AN2483
Application note

Video signal standards

Introduction

As PC games, video editing, streaming movies on TV and DVD playback are becoming more common, there is an increasing demand to display such video graphics on larger display screens like those of TV rather than the PC monitors.

Analog switches are often used to route RGB data (Red, Green, Blue format) or component or composite video data from different video sources, or to feed encoders with the video data to different displays. The former is a multiplexing function while the latter is a de-multiplexing function.

Interest in using analog switches in video signal routing applications is growing due the rising trend of using lower pin count and the possibility of achieving cost reduction by sharing the same video encoder/decoder or RAMDAC. This application note first describes the video signal standards and then explains the various important parameters, which are necessary to consider, in video signal switching.

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1   Video signal standards

The visual resolution of a video signal or display is the amount of detail that can be seen. This is different from the resolution format of a signal or display. For example, in a computer application, an XGA (see *Table 1*) resolution has a format resolution of 1024 horizontal pixels and 768 vertical pixels (lines), and is the implied visual resolution.

There are many different kinds of video signals, which can be divided into either television or computer types. The format of signals varies from country to country. In the United States and Japan, the NTSC format is used. HDTV/SDTV are the High Definition TV and Standard Definition TV. VGA and XGA are PC video resolutions. In Europe, the PAL format is common. PAL stands for Phase Alternating Line. PAL is an improvement on NTSC format. SECAM is used in France and stands for sequential coleur avec memoire (with memory). Although all the above standards use the same basic scanning system and represent colour with a type of phase modulation, they differ in several ways, including specific scanning frequencies, number of scan lines, and colour modulation techniques.

Table 1.   Video signal comparison

Video format	NTSC	PAL	HDTV/SDTV	VGA	XGA
Description	Television format for North America and Japan	Television format for most of Europe and South America	High definition TV /standard definition TV	PC video resolutions	PC video resolutions
Vertical resolution format (visible lines/frame)	Approx 480 (525 total lines)	Approx 575 (625 total lines)	1080 or 720 or 480; 18 different formats	480	768
Horizontal resolution format (visible pixels/line)	Determined by bandwidth, ranges from 320 to 650	Determined by bandwidth, ranges from 320 to 720	1920 or 704 or 640; 18 different formats	640	1024
Horizontal rate (KHz)	15.734	15.625	33.75-45	31.5	60
Vertical frame rate(Hz)	29.97	25	30-60	60-80	60-80
Highest frequency (MHz)	4.2	5.5	25	15.3	40.7

The three basic video signal formats in order of decreasing quality are:

1. Composite or CVBS Interface(Colour, Video, Blanking, and Synchronization/also called Composite Video Baseband Signal), which uses one wire pair.

2. Y/C or S-video Interface, which uses two wire pairs.

3. Component Interface, which uses three wire pairs. In order of increasing quality, the composite (or CVBS) which uses one wire pair;

In order of increasing quality, the composite (or CVBS) which uses one wire pair; Y/C (or Svideo), which uses 2 wire pairs; and component, which uses 3 wire pairs are the 3 basic video signal formats. Each wire pair consists of a signal and ground. The three Interfaces differ in the level of information they can combine (encode). More encoding typically degrades the quality but allows the signal to be carried on fewer wires. Component has the least amount of encoding, whilst composite has the most.

1.1 Composite/CVBS Interface

Composite video signals, which are also referred to as CVBS, are the most commonly used analog video Interface. They combine brightness information (luma), colour information (chroma), and synchronizing signals on just one cable. The connector is typically an RCA jack.

Note: brightness information in the signal is the instantaneous amplitude at any point in time. The amplitude of the modulation is proportional to the amount of colour.

1.2 Y/C Interface

Y/C signals, which are often referred to as 'S-video' signals are less encoded than those of Composite signals. The Y signal represents brightness and the C signal represents color. . They are both carried over 2 separate wire pairs.

1.3 Computer signal Interfaces

Virtually all computer Interfaces use RGB format signals. Picture information is carried separately by the three base components Red, Green and Blue. Synchronizing information is typically carried as separate horizontal (H) and vertical (V) signals. The five signals, R, G, B, H and V, are carried on one cable consisting of a shielded bundle of wires. Sometimes the H and V synchronizes information is merged with one of the RGB signals, typically the Green component, but this is becoming less common. This is referred to as "sync-on-Green". In rarer cases, the sync information is on the Red or the Blue signal.

1.4 Component Interface

The component signal Interface is the best performer as it contains the least encoding. The signals exist in a nearly native format. They use three pairs of wires that typically include a luma (Y) and two color-difference format signals on an RGB format signal. Color-difference formats are normally used in TV applications, whereas an RGB format is almost always used in computer applications. In addition to the brightness, the Y signal also contains synchronizing information. The color-difference signals contain R (Red) minus the Y signal and B (Blue) minus the Y signal. The theory behind this combination is that each of the basic R, G and B components can be derived from the color-difference signals. Common variations of color-difference signals include:

● Y, B-Y, R-Y: Luma and colour-difference signals

● Y, Pr, Pb: Pr and Pb are scaled versions of B-Y and R-Y. Commonly found in high end consumer equipment.

● Y, Cr, Cb: Digital-signal equivalent to Y, Pr and Pb.

● Y, U, V: Not an Interface standard. These are intermediate, quadrature signals used in the formation of composite and Y/C signals. Sometimes, they are incorrectly referred to as "component Interface".

2 Revision history

Table 2. Revision history

Date	Revision	Changes
15-May-2007	1	Initial release

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