Display Solution
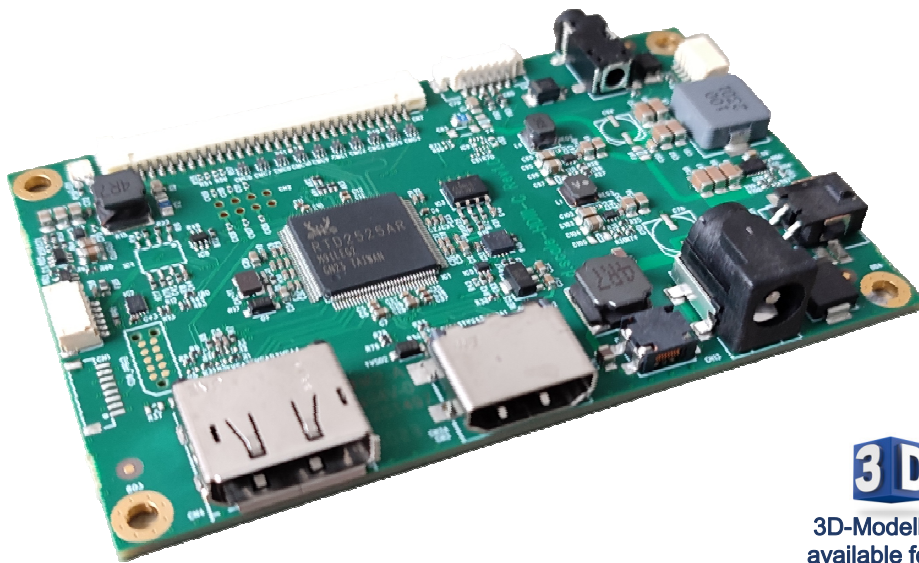Competence in Digital Visualisation

d.scale-HDIIIC

Datasheet

Display Controller Board with DP- & HDMI-Input

3D
3D-Modell (.stp)
available for your
construction

Rev 1.0

PRELIMINARY

February, 2024

Table of Contents

Revision History

Date	Rev	Description	Page
January 2024	1.0	First draft	

1 General Description

The d.scale-HDC-IIIC is a LCD-TFT controller board based on Realtek's scaler-SOC RTD2525AR. It provides a DP and a HDMI input and the LVDs output supports any 6-/8-bit LCD-TFT display up to 1920x1080 (FHD) / 1920x1200 (WUXGA). Depending on the board version it is able to work with a single 12V or 24V power supply. The design of the d.scale-HDIIIC allows the seamless use of our firmware configuration and programming toolbox.

2 Features

2.1 Realtek – RTD2525AR Core Features

The d.scale-HDIIIC is based on Realtek's multi-function display controller RTD2525A which provides the following core features

- ViviColor^{TM}
  - o Independent color management (ICM)
  - o Dynamic contrast control (DCC)
  - o Precise color mapping (PCM)
- Advanced Scaling
  - o Advanced zoom algorithm provides high image quality
  - o Sharpness/Smooth filter enhancement
  - o Support non-linear scaling from 4:3 to 16:9 or 16:9 to 4:3
- Color Processor
  - o True 10 bits color processing engine
  - o sRGB compliance
  - o Dynamic overshoot-smear cancelling engine
  - o Brightness and contrast control
  - o Peaking/Coring function for video sharpness
- DDC/CI, MCCS (Monitor Control Command Set) support
  - o Complete OSD-control via DDC/CI
  - o Supports several manufacturer (Display Solution GmbH) specific commands
- Embedded OSD
- Audio support, 2ch Audio DAC

2.2 Video Input Interfaces

- DisplayPort 1.2 via USB Type-C with Alternate Mode support
  - o Support 2/4 Lanes up to 1.62Gbps/2.7Gbps/5.4GHz each
  - o 6-bit, 8-bit, 10-bit and 12-bit color depth transport
  - o Optional HDCP 1.4/HDCP2.2
- HDMI
  - o Operating speed up to 225MHz (up to 60 Hz)
  - o HDMI 1.4 support
  - o 6-bit, 8-bit, 10-bit and 12-bit color depth transport is supported
  - o Optional HDCP1.4 support

2.3 LCD-TFT Output Interfaces

The d.scale-HDIIIC supports LVDS LCD-TFT displays from VGA up to WUXGA and controls the backlight unit.

- LCD-TFT connection
    - Single/double pixel LVDS output
    - Open-LDI and PSWG (VESA) data-mapping
    - Supports LCD-TFTs up to 1920x1200 and pixel clocks up to 93MHz for single LVDS and 186 MHz for dual LVDS
    - Support for 8 or 6-bit LVDS (with high-quality dithering)
    - Spread-Spectrum DPLL to reduce EMI
    - Supports +3.3V/+5V LCD-TFT logic supply
      LCD-TFT logic supply voltage is controlled by firmware
    - Logic supply is controlled by firmware (no manual jumper-settings required)
- Backlight supply/control
    - Provides backlight-enable and PWM-signal for brightness-control
    - Firmware controlled 3.3V/5V voltage level for ENBKL and PWM signal
    - Optional support for LED backlight converters with I^{2}C-Interface
    - +5V/+12V/(optional up to Vin) supply

Note:
The display settings (incl. backlight) can be adjusted using the
"Firmware Configuration & Programming Toolbox"
For further details see chapter-3

2.4 Additional Interfaces

For control and extended functionality the d.scale-HDIIIC supports the following options and interfaces.

- OSD-control, interface for an external keypad and dual status LED
- A dual on-board status LED
- 3.5mm audio jack for direct connection of a stereo-headphone (version-dependent)
- Support of I2C peripherals via the MCCS DDC/CI Interface. This interface specified by VESA uses the DDC-channel of HDMI or the AUX-channel of DP, so no additional USB or RS232 etc. connection is required.
    - Version-dependent on-board
        - 3-axis Gyro-sensor for Pivot-functionality
        - temperature sensor
    - I^{2}C-interface for external connection, currently supported:
        - 3-axis Gyro-sensor for Pivot-functionality
        - temperature sensor
        - ambient-light sensor

2.5 Power Supply

The d.scale-HDIIIC is available as +12V version or as a +24V version.

- In case of +12V single supply, the backlight-supply voltage is the same as the input-supply voltage.
- The +24V version can provide a +12V backlight supply, but the total power consumption of the display (logic & backlight) must not exceed 30W.

2.6 LVDS-Data Channels & Mapping

The d.scale-HDIIIC provides one or two LVDS data channels and supports 6-bit and 8-bit color-depth.

Single channel
Usually LCD-TFT displays with resolutions from VGA (640x480) up to XGA (1024x768) / WXGA (1366x768) are equipped with a single channel LVDS interface whereas with each clock-cycle the data for one pixel is transmitted

➔ These displays have to be connected to the **TXA...- Channel**

> **NOTE:**
> If a LCD-TFT display with single-channel LVDS is connected it is essential to ensure that the TXBCLK+/- differential pair is terminated with a 100 Ohm resistor.
> ➔ If only single channel LVDS is used in the design, please place the termination resistor close to CN7
>
> On the d.scale-HDIIIC board the termination resistor is R51
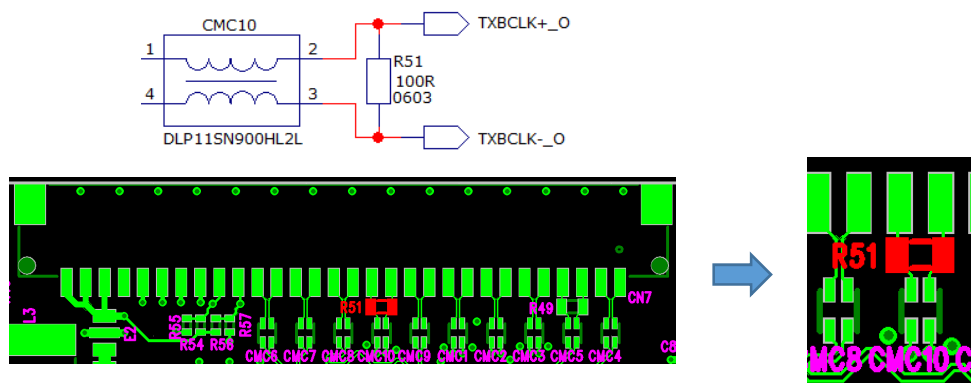
Dual channel
LCD-TFT displays with resolutions from SXGA (1280x1024) up to FHD (1280x1080) / WUXGA (1920x1200) are equipped with a dual channel LVDS interface, whereas with each clock-cycle the data for two pixels is transmitted

➔ These displays have to be connected to the **TXA...- Channel** & **TXB…- Channel**

NOTE
TXA...- Channel
Channel provides the data for the 1. / 3. / 5. / … pixel

TXB…- Channel
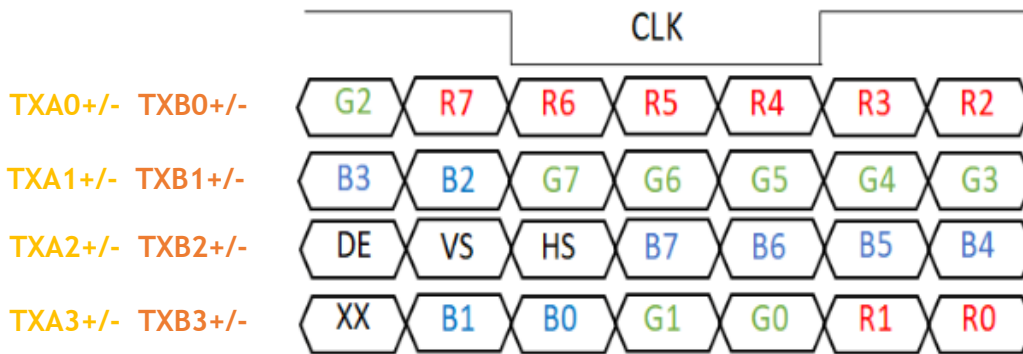Channel provides the data for the 2. / 4. / 6. / … pixel

Mapping
Historically, 2 LVDS data mappings have been established, known by different names

Data-Mapping-1 **known as:**
- Conventional data-mapping
- Open-LDI data-mapping
- JEIDA data-mapping

Characteristics
The LVDS data-pairs TXA3+/- & TXB3+/- transmits the LS-Bits of each color namely Red-0/Red-1, Green-0/Green-1, Blue-0/Blue-1
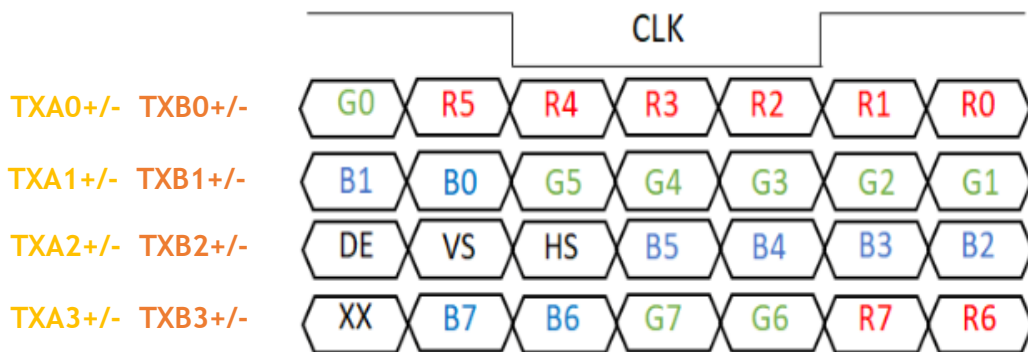

Color-Depth
- Displays with 18-bit color-depth (262K colors) requires TX..0+/- to TX..2+/-
- Displays with 24-bit color-depth (16Mio colors) requires TX..0+/- to TX..3+/-

Data-Mapping-2 **known as:**
- Non-Conventional data-mapping
- VESA data-mapping

Characteristics
The LVDS data-pairs TXA3+/- & TXB3+/- transmits the MS-Bits of each color namely Red-6/Red-7, Green-6/Green-7, Blue-6/Blue-7

Color-Depth
This data-mappings supports 24-bit color depth (16Mio colors), ONLY.

2.7 Scaler Control & Status

Keypad

The d.scale-HDIIIC supports an external keypad to control the OSD-menu. It supports the following buttons:

- Button S1 for power on/off the scaler,
- Button S2 to enter the menu respectively confirm selection
- Button S3 to exit the menu respectively to go one step back
- Button S4 to move left/down respectively decrease the selected value depending on the selected menu status
- Button S5 to move right/up respectively increase the selected value depending on the selected menu status

Depending on the key pressed, the voltage value returned via KEY is evaluated. Below the required resistor values are shown. The reference voltage KEY_REF is +3.3V and can be drawn from the KEY_REF pin.
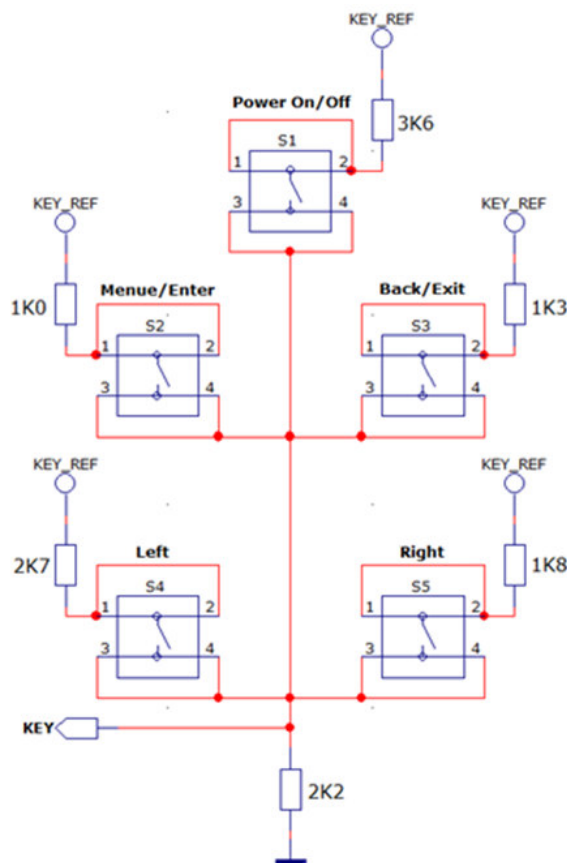
The table below shows keypad functions if OSD is active

Key 5-Button	Function
POWER	Switch On/Off Display
Back/Exit	One Step back / Exit the menue
Menue/Enter	Open OSD-Menue / confirm selection
Right/Up	Move right or up in the OSD
Left/Down	Move left or down in the OSD

Status LEDs

In order to show different system states two GPIOs (push-pull, max.10mA) are available. These GPIOs are provided on CN2 on pins LED1 and LED2. The table below shows the states.
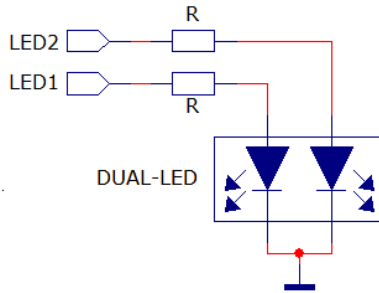

The table below shows the states.

| Description	LED1	LED2
Power-off / Standby	Off	Off
Power-on / System start-up, splash-screen is displayed Power-on / No valid video input detected	Off	On
Power-on / Valid video input detected	On	Off
Power-on / no valid video input detected / go to sleep	On	On

2.8 OSD – On Screen Display

2.8.1 System Messages

If no cable is connected to the board the following message is displayed
If no signal is provided: "No Video Signal Detected"
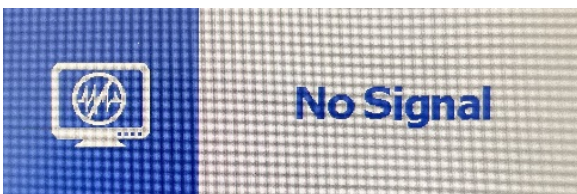
If no valid video signal can be detected the board is powered down and the following message will be displayed
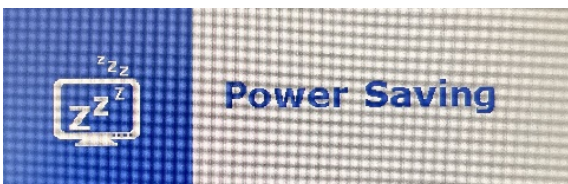
2.8.2 OSD Short-Cuts

Some of the OSD keypad buttons have an additional functionality as long as the OSD dialogue is not entered.
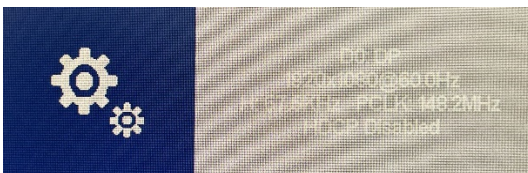
RIGHT / TOP Button

After pressing this button the user will enter the input selector menu. Using this option one of the connected video sources can be selected

LEFT-/ DOWN Button (Blue)

Pressing this button shows the current input

2.8.3 Onscreen Display Menu (OSD)

- To start OSD press the **MENU/ENTER** key.
- Select main/sub menu sections using the **RIGHT** or **LEFT** key.
- Confirm selection by pressing **MENU/ENTER** button again.
- Change values with **RIGHT** or **LEFT** key
- Either confirm with **MENU/ENTER** key or press **EXIT/RETURN** key to dismiss
- Leave OSD using **EXIT/RETURN**

Main Menu Sections

PICTURE
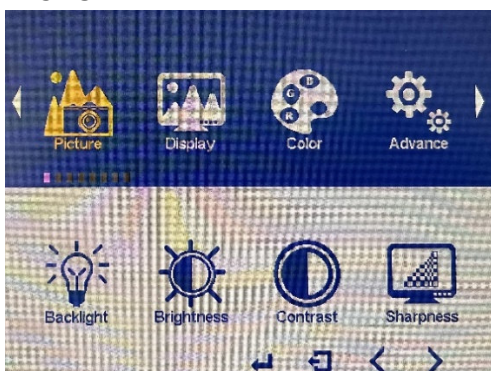
Sub Menu Sections

- **Backlight**
  Controls the screen brightness by adjusting the brightness of the backlight (PWM**)**

- **Brightness**
  Controls the screen brightness by adjusting the pixel colour value

- **Contrast**
  Controls the contrast of the picture displayed on the screen. Contrast is related to the Y-Domain and affects red, green and blue value.
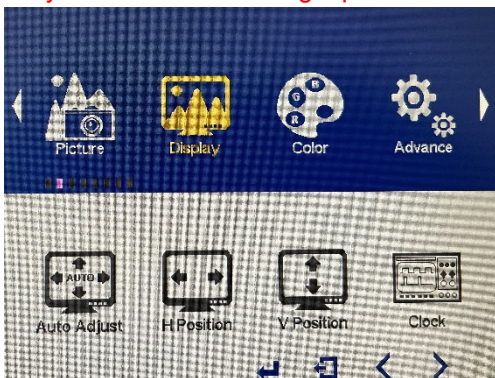
- **Sharpness**
  Controls the sharpness of the picture displayed on the screen

DISPLAY

Only available with analog input

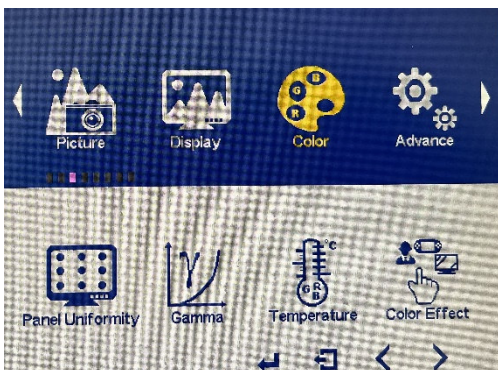**Sub Menu Sections**

- **Auto Adjust**
  Performs an auto adjust if an analog signal is selected as input

- **H Position**
  Using this option the image position can be adjusted

- **V Position**
  Using this option the image position can be adjusted

- **Clock**
  Adjust the sampling phase of the analog input

COLOR

Sub Menu Sections

Panel Uniformity
Can be switched on/off

Gamma

Pre-set Gamma Correction

- 1.8
- 2.0
- 2.2
- 2.4
- Off (default)

Color Temp

- Off (default)
- sRGB   (for colour matching with sRGB compatible peripherals)
- 5800K   (pre-defined colour temperature scheme)
- 6500K   (pre-defined colour temperature scheme)
- 7500K   (pre-defined colour temperature scheme)
- 9300K   (pre-defined colour temperature scheme)
- **User**   User defined adjustment
   Sub-Menu > USER   Individual adjustment of R, G and B

Color Effect

- Standard (pre-defined colour effect scheme)
- Game   (pre-defined colour effect scheme)
- **Movie**   (pre-defined colour effect scheme)
- **Photo**   (pre-defined colour effect scheme)
- **Vivid**   (pre-defined colour effect scheme)
- **User**   User defined adjustment
   Sub-Menu >USER Individual adjustment of Hue and Saturation separately for
                       R,Y,G, B,M

- **Color Demo**   Shows area with special settings
- **Color Format**
   - RGB (default)
   - YUV
- **PCM**   Performance Counter Monitor – can be switched on/off
- **Hue**   Set this in user mode Colour Effect
- **Saturation**   Set this in user mode Colour Effect

ADVANCE
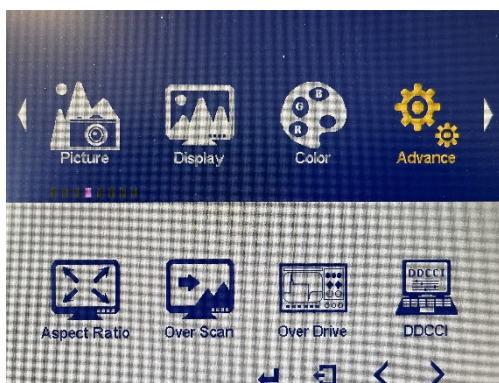
Sub Menu Sections

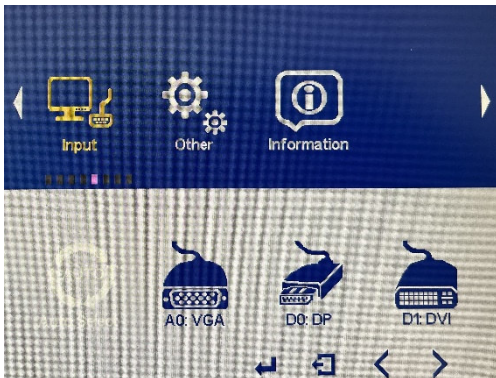- **Aspect Ratio**
  - o 1:1
  - o Full
  - o 16:9
  - o 4:3
  - o 5:4
- **Overscan**
  - o On   stretches image just beyond the border of display
  - o Off
- **Overdrive**   Off (always)
- **Energy Star**   TBD
- **DDCCI**
  - o On   Enable external DDCCI access
  - o Off   Disable external DDCCI access
- **Ultra Vivid**
  - o Off
  - o Low
  - o Medium
  - o High
- **DP Option**
  - o Version 1.1
  - o Version 1.2
  - o Version 1.3

INPUT

Sub Menu Sections

Using this option one of the connected video sources can be selected

- **Auto Select**   This option will select the next active video source automatically
- **VGA**   This connected VGA analog signal will be selected as scaler input
- **HDMI**   The connected HDMI signal will be selected as scaler input
- **DP**   The connected Display Port signal will be selected as scaler input

SOUND (currently not supported)

OTHER
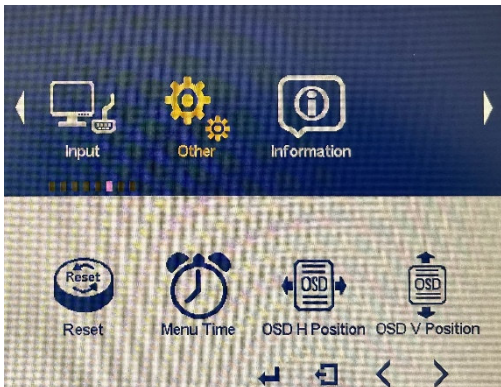
Sub Menu Sections

- **Reset**   Select this option to restore the default factory settings
- **Menu Time**   OSD menu lasting on screen time Defaults to 10s
- **OSD H Position** Horizontal start of OSD Menu on screen
- **OSD V Position** Vertical start of OSD Menu on screen
- **Language**   **OSD**   Menu language (for now "English" only)
- **Transparency**   Use option to adjust transparency of the active OSD
- **Rotate**
  - **0°**
  - **90°**
  - **270°**
  - **360°**

INFO
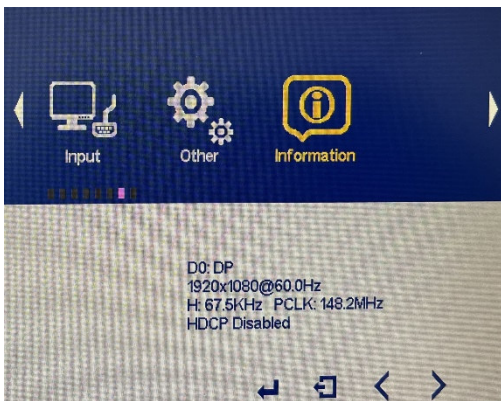
Shows
- Current Mode
- Horizontal and Vertical Frequencies
- Pixel Clock

2.9 DDC/CI (MCCS) Support

OSD defaults

```
code StructOsdUserDataType g_stOSDDefaultData =
{
   0xFF,                 // ucBackLight;
   100,                  // ucOsdHPos;
   100,                  // ucOsdVPos;
   10,                   // ucOsdTimeout;
   0,                    // ucAspectOriginRatio
//-------------------------------------------------------
   _ENGLISH,             // b4Language;
   _COLOREFFECT_STANDARD,    // b4ColorEffect;
//-------------------------------------------------------
   _CT_OFF,              // b4ColorTempType;
   _COLOR_SPACE_RGB,         // b2VGARGBYUV;
   _COLOR_SPACE_RGB,         // b2DVIRGBYUV;
//-------------------------------------------------------
   2,                    // b3Sharpness;
   2,                    // b3Transparency;
   _OFF,                 // b1OsdRotate;
   _ON,                  // b1OverScan;
//-------------------------------------------------------
   _GAMMA_OFF,           // b3Gamma;
   _ASPECT_RATIO_FULL,       // b3AspectRatio;
   _ON,                  // b1DDCCIStatus;
   _OFF,                 // b1OsdESStatus;
//-------------------------------------------------------
   _OD_GAIN_CENTER,          // ucODGain;
   _DEFAULT_HUE,             // cHue;
   _DEFAULT_SATURATION,      // ucSaturation;
   _HL_WIN_OFF,              // ucHLWinType;
   0x00,                 // uc3DEffect;
   0x00,                 // uc3DConvergence;
//-------------------------------------------------------
   _PCM_OSD_NATIVE,          // b2PCMStatus : 2;
   _3D_OFF,              // b23DStatus : 2;
   _3D_MODE_FORMAT_AUTO,     // b23DFormatStatus : 2;
   _3D_DISPLAY_RL,           // b13DLRStatus : 1;
   _OFF,                 // b13D3DTO2DStatus : 1;
//-------------------------------------------------------
   _ULTRA_VIVID_OFF,         // b2UltraVividStatus : 2;
   _OFF,                 // b1Osd3DOSD : 1;
   _OFF,                 // b1VolumeMute : 1;
   _OFF,                 // b1AudioStandAloneStatus : 1;
   0,                    // b1AudioSourceStatus : 1;
   _OFF,                 // b1ODStatus : 1;
//-------------------------------------------------------
   50,                   // ucVolume;
//-------------------------------------------------------
   0x00,                 // b33DConvergenceMode : 3;
   _AUTO_COLOR_TYPE_EXTERNAL, // b1FactoryAutoColorType : 1;
   0,                    // b1SwitchDH : 1;
};
```

2.10 Peripherals

I²C-Interface
Via CN6 the d.scale-HDIIIC provides an I²C-Interface for connection of useful peripheral devices. The devices can be controlled via the DDC/CI (MCCS) which is a standardized channel by VESA. As physical interface the DDC (HDMI) or the AUX-channel (DisplayPort) is used, which means, that no additional connection like USB or UART is required. The user can select and configure the devices in the firmware configuration tool.

Currently the following devices are supported:
- STMicro / LIS3DH
  3-axis Gyro-sensor for Pivot-functionality
- Texas Instruments / TMP102
  Temperature sensor
- Texas Instruments / OPT3001
  ambient-light sensor

Note:
For further information and code samples ask for the application note:
"AN-MCCS_Manufacturer_Functions_Access_R100"

Analog Audio output (ONLY optional)
Via CN10 an analogue stereo output signal is provided.

3 Firmware Configuration & Programming Toolbox

LCD TFT controller boards usually have to be adapted to the display parameters by the manufacturer. This requires not only access to the source code of the firmware but also detailed knowledge of its structure. The Firmware Configuration & Programming Toolbox for the d.scale-HDIII Family provides a remedy here. This GUI tool for customizing the firmware is Windows-based and allows the user to adapt the controller-board firmware to the LCD-TFT of his choice. No programming knowledge is required and there is also no need to recompile the firmware.

3.1 Features

- Converts the display timing and power-on sequencing from the respective specification into the required firmware customization
- Enables display-dependent setting of the supply voltage via firmware
- Supports common configuration options for a wide range of LED backlights
- Supports sensors (pivot, temperature, brightness) via DDC/CI (MCCS), eliminating the need for an additional USB or serial connection
- The built-in programmer enables standard-compliant firmware programming including all required EDIDs in less than 5 seconds

3.2 Components

The firmware of the d.scale-HDIII family consists of a basic firmware and the display-specific panel data block. Together with the required EDID files, these two blocks form the overall firmware. The following modules are available for generation, merging and programming

3.2.1 Generator

The generator creates the panel data block from the display-specific parameters. The following areas can be customized:
- Display resolution/timing
- Display data interface
    - Single-/dual-channel LVDS
    - Color depth
    - Data-mapping
        - Conventional (Open-LDI)
        - Non-conventional (VEAS-/ TI-Mode)
    - Spread-spectrum
    - Drive-Strength
- Display control
    - Power-on/off sequencing
    - Supply-voltage control
    - Color Brightness
    - Backlight/LED-driver control
        - PWM-Frequency
        - PWM-Range
        - PWM standard/inverted
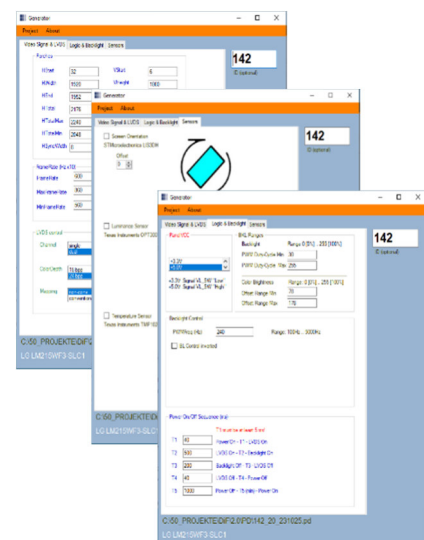
- Sensor Support/Control via DDC/CI – MCCS
  - o Screen orientation (Pivot)
 - o Luminance
  - o Temperature

3.2.2 Composer

The Composer generates a new, complete firmware binary file, using the panel data created with the generator and EDID files created by the user.

3.2.3 Programmer

The programmer enables the following programming options depending on requirements.

- Complete firmware
- Basic firmware only
- Panel data block only

In addition, the programmer takes over the standard compliant programming of the S/N number in the respective EDID files. The required programming hardware is open source, readily available and very inexpensive
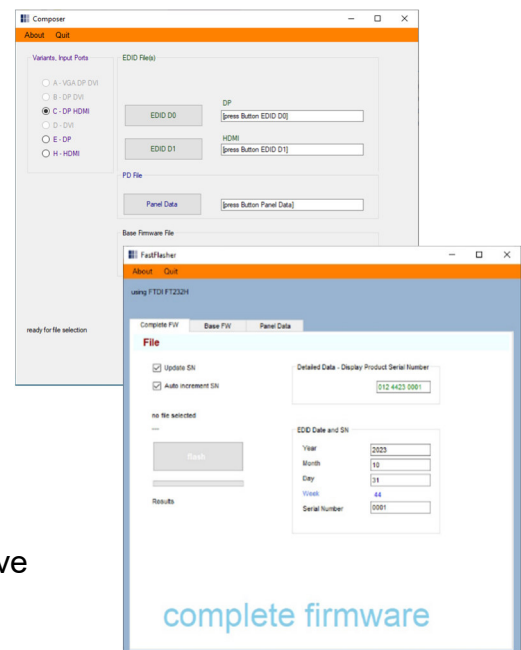
4 Connectors

4.1 Video Input

CN3   HDMI

Pin CN23	Signal	Description
1	TMDS2+	Differential TMDS Data 2+
2	TMDS2_SHLD	TMDS Data2 Shield
3	TMDS2-	Differential TMDS Data 2-
4	TMDS1+	Differential TMDS Data 1+
5	TMDS1_SHLD	TMDS Data1 Shield
6	TMDS1-	Differential TMDS Data 1-
7	TMDS0+	Differential TMDS Data 0+
8	TMDS0_SHLD	TMDS Data0 Shield
9	TMDS0-	Differential TMDS Data 0-
10	TMDSCLK-	Differential TMDS Clock-
11	TMDSCLK_SHLD	TMDS Clock Shield
12	TMDSCLK+	Differential TMDS Clock+
13	RSV	Reserved
14	RSV	Reserved
15	SCL	DDC EDID data clock
16	SDA	DDC EDID data
17	DDC/CEC GND	Ground
18	+5V	+5V / 50mA (sink, for HPD & DDC/EDID)
19	HPD	HotPlug Detect
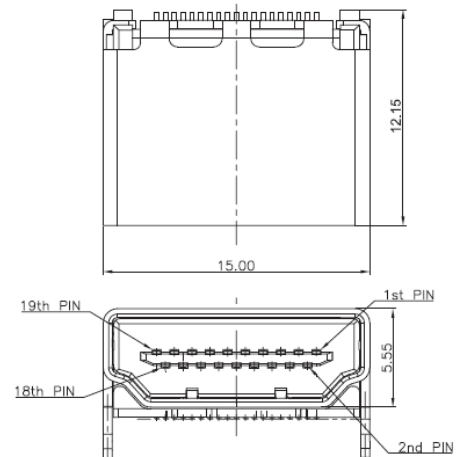
CN4   DisplayPort

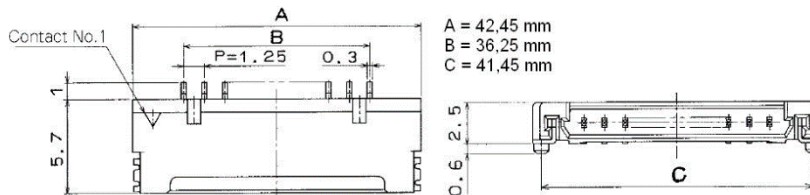| Pin CN12	Signal	Description
1	ML_Lane 0 (p)	Lane 0 (positive)
2	GND	Ground
3	ML_Lane 0 (n)	Lane 0 (negative)
4	ML_Lane 1 (p)	Lane 1 (positive)
5	GND	Ground
6	ML_Lane 1 (n)	Lane 1 (negative)
7	ML_Lane 2 (p)	Lane 2 (positive)
8	GND	Ground
9	ML_Lane 2 (n)	Lane 2 (negative)
10	ML_Lane 3 (p)	Lane 3 (positive)
11	GND	Ground
12	ML_Lane 3 (n)	Lane 3 (negative)
13	Config1	Connected to GND
14	Config2	Connected to GND
15	AUX CH (p)	Auxiliary Channel (positive)
16	GND	Ground
17	AUX CH (n)	Auxiliary Channel (negative)
18	Hot Plug	Hot Plug Detect
19	Return	Return for Power
20	DP_PWR	Power for Connector (3.3V/500mA)
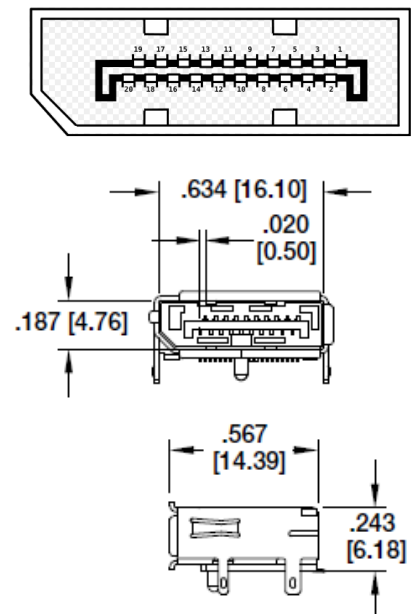
4.2 Video Output

CN7 LVDS Output

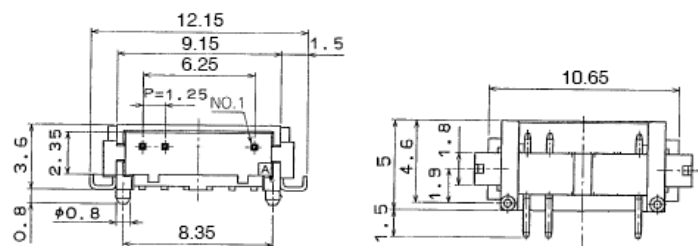| Pin	Signal	Description		Pin	Signal	Description
1	TXA3+	LVDS data 1st pixel		16	TXB2-	LVDS data 2nd pixel
2	TXA3-	LVDS data 1st pixel		17	TXB1+	LVDS data 2nd pixel
3	TXACL+	LVDS clock 1st pixel		18	TXB1-	LVDS data 2nd pixel
4	TXACL-	LVDS clock 1st pixel		19	TXVB0+	LVDS data 2nd pixel
5	TXA2+	LVDS data 1st pixel		20	TXVB0-	LVDS data 2nd pixel
6	TXA2-	LVDS data 1st pixel		21		
7	TXA1+	LVDS data 1st pixel		22	SCD_1	Scan Direction
8	TXA1-	LVDS data 1st pixel		23		
9	TXA0+	LVDS data 1st pixel		24	GND	Ground
10	TXA0-	LVDS data 1st pixel		25		
11	TXB3+	LVDS data 2nd pixel		26		
12	TXB3-	LVDS data 2nd pixel		27		Switched panel power supply +3,3V/ +5V/ +12V (fused)
13	TXBCL+	LVDS clock 2nd pixel		28	SVCC	
14	TXBCL-	LVDS clock 2nd pixel		29		
15	TXB2+	LVDS data 2nd pixel		30		

4.3 Backlight

CN8   Backlight Power Supply & Control
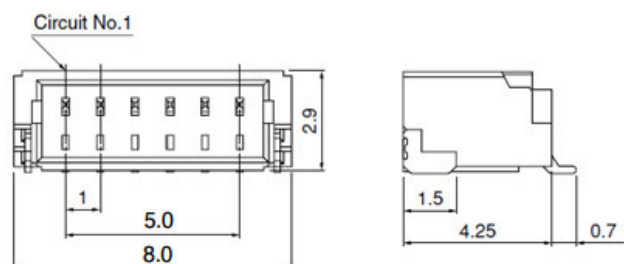
Pin	Signal	Description
1	BPS	Backlight power supply
2	BPS	Backlight power supply
3	EBKL	Enabel backlight signal
4	BRCTRL	Brightness Control
5	GND	Ground
6	GND	Ground



4.4 Board Control

CN5   Keypad Control

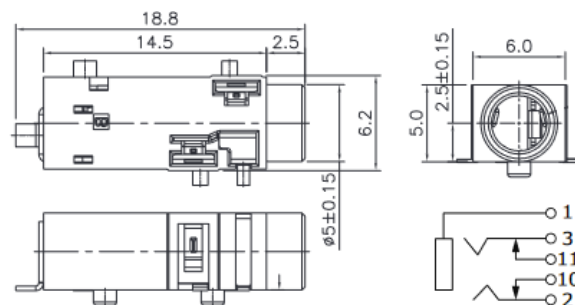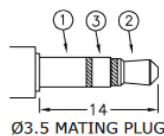| Pin	Signal	Description
1	KP_DRV	Reference Voltage for Voltage Devider - ONLY
2	LED_1	Red Status LED
3	LED_2	Green Status LED
4	Key	Voltage Divider Feedback
5	+3.3V	3.3V Low Power Supply
6	GND	Ground

4.5 Peripherals

CN6   I2C-Interface

Pin	Signal	Description
1	+3.3V	3.3V Low power supply
2	Peri_SDA	I^{2}C data
3	PERI_SCL	I^{2}C clock
4	I2C_S_INT	Reserved for future use
5	GND	Ground
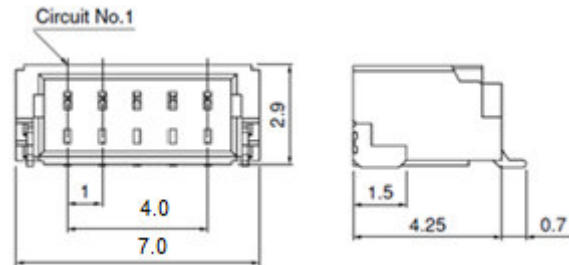
CN10   Audio / Headphone Output
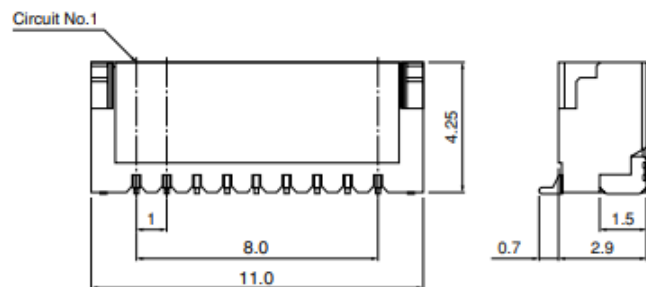
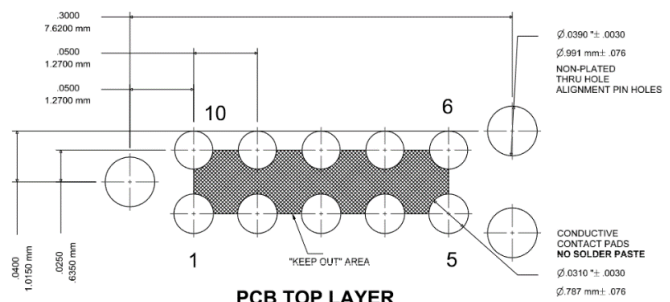| Pin	Signal	Description
1	GND	Ground
2	HOUT_L	Headphone output left
3	HOUT_R	Headphone output right

4.6 Firmware Programming

CN1   ISP-Interface

Pin	Signal	Description
1	3.3V_PRG	3.3V programming supply
2	SCLK_PRG	Serial clock
3	MOSI_PRG	Master-out/slave-in data
4	MISO_PRG	Master-in/slave-out data
5	SCE_PRG	Chip-select
6	FLASH_WP	Write protect
7	SPI_SW_RT	Enable programming, active high
8	GND	Ground

CON_PRG2   ISP-Interface

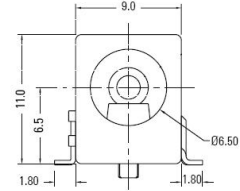| Pin	Signal	Description
1	3.3V_PRG	3.3V programming supply
2	SCLK_PRG	Serial clock
3	MISO_PRG	Master-in/slave-out data
4	NC	Not conneted
5	SPI_SW_RT	Enable programming, active high
6	SCE_PRG	Chip-select
7	GND	Ground
8	FLASH_WP	Write protect
9	MOSI_PRG	Master-out/slave-in data
10	NC	Not conneted

Matching connector/prog-cable:
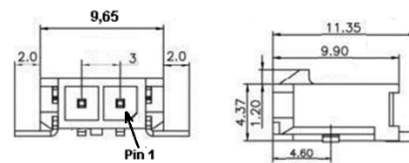Tag-connect / TC2050-IDC-NLFP

4.7 Power Supply

CN13   Power Supply Connector (external)

Pin	Signal	Description
Center	+12V/+24V	12V/24V Power supply (max 3A)
Outer Shield	GND	Ground

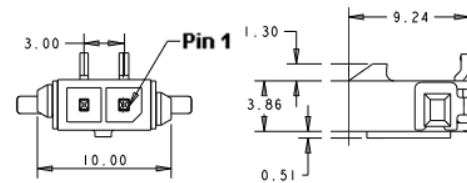**CN12   Power Supply Connector (optional/internal)**

Pin	Signal	Description
1	GND	Ground
2	+12V/+24V	12V/24V Power supply

CN12A   Power Supply Connector (optional/internal)

Pin	Signal	Description
1	GND	Ground
2	+12V/+24V	12V/24V Power supply

4.8 Connector Overview

CN	Description	Type	Manufacturer
CN1	I2C-Interface	BM10B-SRSS-TB	JST
CN3	HDMI	e.g. 685119134923	Würth
CN4	DP	e.g. DPC-F-S-RA-SMT	Adam-Tech
CN5	Keypad Control	SM06B-SRSS-TB	JST
CN6	I2C-Interface	SM05B-SRSS-TB	JST
CN7	LCD-TFT Interface: LVDS	DF14-30P-1.25	Hirose
CN8	Backlight Supply	53261-0671	Molex
CN10	Headphone Jack	SJ2-3593D-SMT	CUI
CN12	Power Supply	WR-MPC3	Würth
CN12A	Power Supply	2-1445087-2	TE-Connectivity
CN13	Power Supply	2-1445057-2	TE-Connectivity

5 Specifications

5.1 Electrical Characteristics

Operating Values

Item	Condition	MIN.	TYP.	MAX.	Unit	Note
Supply Voltage [1]			12		VDC	*1
Current Input	Stand-by		TBD		mA	
	1920x1200		TBD		mA	Board only
Panel Supply Voltage / Current	+3.3V			2.0	A	Output
	+5V			3.0	A	Output
Supply Voltage [1]		19	24	29	VDC	
Current Input	Stand-by		TBD		mA	
	1920x1200		TBD		mA	Board only
Total 24V to 12V conversion: max 30W						
Panel Supply Voltage / Current	+3.3V			2.0	A	Output
	+5V			3.0	A	Output
Backlight Supply	+12V			TBD	A	Output
Operating Temperature		0	-	70	°C	

*1: Output voltage for display backlight is same as supply voltage

5.2 Temperature & Humidity

Item	MIN.	TYP.	MAX.	Unit	Note
Operating Temperature	0/TBD	-	+70	°C	
Storage Temperature	10/TBD	-	+85	°C	
Humidity	5	-	90	%RHmax	

6 Outline Dimensions