



White Paper: Evaluating Panels for Compatibility with Micro/sys VGA Interfaces

There are so many vendors of LCD panels and so many different sizes and parameters; it is likely that someone will want to use a panel that has not been tested here at Micro/sys. Although there are many different parameters that define a particular panel, there are usually only a few parameters that commonly affect compatibility. Here are some of the main parameters to look at.

1. Panel Type

Most of the panels fall into the category of TFT (thin-film transistor) or STN (super twist nematic). These are also called active-matrix and passive-matrix respectively. Usually the TFT panels are color, while STN panels are available in both color and monochrome. The panel type must match the capabilities of the VGA controller. If the controller only supports TFT panels, it cannot drive an STN panel.

2. Supply Voltage

The supply voltage should be compatible between the panel and the VGA chip. If both the panel and VGA chip are 5v devices or if they're both 3.3v devices, then there is no problem. If they are different, then other parameters must be evaluated. Attaching power lines directly to the supply is not recommended in most cases because most panels have strict power sequencing requirements.

a. *VGA chip is 5v, panel is 3.3v*

In this case, external interface circuitry is almost certainly needed. The panel requires a 3.3v supply (and possibly other supplies) that is capable of being switched on and off by the VGA chip. Connecting the supply voltage directly to a panel is usually not a good idea because there are often many requirements for power sequencing.

The signals will probably need to go through some sort of buffers to translate the 5v inputs to 3.3v outputs. There may be some 3.3v panels that have 5v-tolerant inputs, but we are currently unaware of any that support this.

b. *VGA chip is 3.3v, panel is 5v*

In this case, external interface circuitry may or may not be needed. On some Micro/sys boards, there is a jumper that selects whether the supply voltage is 5v or 3.3v. However, the jumper does not change the signal voltages, which are still 3.3v. If the panel uses TTL-level threshold voltages (i.e. V_{IH} is above about 1.6v), then this will work. However, it seems like many panels use CMOS thresholds. Some require V_{IH} to be a minimum of $.7V_{DD}$, which translates to above 3.5v. These will not work reliably unless some sort of buffer is used to translate the 3.3v inputs to 5v outputs.

3. Other Voltages

Many panels require an additional supply voltage or contrast adjustment voltage. This voltage may be positive or negative. In the case of the contrast adjustment voltage, it should be able to be varied with a potentiometer. In many cases, specific power sequencing needs to be followed. This means that the VGA chip will need to be able to control the order in which the supply voltages and contrast voltages are turned on and turned off. Damage to the panel may occur if voltages and signals are applied in an incorrect sequence. If a particular Micro/sys board does not support switching of these voltages, it will have to be added on with external circuitry. Attaching power lines directly to the supply is not recommended in most cases.

4. Signals

The VGA chip must have the signals needed to drive a particular panel. Note that the signal names are often different between different manufacturers' panels.

Some panels may have some additional signals that only need to have a fixed voltage on them. For example, some panels have a signal that can flip an image upside down. These probably will not need to be driven from the VGA chip.

LVDS (low voltage differential signaling) signals are used on many newer TFT panels because they support faster signals at longer distances and lower power. They also require fewer signal wires. However, TTL and LVDS signals are not compatible without an interface chip. Thus, a board that has an LVDS panel interface can typically only interface with a panel that has an LVDS interface. Contact Micro/sys for information on adapting one interface to another.

5. Resolution

The VGA chip must have a mode where the resolution is the same as the panel, with a few exceptions. The common resolutions supported by VGA chips are 640x480, 800x600, and 1024x768.

Many manufacturers also make panels with a resolution of 320x240, which is a "quarter VGA" panel. This panel can be used with a VGA chip in the 640x480 mode. What will show on the panel is the text or graphics that would be displayed in the upper-left quarter of a 640x480 panel.

If there are any questions not answered by this application note, contacting a Micro/sys applications engineer should be able to resolve them.

Table of Micro/sys Boards with VGA Panel Support

Board with Panel Support	Panel Types	Signals	Signal Levels	Panel Supply Voltage
MPC204	TFT, STN	TTL	5v	5v
SBC1486	TFT	TTL	3.3v	3.3v or 5v
SBC0486	TFT	TTL	3.3v	3.3v or 5v
SBC1495	TFT	LVDS	LVDS	3.3v
SBC4495	TFT	LVDS	LVDS	3.3v
SBC2590	TFT, STN	TTL	3.3v	3.3v or 5v

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