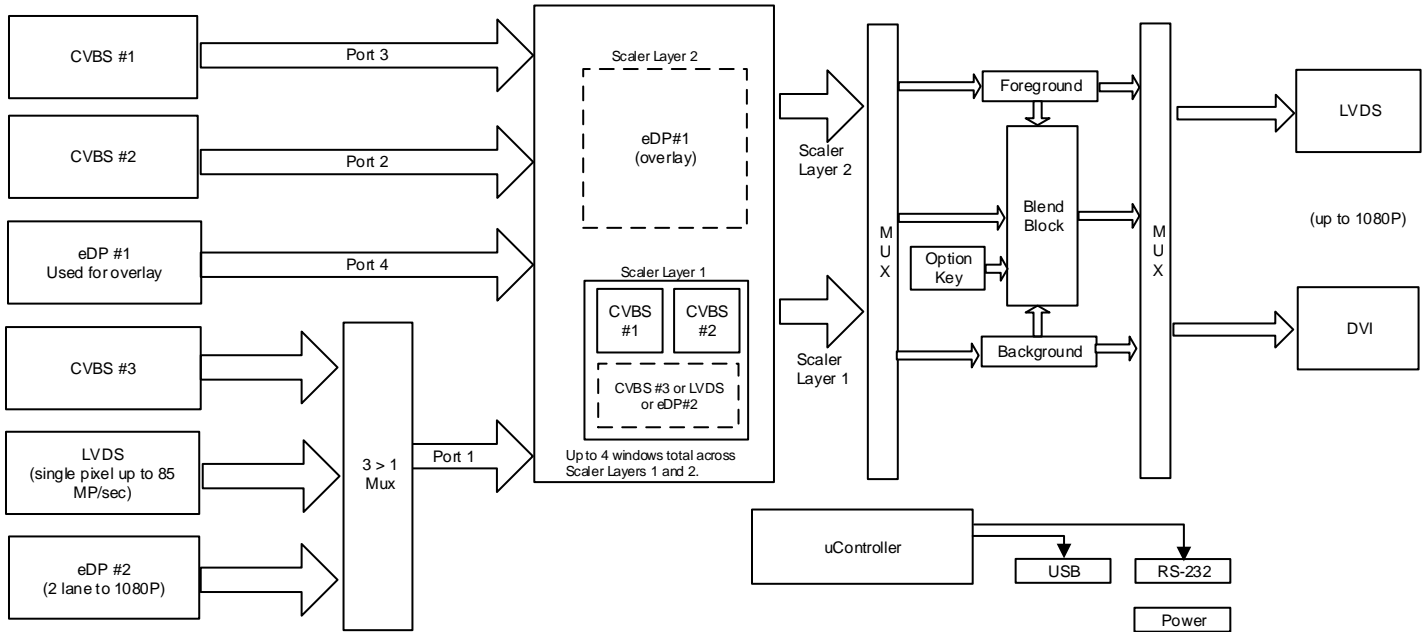


The VP15 has a variety of video and graphics inputs. The VP15 can display video from 4 input ports in 4 highly configurable windows. Any of the 4 ports can be assigned to the 2nd scaler layer and serve as foreground layer keying applications. Any of the 4 ports can be mapped to the background layer for highly flexible windowing. Each input port supports automatic detection of multiple video modes. Each of 4 windows is assigned to an input, with window size, location, input area-of-interest, and rotation determined by the detected mode. The output is synced to either of 4 input ports, allowing lowest latency on a selected port. The dual LVDS output supports up to 165 MPixels/sec for panels up to WUXGA or 1080P. A single link DVI output is provided for a 2nd output device.

Figure 1 VP15 Block Diagram



VP15 LCD Controller

The VP15 LCD Controller (see Figure 1 above) is ideal for applications requiring simultaneous display of up to 4 inputs. One input may be used for keying applications. The supported video inputs are:

- 1) 1 of 3 of the following video types on Port 1:
 - a) CVBS #3,
 - b) LVDS, or
 - c) eDP#2
- 2) CVBS #1 on Port 3,
- 3) CVBS #2 on Port 2,
- 4) eDP #1 on Port 4

Up to 4 windows can be placed within the output active area. Each window is linked to 1 of the 4 input ports. Supported outputs include dual LVDS and Single Link DVI.

VP15 Highlights

The VP15 has many advanced features, including:

- Input resolutions on eDP up to 1080P,
- Input resolutions on single pixel LVDS up to WXGA (85 MPixels/sec),
- CVBS inputs support NTSC/PAL formats.
- Up to 4 windows assigned to any of the 4 input ports,
- Windows may be placed in Scaler Layer 1 (typical) or Scaler Layer 2 (for overlay). Each scaler layer is up to 1080P.
- Window size, location, input area-of-interest, flip, and rotation (90/180/270) defined per detected input mode,
- RS-232 or USB program interface. (Ethernet optional)

User Programmable Video Input Modes

The VP15 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 an input type (LVDS, eDP, CVBS, etc) and video timing. Each input port has a mode selection subsystem to scan for defined modes per a specific input type. [For Port 1, this input type may be CVBS, LVDS, or eDP]. 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 either CVBS, LVDS, or eDP resolutions,
- Input Ports 2 and 3 can detect CVBS resolutions,
- Input Port 4 can detect eDP resolutions

VP15 Rugged/Embedded features

The VP15 has several features intended for rugged applications, including:

- low-profile, small form factor board, with no mezzanine boards
- differential receivers for analog inputs
- LVDS or eDP inputs for easy connection to embedded single-board computers
- Samtec TFM series connectors with Weld Tabs for superior connector <> board stability and lock for mating connector.

VP15 Configuration Application

The VP15 is configured via a PC application.

VP15 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 VP15 Configure application output is a .txt file composed of VP15 commands. This file can be downloaded to the VP15 or saved on a PC. Commands are defined in the VP15 Command Line Description document. The application runs on Windows 7 and Windows 10.

The VP15 supports:

Video Conversion and Synchronization

- Digitization and de-interlacing of consumer video formats, including NTSC and PAL Composite,
- Analog video inputs are received through a high-speed differential receiver,
- Per window YUV and RGB color space adjustments,
- Free-running output or genlocked to a selected Port. If video is lost from the selected port, then timing converts to free-running until the video re-appears, or the board is programmed to gen-lock to a different port.

Scaling, Windowing, and Area-of-Interest Control

- Unlimited, independent horizontal and vertical scaling for Input Ports 1-4,
- 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 VP15 offers robust windowing for display resolutions with pixel clock frequencies ≤ 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.

Note: Due to scalar bandwidth limitations, possible window configurations may be limited. For XGA outputs, almost all window configurations should be possible. For 1080 outputs, multiple large windows may cause memory contention. Please contact the factory for more information.

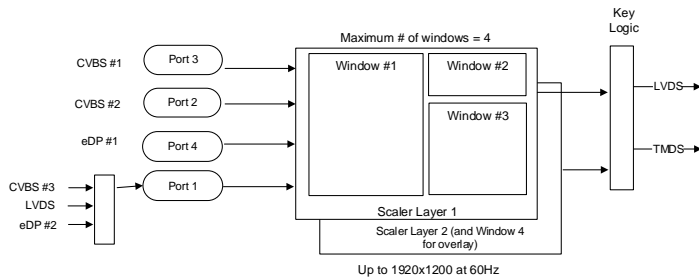


Figure 2 Windowing within output active area

Programmable

- In addition to the initial configuration programmed at power up, commands may be sent dynamically to the VP15. 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

Special features

- 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 VP15 action, such as a mode switch. Discrete outputs are typically used for parameter selection on a display, such as scan direction.

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 VP15. 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”.

VP15 LCD Controller

Figure 3 below shows the high level specifications for VP15. Figure 4 lists the VP15 connectors. Figure 5 shows the VP15 front side and Figure 6 shows the VP15 back side.

Physical Dimensions	93mm x 152.5mm x 11mm
Temperature Range	Operating: 0°C to +70°C (additional data available) Storage: -40°C to +100°C
Video Inputs	Port 1: CVBS (NTSC/PAL), LVDS (up to 85 MP/sec) or eDP (not to exceed 1080P or 148.5 MP/sec) Port 2: CVBS (NTSC/PAL) Port 3: CVBS (NTSC/PAL) Port 4: eDP (up to 1080P)
Video Outputs	Single, Dual LVDS up to WUXGA DVI (TMDS) up to WUXGA
Input Power	+9 to +30 VDC, 10 Watts max. Does not include panel and backlight power. Actual power varies with resolutions, I/O clock rates, data content, etc.
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 3 VP15 Specifications

Conn	Type	Description	Conn	Type	Description
J1	TFM-103-01-L-D-WT	USB Interface	J33	TFM-120-01-L-D-WT	LCD Panel Interface
J3	TFM-103-01-L-D-WT	Ethernet Module Interface	J36	TFM-103-01-L-D-WT	Analog Control Input
J5	DF11-10DP	Factory Use Only	J37	TFM-106-01-L-D-WT	TMDS Output
J6	TFM-105-01-L-D-WT	RS-232 Interface	J129	DF11-10DP	Factory Use Only
J13	TFM-104-01-L-D-WT	Power Input	J130	10 position header	Factory Use Only
J24	TFM-104-01-L-D-WT	Composite Video Input	J131	TFM-110-01-L-D-WT	DisplayPort Input #2
J25	TFM-106-01-L-D-WT	LVDS Video Input	J132	DF11-06DP	Factory Use Only
J28	1 position jumper	Factory Use Only	J133	TFM-110-01-L-D-WT	DisplayPort Input #1
J29	DF11-10DP	Factory Use Only	J134	DF11-06DP	Factory Use Only



Figure 5 VP15 front



Figure 6 VP15 back

