DATA MODUL

eMotion NT3:3

Product Specification

This document might be changed without prior notice

12045340 eMotionNT3:3

Revision: 000

Date: 2020-06-15

Revision History

Rev.	Date	Author	Modifications
000	15.06.2020	R. Muhler	Initial revision
001			

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 scaler board eMotionNT3:3 are described.

The eMotionNT3:3 scaler board can drive TFTs up to WQHD resolution with 60Hz (i.e. 2560 x 1600 @60Hz) or TFTs up to WUGXA resolution with 120Hz (i.e. 1920 x 1200 @120Hz).

1.2. *Abbreviations*

UHD	ULTRA HIGH DEFINITION
I²C	INTER-IC
EDP	EMBEDDED DISPLAY PORT
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
TBD	TO BE DEFINED
TMDS	TRANSITION MINIMIZED DIFFERENTIAL SIGNALING
DVI	DIGITAL VIDEO INTERFACE
DP	DISPLAY PORT
HDMI	HIGH DEFINITION MULTIMEDIA INTERFACE
OSD	ON SCREEN DISPLAY
DPMS	DISPLAY POWER MANAGEMENT SYSTEM
VESA	VIDEO ELECTRONICS STANDARDS ASSOCIATION
DDC / CI	DISPLAY DATA CHANNEL / COMANND INTERFACE
USB	UNIVERSAL SERIAL BUS
UART	UNIVERSAL ASYNCHRONOUS RECEIVER TRANSMITTER
VBO	V-BY-ONE

1.3. *Additional Documentation*

TBD

2. Product Description

2.1. *Functional description of the eMotionNT3:3*

The eMotionNT3:3 is a LCD controller board for industrial applications. By using the latest generation of suitable scaler-ICs the eMotionNT3:3 board can be used to drive LVDS-panels.

The eMotionNT3:3 can be controlled by OSD board as well as by IR remote. An additional control by RS232 and DDC/CI is possible.

2.2. *ERP-Nr. and variants of eMotionNT3:3*

eMotionNT3:3 is listed in DATA MODUL ERP-system ProAlpha with Nr. 12045340.

In the following all options are already described, but it is always noted that they are optionally! The same applies for connectors which would be necessary for these features: the connectors are described but marked as *not mounted*.

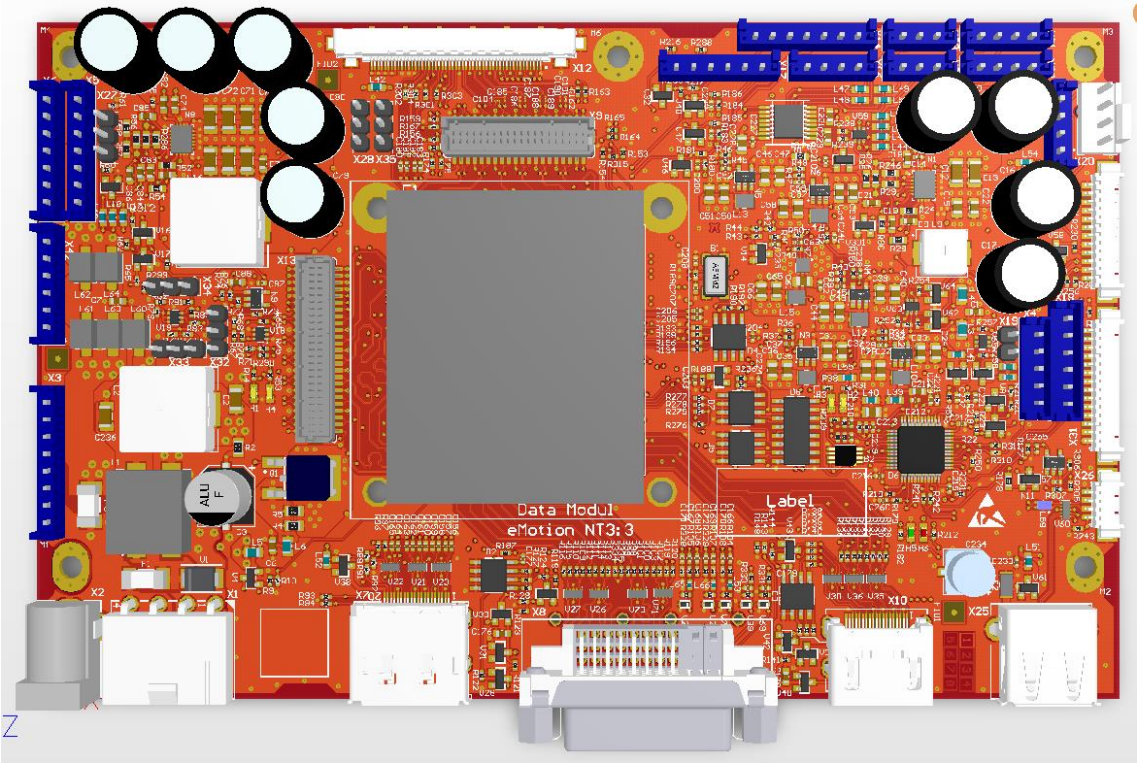
2.3. *Features of emotionNT3:3*

Scaler	NT68394G from Novatek
Input resolution	Up to WQHD (2560x1600@60Hz)
Output resolution	VGA to WQHD
Colors	24bit / 30bit (1,07Bio)
Power supply	Single power supply +12V or +24V DC
Backlight support	PWM dimming / analogue dimming (0..3.3V or 0..5V)
EMI	onboard EMI filtering circuit support SSC for reduce EMI
Operating temperature	0°C ...60°C
Inputs	1 x DisplayPort 1.2 support HDCP 1.4 (Compliance V1.2) and HDCP 2.2 1 x HDMI 2.0 support HDCP 1.4 (Compliance V1.2) and HDCP 2.2 1 x DVI-I (205MHz analogue, 165MHz digital, single link) for up to 1920x1200@60Hz input
Panel voltage	5.0V, 10.0, 12.0V (selectable by firmware or jumpers)
Backlight support	Analog & PWM dimming
LVDS output	4 port LVDS-Output JEIDA or VESA mapping with 6/8/10-bit up to 2560 x 1600 on 2 output connectors
Picture in Picture	All combinations of all inputs can be displayed
Power safe mode	VESA DPMS compatible
DDC CI	Support of DDC / CI
Remote control	- RS232 remote control - 5 key OSD Keyboard - IR control by RECS80
Software update	- DDC/CI-interface of HDMI-inputs (using USB-ISP board) - USB-port
Audio input	Integrated in DisplayPort- or HDMI-video-stream
Audio output	- Digital I²S on separate output connector
Temperature control	Onboard temperature sensor

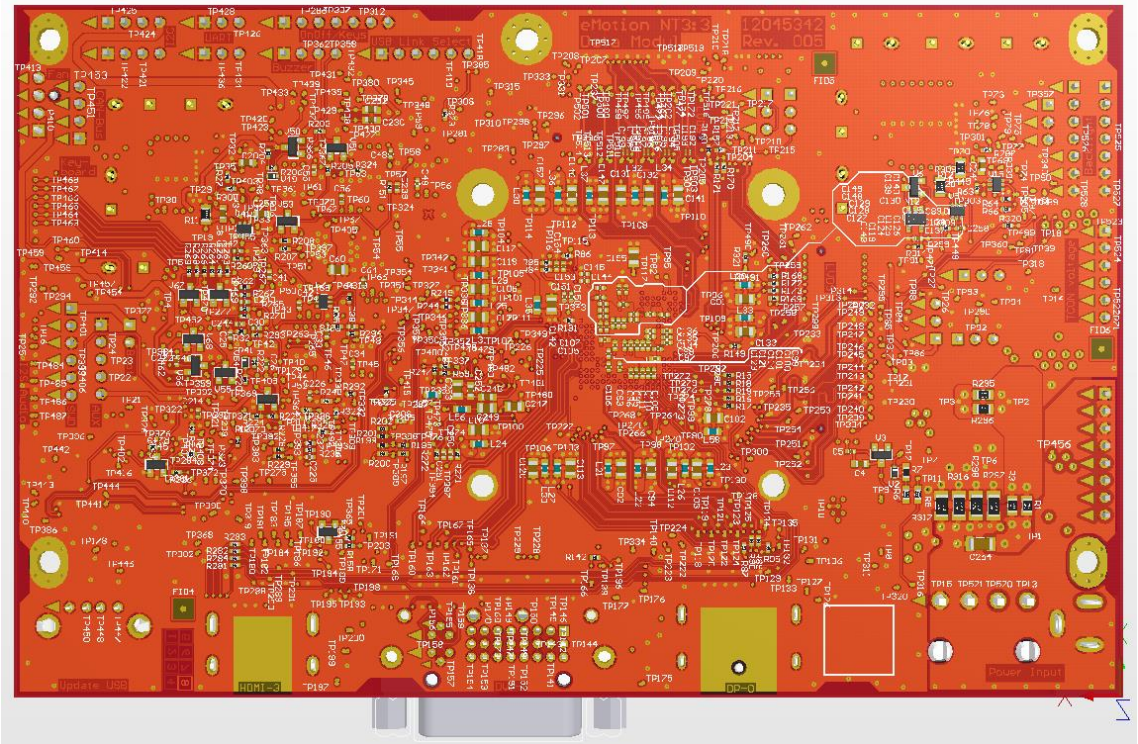
3. Outline Dimensions of eMotionNT3:3

3.1. *Drawing of PCB*

Top view of eMotionNT3:3



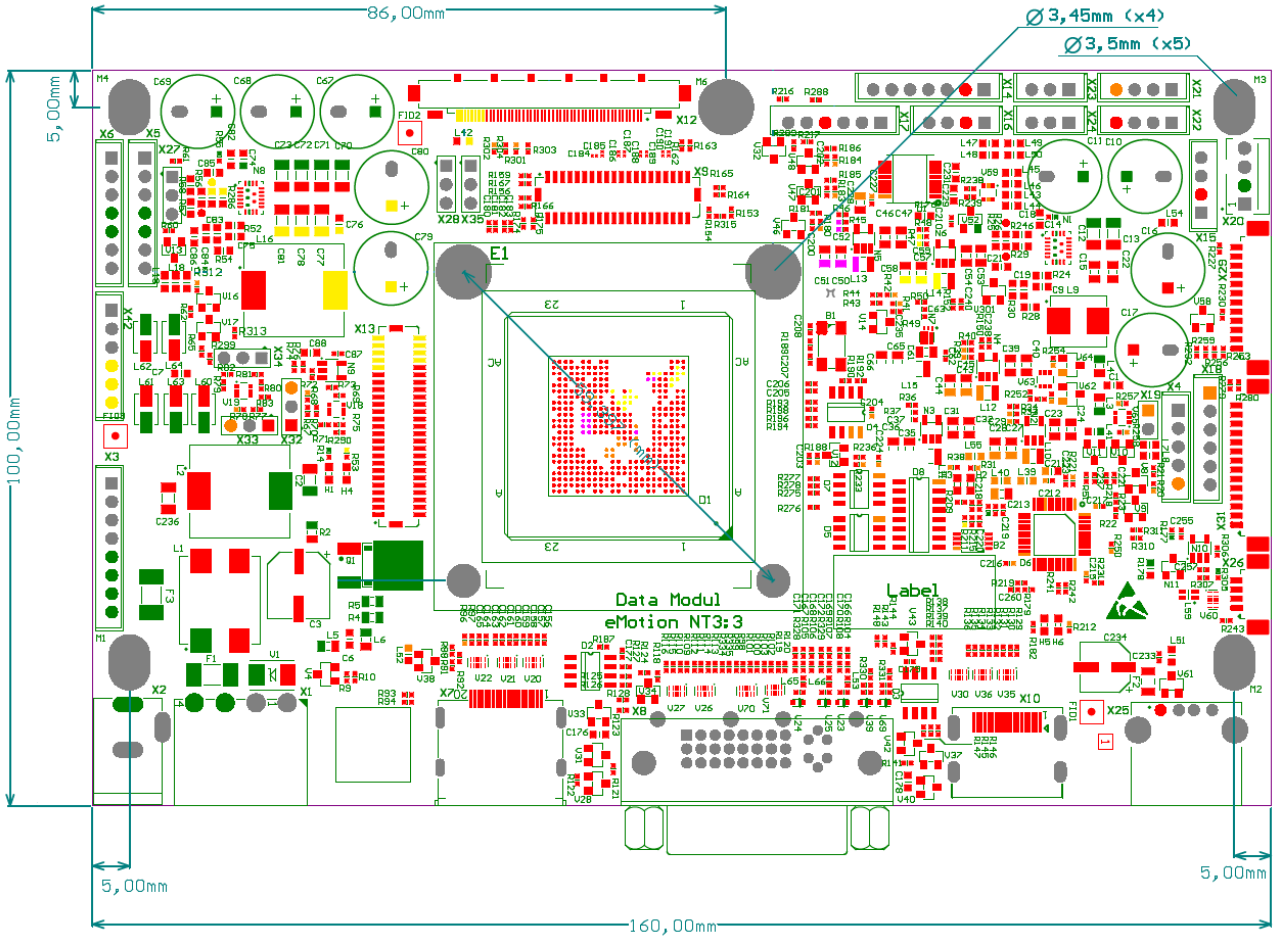
Bottom view of eMotionNT3:3



3.2. *Dimensions of PCB*

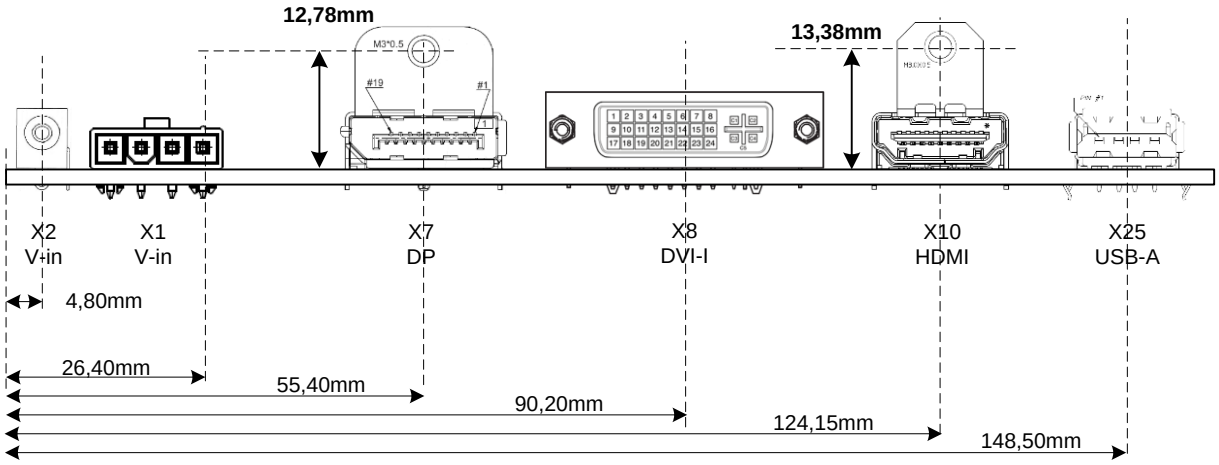
The dimensions of the eMotionNT3:3 board are 100mm x 160mm.

It has 5 mounting holes M3

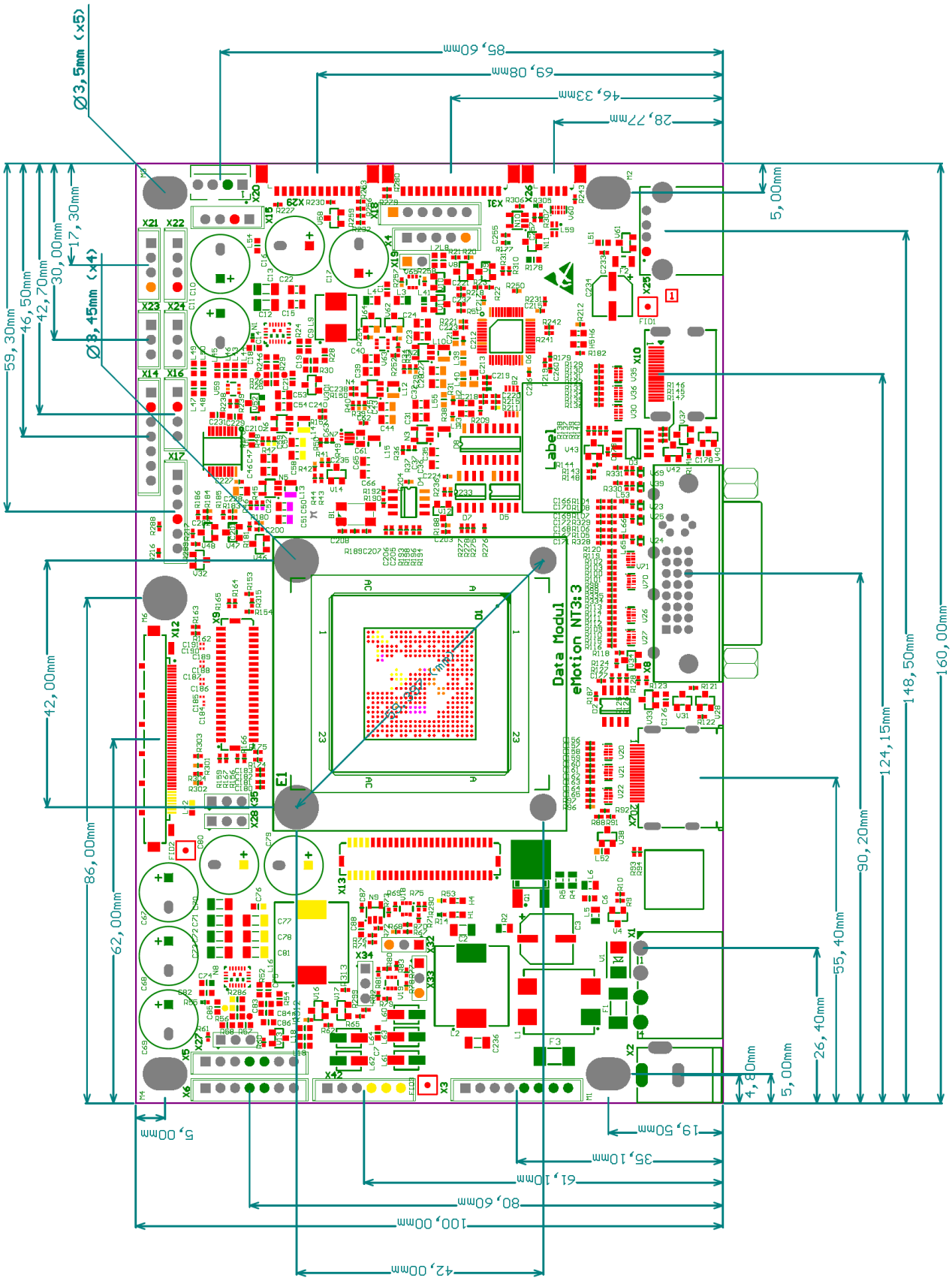


A drawing with detailed position of all connectors is shown on next page

3.3. *Connector Panel*



3.4. *Connector Positions*



4. Connectors on eMotionNT3:3

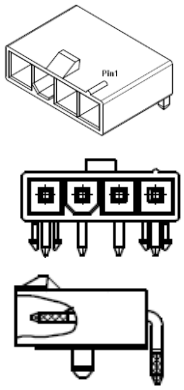
The designator of each connector is visible on silkscreen of eMotionNT3:3 board.
Connectors marked as option are not mounted.

4.1. *Power Input*

For supply voltage input of eMotionNT3:3 there are 3 different connectors implemented. X1 and X2 are placed at the connector panel and X3 is placed for connecting supply voltage from inside of the monitor.

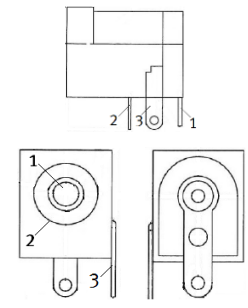
4.1.1 X1, Power Input (High Current Connector)

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

Pin arrangement	Pin	Signal	I/O	Description
 Top- Front-, Side-View	1	GND	I/O	GND
	2	GND	I/O	GND
	3	+Vin	I	+24V/4A*
	4	+Vin	I	+24V/4A*
				* 4A per pin / max 8A on connector

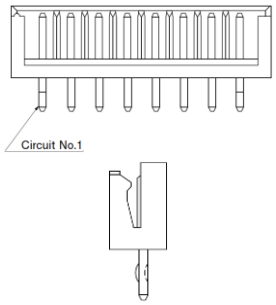
4.1.2 X2, Power Input (DC Jack)

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

Pin arrangement	Pin	Signal	I/O	Description
 Side-, Front-, Rear-View	1	+Vin	I	+24V/5A
	2	GND	I/O	GND / 5A
	3	GND	I/O	GND / 5A

4.1.3 X3, Power Input (Internal Power)

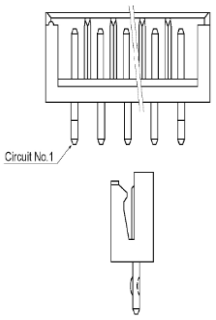
Type: JST-Ref.-No. B8B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND		Ground
	2	GND		Ground
	3	GND		Ground
	4	GND		Ground
	5	+Vin		+24V DC / max 3A per pin
	6	+Vin		+24V DC / max 3A per pin
	7	+Vin		+24V DC / max 3A per pin
	8	+Vin		+24V DC / max 3A per pin

4.2. *X4, External Load Switch and Analog Poti – not mounted*

This connector can be used to switch an external load switch (e.g. for TCON- or backlight-supply) or to drive an external buzzer.

Type: JST-Ref.-No. B5B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND	I/O	Ground
	2	AUX_LOAD_SWITCH_ADC2	O	ADC2 IN / ex. Buzzer detect
	3	AUX_LOAD_SWITCH_ADC1	O	ADC1 IN / ex. Buzzer enable
	4	AUX_LOAD_SWITCH_EN	O	AUX_LOAD_SWITCH_EN
	5	+3V3_STBY	O	+3V3

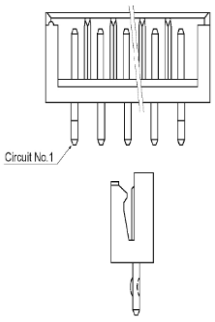
4.3. *Backlight Connector*

For driving the backlight inverter there are 2 connectors on eMotionNT3:3. Both connectors are routed in parallel. Both connectors should be used, if the driving current for backlight inverter is too high for one connector.

Maximum output current for backlight operating voltage is limited by fuse to 8A!

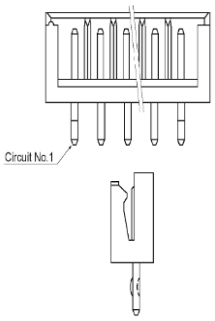
4.3.1 X5, Backlight Connector 1

Type: JST-Ref.-No. B7B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	ADIM*	O	Analog dimming voltage*
	2	PWM*	O	PWM diming output*
	3	EN**	O	ON/OFF **
	4	VDD***	O	Operating voltage +24V***
	5	VDD***	O	Operating voltage +24V***
	6	GND	I/O	Ground
	7	GND	I/O	Ground

4.3.1 X6, Backlight Connector 2

Type: JST-Ref.-No. B7B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	ADIM*	O	Analog dimming voltage*
	2	PWM*	O	PWM diming output*
	3	EN**	O	ON/OFF **
	4	VDD***	O	Operating voltage +24V***
	5	VDD***	O	Operating voltage +24V***
	6	GND	I/O	Ground
	7	GND	I/O	Ground

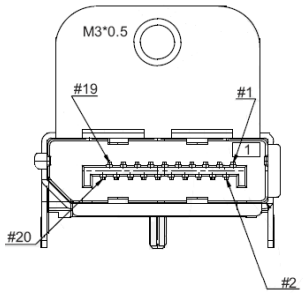
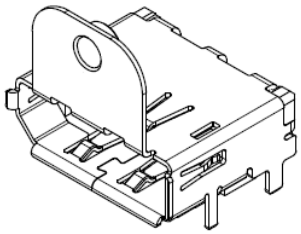
*: range of ADIM-signal and level of PWM-signal can be set by jumper on X32

**: level and polarity of EN-signal can be set by jumpers on X33, X34

***: max. current per pin is 3A, for all pins together 8A must not be exceeded

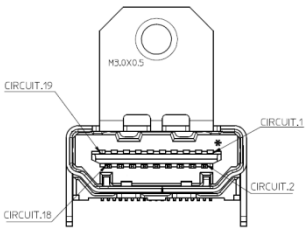
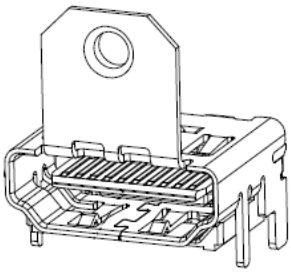
4.4. X7, Display-Port-In (DP1.2 compliant)

Type: Nexus: 3662-FA-R (Molex reference: 47272-1004), or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Front-View 	1	ML_L3N	I	Main Link Ch. 3 Differential Input negative
	2	GND		Ground
	3	ML_L3P	I	Main Link Ch. 3 Differential Input positive
	4	ML_L2N	I	Main Link Ch. 2 Differential Input negative
	5	GND		Ground
	6	ML_L2P	I	Main Link Ch. 2 Differential Input positive
	7	ML_L1N	I	Main Link Ch. 1 Differential Input negative
	8	GND		Ground
	9	ML_LN1P	I	Main Link Ch. 1 Differential Input positive
	10	ML_LN0N	I	Main Link Ch. 0 Differential Input negative
	11	GND		Ground
	12	ML_LN0P	I	Main Link Ch. 0 Differential Input positive
	13	Config 1	O	Config Pin1, connect to GND with 1M
	14	Config 2	O	Config Pin2, connect to GND with 1M
	15	AUXP	I	Auxiliary Ch. Differential Input positive
	16	GND		Ground
	17	AUXN	I	Auxiliary Ch. Differential Input negative
	18	HPD	I/O	Hot Plug Detect
	19	POR	I/O	Connect to Ground
	20	PO	O	Not Connected to internal circuits

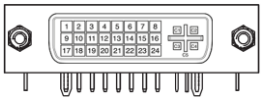
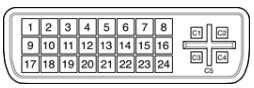
4.5. X9, HDMI-In (HDMI 2.0 compatible)

Type: W&P 8800-19-2-2-1-70 (Molex-Ref.-No. 47151-0002), or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Front-View 	1	RX2+	In	TMDS Data2+
	2	GND		TMDS Data2 Shield
	3	RX2-	In	TMDS Data2-
	4	RX1+	In	TMDS Data1+
	5	GND		TMDS Data1 Shield
	6	RX1-	In	TMDS Data1-
	7	RX0+	In	TMDS Data0+
	8	GND		TMDS Data0 Shield
	9	RX0-	In	TMDS Data0-
	10	RXC+	In	TMDS Data-Clock+
	11	GND		TMDS Data-Clock Shield
	12	RXC-	In	TMDS Data-Clock-
	13	CEC		CEC
	14	NC		No internal Connection
	15	DSCL	In	I2C-Clock, +5V level
	16	DSDA	I/O	I2C-Data, +5V level
	17	GND		DDC/CEC-GND
	18	HDMIHOT	In	+5V Power
	19	HOTPLUG	Out	Hot Plug Detect Signal

4.6. X8, DVI-I (DVI1.0 compliant)

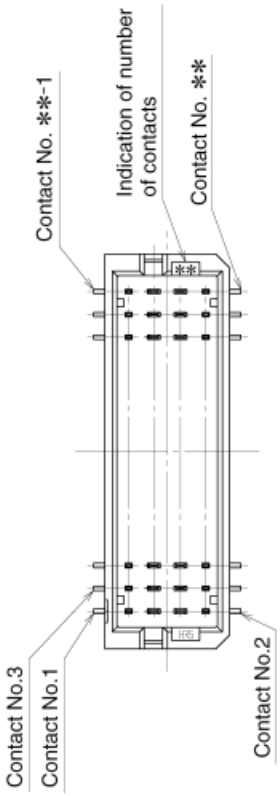
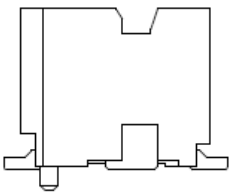
Type: DVI-socket W+P: 507-29-2-2-20, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	DT2-	In	TMDS Data2-
	2	DT2+	In	TMDS Data2+
	3	TX2/4-SHLD		TMDS Data2/4 Shield
	4	N.C.		
	5	N.C.		
	6	DDC-CLK	In	I2C-Clock, +5V level
	7	DDC-Data	I/O	I2C-Data, +5V level
	8	AVS	In	Analog V-Sync
	9	DT1-	In	TMDS Data1-
	10	DT1+	In	TMDS Data1+
	11	TX1/3-SHLD		TMDS Data1/3 Shield
	12	N.C.		
	13	N.C.		
	14	+5V	In	+5V Power*
	15	Ground (for +5V)		
Front view	16	HP Detect	Out	Hot Plug Detect
	17	DT0-	In	TMDS Data0-
	18	DT0+	In	TMDS Data0+
	19	TX0/5-SHLD		TMDS Data0/5 Shield
	20	N.C.		
Pinning	21	N.C.		
	22	TXC-SHLD		TMDS Clock Shield
	23	CLK+	In	TMDS Clock +
	24	CLK-	In	TMDS Clock –
	C1	ARED	In	Analog RED (option)
	C2	AGRN	In	Analog GREEN (option)
	C3	ABLU	In	Analog BLUE (option)
	C4	AHS	In	Analog H-Sync (option)
	C5	Analog RGB Ground		

4.7. *Display Connector*

Output signal of eMotionNT3:3 for driving TFT is LVDS. X13, LVDS-output – Ports A/B

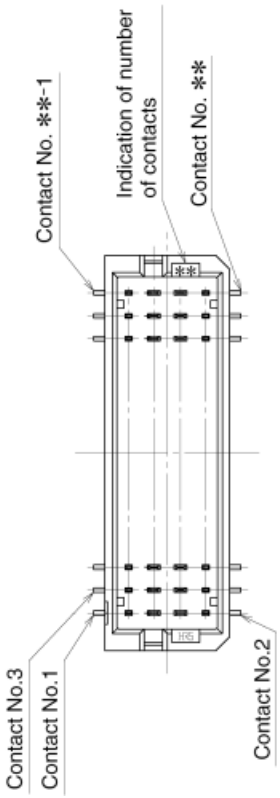
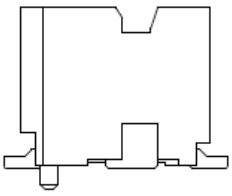
Type: DF20G-50DP-1 from Hirose, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Top-View  Side-View	1	LVDS_GPIO2	I/O	Digital in/out (3V3 or 0V)
	2	LVDS_GPIO1	I/O	Digital in/out (3V3 or 0V)
	3	LVDS_A.TX0_N	O	TXA0 negative
	4	LVDS_B.TX0_N	O	TXB0 negative
	5	LVDS_A.TX0_P	O	TXA0 positive
	6	LVDS_B.TX0_P	O	TXB0 positive
	7	GND		Ground
	8	GND		Ground
	9	LVDS_A.TX1_N	O	TXA1 negative
	10	LVDS_B.TX1_N	O	TXB1 negative
	11	LVDS_A.TX1_P	O	TXA1 positive
	12	LVDS_B.TX1_P	O	TXB1 positive
	13	GND		Ground
	14	GND		Ground
	15	LVDS_A.TX2_N	O	TXA2 negative
	16	LVDS_B.TX2_N	O	TXB2 negative
	17	LVDS_A.TX2_P	O	TXA2 positive
	18	LVDS_B.TX2_P	O	TXB2 positive
	19	GND		Ground
	20	GND		Ground
	21	LVDS_A.TXC_N	O	TXA clock negative
	22	LVDS_B.TXC_N	O	TXB clock negative
	23	LVDS_A.TXC_P	O	TXA clock positive
	24	LVDS_B.TXC_P	O	TXB clock positive
	25	GND		Ground
	26	GND		Ground
	27	LVDS_A.TX3_N	O	TXA3 negative
	28	LVDS_B.TX3_N	O	TXB3 negative
	29	LVDS_A.TX3_P	O	TXA3 positive
	30	LVDS_B.TX3_P	O	TXB3 positive
	31	GND		Ground
	32	GND		Ground
	33	LVDS_A.TX4_N	O	TXA4 negative
	34	LVDS_B.TX4_N	O	TXB4 negative
	35	LVDS_A.TX4_P	O	TXA4 positive
	36	LVDS_B.TX4_P	O	TXB4 positive
	37	LVDS_GPIO4	I/O	Digital in/out (3V3 or 0V)
	38	LVDS_GPIO5	I/O	Digital in/out (3V3 or 0V)
	39	LVDS_GPIO3	I/O	Digital in/out (3V3 or 0V)
	40	VTX_SDA	I/O	I2C-DATA (3V3-Level)
	41	+V_TCON*	O	Panel Power (12V, 10V, 5V)
	42	VTX_SCL	O	I2C-CLOCK (3V3-Level)
	43	+V_TCON*	O	Panel Power (12V, 10V, 5V)
	44	+V_TCON*	O	Panel Power (12V, 10V, 5V)
	45	+V_TCON*	O	Panel Power (12V, 10V, 5V)
	46	+V_TCON*	O	Panel Power (12V, 10V, 5V)
	47	+V_TCON*	O	Panel Power (12V, 10V, 5V)
	48	+V_TCON*	O	Panel Power (12V, 10V, 5V)
	49	+V_TCON*	O	Panel Power (12V, 10V, 5V)
	50	+V_TCON*	O	Panel Power (12V, 10V, 5V)

*: max 1A per pin @ AWG28 wire; 0.7A @ AWG32 wire

4.7.1 X9, LVDS-output – Ports C/D

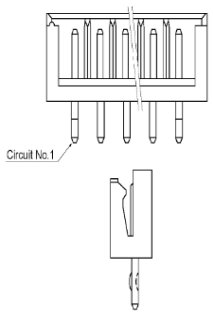
Type: DF20G-40DP-1 from Hirose, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Top-View	1	LVDS_GPIO2	I/O	Digital in/out (3V3 or 0V)
	2	LVDS_GPIO1	I/O	Digital in/out (3V3 or 0V)
	3	LVDS_C.TX0_N	O	TXC0 negative
	4	LVDS_D.TX0_N	O	TXD0 negative
	5	LVDS_C.TX0_P	O	TXC0 positive
	6	LVDS_D.TX0_P	O	TXD0 positive
	7	GND		Ground
	8	GND		Ground
	9	LVDS_C.TX1_N	O	TXC1 negative
	10	LVDS_D.TX1_N	O	TXD1 negative
	11	LVDS_C.TX1_P	O	TXC1 positive
	12	LVDS_D.TX1_P	O	TXD1 positive
	13	GND		Ground
	14	GND		Ground
	15	LVDS_C.TX2_N	O	TXC2 negative
	16	LVDS_D.TX2_N	O	TXD2 negative
	17	LVDS_C.TX2_P	O	TXC2 positive
	18	LVDS_D.TX2_P	O	TXD2 positive
	19	GND		Ground
	20	GND		Ground
	21	LVDS_C.TXC_N	O	TXC clock negative
	22	LVDS_D.TXC_N	O	TXD clock negative
	23	LVDS_C.TXC_P	O	TXC clock positive
	24	LVDS_D.TXC_P	O	TXD clock positive
	25	GND		Ground
	26	GND		Ground
	27	LVDS_C.TX3_N	O	TXC3 negative
	28	LVDS_D.TX3_N	O	TXD3 negative
	29	LVDS_C.TX3_P	O	TXC3 positive
	30	LVDS_D.TX3_P	O	TXD3 positive
	31	GND		Ground
	32	GND		Ground
 side-View	33	LVDS_C.TX4_N	O	TXC4 negative
	34	LVDS_D.TX4_N	O	TXD4 negative
	35	LVDS_C.TX4_P	O	TXC4 positive
	36	LVDS_D.TX4_P	O	TXD4 positive
	37	LVDS_GPIO4	I/O	Digital in/out (3V3 or 0V)
	38	LVDS_GPIO5	I/O	Digital in/out (3V3 or 0V)
	39	VTX_SDA	I/O	I2C-DATA (3V3-Level)
	40	VTX_SCL	I/O	I2C-CLOCK (3V3-Level)

4.8. X14, Brightness Keys and external ON-Signal

Used for ship displays. Brightness Key 1/2 for external keys, ON-OFF-CTRL for switching off the display.

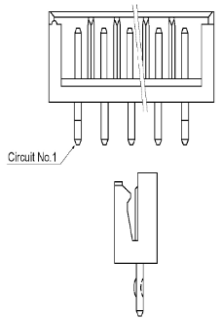
Type: JST-Ref.-No. B7B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND		Ground
	2	+5V	P	+5V
	3	ON-OFF-CTRL	I	External ON / OFF CTRL
	4	Brightness Key1	I	Brightness Key1
	5	GND		Ground
	6	Brightness Key2	I	Brightness Key2
	7	GND		Ground

4.9. *X15, uC CAN and LED-Control (optional) – not mounted*

This connector can be configured as CAN-interface or for driving external LEDs.

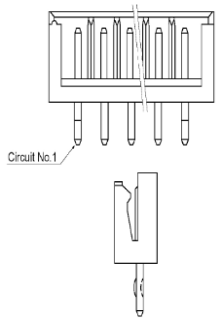
Type: JST-Ref.-No. B4B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND		Ground
	2	+5V	P	+5V
	3	CAN RX	I	CAN RX / LED1-Out
	4	CAN TX	O	CAN TX/ LED2-Out

4.10. *X16, Buzzer (optional) – not mounted*

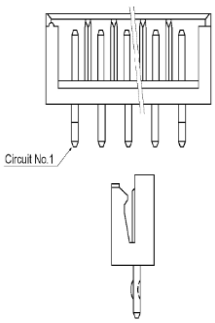
Optional for ship displays. Connection of internal buzzer, signals are connected with microcontroller STM32F072.

Type: JST-Ref.-No. B4B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND		Ground
	2	+5V	P	+5V
	3	BUZZER_POWER_OUT	O	+24V switched (max 100mA)
	4	BUZZER_PWM_OUT	O	PWM Out (+5V Level)

X17, USB Link-Select (optional) – not mounted
Connector for USB-Link-Select Board.

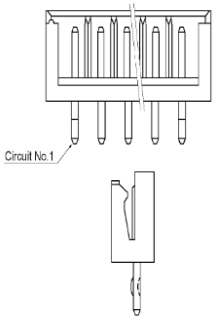
Type: JST-Ref.-No. B4B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND		Ground
	2	I2C-SCL	P	I2C-SCL (5V Level)
	3	I2C-SDA	O	I2C-SDA (5V Level)
	4	+5V	I/O	+5V
	5	USB-Link-Out	O	USB-Link-Out (+5V Level)
	6	USB-Link-IO	I/O	GPIO (+3V3 Level)

4.11. *X18, STM32 Debug & ISP Header (optional) – not mounted*

Only for debugging and software update. Not assembled in MP.

Type: JST-Ref.-No. B6B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	+3V3	P	+3V3
	2	SWCLK	O	SWCLK (DEGUB) /GPIO
	3	GND	I/O	Ground
	4	SWDIO	O	SWDIO (DEBUG) / GPIO
	5	RESET	I/O	uC Reset#
	6	NC		

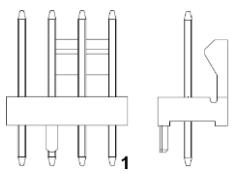
4.12. *X19, STM32 Boot Select Jumper (optional) – not mounted*

X19 is only for debugging and software development purposes, will not be assembled in MP.

4.13. *X20, PWM Fan (option) – not mounted*

For connection of PWM-fan. (+12V, +24V optional)

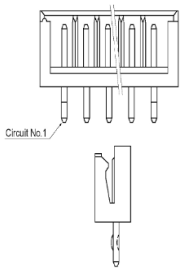
Type: Molex 4pin 47053-1000 / 2,54mm (2170-0136-1041), or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND		GROUND
	2	+V_FanPower	Out	Fan Power (+24V / max 500mA)
	3	N.C.	In	N.C.
	4	FAN_PWM#	Out	PWM fan speed control

4.14. *X21, System-Bus (I2C 3V3 Level)*

Systembus (I2C/ 3V3 Level) for external components

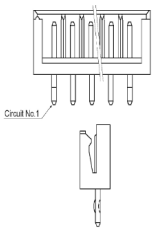
Type: JST-Ref.-No. B4B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND		Ground
	2	I2C-SCL	P	I2C-SCL (3V3 Level)
	3	I2C-SDA	O	I2C-SDA (3V3 Level)
	4	+3V3	I/O	+3V3

4.15. *X22, System-Bus (I2C 5V Level)*

Systembus (I2C/ 5V Level) for external components

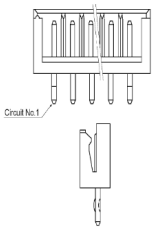
Type: JST-Ref.-No. B4B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND		Ground
	2	I2C-SCL	P	I2C-SCL (5V Level)
	3	I2C-SDA	O	I2C-SDA (5V Level)
	4	+5V	I/O	+5V

4.16. *X23, RS232 uC UART (optional) – not mounted*

RS232- interface for communication with uC

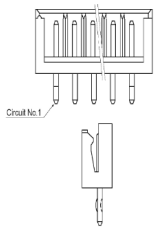
Type: JST-Ref.-No. B3B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND	P	Ground
	2	TXD	O	Transmit Data
	3	RXD	I	Receive Data

4.17. *X24, RS232 Scaler UART*

RS232-interface for communication with Novatek scaler

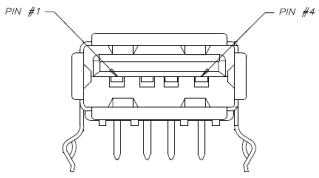
Type: JST-Ref.-No. B3B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND	P	Ground
	2	TXD	O	Transmit Data
	3	RXD	I	Receive Data

4.18. X25, USB Firmware update

Connector for update of firmware for Novatek scaler. Update from USB-stick possible.

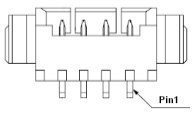
Type: USB type A receptacle, THT angled from TE Connectivity: 292303-1, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	VBUS	P	VBUS (+5V / 200mA)
	2	D-	IO	Data -
	3	D+	IO	Data +
	4	GND		GROUND

4.19. *X26, USB Communication (optional) – not mounted*

USB for communication with onboard µC.

Type 53261-0471 by Molex, SMT Side entry type, 4pin, pitch 1.25mm, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
 Top View	1	ID	O	ID
	2	D-	IO	Data -
	3	D+	IO	Data +
	4	GND	O	GROUND

4.20. X27, TCON Voltage selection jumper

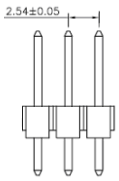
+V_TCON voltage can be selected by placing a jumper on X27 (TCON voltage selection by firmware has to be disabled!)

Jumper on 1-2: +V_TCON = +12V

Jumper on 2-3: +V_TCON = +10V

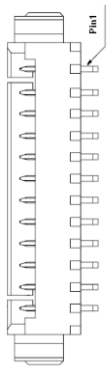
No jumper: +V_TCON = +5V

Type: SL 11/124-03G by Fischer-Elektronik, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1 2 3	GND		GROUND

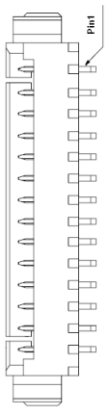
4.21. X29, OSD-Keyboard-Connector

Type 53261-1271 by Molex, SMT Side entry type, 12pin, pitch 1.25mm, or equivalent

Connector	Pin	Signal-Name	I/O	Note
 Top view	1	LED1	O	LED Green
	2	LED2	O	LED RED
	3	IR	I	IR remote
	4	+5V	O	+5V
	5	GND		GND
	6	SW3	I	Button3 (UP / PLUS)
	7	SW2	I	Button2 (DOWN / MINUS)
	8	SW4	I	Button4 (SELECT / DOWN)
	9	SW6	I	Button6 (POWER)
	10	SW1	I	Button1 (MENU)
	11	SW5	I	Button5 (N.C. / UP)
	12	GND		GND

4.22. *X31, Digital Audio Out*

Type: 53261-1471 by Molex, SMT Side entry type, 14pin, pitch 1.25mm, or equivalent

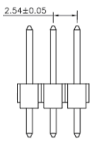
Pin arrangement	Pin	Signal	I/O	Description
 Top view	1	GND		Ground
	2	5V		Power
	3	I2S_WS	O	I2S Word Select
	4	GND		Ground
	5	I2S_Data	O	I2S Data
	6	GND		Ground
	7	I2S_BCLK	O	I2S Clock
	8	GND		Ground
	9	I2S_MCLK	O	I2S MCLK
	10	GND		Ground
	11	MUTE	O	MUTE
	12	AUDIO_GPIO	I/O	GPIO
	13	I2C SDA	I/O	I2C SDA (3V3 level)
	14	I2C SCL	O	I2C SCL (3V3 level)

4.23. X32, Backlight-Dimming-Level select

The range of the analog dimming voltage and the signal high level of the digital PWM signal can be selected with the jumper on X32.

Jumper on X32	Range of signal ADIM (Analog Dimming) on X6-1, X7-1	High Level of signal PWM (Digital Dimming) on X6-2, X7-2
1-2	0V – 5.0V	High Level: 5.0V
2-3	0V – 3.3V	High Level: 3.3V

Type: SL 11/124-03G by Fischer-Elektronik, or equivalent

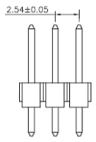
Pin arrangement	Pin	Signal	I/O	Description
	1	+5V		
	2	X32-2		
	3	+3V3_STBY		

4.24. X33, Backlight-Enable-Level select

The level of the backlight-enable signal EN can be selected with the jumper on X33.

Jumper on X33	High Level of EN signal (X6-3, X7-3)
1-2	0V – 5.0V
2-3	0V – 3.3V

Type: SL 11/124-03G by Fischer-Elektronik, or equivalent

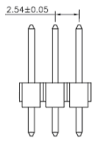
Pin arrangement	Pin	Signal	I/O	Description
	1	+5V		
	2	X33-2		
	3	+3V3_STBY		

4.25. X34, Backlight-Enable-Polarity select

The polarity of the signal EN (for backlight enabling) can be set to active high or active low with the jumper on X34.

Jumper on X34	Polarity of EN-Signal
1-2	High Active
2-3	Low Active

Type: SL 11/124-03G by Fischer-Elektronik, or equivalent

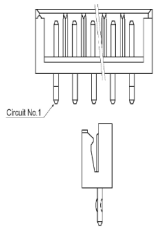
Pin arrangement	Pin	Signal	I/O	Description
	1 2 3	EN		

4.26. X42, TCON power

TCON supply voltage for high current TCON boards: In addition to pins 44 – 50 of X12, this connector can be used to drive high current TCON board or TCON boards which have a separate power supply input connector.

(These TCON board have normally a TCON voltage of +12V, so this voltage is mentioned below)

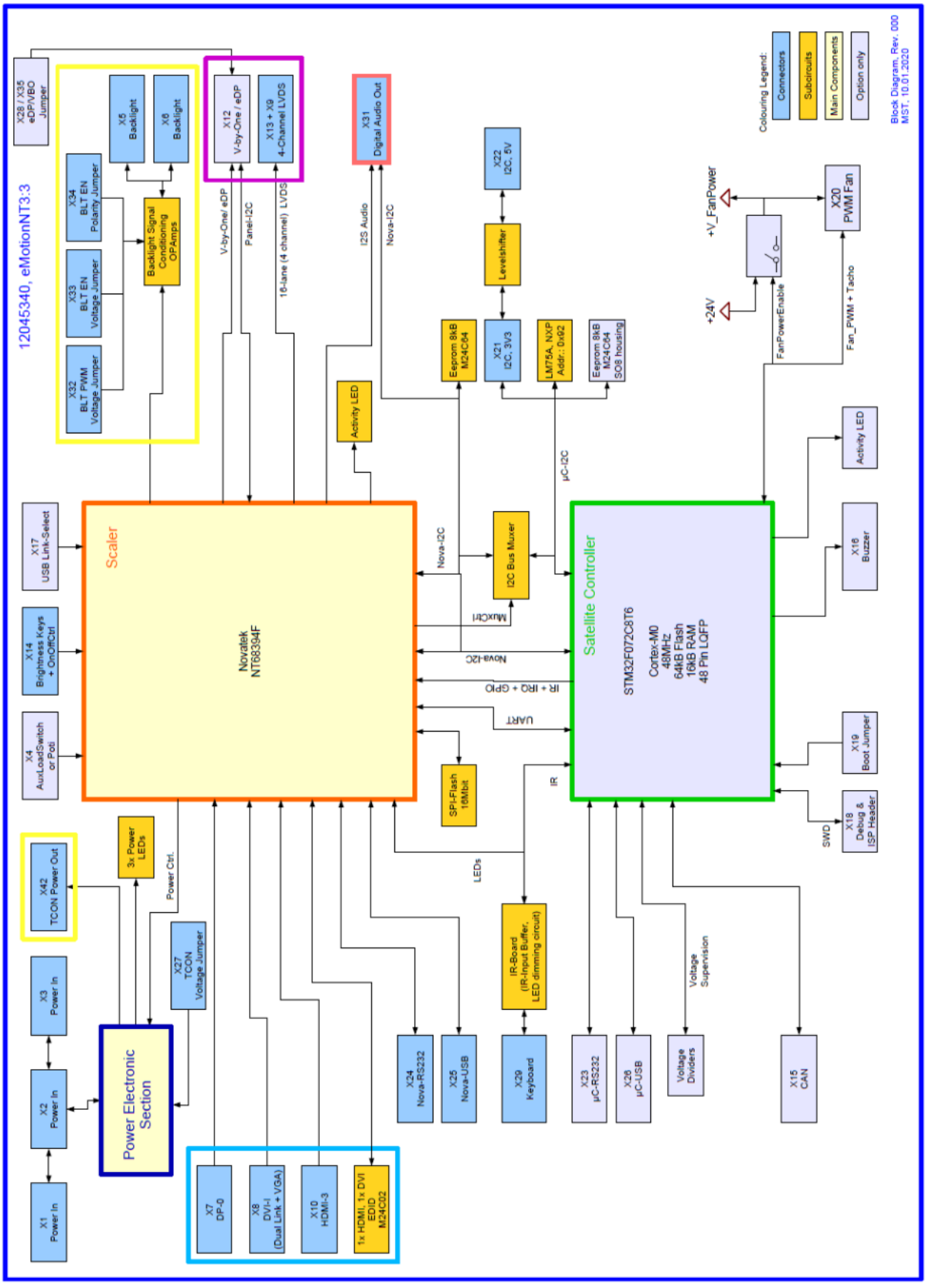
Type: JST-Ref.-No. B6B-EH-A, or equivalent

Pin arrangement	Pin	Signal	I/O	Description
	1	GND		Ground
	2	GND		Ground
	3	GND		Ground
	4	+V_TCON		TCON Power (+5V/ +10V/ +12V)’
	5	+V_TCON		TCON Power (+5V/ +10V/ +12V)’
	6	+V_TCON		TCON Power (+5V/ +10V/ +12V)’

* maximum 6A in total for all pins is available. Voltage can be adjusted by jumper on X27 or by firmware.

5. Technical Details

5.1. Block Diagram



Design with Novatek NT68394G

5.2. Supply voltages and current consumption

The eMotionNT3:3 is developed for a single power supply input voltage. This input voltage should be +12V or +24V. All other supply voltages are generated on the eMotionNT3:3.

Supply voltage	Nominal value	Regulation	Ripple & noise	Onboard current consumption*
+12V**	12V	+/-10%	0.3V	‹ 400mA
+24V	24V	+/-10%	0.6V	‹ 200mA

*: noted current consumption is for eMotionNT3:3 itself. When TFT with TCON-board and backlight inverter is connected input current of eMotionNT3:3 increases with current consumption of TCON-board and backlight inverter.

**: In case that the input voltage is +12V a TCON-output voltage of +12V cannot be achieved! I.e. for units which need a +12V TCON-voltage an input voltage of +24V is necessary.

Note: The backlight supply voltage is always equivalent to the DC input voltage of the eMotionNT3:3. That means that the backlight inverter must fit to the input voltage, if it is not a separate board/circuit is necessary!

5.3. TCON voltage

TCON voltage is selectable by firmware or by using jumper on X7 when firmware feature is disabled. 3 different voltages are selectable. Max current for the TCON is 6A.

TCON Voltage	Nominal value	Max Current	Ripple & noise	Comment
+12V*	12V	6A	0.1V	Jumper on X27: 1-2
+10V	10V	6A	0.1V	Jumper on X27: 2-3
+5V	5V	6A	0.1V	No jumper on X27

*: +12V TCON voltage is only possible when eMotionNT3:3 input voltage is +24V! See also 5.2

5.4. Input and output signals

5.4.1 DP input

PARAMETER	MIN	TYP	MAX	UNIT	Remark
Peak-to-peak input differential voltage	0.12		1.4	V_{p-p}	
Rx DC Common Mode Voltage	0		V_{DD}	V	
R_T Termination Resistance	45	50	55	Ohm	

5.4.2 DVI-I digital 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	

5.4.3 DVI-I analog input

PARAMETER	MIN	TYP	MAX	UNIT	Remark
Conversion rate	10		205	MHz	
ADC resolution	8		8	bit	
Input level range	0,64	0,7	0,9	Vpp	at 75R
Band width	9		290	MHz	
SOG level		0,3		V	at 75R

5.4.4 LVDS output

PARAMETER	MIN	TYP	MAX	UNIT	Remark
Differential Output Voltage	300	500	700	mV	
Common Mode Voltage		1.25		V	
Clock Frequency			85	MHz	Single Channel Dual Channel

6. Optional Features

Optional features for ship displays are available for eMotionNT3:3. Some of that features can be realized with a special firmware for the scaler IC and for some features a separate microcontroller is implemented on eMotionNT3:3.

The variant with a separate microcontroller has no ProAlpha-nr. up to now.

Following features for ship displays are available for the eMotionNT3:3.

6.1. External Brightness Key

The feature “External Brightness Keys“ is realized by the connector pins X14-4 and X14-6. The functionality is implemented in the firmware of the scaler IC NT68394.

6.2. External ON/OFF Signal

The feature “External ON/OFF Signal“ is realized by the connector pin X14-3. The functionality is implemented in the firmware of the scaler IC NT68394.

6.3. ALC Sensor

An ambient light sensor can be connected to X21 or X22 (I²C-bus with 3V3- or 5V-level). Based on the measurements the backlight brightness can be controlled. This functionality is implemented in the firmware of the scaler IC NT68394.

6.4. RS232

The RS232-interface for the scaler is implemented on X24.

7 Qualification

7.1 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)	

7.2 EMI-Standards

7.2.1 EMC/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_{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).

7.3 Safety

- Designed to meet: IEC 62368-1
- Designed to meet UL 62368-1
- PCB is manufactured to meet UL94V-0 and 130°C operating temperature max. UL-sign and E-file-no. are visible on PCB, see chapter 9.2

7.4 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

7.5 Reliability, MTBF

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

8 Warranty, Quality and Environmentalism

8.1 Warranty

- Manufacturer warranty: 12 month after delivery

8.2 Quality

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

Workmanship standard: IPC-A-610F Class2

8.3 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.

9 Label and PCB markings

9.1 Label and material number

The following points are visible on the label of the eMotionNT3:3 board.

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

9.2 Marking of PCB

The following points are visible on the PCB of the eMotionNT3:3 board.

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

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