

DATA SHEET

Model : Lily – Digital (Rev.2.0)

Part No. : FCB-AOD-Axx8

April, 2005

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The information presented in this document may form a part of quotation or contract under the agreement of both parties. Otherwise, this datasheet is subject to change without prior notice.

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1. Revisions of History

Revision No.	Date	Page	Description	Engineer
Ver. 0.0	Mar.11,'04	All	First Draft, Mechanical Dimension	Injoon Lee
Ver. 1.0	Mar.16,'04	All	Preliminary Specification	Injoon Lee
Ver. 1.1	Apr.20,'04	Cover & 24	Change Company Address	Jaya Yoon
Ver. 1.2	Apr.21,'04	25	Modify Supportable Panel List	Jaya Yoon
Ver. 2.0	Apr.22,'05	All	Chage Scailer, adding function	Injoon Lee

2. General Descriptions

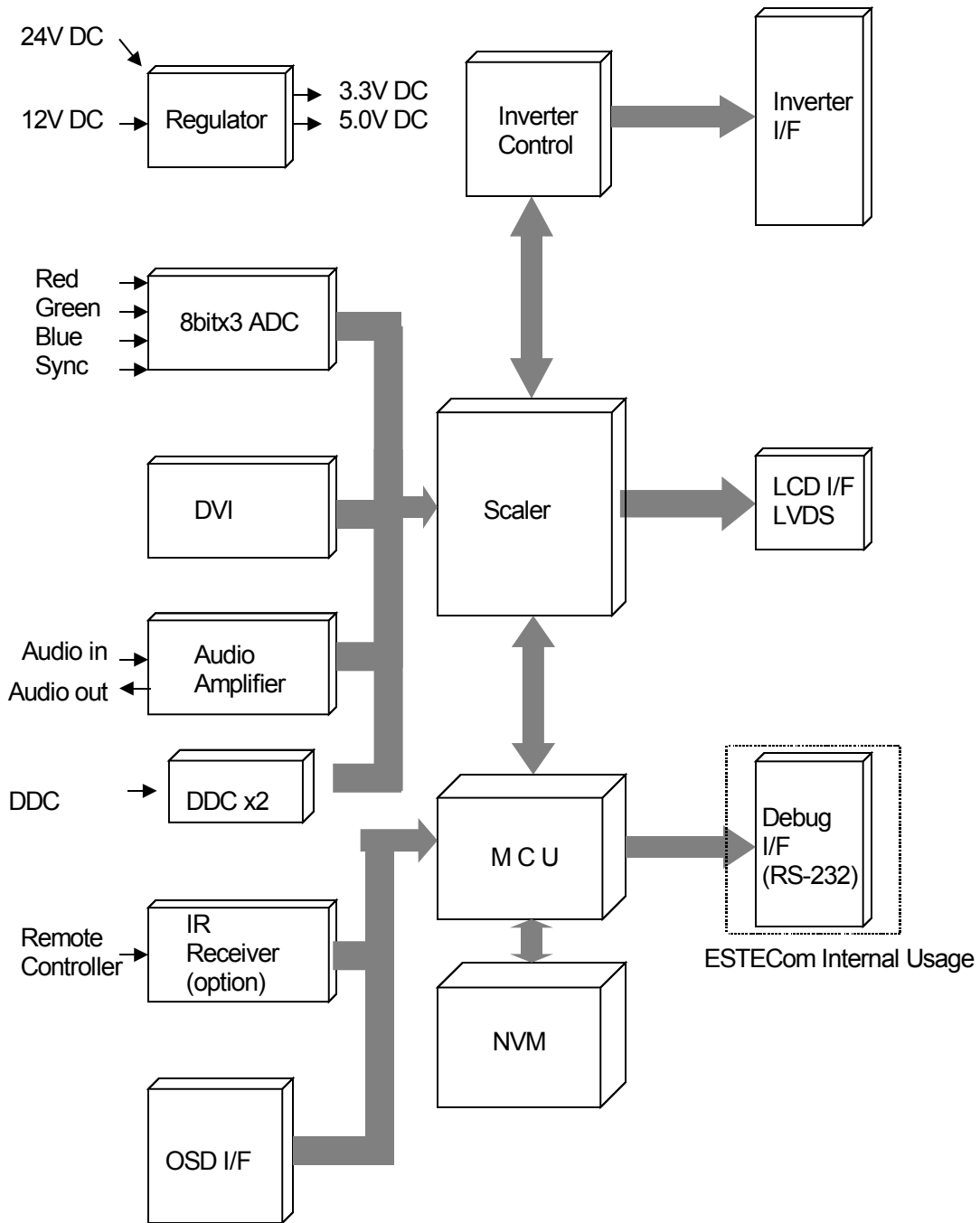
Lily-Digital is an advanced TFT-LCD Monitor Control Board. The function of this design can replace a full conventional CRT monitor with a large size of TFT-LCD modules. It is suitable for video resolution up to SXGA @ 75Hz in all video modes, the full display area of the module is used. The design is implemented as a single printed circuit board, the main function of which will be analog and digital video interface.

Lily-Digital is designed to support various TFT LCDs up to SXGA resolution by BIOS option, as shown in item 13 “Supportable Panel List” on page 25.

3. Features

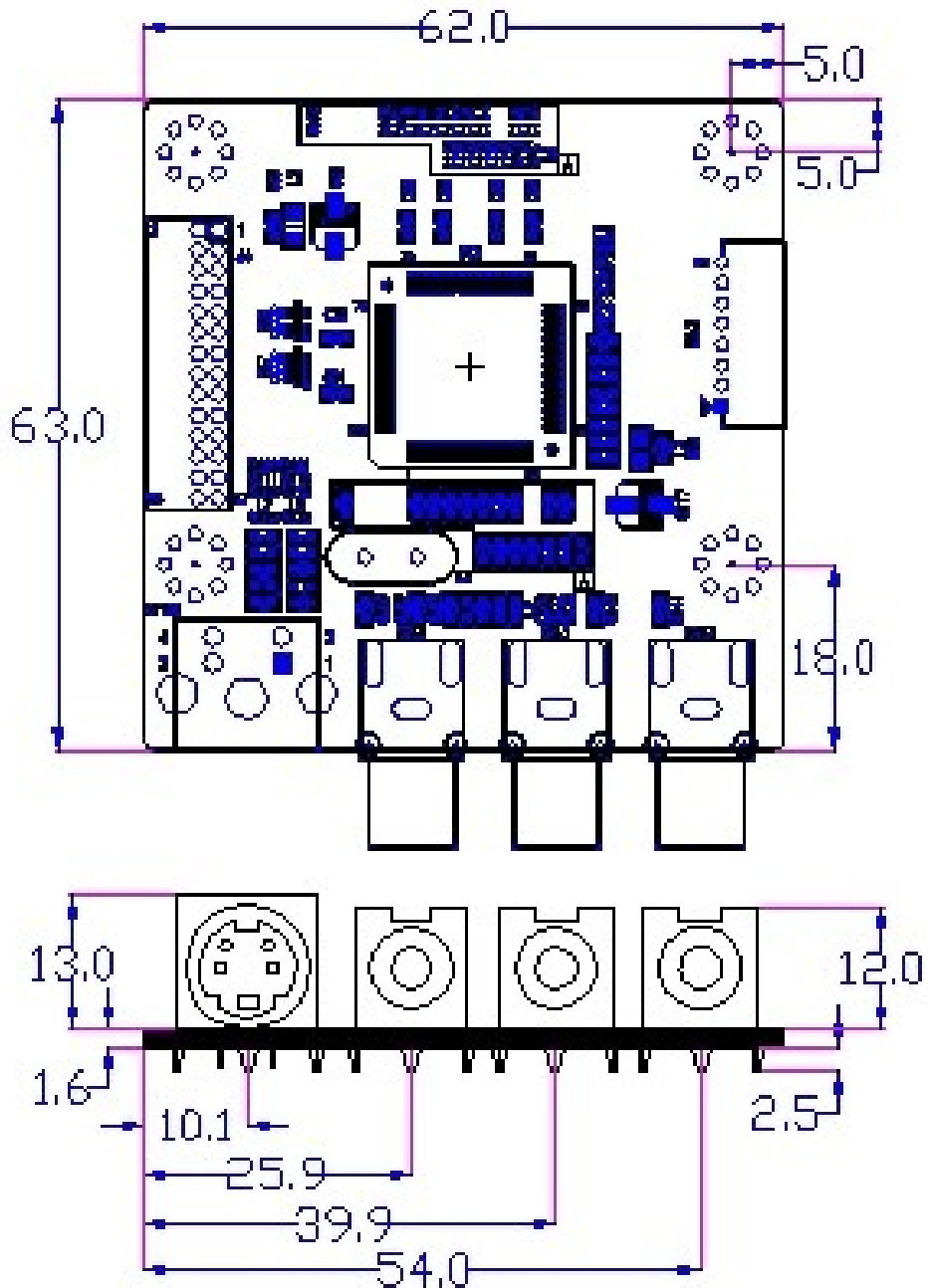
- Designed to give state-of-the-art picture quality
- Analog RGB / DVI (Digital Video Interface) / Audio input (PC) / Speaker out (x1)
- Optional support to composite video and Y/C input
- Optional input combination, e.g., PC monitor only
- Full CRT multi-sync monitor compatibility
- Multi-sync capability up to SXGA resolution @ 75Hz, compatible standard SVGA, XGA and SXGA VESA timing
- Expand DOS, VGA, SVGA and SXGA to full screen display
- True color (16.7M) data processing and display driving
- Single control operated & transparent On-Screen-Display (hereafter ‘OSD’) user interface
- Full control of all relevant display and interface parameters via OSD
- Multi-language
- VESA DDC1/2B compliant
- Compatible with VESA DPMS power saving modes
- Form factor: 100mm (L) x 150mm (W) x 19.1mm(H)
- +12V DC single power: 48watts AC/DC power adapter recommended
- Operating temperature: 0 C to 50 C
- The 2watt x 2ch. @ 8ohms audio capability with volume and mute control through either OSD or optional remote controller
- OSD & Power Switch Board : FOSD-xxx

4. Block Diagram



5.2 Optional Video Daughter Board Connectors for Composite / S-Video Input

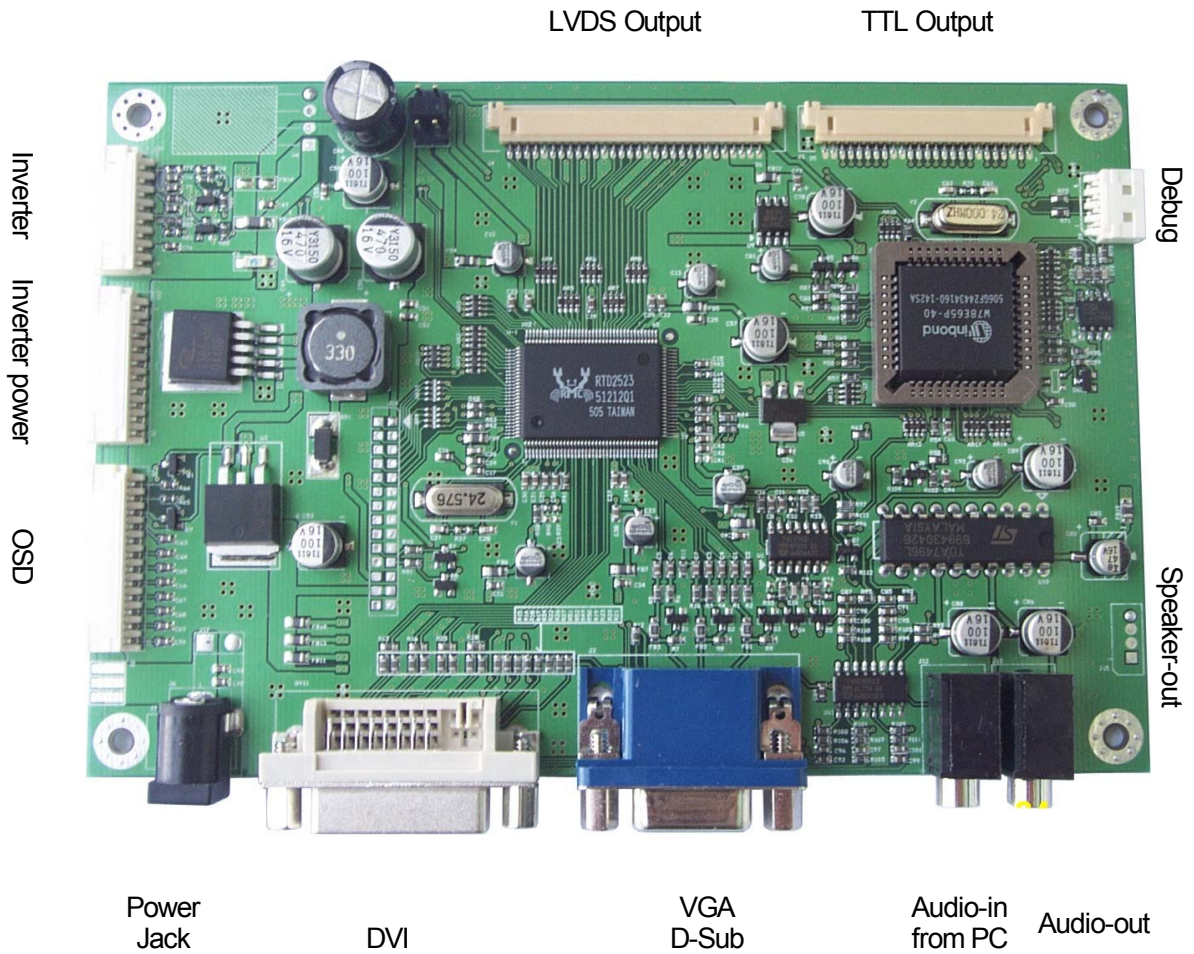
- Dimension : 63mm (L) x 62mm (W) x 17.1mm(H)



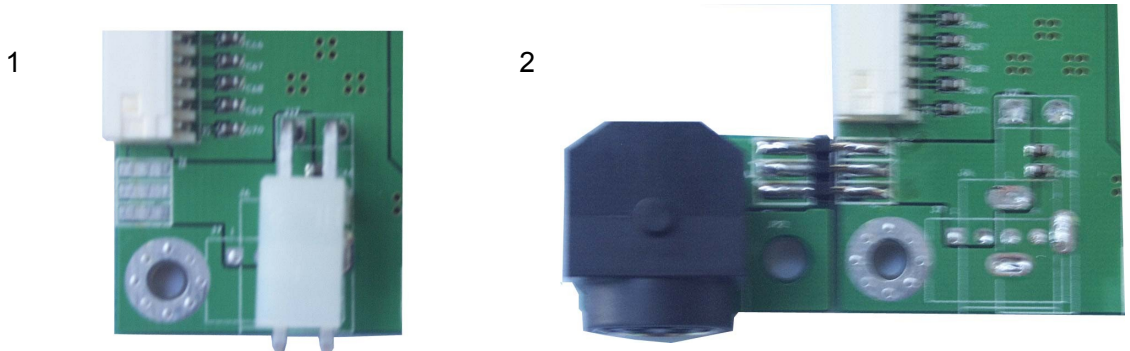
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5.3 Board with the Standard Connectors Configuration

- Analog & DVI (Actual Size)



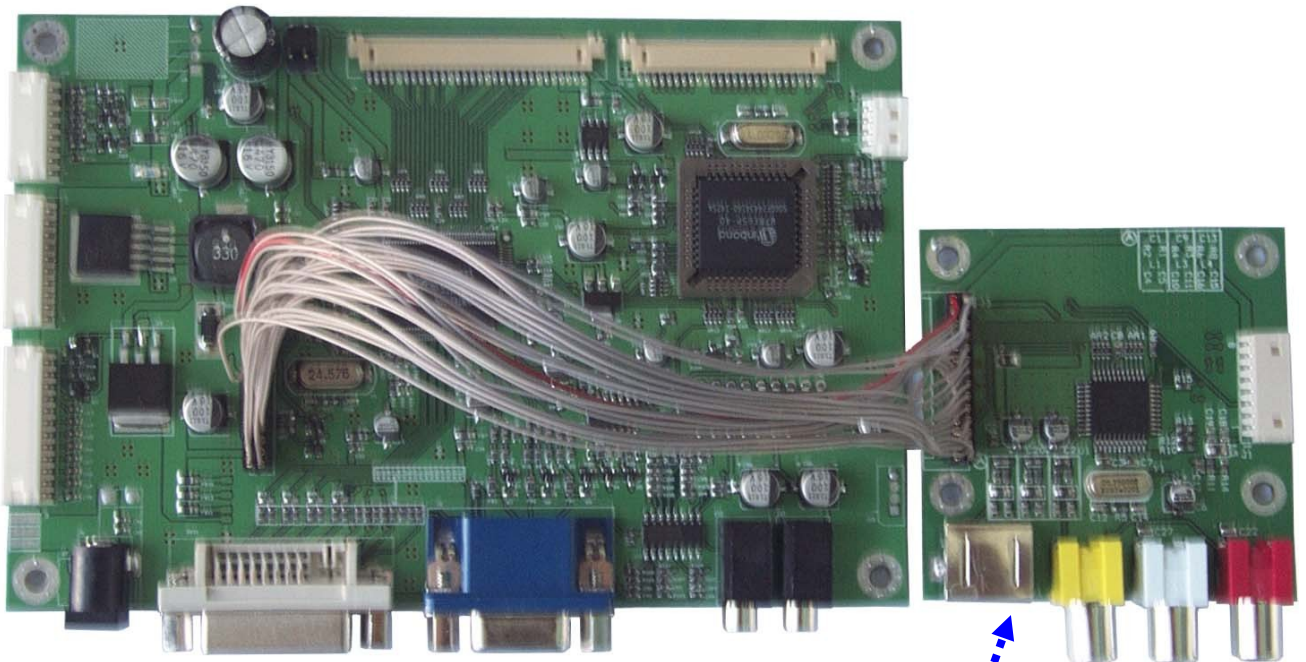
- Power Input option



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5.4 Video Board Connectors Configuration (Option)

- Analog & DVI & Composite Video & S-Video



Y/C (S-Video)

Composite Video

Left Sound-In from VHS or DVD

Right Sound-In from VHS or DVD

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6. Connectors Information

6.1 Input Connectors

- Power Input Connector
Connector : DC12V Jack (J6)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
2, 1	GND	GND	3	VCC	POWER

- Power Input Connector (**Alternative**)
Connector : Molex 5274-02 (J17)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VCC	POWER	2	GND	GND

- Power Input Connector (**Alternative**)
Connector : Molex 5268-04 (J7)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VCC	POWER	3	GND	GND
2	VCC	POWER	4	GND	GND

- Analog RGB Input Connector
Connector : Mini D-Sub 15pin(J2)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	RED	Analog Red	9	NC	+5Vdc
2	GREEN	Analog Green	10	SGND	Sync GND
3	BLUE	Analog Blue	11	NC	No Connection
4	GND	No Connection	12	SDA	DDC Serial Data
5	GND	Digital GND	13	HSYNC	Horizontal Sync
6	RGND	Red Return	14	VSYNC	Vertical Sync.
7	GGND	Green Return	15	SCL	DDC Data Clock
8	BGND	Blue Return			

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- Analog RGB Input Connector (**Alternative**)
Connector : Molex 53015-1410 (J1)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	NC	No Connection	8	GND	GND
2	GND	GND	9	GND	GND
3	DSCL	DDC Data Clock	10	BLUE	BLUE
4	DSDA	DDC Serial Data	11	GND	GND
5	GND	GND	12	GREEN	GREEN
6	V-Sync	Vertical Sync	13	GND	GND
7	H-Sync	Horizontal Sync	14	RED	RED

- DVI-I Input Connector
Connector : DVI-D (DVI 1)

Pin No.	Symbol	Pin No.	Symbol	Pin No.	Symbol
1	T.M.D.S. Data2-	9	T.M.D.S. Data1-	17	T.M.D.S. Data0-
2	T.M.D.S. Data2+	10	T.M.D.S. Data1+	18	T.M.D.S. Data0+
3	T.M.D.S. Data2/4 Shield	11	T.M.D.S. Data1/3 Shield	19	T.M.D.S. Data0/5 Shield
4	T.M.D.S. Data4-	12	T.M.D.S. Data3-	20	T.M.D.S. Data5-
5	T.M.D.S. Data4+	13	T.M.D.S. Data3+	21	T.M.D.S. Data5+
6	DDC Clock	14	+5V Power	22	T.M.D.S. Clock Shield
7	DDC Data	15	Ground	23	T.M.D.S. Clock+
			(Return for +5V, H-Sync, and V-Sync)		
8	Analog Vertical Sync	16	Hot Plug Detect	24	T.M.D.S. Clock-

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- Audio Input Connector

Input Connector : Stereo Jack (J12)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	GND	4	NC	No Connection
2	NC	No Connection	5	AUDIO	External Audio-R
3	AUDIO	External Audio-L			

- Audio Output Connector

Output Connector : Stereo Jack (J13)

Pin No.	Symbol	Description
1	GND	GND
2	NC	No Connection
3	AUDIO	Audio Out L+
4	NC	No Connection
5	AUDIO	Audio Out R+

* Input Connector :
Stereo Jack (J12)

* Output Connector :
Stereo Jack (J13)

- Speaker Connector : 4 Pin Connector (J15) (**Alternative of J13**)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	AUDIO	Sound Out_R+	3	GND	GND
2	GND	GND	4	AUDIO	Sound Out_L+

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- OSD, LED Interface Connector : OSD1

Connector : 53015-1210 Made by Molex (J8)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	LED 1	LED 1	7	KEY2	Increase
2	LED 0	LED 0	8	KEY3	Decrease
3	Vcc	Vcc 5V	9	KEY4	Exit (Hot Key : Auto Config)
4	RCVR	Remote Control	10	KEY5	Menu
5	GND	GND	11	KEY6	Source Select
6	KEY1	Power	12	KEY7	Up (Not Use)

- Debug Connector : J9

Connector : 53015-0410 Made by Molex(J1)

Pin No.	Symbol	Description
1	GND	GND
2	RX	TXD
3	TX	RXD
4	VCC	Vcc

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6.2 Output Connectors

- LVDS Output Connector (J4) : Yeonho 12507WR-30

Pin No.	LVDS	TTL	Pin No.	LVDS	TTL
1	VCC	VCC	16	Tx1-(ODD)	Not use
2	VCC	VCC	17	Tx0+(ODD)	Not use
3	VCC	VCC	18	Tx0-(ODD)	Not use
4	VCC	VCC	19	GND	GND
5	GND	GND	20	Tx3+(EVEN)	BLUE7
6	N/C	N/C	21	Tx3-(EVEN)	BLUE6
7	GND	GND	22	TxCLK+(EVEN)	BLUE5
8	Tx3+(ODD)	Not use	23	TxCLK-(EVEN)	BLUE4
9	Tx3-(ODD)	Not use	24	Tx2+(EVEN)	BLUE3
10	TxCLK+(ODD)	Not use	25	Tx2-(EVEN)	BLUE2
11	TxCLK-(ODD)	Not use	26	GND	GND
12	Tx2+(ODD)	Not use	27	Tx1+(EVEN)	BLUE1
13	Tx2-(ODD)	Not use	28	Tx1-(EVEN)	BLUE0
14	GND	GND	29	Tx0+(EVEN)	GREEN7
15	Tx1+(ODD)	Not use	30	Tx0-(EVEN)	GREEN6

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- TTL Output Connector :

Connector : Yeonho 12507WR-25 (J3)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	14	RED6	RED6
2	DCLK	Clock Output	15	RED7	RED7
3	GND	Ground	16	GND	Ground
4	DHS	H-SYNC	17	GND	Ground
5	DVS	V-SYNC	18	GREEN0	GREEN0
6	DE	Data Enable	19	GREEN1	GREEN1
7	GND	Ground	20	GREEN2	GREEN2
8	RED0	RED0	21	GREEN3	GREEN3
9	RED1	RED1	22	GREEN4	GREEN4
10	RED2	RED2	23	GREEN5	GREEN5
11	RED3	RED3	24	GND	Ground
12	RED4	RED4	25	GND	Ground
13	RED5	RED5			

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● Backlight Connector

Connector : 53015-0810 made by Molex(J10)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	BRIGHT	Brightness Adjustment	5	GND	Ground
2	ON/OFF	Back-light On/Off	6	GND	Ground
3	GND	Ground	7	VDD	INV PWR
4	5V	5V (NOT USE)	8	VDD	INV PWR

● Backlight Power Connector (For Large size panel)

Connector : 53015-0810 made by Molex(J11)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VDD	INV PWR	6	GND	Ground
2	VDD	INV PWR	7	GND	Ground
3	VDD	INV PWR	8	GND	Ground
4	VDD	INV PWR	9	GND	Ground
5	VDD	INV PWR	10	GND	Ground

7. Reference Data

Video Input Timing:

Supported vertical refresh rates for each mode are as follows:

640 x 350	70Hz
640 x 400	70Hz
720 x 350	70Hz
720 x 400	70Hz
640 x 480	60~75Hz
800 x 600	60~75Hz
1024 x 768	60~75Hz
1152 x 864	60~75Hz
1280 x 960	60Hz
1280 x 1024	60~75Hz

Sync. : H/V Separated TTL

● Electrical Parameters

Reference FCB-xx-Axx8, t_A 25 ° C

Symbol	Description	Min	Typ	Max	Unit
V_{DD}	+12V DC Power Supply	10.8	12.0	13.2	V
$V_{i(RGB)}$	Video Input Signal (w.r.t. GND)	0.5	0.7	1.0	V_{PP}
f_S	Video Sample Rate			80	MHz
f_{HS}	Horizontal Sync Frequency	30		60	KHz
f_{VS}	Vertical Sync Frequency	56		75	Hz
F_{SIH}	Sync Input High Level	2.5			V
V_{SIL}	Sync Input Low Level			0.8	VDC
I_{DD2}	Supply Current +12V (with LCD & Inverter)		3.0	3.3	A

Note : Power consumption measuring condition is 2 pixel checkboard pattern @ XGA 75Hz and maximum brightness with Samsung LTM170E4 & inverter at t_A 25°C.

8. Supported Input Formats

8.1 Video Mode Support

Lily-Digital can support any video mode within the following input constraints:

- Signal sample frequency with the input 80MHz
- Horizontal sync frequency between 30KHz and 80KHz

The modes are detected with the presentation of the input and previous alignments for setup are automatically recalled. The emulation of a true multi-sync monitor is implemented.

The factory preset supported modes are as follows:

Mode	Resolution	Refresh Rate	H-Freq.	Pixel Freq.	Remarks
VGA	640 x 350	70Hz	31.47KHz	25.175MHz	VESA Standard
VGA	720 x 400	59.940HZ	31.469KHZ	25.175MHZ	IBM VGA 3H
VGA	640 x 480	60Hz	31.5KHz	25.175MHz	Industry Standard
VGA	640 x 480	72Hz	37.9KHz	31.500MHz	VESA Standard
VGA	640 x 480	75HZ	37.5KHZ	31.500MHZ	VESA Standard
SVGA	800 x 600	60Hz	37.9KHz	40.000MHz	VESA Guidelines
SVGA	800 x 600	72Hz	48.1KHz	50.000MHz	VESA Standard
SVGA	800 x 600	75HZ	46.9KHZ	49.500MHZ	VESA Standard
XGA	1024 x 768	60Hz	48.4KHz	65.000MHz	VESA Guidelines
XGA	1024 x 768	70Hz	56.5KHz	75.000MHz	VESA Standard
XGA	1024 x 768	75HZ	60KHZ	78.750MHZ	VESA Standard
SXGA	1280 x 1024	60Hz	64KHZ	108.000 MHZ	VESA Standard
SXGA	1280 x 1024	75HZ	80KHZ	135.000 MHZ	VESA Standard

Notes:

2. All mentioned modes are non-interlaced. The maximum and minimum frame rates are decided by the TFT-LCD.
3. Factory preset modes are overwritten by additional user alignments for automatic recall. The factory preset modes can be recalled at any time.

8.2 LCD Panel & I/O Support

Lily-Digital is an advanced and general application for a TFT-LCD Monitor Control Board.

Therefore, the application of this board is not limited to panel manufacturers or models.

Furthermore, this board operates with any LVDS interface panel ranging from VGA to SXGA that can be driven with three or less timing signals. The usual timing signals to a panel are H-sync, V-sync and Data Enable.

For backlight intensity control mechanism, a built-in DC dimming drive signal is installed into the CCFL inverter control port. The CCFL inverter DC power, generally 12V DC, is attached to the same port. Users can design their own key pad board by using OSD & power tact switch as well as a two-color LED. On/off power switch and OSD input signal are detected and executed by the micro controller.

8.3 Audio Support

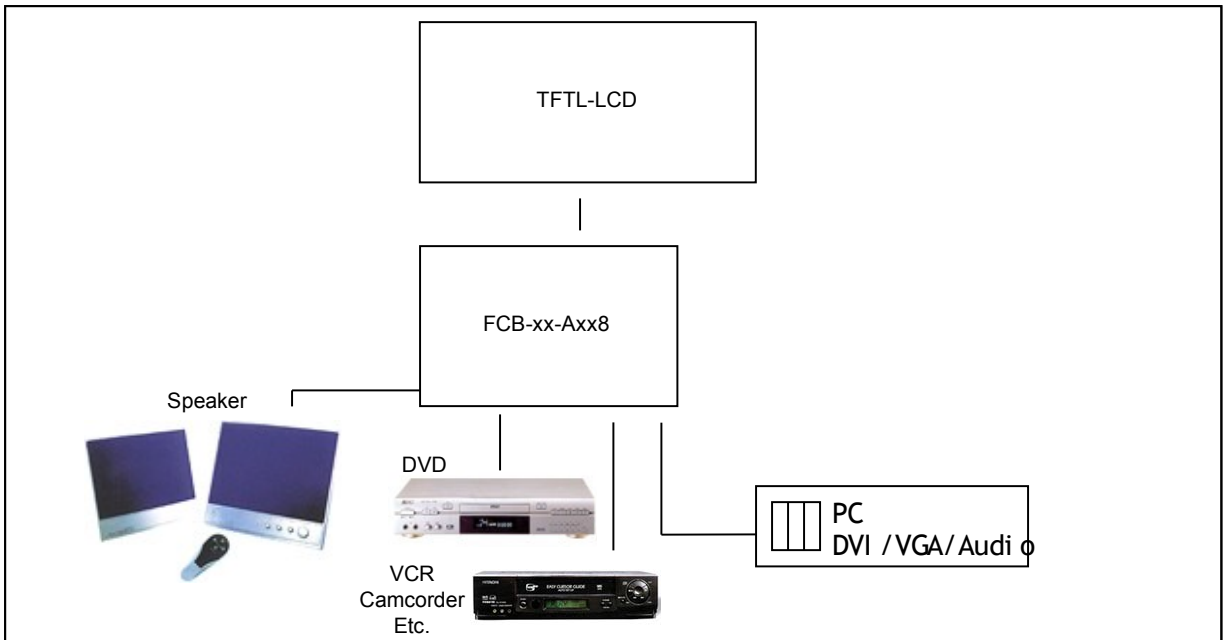
Lily-Digital has a Hi-Fi Stereo Audio amplifier that users can control by using OSD interface. There is 1 input channel to the audio input port. The audio output is 2 x 2watt, and users can easily configure the audio interface features by using the earphone output and speaker output ports.

Output Max. : 2 x 2watts @ 8ohm
Current : 450mA max.
Input Voltage: 12V DC
THD (Total Harmonic Distortion): 0.15%
S/N: 105dB

8.4 DVI (Digital Video Interface)

Lily-Digital has one DVI input port which complies with VESA DVI standard. Therefore, users can make direct interface to the DVI output of Digital VGA cards. The signal source can be switched through OSD.

High-end Multi-media Display System

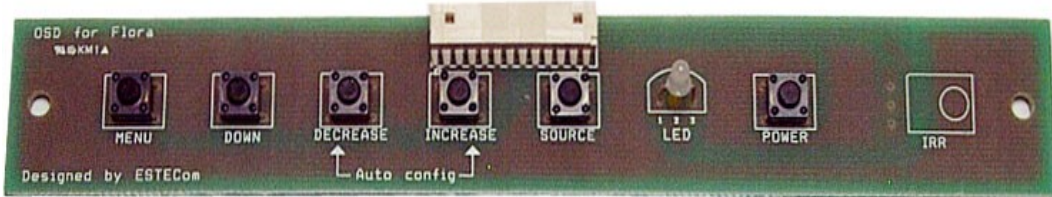


9. OSD (On Screen Display)

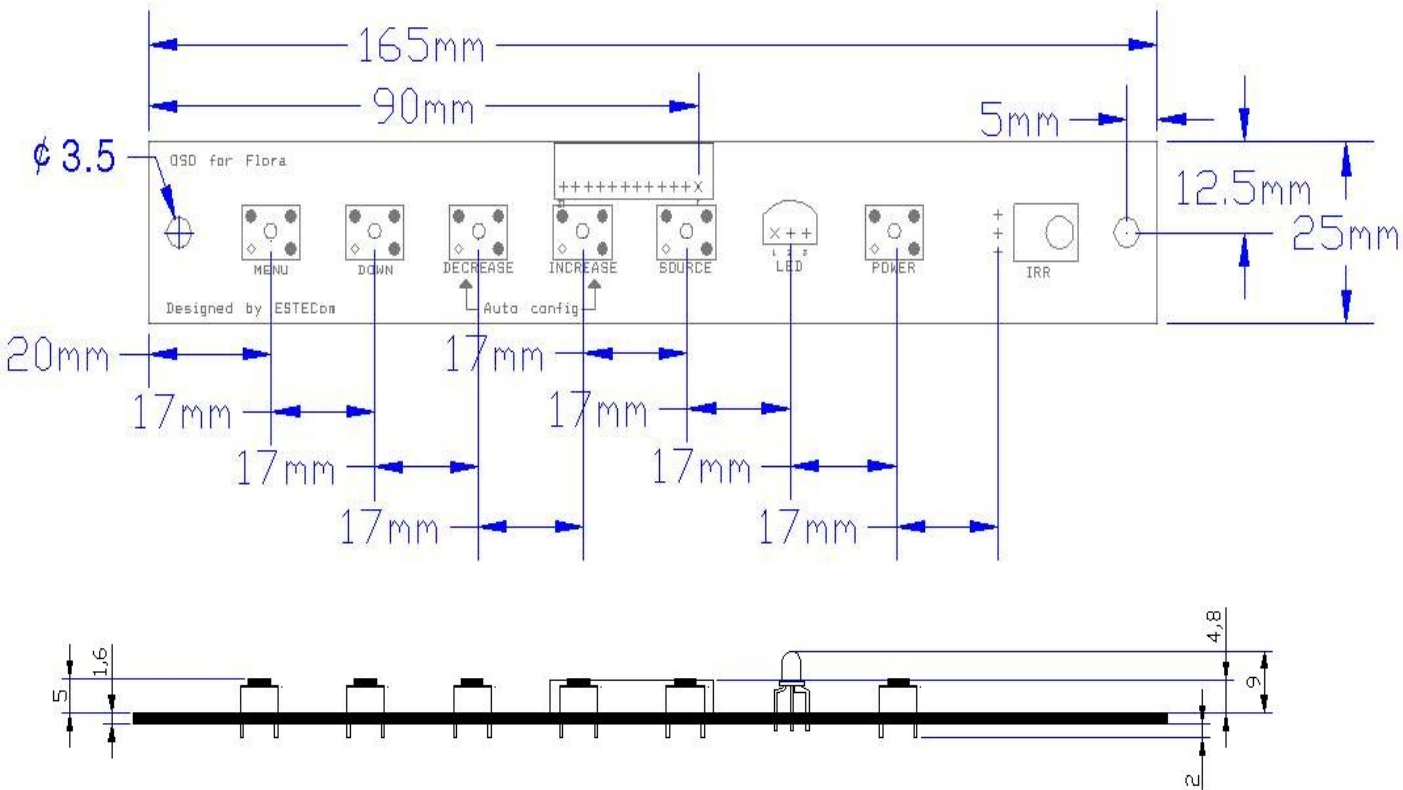
9.1 OSD Board Dimension

9.1.1 OSD Board with 6 Buttons

Part number : FOSD-T01-6



Menu/Exit(Auto Config.)/Decrease(Left)/Increase(Right)/Source Select/Power



OSD Key Description

- MENU : Menu Key
- DOWN (EXIT): Exit Key (HOT Key : Auto Config.)
- DECREASE : Decrease Key, Left Key (HOT Key : Audio Decrease)
- INCREASE : Increase Key, Right Key (HOT Key : Audio Increase)
- SOURCE : Source Select HOT Key : Source Select [Analog – DVI] [– Composite – S-Video {option}])

9.2 OSD menu enables user to manipulate the image and settings.

MODE 40	1280x1024 60Hz
<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: center;"> Color </div> <div style="display: flex; align-items: center;"> Picture </div> <div style="display: flex; align-items: center;"> Function </div> <div style="display: flex; align-items: center;"> OSD Menu </div> <div style="display: flex; align-items: center;"> Misc. </div> <div style="display: flex; align-items: center;"> Exit </div> </div>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; justify-content: space-between;"> Contrast 50 - <div style="width: 100px; height: 10px; background: linear-gradient(to right, #00FF00, #FFFFFF);"></div> + </div> <div style="display: flex; justify-content: space-between;"> Brightness 100 - <div style="width: 100px; height: 10px; background: linear-gradient(to right, #00FF00, #FFFFFF);"></div> + </div> <div style="display: flex; justify-content: space-between;"> Gamma 0 1 2 3 </div> <div style="display: flex; justify-content: space-between;"> Color Temp. Cool Normal Warm User </div> <div style="display: flex; justify-content: space-between;"> Color Adjust </div> <div style="display: flex; justify-content: space-between;"> Exit </div> </div>







Main Menu	Sub Menu	Operation
Color Available Mode - Analog RGB - DVI - Video - S-Video - TV	Contrast	- Contrast is ratio of luminance between black and white. - Adjust distinction. (Analog RGB Only)
	Brightness	- Adjust Brightness of the screen. (used to PWM control)
	Gamma	- RGB gain option.
	Color Temp	- Choice of Warm, Normal, Cool and user's option is chosen, RGB can be adjusted. - User : Able to adjust the color by controlling Red, Green, and Blue. - Warm : Red-tinged screen. - Normal : Green-tinged screen. - Cool : Blue-tinged screen.
	Color Adjust	- If the menu of Color Temp is set in user mode, the color can be controlled freely.
	Exit	- Go back to main menu.

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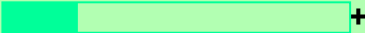

MODE 40	1280x1024 60Hz
Color	H.Position 50 - +
Picture	V.Position 100 - +
Function	Phase 0 - +
OSD Menu	Clock 50 - +
Misc.	Sharpness 1 2 3 4 5
Exit	Exit

Main Menu	Sub Menu	Operation
Picture <u>Available</u> <u>Mode</u> - Analog RGB	H.Position	- Move screen horizontally.
	V.Position	- Move screen vertically.
	Phase	- Adjust Phase of screen. Used when noise or overlapped lines are shown on the screen. Caution : Do not make manual adjustment when the picture is in its normal Shape or you will create problem on it.
	Clock	- Adjust horizontal size of the screen by increasing or decreasing the number of picture elements. Caution : Perform this adjustment just in the case of having horizontallyUnmatched picture after operation the " Auto Adjustment "
	Sharpness	- Adjust sharpness of pictures in 5 levels.
	Exit	- Go back to main menu.

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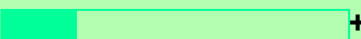
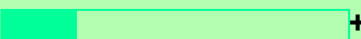
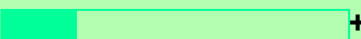
MODE 40	1280x1024 60Hz		
 Color	Auto Adjust	YES	NO
 Picture	Auto Color	YES	NO
 Function	Exit		
 OSD Menu			
 Misc.			
 Exit			

Main Menu	Sub Menu	Operation
Function <u>Available Mode</u> - Analog RGB	Auto Adjust	-Auto configuration of geometry. - Automatically adjusted items are : 1) Clock 2) Phase 3) Position is centered
	Auto Color	Color automatically set from strange input signal.
	Exit	- Go back to main menu.

MODE 40	1280x1024 60Hz
 Color  Picture  Function  OSD Menu  Misc.  Exit	Language OSD H.Pos 92 -  + OSD V.Pos 92 -  + OSD Timer 20 -  + Translucent 1 -  + Exit




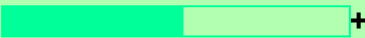





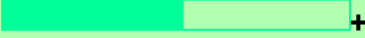

Main Menu	Sub Menu	Operation
OSD Menu <u>Available Mode</u> - Analog RGB - DVI - Video - S-Video - TV	Language	- Select the language of OSD menu. English / Français / Deutsch / Español / Italiano / Danish
	OSD H.Pos	- Adjust horizontal position of OSD menu by value.
	OSD V.Pos	- Adjust vertical position of OSD menu by value.
	OSD Timer	- The range of controlling the duration time of the OSD menu (OSD turn-off time).
	Translucent	- Choose between “translucent” and “opaque” for the basic color Of OSD menu.
	Exit	- Go back to main menu

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MODE 40	1280x1024 60Hz									
 Color  Picture  Function  OSD Menu <div style="background-color: #00FF00; padding: 2px;"> Misc.</div>  Exit	<p>Signal Source</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Mode Select</td> <td style="width: 35%; text-align: center;">640x400</td> <td style="width: 35%; text-align: center;">720x400</td> </tr> <tr> <td>Reset</td> <td style="text-align: center;">YES</td> <td style="text-align: center;">NO</td> </tr> <tr> <td>Volume</td> <td style="text-align: center;">30 -</td> <td style="text-align: center;">+ </td> </tr> </table> <p>Exit</p>	Mode Select	640x400	720x400	Reset	YES	NO	Volume	30 -	+ 
Mode Select	640x400	720x400								
Reset	YES	NO								
Volume	30 -	+ 								

Main Menu	Sub Menu	Operation
Misc. <u>Available Mode</u> - Analog RGB - DVI Video - S-Video - TV	Signal Source	- Select input signal source. Analog RGB / DVI / Composite Video / S-Video / TV
	Mode Select	- Select DOS 640(Graphic) or DOS 720(Text) input mode.
	Reset	- Initial set-up, preset by the factory before forwarding.
	Volume	- Adjust volume.
	Exit	- Go back to main menu.

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MODE 61	N T S C 60Hz
 Color	Contrast 50 -  +
 Video	Bright 50 -  +
 Function	Hue 0 +  +
 OSD Menu	Saturation 50 -  +
 Misc.	Sharpness 57 -  +
 Exit	Exit

Main Menu	Sub Menu	Operation
Video Available Mode - Video - S-Video - TV	Contrast	- Contrast is ratio of luminance between black and white. - Adjust distinction.
	Bright	- Adjust white offset.
	Hue	- Adjust between green tone and purple tone.
	Saturation	- Adjust color intensity.
	Sharpness	- Adjust sharpness of pictures in 7 levels.
	Exit	- Go back to main menu.

10. Operation Message

AUTO TRACKING (Analog RGB mode)

- Execute Auto Function

AUTO TRACKING

Self Diagnostics (Analog RGB mode)

- Input Signal is not present after power on with power switch. This message is disappeared after 10 sec or activity of input signal

NO SIGNAL

Self Diagnostics(Video/S-Video Mode)

- Input Signal is not present after power on with power switch. This message is disappeared activity of input signal

**COMPOSITE VIDEO /
S-VIDEO**

Out of Range

- Input Signal is over the supporting range

NO SUPPORT