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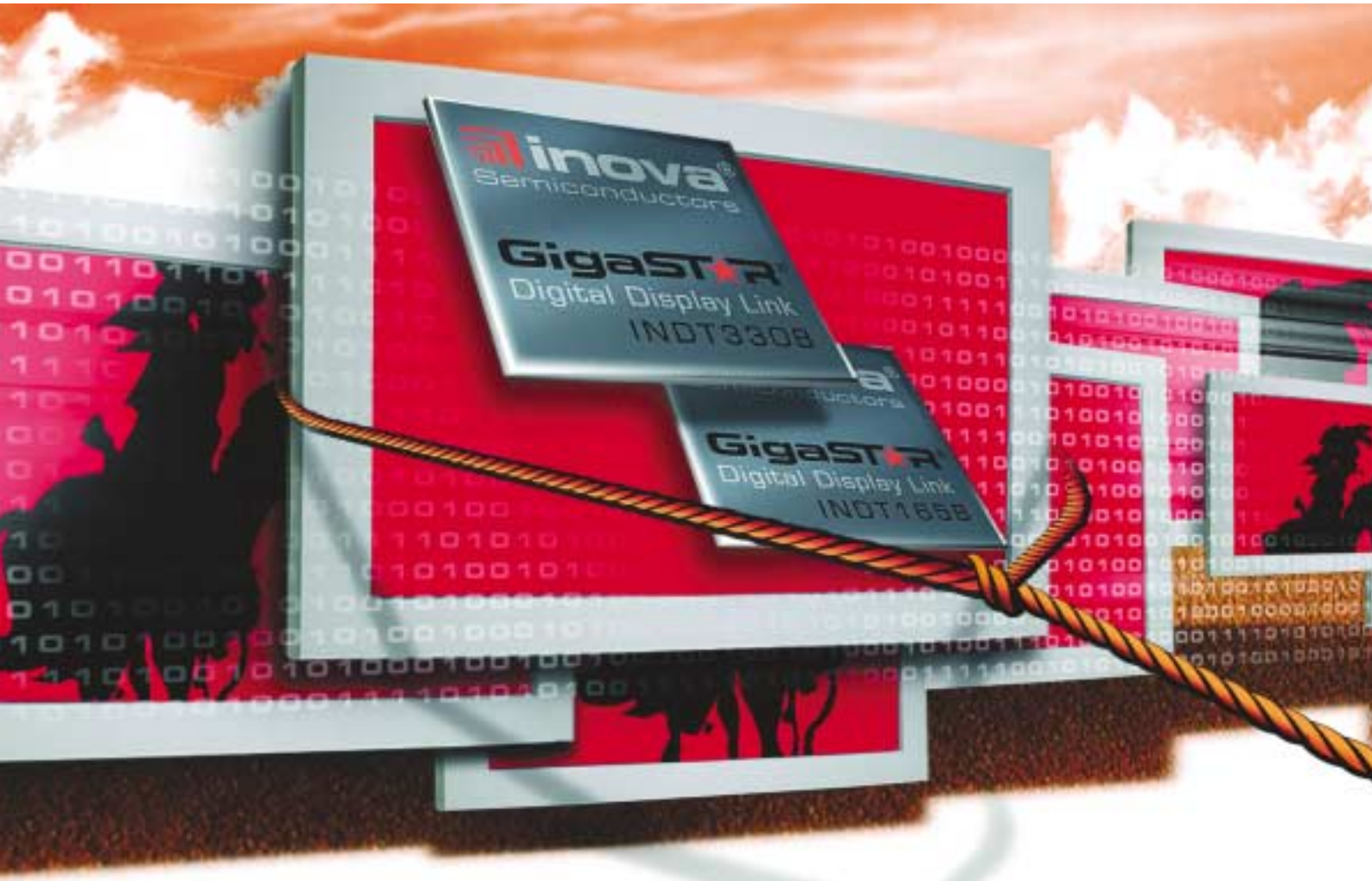

Lucky Look

Displays „on the long leash“

In “The Singing Wire” story about Lucky Luke, the great comic hero swung his lasso in the service of data communications to help erect the first telegraph line from Carson City, Nevada to Omaha, Nebraska. A long line is also used by Lucky Look, but not to transmit a few simple Morse codes.
Instead it provides the perfect connection between modern plasma/TFT displays and a wide variety of video and graphics sources – even over long distances.

*Roland Neumann and Axel Krepil**

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When the Munich-based fabless semiconductor manufacturer Inova Semiconductors unveiled the GigaSTaR – a serial link for stable data transmission in the gigabit range - at the beginning of 2000, no one could foresee that the true value of the technology would eventually lie in the transmission of pixel data. The GigaSTaR was originally developed for data transmission in demanding industrial and military systems where the link had already been implemented on a global scale. An entirely new application field opened up for the GigaSTaR when Inova Semiconductors, together with its European distributor WBC, presented the first prototype of a "video transmission solution using GigaSTaR" in the summer of 2000. Properties including long-haul, secure transmission, low bit error rate, double wire technology (thin, flexible cable), AC coupling, no-loss repeater function as well as the optional use of copper or fiber optic cable lay the groundwork for a wide variety of new display applications that cannot be implemented in this form with existing display link solutions.

Hence the GigaSTaR link is used not only in many modern passenger information systems in Europe and Asia, but also in remote control terminals and consoles by the world's major manufacturers wherever long distances need to be bridged. In fact, system developers around the world are working on so called DVI extenders based on the GigaSTaR link in order to increase the limited reach of the increasingly popular DVI standard.

The automotive industry is currently testing the GigaSTaR potential for future display based navigation and infotainment systems, as well as visual driver assistance systems coupled with modern CMOS camera sensors.

Universal data link for transmission in GBit range

The current GigaSTaR device, however, does have a certain handicap compared to standardized display links. Conceived as a universal data link for data transmission in the GBit range, the GigaSTaR link is equipped with a transparent 36-bit TTL interface with a maximum clock-pulse rate of 33 MHz. In order to connect to the typical 18 or 24-bit graphics interfaces with a pixel frequency of up to 160 MHz, a certain amount of time and expense is required for interface configuration at both the transmission and reception ends. This usually occurs in the form of a PLD that not only sees to the configuration but also the scrambling of the video data. All of which is no problem for developers experienced in the transmission of digital pixel data and the control of modern TFT flat screen displays, however it is certainly not a simple Plug & Play solution for all scenarios.

With the new GigaSTaR Digital Display Link (DLL) that just was launched onto the market, Inova Semiconductors has coupled the high stability and reliability of the preceding GigaSTaR link with the demands placed on a modern display link in a single module.

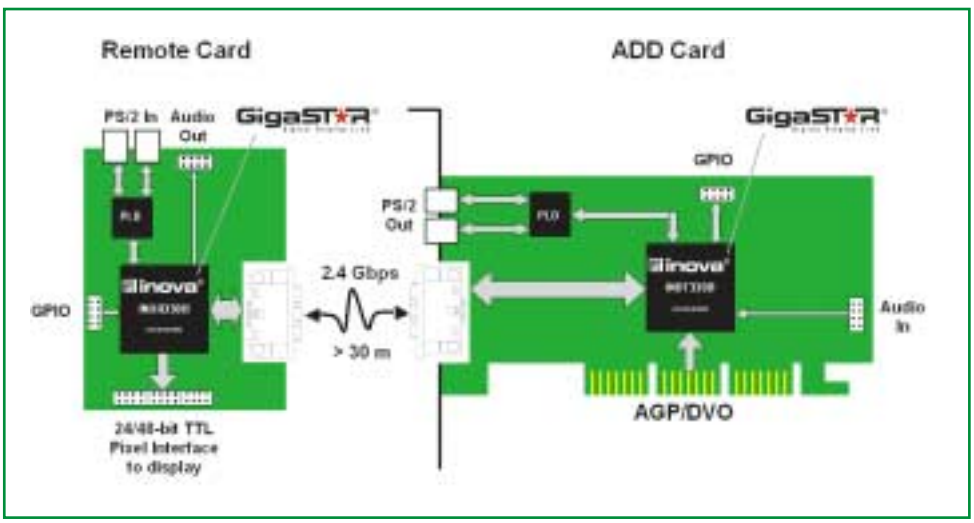
To this end, the IND165/330 Digital Display Link (DDL) chips with VESA standard resolutions up to XGA (IND165) or UXGA (IND330) are equipped with a configurable graphics interface that supports all modern graphics controllers or TFT-LCD and plasma display standards. The DDL can handle 18/24-bit interfaces with 1 pixel/clock or 36/48-bit interfaces with 2 pixels/clock as well as the new DVO graphics format from Intel, whereby graphics data are directly output over the AGP port of the PC through a 12-bit parallel interface with 1/2 pixel/clock.

Using a clever integrated clock system, the link automatically adapts itself to the respective pixel rate, which can range from 24 to 161 MHz. The CMOS-TTL interfaces of the transmitting and receiving chip are designed for easy adaptation to the widely used DVI and LDI/LVDS standard interfaces using standard translator devices.

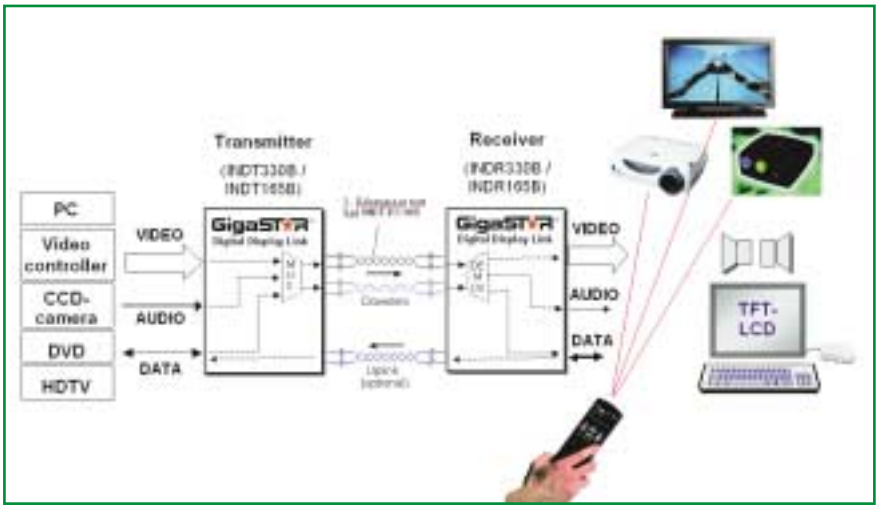
DDL modules make multimedia interactive

In addition to pure graphics properties, developers have installed another series of new functions that transform the DDL into a multitalented innovation for interactive multimedia. Aside from the universal graphics interface, the DDL modules are also equipped with four IEC 958-compliant S/P-DIF audio channels, through which, for example, digital audio data from a sound card can be transmitted together with pixel data. Auxiliary data or sideband channels also permit the transmission of digital control signals (e.g. for controlling connected end devices) in addition to digital video and audio data.

Also noteworthy is the integrated return channel with a data transmission rate exceeding 100 MBit/sec. This makes it easy to set up remote control terminals, whereby the return channel



The DDL supports Intel's Digital Video Output (DVO) pixel format for digital flat panels, making it very easy to integrate an ADD card (AGP Digital Display) for the PC. The remote card with connection for display and other peripheral devices is linked to the ADD card in the computer via CAT 7 copper cable.



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- Application and performance characteristics of the Digital Display Link
- Capabilities of the GigaSTaR serial link for data transmission in the gigabit range

transmits the signals from input devices equipped with a PS/2 interface or other proprietary data, such as for display monitoring.

To attain a long service life for high-quality LCD-TFT and plasma displays, it is becoming more important for the computer to receive characteristic data such as power consumption and temperature so that it is informed of the status of the connected display and can appropriately intervene (by reducing the display intensity in order to preserve the backlight for example) when deviations arise.

Thanks to the high data rate of the return channel, a CMOS camera sensor can be connected directly to the receiving end without any compression logic with video signals sent back to the computer – an interesting feature especially when considering widely distributed video systems.

Bridging distances of more than 500 meters

Like the first GigaSTaR link, the new Digital Display Link also works with a variety of copper and fiberoptic cable depending on the desired distance and mechanical requirements. With simple and economical CAT 7 copper cable, distances of 30 to 50 meters are possible;

With the DDL, video, audio and sideband data are transmitted to the display through the fast downlink – 1 channel (IND165); 2 channels (IND330) – whereby the user to a certain extent is able to split the available bandwidth among the various sources.

with high quality STP copper cable, much longer distances can be bridged. Cable manufacturers such as W.L. Gore and Ernst & Engbring (E&E) offer a series of special GigaSTaR cables developed for specific application areas and customer requirements (e.g. in train infotainment, home entertainment and the automotive sector) that can also be used with the new Digital Display Link without any restrictions.

The DDL can be directly connected to fiberoptic modules using simple multimode fiber cable bridging distances of over 500 meters.

There are nearly no restrictions for these new chips when it comes to their area of imaging application. In addition to the applications already mentioned, such as remote control terminals and (passenger) infotainment systems, the new DDL is also used where digital video signals are widely distributed and ancillary data need to be exchanged between the signal source and display.

Such is the case with large, wall-sized video screens in stadiums and train stations, as well as other places where video material is distributed, including department stores, museums, galleries and movie theaters.

The rapidly growing sector of digital home theaters is also an important target market for the DDL. Video projectors placed far from the screen, as well as flat LCD and plasma displays, require a reliable solution that allows sizable distances between the playback device and the display to be bridged using thin and highly flexible cable.

Additionally, the new link finds application in the home PC sector. With the DDL, it will soon be even easier to implement the DVI extenders mentioned at the beginning of the article and all but eliminate the limited reach associated with this popular display link standard. *(jm)*

Important performance characteristics at a glance:

- Self-synchronizing point-to-point link
- VGA to XGA resolution (up to 24-bit color depth): INDT165B/INDR165B
- SXGA/UXGA resolution (24/18-bit color depth); INDT330B/INDR330B
- Configurable 12 to 48-bit RGB pixel interface: Px data, PCLK, HSYNC, VSYNC, DE
- Integrated, generic return channel up to 100 MBit/sec.
- S/P-DIF compatible audio interface (IEC 958)
- AC-coupled transmission (forward and return channels)
- Reach up to 50 meters with CAT 5/7 copper cable and over 500 meters with multimode fiber cable
- Vref pin for setting the input level (3.3 or 1.8 V) for the transmission module
- 3.3 V power supply