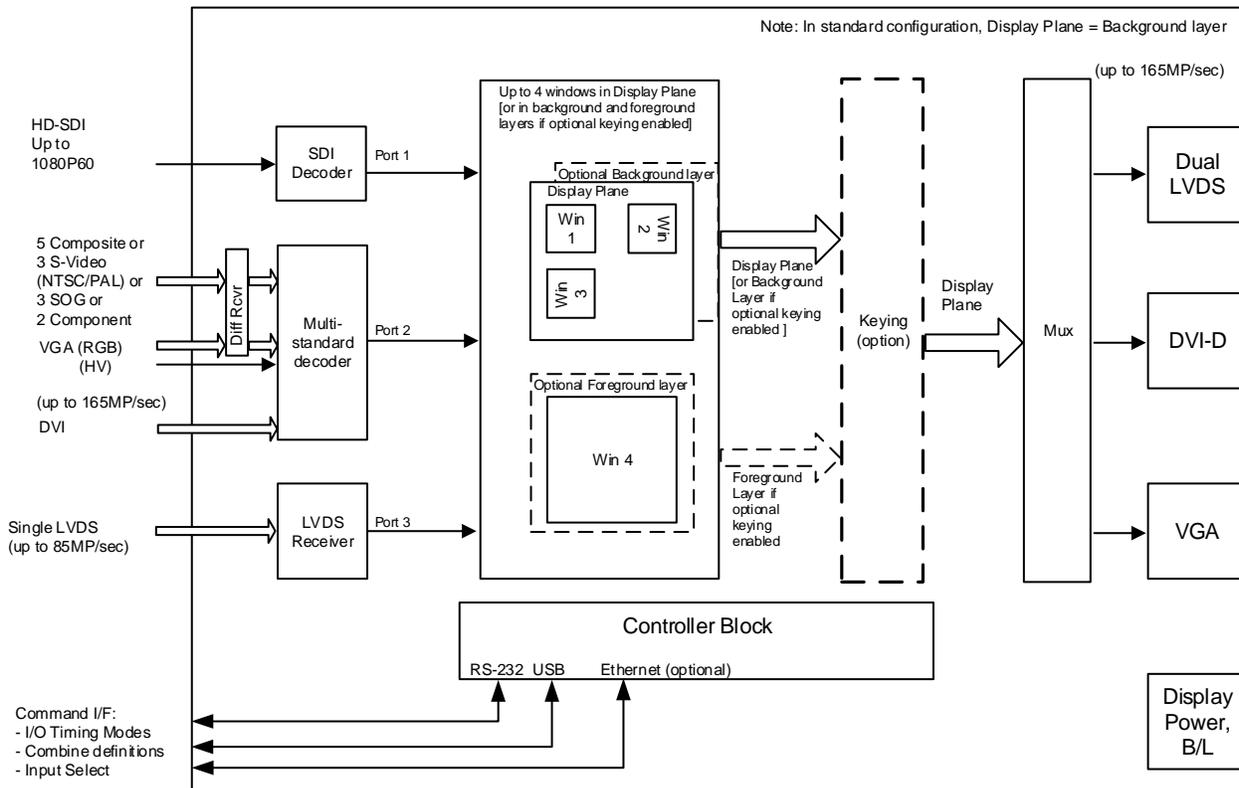


The VP16 has a variety of video and graphics inputs. The VP16 can simultaneously display video from up to 3 input ports: 1) the HD-SDI input, 2) any one of the DVI/RGB/Composite/Component/SOG inputs, and 3) the LVDS input. Automatic analog and digital input mode detection on each input port. Up to 4 windows can be placed in the output active area. Via VP16 configuration utility, each window is assigned to an input, with window size, location, input area-of-interest, and rotation determined by the detected mode. One or more windows may be assigned to the foreground for optional keying operations. The dual LVDS output supports up to 165 MPixels/sec for panels up to WUXGA or 1080P. VGA and Single link DVI output for other output devices.

Figure 1 VP16 Block Diagram



## VP16 LCD Controller

The VP16 LCD Controller (see Figure 1 above) is ideal for applications requiring simultaneous display of 2 or more inputs. Video inputs from (3) ports can be viewed simultaneously:

1. SDI (typically a video camera) on Port 1,
2. a general purpose video input that can be DVI, VGA, Composite, Component, or RS170/RS343 sync-on-green inputs on Port 2, and
3. LVDS (typically from a single board computer) on Port 3.

Up to 4 windows can be placed within the display plane (output active area). With optional keying, windows may be placed in either the foreground (key) layer or the background layer.

Supported outputs include dual LVDS, Single Link DVI, and VGA.

## VP16 Highlights

The VP16 includes many advanced features, including:

- Input resolutions up to WUXGA (DVI/HDMI, and analog RGB), and up to 1080P (HD-SDI),
- Up to 3G resolutions auto-detected on SDI Port 1
- Up to (5) video connections on Port 2, supporting NTSC/PAL (composite and S-Video), component, STANAG, and Computer (DVI / RGB) formats,
- Single channel LVDS on Port 3, supporting up to 85 MPixels/sec and WXGA resolutions
- Up to 4 windows assigned to any of 3 input ports
- Window size, location, input area-of-interest, flip, and rotation (90/180/270) defined per detected input mode,
- LVDS, VGA and DVI outputs (up to 165 MPixel)
- RS-232 or USB program interface. (Ethernet optional)

## User Programmable Video Input Modes

To support multiple input types and resolutions per input port and multiple windows in an embedded application, the VP16 offers a comprehensive approach for automatic detection, conversion, and windowing of multiple video formats. Each input port can have multiple, prioritized video input modes associated with it. A mode consists of the input type (DVI, VGA, CVBS, etc) and video timing. Each input port has a mode selection subsystem to scan for defined modes per a specific input type and sub-channel (such as VGA1), or sub-channel 1 of multiple input types (Auto mode). Windows are linked to a specific input port. Each window can have either mode-independent or mode-dependent size, location, input area-of-interest, rotation and other parameters.

At power up, each port's mode selection subsystem initiates a scan. Once a mode is matched (either exactly or within pre-defined limits), that video input is displayed in any associated window(s) per the mode's window parameters (input area-of-interest, window size, window location, rotation, flip, etc).

The mode selection subsystem continually monitors each port. If the port's currently selected video mode is lost, then a pre-programmed flat-field color can be placed in an associated window(s) with a text message, (or the window can be removed altogether) and a new scan is initiated. Even in the presence of valid video, a new scan can be initiated via remote command or discrete input.

Input Port 1 can detect multiple SDI resolutions

Input Port 2 can detect modes from one or more of the following inputs:

- RGB (SOG or HV),
- DVI (HDMI),
- up to 5 NTSC/PAL composite inputs,
- up to 3 S-Video inputs
- up to 2 component inputs

Input Port 3 can detect multiple LVDS resolutions.

## VP16 Rugged features

The VP16 has several features intended for rugged applications, including:

- low-profile, small form factor board, with no mezzanine boards
- differential receivers for analog inputs
- LVDS input for easy connection to embedded single-board computers

## VP16 Configuration Application

The VP16 is configured via a PC application.

VP16 Configure Application supports the setup of:

- Output timing/electrical parameters and synchronization method,
- All inputs, including a prioritized list of all applicable video input modes that can be automatically detected for each input port,
- Up to 4 windows with mode dependent and mode independent parameters such as size, location, and input area-of-interest for each detected mode per window
- Sequences for display initialization, loss of video, and video detection.

All parameters are stored in non-volatile memory for automatic operation upon power up. The VP16 Configure application output is a .txt file composed of VP16 commands. This file can be downloaded to the VP16 or saved on a PC. Commands are defined in the VP16 Command Line Description document. The application runs on Windows 7 and Windows 10.

The VP16 supports:

## Video Conversion and Synchronization

- Digitization of computer-generated analog RGB video sources with separate syncs or sync-on-green, non-interlaced and interlaced,
- Digitization and de-interlacing of consumer video formats, including NTSC and PAL Composite, component, and S-Video,
- Support for custom video formats and specialty formats such as RS-343, RS-170, and STANAG,
- Analog video inputs are received through a high-speed differential receiver,
- decoding of DVI (TMDS) and SDI digital inputs,
- Incoming video gain and offset adjustments,
- Fine phase clock adjustment for RGB pixel sampling,
- Per window YUV and RGB color space adjustments,
- Free-running output or genlocked to an input port. If video is lost from the associated genlock input port, then timing converts to free-running until a new input is detected for that port. Note: Genlocked output provides the lowest possible latency.

## Scaling, Windowing, and Area-of-Interest Control

- Unlimited, independent horizontal and vertical scaling,
- Up to 4 windows with programmable size and position,
- Image can be reversed left to right and flipped top to bottom,
- Image can be rotated 90, 180, or 270 degrees.

## Video Combining up to WUXGA and 1080P

The VP16 offers robust windowing for display resolutions with pixel clock frequencies  $\leq 165$  MPixels/sec (eg 1080P and WUGA @ 60Hz). Up to 4 windows may be sized and placed anywhere in the output active area, per Figure 2 below. Window techniques include PIP, side-by-side, and other window configurations.

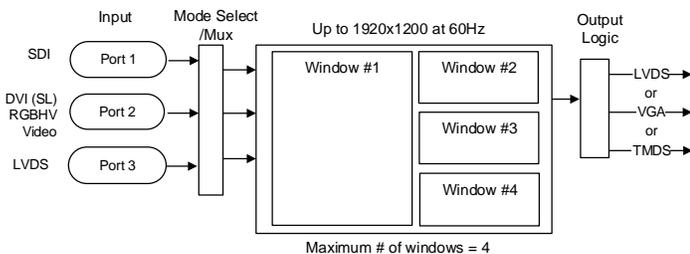


Figure 2 Windowing within output active area

## Programmable

- In addition to the initial configuration programmed at power up, commands may be sent dynamically to the VP16. Dynamic adjustments include brightness and contrast,
- Programmable On-screen Display messages,
- Programmable “initialization” and “loss of video” sequences with user-defined “On Screen Display” Messages,
- (2) RS-232 interface and (1) USB interface are standard,
- Optional Ethernet interface assembly is available.

## Video Output Interfaces

- Supports most single and dual LVDS panels,
- Supports various LVDS pixel mappings, including multiple MSBit/LSBit arrangements, and 3/4/5 channels (pairs) per link,
- Single link TMDS output for up to 1920x1200 displays,
- VGA output up to WUXGA.

## Special features

- EDID prom on input port 2 (for DVI or VGA type input), programmable via VP16 Configuration Utility,
- Backlight Power/Enable/PWM/Sync features,
- Video Contrast and Backlight PWM controllable via discrete input (pushbutton), rotary encoder, analog input, or command
- Discrete I/O interfaces. A discrete input can trigger a VP16 action, such as a mode switch. Discrete outputs are typically used for parameter selection on a display, such as scan direction.

## Port 2 Video Input Selections

Port 2 accepts both TMDS (SL-DVI) and analog video. Possible analog video configurations include:

- 1x RGBHV input and 4x NTSC/PAL composite (CVBS) inputs
- 5x NTSC/PAL CVBS inputs
- 4x S-Video (Y/C) inputs, or
- 3x component (YPbPr) inputs.

Figure 3 below shows possible Port 2 configurations. The number after the designation defines the sub-channel. For example, R1 is the Red component of RGB sub-channel #1. Automatic mode detection is possible among the Orange sub-channels, and the TMDS input.

VP16 pin	VGA (RGB)	YPbPr	s-video (YC)	Composite (CVBS)
J17- 1	R1	Pr3		
J17- 3	G1	Y3	Y4	CVBS5
J17- 5	B1	Pb3	C4	
J17- 7	VS1			
J17- 9	HS1			
J24- 1	R2	Pr1	C2	
J24- 5	G2	Y1	Y2	CVBS3
J24- 3	B2	Pb1	C3	
J24- 13			Y3	CVBS2
J24- 7	G3	Y2	Y1	CVBS4
J24- 9	B3	Pb2	C1	
J24- 11	R3	Pr2		CVBS1

Figure 3 Port 2 Analog Video Input Possibilities

## Video Combining (Standard)

- PIP is performed by assigning windows in a layer.
- Programmable alphas in a layer support z-order priority and alpha blending per window overlap area.

## Keying (Standard)

- Alpha blending between foreground and background is standard on the VP16. This is also known as “area keying”.
- Keying requires both the foreground and background layer of equal resolution (typically 1080P), to form a display plane.
- A rectangular key area is defined in the active area.
- With standard “area keying”, programmable foreground and background alpha values are defined for outside the key area and inside the key area.
- An output pixel in the display plane is computed as:

$$\text{Output pixel} = (\text{Foreground alpha} * \text{foreground pixel}) + (\text{Background alpha} * \text{background pixel})$$

## Keying (Optional)

- Optional keying (:Key) supports calculations on foreground pixels that are “inside” the key area. These calculations may be based on RGB, Luma, or HSV values. Foreground and background alpha values are applied based on the key calculation result (Key = True or Key = False)
- Option also includes a technique that “extracts” an alpha LUT index from the (2) LSB’s of the RGB foreground pixel, supporting a 64 entry table of Foreground/Background alpha values. This technique is “symbology-encoded alpha”.
- Option also includes using the blue content as a LUT pointer for both foreground and background alpha values. This technique is referred to as “blue alpha

## Test Pattern / Messaging

- Test Patterns include: flood fields, color wedges, checkerboards, and color wedges; each highly programmable
- Test pattern overlay capabilities include: outline, lines, and pixel.
- Up to 8 on-screen messages using built-in 8x10 pixel character generator based on ASCII character set. Each message has:
  - up to 64 characters
  - 1x, 2x, 4x, 8x character size multiplier
  - programmable location in x and y

# VP16 LCD Controller

Figure 4 below shows the high level specifications for VP16. Figure 5 lists the VP16 connectors.

Physical Dimensions	5" x 4" x 0.8"
Temperature Range	Operating: 0°C to +70°C (additional data available) Storage: -40°C to +100°C
Video Inputs	Chan 1: SDI up to 1080P60 Chan 2: RGB (up to WUXGA resolutions @ 60Hz), DVI (up to 165 MHz) NTSC/PAL (composite or S-Video), Component, all received via differential receivers Chan 3: LVDS, single channel, up to 85 MPixels/sec
Video Outputs	Single, Dual LVDS up to WUXGA DVI (TMDS) up to WUXGA VGA up to WUXGA
Input Power	+12 VDC, 10 Watts
Control Interface	(2) RS-232, USB, Ethernet (via optional Ethernet interface assembly) Maintenance RS-232 interface fixed at 115kbps for Configuration Application User RS-232 interface has programmable baud rate

Figure 4 VP16 Specifications

Conn	Type	Description	Conn	Type	Description
J1	DF11-06DP	USB Interface	J25	DF11-12DP	Port 2 – TMDS Video Input
J3	DF11-06DP	Ethernet Module Interface	J26	DF11-14DP	Port 3 LVDS Input
J5	DF11-10DP	Factory Use Only	J28	1 position jumper	Factory Use Only
J6	DF11-10DP	(2) RS-232 Interface	J29	DF11-10DP	Factory Use Only
J9	1 position jumper	Panel Power	J32	DF11-14DP	LVDS Video Out, 2
J10	DF11-08DP	Backlight Driver	J33	DF11-14DP	LVDS Video Out, 1
J13	DF11-06DP	Power Input	J34	DF11-04DP	Port 2 – TMDS EDID
J17	DF11-10DP	Port 2 VGA Input	J36	DF11-10DP	VGA Output
J18	DF11-12DP	Discrete I/O	J37	DF11-12DP	TMDS Output
J24	DF11-14DP	Port 2 – Component /Composite Video Input	J75	MMCX7-J-P	Port 1 SDI Input (contact factory for BNC input)
			J76	DF11-06DP	ADC Input

Figure 5 VP16 Connector Definitions

Figure 6 below shows the VP16 connector locations.

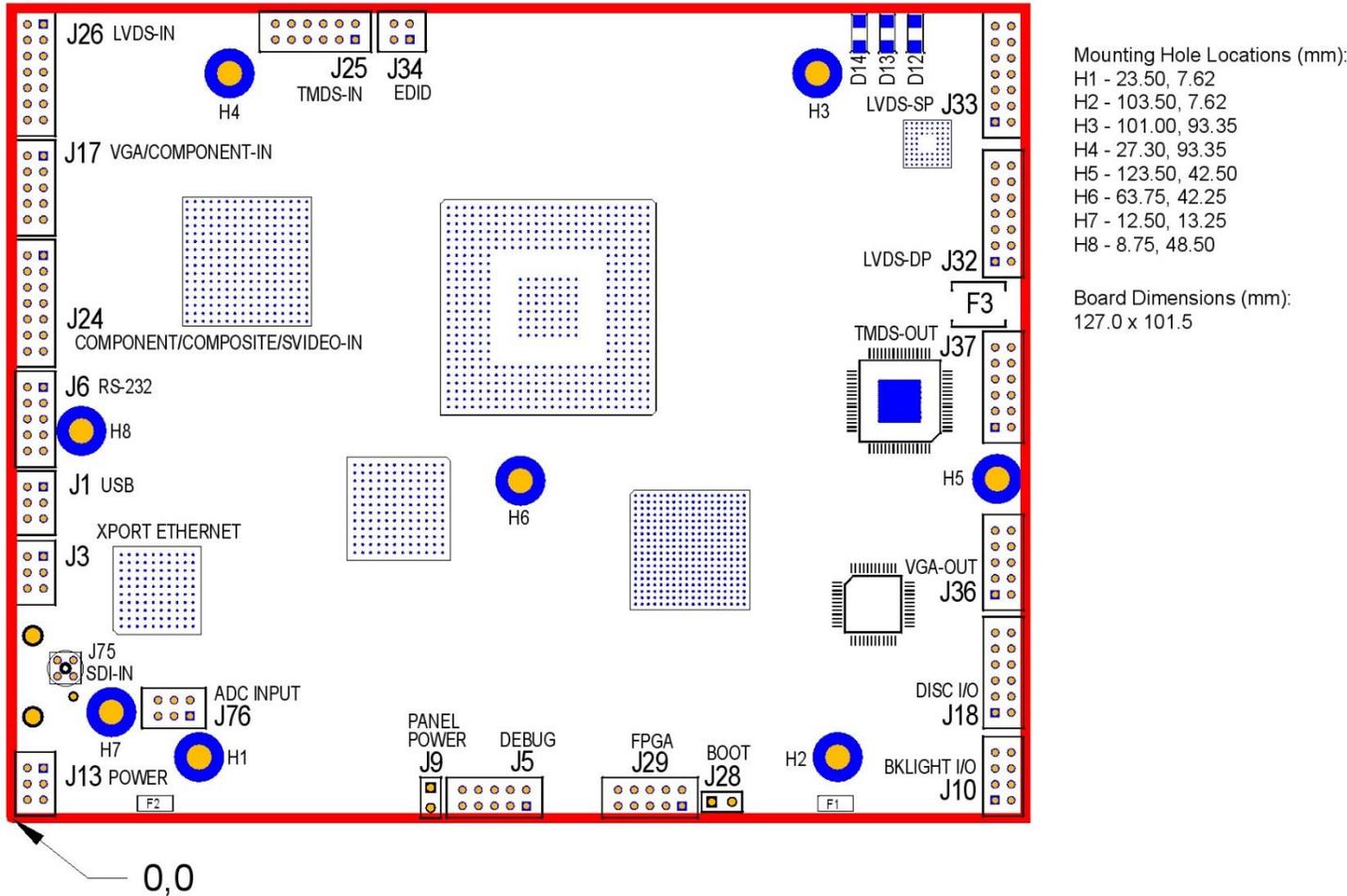


Figure 6 VP16 connector locations

## VP16 Operation

Typically, the VP16 operates as follows:

1. Upon power up, the VP16 configures itself based on its internal BIOS. The BIOS includes various input mode definitions per input port, windowing definitions, and an output mode (timing, electrical format, video combining definition, etc.)
2. For each input port, if a valid video mode is detected on an input port, the VP16 drives windows associated with that input port per the mode definition.

## Ordering Configuration

VP16	standard VP16
VP16 /Key	VP16 with optional foreground keying

Optional Ethernet is available via a cable assembly with built-in Ethernet port.

## Contact Us

Call us for additional product info and pricing.

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