

Silicon & System Design Services

Product Demo- Experience Zone 5

CAR Infotainment

For one of largest electronics manufacturer



First Time Right
Short TTM



HDMI | GPS | BLE
UX Design
Reliability | uTron OS



Turn Key Product
Niche Segment
E2E Design



Product Features

6" LCD panel with resistive touch screen
GPS Navigation | Bluetooth support
Nano-E Air purifying system
Built-in AM, FM, DVD Players
Aux, HDMI, USB, Camera, Mic, Menu Keys



Interface and User Language support
OEM Automotive reliability standard specifications
Design based on customer proprietary Audio/Video ASICs

Challenges



Scope

Design : Architecture, Circuit design, PCB layout
Analysis : Signal Integrity, DRBFM , BT Antenna Pattern
Compliance : EMI ESD Precompliance
Testing : Bringup, DVT, Reliability, Performance & Qualification

CONFIDENTIAL

HD Set Top Box

For a leading American Networking Player



Tight BOM
First Time Right



MoCA 1.1
DOCSIS 2.0
Energy Star 3.0



Turnkey Product
End to End Design



Cost Savings with New Design | EOL Problem addressed
80% ICT Coverage | 100% FCT Coverage
RF Performance Testing | Improved Component Risk Strategy
Automatic calibration for Tuner & MoCA Power measurements

Product Features



Challenges

Mechanical Constraints
PCB Routing Constraints
Tuner Characterization
MoCA Characterization



Scope

Board DX : Architecture, Mixed Signal, RF & Antenna
PCB Design : Layout, SI Analysis
FW : Diagnostics Driver
Validation : EVT, Factory support
Compliance : Energy star 3.0
Mechanical : Thermal analysis and heat-sink design



CONFIDENTIAL

HCL

Tablet PC

For a leading Asian manufacturer of digital consumer electronics



6 Months TTM
100 Man Months



OMAP4 Platform
Android 4.0
Google CTS Certified



Mn+ Units
Production



**Product
Features**

Multimedia playback
Wireless Internet
Video Calling
Personal Navigation



Challenges

Need to demo product at CES-2012, within 9 weeks of project
OMAP evaluation board unavailable early for FW development
Android source code not available in Project timeline
Product was successfully demo'ed at CES2012 despite all odds

Design : Architecture, Mixed signal, RF & Antenna, Mechanical
Validation : Prototyping, EVT, Transfer to Manuf, Factory support
Compliance : FCC , CE, Google CTS certification
FW : Android ICS Kernel Porting, Board Support Package
Driver : Display, Camera, Sensors, Touch screen, Battery, Audio
Software : Over the Air upgrade, Application layer Customization
ATE : Sanity, Diagnostics, Programming, Wireless, System



Scope



CONFIDENTIAL

HCL

Professional DSMC Camera

For a leading manufacturer of digital cinema cameras



18 Months 1st shoot
250+ Engineers
Rapid Proto | FTR



Flex Rigid PCB
Zigbee | HDMI
Team Wins



Turn Key Product
Niche Segment
E2E Design



Product Features

Best in Class Cinematography
Resolution 6K @120fps 2K@300fps
HDMI and HD-SDI outputs
Recording on SSD, CF media
MIC, Line-in, AES3 Digital audio inputs
4-channel audio, 24-bit @ 48kHz sampling



Scope

Sys Arch

: Main Camera and Accessories

Design

: Mixed signal, RF & Antenna, Si, PI, PoCs,
Image Sensor Integration

ASIC

: Worked with Client's ASIC Partner, FPGA Platform

FW

: Boot loader, Diagnostics, Kernel, Drivers, APIs, HAL

SW

: UI, Data and Control Path management

Testing

: Bringup, DVT, system integration, Audio validation

ME

: Enclosure, Thermal & Accessories Design



Challenges

Micro Form Factor | 24 layer Board | Blind & buried micro vias
4 lamination cycles | 0.4 mm pitch BGAS | High current 24A @ 1V
Exhaustive SI Analysis for high speed (Via modeling, TDR analysis)
Extensive PI analysis to eliminate noise in captured image
Concurrent Integrated development spanning multiple locations
Demonstrated Fully Functional Camera in NAB2010 & 2011



HCL

CONFIDENTIAL

Rugged Wireless VoIP Phone

For a leading American multinational technology conglomerate



11 Months C2P
100 Man Months
First Time Right



Wireless 802.11
Bluetooth BLE 4.0
TIA Standards
Rugged Env Compliance



Mn+ Units
Production



Product Features

2.4" LCD 240 x 320 16-bit colour
USB host mode | 2000mAh Battery
13 hours of Call | 200 hours Standby
P2T Support | Stereo Headset w/Mic

Scope of Work

EE

Digital, Audio, RF , Board Bring-up,
Functional, Integration and EDVT Testing,
Regulatory pre-compliance, Power and
Battery Management, Keypad design ,
Factory Diagnostics FW

NPI

Collaboration: Vendor, customer Supply
chain and CMS
Build management at CM, Onsite Factory
support

SW

UX & UI Design, Development & Testing,
Feature enhancement, System Testing

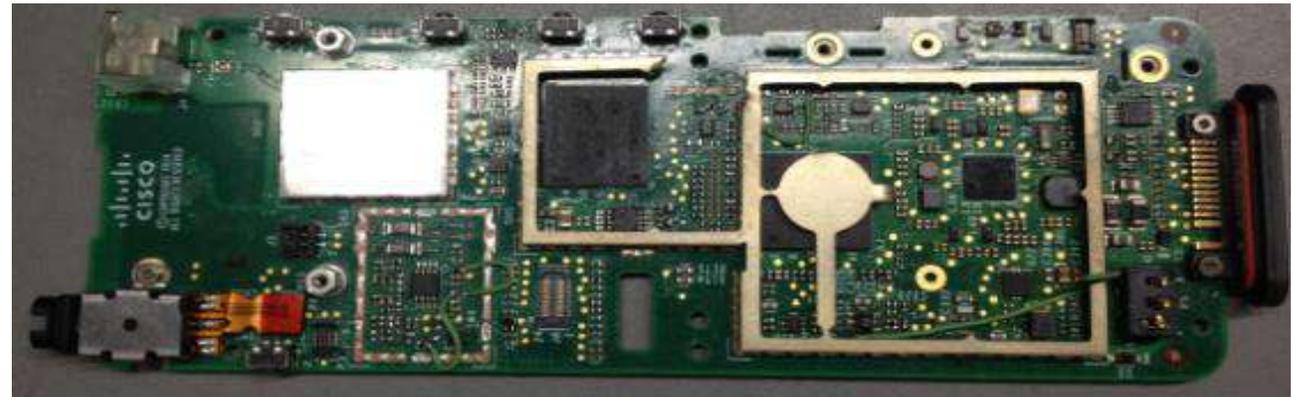
ME

Concept 2 Detailed Design, CAE/Thermal &
Structural analysis



Challenges

Uni-body ID introduces assembly and ME design complexity
High Capacity battery in SFF restricted PCBA real estate
No Evaluation board with SoC Vendor for HW platform
Non-conventional Keypad design for IP67 requirements
First Form fit prototype developed & tested successfully



CONFIDENTIAL

HCL

Media Player Unit

For a leading American provider of industrial automation



Patented QRM
First Time Right
Modular Serviceable



Display Touch Tech
Optical Bonding
DDR3 | QNX OS



Turn Key Product
Niche Segment
E2E Design



Product Features

10.1 Multi touch/gesture Touchscreen
iMX6 Quad core processor | 2GB DDR3
Local Media storage
Play Passenger Content :Headphone/USB
Patented Quick Release Mechanism (QRM)



Interfaces: SATA, Gigabit Ethernet, SDXC and USB 2.0
Remote sense audio amplifier for better channel separation
Single Hardware board design for multi size display
Challenges Field firmware Upgrade support for Touchscreen, CPLD and VPU



Scope

Special Req : Modular Design, Quick to Service , Fanless Design
Design : Mixed signal circuit, PCB layout, SI, PI analysis
Compliance : DO 160 Avionics and Consumer UX
Testing : Bringup, DVT, System integration, Qualification testing
ME : Heat Spreader Thermal analysis



CONFIDENTIAL

HCL

80 Gbps Complex Storage Product

For a storage Startup



80 Gbps Complex product
New Product Development
Best of Breed in Market



Small Form Factor | Low power design
Highly scalable architecture
Concept to Manufacture transfer



Complete Product ownership
Engineering Design Partner



Product Features

4 x 40G interface | Dual Slot Mid-Plane Design
1+1 redundant Host Controller
80G (40 Gbps R+W Host Interface)
16-Slot Storage Controller Cards (>10 TB)



Challenges

25 Inch Flex Cable Design | Power density 4000 W
28 Layer Stack-up Layout
>2000 balls BGA placement
DDR3 operating @ 1600MT/s @ controller card



Scope of work

Hardware design and Development
Bring-up and design verification
Signal Integrity, Power integrity, Thermal, Structural analysis
PCB Modelling, 3D analysis (PCIe3.0 & 10 G KR)
System validation testing
Pre-compliance and compliance testing
Support for storage and safety compliance
Proto build and roll out to production

CONFIDENTIAL

HCL

Digital TV

For the world's largest and highly valued semiconductor company



TTM – 2 weeks
FTR Design



DTV | Tuner Design
DDR3 | RMII
HDMI | PCIe | USB



Niche Design
High Complex



Product Features

Motherboard Ref design based on Berryville SOC
Frame Rate Converter based on IDT FRC chip
LVDS adapter board | Tuner card - COTS card
eMMC carrier card



Challenges

Design of Experiment (DoE) was done using the JMP tool
Maximum signal frequency routed: 2.97GHz (HDMI 1.4a)
No bug on signal or routing quality on the HCL delivered Gerbers



Scope

Signal Integrity: Planning, Model Collection, Topology Finalization
Schematics, Routing Guidelines, Validation Report, Gerber
RDG1.4 Amendment for the Main Board
EVT for DDR3, PCIe, HDMI, LVDS, SATA and IO33
Functional Test plan | HDMI compliance issue analysis



CONFIDENTIAL

HCL



Short TTM
FTR Design



Sensor Design
WiFi | Ethernet
Android OS



Turn Key Product
Niche Segment
E2E Design



Product Features

- TI DM3730 | Android | 3 axis accelerometer
- 3.5 inch LTPS LCD 960*640 Pixel
- Proximity | Ambient light Sensor
- Wireless 802.11 | BT | Ethernet
- Graphic Processor (H 264)
- Aero Handset | Standalone | Modular Design
- Aero regulatory standards DO178B Level E and DO160F
- Efficient suppression of ambient aircraft noise upto 90 dB
- Collaborative solutioning using HCL's partnership with processor vendors; Telecom, Wireless & Android COEs
- Supports VoIP telephony –SIP stack integration with TP codecs
- New drivers for sensor/peripherals integrated on the base TI BSP



Challenges



Scope of Work

- End-to-end design, test, document, prototype, certify and supply the products with multiple variants supports
- Compliance for DO254, DO178B Level E and DO160F , Google CCD
- Application Development for Home screen & setting customization; Address Book, Dial Strings



Night Vision Camera

For the world leader in thermal imaging IR Camera manufacturer



Tight BOM
STTM : 9 months
Rich UXD



DSP | COTS VF
JPEG | MPEG4
Thermal | Aesthetics



Turn Key Product
Niche Segment
E2E Design



Product Features

On screen Display | Wake up Time < 1 sec
COTS VF: uLCD, Optics
Linux OS | DSP Video Processing
Removable Memory | Long Battery Life
IP67 Enclosure | 1.2m Drop Spec



Scope

Special Req : Low Cost industrial design
Design : Mixed signal circuit, Image Sensor Integration, SI, PI analysis, Compliance: Product certification
Testing : Bringup, DVT, System integration & Qualification
ME : ID, Mechanical Enclosure, structural & thermal design



Challenges

Identification of low cost IR camera Head
Compact design with high emphasis on aesthetics & User Exp
PC Casing with Rubber Over-mold
Un-obtrusive Metal Structures for improved Thermal performance



CONFIDENTIAL

HCL

Wireless Access Point

For the world leader in IT



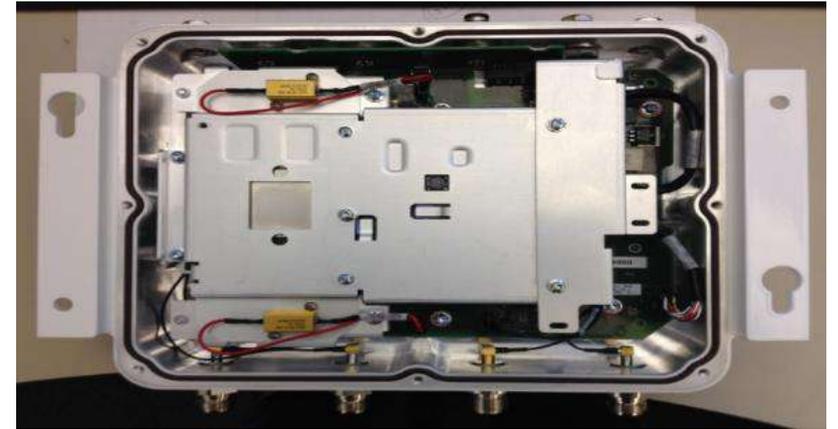
Short TTM
FTR



Harsh Env Compliance
Wi Fi | POE+



Tight BOM
Target



Customer's 1st Exp: Board with both POE in & out
Single SKU to cover all DC input use cases

Identified Low cost components and sources
10USD down from the target BOM cost

**Product
Features**



Scope of Work



- Env Req : Rugged design for rail and outdoor environment
- Design : Architecture, Mixed signal, Power Supply
- Analysis : RF Hardening, Thermal Analysis & Characterization
- Validation : DVT, EVT, MDVT, Margin Analysis, Factory support
- Compliance: CERT – RDT, EMI/EMC Pre compliance
- FW-SW : Boot loader, Diagnostics driver, IOS Application SW
- ATE : Transfer to CM and CPE, Factory support

CONFIDENTIAL

HCL

ADAS

For a Japanese based global supplier on automotive safety



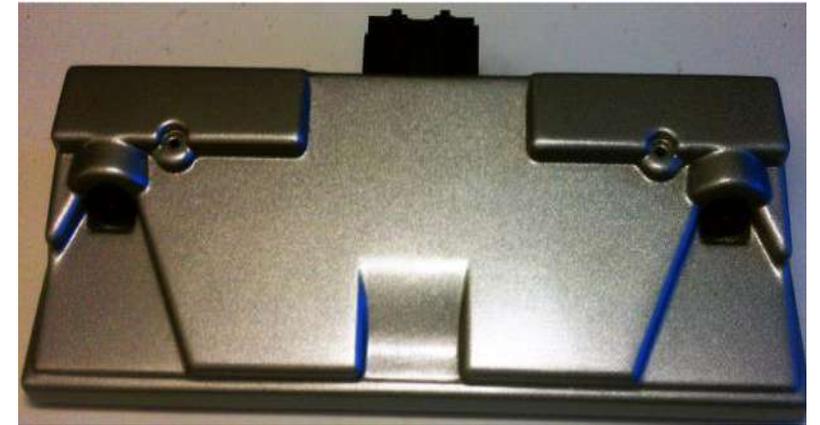
Complexity
Rich Design



Video DMA | TI DSP
ARM A9 | Flex-ray
CAN | VADAR



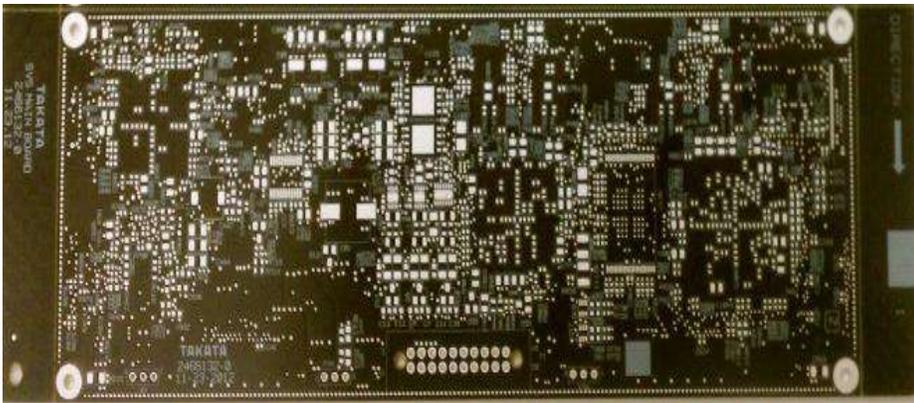
Turn Key
Niche Segment



Detect and Track - Lane, Objects | Assist - Narrow Passage, Construction Zone
Warning Systems --Lane departure, forward collision, Headway, Curve Speed
Control – Adaptive Cruise, Headlamp, Collision mitigation braking

Electronic Video Data Transfer | Pedestrian detection and protection

Product Features



Challenges

FPGA – 484 Pins | DDR2 400 MHz | 12 Layer Design | 30 FPS
Real time image processing for active safety and driver assistance
Image Processing algorithm and its implementation on FPGA
fabric, Cortex-A9 and TI Vision Mid DSP



Scope

Architecture: Feasibility Study, High Level Design
Design : Circuit, PCB Layout, FPGA, DSP
Mechanical: Form factor fitting, Enclosure design
FW : Embedded Communication, DSP Framework
Testing : Test Jig development, Verification and Validation

CONFIDENTIAL

THANK YOU!

GET IN TOUCH WITH US!

