage for BL-Inverter*
	5	+12V_BLT_VCC		+12V from Regulator
	6	+12V_BLT_VCC		+12V from Regulator

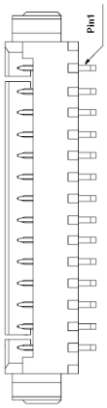
‘Note: two jumper cabs must be mounted on same side of X201, i.e. on 1-3 and 2-4 OR 3-5 and 4-6!

For details of mounting see chapter 4.5

Jumper Type W+P: 165-101-10-00

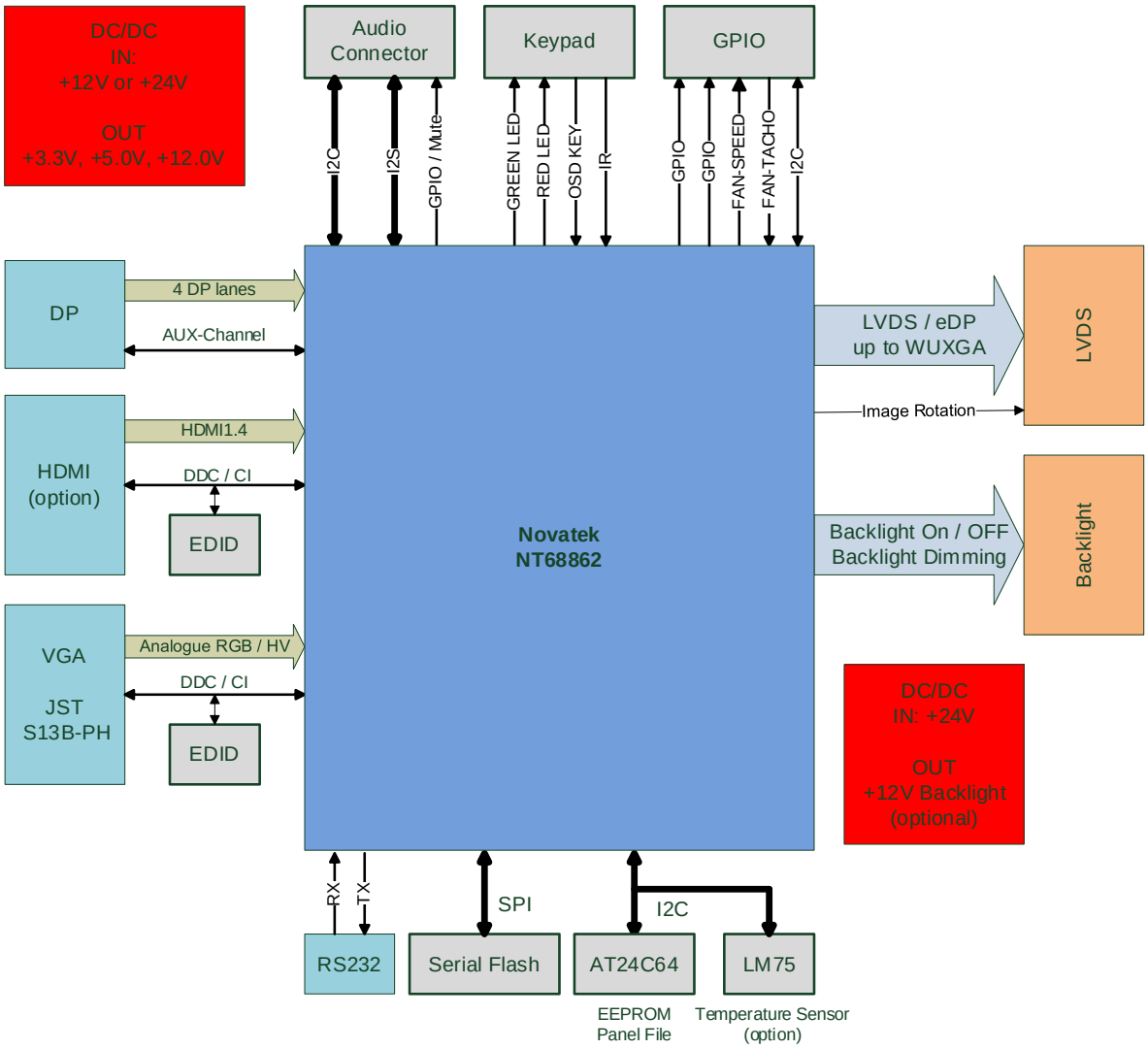
3.15. *I2S-Audio Connector, X700*

Type MOLEX: 53261-1471, SMT Side entry type, 14 pin, RM 1.25mm ; or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Top-View	1	GND	I/O	Ground
	2	+5V	O	Power / max. 100mA
	3	I2S_WS	O	I2S Word Select
	4	GND	I/O	Ground
	5	I2S_Data	O	I2S Data
	6	GND	I/O	Ground
	7	I2S_SCLK	O	I2S Clock
	8	GND	I/O	Ground
	9	I2S_MCLK	O	I2S MCLK
	10	GND	I/O	Ground
	11	AUDIO_MUTE	O	MUTE
	12	AUDIO_GPIO	I/O	GPIO
	13	I2C_EXT.SDA	I/O	I2C SDA (5V level)
	14	I2C_EXT.SCL	O	I2C SCL (5V level)

4. Technical Details

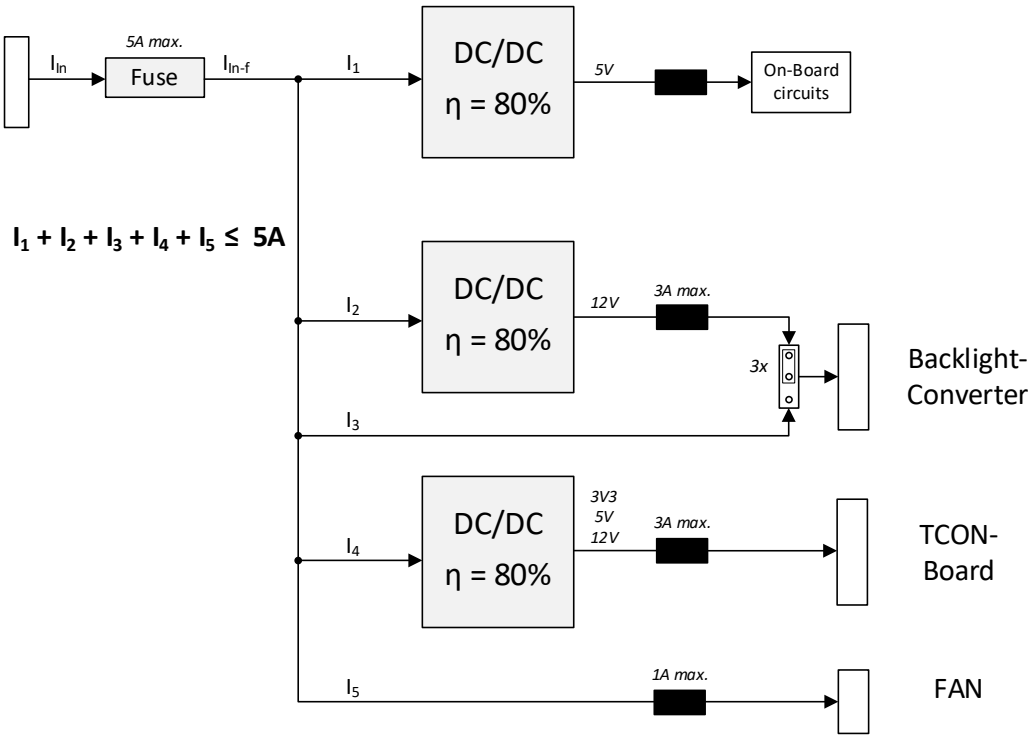
4.1. Block diagram



eMotionNT5:3 Block Diagram

4.2. *Supply voltages, fuse rating and current consumption*

Power distribution on eMotionNT5:3 (details in following chapters):



The eMotionNT5:3 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 eMotionNT5:3.

The eMotionNT5:3 is protected by an onboard fuse.
The nominal current rating of the fuse is 5A@25°C. The temperature rerating of the fuse causes that the fuse will open at currents lower than 5A when temperature increases, e.g. 4.5A@125°C => total input current should not exceed 4.5A

Onboard current consumption:

Supply voltage	Nominal value	Regulation	Ripple & noise	Onboard current consumption	
				Operating	Stand-By / Power-Off
+12V	+12V	+/-10%	0.3V	200mA max.	40mA max.
+24V	+24V	+/-10%	0.3V	100mA max.	20mA max.

The output voltage for the backlight inverter (X101) can be set to the DC input voltage V_IN of the eMotionNT5:3 (X100 resp. X102) or to +12V when V_IN is +24V. For these setting see see chapter *3.14 BLT_VCC-Select and 4.5 Backlight Inverter Supply*.

4.3. *Configuration Options on eMotionNT5:3*

eMotionNT5:3 can drive panels with different values for TCON-supply-voltage. Additionally backlight inverters with different values for backlight PWM-voltage / backlight enable-voltage and backlight logic-level can be driven.

Values for TCON-supply-voltage / backlight PWM-voltage and backlight enable voltage will be set by firmware on eMotionNT5:3! I.e. to ensure functionality of connected TFT it is necessary to program the correct firmware on eMotionNT5:3 first!
Backlight enable-logic-level is set by 0R-resistor (hardware mounting option)

Possible adjustments:

Value	Can be set to...		
TCON-supply-voltage	+3V3	+5V	+12V*
Backlight PWM-voltage	+3V3	+5V	
Backlight enable voltage	+3V3	+5V	
Backlight enable-logic-level	Active high (default)	Active low (mounting option)	

*: +12V for TCON-supply is only possible when input voltage is +24V

4.4. *TCON-current capability of eMotionNT5:3*

eMotionNT5:3 can deliver the following supply currents to a connected TCON-board

TCON Voltage	Nominal value	Max Current (total)	Ripple & noise
+3V3	3V3	3A	0.15V
+5V	5V	3A	0.15V
+12V	12V	3A	0.15V

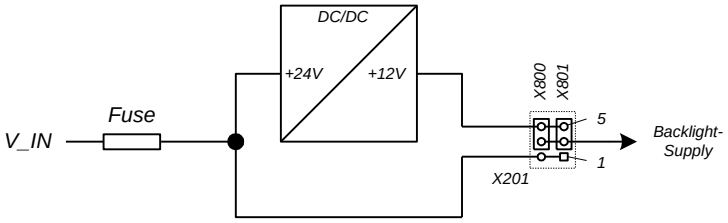
TCON-voltage is suppled to TCON-board by pins with signal Panel VCC on X106

4.5. *Backlight Inverter Supply*

There are very many backlight inverters available for driving TFT backlights. Supply voltage for these inverters can be different.
Amongst others backlight inverters can operate with input voltages of +12V or +24V or have an input range from +12V to +24V. These inverters can be driven by eMotionNT5:3.
To handle the different backlight inverters the backlight supply voltage can be routed in 2 different ways on eMotionNT5:3:

- Input voltage (V_IN) supplies DC/DC-regulator and output of this regulator ist backlight supply voltage
- Input voltage (V_IN) is directly connect to backlight inverter supply input

The routing can be set by the user by setting jumper cabs X800, X801 on connector X201:



Depending on eMotionNT5:3 input voltage and required input voltage for the backlight inverter the jumpers on X201 have to be set in the following way:

V_IN	BLT_VCC	Jumper-Position on X201
+12V	+12V	1-3; 2-4
	+12V…+24V	1-3; 2-4
	+24V	Not possible
+24V	+12V	3-5; 4-6
	+12V…+24V	1-3; 2-4
	+24V	1-3; 2-4

4.6. *Backlight-current capability of eMotionNT5:3*

Output current of eMotionNT5:3 for a connected backlight inverter depends on configuration of eMotionNT5:3:

- If jumper cabs X800, X801 are mounted to 3-5 and 4-6 on X201, i.e. Vin=+24V and V_BL=+12V (see chapter above), the output current is limited to 3A
- If onboard regulator for BLT_VCC is not used, i.e. BLT_VCC =V_IN, the sum of output current for BLT_VCC, the onboard current consumption and the TCON-board current consumption may not exceed the current capability of used input connector for V_IN.

4.7. Input and output signals

4.7.1st DP input

According to DisplayPort V1.2,

DP input supports:

- RBR/HBR with 1,2 or 4 lanes
- AUX CH 1 Mbps
- HDCP 1.1 Compliant
- HPD out

4.7.2nd HDMI input

PARAMETER	MIN	TYP	MAX	UNIT	Remark
Termination Supply Voltage AV_{CC}	3,135	3.3	3,465	V	
Differential Input Voltage	150		1200	mV	
Input Common Mode Voltage	AV_{CC} -300		AV_{CC} -37	mV	
Input Clock frequency	20		165	MHz	

4.7.3rd 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	Vpp	at 75R
SOG level		0,3		V	at 75R

4.7.4th LVDS connector (output)

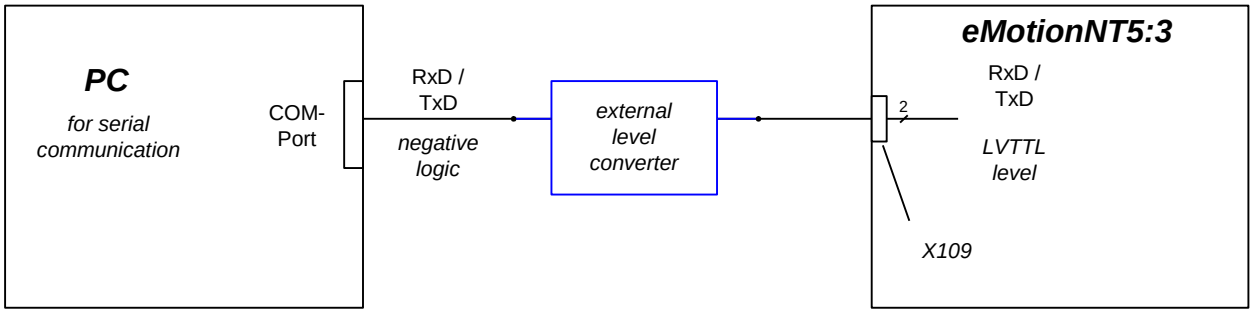
PARAMETER	MIN	TYP	MAX	UNIT	Remark
Differential Output Voltage	300	500	700	mV	
Common Mode Voltage		1.25		V	
Clock Frequency			100 90	MHz	Single Channel Dual Channel

4.8. *Serial Communication with eMotionNT5:3*

The eMotionNT5:3 can be controlled by RS232 commands which can be send by COM-port of PC e.g..

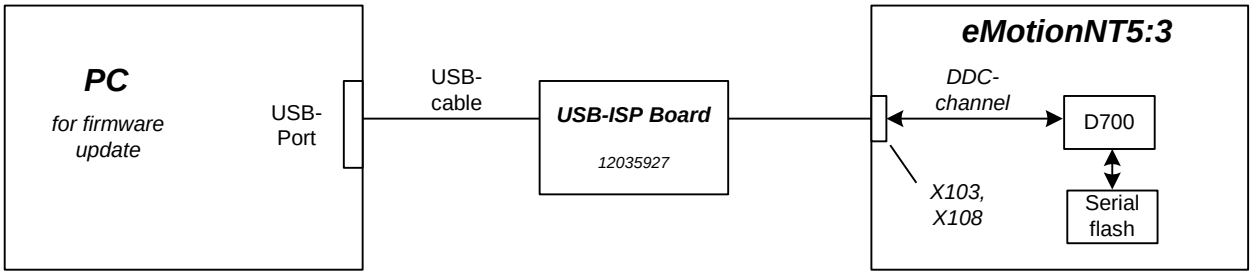
RS232-signals RxD and TxD at X109 should have LVTTL-level.

⇨ for communication an external level converter is needed!



4.9. *Firmware Update on eMotionNT5:3*

Firmware update on eMotionNT5:3 is done over DDC-channel of video-inputs HDMI or VGA. An USB-ISP Board is necessary for this operation!
This board is connected to PC with USB2.0 cable and to eMotionNT5:3 with videocable to input HDMI or VGA.



Details for firmware update on request.

5. Qualification

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 3000m)	

5.2. *EMI-Standards*

Designed to meet EMC (Electro-Magnetic Compatibility): Emission standard for industrial environments, according to EN 61000-6-4 and Immunity for industrial environments, according to EN 61000-6-2:

Description	Requirements	Test parameter	Criteria
Electromagnetic compatibility of multimedia equipment - Emission Requirements	EN 55032		Class A
Electrostatic discharge immunity test	EN 61000-4-2	±4 kV contact discharge, ±8 kV air discharge	Criteria B
Radiated, radio frequency, electromagnetic field immunity test	EN 61000-4-3	80-1000 MHz 10 V/m, 1,4-6 GHz 3 V/m 80 % AM (1 kHz)	Criteria A
Electrical fast transient/burst immunity test	EN 61000-4-4	±1 kV on I/O lines	Criteria B
Immunity to conducted disturbance, induced by radio-frequency fields	EN 61000-4-6	0,15 – 80 MHz 10 V_{rms} 80 % AM (1 kHz)	Criteria A
Immunity to magnetic field	EN 61000-4-8	30 A/m	Criteria 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. aluminum enclosure).

5.3. *Safety*

- Designed to meet IEC 62368-1
- Designed to meet UL 62368-1

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

5.5. *Reliability, MTBF*

- min. 500.000h at Ta = 40°C, determined according to Telcordia SR-332

6. Warranty, Quality and Environmentalism

6.1. *Warranty*

- Manufacturer warranty: 12 month after delivery

6.2. *Quality*

The producing process of the board is aligned with the guideline according to the DIN ISO 9001 certification.

Workmanship standard: IPC-A-610D Class2

6.3. *Environmentalism*

The list of used materials is based on the parts list, which is available at DATA MODUL ERP-system

The PCB is produced under lead free soldering conditions.

All components are produced according to European RoHS (RoHS-1 = 2002/95/EU, RoHS-2 = 2011/65/EU) and REACh (2006/1907/EU) regulations. The board is designed and manufactured to meet ISO 14001.

The packing complies to directive 1994/62/EU.

7. Label and package

7.1. *Label and material number*

The following points are visible on the label of the eMotionNT5:3 board.

- Material number
- Serial- and Revision-number
- Manufacturing date

7.2. *Marking of PCB*

The following points are visible on the PCB of the eMotionNT5:3 board.

- DATA MODUL Logo
- UL-Sign on PCB
- E-File-No. of PCB manufacturer

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