

# **DATA SHEET**

**Model : LILY – Digital - SLIM (Rev.1.1)**

October, 2004

**D.C.D. Display Solution srl,  
Via Timermans ,6  
Torino, ITALY  
Tel : +39-011-7731830  
Fax : +39-011-7731830  
Web site: [www.dcd.it](http://www.dcd.it)**

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# Lily Digital Slim

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## 1. Revisions of History

| Revision No. | Date     | Page  | Description   | Actionee   |
|--------------|----------|-------|---|------------|
| Ver. 0.1     | Aug.'04  | All   | Preliminary Specification   | Injoon Lee |
| Ver. 1.0     | Aug.'04  | All   | Re-arrangement focusing on Panel  | Jaya Yoon  |
| Ver. 1.1     | Oct. '04 | 29-33 | Deleted Smart Panel Accessories<br>and Inserted an Optional Input Board | Jaya Yoon  |

## 6. Board Information

### 6-1. General Descriptions

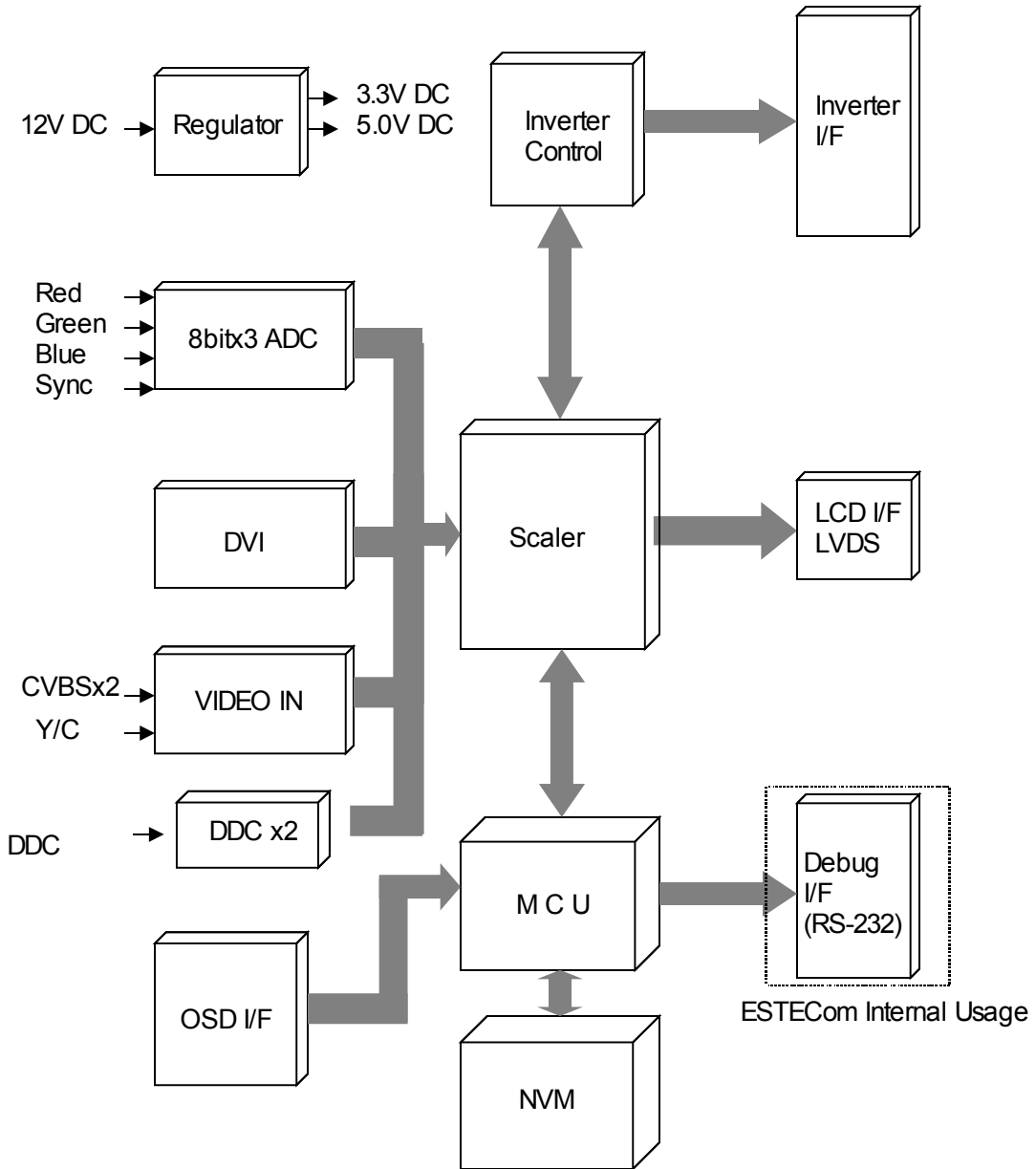
Lily-Digital-S is an advanced low profile TFT-LCD Monitor Control Board. The function of this design can replace a full conventional CRT monitor with Active MatrixTFT-LCD modules. It is suitable for video resolution up to SXGA @ 75Hz in all video modes, the full display area of the module is used. The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

Lily-Digital-S is designed to support various TFT LCDs up to SXGA resolution by BIOS option, as shown in item 3 "Supportable Panel List" on page 4.

### 6-2. Features

- Designed to give state-of-the-art picture quality
- Analog RGB / DVI (Digital Video Interface) / 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 DDC 1/2B compliant
- Compatible with VESA DPMS power saving modes
- Form factor: 100mm (L) x 120mm (W) x 7mm(H) **[Low profile supported]**
- +12V DC single power: 48watts AC/DC power adapter recommended
- Operating temperature: 0 C to 50 C
- OSD & Power Switch Board : FOSD-xxx

## 6-3 Block Diagram



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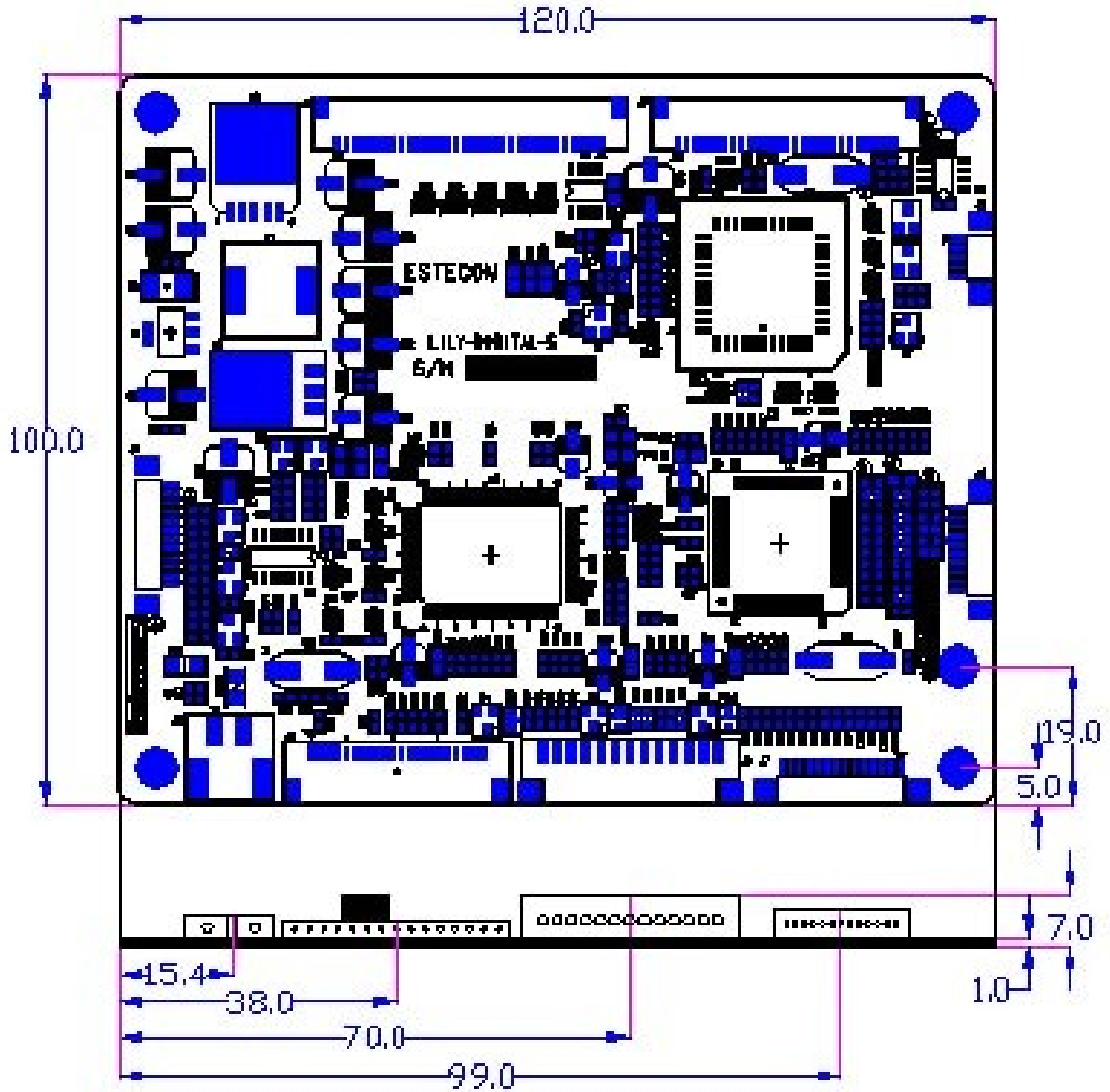
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## 6-4 Outline Dimensions

### 6.4.1 Standard Connectors for Power, DVI, Audio, OSD, Inverter

- Dimension : 100mm (L) x 120mm (W) x 7mm(H)



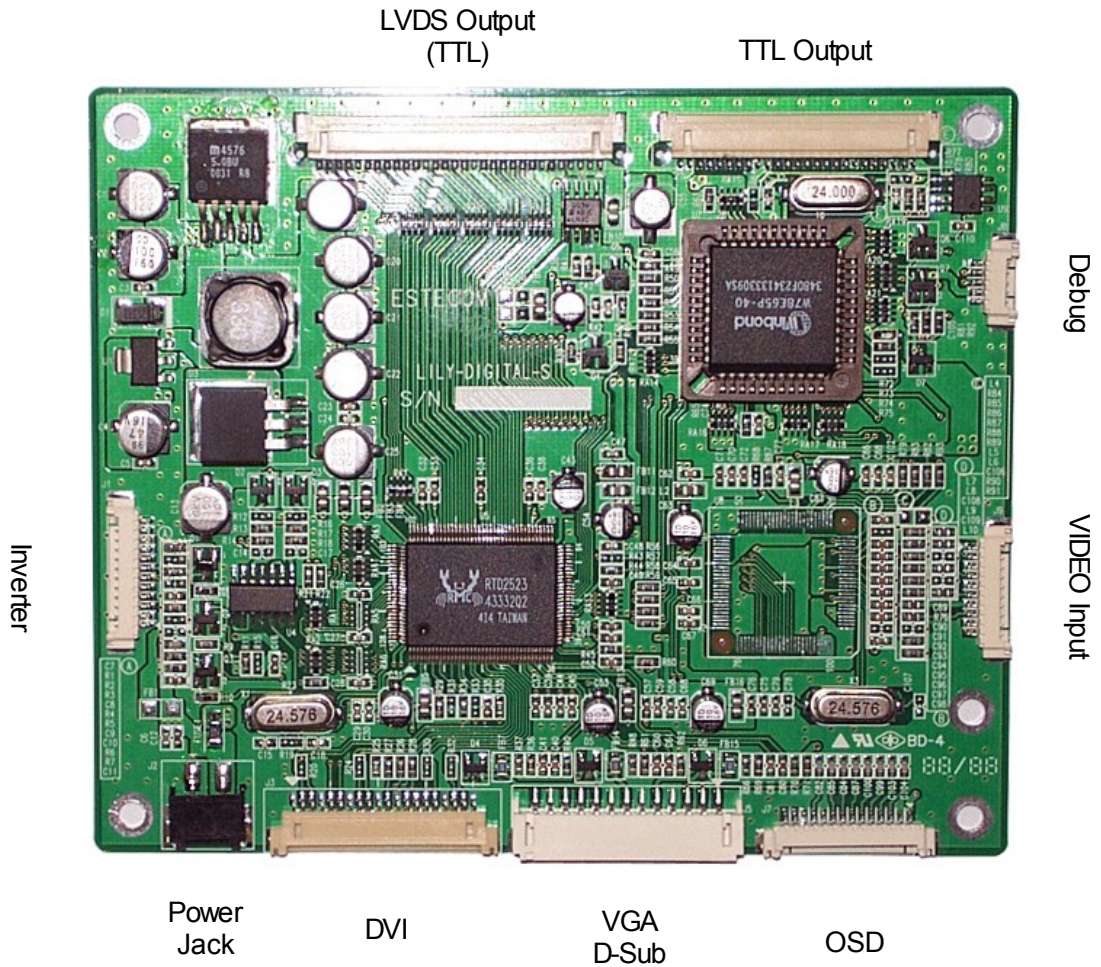
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## 6.4.2 Board with the Standard Connectors Configuration

- Analog & DVI (Actual Size)



## 6-5 Connectors Information

### 6.5.1 Input Connectors

- Power Input Connector

Connector : Yeonho 40006WR-02 (J2)

| Pin No. | Symbol | Description | Pin No. | Symbol | Description |
|---------|--------|-------------|---------|--------|-------------|
| 1       | GND    | GND         | 2       | Vin    | +12V DC     |

- Analog RGB Input Connector

Connector : JST S13B-PH-SM3-TB (J5)

| Pin No. | Symbol  | Description     | Pin No. | Symbol | Description     |
|---------|---------|-----------------|---------|--------|-----------------|
| 1       | CONNECT | VGA detect      | 8       | BGND   | Blue Return     |
| 2       | SDA     | DDC Serial Data | 9       | BLUE   | Blue input      |
| 3       | SCL     | DDC Data Clock  | 10      | NC     | No Connection   |
| 4       | RGND    | Red Return      | 11      | VSYNC  | Vertical Sync.  |
| 5       | RED     | Red input       | 12      | GND    | GROUND          |
| 6       | GGND    | Green Return    | 13      | HSYNC  | Horizontal Sync |
| 7       | GREEN   | Green input     |         |        |                 |

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● DVI-D Input Connector

Connector : Yeonho 12507WR-20 (J3)

| Pin No. | Symbol          | Pin No. | Symbol          | Pin No. | Symbol          |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 1       | Ground          | 8       | T.M.D.S. Data1+ | 15      | T.M.D.S. Data0+ |
| 2       | T.M.D.S. Data2+ | 9       | T.M.D.S. Data1- | 16      | T.M.D.S. Data0- |
| 3       | T.M.D.S. Data2- | 10      | Ground          | 17      | Ground          |
| 4       | Ground          | 11      | Bus Power (+5V) | 18      | T.M.D.S. Clock+ |
| 5       | DDC Clock       | 12      | Ground          | 19      | T.M.D.S. Clock- |
| 6       | DDC Clock       | 13      | Hot Plug Detect | 20      | Ground          |
| 7       | Ground          | 14      | NC              |         |                 |

● Video Input Connector

Input Connector : Yeonho 12505WR-10 (J9)

| Pin No. | Symbol | Description | Pin No. | Symbol | Description |
|---------|--------|-------------|---------|--------|-------------|
| 1       | GND    | Ground      | 6       | C-IN   | S-video     |
| 2       | CVBS2  | Composite   | 7       | GND    | Ground      |
| 3       | GND    | Ground      | 8       | CVBS1  | Composite   |
| 4       | Y-IN   | S-video     | 9       | GND    | Ground      |
| 5       | GND    | Ground      | 10      | NC     | No connect  |

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- OSD, LED Interface Connector :

Connector : Yeonho 12505WR-14 (J7)

| Pin No. | Symbol | Description                     | Pin No. | Symbol | Description |
|---------|--------|---------------------------------|---------|--------|-------------|
| 1       | VCC    | Vcc 5V                          | 8       | KEY5   | Increase    |
| 2       | GND    | Ground                          | 9       | KEY6   | Menu        |
| 3       | KEY1   | Reserved                        | 10      | GND    | Ground      |
| 4       | KEY2   | Exit<br>(Hot Key : Auto Config) | 11      | KEY7   | Power       |
| 5       | KEY3   | Decrease                        | 12      | GND    | Ground      |
| 6       | Remote | Reserved                        | 13      | LED1   | LED_RED     |
| 7       | KEY4   | Source Select                   | 14      | LED2   | LED_GREEN   |

- Debug Connector :

Connector : Yeonho 12505WR-05 (J8)

| Pin No. | Symbol | Description |
|---------|--------|-------------|
| 1       | GND    | Ground      |
| 2       | RX     | TXD         |
| 3       | TX     | RXD         |
| 4       | VCC    | Vcc         |
| 5       | GND    | Ground      |

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## 6.5.2 Output Connectors

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

| 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      | Ground       | Ground  |
| 5       | Ground      | Ground  | 20      | Tx3+ (Even)  | Blue7   |
| 6       | NC          | NC      | 21      | Tx3-(Even)   | Blue6   |
| 7       | Ground      | Ground  | 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      | Ground       | Ground  |
| 12      | Tx2+(Odd)   | Not use | 27      | Tx1+(Even)   | Blue1   |
| 13      | Tx2-(Odd)   | Not use | 28      | Tx1-(Even)   | Blue0   |
| 14      | Ground      | Ground  | 29      | Tx0+(Even)   | Green7  |
| 15      | Tx1+(Odd)   | Not use | 30      | Tx0-(Even)   | Green6  |

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● TTL Output Connector : Yeonho 12507WR-25 (J6)

| 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         |         |        |             |

● Backlight Power Connector  
Connector : Yeonho 12505WR-12 (J1)

| Pin No. | Symbol | Description       | Pin No. | Symbol | Description           |
|---------|--------|-------------------|---------|--------|-----------------------|
| 1       | GND    | Ground            | 7       | BRIGHT | Brightness Adjustment |
| 2       | VCC    | 12V               | 8       | NC     | No Connect            |
| 3       | NC     | No Connect        | 9       | VCC    | 12V                   |
| 4       | NC     | No Connect        | 10      | VCC    | 12V                   |
| 5       | NC     | No Connect        | 11      | GND    | Ground                |
| 6       | ON/OFF | Back-light On/Off | 12      | GND    | Ground                |

## 6-6 Reference Data

Video Input Timing:

Supported vertical refresh rates for each mode are as follow:

|             |         |
|-------------|---------|
| 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-S,  $t_A$  25 °C

| Symbol      | Description                               | Min  | Typ        | Max        | Unit     |
|-------------|---|------|------------|------------|----------|
| $V_{DD}$    | +12V DC Power Supply                      | 10.8 | 12.0       | 13.2       | V        |
| $V_{(RGB)}$ | 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       |
| $F_{SH}$    | Sync Input High Level                     | 2.5  |            |            | V        |
| $V_{SL}$    | Sync Input Low Level                      |      |            | 0.8        | VDC      |
| $I_{DD2}$   | Supply Current +12V (with LCD & Inverter) |      | <b>3.0</b> | <b>3.3</b> | 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.

## 6-7 Input Formats

### 6.7.1 Video Mode Support

The Lily-digital-S series 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.

### 6.7.2 LCD Panel & I/O Support

The Lily-digital-S 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.

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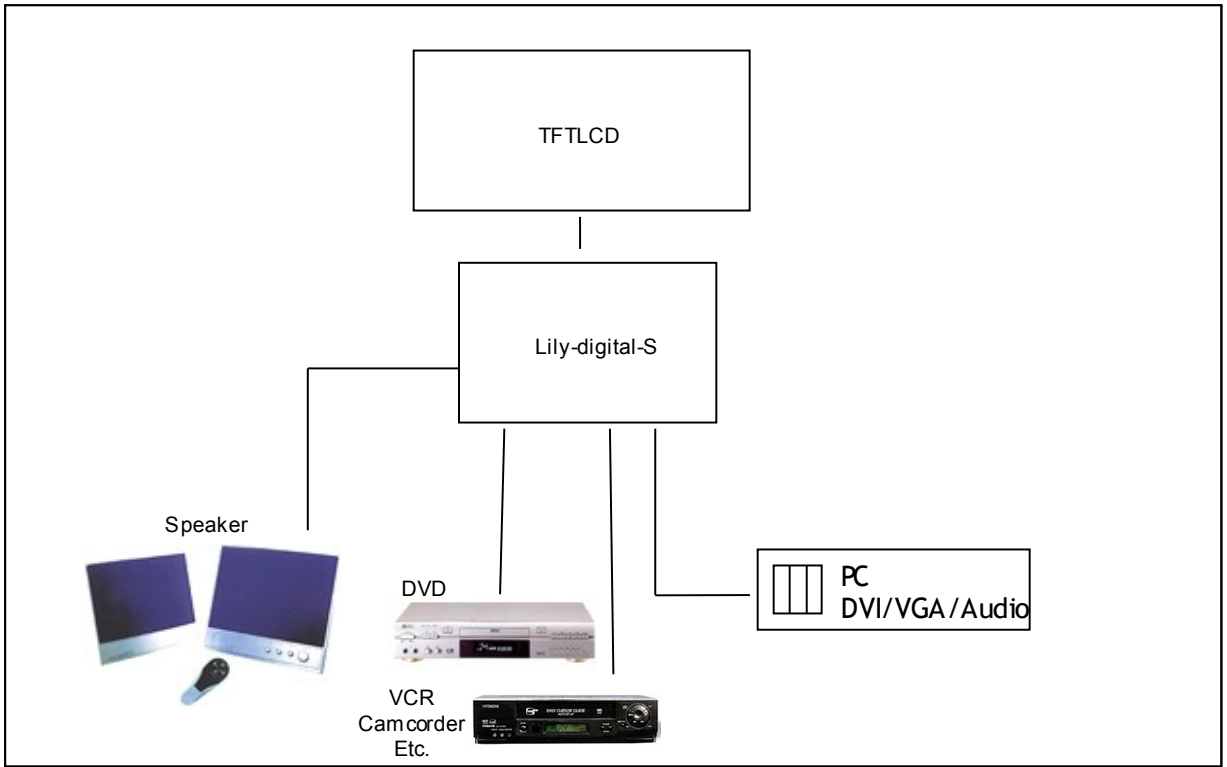
# Lily Digital Slim

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## 6.7.3 DVI (Digital Video Interface)

The Lily-digital-S 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

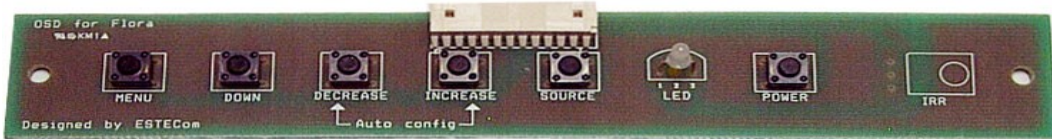


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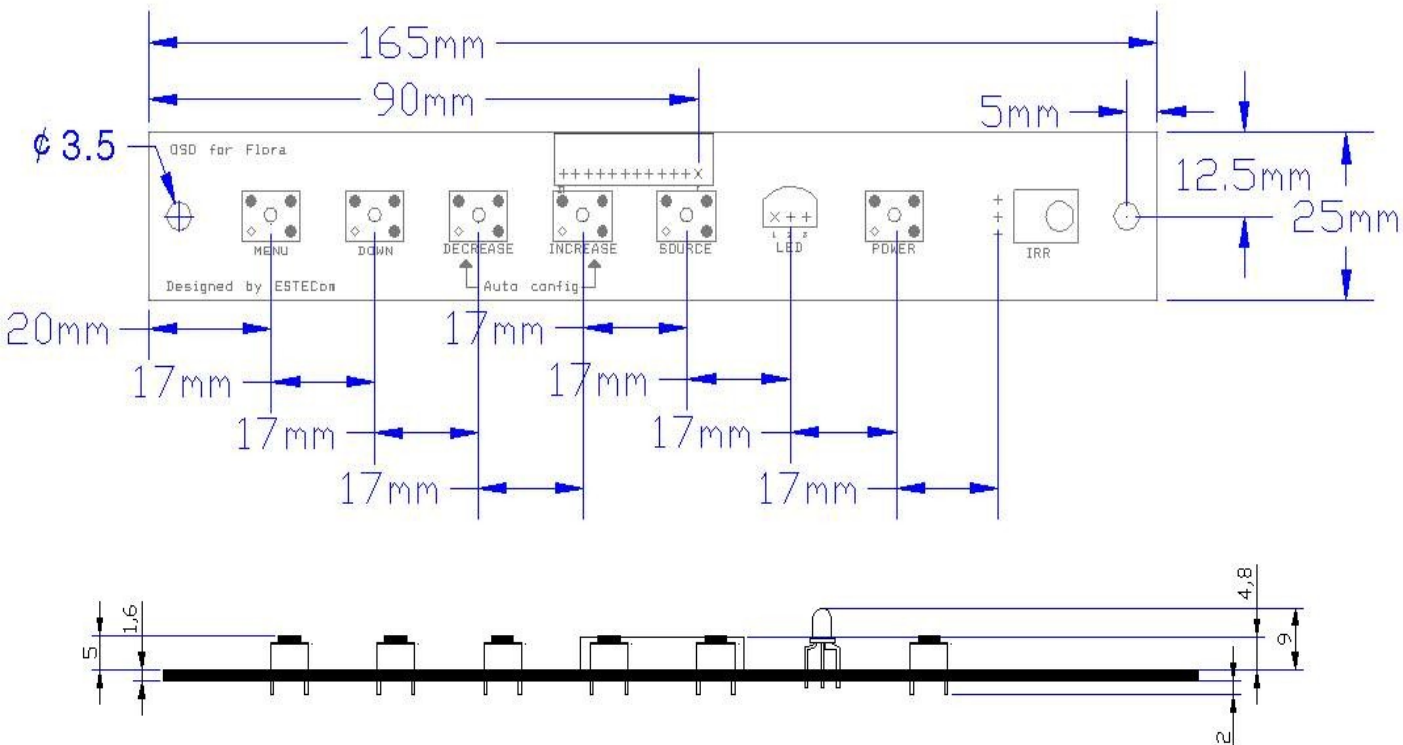
## 6-8 OSD (On Screen Display)

### 6.8.1 OSD Board Dimension

Part number : FOSD-6



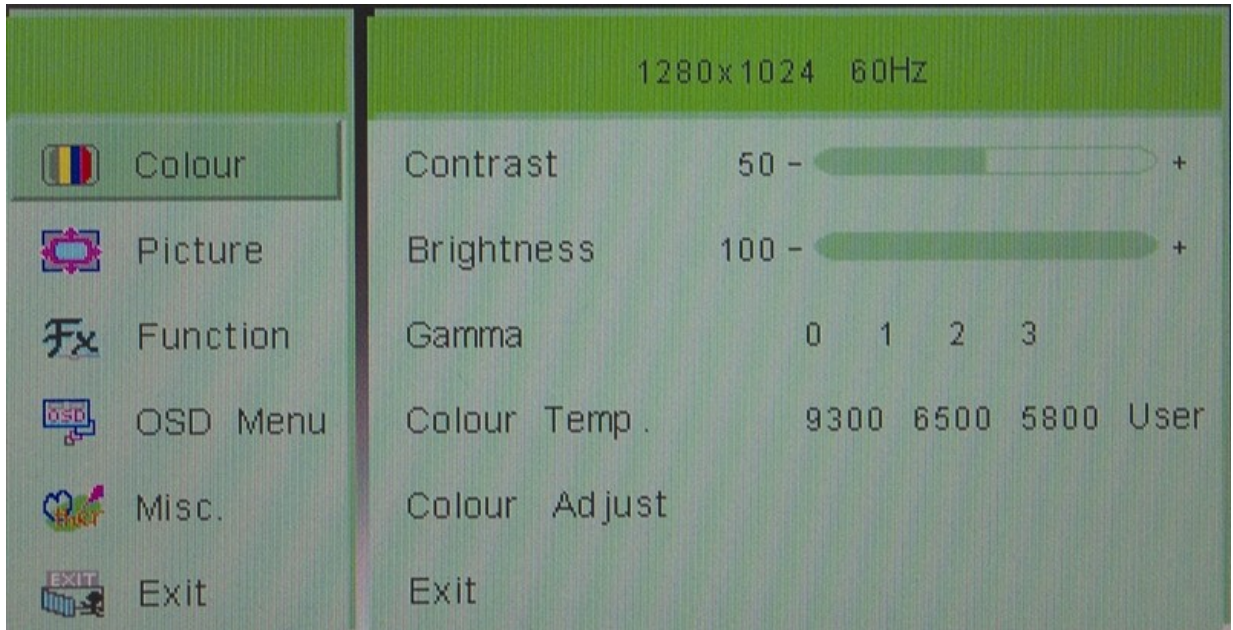
Menu / Down / Decrease / Increase / Source Select / Power  
(Auto Config)



### 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} ] )

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

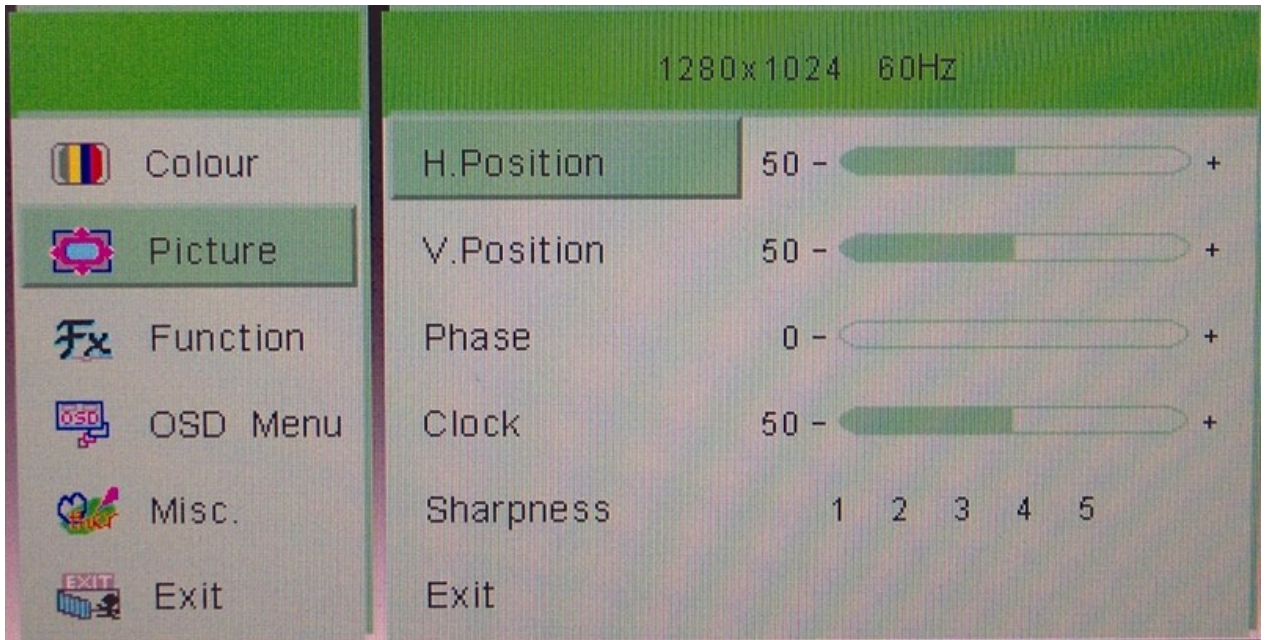


- Contrast : Adjust distinction
- Brightness : Adjust brightness of the screen. (used to pwm control)
- Gamma Correct : RGB gain option
- Color Temp : Choice of 5800, 6500, 9300, and user's option  
Initial value is set by user. In case the user's option is chosen, RGB can be adjusted.  
5800 : Red-tinged screen  
6500 : Green-tinged screen  
9300 : 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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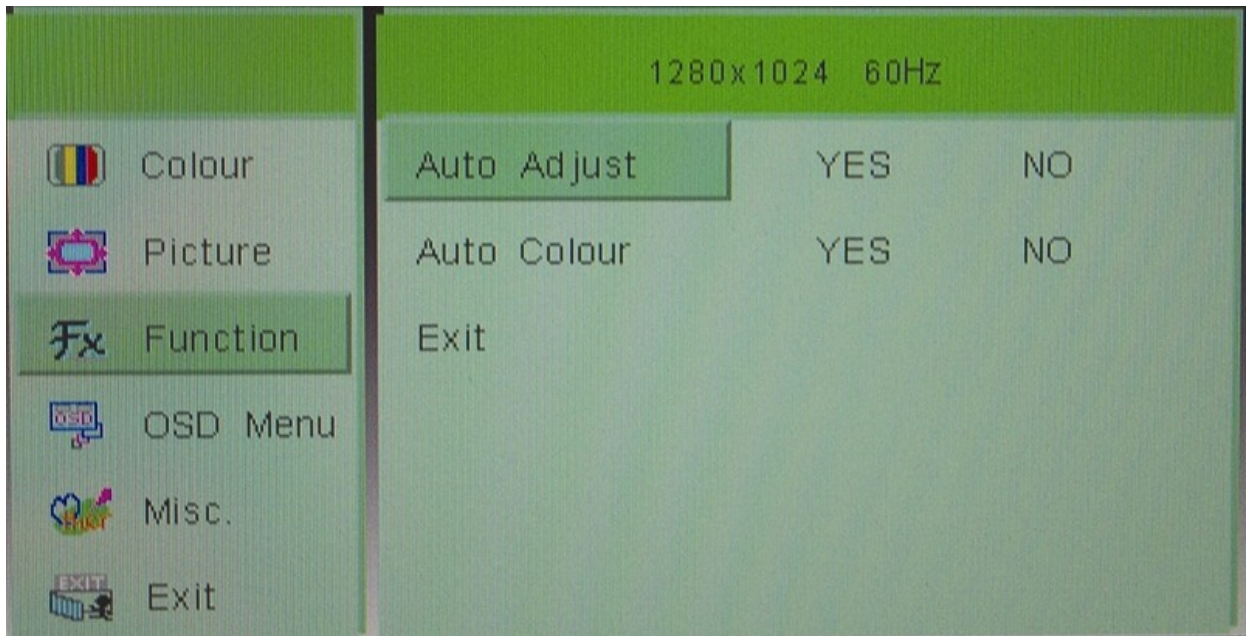


- H-Position : Move screen horizontally
- V-Position : Move screen vertically
- Sharpness : Adjust sharpness of colors in 5 levels
- Phase : Adjust phase of screen. Used when noise or overlapped lines are shown on the screen
- Clock : Adjust horizontal size of the screen by increasing or decreasing the number of picture elements
- Exit : Go back to main menu

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## Lily Digital Slim

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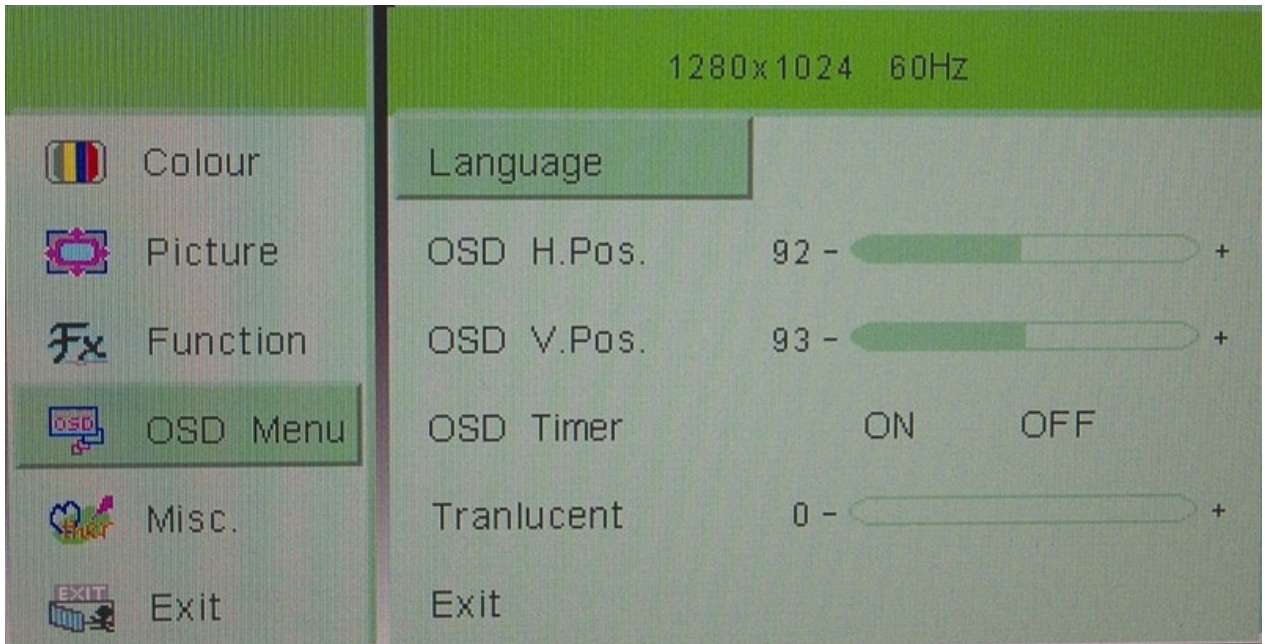


- Auto Adjust : Auto configuration of geometry
- Auto Color : Color automatically set from strange input signal
- Exit : Go back to main menu

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## Lily Digital Slim

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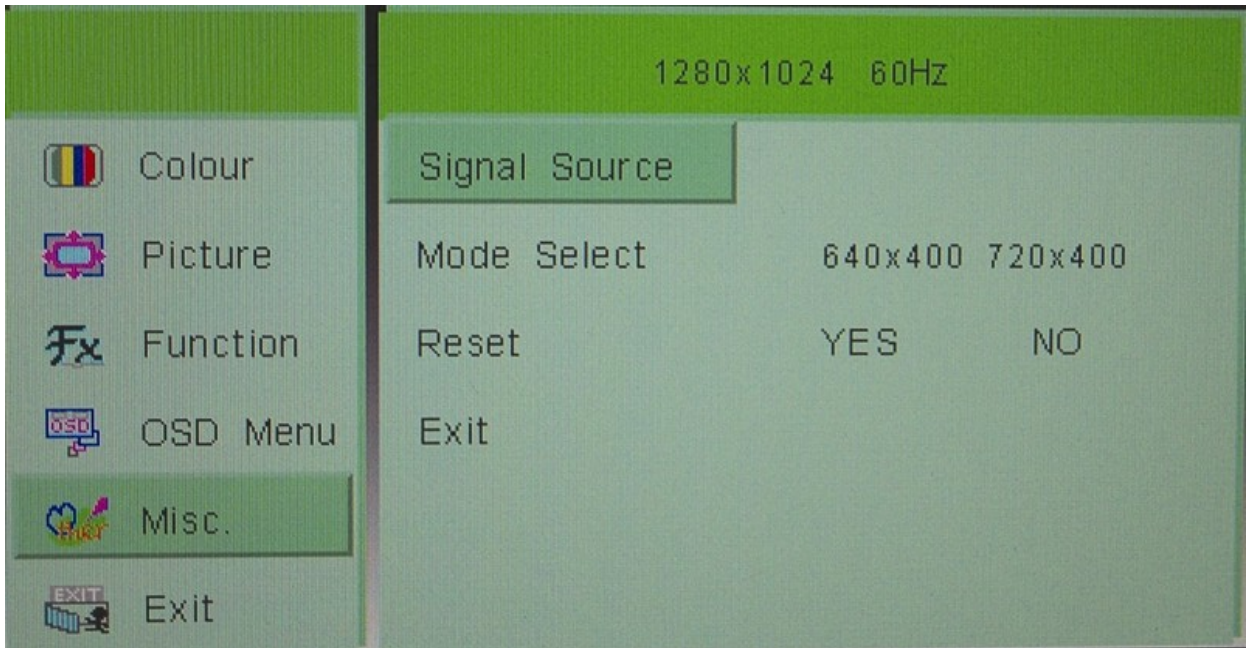


- Language : Choice of English, German, French, Italian, Spanish, Danish, Japanese
- OSD H.Position : Adjust horizontal position of OSD menu by value
- OSD V.position : Adjust vertical position of OSD menu by value
- OSD Timer : (OSD turn-off time) Adjust the time the OSD menu disappears from the screen. OSD disappears when there is no input for up to a max.1 minute
- Tranlucent : (OSD basic color) Choose between “clear” and “opaque” for the basic color of OSD menu.
- Exit : Go back to main menu

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- Signal Source : Choose input signal source Analog RGB – DVI, Composite video <optional> , S video <optional>
- Mode Select : Choose DOS 640(Graphic) or DOS 720(Text) input mode
- Factory Setting : Initial set-up, preset by the factory before forwarding (Reset)
- Exit : Go back to main menu

# DATA SHEET

**MODEL : Input Board  
(Option)**

October, 2004

D.C.D. Display Solution srl,  
Via Timermans ,6  
Torino, ITALY  
Tel : +39-011-7731830  
Fax : +39-011-7731830  
Web site: [www.dcd.it](http://www.dcd.it)

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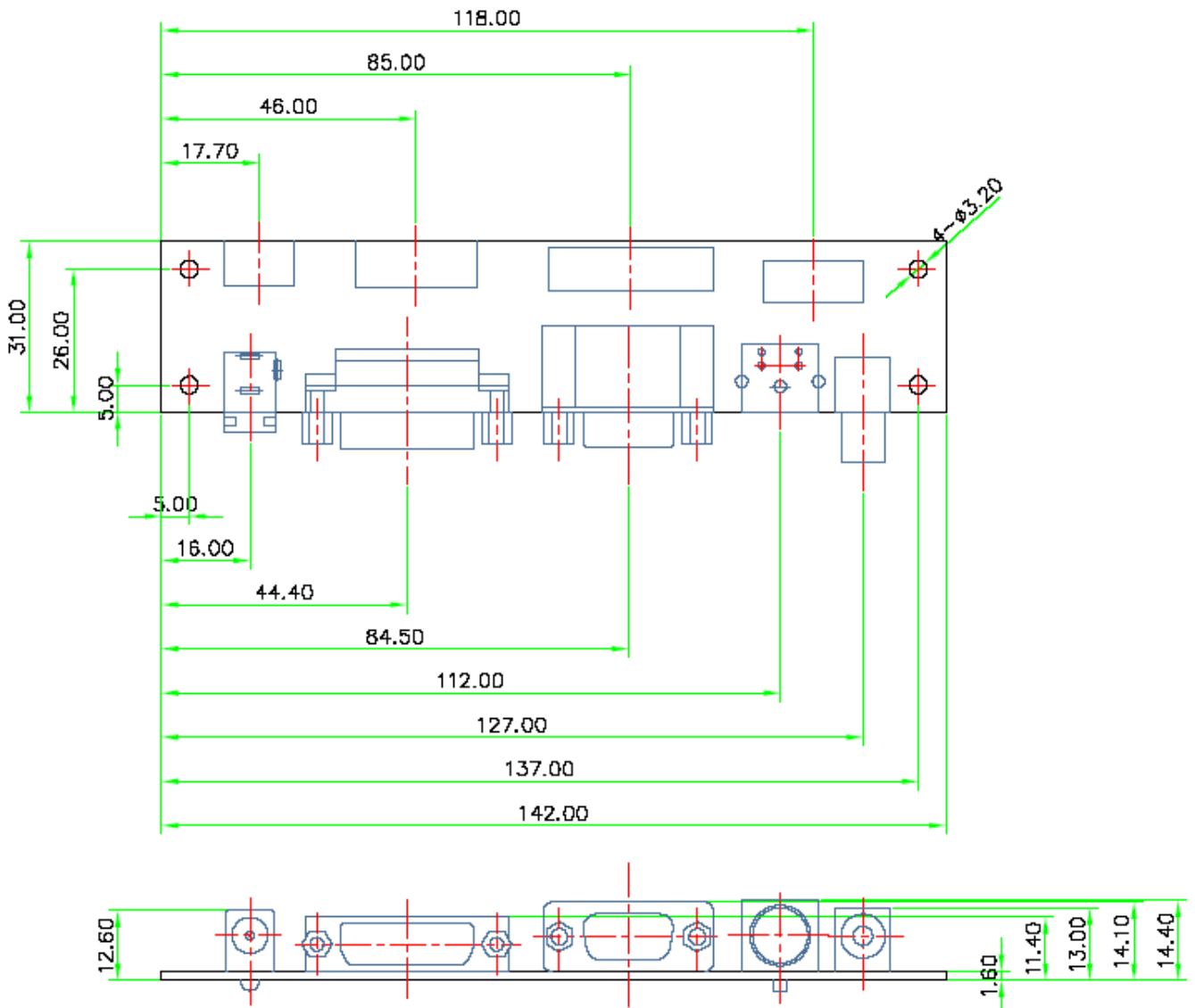
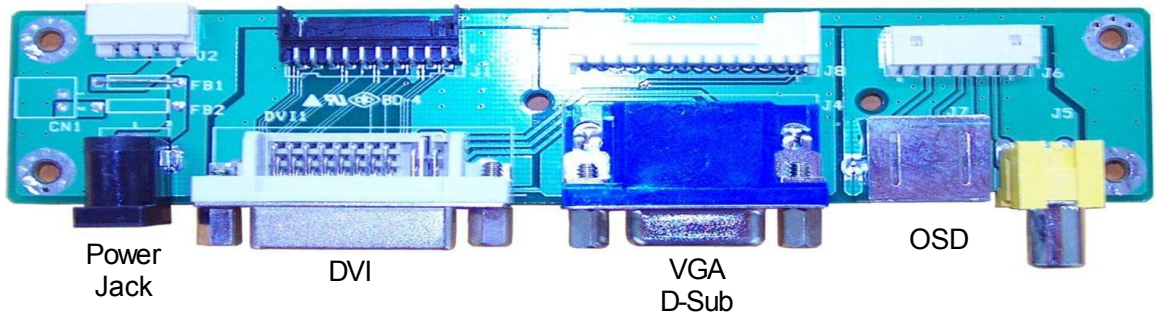
|    |                   |       |   |
|----|-------------------|-------|---|
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# Lily Digital Slim

## 1. Input Daughter Board

- Dimension : 31mm (L) x 142mm (W) x 14.4mm(H)



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# Lily Digital Slim

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## 2. Pin Configuration

### 2.1 Analog RGB output

J8 : SMAW200-14 (Yeonho)

| Pin no | Symbol | Description      | Pin no | Symbol | Description          |
|--------|--------|------------------|--------|--------|----------------------|
| 1      | DB_HSY | H sync input     | 8      | GGND   | Green ground         |
| 2      | SGND   | Sync ground      | 9      | DB_RED | Red data input       |
| 3      | DB_VSY | V sync input     | 10     | RGND   | Red ground           |
| 4      | NC     | NC               | 11     | DB_SCL | Serial clock for DDC |
| 5      | DB_BLU | Blue data input  | 12     | DB_SDA | Serial data for DDC  |
| 6      | BGND   | Blue ground      | 13     | DB_DET | Cable detect pin     |
| 7      | DB_GRN | Green data input | 14     | GND    | Ground               |

### 2.2 DVI output

J1 : YDAW200-20 (Yeonho)

| Pin no | Symbol | Description | Pin no | Symbol | Description          |
|--------|--------|-------------|--------|--------|----------------------|
| 1      | D-CK-  | RXCLK-      | 11     | GND    | Ground               |
| 2      | D-CK+  | RXCLK+      | 12     | SHIELD | Shield               |
| 3      | SHILD  | Shield      | 13     | D1-    | RXD1-                |
| 4      | NC     | NC          | 14     | D1+    | RXD1+                |
| 5      | HP     | Hot Plug    | 15     | SDA    | Serial data for DDC  |
| 6      | GND    | Ground      | 16     | SCL    | Serial clock for DDC |
| 7      | BP     | Bus Power   | 17     | GND    | Ground               |
| 8      | SHILD  | Shield      | 18     | SHIELD | Shield               |
| 9      | D2-    | RXD2-       | 19     | D0-    | RXD0-                |
| 10     | D2+    | RXD2+       | 20     | D0+    | RXD0+                |

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# Lily Digital Slim

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## 2.3 VIDEO output

J6 : 53015-0810 (Molex)

| Pin No. | Symbol | Description     | Pin No. | Symbol | Description    |
|---------|--------|-----------------|---------|--------|----------------|
| 1       | CGND   | CVBS ground     | 5       | SGND   | S-Video ground |
| 2       | CVBS   | Composite Video | 6       | C      | S-Video ©      |
| 3       | CGND   | CVBS ground     | 7       | SGND   | S-Video ground |
| 4       | Y      | S-Video (Y)     | 8       | NC     | NC             |

## 2.4 DC 12V output

J2 : 5268-04A (Molex)

| Pin No. | Symbol | Description  | Pin No. | Symbol | Description |
|---------|--------|--------------|---------|--------|-------------|
| 1       | 12V    | DC 12V Power | 3       | GND    | Ground      |
| 2       | 12V    | DC 12V Power | 4       | GND    | Ground      |