G-Pulse ADCU Solution

系统经理：石丰略
About G-Pulse

Intron Tech (HKSEx#: 1760.HK)

- 900+ Employee
- 600+ Engineer
- 200+ Master
- 1000+ Customer
- 15+ Branch

20-years experience in Automotive electronics

- > 10 Million Automotive controller & sensor
- > 6000m² Engineering Lab
- > 65% R&D Engineer
- > 160 Patent & Copy right
Solutions for Automated Vehicle

Central Gateway

- CAN
- CAN/ETH
- CAN/ETH
- ETH

Body & Comfort
- Powertrain Domain
  - E-Motor
  - BMS
  - DCDC
  - Others

Chassis Domain
- Steering
- Braking
- ABS
- Others

ADAS/AD Domain
- Front Radar
- Front Camera
- Corner Radar
- Others

Infotainment System

Telematics
- ETH

CAN

CAN/ETH

ETH

Infotainment System

Central Gateway

Telematics
Our focus in ADCU development

- Functional Safety & Cyber Security
- Mass Producible computing platform
  - HW platform
  - SW platform (AUTOSAR, RTOS, Hypervisor, MW......)
- Test & Validation
- Continuous Integration & Continuous Delivery
Typical AD Function Topology

Perception Layer
- GNSS*
- IMU*
- Vehicle Sensors*
- Radar*, USS, etc…
- Cameras

Fusion Layer
- Positioning
- Vehicle State Estimation
- Object Detection & Barrier Detection

Scene Understanding

Behavior & Motion Planning
- Behavior Planning
- Path Planning
- Motion Planning

Vehicle Dynamic
- Vehicle Control & Stabilization
- Steering
- Braking
- Accelerating

ASIL-QM~
ASIL-B ~
ASIL-B~D
ASIL-D
CAELUS Architecture for ADCU

Perception Layer
- GNSS*
- IMU*
- Vehicle Sensors*
- Radar*, USS, etc…
- Cameras

Fusion Layer
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- Path Planning
- Motion Planning

Vehicle Dynamic
- Vehicle Control & Stabilization
- Steering
- Braking
- Accelerating

Perception Host
- FGPA / ASIC / GPU (ASIL-QM)

Internal backbone connection

Application Host
- AUTOSAR
- uController (ASIL-D)
MPSoC (ZUx) series ADCU

TC297+ZU2

TC397+ZU5 (9 DRAM Ver.)

TC397+ZU11 9 (9 DRAM Ver.)
MPSoC-based ADCU solution
Recommended SW architecture

**Infineon AURIX**
- Safety Dynamic Control
  - Vehicle
  - Classic AUTOSAR
  - AUTOSAR Runtime Environment

**Xilinx MPSoC UltraScale+**
- Perception
- Fusion
- Path Planning
- Other App.

**G-Pulse Middleware**
- Wind River Linux
- Wind River VxWorks
- Helix Virtualization Platform

**FPGA**
- Expandable ETH-based architecture
- Hypervisor: Decouple S/W from each other

**APU**
- ~ ASIL-B Performance ARM core to support complex algorithm

**RPU**
- RTE: to support Safety on ARM

**FPGA**
- Decouple S/W from each other

**APU**
- Deep/machine learning

**RPU**
- Parallel computing & Deep/machine learning

**Most vehicle control APP could be seamlessly migrated from AURIX**

**AUTOSAR architecture:** Decouple S/W from H/W

**AURIX:** Safety + Security
Open ADCU for Developer User

A ready-to-use package for ADAS/AD developer.
Open ADCU for Developer User

A validated ECU hardware, which could be used as prototype or A-sample.

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-40°C ~ 85°C</td>
<td></td>
</tr>
<tr>
<td>Size (mm)</td>
<td>259<em>132.5</em>40</td>
<td>mm</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>≤0.9kg</td>
<td></td>
</tr>
<tr>
<td>Input voltage</td>
<td>13.5V (Typ)</td>
<td>Voltage range: 9V ~ 16V</td>
</tr>
<tr>
<td>Communication Interface</td>
<td>CAN<em>1  LIN</em>4 100 Base T1*1</td>
<td></td>
</tr>
<tr>
<td>Sensor interface</td>
<td>CAN<em>5  LIN</em>12</td>
<td></td>
</tr>
<tr>
<td>Debug interface</td>
<td>JTAG<em>2, UART</em>2, 1000 Base T*2</td>
<td></td>
</tr>
<tr>
<td>MCU</td>
<td>TC397</td>
<td></td>
</tr>
<tr>
<td>SOC</td>
<td>XAZU5EV</td>
<td></td>
</tr>
<tr>
<td>Video input</td>
<td>MAX9286, MAX9276</td>
<td>HFM, FAKRA</td>
</tr>
<tr>
<td>Video output</td>
<td>MAX9295</td>
<td>HSD</td>
</tr>
</tbody>
</table>
Open ADCU for Developer User

A structured SW platform, to enable rapid application/algorithm development.

TC397
Open ADCU for Developer User

An OPEN platform, to foster customer development.

<table>
<thead>
<tr>
<th>Artefact list</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hardware Datasheet</td>
</tr>
<tr>
<td>2 Hardware User Manuel</td>
</tr>
<tr>
<td>3 Hardware Diagram</td>
</tr>
<tr>
<td>4 Hardware Schematic drawing</td>
</tr>
<tr>
<td>5 Hardware Test Report</td>
</tr>
<tr>
<td>6 Software architect</td>
</tr>
<tr>
<td>7 Software tool-chain application note</td>
</tr>
<tr>
<td>8 Software User Manual</td>
</tr>
<tr>
<td>9 Software Source Code (AURIX + MPSoC)</td>
</tr>
<tr>
<td>10 Application note for MIPI</td>
</tr>
<tr>
<td>11 PC Client</td>
</tr>
<tr>
<td>Etc…</td>
</tr>
</tbody>
</table>
## Application Scenarios - I

<table>
<thead>
<tr>
<th>Host</th>
<th>Development &amp; Evaluation</th>
</tr>
</thead>
</table>
| Safety Host (AURIX)         | ✓ AUTOSAR Platform  
|                             | ✓ Vehicle dynamic control                                                                                                                                  |
| Fusion Host (Cortex-A53)    | ✓ RTOS, eg. Wind River VxWorks  
|                             | ✓ Hypervisor, eg. Wind River HVP  
|                             | ✓ Sensor Fusion (front radar + front camera)  
|                             | ✓ ADAS application, eg. AEB, ACC, FCW, etc…                                                                                                             |
| Perception Host (FPGA)      | ✓ Front camera perception algorithm                                                                                                                         |
## Application Scenarios - II

<table>
<thead>
<tr>
<th>Host</th>
<th>Development &amp; Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Host (AURIX)</td>
<td>✓ AUTOSAR Platform evaluation</td>
</tr>
<tr>
<td></td>
<td>✓ Vehicle dynamic control evaluation</td>
</tr>
<tr>
<td></td>
<td>✓ etc…</td>
</tr>
<tr>
<td>Fusion Host (Cortex-A53)</td>
<td>✓ RTOS, eg. Wind River VxWorks</td>
</tr>
<tr>
<td></td>
<td>✓ Hypervisor, eg. Wind River HVP</td>
</tr>
<tr>
<td></td>
<td>✓ (Multiple) Sensor Fusion algorithm</td>
</tr>
<tr>
<td></td>
<td>✓ Path planning algorithm</td>
</tr>
<tr>
<td></td>
<td>✓ Other algorithm &amp; complex application</td>
</tr>
<tr>
<td></td>
<td>✓ etc…</td>
</tr>
<tr>
<td>Perception Host (FPGA)</td>
<td>✓ Surround view camera perception</td>
</tr>
</tbody>
</table>

![Diagram of ADCU with connectivity to Vehicle Network (CAN/Ethernet)]
## Application Scenarios - III

<table>
<thead>
<tr>
<th>Host</th>
<th>Development &amp; Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Host (AURIX)</td>
<td>✓ AUTOSAR Platform</td>
</tr>
<tr>
<td></td>
<td>✓ Vehicle dynamic control</td>
</tr>
<tr>
<td></td>
<td>✓ etc…</td>
</tr>
<tr>
<td>Fusion Host (Cortex-A53)</td>
<td>✓ RTOS, eg. Wind River VxWorks</td>
</tr>
<tr>
<td></td>
<td>✓ Hypervisor, eg. Wind River HVP</td>
</tr>
<tr>
<td></td>
<td>✓ AI accelerator host (via Ethernet)</td>
</tr>
<tr>
<td></td>
<td>✓ Sensor Fusion algorithm (object fusion, map fusion, etc…)</td>
</tr>
<tr>
<td></td>
<td>✓ Path planning algorithm</td>
</tr>
<tr>
<td></td>
<td>✓ Other algorithm &amp; complex application</td>
</tr>
<tr>
<td></td>
<td>✓ etc…</td>
</tr>
<tr>
<td>Perception Host (FPGA)</td>
<td>✓ Camera perception algorithm</td>
</tr>
</tbody>
</table>

### Diagram:
- ADCU
- Vehicle Network (CAN/Ethernet)
- AI Accelerator
- CAN
- CAN
- CAN
- GMSL
- GMSL
- GMSL
- GMSL
- GMSL
- GMSL
- USS Link
Mission
To foster the development of Automotive Industry in China with cutting-edge technology capability and exceptional service offering.

Vision
To become the greatest service platform for Automotive Electronics Industry.