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112g Hands-free Headset with 15 inch Virtual Display

Introduction

Mobile computing has scaled new heights in the last few years and is changing the way people see, hear and communicate.

This case study showcases Mistral's capability in designing a next-generation hands-free, headset computer with a micro-display that allows users to interact using natural voice, hand or head gestures. The product was developed as a global multi-national endeavor, working with many of the world's best technology companies.

> This case study showcases Mistral's expertise in development of feature rich, low-power handheld devices that expedite product to market timelines.

The Customer

The customer is a leading producer of semiconductor products and micro-displays that play a critical role in enhancing the performance of mobile devices for consumer, industrial, and military applications.

The Requirement

The customer has expertise in designing, building and deploying lightweight, power-efficient, ultra-small liquid crystal displays (LCDs) that would revolutionize the way people communicate. The customer wanted to build a light-weight, next-generation headset computing and communications system that would provide both wireless Bluetooth/WiFi connectivity with their proprietary near-eye virtual 15-inch cyber display that facilitates spontaneous, hands-free mobile communication and computing. They requested Mistral to design the system around the powerful OMAP3530 processor, with WiFi, Bluetooth and various other peripherals, along with their micro- display to deliver an optimized solution in a low-power, ultra-small form-factor design that integrates advanced voice/gesture recognition technology, allowing users to remotely control up to six independent devices and networks at one time - cell phones, handhelds, PC's, industrial and enterprise systems.

Solution Provided

The solution provided by Mistral was a small form factor design with the following features:

- 65nM CMOS Texas Instruments OMAP3530 Application Processor (a flexible 400MHz to 1GHz ARM Cortex 8 with a flexible 32-bit 300 to 600MHz DSP)
- Package-on-package (POP) high speed, low power mobile DDR and NAND Flash
- TPS65950 Power Companion Chip with Audio Interface
- SVGA Cyber Display Interface
- BT and WLAN Interface
- Head Tracker Connectivity
- < 32GB Micro-SD card removable memory
- USB Interface

- Battery Monitoring and Charging Circuit
- Optional DVI and Camera interfaces for Development purpose

The antenna section of the WLAN and BT was implemented in a separate board which made the solution more effective in terms of mechanical and antenna performance. The board is designed in such away that it will work, both as a development platform (with additional expansion boards) and also as the final product.

Diagnostic Software

Mistral developed the Engineering diagnostic and production diagnostic software for the hardware. The Engineering diagnostics software tests all the peripherals in detail and identifies issues if any, in order to make further debugging of the problem much easier. The production diagnostics software focuses on a quick pass/fail test of all peripherals keeping in mind the fastest turn around time required at the production facility.

The Challenges

- First challenge was fitting all the interfaces into a small form factor of 52.8mm x 43.13mm. Due to this the routing and layout also became complicated

- Bluetooth throughput performance was another challenge because of the possibility of RF signals getting affected due to the close proximity of other noisy components on the board. Since it was a small form factor design it was inevitable for the components to be close to each other

- Like all other battery operated handheld devices, power and heat generated by the circuit was another concern. Running the processor at its maximum speed to execute complex algorithms made the processor generate a considerable amount of heat. Small form factor of the board with less surface area resulted in an elevated temperature. Careful design techniques had to be implemented to reduce the overall power consumption and heat dissipation in the board

- Successfully combining mechanical constraints, signal integrity and

EMI/EMC requirements in a small footprint design was a challenge. This was achieved by having regular interaction with the Customer, CAD and Design teams in the early stages of development. Regulatory certification for the US, Canada and the European Union was completed in two weeks.

Key Achievements

- Building a mixed signal device with WLAN-BT and high-speed digital design working in close proximity

- The product has been on display at several key events and captured the attention of leading technology experts. Some of these events include:
  - Consumer electronics Show (CES)
  - World Wireless Congress
  - Cellular Technology Industry Association
  - Technology Services World (TSIA)
  - International Chief of Police Conference
  - Microsoft Partners and Professional Developer Conferences.

Customer Benefits

- Leveraged Mistral's proven expertise in development of low-power handheld devices that expedite product-to-market time lines.

- Customer received rich accolades for the product, these include:
  - TSIA Recognized Innovator Award for Mobility for 2010, 2011 & 2012
  - World Future Society Product of the Year 2011
  - Popular Science Magazine Top 100 New Products 2011

- Customer signed a Product Licensing Agreement with Motorola in 2010

- A fully integrated deployable solution, thoroughly verified and certified for deployment, and compliant with functional and environmental standards was made available.

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