

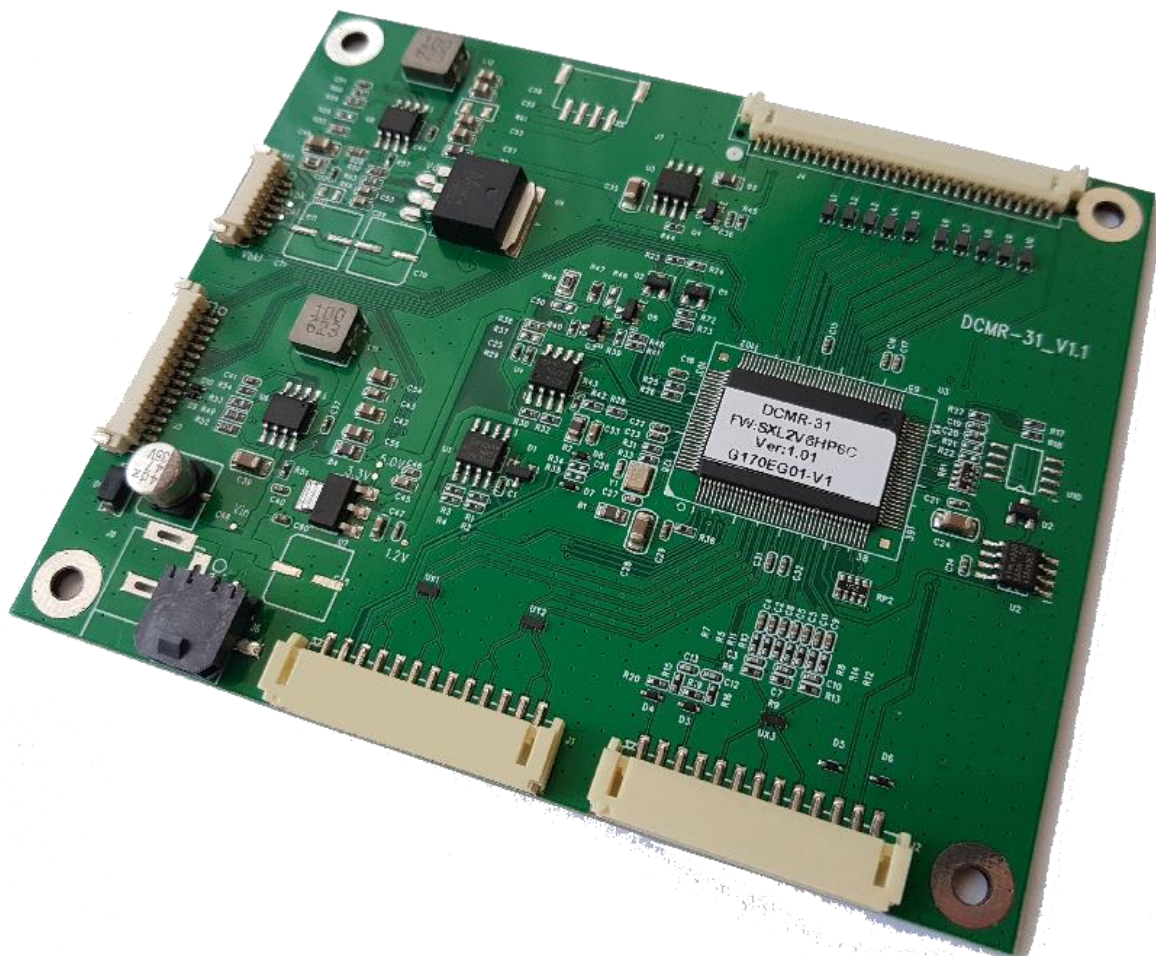
## Specification for approval

(DVI/HDMI and analog RGB Interface Controller for TFT-LCD Interface)

### Product Specification Status

- Preliminary
- ✓ Final

Model: DCMR-31



### 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

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This DVI/HDMI and analog RGB to LVDS converter board accepts common video signals. Digital interfaces 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.

## 2. Features

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### 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)

### 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

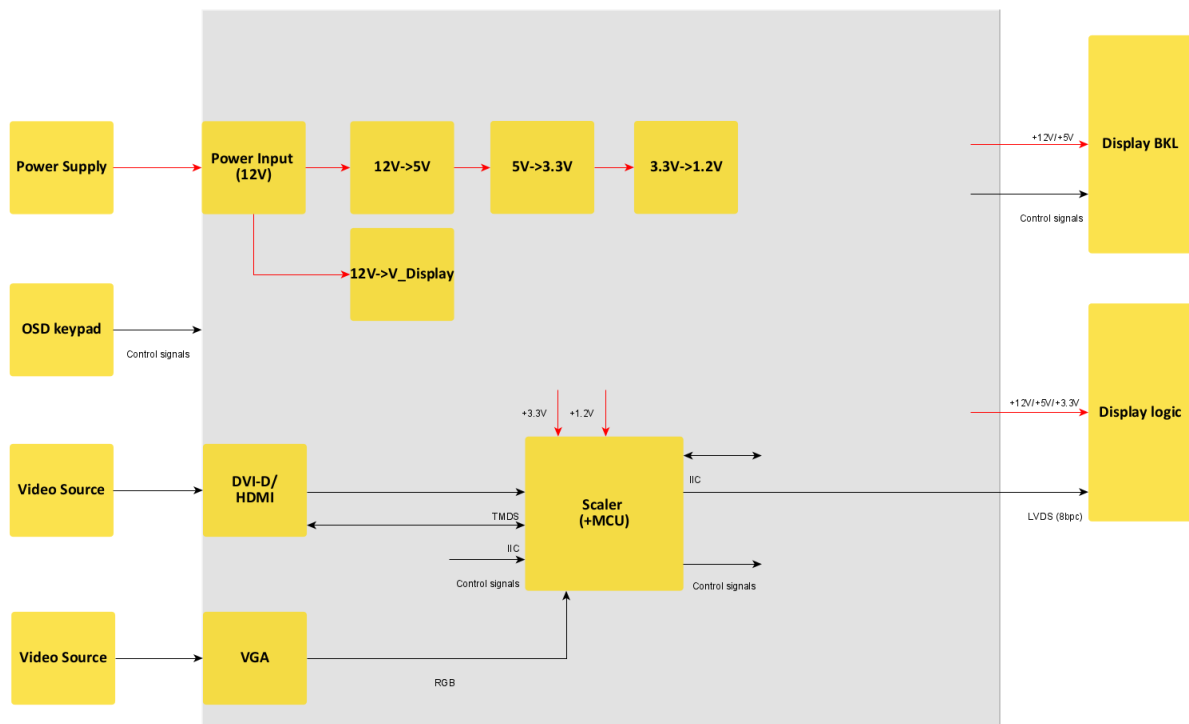


Fig 1. System Diagram

## 4. Typical Application

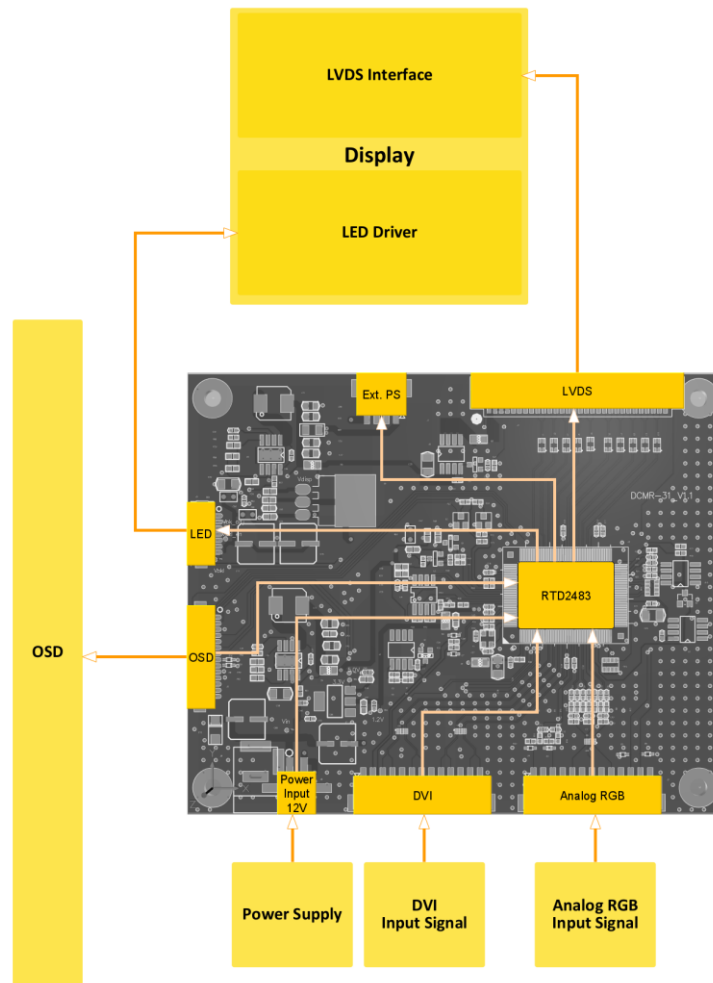


Fig 2. Application of DCMR-31

## 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	-	10.8	12.0	13.2	V DC
$V_{DDmax}$	Absolute Max. Rating <sup>1</sup>	-	-0.3	-	16.0	V DC
$I_{DD}$	Current Consumption <sup>2</sup>	Board Only	105	124	143	mA

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

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

		(active mode)				
		Board Only	-	23	-	mA
		(sleep mode)				
		With WVGA Display <sup>3</sup>	0.18	0.28	0.39	A
		With XGA Display <sup>4</sup>	0.24	0.48	0.78	A
		With FHD Display <sup>5</sup>	0.44	1.09	1.84	A
P <sub>c</sub>	Power Consumption	Active mode	1.26	1.49	1.72	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	-	V <sub>DD</sub>	-	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>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 AUO G150XTK01.0 (XGA, 300cd/m<sup>2</sup>). Backlight PWM duty ratio min: 5%

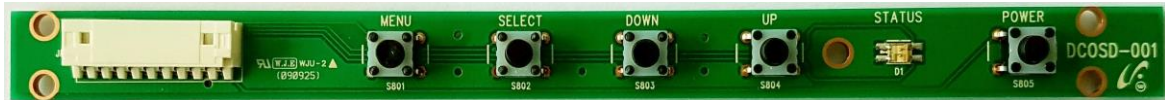
<sup>5</sup> Test was performed with AUO G215HVN01.0 (FHD, 300cd/m<sup>2</sup>). Backlight PWM duty ratio min: 10%

## 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	Auto Adjust <sup>6</sup> Auto Color (long press) <sup>6</sup>
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.

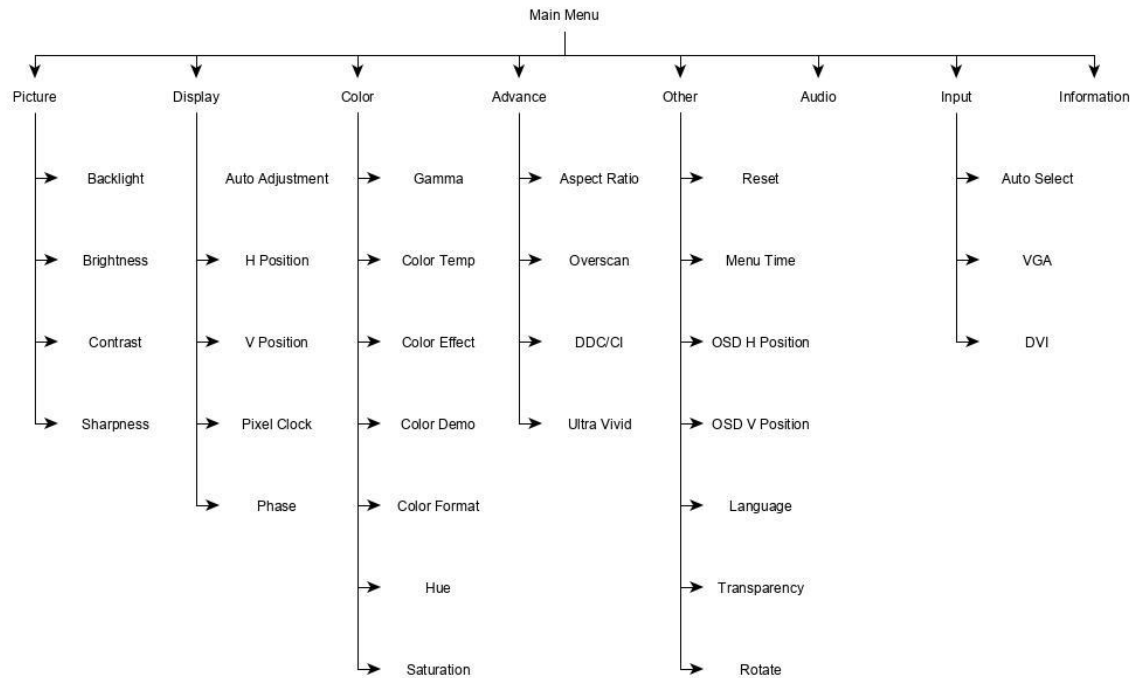
**Table 4. OSD-keyboard LED status lights**

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

<sup>6</sup> With VGA input signal only.

## 6.2.OSD-menu

### Menu Structure



### 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

**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

Main-Menu: Display

**Table 7. 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

Main-Menu: Color

**Table 8. 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

**Table 9. OSD Overview: Sub-Menu: Color Temp - User**

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

Sub-Menu: Color Effect - User

**Table 10. 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

**Table 11. 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

**Table 12. OSD Overview: Main-Menu Input**

Title	Function
Auto Select	Detect active input
VGA	Select VGA input
DVI	Select DVI input



Main-Menu: Other

**Table 13. 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

Main-Menu: Information

**Table 14. 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 15. 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 16. 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 17. 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. 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-31 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:

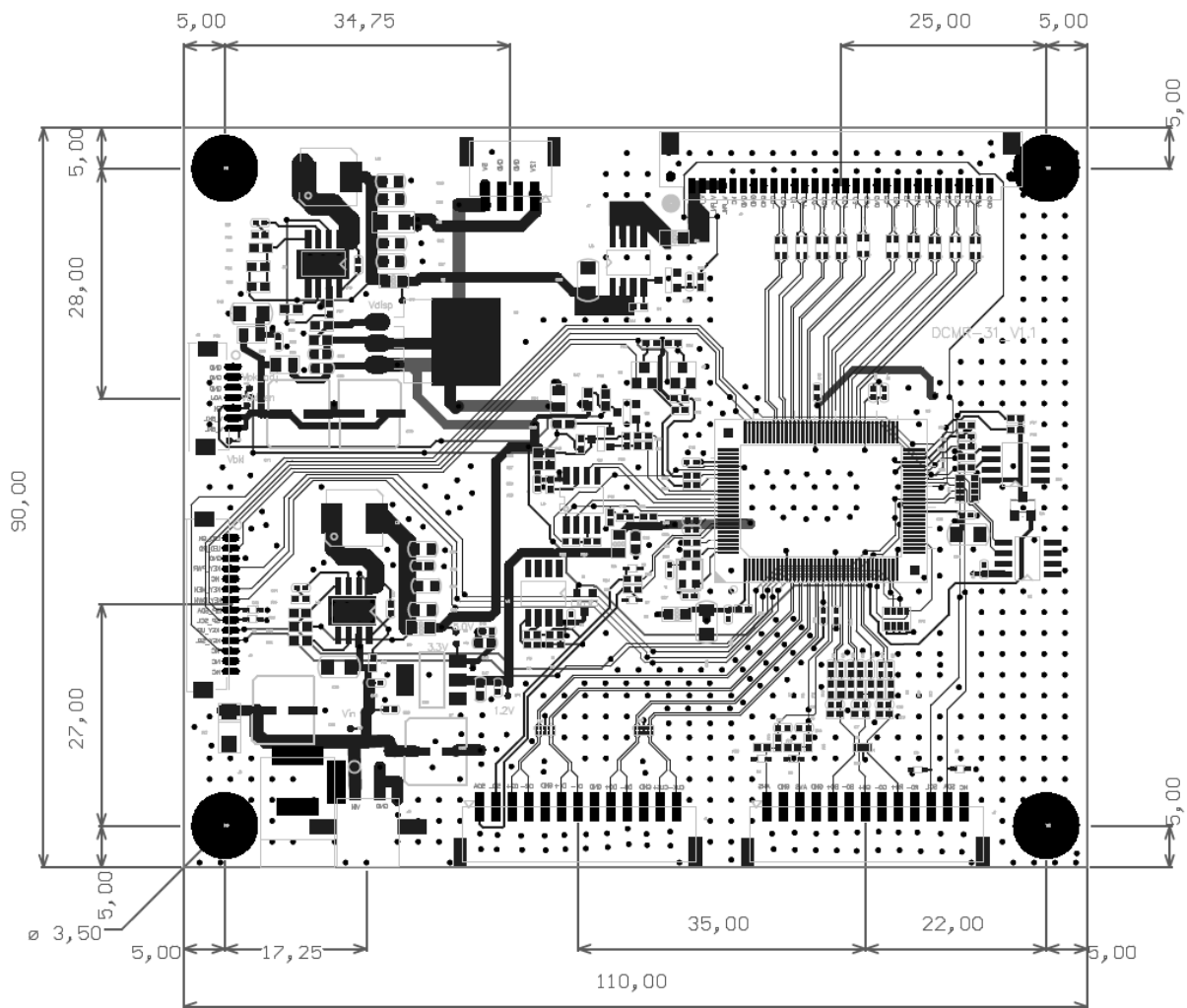
- Image Adjustments
- Color Adjustments
- Image Geometry Adjustments
- Audio Adjustments
- Window Operations
- DPVL Support

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

## 8. Mechanical Characteristics

**Table 18. Mechanical Characteristics**

Parameter	Value
Dimensions (H x V)	110.0mm x 90.0mm
Contour	Rectangular
Production technology	SMT
Total height	7.7mm <sup>7</sup> (Top: 6.1mm / PCB: 1.6mm)
Weight	48g



<sup>7</sup> assembled with power connector J6

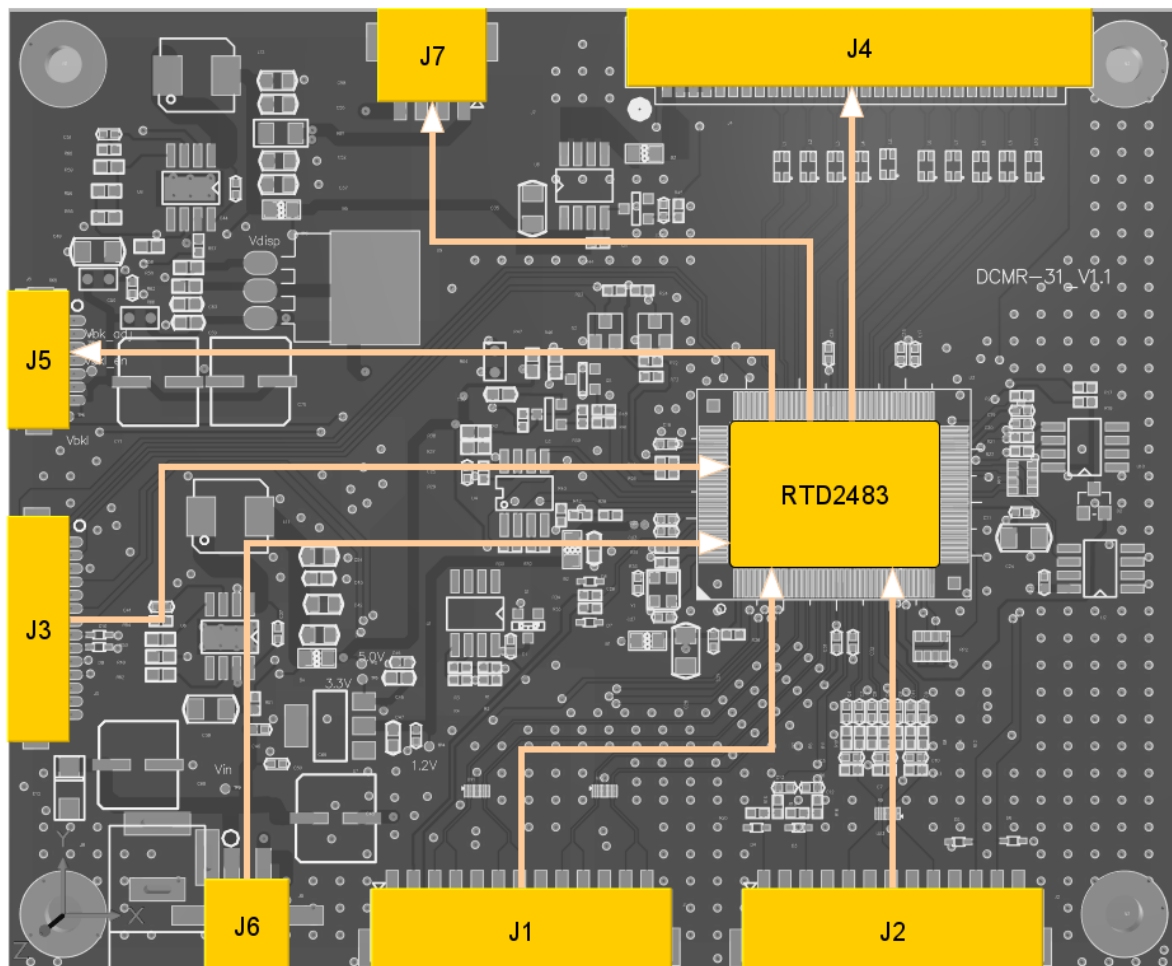
## 9. Connectors

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

**Table 19. 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 4. Connector Overview**

## 9.2. Input Connectors

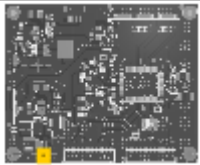
### Power Connectors

The board has different connector configurations to be supplied with power. In standard configuration connector J6 is assembled, the other type is available on request.

#### Power Connector (J6)

The Power Connector (J6) supplies the board with power. The connection is mandatory.

**Table 20. Power Connector (J6)**

Parameter	Value	
Manufacturer: Connector model no.	Molex: 43650-0212	
Pin amount	2 pins (use Pin 1 as marked on PCB / connector)	
Mating housing part	Molex: 43645-0200	



**Fig 5. Molex: 43650-0212**

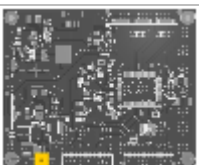
**Table 21. Power Connector Pin Assignment**

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

#### Power Connector (P1)

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

**Table 22. 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 6. Taclex: TDJ-A196GAJ**

**Table 23. Power Connector Pin Assignment**

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

### Video Input

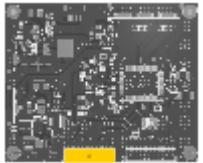
The board has different connectors to connect a source which provides the video signal. In standard configuration connectors J1 and J2 are assembled.

#### DVI Connector (J1)

The DVI Connector (J1) can be used to provide a digital video signal to the board. The connection is mandatory.

**Table 24. DVI Connector (J1)**

Parameter	Value
Manufacturer: Connector model no.	Yeonho: 20022WR-13
Pin amount	13 (use Pin 1 as marked on connector)
Mating housing part	Yeonho: 20022HS-13




**Fig 7. Yeonho: 20022WR-13**

**Table 25. DVI Connector (J1) Pin Assignment**

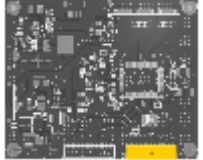
Pin	Signal	Description	Type
1	SDA	DDC data	I/O
2	SCL	DDC clock	I/O
3	D2+	T.M.D.S. Data2+	I
4	D2-	T.M.D.S. Data2-	I
5	GND	T.M.D.S. Data2 shield	GND
6	D1+	T.M.D.S. Data1+	I
7	D1-	T.M.D.S. Data1-	I
8	GND	T.M.D.S. Data1 shield	GND
9	D0+	T.M.D.S. Data0+	I
10	D0-	T.M.D.S. Data0-	I
11	GND	T.M.D.S. Data0 shield	GND
12	RXC+	T.M.D.S. Clock+	I
13	RXC-	T.M.D.S. Clock-	I

VGA Connector (J2)

The VGA Connector (J2) can be used to provide an analog RGB signal to the board. The connection is mandatory.

**Table 26. VGA Connector (J2)**

Parameter	Value
Manufacturer: Connector model no.	Yeonho: 20022WR-13
Pin amount	13 (use Pin 1 as marked on connector)
Mating housing part	Yeonho: 20022HS-13




**Fig 8. Yeonho: 20022WR-13**

**Table 27. VGA Connector (J2) Video InputPin Assignment**

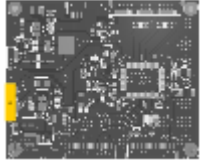
Pin	Signal	Description	Type
1	AHS	Horizontal sync	I
2	GND	Ground	GND
3	AVS	Vertical sync	I
4	GND	Ground	GND
5	B0+	Blue signal	I
6	B0-	Blue ground	I
7	G0+	Green signal	I
8	G0-	Green ground	I
9	R0+	Red signal	I
10	R0-	Red ground	I
11	SCL	DDC clock	I/O
12	SDA	DDC data	I/O
13	n.c.	-	n.c.

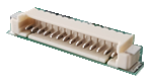


### OSD, ISP Interface Connector (J3)

The OSD, ISP Interface Connector (J3) can be used to connect an OSD-keyboard including status-LED. The connection is optional.

**Table 28. OSD, ISP Interface (J3)**

Parameter	Value	
Manufacturer: Connector model no.	Molex: 53261-1471	
Pin amount	14 pins (use Pin 1 as marked on connector)	
Mating housing part	Molex: 51021-1400	



**Fig 9. Molex: 53261-1471**

**Table 29. Pin description**

Pin	Signal	Description	Type
1	LED_GN	LED Green	O
2	LED_RD	LED Red	O
3	GND OSD/ISP	Ground	GND
4	Power Key	OSD Key Power	I
5	n.c.	-	n.c.
6	Menu Key	OSD Key Menu	I
7	Down Key	OSD Key Down	I
8	ISP DATA	ISP-I <sup>2</sup> C SDA	I/O
9	ISP CLK	ISP-I <sup>2</sup> C SCL	I/O
10	Up Key	OSD Key Up	I
11	Sel Key	OSD Key Select	I
12	n.c.	-	n.c.
13	n.c.	-	n.c.
14	n.c.	-	n.c.


### 9.3. Output Connectors

#### LVDS Interface (J4)

The LVDS Interface (J4) is the video output interface. The connection is mandatory.

**Table 30. LVDS Interface (J4)**

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

**Table 31. 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 data output (even)	O
27	TXECLK+	Positive LVDS differential data output (even)	O

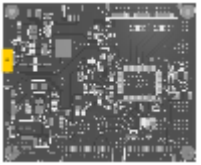
28	TXE3-	Negative LVDS differential data output – Line 3 (even)	O
29	TXE3+	Positive LVDS differential data output – Line 3 (even)	O
30	GND	Ground	GND

### Backlight Power Connector (J5)

The Backlight Power Connector (J5) is used to connect a (in the display integrated) LED-driver. The connection is mandatory.

**Table 32. Backlight Connector (J5)**

Parameter	Value
Manufacturer: Connector model no.	Molex: 53261-0771
Pin amount	7 pins (use Pin 1 as marked on connector)
Mating housing part	Molex: 51021-0700




**Fig 11. Molex: 53261-0771 (similar)**

**Table 33. Pin description**

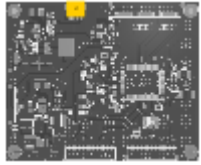
Pin	Signal	Description	Type
1	GND	Ground	GND
2	GND	Ground	GND
3	GND	Ground	GND
4	BKL_ADJ	Backlight Adjust	O
5	BKL_EN	Backlight Enable	O
6	VBKL <sup>8</sup>	Backlight Power	O
7	VBKL <sup>8</sup>	Backlight Power	O

<sup>8</sup> In  $V_{DD} = 12V$  and  $V_{BKL}=12V$  configuration:  $V_{BKL} = V_{DD}$

### External Power Supply (J7)

The External Power Supply (J7) offers different voltage levels for powering additional components. The connection is optional.

**Table 34. External Power Supply (J7)**

Parameter	Value	
Manufacturer: Connector model no.	Yeonho: 20022WR-04	
Pin amount	4 (use Pin 1 as marked on PCB)	
Mating housing part	Yeonho: 20022HS-04	



**Fig 12. Yeonho: 20022WR-04 (similar)**

**Table 35. Power Connector Pin Assignment**

Pin	Signal	Description	Type
1	VEXT_12 <sup>9</sup>	12V power output	O
2	GND	Ground	GND
3	GND	Ground	GND
4	VEXT_5	5V power output	O

<sup>9</sup> In V<sub>DD</sub> = 12V configuration, V<sub>EXT\_12</sub> = V<sub>IN</sub>

## 10. Reliability

**Table 36. Reliability test**

Symbol	Test item	Min	Max	Unit
$\vartheta_{ST}$	Storage temperature	-10	85	°C
$\vartheta_{OP}$	Operating temperature	0	60	°C

## 11. Absolute Maximum Ratings

**Table 37. Absolute maximum ratings**

Symbol	Test item	Min	Max	Unit
$\vartheta_{ST}$	Storage temperature	-20	95	°C
$\vartheta_{OP}$	Operating temperature <sup>10</sup>	-5	65	°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>10</sup> Phase- or clock-shift can appear between -5°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 38. S/N Encoding**

Code	Meaning
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 39. 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>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
<b>RoHS</b>	Restriction of Hazardous Substances

## Abbreviations

<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>VCP</b>	Virtual Control Panel
<b>VESA</b>	Video Electronics Standards Association
<b>VGA</b>	Video Graphics Array



## 15. Revision History

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**Table 40. Revision History**

Rev.	Date	Section	Specification Status	Description
1.0	Oct 19, 2020	All	Final	Initial release

## 16. Legal Information

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### 16.1. Disclaimers

#### Limited warranty and liability

Information in this document is believed to be accurate and reliable. However, Beck GmbH & Co. Elektronik Bauelemente KG does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information.

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Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

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#### Applications

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The customer is responsible for the design and operation of his application. It is the customer's responsibility to determine whether this product is suitable for his applications and products.

#### Limiting values

Stress above one or more limiting values (as defined in section Absolute maximum ratings) may cause permanent damage and irreversibly affect the quality and reliability of the device.

### 16.2. Trademarks

All referenced brands, product names, service names and trademarks are the property of their respective owners.

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## Contact Information

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For more information or technical support, please visit: <https://www.beck-elektronik.de>