An MPEG 2 Decoder Multichip Module for Digital TV and Multimedia Applications

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Introduction

The digitization of audiovisual and written information offers the possibility of joining them to one package and transmitting them via the same channel. Now these different kinds of information can be processed on computers and any other common hardware. Furthermore the user can interact with his system and manipulate the information instead of only consuming it. This conveniance means a high datarate to be transmitted and processed. So basing on the standard for teleconferencing H.261 and **JPEG** (**J**oint **P**hotographic **E**xperts **G**roup) for images the **M**oving **P**ictures **E**xperts **G**roup (**MPEG**) established the standards MPEG 1 and MPEG 2. Especially MPEG 2 addresses different kinds of applications which can be used in portable and stationary systems for computers or in consumer products. As portability and more functionality are the main selling features the systems have to be miniaturized. To meet these demands **M**ulti**c**hip **M**odules **(MCM**) are a suitable means of designing systems of small size with high functionality. In this paper an MCM for MPEG 2 decoding is presented.

Possible Applications

In 1994 MPEG published the final version of MPEG 2 „Information Technology - Generic coding of moving pictures and associated audio information; International standard / recommendation ISO / IEC 13818". This standard covers all aspects of digital coding and transmission of audiovisual information and supports for different applications such as **DVB** (**D**igital **V**ideo **B**roadcast), **DAB** (**D**igital **A**udio **B**roadcast), **DSS** (**D**igital **S**atellite **S**ervices), **DVD** (**D**igital **V**ersatile **D**isc) or Videoconferencing. Thus basing on the algorithms for data reduction described in the MPEG 2 standard subsystems for computers portable or stationary disc players codecs for handycams and for receivers for set-top-boxes and TV-sets can be designed. As the MPEG standards only describe the decoding algorithm and the bitstream organization parameters and features such as aspect ratio simulcasting audio formats and **CA** (**C**onditional **A**ccess) have to be regarded individually for the particular application. In Figure 1 the application areas for MPEG 2 Decoder MCM are shown.

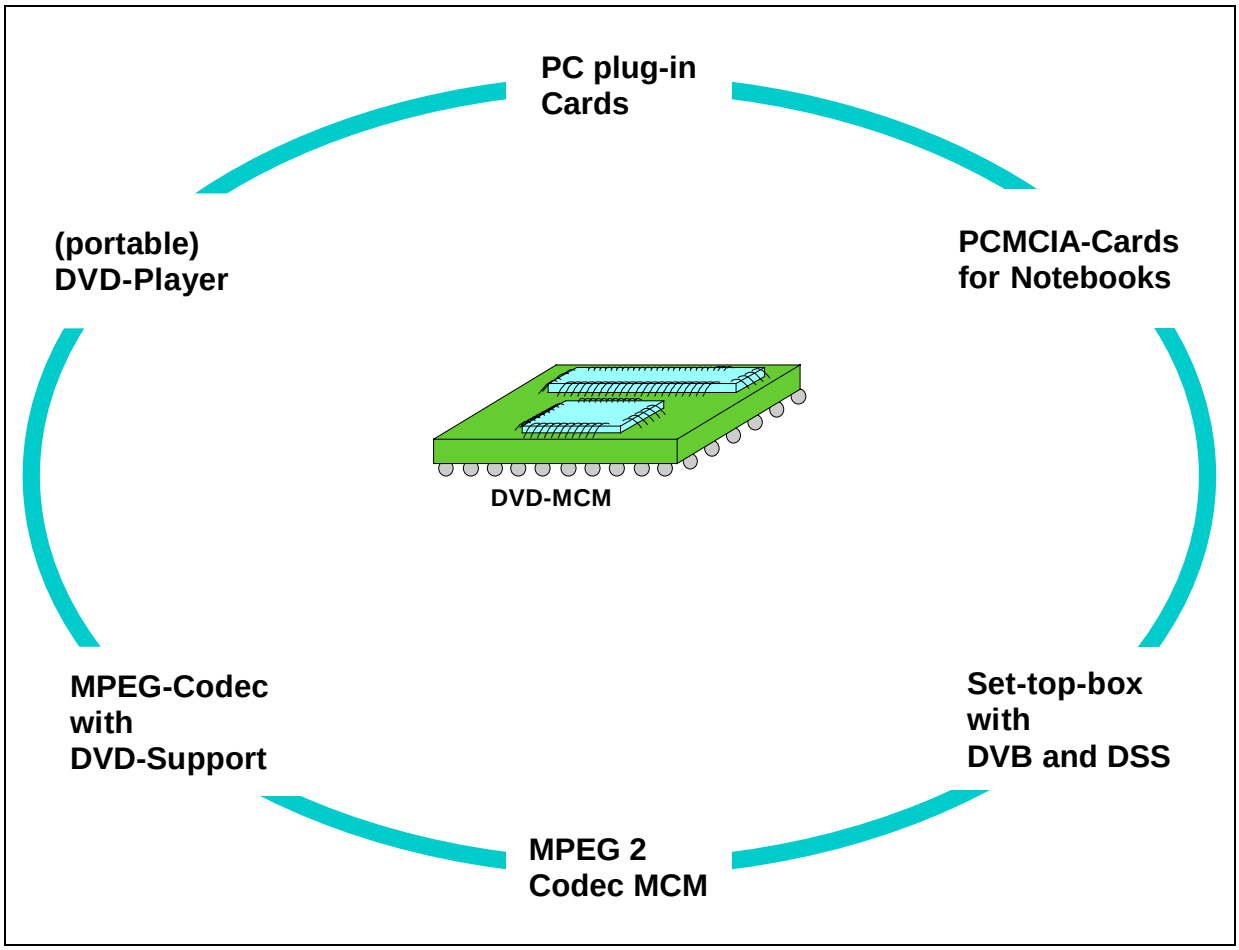

Figure 1: Applications with an MPEG 2 Decoder MCM

MPEG 2 Decoder MCM

An MPEG 2 Decoder MCM suitable for PC-Cards or portable devices can consist of the decoder chip, the memory (Figure 2) and if necessary a decryption engine for conditional access.

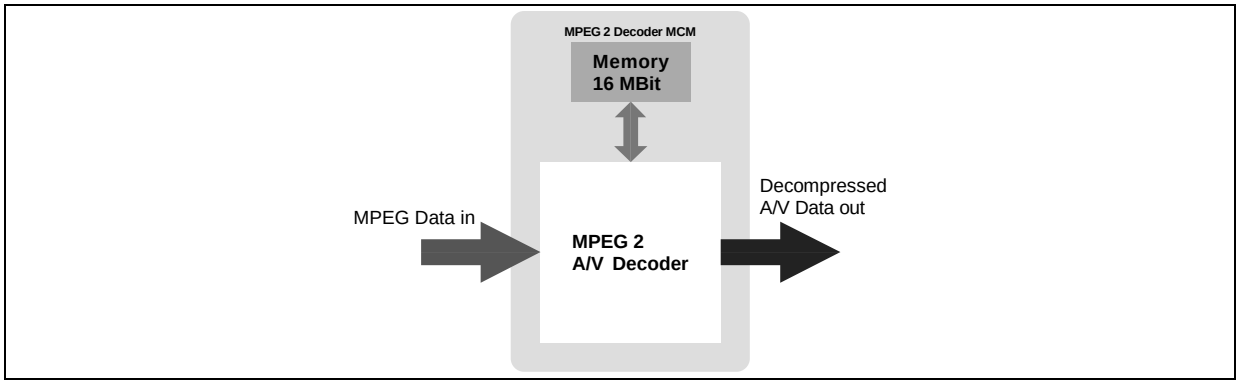

Figure 2: MPEG 2 Decoder MCM

An area comparison between discrete SMT devices and bare dice mounted on a substrate shows that the size shrinks to a quarter. So the whole decoder systems can be placed into a package as large as the package of the discrete MPEG decoder chip as shown in Table 1 and Figure 3.

Device	Quantity	IC area / mm^2	Die area / mm^2
MPEG Decoder	1	900	129,96
DRAM 256k x 16	5	5 x 286 = 1430	5 x 27,15 = 135,75
total area		2330	265,71

Table 1: Area comparison packaged devices vs. bare dice

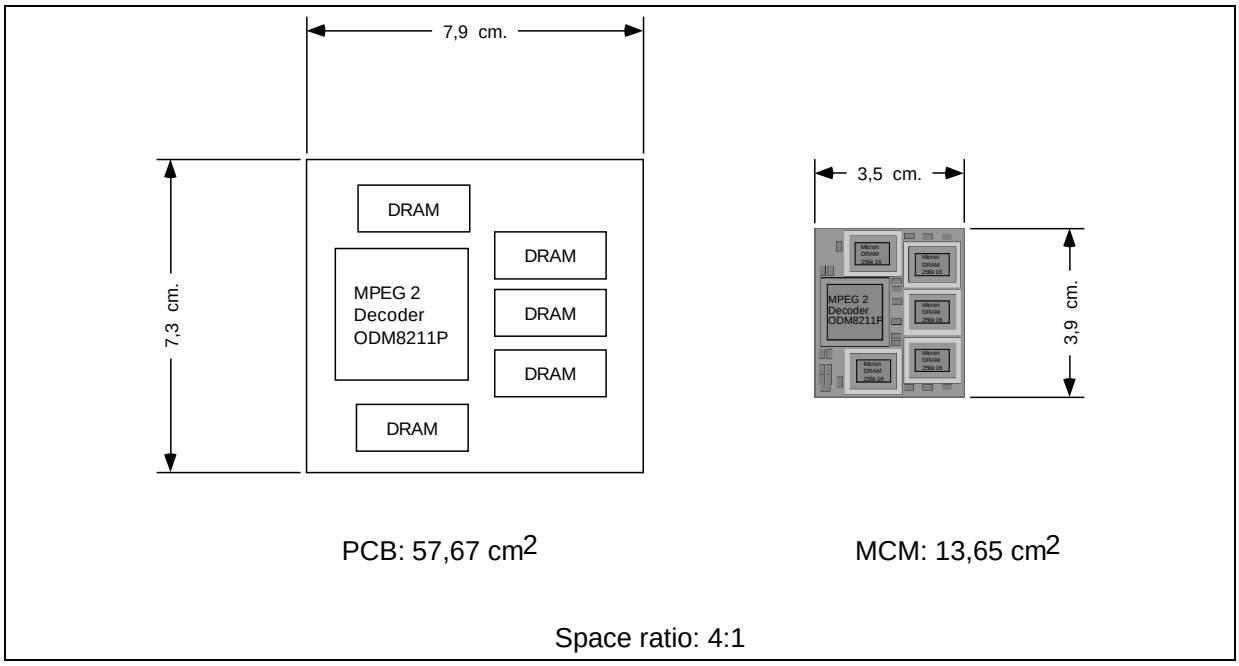

Figure 3: Size comparison packaged devices vs. bare dice

If placed into a PLCC package the MCM can be placed into a socket. Then it can be removed and replaced by an upgraded version. This can also be achieved by mounting J-leads on the edges of the substrate. An alternative is putting bumps on the downside of the substrate and sealing the upside with a globtop. This is the most simple and cheapest way of getting a **BGA** (**B**all **G**rid **A**rray). This way no additional package is needed. This is suitable for small systems and applications in price sensitive market segments.

Conclusion

With this technology various benefits can be gained. As the size is shrinked possible EMC problems of the discrete SMT solution caused by clock signals and high datarates can be minimized. The MCM offers a standardized interface. Therefore silent upgrades can be made as the main changes occure in the MCM. A simple base system is suitable for many product generations. These properties of the MCM technology yield in design flexibility with shorter design time and lower development costs. Furthermore one type of MCM can be used for a variety of products. The integration of further devices onto the MCM and combining it with other function units can yield in new product categories.

References

„Audio- und Videodatenkompression mit MPEG2“
Prof. Dr. R.R. Grigat, TU Hamburg Harburg
Dipl.-Ing. A. Ibenthal, Philips Semiconductors/MK)
Funkschau 3/95 S. 26

„Der MPEG-2-Standard“
D. Teichner
Fernseh- und Kinotechnik 48. Jahrgang Nr. 4/1994 S. 155

DVD Video
DVD Specifications for Read-Only Disc
Toshiba, 1997

„Introduction to Multichip Modules“
Naveed Sherwani, Qiong Yu, Sandeep Badida
John Wiley & Sons, Inc.
New York/Chichester/Brisbane/Toronto/Singapore 1995