

# eMotion NT1:3

## Product Specification

This document might be changed without prior notice

12034795 – eMotion NT1:3 Standard – LCD-Controller board

12038990 – eMotion NT1:3 – G – LCD-Controller board

Revision: 003

Date: 2020-07-22

## Revision History

Rev.	Date	Author	Modifications
000	09.01.2019	R. Muhler	Initial revision
001	15.03.2019	R. Muhler	Pin 1 of CN109 (chapter 3.3) corrected, pin 3 of CN114 is N.C. (chapter 3.17), added description of CN116 (chapter 3.19), added TCON max current in chapter 4.4, added backlight current capability on chapter 4.6
002	05.06.2019 17.09.2019 13.12.2019	R. Muhler	Added eMotionNT1:3-G in specification (this is just a reduced variant of former eMotionNT1:3). Chapter 7 adapted. TCON-current reduced to 2.5A and TCON-ripple increased to 150mV (chapter 4.4)
003	22.07.2020	R. Muhler	Chapter 5.2: EMI standards actualized

Change History (Optional)

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## 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 eMotionNT1:3 are described

### 1.2. *Abbreviations*

I <sup>2</sup> C	INTER-IC
I <sup>2</sup> S	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 INTERFACE
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 eMotionNT1:3 board is able to control panels from VGA up to WUXGA. The eMotionNT1:3 can drive panels with LVDS.

The eMotionNT1:3 graphic controller board can be connected to input signals coming from DP-, VGA- and DVI-D-sources.

The board can be controlled by a 5-key OSD keyboard and IR-controller.

The interface board is compatible with VESA DPMS, DDC2B, DDC/CI and can be controlled by RS232.

### 2.2. *Special Features*

- DP 1.2 compliant input (HBR)
- DVI-I on request (analoge 205MHz / digital 165MHz)
- 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)

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

\*\* : regulator is not implemented on eMotionNT1:3-G

### 2.3. *Versions of eMotionNT1:3*

The eMotionNT1:3 board is available in 2 versions which can be ordered by a different article number:

**12034795** eMotion NT1:3 Standard

**12038990** eMotion NT1:3 – G

The eMotionNT1:3-G (Gaming) is an assembly version of the eMotionNT1:3 Standard. Some functions and connectors are not implemented or mounted.

On eMotionNT1:3-G there is no built in DC/DC regulator for +12V backlight supply, i.e. backlight supply is always identical to input voltage  $V_{in}$

Overview of connectors which are mounted on the variants is given in chapter 3.3.

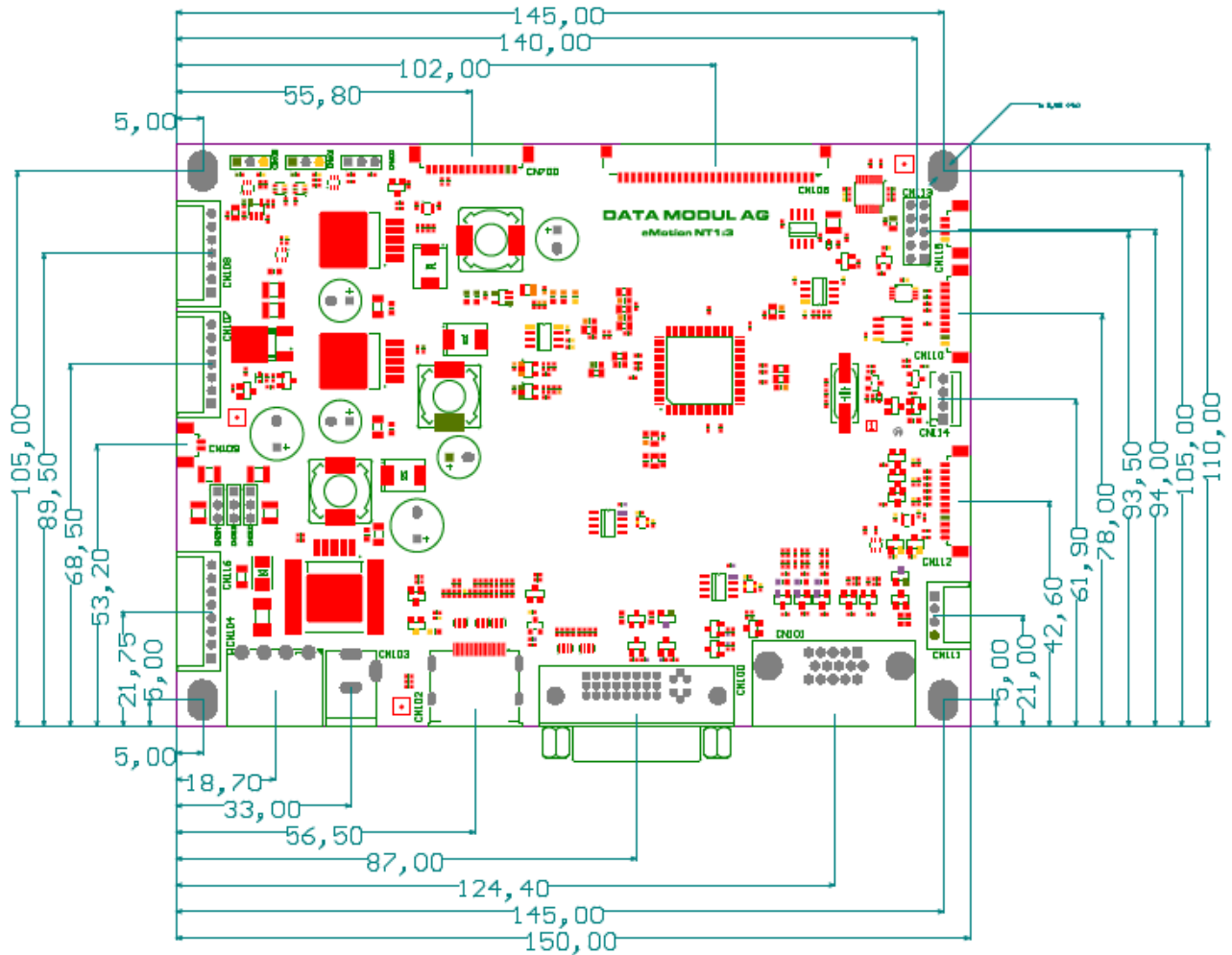
Talking about eMotionNT1:3 hereinafter always both variants are meant. If only one variant is meant it is written explicitly (eMotionNT1:3 Standard or eMotionNT1:3-G).

### 3. PCB description

#### 3.1. Dimensions of eMotionNT1:3

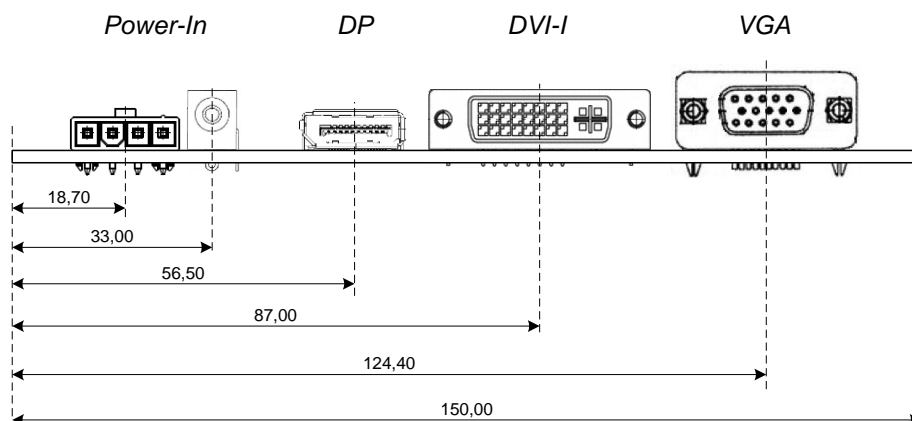
Dimensions: 150 mm (L) x 110 mm (W) x 17 mm (H). Mounting holes diameter: 4 x 3.5mm

(Remark: The dimensions of eMotionNT1:3 will be the same as eMotionST1:3. Most of the connectors will have the same position as on the eMotionNT1:3)



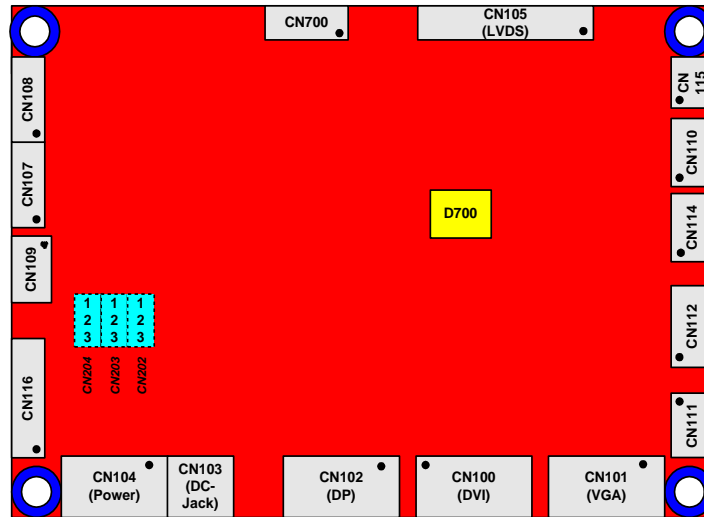
All dimensions can be found in DATA MODUL file-Nr.: 12034798\_Rev000\_PcbComposite.PDF

#### 3.2. Connector Panel



### 3.3. Connector overview

#### 3.3.1 Connectors on eMotionNT1:3 Standard

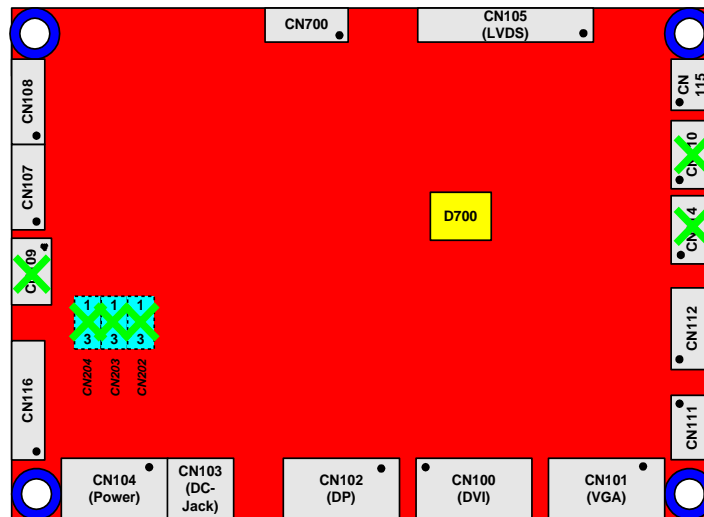


Item	Description	Remarks
CN100	DVI input	24 pin DVI-I connector, female
CN101	VGA input	15 pin HD-Sub connector, female
CN102	DP input	DisplayPort connector without flange
CN103	Power	DC-Jack 2.5mm
CN104	Power	4pin connector, max 5A
CN105	LVDS Dual link output	30pin Display Interface Connector (LVDS)
CN107	Backlight connector	7pin, Power supply / dimming
CN108	Backlight connector	7pin, Power supply / dimming
CN109	Inverter Switch	2pin, Inverter switch signal
CN110	GPIO connector	10pin multi functions connector
CN111	Systembus	4pin, I <sup>2</sup> C-signal-connector
CN112	OSD	12pin, OSD, IR, LED, etc.
CN114	FAN	4pin, Fan connector (MOLEX 47053-1000)
CN115	RS232	4pin, LVTTTL signal level
CN116	Power (internal)	8pin power connector internal, max 3A per pin
CN202 CN203 CN204	Jumper block for Backlight supply voltage select	3pin single row connectors Note: Same position must be set for all three jumpers.
CN700	I2S Audio	14 pin I2S Audio



## 3.3.2 Connectors on eMotionNT1:3-G


Unused connectors/jumpers are crossed out



Item	Description	Remarks
CN100	DVI input	24 pin DVI-I connector, female
CN101	VGA input	15 pin HD-Sub connector, female
CN102	DP input	DisplayPort connector without flange
CN103	Power	DC-Jack 2.5mm
CN104	Power	4pin connector, max 5A
CN105	LVDS Dual link output	30pin Display Interface Connector (LVDS)
CN107	Backlight connector	7pin, Power supply / dimming
CN108	Backlight connector	7pin, Power supply / dimming
<i>CN109</i>		<i>Not mounted</i>
<i>CN110</i>		<i>Not mounted</i>
CN111	Systembus	4pin, I <sup>2</sup> C-signal-connector
CN112	OSD	12pin, OSD, IR, LED, etc.
<i>CN114</i>		<i>Not mounted</i>
CN115	RS232	4pin, LVTTTL signal level
CN116	Power (internal)	8pin power connector internal, max 3A per pin
<i>CN202</i> <i>CN203</i> <i>CN204</i>		<i>Not mounted</i>
CN700	I2S Audio	14 pin I2S Audio

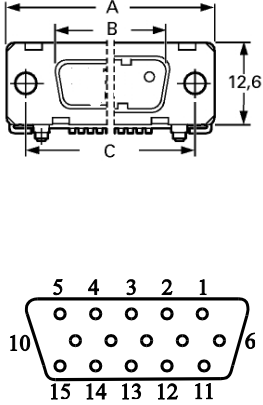
### 3.4. DVI input connector, CN100

Type: DVI-socket W+P: 507-29-2-2-20, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Front view</p>	1	DVI_D.TX2_N	In	TMDS Data2-
	2	DVI_D.TX2_P	In	TMDS Data2+
	3	GND	I/O	TMDS Data2 Shield (Ground)
	4	N.C.		
	5	N.C.		
	6	DVI_D.DDC_SCL	In	I2C-Clock, +5V level
	7	DVI_D.DDC_SDA	I/O	I2C-Data, +5V level
	8	DVI_A.VSYNC	In	Analog Vertical Sync
	9	DVI_D.TX1_N	In	TMDS Data1-
	10	DVI_D.TX1_P	In	TMDS Data1+
	11	GND	I/O	TMDS Data1 Shield (Ground)
	12	N.C.		
	13	N.C.		
	14	+5V_DVI	In	+5V Power*
	15	Ground (for +5V_DVI)	I/O	
	16	DVI_D.HPD	Out	Hot Plug Detect
	17	DVI_D.TX0_N	In	TMDS Data0-
	18	DVI_D.TX0_P	In	TMDS Data0+
	19	GND	I/O	TMDS Data0 Shield (Ground)
	20	N.C.		
	21	N.C.		
	22	GND	I/O	TMDS Clock Shield (Ground)
	23	DVI_D.TXC_P	In	TMDS Clock +
	24	DVI_D.TXC_N	In	TMDS Clock -
	C1	DVI_A.RED	In	Analog Red
	C2	DVI_A.GREEN	In	Analog Green
	C3	DVI_A.BLUE	In	Analog Blue
	C4	DVI_A.HSYNC	In	Analog Horizontal Sync
	C5	GND	I/O	Analog RGB Ground

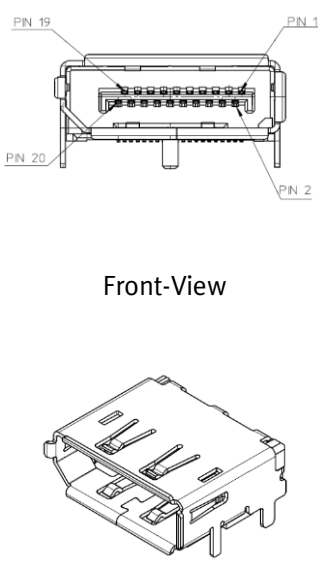
### 3.5. VGA input connector, CN101

Type: 15pin, HD-Sub, W+P: 110-15-2-2-20, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	VGA_IN.RED	I	Analog Red
	2	VGA_IN.GREEN	I	Analog Green
	3	VGA_IN.BLUE	I	Analog Blue
	4	N.C.		N.C.
	5	GND	I/O	GND
	6	GND	I/O	GND
	7	GND	I/O	GND
	8	GND	I/O	GND
	9	+5V_VGA	I	+5V
	10	GND	I/O	GND
	11	N.C.		N.C.
	12	VGA_IN.SDA	I/O	DDC SDA
	13	VGA_IN.HSYNC	I	Analog HSYNC
	14	VGA_IN.VSYNC	I	Analog VSYNC
	15	VGA_IN.SCL	I	DDC SCL

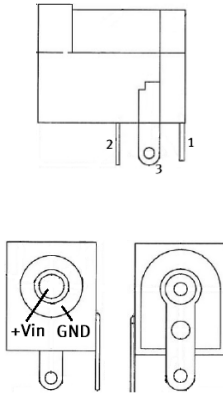
### 3.6. Display-Port input connector, CN102

Type: W+P: 8470-2-2-1-80-TR, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Front-View</p>	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, connect to GND with 1M
	14	DP_IN.CONFIG2	O	Config Pin2, connect to GND with 1M
	15	DP_IN.AUX_P	I/O	Auxiliary Ch. Differential Input positive
	16	DP_IN.DET	I	Detect pin for cable connection
	17	DP_IN.AUX_N	I/O	Auxiliary Ch. Differential Input negative
	18	DP_IN.HPD	I/O	Hot Plug Detect
	19	DP_IN.RTN	O	Connected to Ground
	20	N.C.		Not Connected to internal circuits

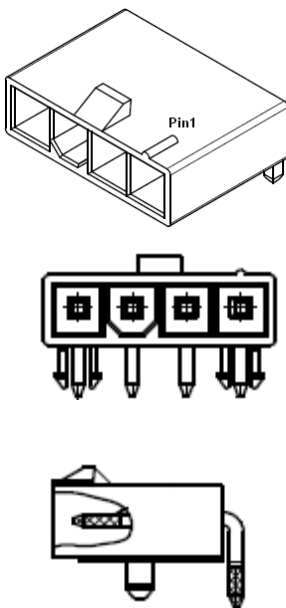
### 3.7. Input voltage connector, CN103

Type: W+P Products, W+P-No.: 649-2-2.5-20-5A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Side-, Front-, Rear-View</p>	1	V_IN	I	+Vin: +12V/5A or +24V/5A
	2	GND	I/O	GND / 5A
	3	GND	I/O	GND / 5A

### 3.8. Input voltage connector, CN104

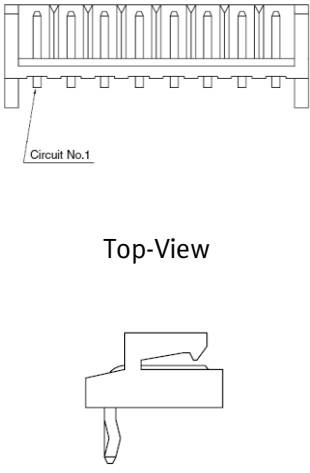
Type: Molex-Ref.-No: 0039303045, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Top- Front-, Side-View</p>	1	GND	I/O	GND / 4A
	2	GND	I/O	GND / 4A
	3	V_IN	I	+12V/4A* or +24V/4A*
	4	V_IN	I	+12V/4A* or +24V/4A*

\*: both pins of CN104 can carry 4A => in total 8A are available!

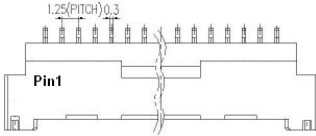
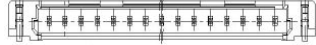
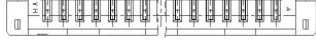
### 3.9. Input Voltage – Internal connector, CN116

Type: JST-Ref.-No.S8B-EH, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Top-View</p> <p>Side-View</p>	1	GND	I/O	Ground
	2	GND	I/O	Ground
	3	GND	I/O	Ground
	4	GND	I/O	Ground
	5	V_IN	O	+12V/2A or +24V/2A
	6	V_IN	O	+12V/2A or +24V/2A
	7	V_IN	O	+12V/2A or +24V/2A
	8	V_IN	O	+12V/2A or +24V/2A

### 3.10. LVDS-output connector, CN105

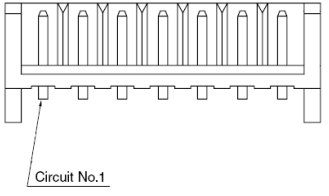
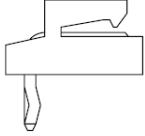
Type: Hirose-Ref.-No. DF14-30P-1.25H, (YEON-HO 12507WR-30), or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Top-View</p>	1	PanelVCC	0	PanelVCC *
	2	PanelVCC	0	PanelVCC*
	3	PanelVCC	0	PanelVCC*
	4	PanelVCC	0	PanelVCC*
	5	GND	I/O	GROUND
	6	Reverse_Scan#	0	Digital out (3V3 or 0V), e.g. for LVDS-select
	7	GND	I/O	Ground
 <p>Front-View</p>	8	LVDS.TXA3_P	0	TX3 odd positive
	9	LVDS.TXA3_N	0	TX3 odd negative
	10	LVDS.TCLKA_P	0	Clock odd positive
	11	LVDS.TCLKA_N	0	Clock odd negative
	12	LVDS.TXA2_P	0	TX2 odd positive
	13	LVDS.TXA2_N	0	TX2 odd negative
	14	GND	I/O	Ground
 <p>Rear-View</p>	15	LVDS.TXA1_P	0	TX1 odd positive
	16	LVDS.TXA1_N	0	TX1 odd negative
	17	LVDS.TXA0_P	0	TX0 odd positive
	18	LVDS.TXA0_N	0	TX0 odd negative
	19	GND	I/O	Ground
	20	LVDS.TXB3_P	0	TX3 even positive
	21	LVDS.TXB3_N	0	TX3 even negative
	22	LVDS.TCLKB_P	0	Clock even positive
	23	LVDS.TCLKB_N	0	Clock even negative
	24	LVDS.TXB2_P	0	TX2 even positive
	25	LVDS.TXB2_N	0	TX2 even negative
	26	GND	I/O	Ground
	27	LVDS.TXB1_P	0	TX1 even positive
	28	LVDS.TXB1_N	0	TX1 even negative
	29	LVDS.TXB0_P	0	TX0 even positive
	30	LVDS.TXB0_N	0	TX0 even negative

\* Note: Pin1, 2, 3, 4: Output voltage 3.3V / 5.0V / 12.0V

### 3.11. Backlight Supply Voltage connector, CN107, CN108

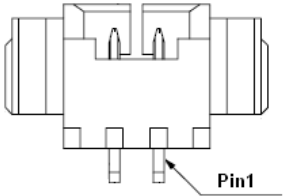
Type: JST-Ref.-No. S7B-EH, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Top-View</p>  <p>Side-View</p>	1	B_ADIM	O	Analog dimming voltage
	2	B_PWM	O	PWM diming output
	3	B_EN	O	Backlight ON/OFF
	4	BLT_VCC*	O	Operating voltage +12V / +24V
	5	BLT_VCC*	O	Operating voltage +12V / +24V
	6	GND	I/O	Ground
	7	GND	I/O	Ground

\* Note: BLT\_VCC follows the board supply voltage (+12V or +24V) or is selectable with jumpers on CN202, CN203, CN204. All jumpers must be set in the same position!! For details see chapter 4.5.

### 3.12. Backlight ON/OFF-Signal connector, CN109

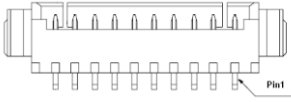
Type: Molex-Ref.-No: 53261-0271, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Top-View</p>	1	B_EN	O	ON/OFF
	2	GND	I/O	Ground



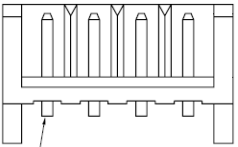
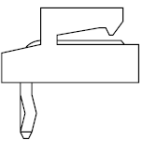
### 3.13. GPIO connector, CN110

Type: Molex-Ref.-No: 53261-1071 or YEONHO: 12505WR-10, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Top-View</p>	1	+3V3_DVDD	0	3.3V
	2	+5V	0	5V
	3	Fan_PWM	0	Fan speed control (5V-Level)
	4	Fan_Tacho	I	Fan speed feedback
	5	Fan_Vcc	0	Operating voltage +12V / +24V
	6	GPIO1	I/O	GPIO from NT68862C (Pin 2)
	7	GPIO2	I/O	GPIO from NT68862C (Pin 3)
	8	I2C_EXT.SCL	0	I <sup>2</sup> C SCL (5V-Level)
	9	I2C_EXT.SDA	I/O	I <sup>2</sup> C SDA (5V-Level)
	10	GND	I/O	Ground

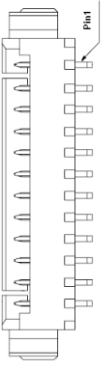
### 3.14. Systembus connector, CN111

Type: JST-Ref.-No. S4B-EH, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Top-View</p>  <p>Side-View</p>	1	GND	I/O	Ground
	2	I2C_EXT.SCL	0	I <sup>2</sup> C SCL (5V-Level)
	3	I2C_EXT.SDA	I/O	I <sup>2</sup> C SDA (5V-Level)
	4	+5V	0	5V

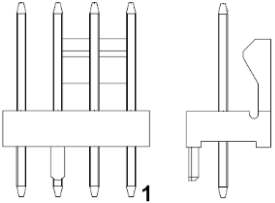
### 3.15. OSD-Keyboard-Connector, CN112

Type 53261-1271 by Molex, SMT Side entry type, 12pin, or equivalent

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

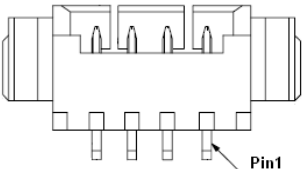
### 3.16. Fan-connector, CN114

Type: MOLEX: 47053-1000 or W+P: 528-04-3-50, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Top- an Side-View</p>	1	GND	I/O	Ground
	2	Fan_Vcc	O	Operating voltage +12V / +24V
	3	N.C.		No internal connection
	4	Fan_PWM	O	Fan speed control (5V-Level)

### 3.17. RS232-connector 4pin, CN115

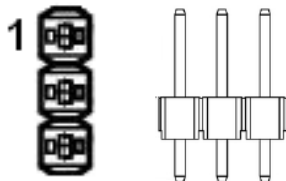
Type: Molex-Ref.-No: 53261-0471 or YEONHO: 12505WR-04, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Top-View</p>	1	DVDD33	O	3.3V
	2	RS232_DOUT*	O	Transmit Data
	3	RS232_DIN*	I	Receive Data
	4	GND	I/O	Ground

\*: please see chapter 4.8 for level of RS232\_DIN- / RS232\_DOUT-signals

### 3.18. Backlight-Voltage-Select, CN202, CN203, CN204

Type W+P: 943-10-003-50, or equivalent

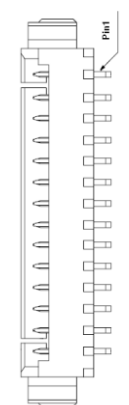
Pin arrangement	Pin	Signal	I/O	Description
 <p>Top- an Side-View</p>	1	+12V_BLT_VCC		+12V
	2	BLT_VCC		Backlight-Supply-Voltage
	3	V_IN		+12V or +24V

Note: 1 jumper must be mounted on each connector, i.e. in total 3 jumpers have to be mounted. All jumpers must be set to the same position! (1-2 or 2-3), see also chapter 4.5

Jumper Type W+P: 165-101-10-00, or equivalent

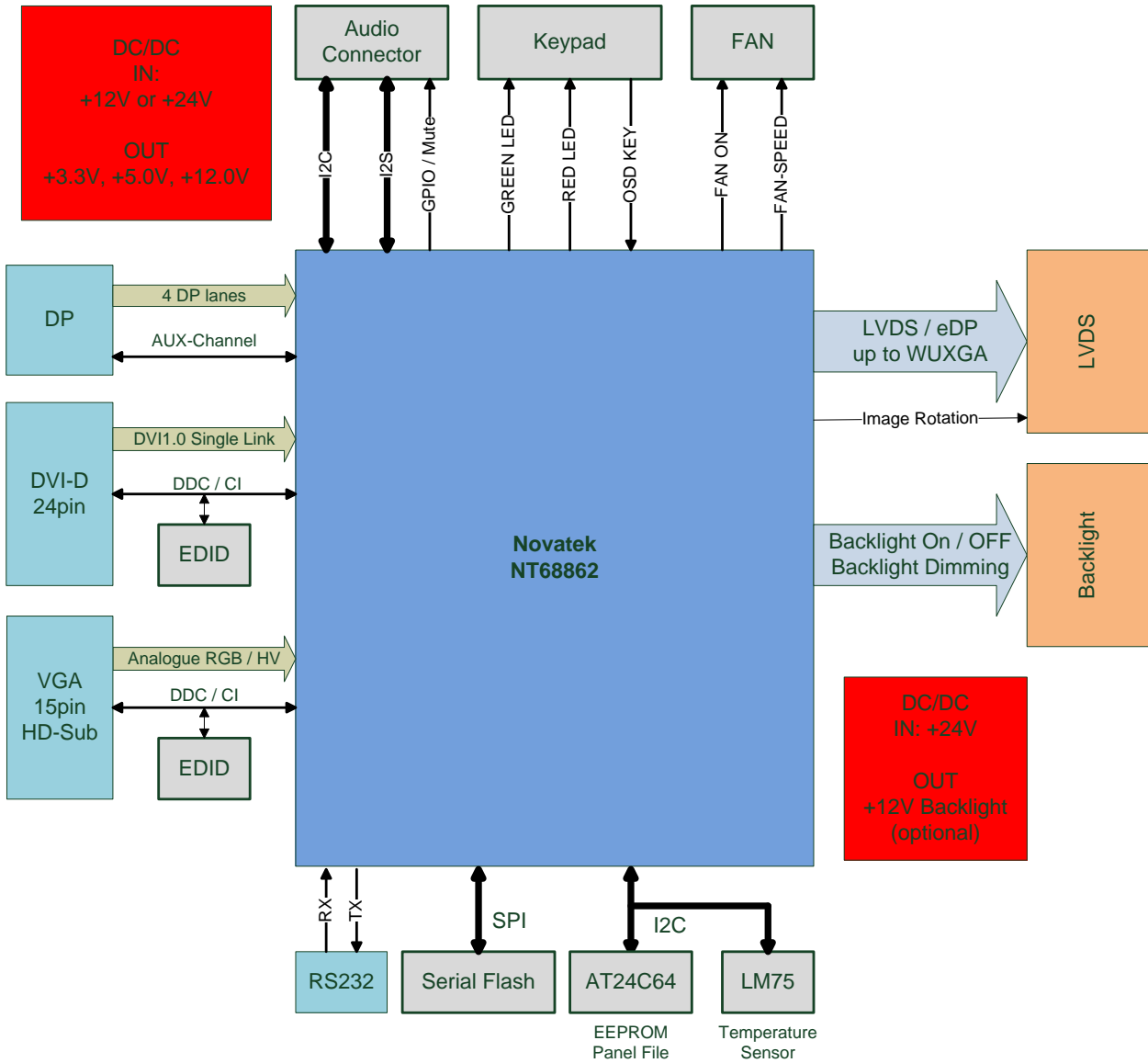
### 3.19. I2S-Audio Connector, CN700

Type: MOLEX: 53261-1471, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 <p>Top view</p>	1	GND	I/O	Ground
	2	+5V	0	Power
	3	I2S_WS	0	I2S Word Select
	4	GND	I/O	Ground
	5	I2S_Data	0	I2S Data
	6	GND	I/O	Ground
	7	I2S_SCLK	0	I2S Clock
	8	GND	I/O	Ground
	9	I2S_MCLK	0	I2S MCLK
	10	GND	I/O	Ground
	11	AUDIO_MUTE	0	MUTE
	12	AUDIO_GPIO	I/O	GPIO
	13	I2C_EXT.SDA	I/O	I2C SDA (5V level)
	14	I2C_EXT.SCL	0	I2C SCL (5V level)

## 4. Technical Details

### 4.1. Block diagram



eMotionNT1:3 Block Diagram

## 4.2. Supply voltages and current consumption

The eMotionNT1:3 can handle 12V or 24V DC input voltage. On eMotionNT1:3 Standard the output voltage for the backlight inverter (CN107 and CN108) can be set to the DC input voltage  $V_{IN}$  of the eMotionNT1:3 (CN103 resp. CN104) or to +12V when  $V_{IN}$  is +24V. For these setting see see chapter 4.5 *Backlight Inverter Supply*.

On eMotionNT1:3-G the output voltage for the backlight inverter is always  $V_{IN}$ !

The board is designed for a single power supply. All other supply voltages are generated on the eMotionNT1:3.

Supply voltage	Nominal value	Regulation	Ripple & noise	Onboard current consumption
+12V	+12V	+/-10%	0.3V	200mA max.
+24V	+24V	+/-10%	0.3V	100mA max.

## 4.3. Configuration Options on eMotionNT1:3

eMotionNT1:3 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 eMotionNT1:3! I.e. to ensure functionality of connected TFT it is necessary to program the correct firmware on eMotionNT1:3 first!

Backlight enable-logic-level is set by OR-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 eMotionNT1:3

eMotionNT1:3 can deliver the following supply currents to a connected TCON-board

TCON Voltage	Nominal value	Max Current (total)	Ripple & noise
+3V3	3V3	2.5A	0.15V
+5V	5V	2.5A	0.15V
+12V	12V	2.5A	0.15V

TCON-voltage is supplied to TCON-board by pins with signal Panel VCC on CN105

Chapter 4.5 and 4.6 are for eMotion NT1:3 Standard! As already mentioned eMotionNT1:3-G has built in DC/DC-regulator and backlight supply voltage is always  $V_{IN}$ .

#### 4.5. Backlight Inverter Supply

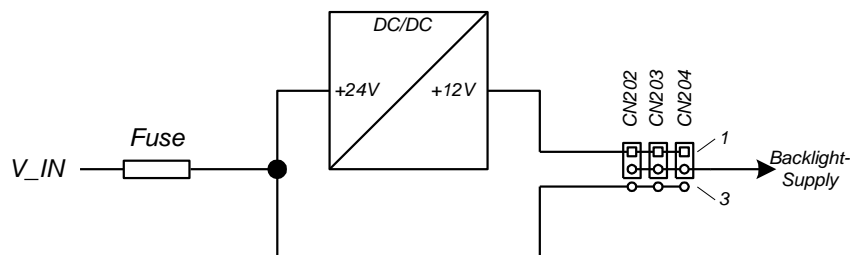
There are very many backlight inverters available for driving TFT backlights. Supply voltage for these inverters can be different.

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 eMotionNT1:3.

To handle the different backlight inverters the backlight supply voltage can be routed in 2 different ways on eMotionNT1:3:

- Input voltage ( $V_{IN}$ ) supplies DC/DC-regulator and output of this regulator is 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 jumpers on CN202, CN203 and CN204:



Depending on eMotionNT1:3 input voltage and required input voltage for the backlight inverter the jumpers on CN202, CN203 and CN204 have to be set in the following way:

$V_{in}$	$V_{BL}$	Jumper-Position CN202, CN203, CN204
+12V	+12V	2-3
	+12V...+24V	2-3
	+24V	Not possible
+24V	+12V	1-2
	+12V...+24V	2-3
	+24V	2-3

#### 4.6. Backlight-current capability of eMotionNT1:3

Output current of eMotionNT1:3 for a connected backlight inverter depends on configuration of eMotionNT1:3:

- If jumpers CN202, CN203, CN204 are mounted to 1-2, i.e.  $V_{in}=+24V$  and  $V_{BL}=+12V$  (see chapter above), the output current is limited to 3A
- If onboard regulator for  $V_{BL}$  is not used, i.e.  $V_{BL}=V_{in}$ , the sum of output current for  $V_{BL}$ , 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

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

### 4.7.2nd DVI input

PARAMETER	MIN	TYP	MAX	UNIT	Remark
Termination Supply Voltage AV <sub>CC</sub>	3,135	3.3	3,465	V	
Differential Input Voltage	150		1200	mV	
Input Common Mode Voltage	AV <sub>CC</sub> -300		AV <sub>CC</sub> -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	V <sub>pp</sub>	at 75R
Band width	9		290	MHz	
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

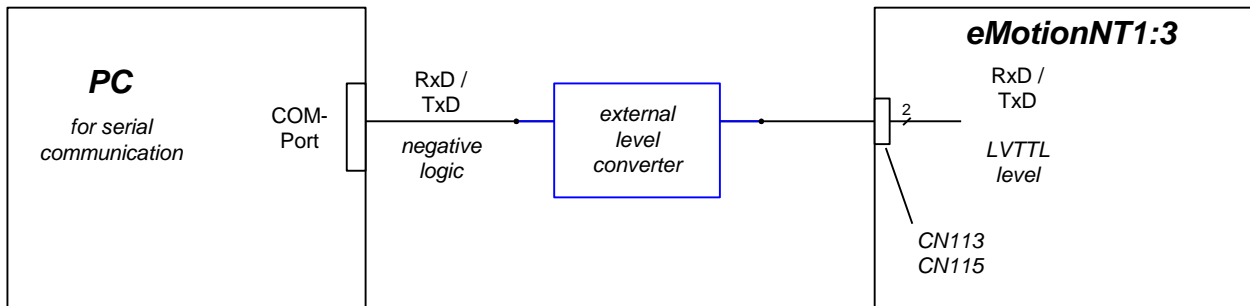


#### 4.8. Serial Communication with eMotionNT1:3

The eMotionNT1:3 can be controlled by RS232 commands which can be send by COM-port of PC e.g..

RS232-signals RxD and TxD at CN115 should have LVTTTL-level.

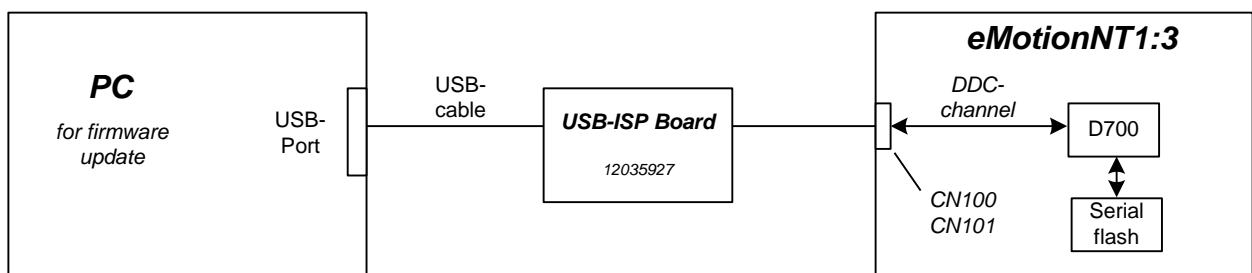
⇒ for communication an external level converter is needed!



#### 4.9. Firmware Update on eMotionNT1:3

Firmware update on eMotionNT1:3 is done over DDC-channel of video-inputs DVI or VGA. An USB-ISP Board is necessary for this operation!

This board is connected to PC with USB2.0 cable and to eMotionNT1:3 with normal videocable to input DVI 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, 1,4-2 GHz 3 V/m 2-6 GHz 1 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 <sub>rms</sub> 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 PCB markings

### 7.1. *Label and material number*

The following points are visible on the label of the eMotionNT1:3 board.

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

### 7.2. *Marking of PCB*

The following points are visible on the PCB of the eMotionNT1:3 board.

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

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