

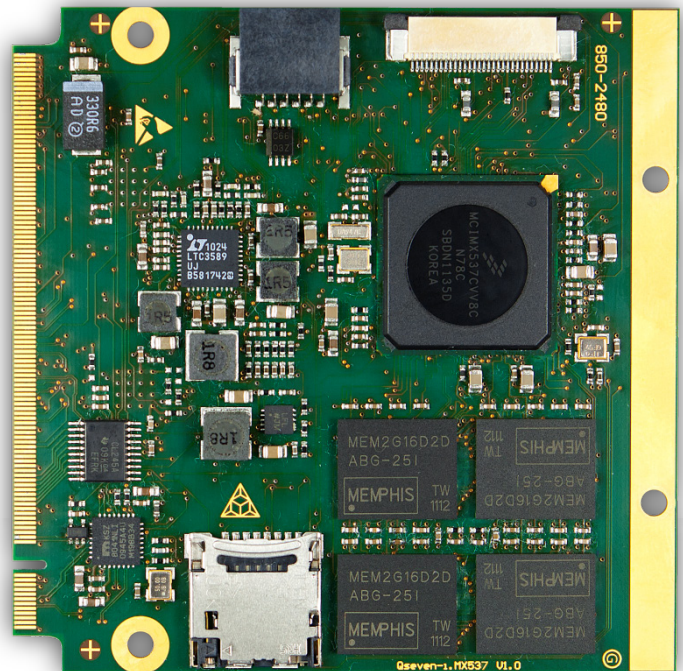
# BLUETECHNIX

## Embedding Ideas

# Qseven-i.MX537

Hardware User Manual

Version 1.2





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#### Information

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#### Warning

Due to technical requirements components may contain dangerous substances.

# 1 Introduction

The Qseven-i.MX537 module is based on Freescale’s next generation, high-performance, power-efficient, multimedia applications processor i.MX53. This processor features OpenGL® ES 2.0 and OpenVG™ 1.1 hardware accelerators, a multi-format HD1080p video decoder and a HD720p video encoder hardware engine, dual display capability, a SATA controller, IEEE1588 time-stamping and numerous serial interfaces (SDIO, SPI, I2C, UART). Further features are integrated security solutions, USB 2.0 controllers, Ethernet controller, two LVDS Display outputs and a camera sensor input (CSI). The Qseven module is available for industrial temperature range. It addresses 1GByte DDR2-SDRAM, has an on-board NAND flash of 2GByte and an additional SPI-NOR flash of 4MByte.

The state of the art i.MX53 SoC in combination with the outstanding integration of several peripheral controllers, memory and voltage control, turn the Qseven-i.MX537 module into a high-performance embedded platform for your future applications.

## 1.1 Overview

Figure 1-1 shows the main components of Qseven-i.MX537 module.

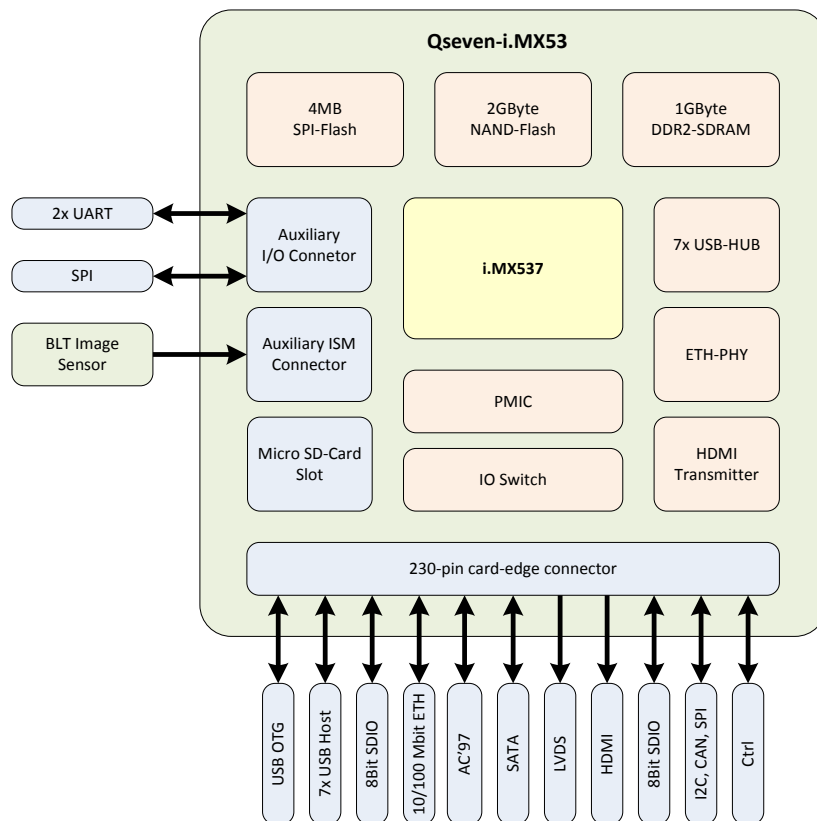


Figure 1-1: Main components of the Qseven-i.MX537 module



## 1.2 Key Features

- **Freescale Application Processor**
  - MCIMX537CVV8C Rev2.1
- **1 GB DDR2-SDRAM**
  - MEM2G16D2DABG-25I
  - DDR2-SDRAM Clock up to 400MHz
  - 4x (128Mx16, 1Gbit at 1.8V)
- **2 GB NAND-Flash**
  - MT29F16G08ABACAWP-IT:C
  - (16Gbit at 3.3V)
- **4 MB SPI-Flash**
  - M25PX32-VMW6E
  - 32Mbit at 3.3V
- **PMIC**
  - LTC3589 & ADP2119
  - Energy Management
  - Power-up sequencer
- **Ethernet-PHY**
  - KSZ8041NLI
- **HDMI-Trasmitter**
  - AD9889B
- **USB-Hub**
  - USB2517-JZX
- **µSD Card slot**
- **Connectors**
  - Qseven 230-pin card-edge connector
  - Auxiliary ISM connector
  - Auxiliary I/O connector

## 1.3 Applications

- Tablets
- Smart Mobile Devices
- Human-Machine-Interface
- Medical Devices
- Video Conference Systems
- Imaging and Consumer Multimedia
- Set Top Boxes
- Video Conference Applications
- Portable Media Players
- Industrial Applications

## 2 General Description

### 2.1 Functional Description

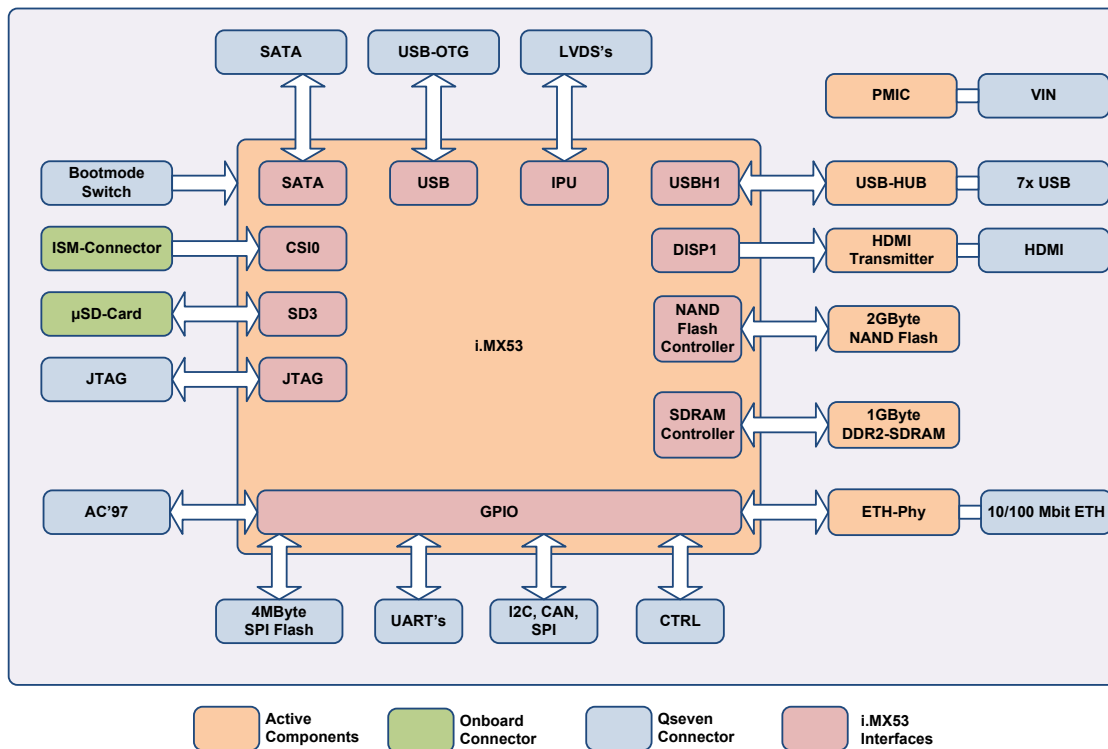


Figure 2-1: Functional overview

### 2.2 Boot Mode

The boot mode of the i.MX53 processor is determined by BOOT\_ALT pin (pin 41 of edge connector).

| Pin      | SPI-Flash | USB/UART |
|----------|-----------|----------|
| BOOT_ALT | 0         | 1        |

Table 2-1: Boot Mode Selection Table

### 2.3 Memory Map

| Component             | Memory area               | Chip select |
|-----------------------|---------------------------|-------------|
| 512 MB DDR2-800 SDRAM | 0x7000_0000 – 0x8FFF_FFFF | CSD0        |
| 512 MB DDR2-800 SDRAM | 0xB000_0000 – 0xCFFF_FFFF | CSD1        |

Table 2-2: Memory Map

SPI-NOR and NAND flashes are not directly memory-mapped, but accessed via i.MX53 internal controllers. Please consult the i.MX53 Reference Manual for the i.MX53 memory map.





## 2.4 PCB Placement

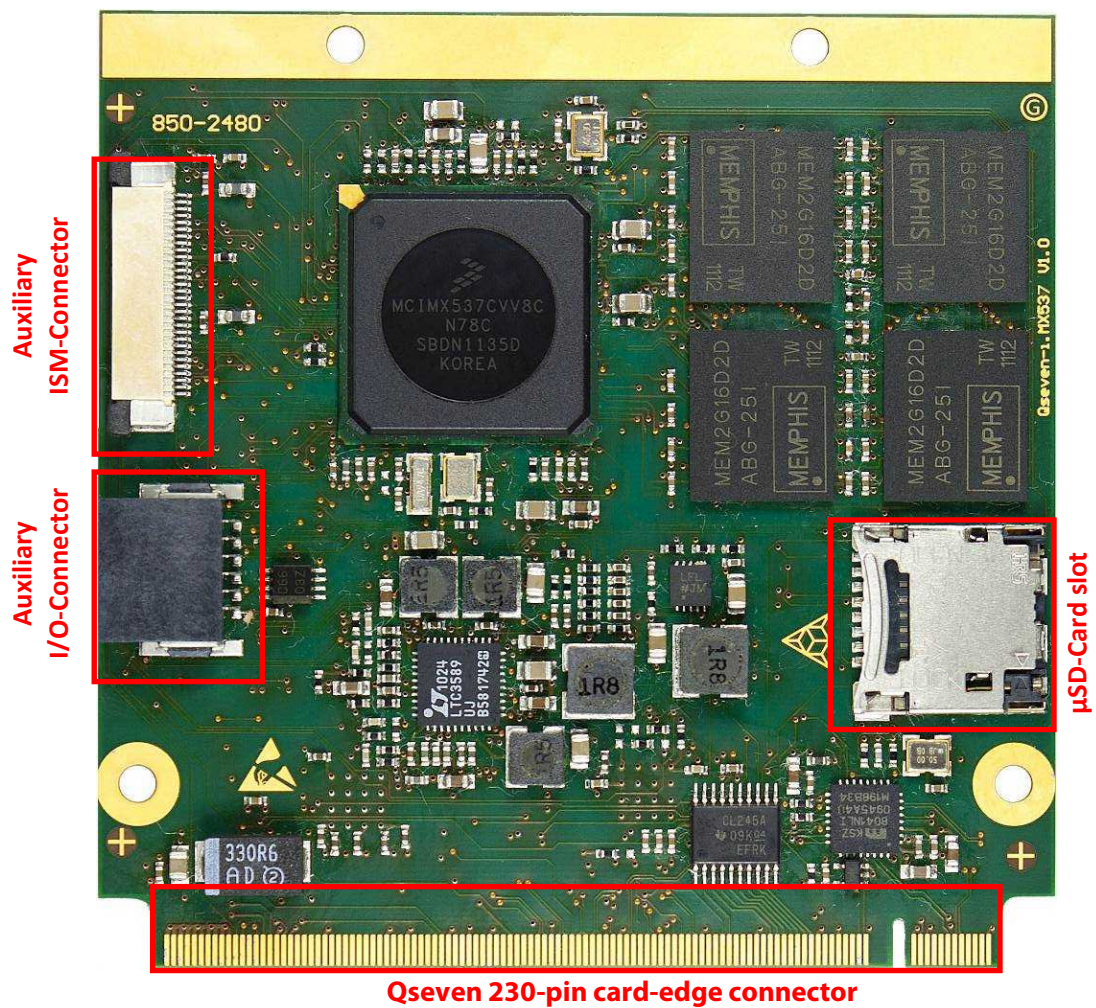


Figure 2-2: Top connectors placement



## 3 Specifications

### 3.1 Electrical Specifications

#### 3.1.1 Operating Conditions

| Symbol                | Parameter  | Min              | Typical          | Max               | Unit    |
|-----------------------|--|------------------|------------------|-------------------|---------|
| $V_{IN}$              | Input supply voltage   | 4.5              | 5.0              | 5.5               | V       |
| $I_{IN}$              | Input supply current @ $V_{IN}=5.0V$ , $T_{AMB}=25^{\circ}C$ | 300 <sup>1</sup> | 500 <sup>2</sup> | 1000 <sup>3</sup> | mA      |
| $V_{OH}$              | High level output voltage                                    | 2.0              | 3.3              | 3.6               | V       |
| $V_{OL}$              | Low level output voltage                                     | -0.3             |                  | 1.0               | V       |
| $I_{IO}$ <sup>4</sup> | IO input current   | 2                |                  | 161               | $\mu A$ |
| $I_{RTC}$             | $V_{RTC}$ current  |                  |                  | 1                 | mA      |
| $I_{USB\_FS}$         | $V_{USB}$ current in low/full speed mode                     |                  |                  | 7                 | mA      |
| $I_{USB\_HS}$         | $V_{USB}$ current in high speed mode                         |                  |                  | 22                | mA      |
| $f_{CCLKC}$           | Core clock frequency for industrial grade modules            |                  |                  | 800               | MHz     |
| $f_{CCLKI}$           | Core clock frequency for commercial grade modules            |                  |                  | 1000              | MHz     |

Table 3-1: Electrical characteristics

<sup>1</sup> Linux running in idle mode; no USB devices plugged in

<sup>2</sup> Linux writes file to SATA HDD; one USB devices plugged in; display output on one LVDS interface

<sup>3</sup> TBD

<sup>4</sup> Dependent on which internal Pull-up resistor is asserted

#### 3.1.2 Maximum Ratings

Stressing the device above the rating listed in the absolute maximum ratings table may cause permanent damage to the device. These are stress ratings only. Operation of the device at these or any other conditions greater than those indicated in the operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

| Symbol          | Parameter  | Min  | Max             | Unit        |
|-----------------|--|------|-----------------|-------------|
| $V_{IO}$        | Input or output voltage                          | -0.5 | OVDD+0.3        | V           |
| $V_{IN}$        | Input supply voltage                             | -0.3 | 6               | V           |
| $I_{OH}/I_{OL}$ | Output current per pin                           |      | 10              | mA          |
| $T_{AMBI}$      | Ambient temperature for industrial grade modules | -40  | 85 <sup>1</sup> | $^{\circ}C$ |
| $T_{AMBC}$      | Ambient temperature for commercial grade modules | 0    | 70 <sup>1</sup> | $^{\circ}C$ |
| $T_{STO}$       | Storage temperature                              | -55  | 150             | $^{\circ}C$ |
| $\Psi_{AMB}$    | Relative ambient humidity (non condensing)       |      | 90              | %           |

Table 3-2: Absolute maximum ratings

<sup>1</sup> If extreme high ambient temperatures are expected (75 $^{\circ}C$  in industrial environments or 60 $^{\circ}C$  for commercial products), the user has to apply a heat dissipator on CPU and DDR-RAM (avoid heat accumulation!). The die temperature should be monitored regular, so that the CPU and RAM clock can be throttled if necessary.



### 3.1.3 ESD Sensitivity



**ESD (electrostatic discharge) sensitive device.** Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.



## 4 Connector Description

For a detail signal description please consult the i.MX53 reference manual, available on the Freescale web site.

### 4.1 Qseven edge connector

| Pin No. | Signal Name    | Direction        | I/O Type        | Function  |
|---------|----------------|------------------|-----------------|---|
| 1       | GND            | PWR              | GND             |   |
| 2       | GND            | PWR              | GND             |   |
| 3       | NC             |                  |                 |   |
| 4       | NC             |                  |                 |   |
| 5       | NC             |                  |                 |   |
| 6       | NC             |                  |                 |   |
| 7       | ETH.LED_SPD    | O                | CMOS 3.3V<br>PP | ETH Speed LED Driver  |
| 8       | NC             |                  |                 |   |
| 9       | ETH.Rx_P       | I_DP             | LAN             | ETH Receive Data+   |
| 10      | ETH.Tx_N       | O_DP             | LAN             | ETH Transmit Data-  |
| 11      | ETH.Rx_N       | I_DP             | LAN             | ETH Receive Data-   |
| 12      | ETH.Tx_P       | O_DP             | LAN             | ETH Transmit Data+  |
| 13      | NC             |                  |                 |   |
| 14      | ETH.LED_ACT    | O                | CMOS 3.3V<br>PP | ETH Activity LED Driver   |
| 15      | VA_ETH         | PWR_O            | 3.3V            | ETH Analog Voltage  |
| 16      | NC             |                  |                 |   |
| 17      | NC             |                  |                 |   |
| 18      | NC             |                  |                 |   |
| 19      | NC             |                  |                 |   |
| 20      | PWRON          | I – 10k pull-up  | CMOS 1.2V<br>OD | Start-Up Module if PIN is low for 400ms   |
| 21      | UART2.CTS      | O                | CMOS 3.3V<br>PP | UART Request To Send / GPIO7_2  |
| 22      | UART2.RTS      | I                | CMOS 3.3V<br>PP | UART Clear To Send / GPIO7_3  |
| 23      | GND            | PWR              | GND             |   |
| 24      | GND            | PWR              | GND             |   |
| 25      | GND            | PWR              | GND             |   |
| 26      | PWGIN          | I                | CMOS 5.0V       | High active input for the Qseven® module indicates that all power rails located on the carrier board are ready for use. |
| 27      | OWIRE          | I/O              | CMOS 3.3V<br>PP | One Wire Interface / GPIO7_6  |
| 28      | CTRL.nRESET_IN | I – 100k pull up | CMOS 1.8V<br>OD | Soft Reset  |
| 29      | SATA.TX_P      | O_DP             | SATA            | SATA Transmit Data+   |
| 30      | NC             |                  |                 |   |
| 31      | SATA.TX_N      | O_DP             | SATA            | SATA Transmit Data-   |
| 32      | NC             |                  |                 |   |
| 33      | NC             |                  |                 |   |
| 34      | GND            | PWR              | GND             |   |



| Pin No. | Signal Name  | Direction         | I/O Type        | Function                                   |
|---------|--------------|-------------------|-----------------|--|
| 35      | SATA.RX_P    | I_DP              | SATA            | SATA Receive Data+                         |
| 36      | NC           |                   |                 |  |
| 37      | SATA.RX_N    | I_DP              | SATA            | SATA Receive Data-                         |
| 38      | NC           |                   |                 |  |
| 39      | GND          | PWR               | GND             |  |
| 40      | GND          | PWR               | GND             |  |
| 41      | BOOT_ALT     | I - 10k pull-up   | CMOS 3.3V<br>OD | Pull low to disable module's on-board BIOS |
| 42      | SD2.CLK      | O                 | CMOS 3.3V<br>PP | SD Clock / GPIO1_15                        |
| 43      | SD2.CD       | I                 | CMOS 3.3V<br>PP | SD Card Detect / GPIO1_4                   |
| 44      | UART3.RXD    |                   | CMOS 3.3V<br>PP | UART Receive Data / GPIO7_10               |
| 45      | SD2.CMD      | O                 | CMOS 3.3V<br>PP | SD Command / GPIO1_11                      |
| 46      | SD2.WP       | I                 | CMOS 3.3V<br>PP | SD Write Protect / GPIO1_2                 |
| 47      | UART3.TXD    |                   | CMOS 3.3V<br>PP | UART Transmit Data / GPIO7_9               |
| 48      | SD2.D1       | I/O               | CMOS 3.3V<br>PP | SD Data 1 / GPIO1_14                       |
| 49      | SD2.D0       | I/O               | CMOS 3.3V<br>PP | SD Data 0 / GPIO1_15                       |
| 50      | SD2.D3       | I/O               | CMOS 3.3V<br>PP | SD Data 3 / GPIO1_12                       |
| 51      | SD2.D2       | I/O               | CMOS 3.3V<br>PP | SD Data 2 / GPIO1_13                       |
| 52      | SD2.D5       | I/O               | CMOS 3.3V<br>PP | SD Data 5 / GPIO2_13                       |
| 53      | SD2.D4       | I/O               | CMOS 3.3V<br>PP | SD Data 4 / GPIO2_12                       |
| 54      | SD2.D7       | I/O               | CMOS 3.3V<br>PP | SD Data 7 / GPIO2_15                       |
| 55      | SD2.D6       | I/O               | CMOS 3.3V<br>PP | SD Data 6 / GPIO2_14                       |
| 56      | NC           |                   |                 |  |
| 57      | GND          | PWR               | GND             |  |
| 58      | GND          | PWR               | GND             |  |
| 59      | AUD5.RFS     | I - 47R serial    | CMOS 3.3V<br>PP | AUD Receive Frame Sync / GPIO3_24          |
| 60      | NC           |                   |                 |  |
| 61      | GPIO.(3V3)_3 | I/O               | CMOS 3.3V<br>PP | GPIO4_5 / CLKO                             |
| 62      | NC           |                   |                 |  |
| 63      | AUD5.RSCK    | I - 47R serial    | CMOS 3.3V<br>PP | AUD Receive Clock / GPIO3_25               |
| 64      | NC           |                   |                 |  |
| 65      | AUD5.RX      | I                 | CMOS 3.3V<br>PP | AUD Receive Data / GPIO4_9                 |
| 66      | I2C1.SCL     | O - 4k7 pull-up   | CMOS 3.3V<br>PP | I2C Clock / GPIO5_27                       |
| 67      | AUD5.TX      | O                 | CMOS 3.3V<br>PP | AUD Transmit Data / GPIO4_7                |
| 68      | I2C1.SDA     | I/O - 4k7 pull-up | CMOS 3.3V       | I2C Data / GPIO5_26                        |



| Pin No. | Signal Name           | Direction | I/O Type        | Function                          |
|---------|-----------------------|-----------|-----------------|-----------------------------------|
| 69      | FIRI.TXD              | O         | PP<br>CMOS 3.3V | FIRI Transmit Data / GPIO1_8      |
| 70      | NC                    |           |                 |                                   |
| 71      | FIRI.RXD              | I         | PP<br>CMOS 3.3V | FIRI Receive Data / GPIO1_7       |
| 72      | NC                    |           |                 |                                   |
| 73      | GND                   | PWR       | GND             |                                   |
| 74      | GND                   | PWR       | GND             |                                   |
| 75      | USBH2.D_N             | I/O_DP    | USB             | USB Data-                         |
| 76      | USBH3.D_N             | I/O_DP    | USB             | USB Data-                         |
| 77      | USBH2.D_P             | I/O_DP    | USB             | USB Data+                         |
| 78      | USBH3.D_P             | I/O_DP    | USB             | USB Data+                         |
| 79      | USBH3.OC<br>USBH2.OC  | I         | PP<br>CMOS 3.3V | Over-Current Sense                |
| 80      | USBH4.OC<br>USBH5.OC  | I         | PP<br>CMOS 3.3V | Over-Current Sense                |
| 81      | USBH5.D_N             | I/O_DP    | USB             | USB Data-                         |
| 82      | USBH4.D_N             | I/O_DP    | USB             | USB Data-                         |
| 83      | USBH5.D_P             | I/O_DP    | USB             | USB Data+                         |
| 84      | USBH4.D_P             | I/O_DP    | USB             | USB Data+                         |
| 85      | USBH7.OC<br>USBH6.OC  | I         | PP<br>CMOS 3.3V | Over-Current Sense                |
| 86      | USBOTG.OC<br>USBH0.OC | I         | PP<br>CMOS 3.3V | Over-Current Sense                |
| 87      | USBH7.D_N             | I/O_DP    | USB             | USB Data-                         |
| 88      | USBH6.D_N             | I/O_DP    | USB             | USB Data-                         |
| 89      | USBH7.D_P             | I/O_DP    | USB             | USB Data+                         |
| 90      | USBH6.D_P             | I/O_DP    | USB             | USB Data+                         |
| 91      | USBOTG.VBUS           | PWR       | PP<br>CMOS 3.3V | USB VBUS                          |
| 92      | USBOTG.ID             | I         | PP<br>CMOS 3.3V | USB ID                            |
| 93      | USBOTG.D_N            | I/O_DP    | USB             | USB Data-                         |
| 94      | USBH0.D_N             | I/O_DP    | USB             | USB Data-                         |
| 95      | USBOTG.D_P            | I/O_DP    | USB             | USB Data+                         |
| 96      | USBH0.D_P             | I/O_DP    | USB             | USB Data+                         |
| 97      | GND                   | PWR       | GND             |                                   |
| 98      | GND                   | PWR       | GND             |                                   |
| 99      | LVDS0.TX0_P           | O_DP      | LVDS            | LVDS0 Transmit Data0+ / GPIO7_30  |
| 100     | LVDS1.TX0_P           | O_DP      | LVDS            | LVDS1 Transmit Data 0+ / GPIO6_30 |
| 101     | LVDS0.TX0_N           | O_DP      | LVDS            | LVDS0 Transmit Data0- / GPIO7_31  |
| 102     | LVDS1.TX0_N           | O_DP      | LVDS            | LVDS1 Transmit Data 0- / GPIO6_31 |
| 103     | LVDS0.TX1_P           | O_DP      | LVDS            | LVDS0 Transmit Data1+ / GPIO7_28  |
| 104     | LVDS1.TX1_P           | O_DP      | LVDS            | LVDS1 Transmit Data 1+ / GPIO6_28 |
| 105     | LVDS0.TX1_N           | O_DP      | LVDS            | LVDS0 Transmit Data1- / GPIO7_29  |
| 106     | LVDS1.TX1_N           | O_DP      | LVDS            | LVDS1 Transmit Data 1- / GPIO6_29 |
| 107     | LVDS0.TX2_P           | O_DP      | LVDS            | LVDS0 Transmit Data2+ / GPIO7_26  |
| 108     | LVDS1.TX2_P           | O_DP      | LVDS            | LVDS1 Transmit Data 2+ / GPIO6_24 |
| 109     | LVDS0.TX2_N           | O_DP      | LVDS            | LVDS0 Transmit Data2- / GPIO7_27  |
| 110     | LVDS1.TX2_N           | O_DP      | LVDS            | LVDS1 Transmit Data 2- / GPIO6_25 |
| 111     | UART3.CTS             | I         | CMOS 3.3V       | UART Clear To Send / GPIO7_7      |



| Pin No. | Signal Name | Direction         | I/O Type  | Function                                |
|---------|-------------|-------------------|-----------|---|
|         |             |                   | PP        |   |
| 112     | UART3.RTS   | I                 | CMOS 3.3V | UART Clear To Send / GPIO7_3            |
|         |             |                   | PP        |   |
| 113     | LVDS0.TX3_P | O_DP              | LVDS      | LVDS0 Transmit Data3+ / GPIO7_22        |
| 114     | LVDS1.TX3_P | O_DP              | LVDS      | LVDS1 Transmit Data 3+ / GPIO6_22       |
| 115     | LVDS0.TX3_N | O_DP              | LVDS      | LVDS0 Transmit Data3- / GPIO7_23        |
| 116     | LVDS1.TX3_N | O_DP              | LVDS      | LVDS1 Transmit Data 3- / GPIO6_23       |
| 117     | GND         | PWR               | GND       |   |
| 118     | GND         | PWR               | GND       |   |
| 119     | LVDS0.CLK_P | O_DP              | LVDS      | LVDS0 Clock+ / GPIO7_24                 |
| 120     | LVDS1.CLK_P | O_DP              | LVDS      | LVDS1 Clock + / GPIO6_26                |
| 121     | LVDS0.CLK_N | O_DP              | LVDS      | LVDS0 Clock- / GPIO7_25                 |
| 122     | LVDS1.CLK_N | O_DP              | LVDS      | LVDS1 Clock - / GPIO6_27                |
| 123     | CTRL.PWM1   | O                 | CMOS 3.3V | Pulse Width Modulation Output / GPIO1_9 |
|         |             |                   | PP        |   |
| 124     | NC          |                   |           |   |
| 125     | I2C3.SDA    | I/O – 4k7 pull-up | CMOS 3.3V | I2C3 Data / GPIO1_6                     |
|         |             |                   | OD        |   |
| 126     | NC          |                   |           |   |
| 127     | I2C3.SCL    | O – 4k7 pull-up   | CMOS 3.3V | I2C3 Clock / GPIO1_5                    |
|         |             |                   | OD        |   |
| 128     | NC          |                   |           |   |
| 129     | CAN1.TX     | O                 | CMOS 3.3V | CAN Transmit Data / GPIO4_10            |
|         |             |                   | PP        |   |
| 130     | CAN1.RX     | I                 | CMOS 3.3V | CAN Receive Data / GPIO4_11             |
|         |             |                   | PP        |   |
| 131     | HDMI.TC_P   | O_DP              | HDMI      | HDMI Clock+                             |
| 132     | NC          |                   |           |   |
| 133     | HDMI.TC_N   | O_DP              | HDMI      | HDMI Clock-                             |
| 134     | NC          |                   |           |   |
| 135     | GND         | PWR               | GND       |   |
| 136     | GND         | PWR               | GND       |   |
| 137     | HDMI.Tx1.P  | O_DP              | HDMI      | HDMI Transmit Data 1+                   |
| 138     | NC          |                   |           |   |
| 139     | HDMI.Tx1_N  | O_DP              | HDMI      | HDMI Transmit Data 1-                   |
| 140     | NC          |                   |           |   |
| 141     | GND         | PWR               | GND       |   |
| 142     | GND         | PWR               | GND       |   |
| 143     | HDMI.Tx0_P  | O_DP              | HDMI      | HDMI Transmit Data 0+                   |
| 144     | NC          |                   |           |   |
| 145     | HDMI.Tx0_N  | O_DP              | HDMI      | HDMI Transmit Data 0-                   |
| 146     | NC          |                   |           |   |
| 147     | GND         | PWR               | GND       |   |
| 148     | GND         | PWR               | GND       |   |
| 149     | HDMI.Tx2_P  | O_DP              | HDMI      | HDMI Transmit Data 2+                   |
| 150     | HDMI.SDA    | I/O – 2k2 pull-up | CMOS 5.0V | HDMI I2C Data                           |
|         |             |                   | OD        |   |
| 151     | HDMI.Tx2_N  | O_DP              | HDMI      | HDMI Transmit Data 2-                   |
| 152     | HDMI.SCL    | I/O – 2k2 pull-up | CMOS 5.0V | HDMI I2C Clock                          |
|         |             |                   | OD        |   |
| 153     | HDMI.HPD    | I                 | CMOS 5.0V | HDMI Hot Plug Detect                    |
|         |             |                   | PP        |   |



| Pin No. | Signal Name  | Direction | I/O Type        | Function                                    |
|---------|--------------|-----------|-----------------|---|
| 154     | NC           |           |                 |   |
| 155     | NC           |           |                 |   |
| 156     | NC           |           |                 |   |
| 157     | NC           |           |                 |   |
| 158     | NC           |           |                 |   |
| 159     | GND          | PWR       | GND             |   |
| 160     | GND          | PWR       | GND             |   |
| 161     | NC           |           |                 |   |
| 162     | NC           |           |                 |   |
| 163     | NC           |           |                 |   |
| 164     | NC           |           |                 |   |
| 165     | GND          | PWR       | GND             |   |
| 166     | GND          | PWR       | GND             |   |
| 167     | NC           |           |                 |   |
| 168     | NC           |           |                 |   |
| 169     | NC           |           |                 |   |
| 170     | NC           |           |                 |   |
| 171     | NC           |           |                 |   |
| 172     | NC           |           |                 |   |
| 173     | NC           |           |                 |   |
| 174     | NC           |           |                 |   |
| 175     | NC           |           |                 |   |
| 176     | NC           |           |                 |   |
| 177     | NC           |           |                 |   |
| 178     | NC           |           |                 |   |
| 179     | NC           |           |                 |   |
| 180     | NC           |           |                 |   |
| 181     | NC           |           |                 |   |
| 182     | NC           |           |                 |   |
| 183     | GND          | PWR       | GND             |   |
| 184     | GND          | PWR       | GND             |   |
| 185     | NC           |           |                 |   |
| 186     | NC           |           |                 |   |
| 187     | NC           |           |                 |   |
| 188     | NC           |           |                 |   |
| 189     | NC           |           |                 |   |
| 190     | NC           |           |                 |   |
| 191     | NC           |           |                 |   |
| 192     | NC           |           |                 |   |
| 193     | NC           |           |                 |   |
| 194     | GPIO.(2V5)_2 | I/O       | CMOS 2.5V<br>PP | GPIO1_18                                    |
| 195     | GPIO.(2V5)_1 | I/O       | CMOS 2.5V<br>PP | GPIO1_17                                    |
| 196     | CTRL.PWM2    | O         | CMOS 2.5V<br>PP | Pulse Width Modulation Output /<br>GPIO1_19 |
| 197     | GND          | PWR       | GND             |   |
| 198     | GND          | PWR       | GND             |   |
| 199     | ECSPI1.MOSI  | O         | CMOS 3.3V<br>PP | SPI MOSI / GPIO5_23                         |
| 200     | ECSPI1.SS0   | O         | CMOS 3.3V<br>PP | SPI Select 0 / GPIO5_25                     |





| Pin No. | Signal Name | Direction | I/O Type        | Function                |
|---------|-------------|-----------|-----------------|-------------------------|
| 201     | ECSPI1.MISO | I         | CMOS 3.3V<br>PP | SPI MISO / GPIO5_24     |
| 202     | ECSPI1.SS1  | O         | CMOS 3.3V<br>PP | SPI Select 1 / GPIO3_19 |
| 203     | ECSPI1.SCLK | O         | CMOS 3.3V<br>PP | SPI CLK / GPIO5_22      |
| 204     | JTAG.nTRST  | I         | CMOS 2.8V<br>PP | JTAG Test Reset         |
| 205     | NC          |           |                 |                         |
| 206     | NC          |           |                 |                         |
| 207     | JTAG.TCK    | I         | CMOS 2.8V<br>PP | JTAG Test Clock         |
| 208     | JTAG.TDI    | I         | CMOS 2.8V<br>PP | JTAG Test Data Input    |
| 209     | JTAG.TDO    | O         | CMOS 2.8V<br>PP | JTAG Test Data Output   |
| 210     | JTAG.TMS    | I         | CMOS 2.8V<br>PP | JTAG Test Mode Select   |
| 211     | VIN         | PWR       | 5V0             |                         |
| 212     | VIN         | PWR       | 5V0             |                         |
| 213     | VIN         | PWR       | 5V0             |                         |
| 214     | VIN         | PWR       | 5V0             |                         |
| 215     | VIN         | PWR       | 5V0             |                         |
| 216     | VIN         | PWR       | 5V0             |                         |
| 217     | VIN         | PWR       | 5V0             |                         |
| 218     | VIN         | PWR       | 5V0             |                         |
| 219     | VIN         | PWR       | 5V0             |                         |
| 220     | VIN         | PWR       | 5V0             |                         |
| 221     | VIN         | PWR       | 5V0             |                         |
| 222     | VIN         | PWR       | 5V0             |                         |
| 223     | VIN         | PWR       | 5V0             |                         |
| 224     | VIN         | PWR       | 5V0             |                         |
| 225     | VIN         | PWR       | 5V0             |                         |
| 226     | VIN         | PWR       | 5V0             |                         |
| 227     | VIN         | PWR       | 5V0             |                         |
| 228     | VIN         | PWR       | 5V0             |                         |
| 229     | VIN         | PWR       | 5V0             |                         |
| 230     | VIN         | PWR       | 5V0             |                         |

Table 4-1: Qseven edge connector description

## 4.2 Image Sensor Connector X4 (Auxiliary-ISM-Connector)

| Pin | Name     | Direction         | I/O Type        | Description                  |
|-----|----------|-------------------|-----------------|------------------------------|
| 1   | VCAMA    | PWR               | -               | Camera Analog Voltage Supply |
| 2   | GND      | PWR               | -               | Power Ground                 |
| 3   | SADDR    | NC                | -               | Not Connected                |
| 4   | NC       | NC                | -               | Not Connected                |
| 5   | GPIO4_0  | O                 | CMOS 2.8V<br>PP | Global Camera Reset          |
| 6   | I2C1.SCL | O – 4k7 pull-up   | CMOS 3.3V<br>OD | Configuration Bus Clock Line |
| 7   | I2C1.SDA | I/O – 4k7 pull-up | CMOS 3.3V       | Configuration Bus Data Line  |



| Pin | Name       | Direction | I/O Type        | Description                |
|-----|------------|-----------|-----------------|----------------------------|
|     |            |           | OD              |                            |
| 8   | NC         | NC        | -               | Not Connected              |
| 9   | GND        | PWR       | -               | Power Ground               |
| 10  | CSI0.PCLK  | I         | CMOS 3.3V<br>PP | Pixel Clock                |
| 11  | CSI0.VSYNC | I         | CMOS 3.3V<br>PP | VSYNC                      |
| 12  | CSI0.HSYNC | I         | CMOS 3.3V<br>PP | HSYNC                      |
| 13  | GPIO4_1    | O         | CMOS 2.8V<br>PP | Camera Trigger             |
| 14  | GPIO4_2    | I         | CMOS 2.8V<br>PP | Strobe Signal from Camera  |
| 15  | NC         | NC        | -               | Not Connected              |
| 16  | NC         | NC        | -               | Not Connected              |
| 17  | CSI0.D0    | I         | CMOS 3.3V<br>PP | Pixel Data                 |
| 18  | CSI0.D1    | I         | CMOS 3.3V<br>PP | Pixel Data                 |
| 19  | VCAMIO     | PWR       | -               | Camera IO Power Supply     |
| 20  | GND        | PWR       | -               | Power Ground               |
| 21  | CSI0.D2    | I         | CMOS 3.3V<br>PP | Pixel Data                 |
| 22  | CSI0.D3    | I         | CMOS 3.3V<br>PP | Pixel Data                 |
| 23  | CSI0.D4    | I         | CMOS 3.3V<br>PP | Pixel Data                 |
| 24  | CSI0.D5    | I         | CMOS 3.3V<br>PP | Pixel Data                 |
| 25  | GND        | PWR       | -               | Power Ground               |
| 26  | CSI0.D6    | I         | CMOS 3.3V<br>PP | Pixel Data                 |
| 27  | CSI0.D7    | I         | CMOS 3.3V<br>PP | Pixel Data                 |
| 28  | CSI0.D8    | I         | CMOS 3.3V<br>PP | Pixel Data                 |
| 29  | CSI0.D9    | I         | CMOS 3.3V<br>PP | Pixel Data                 |
| 30  | CSI0.DE    | O         | CMOS 3.3V<br>PP | Output Enable (Active Low) |

Table 4-2: BLT-ISM-Connector interface description (X4)

### 4.3 Auxiliary I/O Connector X3

All I/O Types are CMOS 3.3V PP.

| Pin | Name      | Direction     | Description           |
|-----|-----------|---------------|-----------------------|
| 1   | 3.3V      | PWR           | Power Supply          |
| 2   | GND       | PWR           | Power Supply          |
| 3   | EN_PERI   | O -1k pull-up | Enable Periphery      |
| 4   | GPIO5_0   | IO            | General Purpose GPIO  |
| 5   | UART1.RXD | IO            | UART1 RxD or GPIO6_18 |
| 6   | UART1.TXD | IO            | UART1 TxD or GPIO6_17 |
| 7   | UART2.RXD | IO            | UART2 RxD or GPIO7_1  |



| Pin | Name        | Direction | Description             |
|-----|-------------|-----------|-------------------------|
| 8   | UART2.TXD   | IO        | UART2 TxD or GPIO7_0    |
| 9   | ECSPI2.MISO | IO        | ECSPI2 MISO or GPIO2_25 |
| 10  | ECSPI2.MOSI | IO        | ECSPI2 MOSI or GPIO2_24 |
| 11  | ECSPI2.SCLK | IO        | ECSPI2 SCLK or GPIO2_24 |
| 12  | ECSPI2.SS0  | IO        | ECSPI2 SS0 or GPIO2_26  |

Table 4-3: Extension Connector interface description (X3)



## 5 Application Information

### 5.1 Qseven Specification

Have a look at the Qseven Specification to get more information about the Qseven standard:

[http://www.qseven-standard.org/fileadmin/spec/Qseven-Spec\\_1.20.pdf](http://www.qseven-standard.org/fileadmin/spec/Qseven-Spec_1.20.pdf)

### 5.2 Differential pairs

All signals/pins named \*\_N/\*\_P (for example: LVDS1.CLK\_N and LVDS1.CLK\_P) are differential pairs which should be routed with a differential impedance of 100Ω for LVDS and SATA or 90Ω for USB for a good signal integrity and to prevent EMI problems.

### 5.3 Signals

All signals which are not differential pairs should be routed with a single ended impedance of 50Ω to minimize EMI.

## 6 Mechanical Outline

### 6.1 Top View

Figure 6-1 shows the top view of the mechanical outline of the Qseven-i.MX537 module. All dimensions are given in millimeters! Outline dimensions +/- 0,5mm.

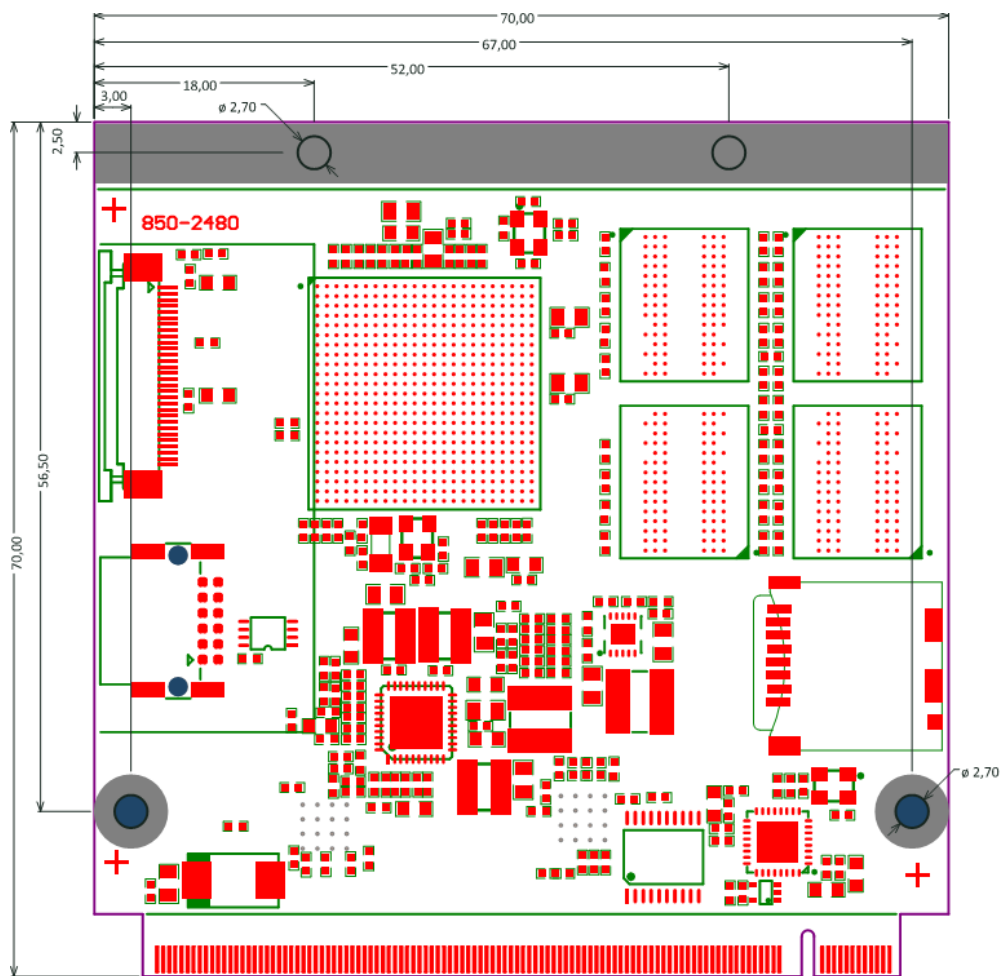


Figure 6-1: Mechanical outline (top view)

### 6.2 MXM Connector

The Qseven module features a 230-pin card-edge connector. The base board has to use the opposite connector (AS0B326-S78N-7F).

| Manufacturer | Part Number             |
|--------------|-------------------------|
| Foxconn      | AS0B326-S78N-7F         |
| Yamaichi     | BEC-0.5-230-S9-xF-R-EDC |

Table 6-1: Compatible Qseven connector types



## 7 Support

### 7.1 General Support

General support for products can be found at Bluetechnix' support site <https://support.bluetechnix.at/wiki>

### 7.2 Board Support Packages

Board support packages and software downloads are for registered customers only  
<https://support.bluetechnix.at/software/>

### 7.3 Blackfin® Software Support

#### 7.3.1 BLACKSheep® OS

BLACKSheep® OS stands for a powerfully and multithreaded real-time operating system (RTOS) originally designed for digital signal processing application development on Analog Devices Blackfin® embedded processors. This high-performance OS is based on the reliable and stable real-time VDK kernel from Analog Devices that comes with VDSP++ IDE. Of course BLACKSheep® OS is fully supported by all Bluetechnix Core-Modules and development hardware.

#### 7.3.2 LabVIEW

You can get LabVIEW embedded support for Bluetechnix Core Modules by Schmid-Engineering AG  
<http://www.schmid-engineering.ch>.

#### 7.3.3 uClinux

You can get uClinux support (boot loader and uClinux) for Bluetechnix Core Modules at  
<http://blackfin.uClinux.org>.

### 7.4 Blackfin® Design Services

Based on more than seven years of experience with Blackfin, Bluetechnix offers development assistance as well as custom design services and software development.

#### 7.4.1 Upcoming Products and Software Releases

Keep up to date with all product changes, releases and software updates of Bluetechnix at  
<http://www.bluetechnix.com>.



## 8 Ordering Information

| Article Number | Name            | Temperature Range |
|----------------|-----------------|-------------------|
| 100-1500-1     | Qseven-i.MX537  | Industrial        |
| 100-1520-1     | DEV-Qseven-i.MX | Commercial        |

Table 8-1: Ordering information

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**NOTE:** Custom Core Modules are available on request! Please contact Bluetechnix ([office@bluetechnix.com](mailto:office@bluetechnix.com)) if you are interested in custom Core Modules.

---



## 9 Dependability

### 9.1 MTBF

Please keep in mind that a part stress analysis would be the only way to obtain significant failure rate results, because MTBF numbers just represent a statistical approximation of how long a set of devices should last before failure. Nevertheless, we can calculate an MTBF of the Core Module using the bill of material. We take all the components into account. The PCB and solder connections are excluded from this estimation. For test conditions we assume an ambient temperature of 30°C of all Core Module components except the Blackfin® processor (80°C) and the memories (70°C). We use the MTBF Calculator from ALD (<http://www.aldservice.com/>) and use the reliability prediction MIL-217F2 Part Stress standard. Please get in touch with Bluetechnix ([office@bluetechnix.com](mailto:office@bluetechnix.com)) if you are interested in the MTBF result.





## 10 Product History

### 10.1 Version Information

#### 10.1.1 Qseven-i.MX537

| Version | Component   | Type                   |
|---------|-------------|------------------------|
| 1.1.0   | Processor   | MCIMX537CVV8C Rev2.1   |
|         | RAM         | MEM2G16D2DABG-25I      |
|         | SPI-Flash   | M25PX32-VMW6E          |
|         | NAND-Flash  | MT29F16G08ABACAWP-IT:C |
|         | ETH PHY     | KSZ8041NLI             |
|         | USB HUB     | KUSB2517I-JZX          |
|         | HDMI Trans. | AD9889BBCPZ-165        |
|         | Audio       | SGTL5000XNAA3R2        |

Table 10-1: Overview Qseven-i.MX537 product changes

### 10.2 Anomalies

| Version | Date       | Description                |
|---------|------------|----------------------------|
| 1.0.0   | 2011-12-09 | No anomalies reported yet. |

Table 10-2: Overview product anomalies



## 11 Document Revision History

| Version | Date       | Document Revision                   |
|---------|------------|-------------------------------------|
| 1       | 2011-11-22 | Preliminary Release of the Document |
| 1       | 2012-01-10 | Processor change to MCIMX537CVV8C   |
| 2       | 2012-11-28 | Updated HUM with new CI-Design.     |

Table 11-1: Revision history



## 12 List of Abbreviations

| Abbreviation          | Description                                 |
|-----------------------|---|
| <b>ADI</b>            | Analog Devices Inc.                         |
| <b>AI</b>             | Analog Input                                |
| <b>AMS</b>            | Asynchronous Memory Select                  |
| <b>AO</b>             | Analog Output                               |
| <b>CM</b>             | Core Module                                 |
| <b>DC</b>             | Direct Current                              |
| <b>DSP</b>            | Digital Signal Processor                    |
| <b>eCM</b>            | Enhanced Core Module                        |
| <b>EBI</b>            | External Bus Interface                      |
| <b>ESD</b>            | Electrostatic Discharge                     |
| <b>GPIO</b>           | General Purpose Input Output                |
| <b>I</b>              | Input                                       |
| <b>I<sup>2</sup>C</b> | Inter-Integrated Circuit                    |
| <b>I/O</b>            | Input/Output                                |
| <b>ISM</b>            | Image Sensor Module                         |
| <b>LDO</b>            | Low Drop-Out regulator                      |
| <b>MTBF</b>           | Mean Time Between Failure                   |
| <b>NC</b>             | Not Connected                               |
| <b>NFC</b>            | NAND Flash Controller                       |
| <b>O</b>              | Output                                      |
| <b>OS</b>             | Operating System                            |
| <b>PPI</b>            | Parallel Peripheral Interface               |
| <b>PWR</b>            | Power                                       |
| <b>RTOS</b>           | Real-Time Operating System                  |
| <b>SADA</b>           | Stand Alone Debug Agent                     |
| <b>SD</b>             | Secure Digital                              |
| <b>SoC</b>            | System on Chip                              |
| <b>SPI</b>            | Serial Peripheral Interface                 |
| <b>SPM</b>            | Speech Processing Module                    |
| <b>SPORT</b>          | Serial Port                                 |
| <b>TFT</b>            | Thin-Film Transistor                        |
| <b>TISM</b>           | Tiny Image Sensor Module                    |
| <b>TSC</b>            | Touch Screen Controller                     |
| <b>UART</b>           | Universal Asynchronous Receiver Transmitter |
| <b>USB</b>            | Universal Serial Bus                        |
| <b>USBOTG</b>         | USB On The Go                               |
| <b>ZIF</b>            | Zero Insertion Force                        |

Table 12.1: List of abbreviations



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