Data Sheet

UHD Monitor Board
(Ultra high Resolution)
FOR TFT LCD V_by_one

NT4200

Feb.,2014

1. Description

The NT4200 from First is an interface board for TFT LCD 4K2K panel providing high quality of screen image from the HDMI(1.4), Display Port(1.2) from various type of VGA card & media player.

This board supports from VGA to UHD resolution and various range of panels interfaced with V-by-one type.

Reliable H/W and S/W Design LCD Application.

2. General Features

- Panel Support:
  - VGA, SVGA, XGA, SXGA, UXGA, WQXGA, UHD resolution LCD panels
  - TFT LCD Panels from LG-Philips, Samsung, BOE-Hydis, AUO, INNOLUX etc.
  - Up to 1,073M color(10-bit)
  - V-by-one type panel interface (8 lane)

- Input Signal:
  - All VESA standard input with clear image
  - Refresh rate from 56Hz up to 75Hz (up to 4096 x 2160), 4K2K Resolution up to 60Hz Only
  - Extension to 4Kx2K 60Hz Display
  - High display quality of expanded image from the lower resolution input
  - HDMI receiver (v1.4a)
  - Display Port receiver (v1.2)

- Easy to use On-screen Display menu to control all supported function
  - Automatic adjustment for screen image control
  - Bright and Contrast control
  - Color balance and color temperature control
  - Positioning of OSD Menu and 2 language(Korean/English) selection.
  - Input source selection
  - OSD control button (5 key or 7 key)
  - Remote Control Support

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3. Electrical Specification

3.1. Input Characteristic

Description	Signal	Unit	Min	Typical	Max.	Remarks
Power In (24Vdc)						
	Input Voltage	Vdc	22	24	26	
	Consumption	Watt				< TBD W(DPMS)
DISPLAY PORT	Signal Cable	D.P connector				
	Signal Type	Base on DPRX technology				
HDMI	Signal Cable	HDMI connector				
	Signal Type	Base on TMDS technology				

3.2. Output Characteristics

Description	Signal	Unit	Min	Typical	Max.	Remarks
V by one Interface						
	Differential output	mVp-p	250	350	450	
	LCD Power (10v)	Vp-p	9.40	10	10.60	
	LCD Power (12v)	Vp-p	11.40	12	12.60	
	Signal Cable	V by one connector				
	Signal Type	Base on V by one technology				
Converter Interface						
	Power out	Vdc	19	24	26	
	On/off control	Vp-p	0	3.3	3.6	L=off, H=on
	Bright Control	Vp-p	3.3		0	
Audio control						
	Output Power	Watt		20		Each Channel

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4. Notes for Installation

This controller is designed for Display port, HDMI monitor using different size of TFT LCD panels.
This section provides some guidelines for assembly and preparation of a finished display solution.

Preparation: Before proceeding, it is important to familiarize yourself with the parts making up a system and the various connectors, mounting holes, and general layout of the controller. All connectors have their own number printed on the controller board. And their signal arrangements are shown in the following relevant sections.

LCD signal cables: In order to provide a good signal, it is recommended that LCD signal cables should be no longer than 10cm. But it depends on signal frequency and LCD interface type.

LED Converter: Each LCD panels have their own converter to obtain optimum performance and long life time.
Because, Each LCD panel makers use different type of back light tubes for their all different models and converter drives the tubes directly.
The controller board just supplies the power for converter logic and controls a light On/Off signal and a brightness control signal. So, it is important to use the converter that has proper driving capacity and control input signal.

Converter cable: This cable supplies Converter's power, an on/off control signal and a brightness control signal to the Converter.

OSD Button: See Operational Function section.

3 Color LED: This LED shows the state of controller.
- Blue – Normal state
- Led Off – Power Off mode
- Blue Blinking a per 1 second – No-Signal & No-cable
- Red – DPMS

Power switch: This switch is located on OSD button board.

Power input: +24Vdc is required to supply enough power for the controller, Converter and LCD panel.

D.P, HDMI Input Cable: As this may affect regulatory emission test result, a suitably shielded cable should be utilized.

EMI: Shielding will be required for passing certain regulatory emissions tests. Also the choice of video board and power supply can affect the test result.
Consideration should be given to:
- Electrical insulation.
- Grounding.
- EMI shielding.
- Cable management.
- Heat & ventilation

Caution: Ensure adequate insulation is provided for all areas of the PCB with special Attention to high voltage parts such as the Converter.

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5. Setup for Operation

Once the circuit has been connected, a setup procedure for optimal operation is required some time.
The following instructions are likely to form the basis of the finished product operation manual.

LCD Display System Settings
The OSD(On Screen Display) provides certain functions to have clear image and others. This board supports7 buttons OSD operation as a standard. The control functions defined on OSD operation are as below.

5.1 OSD Menu

OSD Menu		Description	Remarks
Luminance	Brightness	Adjust the Brightness of the screen	
	Contrast	Adjust the Contrast of the screen	
	Gamma	Adjust the Gamma of the screen	
Picture	Phase	Adjust the Phase of the screen's image	RGB Only
	Clock	Adjust the Clock of the screen image	RGB Only
	H. Position	Adjust the H-Position of the screen's image	RGB Only
	V. Position	Adjust the V-Position of the screen's image	RGB Only
Color	Color Temperature	Control the temperature of the color	
	Red	Control the intensity of the color of the screen's image(Usable when Color temperature is USER mode.)	
	Green		
	Blue		
OSD Settings	Horizontal	Adjust the H-Position of the OSD Menu	
	Vertical	Adjust the V-Position of the OSD Menu	
	Transparency	Adjust the Transparency of the OSD Menu	
	OSD Time out	Adjust the Off Timer of the OSD Menu	
Setup	Language	Adjust the Language of the OSD Menu	
	Mute	Audio ON/OFF select	
	Input	Input Select	
	DCR	Set the DCR on/off of the screen	
	Reset	Adjust the Initialize of the Set	
PIP	Multi Window	Set the POP on/off of the screen	
	Sub Source	Multiwindows Input Matrix are as below	
	Size	Adjust the Size of the screen	
	H-Position	Set the PIP H-Position of the screen	
	V-Position	Set the PIP V-Position of the screen	
	Swap	Set the PIP main/sub screen select	

*** Audio PIP Mode not supported**

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5.2 Hotkey Function Definition

Key Name	Function	Remarks
Power Key	Power On / Off	
Menu Key	OSD Menu On / Off	
Up Key	Channel Up / OSD Menu Up Select	
Down Key	Channel Down / OSD Menu Down Select	
Left Key	Volume Down	
Right Key	Volume Up	
Select Key	Input Source Select	

5.3 PIP window

Multiwindows Input Matrix are as below

	D.P**(Sub)**	HDMI 1	HDMI 2	HDMI 3
D.P**(Main)**	X	O	O	O
HDMI 1	O	X	O	O
HDMI 2	O	O	X	O
HDMI 3	O	O	O	X

*** Support PIP window up to 1920x1080**

5.4 Daisy chain / Multi-display System support (option)

5.5 Support Flip/Mirror display

5.6 Over-drive for faster response time

5.7 Mode for video Frame Rate Convert (FRC)

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6. Applicable Graphic and Video Mode

6.1. Input format(VESA)

The microprocessor measures the H-sync, V-sync and V-sync/H-sync polarity for RGB inputs, and uses this timing information to control all of the display operation to get the proper image on a screen.
This board can detect all VESA standard Graphic modes shown on the table below and provide more clear and stable image on a screen.

Table 6.1) Timing Table

Character Mode	Pixel Freq.	Horizontal Timing				Vertical Timing			
		Sync Polar	Freq.	Total	Active	Sync Polar	Freq.	Total	Active
	MHz		KHz	Pixel	Pixel		Hz	Line	Line
640x350 @70Hz	25.151	P	31.44	800	640	N	70.02	449	350
720x400 @70Hz	28.295	N	31.44	900	720	P	70.02	449	400
640x480 @60Hz	25.175	-	31.47	800	640	-	59.94	525	480
640x480 @67Hz	30.240	-	35.00	864	640	-	66.67	525	480
640x480 @72Hz	31.500	-	37.86	832	640	-	72.81	520	480
640x480 @75Hz	31.500	-	37.50	840	640	-	75.00	500	480
800x600 @56Hz	36.000	-	35.16	1024	800	-	56.25	625	600
800x600 @60Hz	40.000	-	37.88	1056	800	-	60.32	628	600
800x600 @72Hz	50.000	-	48.08	1040	800	-	72.19	666	600
800x600 @75Hz	49.500	-	46.88	1056	800	-	75.00	625	600
832x624 @74Hz	57.285	-	49.73	1152	832	-	74.55	667	624
1024x768 @60Hz	65.000	-	48.36	1344	1024	-	60.00	806	768
1024x768 @70Hz	75.000	-	56.48	1328	1024	-	70.07	806	768
1024x768 @72Hz	75.235	-	57.70	1304	1024	-	72.30	798	768
1024x768 @75Hz	78.750	-	60.02	1312	1204	-	75.03	800	768
1152x864 @60Hz	88.566	-	54.00	1640	1152	-	60.00	900	864
1152x864 @70Hz	93.930	-	62.62	1500	1152	-	69.58	900	864
1152x864 @75Hz	108.000	-	67.50	1600	1152	-	75.00	900	864
1152x870 @75Hz	100.000	-	68.68	1456	1520	-	75.00	915	870
1280x1024@60Hz	108.000	-	63.98	1688	1280	-	60.02	1066	1024
1280x1024@70Hz	124.995	-	74.40	1680	1280	-	69.99	1063	1024
1280x1024@72Hz	134.626	-	77.91	1728	1280	-	72.00	1082	1024
1280x1024@75Hz	135.001	-	79.98	1688	1280	-	75.03	1066	1024
1600x1200@60Hz	160.875	-	74.48	2160	1600	-	59.96	1242	1200
1920x1080@60Hz	148.500	-	66.60	2160	1920	-	60.00	1125	1080
1920x1200@60Hz	154.110	-	74.10	2080	1920	-	59.99	1235	1200
2560x1440@60Hz	241.000	+	88.80	2720	2560	-	60.01	1481	1440
2560x1600@60Hz	268.000	-	98.71	2720	2560	-	59.97	1646	1600
3840x2160@60Hz	585.980		129.6	4480	3840		60.00	2180	2160

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7. Connectors and Signal Arrangement

7.1 Summary for connectors

Reference	Description	Connector Type
J101	Power input connector for a DC Jack	MD23-604V-4P
J650	HDMI 1 input connector for a HDMI Jack	51U019S-331N-B14R
J675	HDMI 2 input connector for a HDMI Jack	51U019S-331N-B14R
J230	HDMI 3 input connector for a HDMI Jack	51U019S-331N-B14R
J102	USB Jack for +5V charging	FEMALE UP RIGHT DIP
P450	Sound output connector for a wire type cable	SMW200-04
J451	Sound output connector for a PHONE Jack	ST-324
P602	V-by-one Interface connector for 8lane V-by-one	FI-RE51S-HF
P250	OSD Connector for OSD Button, power on/off switch.	20017WR-13 (YEONHO)
P100	Converter interface connector for Converter power and on/off and brightness control	SMAW200-12P (YEONHO)

7.2 Signal Arrangement

1) Power input connector for a DC Jack (J101)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
2,4	+24V	+24V Power Input	1,3,5	GND	Ground

2) HDMI Input connector for a HDMI Jack (J650, J675, JJ230)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	RX2P	Receive data2+	13	CEC	Receive CEC
2	GND	AGND	14	N.C	Not connected
3	RX2N	Receive data2-	15	SCL	HDMI DDC SCL IN
4	RX1P	Receive data1+	16	SDA	HDMI DDC SDA IN
5	GND	AGND	17	GND	AGND
6	RX1N	Receive data1-	18	+5V	HDMI +5V
7	RX0P	Receive data0+	19	HPD	HOT PLUG
8	GND	AGND	20	GND	AGND
9	RX0N	Receive data0-	21	GND	AGND
10	CLKP	Receive clk+	22	GND	AGND
11	GND	AGND	23	GND	AGND
12	CLKN	Receive clk-			

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3) USB Jack for +5V charging (J102)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	5V	+5V Power Output	3	N.C	Not connected
2	N.C	Not connected	4	GND	Ground

4) Sound output connector for a wire type cable (P450)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	SP R-	Right speaker -	3	SP L-	Left speaker-
2	SP R+	Right speaker +	4	SP L+	Left speaker+

5) Sound output connector for a phonejack (J451)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	GND	4	L-OUT	Headphone OUT_LEFT
2	L-IN	Headphone IN_LEFT	5	R-OUT	Headphone OUT_RIGHT
3	R-IN	Headphone IN_RIGHT			

6) OSD Connector for OSD Button, power on/off switch (P250)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VCC	+3.3V	8	CH_DOWN	Input Key 3
2	GND	Ground	9	VOL_UP	Input Key 4
3	IR	Remocon	10	VOL_DOWN	Input Key 5
4	RED	Red led	11	EXIT	Input Key 6(Not USE)
5	BLUE	Blue led	12	MENU	Input Key 7
6	POWER	Input Key 1	13	SOURCE	Input Key 8
7	CH_UP	Input Key 2			

7) Converter interface connector (P100)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	DIMMING	Brightness control	7	N.C	Not connected
2	BL ON/OFF	Backlight on/off	8	N.C	Not connected
3	GND	Ground	9	BL_VDD	IVT +24V
4	GND	Ground	10	BL_VDD	IVT +24V
5	GND	Ground	11	BL_VDD	IVT +24V
6	GND	Ground	12	BL_VDD	IVT +24V

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8) V-by-one Interface connector for 8lane V-by-one (P602)

Pin No.	Symbol	Description
1	NC	No Connection
2	NC	No Connection
3	NC	No Connection
4	NC	No Connection
5	NC	No Connection
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection
10	NC	No Connection
11	NC	No Connection
12	NC	No Connection
13	NC	No Connection
14	NC	No Connection
15	GND	Ground
16	VX1_7P	8th Pixel Positive V by One differential data input Lan 7
17	VX1_7N	8th Pixel Negative V by One differential data input Lan 7.
18	GND	Ground
19	VX1_6P	7th Pixel Positive V by One differential data input Lan 6.
20	VX1_6N	7th Pixel Negative V by One differential data input Lan 6.
21	GND	Ground
22	VX1_5P	6th Pixel Positive V by One differential data input Lan 5.
23	VX1_5N	6th Pixel Negative V by One differential data input Lan 5.
24	GND	Ground
25	VX1_4P	5th Pixel Positive V by One differential data input Lan 4.
26	VX1_4N	5th Pixel Negative V by One differential data input Lan 4.
27	GND	Ground
28	VX1_LOCKN	Lock detect output, Open drain.
29	VX1_HPDN	Hot plug detect output, Open drain.
30	GND	Ground
31	VX1_3P	4th Pixel Positive V by One differential data input Lan 3.
32	VX1_3N	4th Pixel Negative V by One differential data input Lan 3.
33	GND	Ground
34	VX1_2P	Third Pixel Positive V by One differential data input Lan 2.
35	VX1_2N	Third Pixel Negative V by One differential data input Lan 2.
36	GND	Ground
37	VX1_1P	Second Pixel Positive V by One differential data input Lan 1.
38	VX1_1N	Second Pixel Negative V by One differential data input Lan 1.
39	GND	Ground
40	VX1_0P	First Pixel Positive V by One differential data input Lan 0.
41	VX1_0N	First Pixel Negative V by One differential data input Lan 0.
42	GND	Ground
43	GND	Ground
44	NC	No Connection
45	VCC	Power supply
46	VCC	Power supply
47	VCC	Power supply
48	VCC	Power supply
49	VCC	Power supply
50	VCC	Power supply
51	VCC	Power supply

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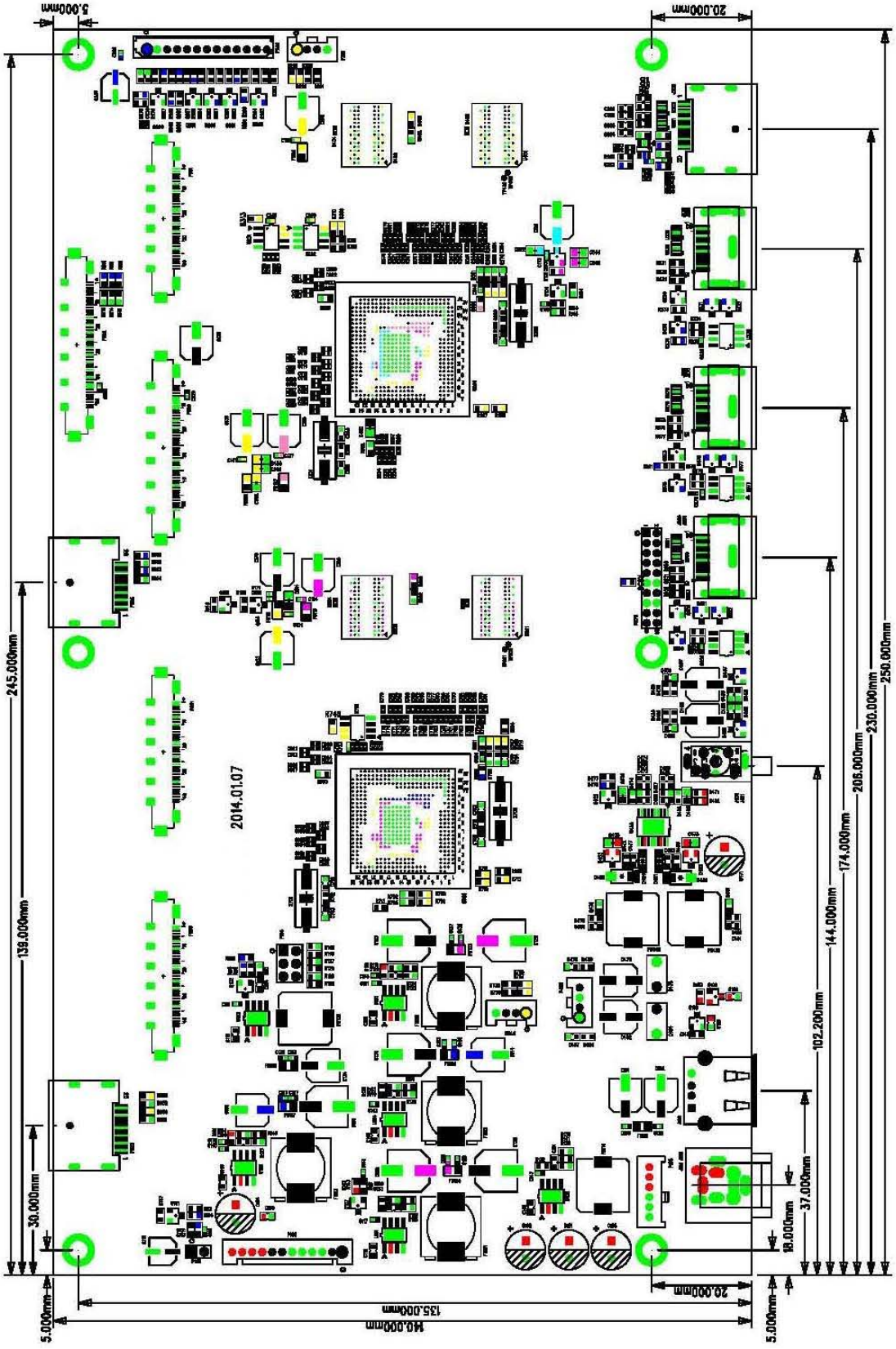
8. Mechanical Dimension



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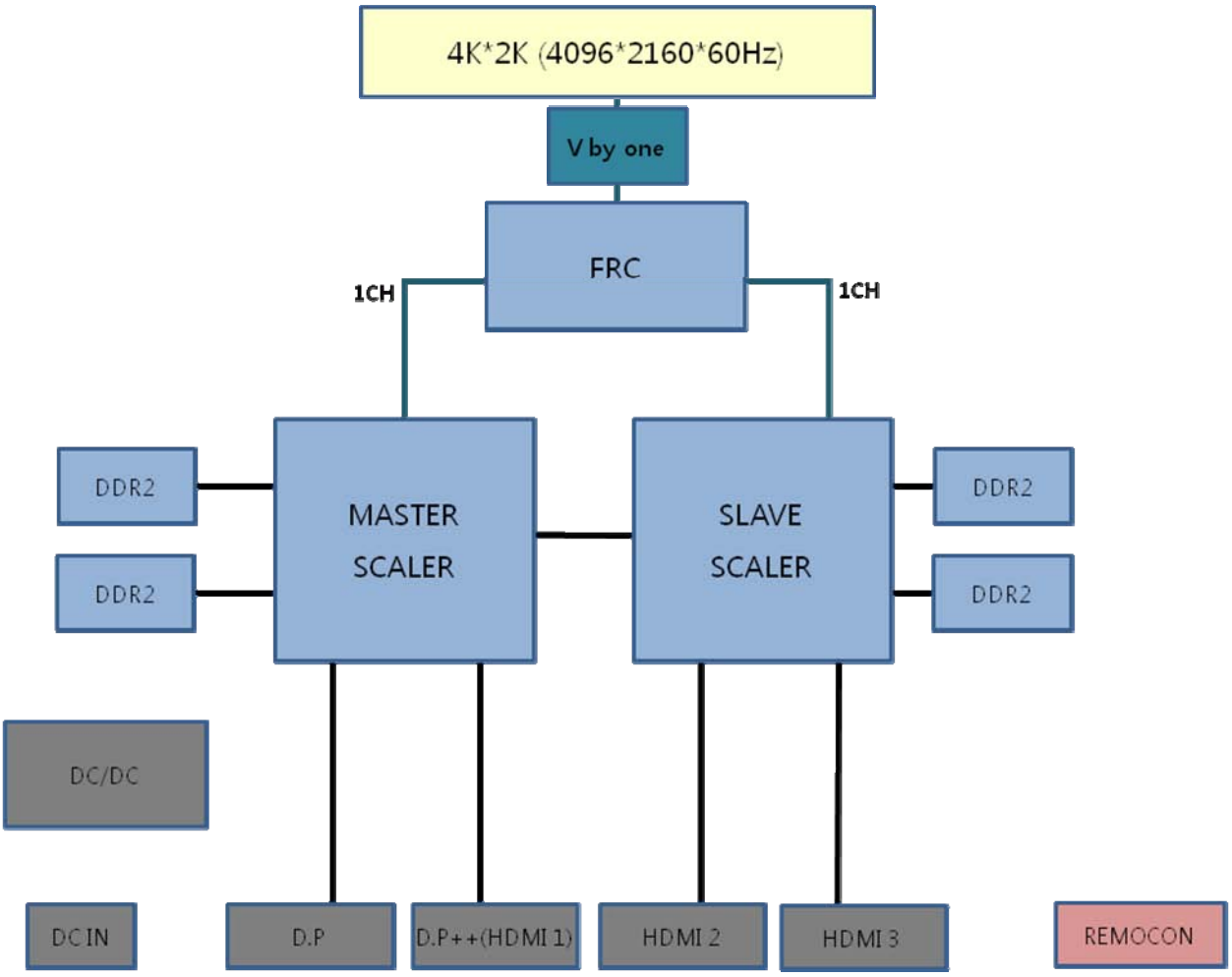
9. Block Diagram



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