Design Guide: TIDEP-01008

Multi-Sensor Platform Reference Design for Jacinto™ ADAS Processors

Description

The Multi-Sensor Platform Reference Design for Texas Instruments™ Jacinto™ TDA3x Advanced Driver Assistance Systems (ADAS) Processors is based on the DesignCore® TDA3x Starter Kit for ADAS from D3 Engineering. This reference design provides qualified developers all the design material to create a fully functioning evaluation platform for testing and development of ADAS applications, for use primarily in the automotive industries and will assist in shortening development time of FPD-Link III based vision and sensing systems.

Resources

TIDEP-01008	Design Folder
TDA3	Product Folder
DesignCore® TDA3x Automotive Starter Kit	Product Folder

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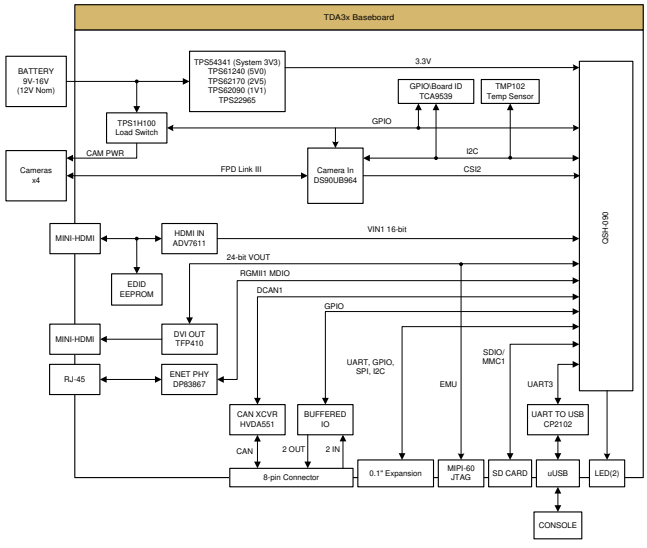
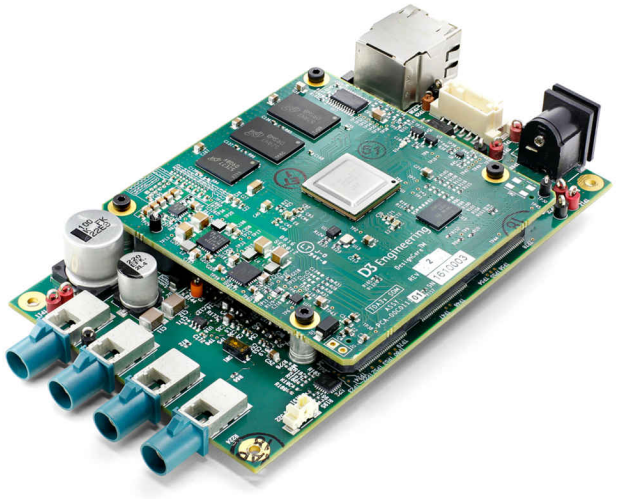
Features

- Compatible with the TDA3x SoC Processor SOM from D3 Engineering
- 4 × FPD-Link III inputs
- HDMI input and output
- USB, CAN bus, and serial connectivity

Applications

- Surround View Systems (SVS ECU)
- Camera Monitoring Systems (Mirror Replacement and In-Vehicle)
- Satellite Radar Systems (Long, Medium, and Short Range)
- Sensor Fusion Systems (ADAS Domain Controller)





1 System Description

The Multi-Sensor Platform Reference Design for Texas Instruments™ Jacinto™ TDA3x Advanced Driver Assistance Systems (ADAS) Processors is based on the DesignCore® TDA3x Starter Kit for ADAS from D3 Engineering. The kits from D3 Engineering are two-part solutions consisting of a processing system on module (SOM) and an application-specific baseboard. This reference design is for an application-specific baseboard. This reference design provides qualified developers all the design material to create a fully functioning evaluation platform for testing and development of ADAS applications, for use primarily in the automotive industries and will assist in shortening development time of FPD-Link III based vision and sensing systems.

Both the completed baseboard and the TDA3x SOM is contained in the full TDA3x Automotive Starter Kit from D3 Engineering. The kit comes ready to use out of the box and includes the processor module, application specific baseboard, power cables, and software. Camera modules, radar modules, displays, calibration tools, and other system components can also be purchased from D3 Engineering to quickly build up a system to support many ADAS use cases. The base support package provides optimized and verified hardware and advanced vision software frameworks to use as a known-good launch point for design and development. The kit also includes a single-use sublicense for all Texas Instruments™ and D3 Engineering firmware and application code.

Throughout this document, the DesignCore® TDA3x Starter Kit may be referred to simply as the TDA3x system or TDA3x module.

2 System Overview

2.1 Block Diagram

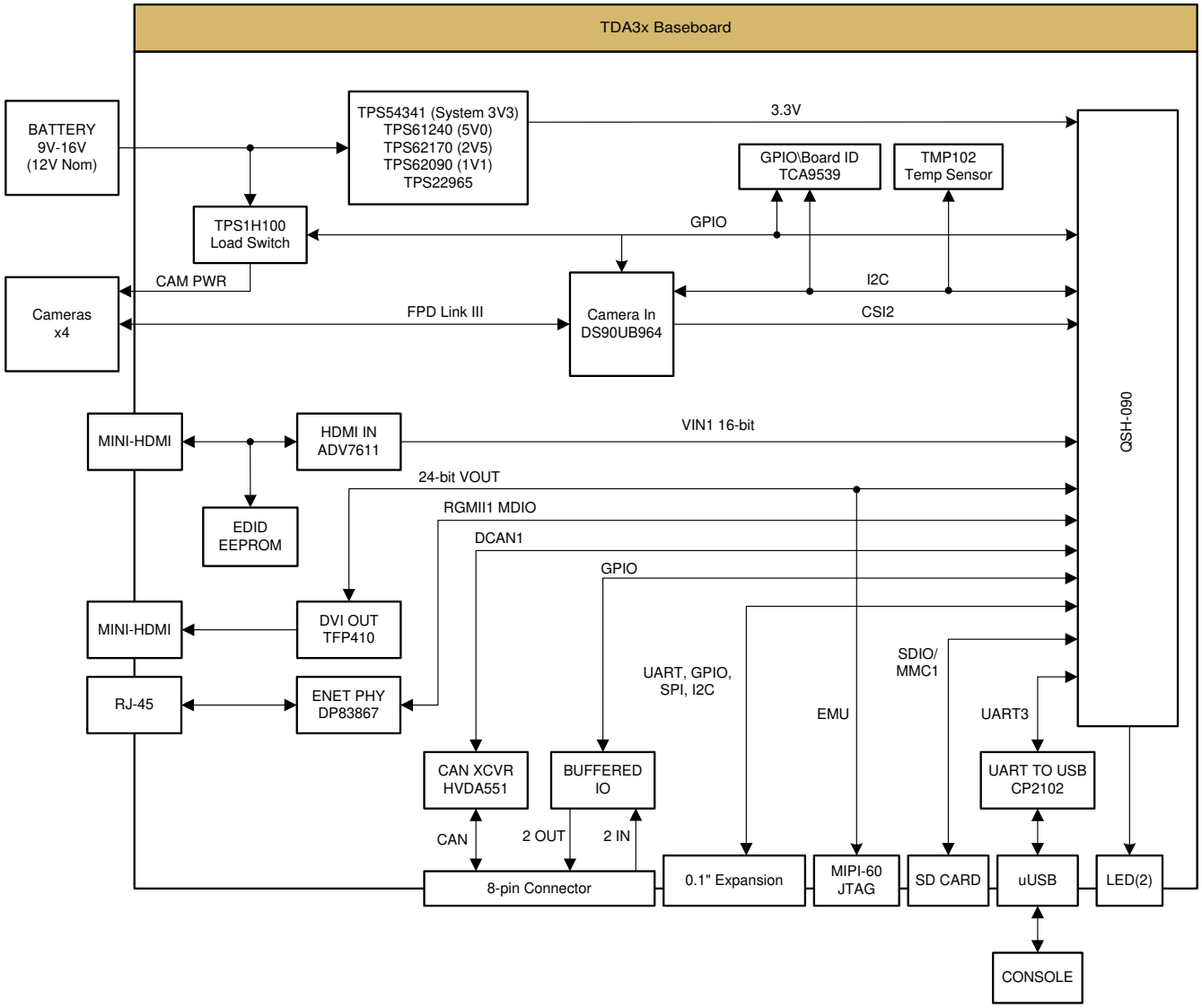


Figure 2-1. TIDEP-01008 Block Diagram

2.2 Design Considerations

2.2.1 TDA3x Applications Processor

This reference design supports the TDA3x application processor. Texas Instruments™ TDA3x System-on-Chip (SoC) is a highly optimized and scalable family of devices designed to meet the requirements of leading Advanced Driver Assistance Systems (ADAS). The TDA3x family enables broad ADAS applications in automobiles by integrating an optimal mix of performance, low power, smaller form factor and ADAS vision analytics processing that aims to facilitate a more autonomous and collision-free driving experience.

The TDA3x SoC enables sophisticated embedded vision technology in today's automobile by enabling the industry's broadest range of ADAS applications including front camera, rear camera, surround view, radar, and fusion on a single architecture. The TDA3x SoC incorporates a heterogeneous, scalable architecture that includes a mix of Texas Instruments™ fixed- and floating-point TMS320C66x digital signal processor (DSP) generation cores, Vision AccelerationPac (EVE), and dual Cortex®-M4 processors. The device allows low power profile in different package options (including Package-On-Package) to enable small form factor designs. TDA3x SoC also integrates a host of peripherals including multi-camera interfaces (both parallel and serial) for LVDS-based surround view systems, displays, CAN and GigB Ethernet AVB. The Vision AccelerationPac for this family of products includes embedded vision engine (EVE) offloading the vision analytics functionality from the application processor while also reducing the power footprint. The Vision AccelerationPac is optimized for vision processing with a 32-bit RISC core for efficient program execution and a vector coprocessor for specialized vision processing.

Additionally, Texas Instruments™ provides a complete set of development tools for the Arm®, DSP, and EVE coprocessor, including C compilers, a DSP assembly optimizer to simplify programming and scheduling, and a debugging interface for visibility into source code execution.

The TDA3x ADAS processor is qualified according to AEC-Q100 standard.

2.2.2 TDA3x Kit Use Cases

The Single-Camera Capture Display Use Cases:

- Capture data from a Single FPD-LinkTM III enabled camera
- Many sensor types are supported with drivers already existing as part of the included software
- Display the data via HDMI

SurroundView Use Cases:

- Capture data from four FPD-LinkTM III enabled cameras
- D3RCM-OV10640 cameras are supported with drivers already existing as part of the included software
- Display the data via HDMI

HDMI Capture and Display Use Cases:

- Capture data from a HDMI source through the HDMI input port
- Display the data via HDMI through the HDMI output port

2.2.3 Power Considerations

- Input voltage range: 9-VDC to 16-VDC operation
- 12-V nominal
- The system is *not* reverse battery protected or transient protected
- Expect no more than 1-A current draw

2.2.4 Display

This baseboard supports an output through an HDMI interface.

2.3 Highlighted Products

This reference design features the following TI devices. Refer to the corresponding data sheets for additional information.

- TDA3x SoC for Advanced Driver Assistance Systems (ADAS)
- DP83867CR
- HVDA551-Q1
- TCA9539 (recommended device for new designs: TCAL6416)
- TFP410
- TMP102
- TPD12S520
- TPD12S521
- TPD2E001
- TPS1H100-Q1
- TPS22965
- TPS54341
- TPS61240
- TPS62090
- TPS62170

3 Hardware, Software, Testing Requirements, and Test Results

3.1 Hardware

The following figures show a possible set up from the reference design implementation. Images below are of the full TDA3x Automotive Starter Kit from D3 Engineering (note that SOM is not part of this reference design).

Note

Images shown are from the TDA3x Automotive Starter Kit.

1. TDA3x system can be connected to a computer to access the debug Serial console. There is a USB Micro B connection, as shown in Figure 3-1.

Figure 3-1. USB Micro B Cable Connected to the Serial Console Debug Port

2. There is a Micro SD Card slot as shown in Figure 3-2.

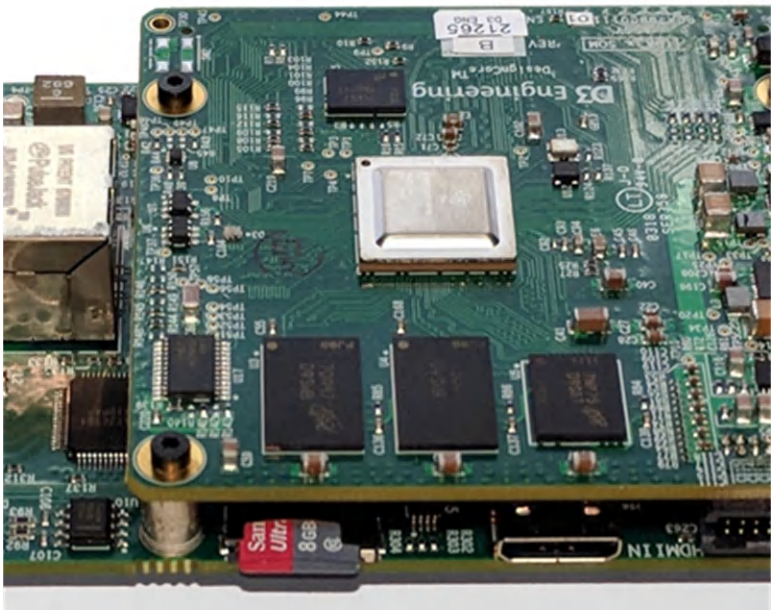


Figure 3-2. Micro SD Card Inserted Into TDA3x System

3. HDMI attached to a display to the TDA3x system in port labeled HDMI OUT, as shown in Figure 3-3.

Figure 3-3. HDMI Mini Connected to the TDA3x System HDMI OUT Port

4. HDMI cable that is attached to a video source (for example, computer) to the TDA3x system in port labeled HDMI IN ,sa shown in Figure 3-4.

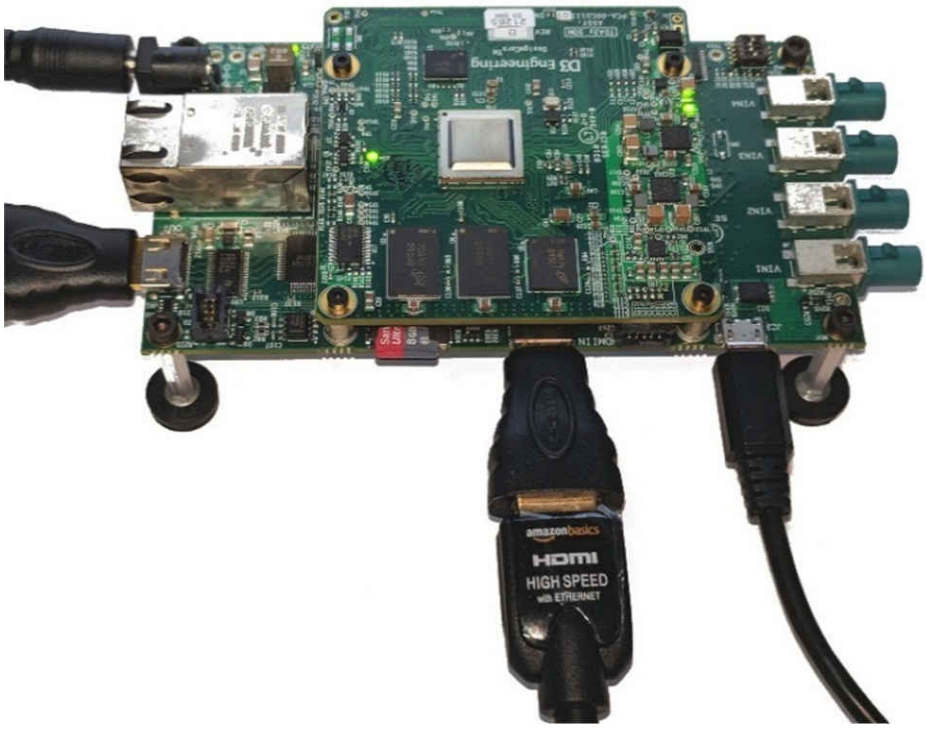


Figure 3-4. HDMI Mini Connected to the TDA3x System HDMI IN Port

5. Power to the TDA3x system, as shown in Figure 3-5.

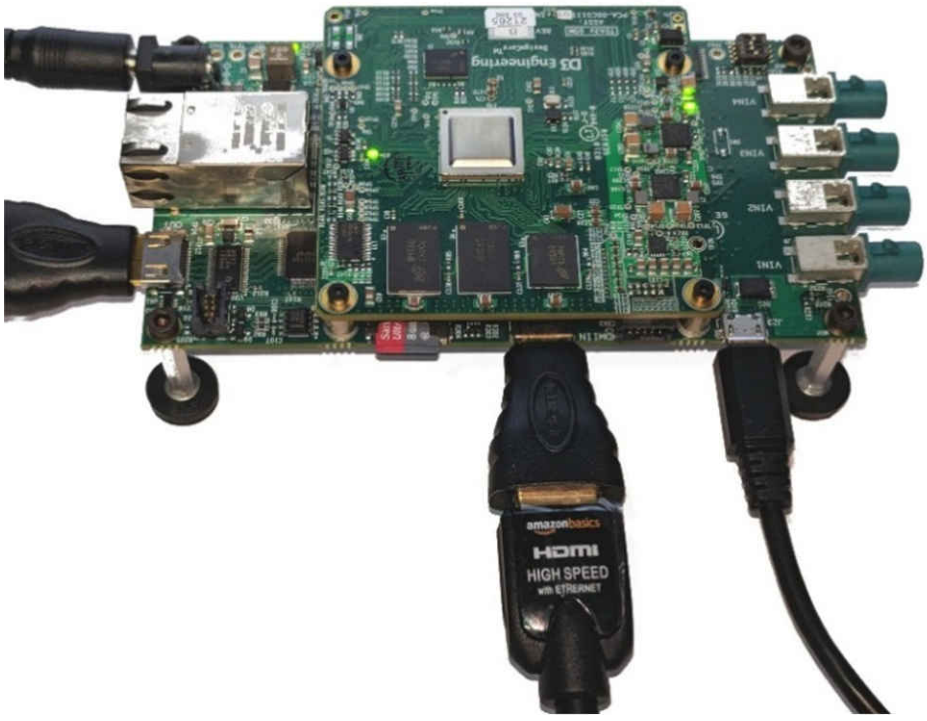


Figure 3-5. TDA3x System Connected to a Power Supply

3.2 Software

Please contact D3 Engineering regarding the latest software to run on the DesignCore® TDA3x Starter Kit (support@D3Engineering.com).

3.3 Testing and Results

Successful load of D3 Engineering software on the DesignCore® TDA3x Starter Kit.

4 Design Files

4.1 Schematics

To download the schematics, see the design files at TIDEP-01008.

4.2 Bill of Materials

To download the bill of materials (BOM), see the design files at TIDEP-01008.

4.3 PCB Layout Prints

To download the layer plots, see the design files at TIDEP-01008.

4.4 Gerber Files

To download the Gerber files, see the design files at TIDEP-01008.

4.5 Assembly Drawings

To download the assembly drawings, see the design files at TIDEP-01008.

5 Trademarks

6 Related Documentation

1. Texas Instruments, *Multi-Sensor Platform Reference Design for TI's Jacinto™ TDA3x ADAS Processors User's Guide*
2. Texas Instruments, *TDA3x SoC for Advanced Driver Assistance Systems (ADAS) Data Sheet*
3. D3 Engineering, *DesignCore® TDA3x Starter Kit Data Sheet*

7 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (December 2018) to Revision A (May 2023)	Page
• Added TCAL6416 as a recommended device for new designs	5

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