

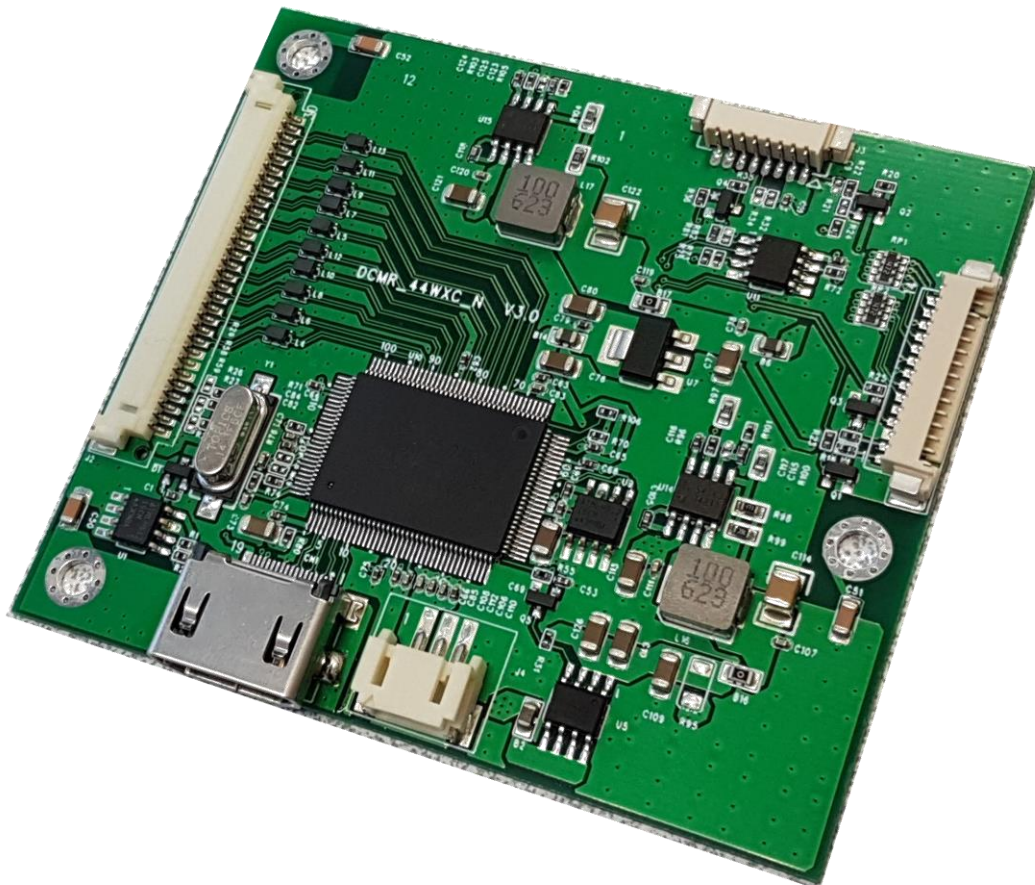
Specification for approval

(HDMI Interface Controller for TFT-LCD Interface)

Product Specification Status

- Preliminary
- Final

Model: DCMR-20



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 HDMI to LVDS converter board accepts common video signals. HDMI 1.4a and all backward compatible signals are supported. 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
- I²C-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

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

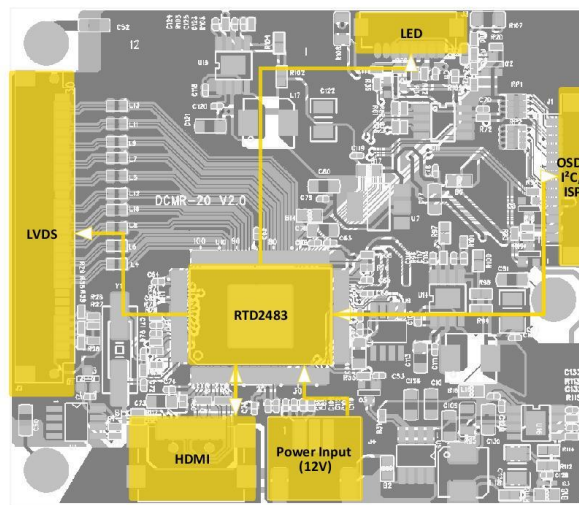


Fig 1. System Diagram

4. Typical Application



Fig 2. Application of DCMR-20

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 ¹	-	-0.3	-	16.0	V DC

¹ Consider ratings of connected parts

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
I _{DD}	Current Consumption ²	Board Only (active mode)	71	89	113	mA
		Board Only (sleep mode)	-	5	-	mA
		With WVGA Display ³	0.14	0.27	0.38	A
		With SXGA Display ⁴	0.21	0.69	1.21	A
		With FHD Display ⁵	0.30	0.74	1.10	A
P _C	Power Consumption	Active mode	0.85	1.07	1.36	W

5.2. Output

Table 2. Electrical Output Characteristics

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V _{Panel}	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 _{BKL}	Backlight Power Supply	5V configuration	4.5	5.0	5.5	V DC
		12V configuration	10.8	12.0	13.2	V DC
V _{BKL_EN}	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 _{BKL_ADJ}	Backlight Adjust Voltage	3.3V configuration	3.0	3.3	3.6	V DC
		5V configuration	4.5	5.0	5.5	V DC

² Current consumption depends on the firmware used (resolution)

³ Test was performed with InnoLux G070Y2-L01 Rev. C6 (WVGA, 500cd/m²). Backlight PWM duty ratio min: 10%

⁴ Test was performed with CPT CLAA190EB01CW (SXGA, 450cd/m²). Backlight PWM duty ratio min: 5%

⁵ Test was performed with AUO G133HAN01.0 (FHD, 400cd/m²). 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.

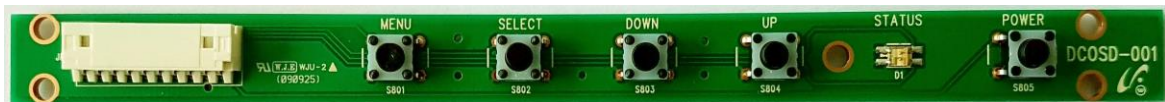


Fig 3. OSD-keyboard

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

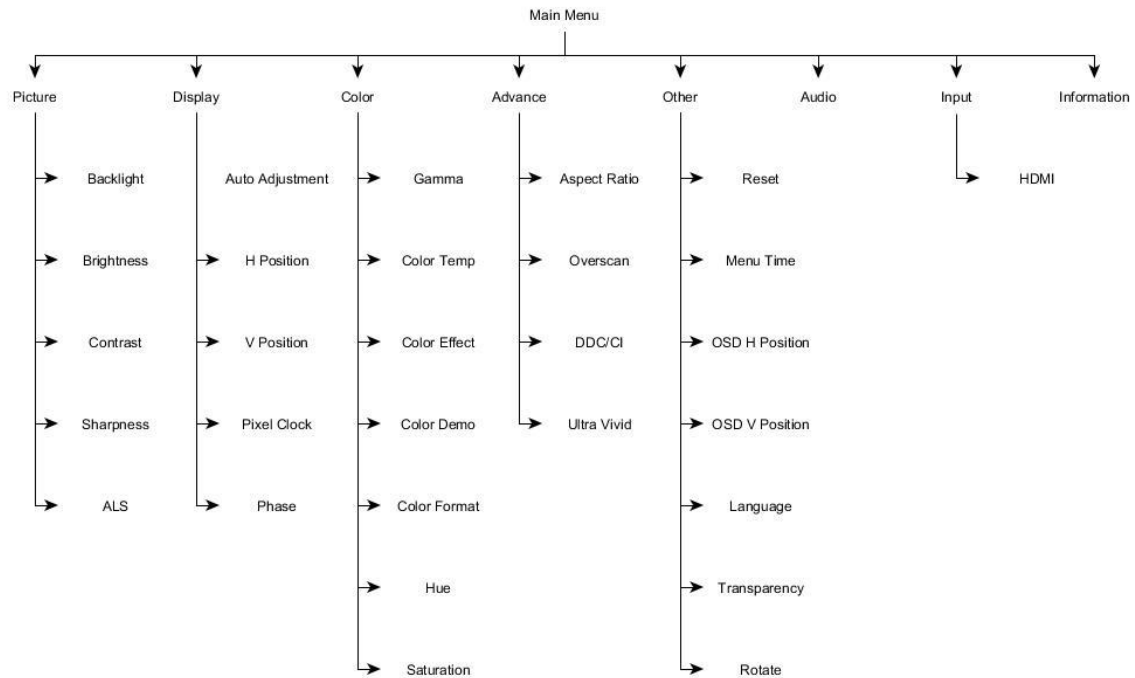
LED colors and their meanings are described in the table below.

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

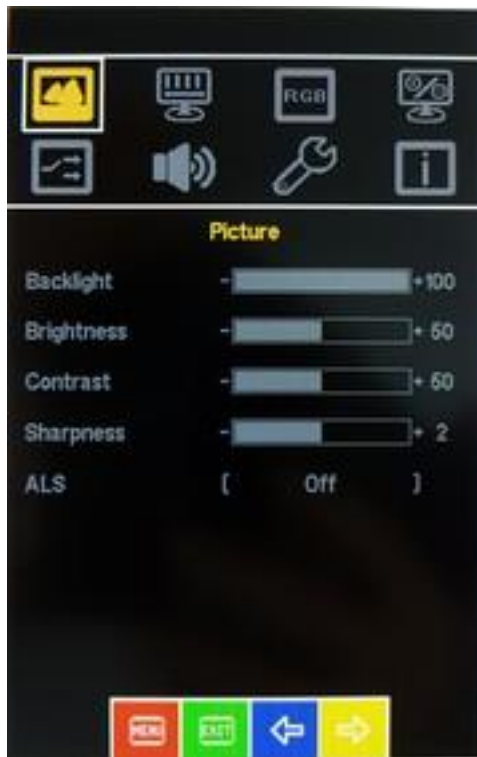


Fig 5. Main-Menu: Picture

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

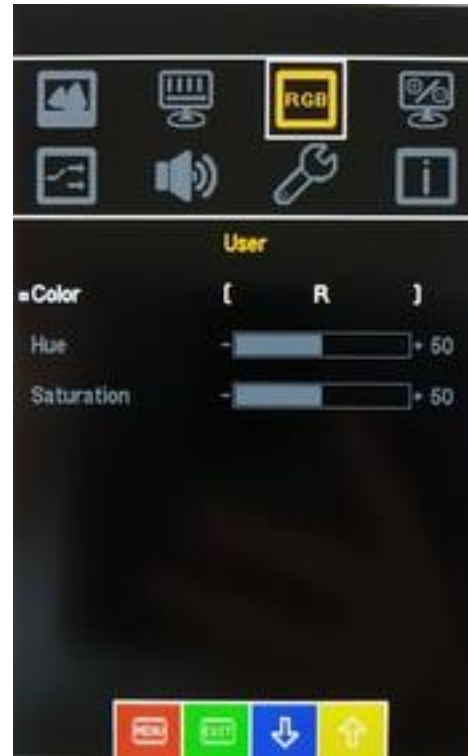


Fig 10. Sub-Menu: Color Effect - User

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

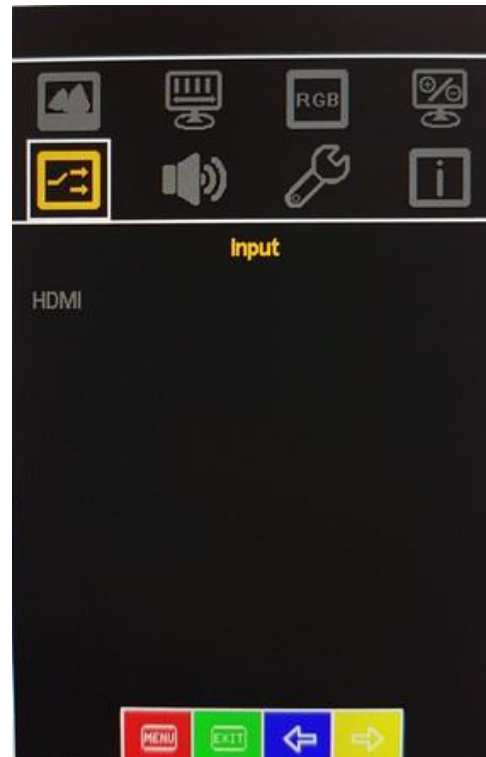


Fig 12. Main-Menu: Input

Table 13. OSD Overview: Main-Menu Input

Title	Function
HDMI	n/a

Main-Menu: Other



Fig 13. Main-Menu: Other

Main-Menu: Information

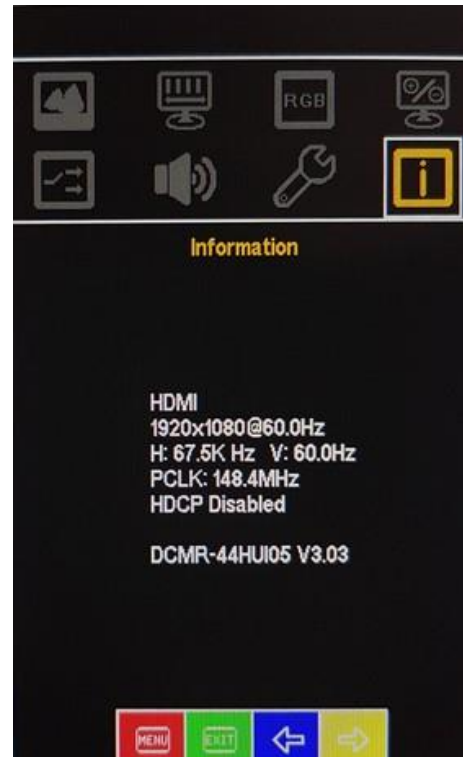


Fig 14. Main-Menu: Information

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	HDMI
Current resolution	1920x1080@60.0Hz
H- & V-frequency	H: 67.5kHz V: 60.0Hz
Pixel clock frequency	PCLK: 148.4MHz
HDCP function state	HDCP Disabled
Firmware name and version	DCMR-44HUI05 V3.03

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. I²C Interface

DCMR-20 can control various slave devices via a general purpose I²C-bus interface. For further information about I²C usage, please contact your local sales partner.

Ambient Light Sensor

DCMR-20 can control an ambient light sensor via an I²C-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. I²C Interface DC Characteristics

Symbol	Characteristic	Test conditions	Min	Typ	Max	Unit
V _{CC}	I ² C-bus operating voltage (internal pull-up)	3.3V configuration	3.0	3.3	3.6	V
V _{IH}	High-level input voltage		0.7 V _{CC}	-	-	V
V _{IL}	Low-Level input voltage		-	-	0.3V _{CC}	V

AC Characteristics

Table 20. I²C Interface AC Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
f _{CLK}	Clock Frequency	-	100	400	kHz
t _{HIGH}	Clock high time	600	-	-	ns
t _{LOW}	Clock low time	1300	-	-	ns

Operations

In general the I²C-bus operations have to follow the I²C-bus standard. For further information about I²C 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-20 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 characters 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:

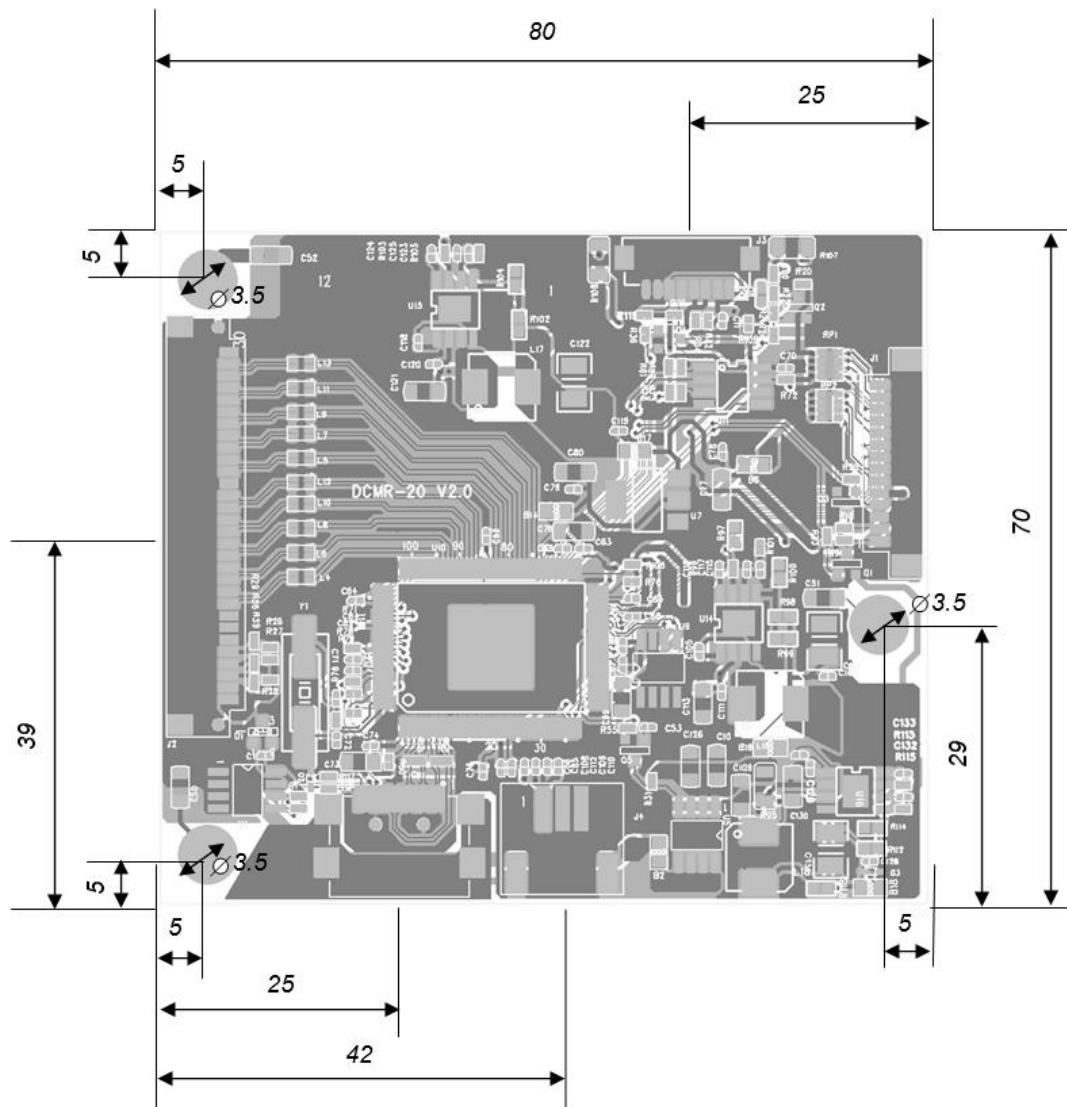
- Image Adjustments
- Color Adjustments
- Image Geometry Adjustments
- Audio Adjustments
- Window Operations
- DPVL Support

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)	81.0mm x 70.0mm (80.0mm PCB + 1.0mm connectors)
Contour	Rectangular
Production technology	SMT
Total height	7.5mm
Weight	24g



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

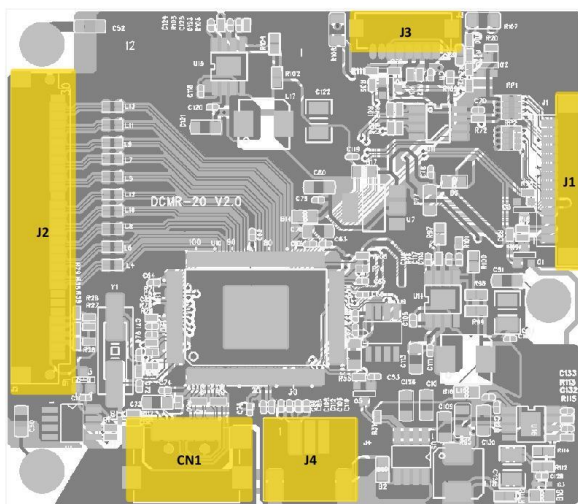


Fig 15. Connector Overview

9.2. Input Connectors

Power Connector (J4)

The Power Connector (J4) supplies the board with power. The connection is mandatory.

Table 23. Power Connector (J4)

Parameter	Value
Manufacturer: Connector model no.	JST: S3B-PH-K-S
Pin amount	3 pins (use Pin 1 as marked on connector)
Mating housing part	JST: PHR-3



Fig 16. JST: S3B-PH-K-S

Table 24. Power Connector Pin Assignment

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

HDMI Connector (CN1)

The HDMI Connector (CN1) can be used to provide a digital video signal to the board. The connection is mandatory.

Table 25. HDMI Connector (CN1)

Parameter	Value
Manufacturer: Connector model no.	Standard HDMI Type A (Single Link) receptacle
Pin amount	19 pins
Mating housing part	Standard HDMI Type A (Single Link) plug



Fig 17. Standard HDMI Type A (Single Link) receptacle

Table 26. HDMI Connector (CN1) Pin Assignment

Pin	Signal	Description	Type
1	D2+	T.M.D.S. Data2+	I
2	GND	T.M.D.S. Data2 shield	GND
3	D2-	T.M.D.S. Data2-	I
4	D1+	T.M.D.S. Data1+	I
5	GND	T.M.D.S. Data1 shield	GND
6	D1-	T.M.D.S. Data1-	I
7	D0+	T.M.D.S. Data0+	I
8	GND	T.M.D.S. Data0 shield	GND
9	D0-	T.M.D.S. Data0-	I
10	RXC+	T.M.D.S. Clock+	I
11	GND	T.M.D.S. Clock shield	GND
12	RXC-	T.M.D.S. Clock-	I
13	n.c.	-	n.c.
14	n.c.	-	n.c.
15	SCL	DDC Clock	I/O
16	SDA	DDC Data	I/O
17	GND	DDC/CEC Ground	GND
18	VCC	+5V Power	PWR
19	HPD	Hot-plug detect	I

OSD, I²C, ISP Interface Connector (J1)

The OSD, I²C, ISP Interface Connector (J1) can be used for different purposes. An OSD-keyboard can be connected, the I²C-bus accessed or the board programmed by this interface. The connection is optional.

Table 27. OSD, I²C, ISP Interface (J1)

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

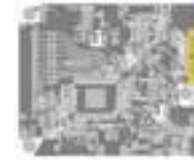


Fig 18. Molex: 53261-1471

Table 28. 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	3.3V	Power	O
6	Menu Key	OSD Key Menu	I
7	Down Key	OSD Key Down	I
8	ISP DATA	ISP-I ² C SDA	I/O
9	ISP CLK	ISP-I ² C SCL	I/O
10	Up Key	OSD Key Up	I
11	Sel Key	OSD Key Select	I
12	n.c.	-	n.c.
13	I ² C SDA	EEPROM I ² C SDA	I/O
14	I ² C SCL	EEPROM I ² C SDA	I/O

9.3. Output Connectors

LVDS Interface (J2)

The LVDS Interface (J2) is the video output interface. The connection is mandatory.

Table 29. LVDS Interface (J2)

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

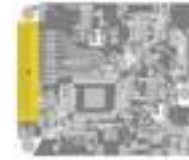


Fig 19. Hirose: DF14-30P1.25H

Table 30. Pin description

Pin	Signal	Description	Type
1	V_Panel	Panel Power	O
2	V_Panel	Panel Power	O
3	DSP	0Ω to V _{CC} or GND; standard: 0Ω to V _{CC}	O/GND
4	FRC	0Ω to V _{CC} or GND; standard: 0Ω to V _{CC}	O/GND
5	MSL	0Ω to V _{CC} or GND; standard: 0Ω to V _{CC}	O/GND
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 (J3)

The Backlight Power Connector (J3) is one of two possible ways to power backlight units. When using an (in the display) integrated LED-driver, the connection is mandatory.

Table 31. Backlight Connector (J3)

Parameter	Value
Manufacturer: Connector model no.	Molex: 53261-0871
Pin amount	8 pins (use Pin 1 as marked on connector)
Mating housing part	Molex: 51021-0800



Fig 20. Molex: 53261-0871

Table 32. Pin description

Pin	Signal	Description	Type
1	12V (VIN)	Backlight Power	O
2	12V (VIN)	Backlight Power	O
3	n.c.	-	-
4	n.c.	0Ω to 12V or GND; standard: n. c.	-
5	BKL_EN	Backlight Enable	O
6	BKL_ADJ	Backlight Adjust	O
7	GND	Ground	GND
8	GND	Ground	GND

10. Reliability

Table 33. Reliability test

Symbol	Test item	Min	Max	Unit
ϑ_{ST}	Storage temperature	-20	70	°C
ϑ_{OP}	Operating temperature ⁶	0	60	°C

11. Absolute Maximum Ratings

Table 34. Absolute maximum ratings

Symbol	Test item	Min	Max	Unit
ϑ_{ST}	Storage temperature	-35	70	°C
ϑ_{OP}	Operating temperature	-10	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 misoperation 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 for 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 and display specification. Always check the signals before connecting the cable. Any

⁶ Phase- or clock-shift can appear between -10°C and 0°C

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 35. 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 36. Abbreviations

Abbr.	Description
ALS	Ambient Light Sensor
BLU	Backlight Unit
BPC	Bits Per Color
BPP	Bits Per Pixel
DDC	Display Data Channel
DDC/CI	Display Data Channel Command Interface
DDWG	Digital Display Working Group
DPLL	Digital Phase-Locked Loop
DPMS	Display Power Management Service
EDID	Extended Display Identification Data
EEPROM	Electrically Erasable Programmable Read-Only Memory
EMI	Electromagnetic Interference
GND	Ground
HDCP	High Digital Content Protection
HDMI	High Definition Multimedia Interface
I²C	Inter Integrated Circuit
ISP	In System Programming
JEIDA	Japan Electronic Industry Development Association
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LVDS	Low Voltage Different Signaling
MCCS	Monitor Command Control Set
OSD	On Screen Display
PCB	Printed Circuit Board
PCLK	Pixel Clock
PWM	Pulse Width Modulation
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
RGB	Red, Green, Blue
RoHS	Restriction of Hazardous Substances
SMBus	System Management Bus
SMT	Surface Mounted Technology

SOG	Sync-On-Green
sRGB	Standard-RGB
TMDS	Transition-Minimized Different Signaling
TFT	Thin-Film Transistor
VCP	Virtual Control Panel
VESA	Video Electronics Standards Association

15. Revision History

Table 37. Revision History

Rev.	Date	Section	Specification Status	Description
0.1	Mar 4, 2019	All	Preliminary	Initial release

16. Legal Information

16.1. Disclaimers

Limited warranty and liability

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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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