

# Well-connected consumer electronics for the well-connected consumer

HDTV is poised to deliver a completely new home entertainment experience. The new, miniature, high-bandwidth physical interconnects, purpose-designed for consumer electronic applications, will ensure that easy set-up and avant garde styling will be an integral and important part of the picture writes **Phil McDavitt**, consumer electronics sales manager, JAE Europe

The HDTV (High Definition Television) revolution has patiently waited for the old order to succumb to natural causes. The technology and components are fully developed; reference designs are ready to go; and major brands are in the throes of finalising their premium differentiators. TV sets entering the market are now proclaimed "HD Ready", and many European broadcasters are ready to start broadcasting in HDTV format. Now, a catalyst is needed, and the next football World Cup, in 2006, is widely tipped to provide the required kickstart to sales of HDTV sets. This, then should be the point from which the majority of consumers will be able to watch television programmes delivered entirely within the digital domain.

Of course, digitally transmitted TV signals have been taking over the airwaves for some time now, with decoding performed at the viewer's end either by a set top box or a digital receiver integrated into the TV itself. Although the so-called digital receiver decodes the digitally broadcast signal, the TV signal within remains analogue. The big giveaway is the persistence of the SCART connections between the TV and units such as the STB, DVD or VCR. While these are convenient, and certainly easier to set up and troubleshoot than separate video and audio connections, the size of SCART connectors represents a physical barrier to the advent of super-slim, super-cool flat-panel televisions. Hence, mass adoption of HDTV is also the point from which TV manufacturers hope to escape the form-factor restrictions of traditional analogue TVs.

The term "HD Ready TV Set" has entered the sales patois, meaning a TV that is featured for the advent of HDTV, which calls for all-digital video and audio. These sets will feature external ports that comply either with the Digital Visual Interface (DVI) or – increasingly in future – HDMI (High Definition Multimedia Interface) formats. DVI is a standard originally created to enable high quality, digital video for PC applications. However,

audio channels are not included, which restricts the value DVI can offer to digital home entertainment products. On the other hand, HDMI was conceived for consumer A/V applications, and has 5 Gbps bandwidth; sufficient to carry high definition DVI-format video as well as up to eight channels of uncompressed digital audio – all on one cable. Hence, consumer A/V equipment can now be connected together as easily as PC USB peripherals. Importantly, HDMI can also distribute basic control data between connected units, which enables new functionality such as automatic configuration to display content in the most effective format. Physical and mechanical attributes include very tight cable specifications, allowing far greater cable length than DVI, and an extremely low profile, 0.5mm pitch 19-way connector that will allow A/V equipment manufacturers to minimise the physical size of forthcoming digital TV and audio products.

Adoption of HDMI, as a consumer-oriented interconnect standard, has been swift among major international brands: more than 100 consumer TV and DVD products were shown at CES 2005 in Las Vegas. Hi-fi equipment is also adopting HDMI to deliver surround sound capability.

Inside the majority of flat panel televisions, LVDS (low voltage differential signalling) is the dominant standard for board-to-panel signalling. Attractions include the inherently high noise immunity and low crosstalk, as well as low skew when using flat flex cable. Ensuring uniform path impedance is the key challenge, which JAE has overcome by minimising the number of physical breaks in the conductor to cross the required number of interconnect boundaries.

But while HDTV naturally calls for higher data rates within the TV set, manufacturers are also driving up the colour resolution of new sets as they seek to differentiate their products in the market. Today, 8-bit colour resolution is typical, allowing a total of 256 steps per colour (Red, Green and Blue). This limitation manifests itself in phenomena such as colour-banding,



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which occurs when insufficient colours are available to reproduce the desired image. Premium brand HDTVs will be the first to adopt 12-bit colour resolution to solve this. But the additional colour data, combined with the increased quantity of image information intrinsic to HDTV signals, must be distributed within the same frame period. As a result, TV manufacturers calculate that data must be clocked at over 120 MHz, which is well in excess of the 80-90 MHz maximum normally recommended for TV LVDS chips. One way to solve this is to use two ICs. But this also doubles the number of connections. A crude solution would be to use two sets of connectors and LVDS interface chips. Smaller pitch LVDS connectors – a more compact and elegant alternative – are now emerging; examples include new LVDS connectors with up to 51 contacts, with closer 0.5mm spacing enabling a smaller footprint than conventional 30-way connectors.

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