

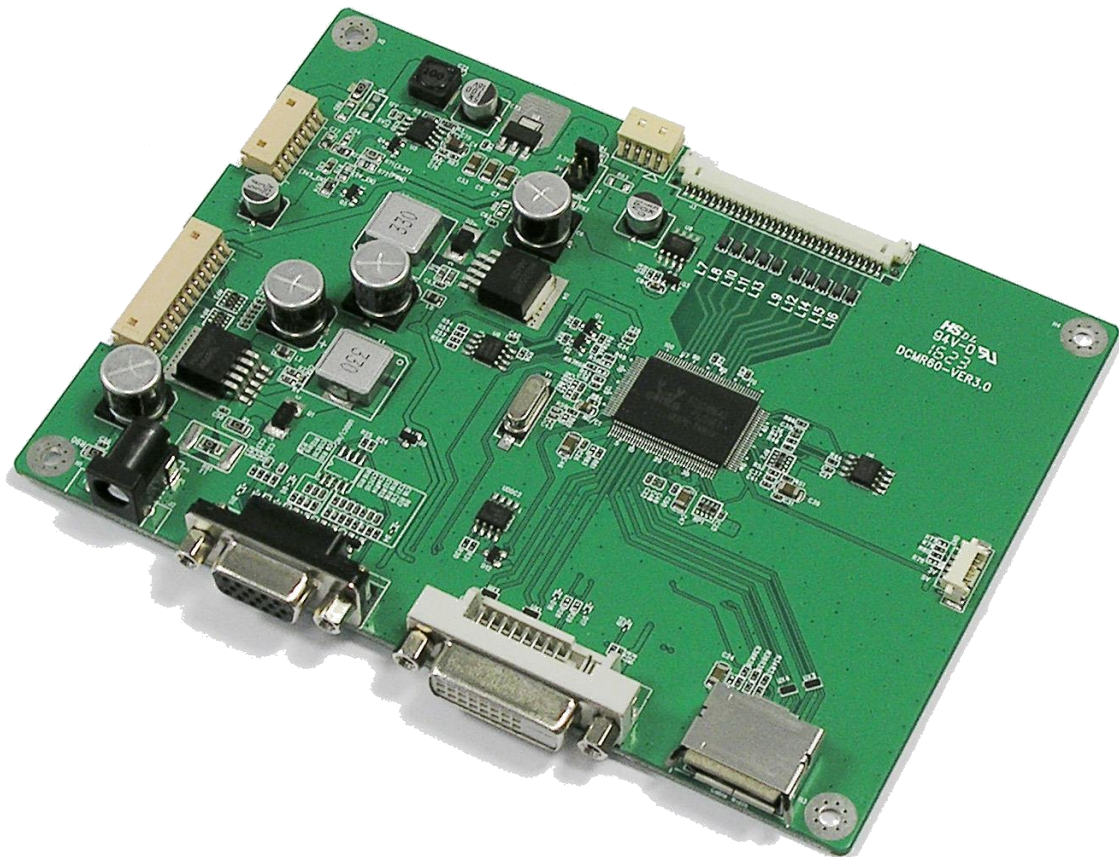
## Specification for approval

(DisplayPort, DVI and analog RGB Interface Controller for TFT-LCD Interface)

### Product Specification Status

- Preliminary
- Final

**Model: DCMR-60**



### Customer

Approved by  
(Name / Title)

Signature

*Please return one of these to us immediately with your signature for approval.*

*This specification is subject to legal disclaimers.*

## 1. Product Overview

This DisplayPort, DVI and analog RGB to LVDS converter board accepts common video signals. Digital interfaces DisplayPort 1.2, DVI 1.0, HDMI 1.4a and all backward compatible signals are supported as well as analog RGB. It generates all necessary control signals and panel data to drive TFT-LCDs with  $V_{DD}$  level 3.3V, 5V or 12V. This TFT-controller board supports resolutions up to 1920x1200 (WUXGA) at a vertical refresh rate up to 60Hz. The user interface includes brightness, contrast adjustment, etc. by on-screen programming. For automatic backlight adjustment an ambient light sensor is supported.

## 2. Features

### General

- Support up to 1920x1200 (WUXGA) resolution @ 60Hz
- Support displays with LVDS  $V_{DD}$  3.3V / 5V / 12V
- DDC/CI support by embedded DDC
- I<sup>2</sup>C-bus Interface
- Power management support (DPMS - VESA compliant)

### DisplayPort 1.2 Digital Input Interface

- High-Bandwidth Digital Content Protection (HDCP v1.3) support
- Support 4 lanes digital input, each lane's speed up to 1.62Gbps and 2.7Gbps
- Support 6-bit, 8-bit, 10-bit, and 12-bit color depth transport

### HDMI 1.4a Compliant Digital Input Interface

- Single link on-chip TMDS receiver up to 225MHz
- High-Bandwidth Digital Content Protection (HDCP v1.3) support
- Support DVI 1.0

### Analog RGB Input Interface

- Support Sync-On-Green (SOG) and various kinds of composite sync modes

### Auto Detection / Calibration

- Input format detection
- Compatibility with standard VESA Mode
- Smart engine for phase / image position /

### color calibration

#### Scaling

- Fully programmable zoom ratios
- Independent horizontal/vertical scaling
- Advanced zoom algorithm provides high image quality
- Sharpness/Smooth filter enhancement
- Support non-linear scaling from 4:3 to 16:9 or 16:9 to 4:3

#### Color Processor

- True 10-bit color processing engine
- sRGB compliance

#### Output Interface

- Dual-LVDS 24-bit output interface
- Spread-Spectrum DPLL to reduce EMI
- Support VESA and JEIDA Mapping

#### On Screen Display menu

- Backlight dimming
- Color adjustment (contrast, brightness, etc.)
- Several other settings

#### Environmental

- ✓RoHS
- ✓REACH

### 3. Functional Diagram

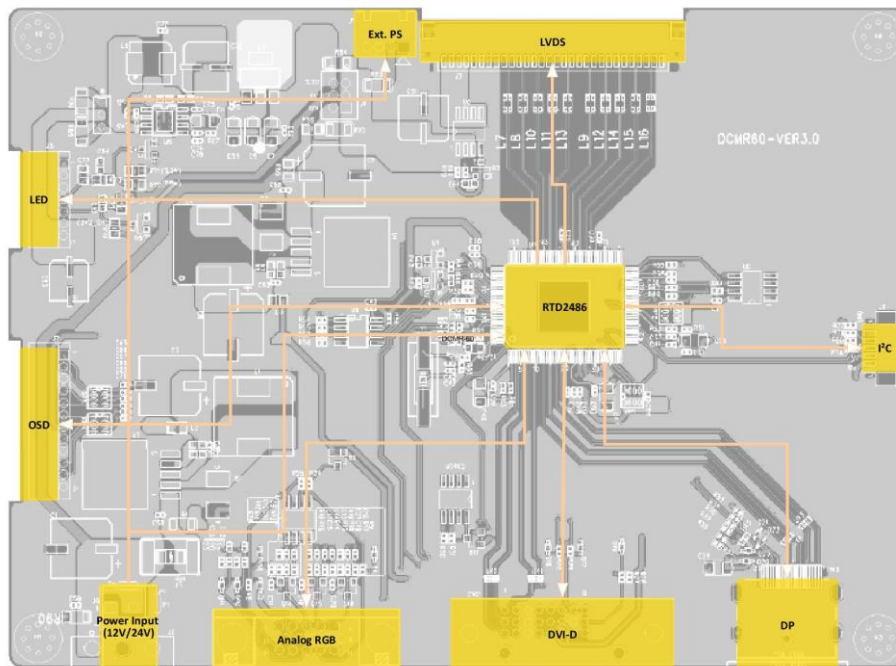
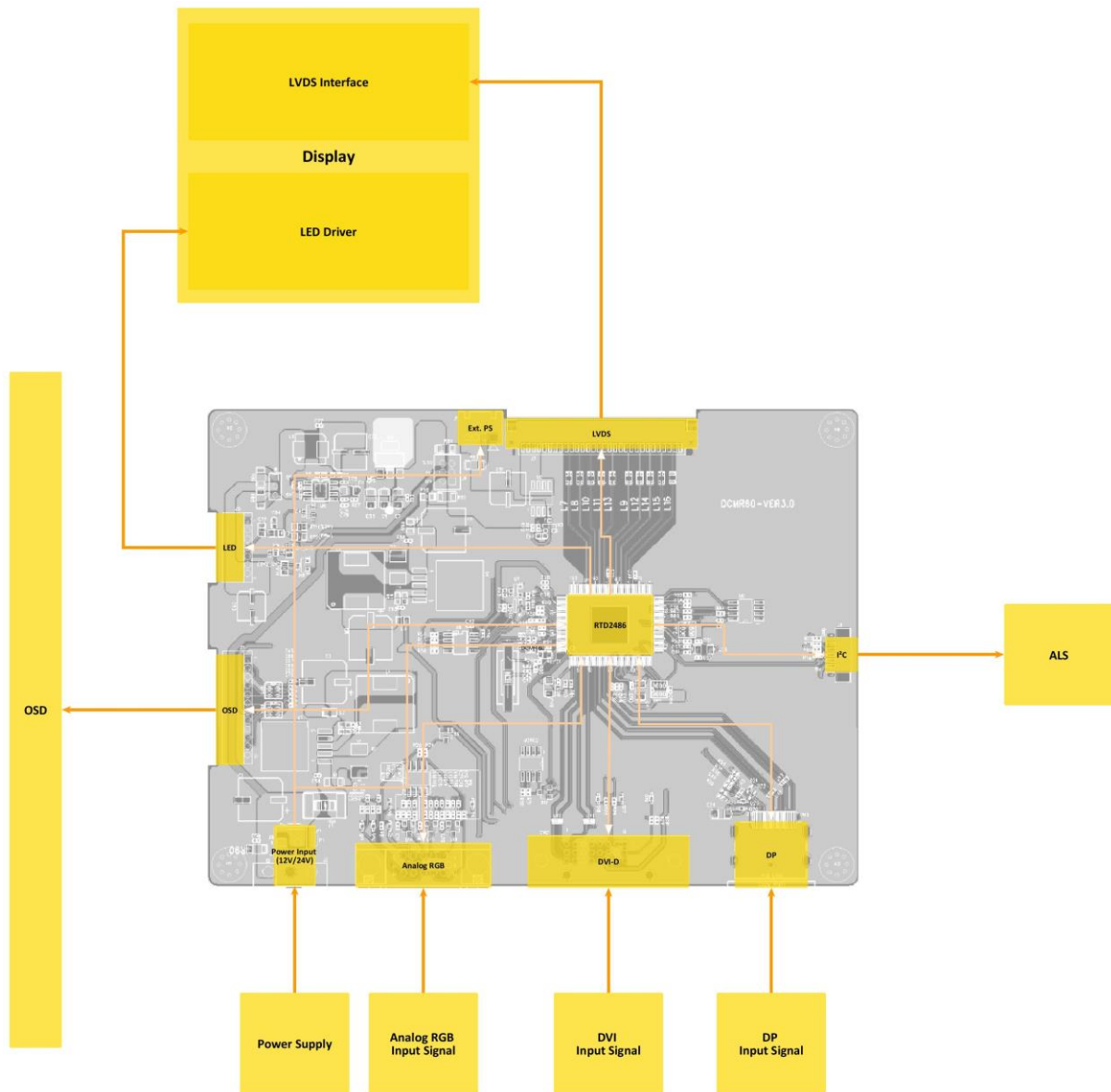


Fig 1. System Diagram

## 4. Typical Application



**Fig 2. Application of DCMR-60**

## 5. Electrical Characteristics

All ratings @  $V_{DD} = 12.0V$ ,  $\vartheta = 25^{\circ}C$  unless otherwise noted.

### 5.1. Input

**Table 1. Electrical Input Characteristics**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$V_{DD}$	Operating Supply Voltage	12V configuration	10.8	12.0	13.2	V DC
		24V configuration	21.6	24.0	26.4	V DC

V <sub>DDmax</sub>	Absolute Max. Rating <sup>1</sup>	12V configuration	-0.3	-	16.0	V DC
		24V configuration	-0.3	-	35.0	V DC
I <sub>DD</sub>	Current Consumption <sup>2</sup>	Board Only (active mode)	56	123	157	mA
		Board Only (sleep mode)	22	34	36	mA
		With WVGA Display <sup>3</sup>	0.12	0.24	0.38	A
		With SXGA Display <sup>4</sup>	0.30	0.74	1.25	A
		With FHD Display <sup>5</sup>	0.30	0.74	1.14	A
P <sub>C</sub>	Power Consumption	Active mode	0.70	1.48	1.88	W

## 5.2. Output

**Table 2. Electrical Output Characteristics**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V <sub>Panel</sub>	Display Power Supply	3.3V configuration	3.0	3.3	3.6	V DC
		5V configuration	4.5	5.0	5.5	V DC
		12V configuration	10.8	12.0	13.2	V DC
V <sub>BKL</sub>	Backlight Power Supply	5V configuration	4.5	5.0	5.5	V DC
		12V configuration	10.8	12.0	13.2	V DC
V <sub>BKL_EN</sub>	Backlight Enable Voltage	3.3V configuration	3.0	3.3	3.6	V DC
		5V configuration	4.5	5.0	5.5	V DC
V <sub>BKL_ADJ</sub>	Backlight Adjust Voltage	3.3V configuration	3.0	3.3	3.6	V DC
		5V configuration	4.5	5.0	5.5	V DC

<sup>1</sup> Consider ratings of connected parts

<sup>2</sup> Current consumption depends on the firmware used (resolution)

<sup>3</sup> Test was performed with InnoLux G070Y2-L01 Rev. C6 (WVGA, 500cd/m<sup>2</sup>). Backlight PWM duty ratio min: 10%

<sup>4</sup> Test was performed with CPT CLAA190EB01CW (SXGA, 450cd/m<sup>2</sup>). Backlight PWM duty ratio min: 5%

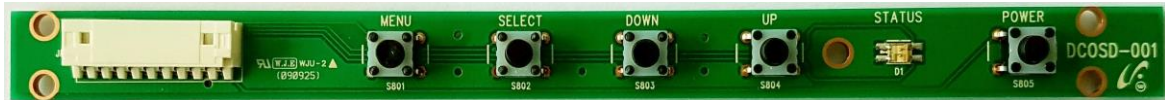
<sup>5</sup> Test was performed with AUO G133HAN01.0 (FHD, 400cd/m<sup>2</sup>). Backlight PWM duty ratio min: 5%

## 6. OSD (On-Screen Display)

The user-friendly, intuitive controllable integrated OSD menu provides certain functions to change settings, adjust the image and others. It can be controlled by an OSD-keyboard. The status of the LCD controller can be checked by a LED which is integrated on the keyboard.

### 6.1.OSD-Keyboard

There are 5 buttons to control the OSD by the OSD-keyboard and one LED on it to show the board's status.



**Fig 3. OSD-keyboard**

#### Buttons

The function of each OSD key is shown in the following table.

**Table 3. OSD keyboard functions**

No.	Button	Switch Function	Hot-Key Function
1	Menu	1. Open / Close OSD Main Menu 2. Leave setting without change	-
2	Select	Select an item / leave setting and save	Change input source
3	Down	1. Move to down / left in menu list 2. Decrease the value of selected item	-
4	Up	1. Move to upside / right in menu list 2. Increase the value of selected item	Show signal info
5	Power	Turn power on / off	-

#### LED

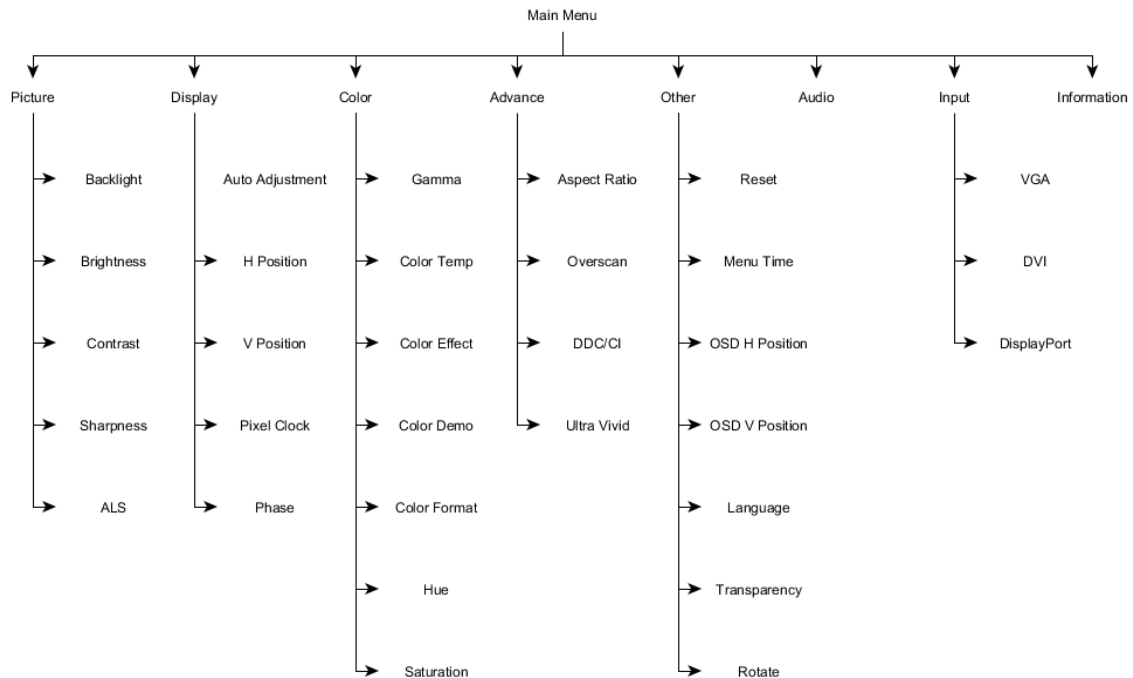
LED colors and their meanings are described in the table below.

**Table 4. OSD-keyboard LED status lights**

LED Color	Status	Meaning
Green	Constant	Normal state
Amber	Flashing	DPMS mode (can't find signal)
Red	Constant	Searching signal

## 6.2.OSD-menu

### Menu Structure



### Menu Items



**Fig 4. Menu Items**

**Table 5. OSD Overview: Menu Items**

Title	Function
Picture	Adjust and optimize the image
Display	Adjust H- & V-Position of the image
Color	Adjust and optimize the color
Advance	Advanced settings
Input	Input source selection
Other	Adjust the On-Screen-Display settings
Information	Information about current timing

Main-Menu: Picture

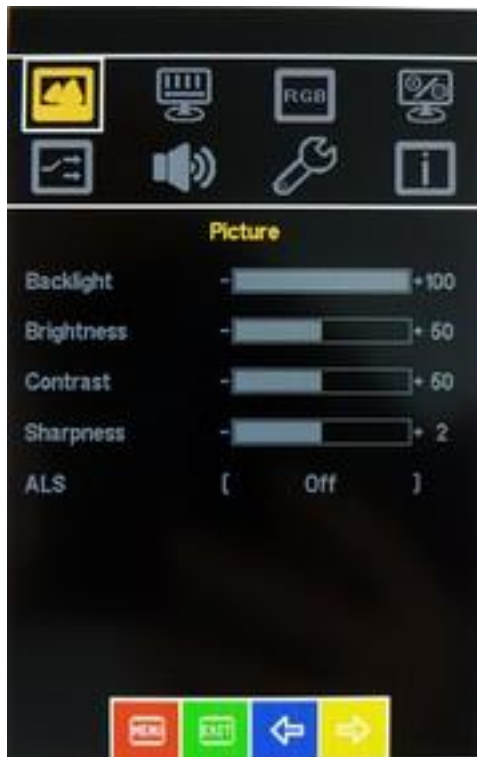


Fig 5. Main-Menu: Picture

Table 6. OSD Overview: Main-Menu Picture

Title	Function
Backlight	Adjust the backlight-intensity
Brightness	Adjust the brightness of the image
Contrast	Adjust the contrast of the image
Sharpness	Adjust the sharpness of the image
ALS	Ambient Light Sensor settings

Sub-Menu: ALS



Fig 6. Sub-Menu: ALS

Table 7. OSD Overview: Sub-Menu ALS

Title	Function
Min. backlight at	Adjust the illuminance for minimal backlight
Max. backlight at	Adjust the illuminance for maximum backlight
Transition speed	Adjust the transition speed [ms]
Ignore Lux diff. less	Minimum difference in illuminance to trigger backlight adjustments
Current Lux value	Displays the current illuminance measured



Main-Menu: Display



Fig 7. Main-Menu: Display

Main-Menu: Color



Fig 8. Main-Menu: Color

Table 8. OSD Overview: Main-Menu Display

Title	Function
Auto Adjustment	Input format detection and phase / image position adjustment
H Position	Adjust horizontal position of the image
V Position	Adjust vertical position of the image
Pixel Clock	Adjust pixel clock
Phase	Adjust phase

Table 9. OSD Overview: Main-Menu Color

Title	Function
Gamma	Adjust gamma level of the image
Color Temp	Adjust the color temperature
Color Effect	Select a color effect
Color Demo	Select a mode to check hue and saturation settings
Color Format	Select a color space
Hue	Adjust the color balance
Saturation	Adjust the color intensity

Sub-Menu: Color Temp - User



Fig 9. Sub-Menu: Color Temp - User

Sub-Menu: Color Effect - User

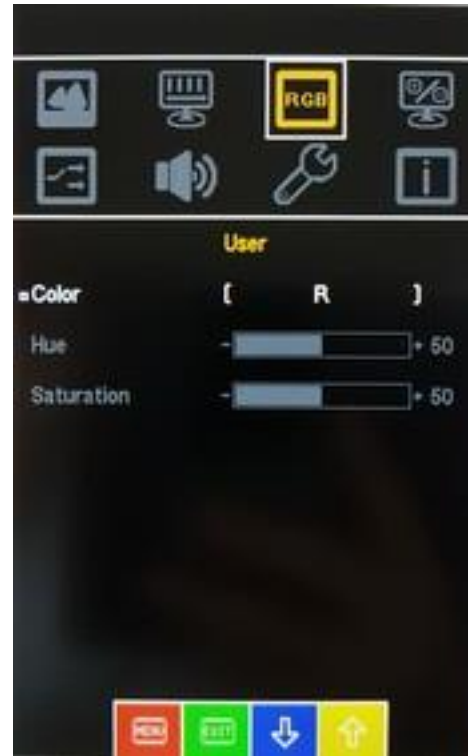


Fig 10. Sub-Menu: Color Effect - User

Table 10. OSD Overview: Sub-Menu: Color Temp - User

Title	Function
R	Adjust red video gain
G	Adjust green video gain
B	Adjust blue video gain

Table 11. OSD Overview: Sub-Menu: Color Effect - User

Title	Function
Color	Select 6-axis color
Hue	Adjust hue of respective color
Saturation	Adjust saturation of respective color

Main-Menu: Advance



Fig 11. Main-Menu: Advance

Table 12. OSD Overview: Main-Menu Advance

Title	Function
Aspect Ratio	Select aspect ratio or scaling factor of the image
Overscan	Enable / Disable overscan function
DDC/CI	Enable / Disable DDC/CI function
Ultra Vivid	Select grades of Ultra Vivid color mode

Main-Menu: Input



Fig 12. Main-Menu: Input

Table 13. OSD Overview: Main-Menu Input

Title	Function
VGA	Select VGA input
DVI	Select DVI input
DisplayPort	Select DisplayPort input

Main-Menu: Other



Fig 13. Main-Menu: Other

Main-Menu: Information



Fig 14. Main-Menu: Information

Table 14. OSD Overview: Main-Menu Other

Title	Function
Reset	Reset all OSD settings to factory mode
Menu Time	Set the OSD duration [s]
OSD H Position	Set the horizontal position of OSD menu
OSD V Position	Set the vertical position of OSD menu
Language	Select the OSD language (EN/DE)
Transparency	Adjust the transparency of the OSD menu
Rotate	Enable / Disable 90° OSD rotation

Table 15. OSD Overview: Main-Menu Information

Title	Function
Signal Source	Shows current signal source
Current resolution	Shows resolution of input signal
H- & V-frequency	Shows horizontal and vertical frequency
Pixel clock frequency	Shows pixel clock frequency
Board model	Board model
Firmware	Firmware name
Version	Firmware version

## 7. Interfaces

### 7.1. LVDS Interface

At the LVDS-Interface, single- and dual-channel LVDS is supported. As the board is delivered pre-configured, no changes have to be made to the settings. Pixel clocks up to 186MHz and therefore a resolution up to WUXGA @ 60Hz are supported.

#### Settings

In order to achieve reliable communication when using longer cables, pre-emphasis may be applied to the LVDS signal lines. On the other hand, the spread spectrum function can enhance the behavior in an EMI sensitive environment.

For further information please contact Beck GmbH & Co. Elektronik Bauelemente KG.

#### Mapping

6-bit and 8-bit per color (18-bit or 24-bit color depth) VESA- and JEIDA-mappings are supported at the LVDS-interface. The bit numbering of pixels is big endian, where the most significant bit has the largest bit number.

**Table 16. LVDS Bit Number Mappings**

VESA		JEIDA	
6-bit	8-bit	6-bit	8-bit
5	7	5	5
4	6	4	4
3	5	3	3
2	4	2	2
1	3	1	1
0	2	0	0
	1		7
	0		6

The following tables are identical for odd and even lines.

**Table 17. VESA Data Packing**

LVDS Data Line	Bit position						
	6	5	4	3	2	1	0
D 0	G0	R5	R4	R3	R2	R1	R0
D 1	B1	B0	G5	G4	G3	G2	G1
D 2	DE	VS	HS	B5	B4	B3	B2
D 3 (for 8-bit)	-	B7	B6	G7	G6	R7	R6

**Table 18. JEIDA Data Packing**

LVDS Data Line	Bit position						
	6	5	4	3	2	1	0
D 0	G2	R7	R6	R5	R4	R3	R2
D 1	B3	B2	G7	G6	G5	G4	G3
D 2	DE	VS	HS	B7	B6	B5	B4
D 3 (for 8-bit)	-	B1	B0	G1	G0	R1	R0

## 7.2. I<sup>2</sup>C Interface

DCMR-60 can control various slave devices via a general purpose I<sup>2</sup>C-bus interface. For further information about I<sup>2</sup>C usage, please contact your local sales partner.

### Ambient Light Sensor

DCMR-60 can control an ambient light sensor via an I<sup>2</sup>C-bus or SMBus interface. Various light sensors are supported which are Plug & Play ready and therefore do not require additional modifications. For further information about ambient light sensor usage, please contact your local sales partner.

### Electrical Characteristics

#### DC Characteristics

**Table 19. I<sup>2</sup>C Interface DC Characteristics**

Symbol	Characteristic	Test conditions	Min	Typ	Max	Unit
V <sub>CC</sub>	I <sup>2</sup> C-bus operating voltage (internal pull-up)	3.3V configuration	3.0	3.3	3.6	V
		5V configuration	4.5	5.0	5.5	V
V <sub>IH</sub>	High-level input voltage		0.7 V <sub>CC</sub>	-	-	V
V <sub>IL</sub>	Low-Level input voltage		-	-	0.3V <sub>CC</sub>	V

#### AC Characteristics

**Table 20. I<sup>2</sup>C Interface AC Characteristics**

Symbol	Characteristic	Min	Typ	Max	Unit
f <sub>CLK</sub>	Clock Frequency	-	100	400	kHz
t <sub>HIGH</sub>	Clock high time	600	-	-	ns
t <sub>LOW</sub>	Clock low time	1300	-	-	ns

### Operations

In general, the I<sup>2</sup>C-bus operations have to follow the I<sup>2</sup>C-bus standard. For further information about I<sup>2</sup>C usage, please contact your local sales partner.

#### Write

A write operation looks the following way:

Start	Device Address	Write	Ack	Word Address	Ack	Data	Ack	Stop
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#### Read

A random read operation looks the following way:

Start	Device Address	Write	Ack	Word Address(n)	Ack	Start	Device Address	Read	Ack	Data(n)	No Ack	Stop
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## 7.3. DDC

This LCD controller provides a serial communications link between the video adapter and the controller, the DDC (Display Data Channel). Properties such as maximum resolution, color depth and supported video timing modes can be transmitted using DDC.

## EDID

The DCMR-60 controller board supports the Extended Display Identification Data (EDID 1.4) standard.

EDID contains basic information about a monitor and its capabilities, including vendor information, maximum image size, color characteristics, factory pre-set timings, frequency range limits, a character's string for the monitor name and serial number. The video adapter uses this information for configuration purposes, so that the monitor and system can work together.

## DDC/CI

The display controller complies with the MCCS 2.2 standard. It supports a standard set of MCCS VCP codes to adjust the displayed image or control the display. Read and write commands are available for the following categories:

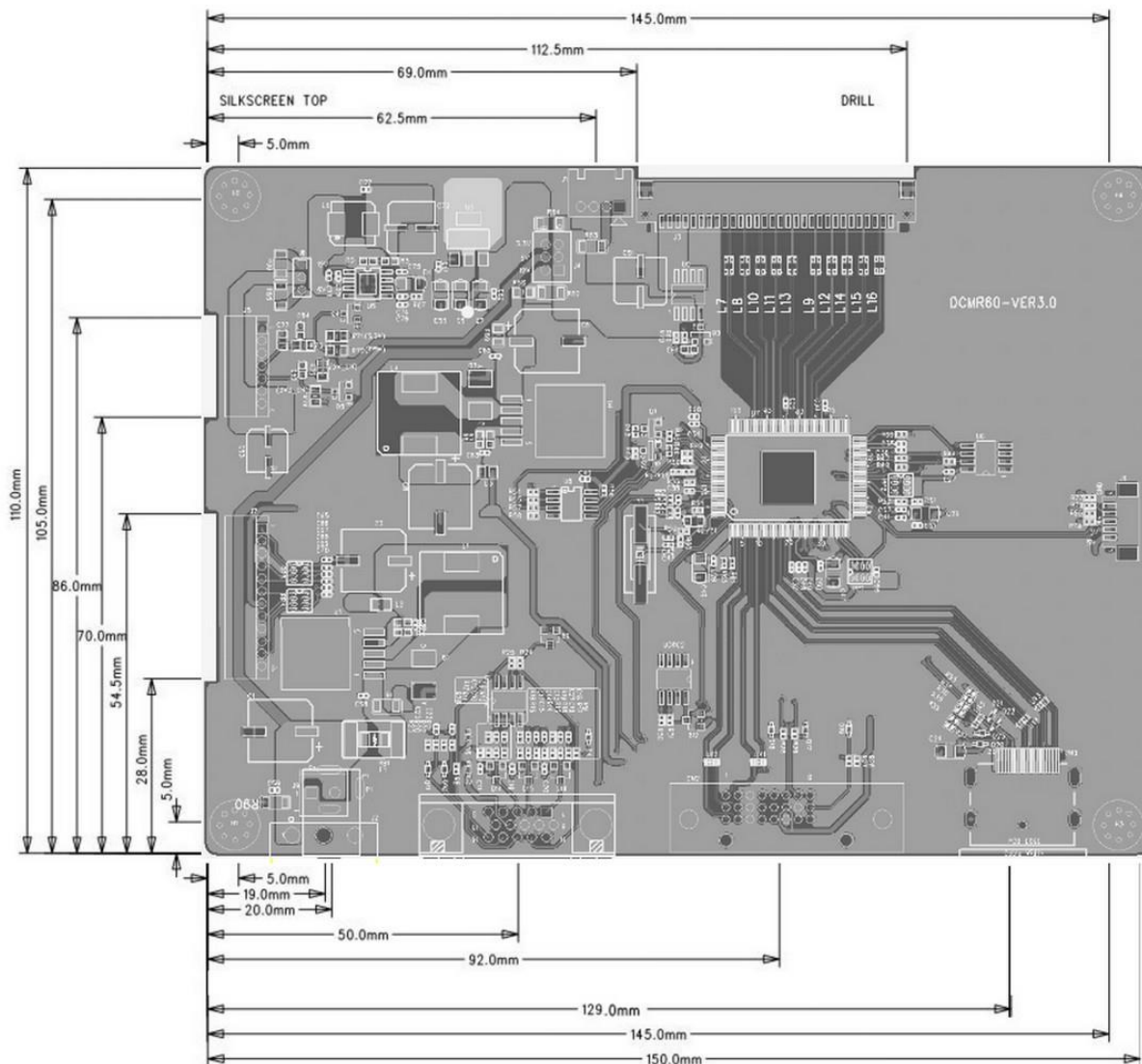
- Image Adjustments
- Color Adjustments
- Image Geometry Adjustments
- Audio Adjustments
- Window Operations
- DPVL Support

For detailed information about the supported MCCS VCP codes, please contact your local sales partner.

## 8. Mechanical Characteristics

**Table 21. Mechanical Characteristics**

Parameter	Value
Dimensions (H x V)	150.0mm x 116.0mm (110.0mm PCB + 6.0mm connectors)
Contour	Rectangular
Production technology	SMT & THT
Total height	16.3mm (1.6mm PCB + 12.7mm top side + 2.0mm bottom side)
Weight	100g





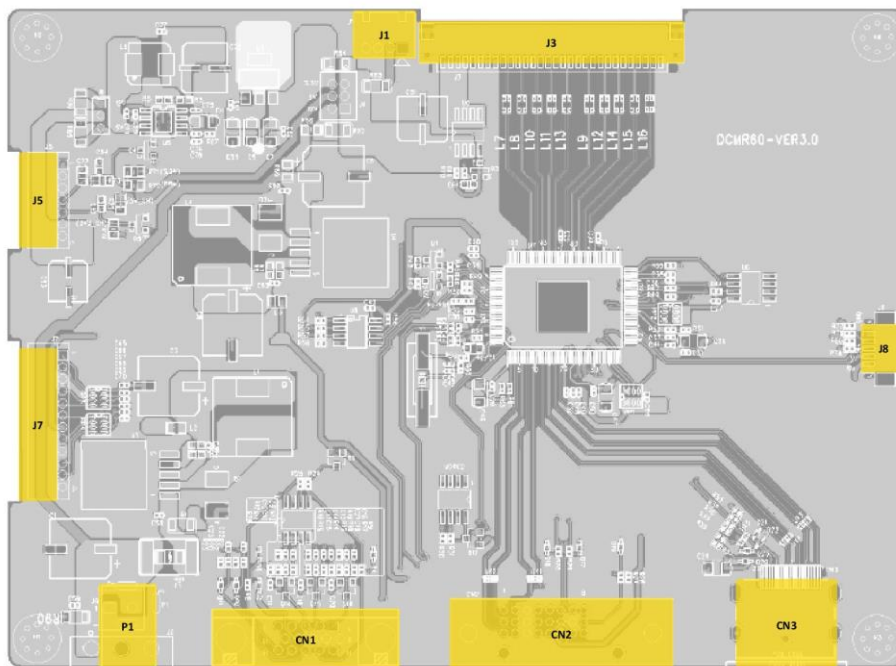
## 9. Connectors

Abbreviations used within this chapter are listed in the table below.

**Table 22. Signal Assignment Abbreviations**

Abbreviation	Description
GND	Ground
PWR	Power
I	Input
O	Output
I/O	Bi-directional
n.c.	Not connected (do not connect)

### 9.1. Connector Overview



**Fig 15. Connector Overview**

## 9.2. Input Connectors

### Power Connectors

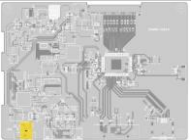
The board has different connector configurations to be supplied with power. In standard configuration connector P1 is assembled, the two other types are available on request.

#### Power Connector (P1)

The Power Connector (P1) supplies the board with power. The connection is mandatory.

**Table 23. Power Connector (P1)**

Parameter	Value
Manufacturer: Connector model no.	Taclex: TDJ-A196GAJ
Pin amount	3 pins (use Pin 1 as marked on connector)
Mating housing part	DC Power Plug 2.5mm x 5mm




**Fig 16. Taclex: TDJ-A196GAJ**

**Table 24. Power Connector Pin Assignment**

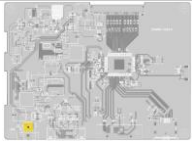
Pin	Signal	Description	Type
1	VIN	12V/24V power input	PWR
2	GND	Ground	GND
3	GND	Ground	GND

#### Power Connector (J9)

The Power Connector (J9) supplies the board with power. The connection is mandatory.

**Table 25. Power Connector (J9)**

Parameter	Value
Manufacturer: Connector model no.	Phoenix Contact: MKDS 1/ 2-3,81 - 1727010
Pin amount	2 pins (use Pin 1 as marked in datasheet)
Mating housing part	Conducting wire AWG16..AWG26




**Fig 17. Phoenix Contact: MKDS 1/ 2-3,81 - 1727010**

**Table 26. Power Connector Pin Assignment**

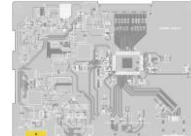
Pin	Signal	Description	Type
1	GND	Ground	GND
2	VIN	12V/24V power input	PWR

Power Connector (J2)

The Power Connector (J2) supplies the board with power. The connection is mandatory.

**Table 27. Power Connector (J2)**

Parameter	Value
Manufacturer: Connector model no.	Phoenix Contact: MSTBA 2,5 HC/ 3-G - 1923762
Pin amount	3 pins (use Pin 1 as marked in datasheet)
Mating housing part	Phoenix Contact: MSTB 2,5 HC/ 3-ST - 1911868



**Fig 18. Phoenix Contact: MSTBA 2,5 HC/ 3-G - 1923762**

**Table 28. Power Connector Pin Assignment**

Pin	Signal	Description	Type
1	VIN	12V/24V power input	PWR
2	n.c.	-	n.c.
3	GND	Ground	GND

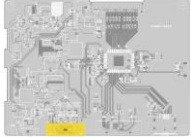
## Video Input

The board has different connectors to connect a source which provides the video signal. In standard configuration connectors CN1 to CN3 are assembled.

### VGA Connector (CN1)

The VGA Connector (CN1) can be used to provide an analog RGB signal to the board. The connection is mandatory.

**Table 29. VGA Connector (CN1)**

Parameter	Value	
Manufacturer: Connector model no.	HD D-Sub DE-15 female	
Pin amount	15 pins (use Pin 1 as marked on connector)	
Mating housing part	HD D-Sub DE-15 male	



**Fig 19. HD D-Sub DE-15 female**

**Table 30. VGA Connector (CN1)Video Input Pin Assignment**

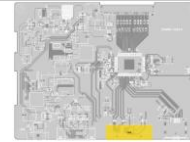
Pin	Signal	Description	Type
1	R0+	Red signal	I
2	G0+	Green signal	I
3	B0+	Blue signal	I
4	n.c.	-	n.c.
5	n.c.	-	n.c.
6	R0-	Red ground	I
7	G0-	Green ground	I
8	B0-	Blue ground	I
9	VCC	+5V Power	PWR
10	n.c.	-	n.c.
11	n.c.	-	n.c.
12	SDA	DDC data	I/O
13	AHS	Horizontal sync	I
14	AVS	Vertical sync	I
15	SCL	DDC clock	I/O

DVI Connector (CN2)

The DVI Connector (CN2) can be used to provide a digital video signal to the board. The connection is mandatory.

**Table 31. DVI Connector (CN2)**

Parameter	Value
Manufacturer: Connector model no.	Standard DVI-D (Dual Link) receptacle
Pin amount	24 + 1 pins
Mating housing part	Standard DVI-D (Dual Link) plug



**Fig 20. Standard DVI-D (Dual Link) receptacle**

**Table 32. DVI Connector (CN2) Pin Assignment**

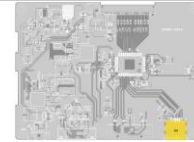
Pin	Signal	Description	Type
1	D2-	T.M.D.S. Data2-	I
2	D2+	T.M.D.S. Data2+	I
3	GND	T.M.D.S. Data2/4 shield	GND
4	n.c.	-	n.c.
5	n.c.	-	n.c.
6	SCL	DDC clock	I/O
7	SDA	DDC data	I/O
8	n.c.	-	n.c.
9	D1-	T.M.D.S. Data1-	I
10	D1+	T.M.D.S. Data1+	I
11	GND	T.M.D.S. Data1/3 shield	GND
12	n.c.	-	n.c.
13	n.c.	-	n.c.
14	VCC	+5V Power	PWR
15	GND	Ground (return for +5V, HSync and VSync)	GND
16	HPD	Hot-plug detect	I
17	D0-	T.M.D.S. Data0-	I
18	D0+	T.M.D.S. Data0+	I
19	GND	T.M.D.S. Data0/5 shield	GND
20	n.c.	-	n.c.
21	n.c.	-	n.c.
22	GND	T.M.D.S. Clock shield	GND
23	RXC+	T.M.D.S. Clock+	I
24	RXC-	T.M.D.S. Clock-	I
C5	n.c.	-	n.c.

DisplayPort Connector (CN3)

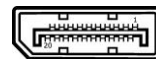
The DisplayPort Connector (CN3) can be used to provide a digital video signal to the board. The connection is mandatory.

**Table 33. DisplayPort Connector (CN3)**

Parameter	Value
Manufacturer: Connector model no.	Standard DisplayPort receptacle
Pin amount	20 pins (use Pin 1 as marked on connector)
Mating housing part	Standard DisplayPort plug



**Fig 21. DisplayPort Connector**



**Fig 22. DisplayPort Connector Pin Config.**

**Table 34. DisplayPort Connector (CN3) Pin description**

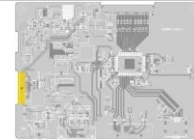
Pin	Signal	Description	Type
1	ML_Lane 3 (n)	Main-Link lane 3-	I
2	GND	Ground	GND
3	ML_Lane 3 (p)	Main-Link lane 3+	I
4	ML_Lane 2 (n)	Main-Link lane 2-	I
5	GND	Ground	GND
6	ML_Lane 2 (p)	Main-Link lane 2+	I
7	ML_Lane 1 (n)	Main-Link lane 1-	I
8	GND	Ground	GND
9	ML_Lane 1 (p)	Main-Link lane 1+	I
10	ML_Lane 0 (n)	Main-Link lane 0-	I
11	GND	Ground	GND
12	ML_Lane 0 (p)	Main-Link lane 0+	I
13	Config 1	-	-
14	Config 2	-	-
15	AUX CH (p)	AUX-CH+	I/O
16	GND	Ground	GND
17	AUX CH (n)	AUX-CH-	I/O
18	HPD	Hot-plug detect	O
19	PWR Return (GND)	Ground	GND
20	PWR (3,3V)	Power	PWR

### OSD Connector (J7)

The OSD Connector (J7) can be used to connect an OSD-keyboard including status-LED. The connection is optional.

**Table 35. OSD Interface (J7)**

Parameter	Value
Manufacturer: Connector model no.	Molex: 53015-1210
Pin amount	12 pins (use Pin 1 as marked on connector)
Mating housing part	Molex: 51004-1200



**Fig 23. Molex: 53015-1210**

**Table 36. Pin description**

Pin	Signal	Description	Type
1	UP	OSD key up	I
2	DOWN	OSD key down	I
3	GND	Ground	GND
4	SELECT	OSD key select	I
5	MENU	OSD key menu	I
6	LED_RD	LED red	O
7	5V	OSD power	O
8	LED_GN	LED green	O
9	GND	Ground	GND
10	POWER	OSD key power	I
11	n.c.	-	n.c.
12	GND	Ground	GND

### I<sup>2</sup>C Connector (J8)

The I<sup>2</sup>C Connector (J8) can be used to connect an external I<sup>2</sup>C slave device. The connection is optional.

**Table 37. I<sup>2</sup>C Interface (J8)**

Parameter	Value
Manufacturer: Connector model no.	Molex: 53261-0571
Pin amount	5 pins (use Pin 1 as marked on connector)
Mating housing part	Molex: 51021-0500



**Fig 24. Molex: 53261-series**

**Table 38. Pin description**

Pin	Signal	Description	Type
1	5V	5V output	O
2	3V3	3.3V output	O
3	SDA	Serial Data	I/O
4	SCL	Serial Clock	I/O
5	GND	Ground	GND

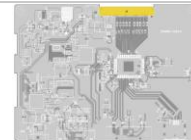
### 9.3. Output Connectors

#### LVDS Interface (J3)

The LVDS Interface (J3) is the video output interface. The connection is mandatory.

**Table 39. LVDS Interface (J3)**

Parameter	Value
Manufacturer: Connector model no.	Hirose: DF14-30P1.25H
Pin amount	30 pins (use Pin 1 as marked on PCB)
Mating housing part	Hirose: DF14-30S-1.25C



**Fig 25. Hirose: DF14-30P1.25H**



**Table 40. Pin description**

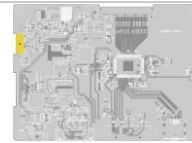
Pin	Signal	Description	Type
1	V_Panel	Panel Power	O
2	V_Panel	Panel Power	O
3	V_Panel	Panel Power	O
4	V_Panel	Panel Power	O
5	n.c.	-	n.c.
6	GND	Ground	GND
7	GND	Ground	GND
8	GND	Ground	GND
9	TXO0-	Negative LVDS differential data output – Line 0 (odd)	O
10	TXO0+	Positive LVDS differential data output – Line 0 (odd)	O
11	TXO1-	Negative LVDS differential data output – Line 1 (odd)	O
12	TXO1+	Positive LVDS differential data output – Line 1 (odd)	O
13	TXO2-	Negative LVDS differential data output – Line 2 (odd)	O
14	TXO2+	Positive LVDS differential data output – Line 2 (odd)	O
15	TXOCLK-	Negative LVDS differential clock output (odd)	O
16	TXOCLK+	Positive LVDS differential clock output (odd)	O
17	TXO3-	Negative LVDS differential data output – Line 3 (odd)	O
18	TXO3+	Positive LVDS differential data output – Line 3 (odd)	O
19	GND	Ground	GND
20	TXE0-	Negative LVDS differential data output – Line 0 (even)	O
21	TXE0+	Positive LVDS differential data output – Line 0 (even)	O
22	TXE1-	Negative LVDS differential data output – Line 1 (even)	O
23	TXE1+	Positive LVDS differential data output – Line 1 (even)	O
24	TXE2-	Negative LVDS differential data output – Line 2 (even)	O
25	TXE2+	Positive LVDS differential data output – Line 2 (even)	O
26	TXECLK-	Negative LVDS differential clock output (even)	O
27	TXECLK+	Positive LVDS differential clock output (even)	O
28	TXE3-	Negative LVDS differential data output – Line 3 (even)	O
29	TXE3+	Positive LVDS differential data output – Line 3 (even)	O
30	GND	Ground	GND

### Backlight Power Connector (J5)

The Backlight Power Connector (J5) is one of two possible ways to power backlight units. When using an (in the display) integrated LED-driver, the connection is mandatory.

**Table 41. Backlight Connector (J5)**

Parameter	Value
Manufacturer: Connector model no.	Molex: 53015-0710
Pin amount	7 pins (use Pin 1 as marked on connector)
Mating housing part	Molex: 51004-0700



**Fig 26. Molex: 53015-0710**

**Table 42. Pin description**

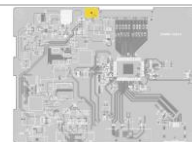
Pin	Signal	Description	Type
1	GND	Ground	GND
2	GND	Ground	GND
3	GND	Ground	GND
4	BKL_ADJ	Backlight Adjust	O
5	BKL_EN	Backlight Enable	O
6	VBKL <sup>6</sup>	Backlight Power	O
7	VBKL <sup>6</sup>	Backlight Power	O

#### External Power Supply (J1)

The External Power Supply (J1) offers different voltage levels for powering additional components. The connection is optional.

**Table 43. External Power Supply (J1)**

Parameter	Value
Manufacturer: Connector model no.	Molex: 53015-0410
Pin amount	4 pins (use Pin 1 as marked on connector)
Mating housing part	Molex: 51004-0410



**Fig 27. Molex: 53015-0410**

<sup>6</sup> In  $V_{DD} = 12V$  and  $V_{BKL}=12V$  configuration:  $V_{BKL} = V_{DD}$

**Table 44. Power Connector Pin Assignment**

Pin	Signal	Description	Type
1	VEXT_12 <sup>7</sup>	12V power output	O
2	VEXT_5	5V power output	O
3	GND	Ground	GND
4	GND	Ground	GND

<sup>7</sup> In  $V_{DD} = 12V$  configuration,  $V_{EXT\_12} = V_{IN}$

## 10. Reliability

**Table 45. Reliability test**

Symbol	Test item	Min	Max	Unit
$\vartheta_{ST}$	Storage temperature	-20	70	°C
$\vartheta_{OP}$	Operating temperature <sup>8</sup>	-10	60	°C

## 11. Absolute Maximum Ratings

**Table 46. Absolute maximum ratings**

Symbol	Test item	Min	Max	Unit
$\vartheta_{ST}$	Storage temperature	-20	70	°C
$\vartheta_{OP}$	Operating temperature	-10	60	°C

## 12. Application Information

### 12.1. Operating Precautions

- Be sure to ground yourself before handling the controller board.
- Turn off power supply before inserting or disconnecting any connector.
- Spike noise causes maloperation of circuits. It should be lower than following voltage:  $\pm 200\text{mV}$  (over and under shoot voltage).
- This module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

### 12.2. General Cautions

- The responsibility for the applicability of customer specific products and use in a particular customer design is always within the authority of the customer.
- An important factor for each system integration is the thermal design. System designers might need to implement a passive or active cooling system in their specific design to keep the temperatures of all parts within the specification.
- Be careful about condensation at sudden temperature change. Condensation damages electrical contacted parts.
- When preparing a cable for a specific display, always refer to appropriate cable pin-out

<sup>8</sup> Phase- or clock-shift can appear between -10°C and 0°C

and display specification. Always check the signals before connecting the cable. Any incorrect pin connection may damage the display and the controller permanently.

- Take care of all the sensitive electronic components
- Do not modify the module assembly
- You must mount a module using its respective mounting holes and avoid any bend force during mounting.
- Be sure to do a reset in OSD if any problem occurs during operation
- Should you need any technical help, please contact Beck GmbH & Co. Elektronik Bauelemente KG

## 13. Packing / Labels

Serial number looks in general the following way:

**ABCN.NN-YYMMDDXXXX**

**Table 47. S/N Encoding**

<b>Code</b>	<b>Meaning</b>
ABC	Acronym for the SMT producer
N.NN	Firmware version VN.NN
YYMMDD	Manufacturing date (YY/MM/DD)
XXXX	Manufacturing sequence of product

## 14. Abbreviations

**Table 48. Abbreviations**

<b>Abbr.</b>	<b>Description</b>
<b>ALS</b>	Ambient Light Sensor
<b>BLU</b>	Backlight Unit
<b>BPC</b>	Bits Per Color
<b>BPP</b>	Bits Per Pixel
<b>DDC</b>	Display Data Channel
<b>DDC/CI</b>	Display Data Channel Command Interface
<b>DDWG</b>	Digital Display Working Group
<b>DP</b>	DisplayPort
<b>DPLL</b>	Digital Phase-Locked Loop
<b>DPMS</b>	Display Power Management Service
<b>DVI</b>	Digital Visual Interface
<b>EDID</b>	Extended Display Identification Data
<b>EEPROM</b>	Electrically Erasable Programmable Read-Only Memory
<b>EMI</b>	Electromagnetic Interference
<b>GND</b>	Ground
<b>HDCP</b>	High Digital Content Protection
<b>HDMI</b>	High Definition Multimedia Interface
<b>I<sup>2</sup>C</b>	Inter Integrated Circuit
<b>I<sup>2</sup>S</b>	Inter-IC Sound
<b>ISP</b>	In System Programming
<b>JEIDA</b>	Japan Electronic Industry Development Association
<b>LCD</b>	Liquid Crystal Display
<b>LED</b>	Light Emitting Diode
<b>LVDS</b>	Low Voltage Different Signaling
<b>MCCS</b>	Monitor Command Control Set
<b>OSD</b>	On Screen Display
<b>PCB</b>	Printed Circuit Board
<b>PCLK</b>	Pixel Clock
<b>PWM</b>	Pulse Width Modulation
<b>REACH</b>	Registration, Evaluation, Authorization and Restriction of Chemicals
<b>RGB</b>	Red, Green, Blue

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<b>RoHS</b>	Restriction of Hazardous Substances
<b>SMBus</b>	System Management Bus
<b>SMT</b>	Surface Mounted Technology
<b>SOG</b>	Sync-On-Green
<b>sRGB</b>	Standard-RGB
<b>TMDS</b>	Transition-Minimized Different Signaling
<b>TFT</b>	Thin-Film Transistor
<b>THT</b>	Through Hole Technology
<b>VCP</b>	Virtual Control Panel
<b>VESA</b>	Video Electronics Standards Association
<b>VGA</b>	Video Graphics Array

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## 15. Revision History

**Table 49. Revision History**

Rev.	Date	Section	Specification Status	Description
1.0	Jul 24, 2013	All	Final	Initial release
1.1	Sep 30, 2013	-	Final	Changed connector types
1.2	Mar 25, 2014	-	Final	Added mechanical dimension image
2.0	Aug 4, 2014	-	Final	Added OSD description and label information
2.1	Oct 8, 2014	-	Final	Changed electrical characteristics
2.2	Oct 23, 2014	-	Final	Changed Power input connector (J2) type
2.3	Jan 14, 2015	-	Final	Changed supply voltage limits
2.4	Sep 17, 2015	-	Final	Added specific connectors to electrical characteristics
3.0	Jun 21, 2016	-	Final	Added EMI-filters on LVDS lines; Added connector options to electrical characteristics
3.1	Feb 11, 2019	All	Final	Specification update; New specification structure
3.2	Mar 19, 2020	9	Final	Added J8 connector description; Updated connector descriptions



## 16. Legal Information

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## Contact Information

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