Fully-Integrated Surround Vision and Mirror Replacement SoC for ADAS/ Automated Driving

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Texas Instruments Inc.
Automotive Processor,
Embedded Processing Division
TDA2PLUS Vision SoC: Block Diagram

**High Speed Interconnect**
- 28 nm

**System Services**
- ARM A15
- ARM M4
- C66x DSP
- EDMA
- WDT
- 15 Timer

**Connectivity & IO**
- McASP
- JTAG
- PCIe
- GMAC x2
- UART x10
- SPI x4
- CAN FD
- GPMC
- QSPI
- CAN x2
- I2C x5
- NAND/NOR

**Display Subsystem**
- Overlay
- GFX Pipeline
- Video Pipeline
- DVOUT
- HDMI

**System Mailbox System**
- x13

**Video Front End**
- 3 Video Input Ports
- CSI-2 Ports

**Display Subsystem**
- ISS 6.5
- Up to 450 Mpix/s

**Video Codec Accelerator**
- IVA HD 1080p Video

**Graphics Engine**
- 2x SGX544

**Programmable Realtime Unit SubSystem (PRU)**

**Video Front End**
- 3 Video Input Ports
- CSI-2 Ports
Multi Display Control

Surround

CMS ECU

Analytics

Auto Interfaces

TDA2Plus SoC (FPDLink based topology)

High Perf. ISP

FPDLink

CAN (Objects information)

DDR

Surround view

Resolution: 880x1080

Auto Interfaces
### External Memory Usage

#### Surround View
- **Configuration**
  - Input: 4 Ch x 2MP@24-30fps
  - Display: 1920x1080@30fps (2MP)

#### CMS
- **Configuration**
  - Input: 2 Ch x 1MP @ 60fps
  - Display: 2x 1280x720@ 60fps (1MP)

#### Detailed Memory Bandwidth Split-up

<table>
<thead>
<tr>
<th>Operation</th>
<th>H</th>
<th>V</th>
<th>BPP</th>
<th>FPS</th>
<th>CH</th>
<th>BW (MB/S)</th>
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<tbody>
<tr>
<td>4x2 MP@30fps capture for SV (WR) RAW</td>
<td>1920</td>
<td>1080</td>
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<td>24</td>
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<td>4x 2MP 30fps capture for SV (WR)</td>
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<td>2x1 MP@60fps capture for CMS (WR) RAW</td>
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<td>720</td>
<td>1.5</td>
<td>60</td>
<td>2</td>
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<td>720</td>
<td>1.5</td>
<td>60</td>
<td>2</td>
<td>165.89</td>
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<tr>
<td>4x 2MP 30fps capture for SV (WR)</td>
<td>1280</td>
<td>720</td>
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<td>Display RGB24</td>
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<td>60</td>
<td>2</td>
<td>165.89</td>
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<td>Deflicker for 2x1MP@60 CMS cameras</td>
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<td>Analytics for 2MP, 3 camera@10fps</td>
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</table>
Processor Cores Loading

**Configuration**

- CPU configurations:
  - Total Number of DSPs = 2
  - Total Number of EVEs = 2
  - Total Number of GPU cores = 2
  - ARM Cortex A15 is free for customers

- Processing details:
  - Surround View Stitching and Top view rendering
  - Analytics: Pedestrian Detection, Animal Detection, Line detection, Lane tracking, Structure From Motion, Free space detection, Kerb detection
  - [Optional]: 4 Channel decode, 1 Channel Encode (Ethernet Use-case)

**Core-wise Loading**

- EVE: 53%
- DSP: 76%
- SGX: 65%
- IVA [Optional]: 92%