Automotive AV Interface Transmits Full-Color Video and Supports Copyright Protection over a Single Differential Pair Cable

CXM4017R
CXM4018R

The convergence of consumer and automotive technologies is accelerating, with the amount of digital electronic content increasing exponentially. High quality digital and audio is no longer restricted to the home. The car is transforming into a digital living space, with access to the technologies people enjoy. Delivery of DVD and other digital TV video brings the issue of content protection/digital rights management. To meet this need, Sony has added HDCP*1 copyright protection to Gigabit Video Interface (GVIF) technology. Next generation automotive entertainment systems are now able to deliver copy-protected 24-bit color digital video over a single differential pair cable.
The continually evolving GVIF supports automotive entertainment.

*1 HDCP: High Bandwidth Digital Content Protection
*: See the following web page for more detailed information.
http://www.sony.net/Products/SC-HP/application/gvif/index.html

- **Support for 24-bit full-color QVGA, VGA, WVGA, SVGA, and XGA display formats**
- **Includes copyright protection technology (HDCP) and built-in GVIF-HDCP keys (DVD-CCA*2 approved)**
- **Transmitter (CXM4017R): built-in PLL synthesizer and differential cable driver circuits**
- **Receiver (CXM4018R): built-in clock and data recovery PLL and adaptive cable equalizer circuits**
- **CMOS logic interface**
- **Dual 2.5 V/3.3 V power supplies, low power consumption**
- **LQFP 100-pin packages**
- **Allows existing GVIF cables to be used without change**

*2 DVD-CCA: DVD Copy Control Association

The CXM4017R and CXM4018R comprise an HDCP compliant chipset for serial transmission of 24-bit full-color digital video in the QVGA, VGA, WVGA, SVGA, and XGA formats. Figure 1 shows the block diagrams of the CXM4017R and CXM4018R. The CXM4017R is a transmitter IC that includes encoder, parallel-to-serial converter, and cable driver functions. The CXM4018R is a receiver IC that includes cable equalizer, serial-to-parallel converter, and decoder functions. The CXM4017R and CXM4018R ICs include embedded HDCP-Cipher technology and HDCP keys required to support HDCP copyright protected transmission. Using HDCP technology, GVIF is uniquely suited for use in automotive entertainment systems based on emerging and increasingly popular digital formats, including DVD and digital TV. Figures 2 and 3 show application and connection examples for the CXM4017R and CXM4018R.

V O I C E

Japan will switch over completely to digital for terrestrial broadcasting in 2011. And the Blu-ray Disc is rapidly gaining popularity. Now that technologies that transmit high-definition video data without degradation directly in its digital form are desired, GVIF is the only technology that can transmit 2 Gbps serial signals over just a single differential pair cable and furthermore provides copyright protection functions. I believe that in the near future GVIF will be deployed in all car models to make car life an even more fulfilling experience.

Features of GVIF Transmission

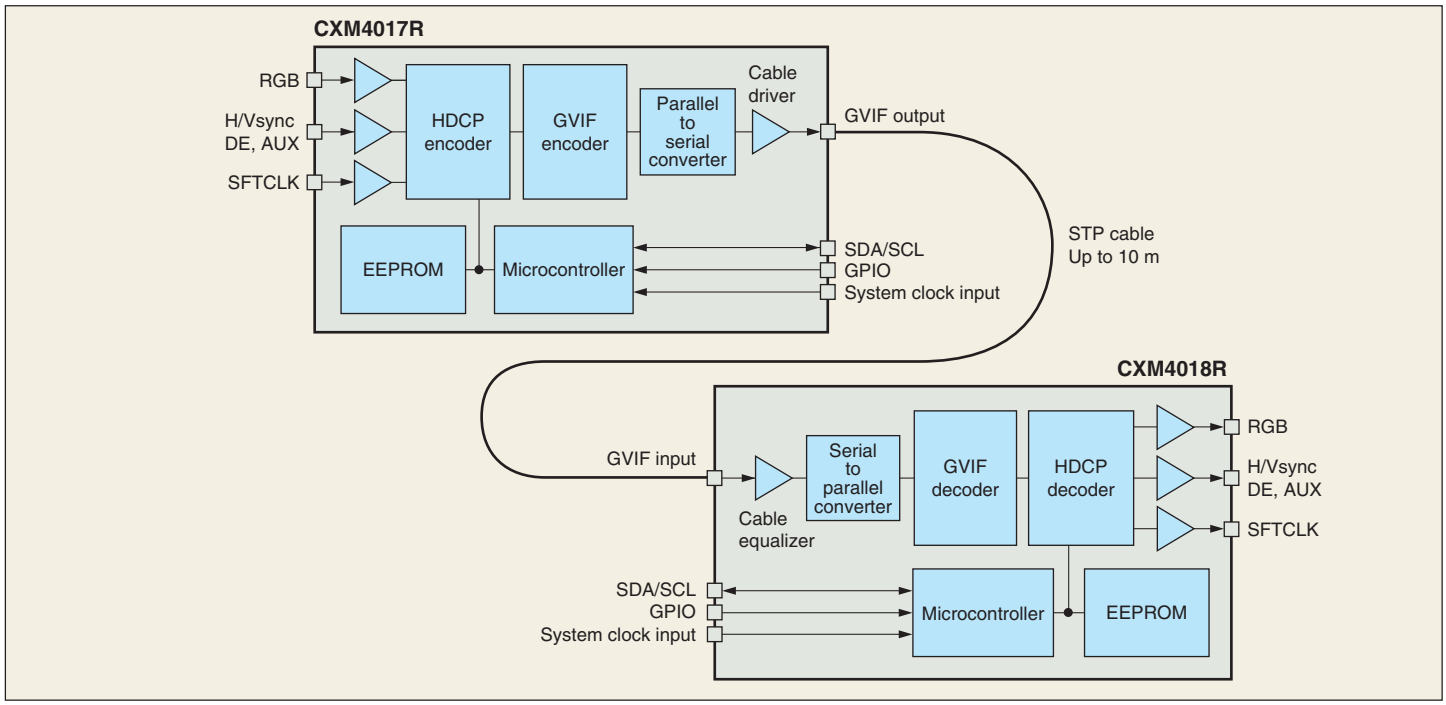
GVIF combines 24-bit video display data, a 2-bit sync data (HSYNC/VSYNC), 2-bit control data (DE/AUX) and authentication data. This serialized data is all delivered over a low amplitude differential signal at speeds of 240 to 1950 Mbps. This can all be achieved using a single shielded twisted pair (STP) cable with 100 Ω impendence. The unique GVIF coding provides DC balance which allows transmitted data stably. Multiple panel resolutions are supported using the automatic frequency negotiation feature (SFTCLK: 8 to 65 MHz).

Authentication Over the Same Differential Pair Cable

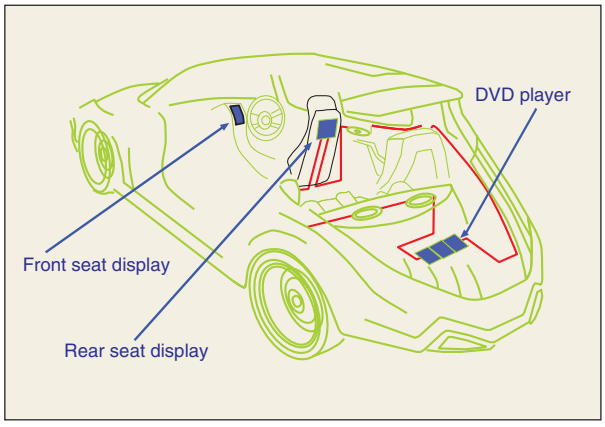
In copyright protected transmission, a signal encrypted by the transmission IC is decrypted by the reception IC. To maintain the integrity of the protection, the transmitting master device must determine (authenticate) whether or not the receiving slave device is appropriate to receive the data. This digital handshake is achieved by utilizing a unique Sony technology to superpose an authentication signal of up to 400 Kbps from the receiver IC to the transmitter IC over a single differential pair cable. Existing GVIF cables can be used as is with no modification.

Built-in Cable Driver and Cable Equalizer Circuits

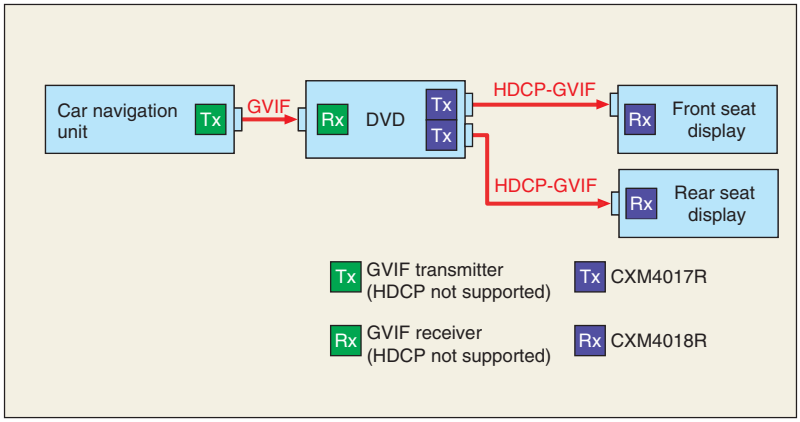
The CXM4017R includes a low-voltage differential signal cable driver circuit and the CXM4018R includes an adaptive cable equalizer circuit. Since the cable equalizer automatically compensates the cable attenuation characteristics, the application designers can freely select any cable length up to 10 meters.
Figure 4 shows the serial data eye pattern before and after the CXM4018R cable equalizer circuit.



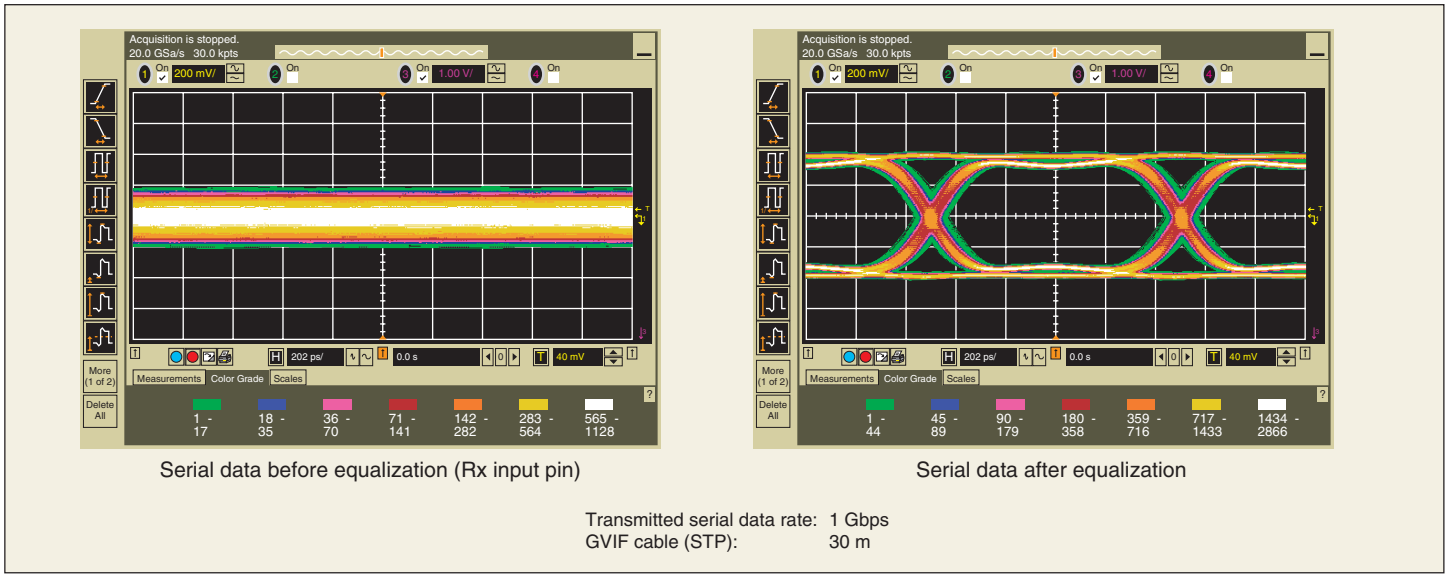
■ **Figure 1 Block Diagram**



■ **Figure 2 Application Example**



■ **Figure 3 Connection Example**



Serial data before equalization (Rx input pin)

Serial data after equalization

Transmitted serial data rate: 1 Gbps
GVIF cable (STP): 30 m

■ **Figure 4 Serial Data Eye Pattern Before and After the CXM4018R Cable Equalizer**