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Digital TV & Home Consumer IP Solutions

Consumer electronics products are changing rapidly. The migration towards “TV Everywhere” solutions and delivery of content to multiple screens both within and outside the home is driving a trend towards a fully converged ecosystem. Today all multimedia products are expected to participate in this ecosystem by supplying audio and visual entertainment to the consumer, anytime, anywhere.

In consumer electronics today we are seeing a move towards ubiquitous internet connectivity, connected TV and online music services, graphically advanced user-interfaces (UI), media-rich electronic programme guides (EPG), interactive applications, widgets and smartphone-like features, all of which combine to create innovative connected CE products delivering visually stunning and engaging user experiences.

Imagination offers a wide variety of licensable intellectual property (IP) for digital TV (DTV), set-top box (STB), digital radio and connected audio which covers the whole range of media platforms and increasingly connected devices we enjoy throughout our homes. We are well established in the STB and DTV markets: major chip designs are available today from our partners, leading to recent market innovations in turn driving considerable support for our technology from third-parties within the consumer electronics segment. Our class-leading PowerVR technologies for video encode, decode and display processing, our Meta audio processing platform plus the broadest range of broadcast and connectivity standards supported by our Ensigma (Radio Processing Unit) RPU IP cores, are enabling growth in the DTV market. These same technologies are taking a significant role in internet audio, shipping in major TV and STB brands and leading the introduction of advanced graphics and applications into STBs.

We are the leader in the digital (DAB) and connected radio segment and have a significant market share in internet and connected audio. Imagination’s Flow technology enables access to over 16,000 online radio stations and includes the ability to purchase music directly from the device, offering licensees additional revenue generating opportunities.

In summary, Imagination’s comprehensive portfolio of multimedia and acceleration IP cores enables semiconductor manufacturers to bring advanced graphics, video, audio and communications to a growing range of home and connected consumer products. Our multi-standard receiver and connectivity technologies, complemented by our significant strengths in HD multimedia (video, audio and graphics) enable us to provide unrivalled platform solutions across the digital TV, connected audio and consumer electronics markets.
Graphics

High quality 3D, 2D and vector graphics acceleration are now an essential technology in digital TV. Driven by demand for next generation UIs with stunning visual impact and high frame rate, designers now appreciate how many key applications can benefit from using low power, highly efficient graphics processors (GPUs). From console quality gaming to multimedia-rich programme guides, even increasing the usability of an internet browser by accelerating key formats like Adobe Flash™, GPUs provide a step-change increase in performance and quality while reducing power consumption.

Our PowerVR Series5/5XT programmable GPU IP core family is the standard for high performance, low power embedded multimedia processing. Incorporating an innovative fully programmable USSE™ (Universal Scalable Shader Engine), it delivers exceptional performance and functionality. PowerVR SGX enables a powerful and flexible solution for all forms of multimedia processing, including 3D/2D/vector and stereoscopic 3D (S3D) graphics with advanced anti-aliasing, image processing and more.

The innovative PowerVR ‘Rogue’ architecture, on which Series6 is based, builds on the maturity and unrivalled success of the previous five generations of PowerVR GPUs. It enables Imagination’s partners to deliver amazing user experiences in devices from innovative ‘natural’ user interfaces to ultra-realistic gaming, as well as enabling new applications never before thought of from advanced content creation and image processing to sophisticated augmented reality and environment-aware solutions.

Over the past few years, PowerVR has become the de facto standard for graphics acceleration in the embedded multimedia market, from mobile phone handsets to tablets, set-top boxes to media players. Shipped in around 500 million devices worldwide, thousands of developers rely on PowerVR’s 3D graphics capabilities for UIs, games, applications and more. All major APIs are supported including OpenGL ES 3.0/2.0/1.1, OpenVG 1.1, OpenGL 2.0/3.0, DirectX9/10.1 and OpenCL.

High performance gaming on set-top boxes

The high performance PowerVR graphics cores are ideally suited to S3D graphics, using single or multi-processor cores, for resolutions up to full 1080p HD, and are capable of supporting all commonly used S3D formats such as frame sequential, side-by-side, top-bottom and interlaced.

PowerVR graphics technologies are complemented by the PowerVR Insider ecosystem, which today has more than 34,000 active members and provides comprehensive support for developers, publishers and middleware developers. The programme also provides extensive co-marketing opportunities for OEMs, ODMs, content developers and our IP core licensees.

Video

The emergence of video on demand (VOD), over-the-top (OTT) TV services, downloadable media and the popularity of digital video recorders (DVR) has significantly increased the diversity of video sources within the digital TV ecosystem. From PayTV over cable/satellite and free-to-air terrestrial services through to internet TV and user-generated content, all video sources and formats must now be efficiently handled by the SoC.
Decoder

PowerVR VXD is a family of ultra low power, high performance 1080p HD hardware video decoder IP cores with multi-standard, multi-stream capabilities, which feature the most extensive range of standards supported by a single video decoder.

Imagination’s IP provides full hardware acceleration support for all international broadcast standards including MPEG-2, H.264, VC-1, AVS, as well as optional support for other key video standards necessary for over-the-top internet video applications, including Sorenson Spark, Real Video 8/9, On2 VP6 and WebM (VP8). VXD supports MPEG-4 and H.264 profiles to enable customers to create a DivX® format compliant solution. VXD is also ideally suited to stereoscopic 3D due to its ability to decode H.264 MVC or full resolution side-by-side or top and bottom formats. A high performance JPEG decoder is included for applications such as photo viewing or browsing album artwork.

PowerVR video decoder’s SD and HD multi-stream capabilities make it ideal for browsing your video collection, or previewing video while also watching broadcast TV. Capable of handling four or more streams simultaneously, each of a different standard, the PowerVR video decoder is the industry leader.

Encoder

For content creation, the PowerVR VXE encoder offers highly efficient H.264 high profile compression, at full HD resolution, allowing the user to record and transmit the highest quality video, whilst minimizing bandwidth and storage requirements. PowerVR VXE is arguably the highest quality IP encoder in the marketplace today, proven to reduce video file sizes whilst maintaining video fidelity when compared to competitive solutions.

The combination of PowerVR VXD and PowerVR VXE creates a powerful and flexible solution, enabling transcoding of video for efficient storage on PVRs (e.g., MPEG 2 to H.264) and place-shift of content to other multimedia devices. Transcode is faster than real-time; for example, a 30 minute TV show can be transcoded to a portable iPod format in under 5 minutes. These IP solutions deliver exceptionally low power consumption – less than 15mW for a full H.264 high profile HD decode using a 40LP process.

Display

Imagination’s long association with the TV industry has enabled us to develop an unrivalled range of display enhancement technologies for HDTV. From state-of-the-art interlace-to-progressive scan conversion technologies and frame rate conversion to TV output capabilities – PowerVR display technologies have it covered.

De-interlacing

Our PowerVR I2P IP cores achieve exceptional de-interlacer performance up to full HD resolutions, while using innovative new algorithms to deliver the highest performance in far smaller silicon area than traditional solutions. Imagination’s I2P de-interlacers have been adopted by industry leaders, and are shipping worldwide in several Tier 1 OEM HDTVs.

Frame rate conversion

Our latest PowerVR FRC frame rate conversion IP cores enable full motion-compensated interpolation of SD and HD resolution content from 24fps to 100/120fps and upwards to 200/240fps, eliminating judder and motion-blur artefacts. PowerVR FRC cores provide advanced image enhancement and a seamless 3D viewing experience with no frame judder, delivering the world’s smallest frame rate conversion solution, capable of full HD at 240Hz, it can also provide full stereo 2x1080p60 output from typical 1080p24 stereo sources (e.g., Blu-ray 3D - Profile 5).
Connectivity and Demodulation

Consumers are growing more technologically sophisticated: they know what they want, and they now want it everywhere, including from the sofa. An ever-growing range of technologies are involved, from demodulation of radio and TV through to processing of 802.11 Wi-Fi and Bluetooth. Traditionally each of these has its own chipset; however, as the number of standards to be supported continues to rise, this approach becomes less cost-effective and more power hungry.

The Ensigma RPU communications IP cores solve these challenges by providing an advanced solution that combines programmability and configurable hardware to deliver a single, universal solution which can accommodate current and future standards. All RPU platforms provide a complete, highly autonomous multi-standard, multi-stream low-power solution for both connectivity and broadcast receiver applications, enabling Wi-Fi, Bluetooth and other connectivity standards in addition to analogue and digital TV, mobile TV, plus digital and FM radio reception standards on a single device. By being able to reconfigure a RPU-based solution almost instantaneously in software, wide multi-standard support on a cost-effective basis becomes a realistic proposition: a single SoC targeting multiple applications; a single product deployed across multiple geographies. The platform is equally well suited to form the basis of a stand-alone communications chipset or integration into larger fully-integrated SoC devices.

General purpose CPU Processing

Meta delivers outstanding audio and system management. SoC designers have traditionally relied on the host CPU for all of the programmability of their solution. However, CPU load continues to increase while memory bandwidth and capacity is always at a premium. Therefore, as multimedia standards continue to evolve, other solutions become more practical for embedded processor/DSP tasks.

One example of this is audio processing, which is taking more processing power than ever before as audio codecs continue to increase in complexity, and demands for multi-channel and multi-stream blended audio increase.

Imagination’s Meta family of multi-threaded processor/DSP IP cores are the ideal solution. The unique multi-threading features of the Meta architecture enable SoCs to make far better use of every cycle of the Meta processor, getting more done in fewer cycles than conventional embedded CPUs. Meta runs the latest Android and Linux operating systems, but can also run low level RTOS or even native DSP code simultaneously – all efficiently sharing SoC resources, which keeps clock speeds down, optimizes memory utilisation and extracts the optimum performance from the SoC.

For more information

For an in-depth view of Imagination’s IP, please refer to our individual factsheets describing our Meta processor, Ensigma communications cores, PowerVR graphics, PowerVR video, PowerVR display, Hellosoft V.VoIP and Caustic ray tracing technologies, available online at www.imgtec.com.