Design Guide: TIDA-020093

Single-Chip mmWave Streaming Radar Reference Design for Automotive Front Radar

Description

With more autonomous driving features, the automotive industry shifts to radar value and performance optimization. Radar performance and cost can be improved by raw radar data streaming topologies. This reference design features the AWR2188 radar front end with 8TX and 8RX antenna elements for high angular resolution. Combined with DS90UB971S-Q1 FPD-Link™ serializer for raw data transmission to central processing units and the MSPM0G3519-Q1 controller, the design enables streaming radar applications. The system incorporates a wide-input voltage pre-regulator and a radar Power Management Integrated Circuit (PMIC), delivering ultra-low noise supply essential for radar performance.

Resources

TIDA-020093	Design Folder
AWR2188, MSPM0G3519-Q1	Product Folder
DS90UB971-Q1, CDC6C-Q1	Product Folder
LM68635-Q1, TPS628501-Q1	Product Folder

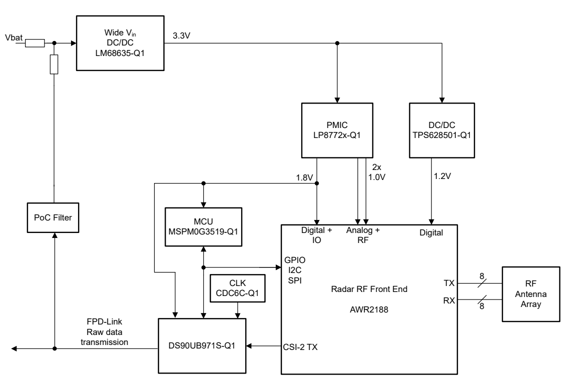
Ask our TI E2E™ support experts

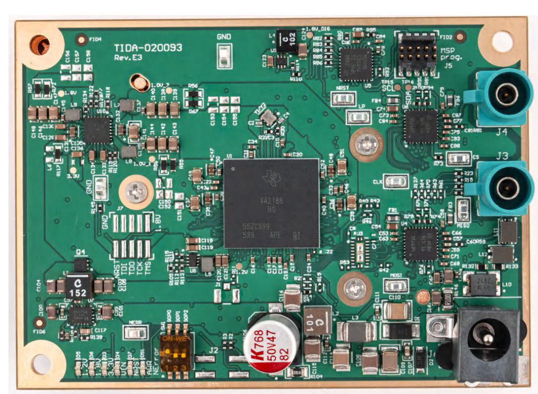
Features

- High performance radar for imaging and long range radar
- 8TX and 8RX 3D waveguide antenna
- Space-optimized design on a single PCB: 82mm × 59mm
- RAW radar data transmission over FPD-Link™
- Power supply optimized for small size, high efficiency, and low noise
- Off-battery power supply or Power over Coax (PoC)
- Diagnostic and monitoring functions for functional safety

Applications

- Satellite, streaming radar for central processing
- Long range radar
- 4D imaging radar





1 System Description

Car manufacturers across the globe are targeting higher levels of autonomous driving by continuously enhancing advanced driver assistance systems (ADAS) features. This radar reference design utilizes TI integrated circuits to build a complete radar module that delivers best-in-class performance by combining the AWR2188 radar transceivers, low noise power supply and FPD-Link analog-to-digital converter (ADC) raw data communication to address the shift of edge processing to streaming radar in the automotive industry.

Streaming radar architecture combined with centralized processing offers significant advantages over traditional edge compute methods by reducing sensor cost, size, weight, and wiring complexity through Power-over-Cable technologies. Additionally, using streaming radar sensors enables system scalability and modularity. The ability to position sensors in more convenient locations around the car enables integration of more ADAS functions. The design can adjust the degree of coverage just by changing the number or configuration of the sensors, thus scaling a single platform from a cost-sensitive low-end vehicle to a differentiated premium vehicle offering with different levels of autonomy. Streaming architecture adds value through a sensor fusion algorithm and the larger computing capability in the central ECU. Simplified streaming radar sensors and differentiation through software can help reduce system complexity and offer new ways of creating value. These benefits – performance, scalability, and simplicity – all contribute to the prominence of the streaming architecture in the automotive industry.

1.1 Key System Specifications

The focus applications for this reference design are front range radar systems for multiple advanced driver assistance systems (ADAS) functions such as adaptive cruise control (ACC), automated emergency braking (AEB), blind spot detection, front cross-traffic assist, and lane change assist. Table 1-1 lists the target[1] system specifications:

Table 1-1. Key System Specifications

8 × 8 PERFORMANCE	DESCRIPTION
Maximum range	Ultra Long Range Mode: up to 350m Long Range Mode: up to 200m Mid-Range Mode: up to 100m
Range resolution	Ultra Long Range Mode: up to 0.43m Long Range Mode: up to 0.29m Mid-Range Mode: up to 0.14m
Maximum velocity	up to –300 to +125kmph
Velocity resolution	up to 0.42kmph
Elevation FoV	up to ± 10 degree
Elevation resolution at boresight	up to 2 degree
Elevation accuracy at boresight	up to 0.28 degree
Azimuth FoV	up to ± 70 degree
Azimuth resolution at boresight	up to 1 degree
Azimuth accuracy at boresight	up to 0.14 degree
Active Chirp	up to 25ms

[1] System specification validation ongoing to confirm performance, deviation possible based on chirp profile and signal processing running on central ECU.

2 System Overview

The radar module can be powered from 12V up to 48V, either through Power over Coax (PoC) or through a barrel jack power supply . The input voltage is stepped down through LM68635-Q1, a wide VIN buck to generate 3.3V. The LP8772x-Q1 then takes the 3.3V input and provides 1.8V and 1.0V rails to supply AWR2188, DS90UB971S-Q1, MSPM0G3519-Q1 and the CDC6C-Q1. The TPS628501-Q1 generates the required 1.2V for the AWR2188. When powered through PoC, both data and power supply are provided through a single coax cable to reduce wiring harness costs and weight.

2.1 Block Diagram

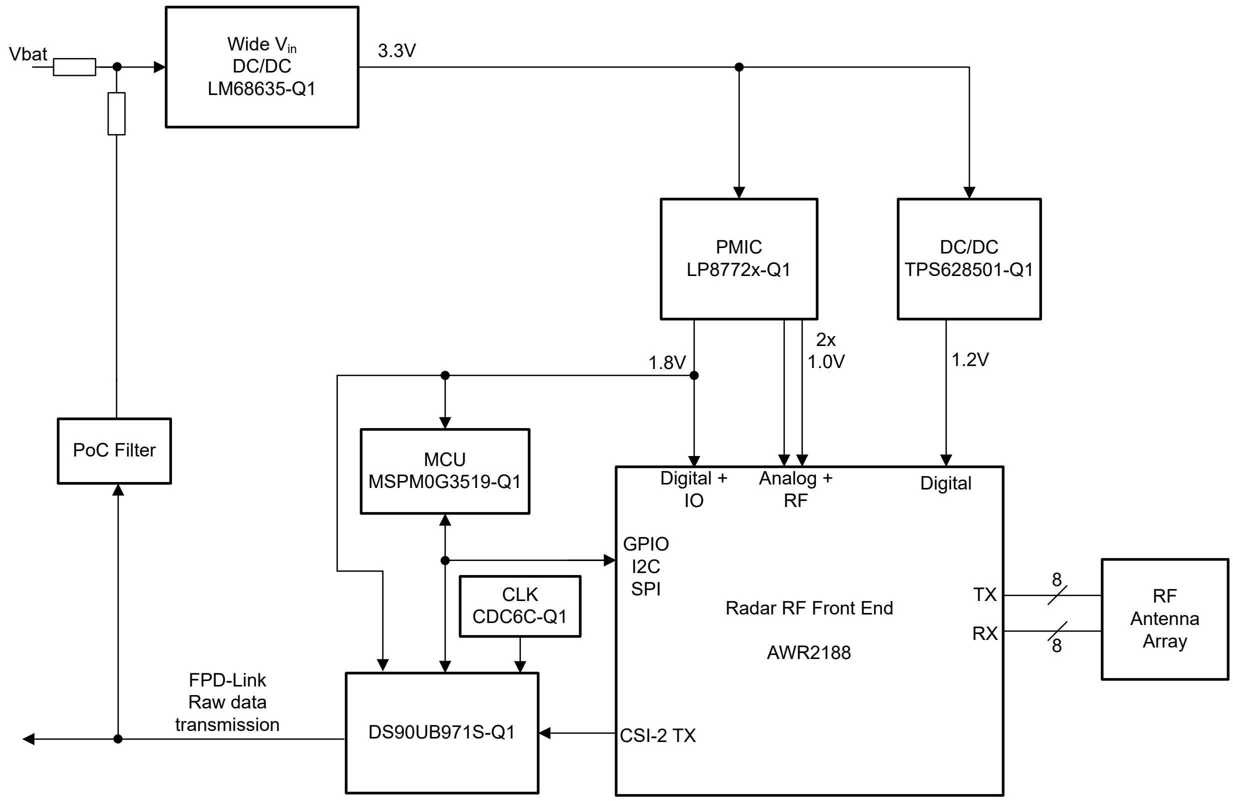


Figure 2-1. TIDA-020093 Block Diagram

2.2 Design Considerations

This streaming radar reference design represents a close-to-end-customer sensing method where each component has been carefully selected to create a seamless, high-performance streaming radar system. At the core, the AWR2188 is a self-contained FMCW transceiver single-chip device radar sensor that simplifies the implementation of Automotive Radar sensors in the band of 76GHz to 81GHz, which delivers exceptional range, resolution, and raw data transmission.

The DS90UB971S-Q1 FPD-Link IV serializer is designed to transmit the radar sensor raw data over a coaxial cable, which also adds support of Power over Coax, simplifying system wiring. The device supports serial peripheral interface and I2C to communicate with the MSPM0G3519-Q1 microcontroller and the LP8772x-Q1 Power Management Integrated Circuit (PMIC). General-Purpose Inputs-Outputs (GPIO) are available to control the reset and the frame sync for the AWR2188.

The CDC6C025000-Q1 Bulk Acoustic Wave (BAW) oscillator provides the clock to the FPD-Link serializer. The low jitter and frequency stability improve the FPD-Link eye diagram and increase system level immunity to interference, such as radiated immunity, Bulk Current Injection (BCI), and system-level electrostatic discharge (ESD) performance.

The MSPM0G3519-Q1 microcontroller replaces flash memory and stores the configuration and firmware. The microcontroller converts I2C to SPI to interact through the APIs from the mmWaveLink application of the host processor and controls the AWR2188. The microcontroller enables boot and run time calibration of AWR2188 and offers specific cybersecurity enablers that support cybersecurity requirements for automotive sensors.

The LM68635-Q1 supports up to 70V input voltage. The higher switching frequency of 2.2MHz enables the design to meet the FPD-Link specification and delivers low noise output voltage to supply the system. The LP8772x-Q1 PMIC with high voltage output accuracy of 1% while providing low noise is the recommended power approach for the AWR2188. The cost, BOM, and space optimized PMIC power approach powers the radar sensor and the principal peripherals. The low noise and ripple performance of the integrated buck regulators meet the AWR2188 noise and ripple performance specifications to provide effective radar performance. The complementary TPS6285018A-Q1 buck converter delivers the 1.2V power rail to the AWR2188.

The radar evaluation board, when combined with a compatible host data capture board, contains everything needed to start evaluating the AWR2188 in a streaming configuration.

2.3 Highlighted Products

2.3.1 AWR2188

The AWR2188 device is an integrated single-chip FMCW transceiver capable of operation in the 76GHz to 81GHz band. The device enables unprecedented levels of integration in an extremely small form factor. AWR2188 is designed for low power, self-monitored, ultra-accurate radar systems in the automotive space.

The AWR2188 device is a self-contained FMCW transceiver single-chip device that simplifies the implementation of Automotive Radar sensors in the band of 76GHz to 81GHz. The device is built on TI's low-power 45nm RFCMOS process, which enables a monolithic implementation of a 8TX, 8RX system with built-in PLL and ADC converters. Simple programming model changes can enable a wide variety of sensor implementation (short, mid, long) with the possibility of dynamic reconfiguration for implementing a multimode sensor. Additionally, the device is provided as a complete platform device including reference hardware design, software drivers, sample configurations, API guide, and user documentation.

2.3.2 DS90UB971S-Q1

The DS90UB971S-Q1 is a serializer which is designed to support ultra-high-speed raw data sensors including 8MP+ Imagers, satellite RADAR, LIDAR, and Time-of-Flight (ToF) sensors. The chip delivers an 7.55Gbps forward channel with an ultra-low latency of 47.1875Mbps bidirectional control channel. The device supports power over a single coax or STP cable. The DS90UB971S-Q1 features advanced data protection and diagnostic features used for automotive applications such as ADAS to achieve functional safety. Together with a companion Texas Instrument's deserializer, the DS90UB971S-Q1 delivers precise multi-camera sensor clock and sensor synchronization. In addition, the device features I2C interface, SPI, and up to 8GPIOs.

The DS90UB971S-Q1 is fully AEC-Q100 qualified with a wide temperature range of –40°C to 115°C. The serializer comes in a small 5mm × 5mm VQFN package for space-constrained sensor applications.

2.3.3 MSPM0G3519-Q1

MSPM0G3519-Q1 microcontrollers (MCUs) are part of the MSP Arm® Cortex®-M0+ 32-bit core platform. The device achieves a good balance of cost, performance, safety, and design flexibility for the automotive environment. To provide stable operation in extreme environments, the MCU adheres to AEC Q100 Grade 1 qualification, supporting an extended temperature range from –40°C to 125°C, and is architected to ASIL-B functional safety level. MSPM0 offers ultimate scalability and flexibility through complete pin-to-pin compatibility, which allows engineers to future-proof the hardware designs, enabling efficient performance scaling and platform consolidation across multiple vehicle programs.

The MSPM0G351x-Q1 delivers high-performance compute (80MHz Cortex-M0+ with math accelerator) alongside tightly integrated analog and digital peripherals in a single automotive-qualified device. The robust memory subsystem of the MCU supports up to 512KB ECC Flash with dual-bank OTA capability and 128KB parity-checked SRAM. Key integration includes two 12-bit 4Msps ADCs, comparators, amplifiers, a 12-bit DAC, and full communication suites (UART, I²C, SPI, CAN FD). Built-in security (AES, TRNG, CRC) provides data integrity. Supported by a mature automotive ecosystem—including production-ready CAN and LIN drivers, MCAL, diagnostics library and reference designs— this device enables rapid development of secure, consolidated ECUs while reducing BOM cost and system complexity.

2.3.4 LM68635-Q1

The LM686x5-Q1 are a family of automotive buck converters designed for high efficiency, high power density, and ultra-low electromagnetic interference (EMI). The converters operate over a wide input voltage range of 3V to 70V (75V tolerant) reducing the need for external input surge protection. The LM686x5-Q1 comes with pin selectable fixed output voltages of 3.3V and 5V or in adjustable configuration. The low EMI operation is enabled with minimized loop inductance and optimized switch node slew rate. The current-mode control architecture with a 30ns typical minimum on-time allows high conversion ratios at high frequencies coupled with a fast transient response and excellent load and line regulation.

The LM686x5-Q1 buck converters are specifically intended for functional safety relevant applications. An array of safety features including ABIST at start-up, redundant and fast VOUT monitoring, feedback path failure detection, redundant temperature sensor, thermal shutdown, and current limiting significantly reduce the residual failure-in-time (FIT).

2.3.5 LP8772x-Q1

The LP8772x-Q1 device meets the power management requirements of the AWR, IWR, and other Monolithic Microwave Integrated Circuits (MMIC) in various automotive and industrial radar applications. The device has three step-down DC/DC converters, an LDO regulator, and a load switch. The LDO receives external power and supplies an Ethernet device or any other device in the system. The load switch cuts off the 3.3V IO supply during the sensor sleep mode. The device operates through I2C communication interface and enable signals.

The low noise step-down DC/DC converters support factory programmed switching frequency of 17.6MHz or 8.8MHz or 4.4MHz. High switching frequency and low noise across wide frequency range, enables LDO-free power approach which helps to reduce the design cost and improve thermal performance. The switching clock is forced to PWM mode for excellent RF performance and can also be synchronized to an external clock. The LP8772x-Q1 device supports remote voltage sensing to compensate IR drop between the regulator output and the point-of-load (POL) which improves the accuracy of the output voltage.

2.3.6 TPS6285018A-Q1

The TPS62850x-Q1 is a family of pin-to-pin 1A, 2A (continuous), and 3A (peak) high efficiency, easy-to-use synchronous step-down DC/DC converters. These devices are based on a peak current mode control topology. These devices are designed for automotive applications such as infotainment and advanced driver assistance systems. Low resistive switches allow up to 2A continuous output current and 3A peak current. In the TPS62850x-Q1, the switching frequency is externally adjustable from 1.8MHz to 4MHz. The devices can also be synchronized to an external clock in the same frequency range. In PWM/PFM mode, the devices automatically enter power save mode at light loads to maintain high efficiency across the whole load range. The family provides a 1% output voltage accuracy in PWM mode which helps design a power supply with high output voltage accuracy.

2.3.7 CDC6C025000-Q1

Texas Instruments' high-precision Bulk-Acoustic Wave (BAW) micro-resonator technology is integrated directly into a package allowing for low jitter clock circuitry. BAW is fully designed and manufactured at TI factories like other silicon-based fabrication processes.

The CDC6Cx-Q1 device is a low jitter, low power, fixed-frequency oscillator which incorporates the BAW as the resonator source. The device is factory-programmed per specific frequency and function pin. With a frequency control logic and output frequency divider, the CDC6Cx-Q1 is capable of generating any frequency from 250kHz to 200MHz, providing a single device family for all frequency needs.

The high-performance clocking, mechanical stability, lower power consumption, flexibility, and small package options for this device are designed for reference clocks and core clocks in automotive applications.

3 System Design Theory

The streaming radar design requires a high-performance processor as well as deserializer to retrieve and to process the radar data on the central compute unit. When powered through PoC, both data and power supply are provided through a single coax cable.

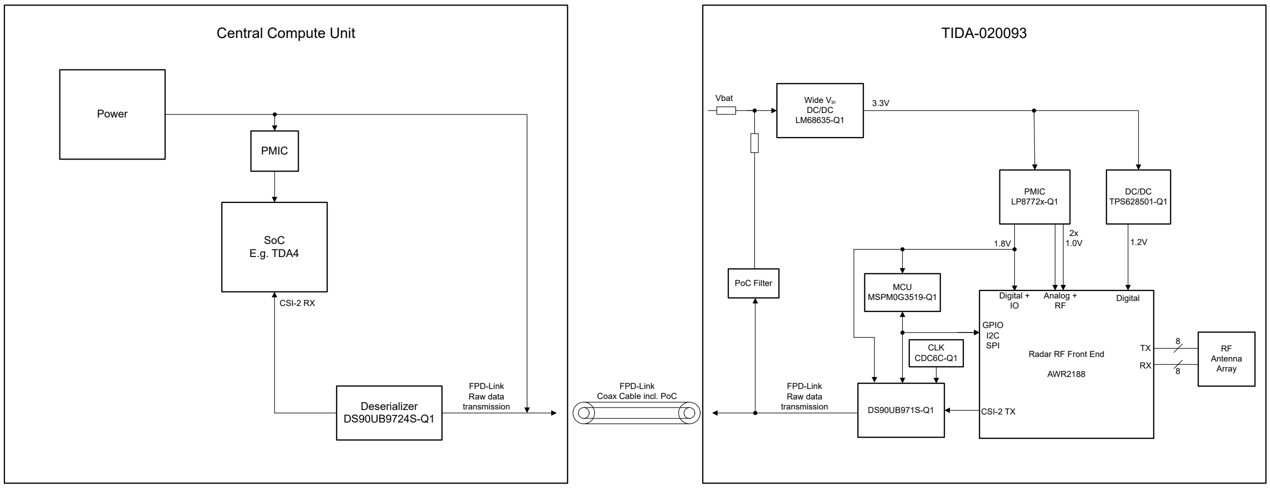


Figure 3-1. Central Compute Unit and Radar Module System Diagram

3.1 Diagnostic and Monitoring Features

For systems with additional safety requirements, diagnostic and monitoring features have been included in this reference design.

Watchdog: The LP8772x-Q1 device includes a Q&A watchdog to monitor software lockup, and a system error monitoring input (nERR) with fault injection option to monitor the lock-step signal of the attached AWR2188. In this implementation, the I2C bus is used for the communication between the PMIC and the MSPM0G3519-Q1. This watchdog requires specific messages from the MSPM0 in specific time intervals to detect correct operation of the MSPM0. When the watchdog detects an incorrect operation of the MSPM0, the LP8772x-Q1 utilizes the nRESET pin to issue a hard reset to the AWR2188.

Voltage Monitors (VMON): The voltage monitoring pins within the LP8772x-Q1 have been connected to the 1V2 generated by TPS6285018A-Q1. In the event of an under voltage or over voltage event, this allows the PMIC to monitor this rail and using nRESET pin to issue a hard reset to the AWR2188. The VMON thresholds and the actions taken during an OV/UV condition are configured in the Non-Volatile Memory (NVM) settings of the PMIC, and are re-configurable over I2C.

3.2 Power over Coax (PoC) Network

The purpose of a Power over Coax network is to separate the high-speed data signal from the DC power signal. The high-speed signal content consists of a high-speed forward channel carrying video and control data to the deserializer and a lower speed back channel carrying control data to the serializer.

To design an appropriate PoC network, consider the frequency range that the network must be able to filter. The PoC network must effectively filter a frequency range from half the back-channel frequency to the forward channel frequency.

This reference design supports FPD-Link in synchronous and non-synchronous mode. The PoC filter needs to support the frequency range of 4.72MHz to 3.775GHz.

Table 3-1. PoC Filter Requirements

DESERIALIZER	SERIALIZER	MODE	BC FREQUENCY	FC FREQUENCY	POC FILTER FREQUENCY RANGE
DS90UB9724S-Q1	DS90UB971S-Q1	Synchronous	47.19MHz	3.775GHz	23.59MHz to 3.775GHz
		Non-Synchronous	9.44MHz	3.775GHz	4.72MHz to 3.775GHz

The selected PoC Filter supports the frequency range of 5MHz to 4.2GHz with a current rating of up to 1000mA at a temperature rating of 115°C

Table 3-2. PoC Filter Component Selection

DESIGNATOR	DESCRIPTION	PART NUMBER	VENDOR
L10	Inductor, 10µH	ADM45FDC-100M	TDK
L11	Inductor, 2.2µH	ADL3225VM-2R2M	
L12			
R132	1kΩ		
R133			

3.3 SPI and I2C Communication Interface

The AWR2188, DS90UB971S-Q1 as well as MSPM0G3519-Q1 supports I2C as well as SPI communication. The board also supports both interfaces. By default, I2C is enabled to communicate between the DS90UB971S-Q1 and MSPM0G3519-Q1. The MSPM0G3519-Q1 communicates through SPI to the AWR2188 and through I2C to the PMIC.

The connection scheme can be modified to connect the DS90UB971S-Q1 through SPI to the AWR2188 directly and communicate through I2C to the PMIC. This way the MSPM0G3519-Q1 can be bypassed in case the MCU is not required. Complete the following to implement this change:

- Populate R36, R61, R62, R63, R64, R69, R70, R127
- Remove R82, R83, R84, R85, R86, R90, R91

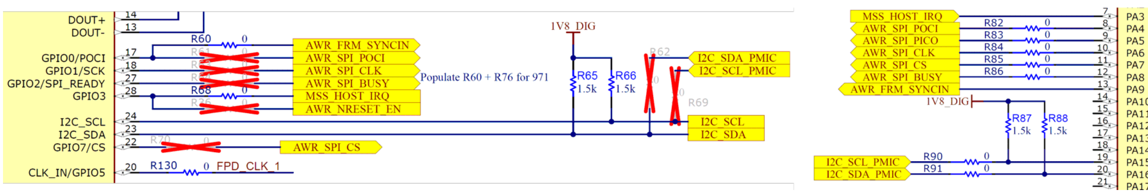


Figure 3-2. Schematic of SPI and I2C Connection

4 Hardware, Software, Testing Requirements, and Test Results

TI provides multiple options to connect the streaming radar reference design to a high-performance host processor for radar processing.

4.1 Hardware Requirements

The data capturing approach with the DCA2000EVM and post-processing through mmWave studio is used to verify the streaming radar module functionality.

Table 4-1. Required Components for Evaluation

QUANTITY	DEVICE DESCRIPTION	DEVICE NUMBER	COMMENTS
1 ×	TIDA-020093 satellite radar module	TIDA-020093	
1 ×	DCA2000EVM raw data capture module	Request now	12V, ≥ 5A barrel jack power supply (2.1mm I.D × 5.5mm O.D. × 9.5mm) • Recommended part number: SDM65-12-U-P5
1 ×	DS90UB9724S-Q1 deserializer adapter card for DCA2000EVM	Request now	12V up to 24V ≥ 2A barrel jack power supply required
1 ×	LP-XDS110 LaunchPad™ TMDS or EMU110-U debug probe	LP-XDS110, TMDSEMU110-U	For programming the MSPM0G3519-Q1. LP-XDS110 requires the following cable: FFSD-05-D-06.00-01-N
2 ×	FAKRA coax cables (3.5GHz+)	for example; TE: 2081376-3	

4.2 Software Requirements

- UniFlash 9.1.0 or higher
- Available through secure access: Request now
  - DCA2000EVM satellite firmware image
  - mmWave Studio 4.5.1.0
  - AWR2188 satellite radar package

To program the MSPM0G3519-Q1 MCU on the reference design, connect the XDS110 debug probe through the Samtec cable with the J5 connector to the ARM serial wire debug (SWD) interface.

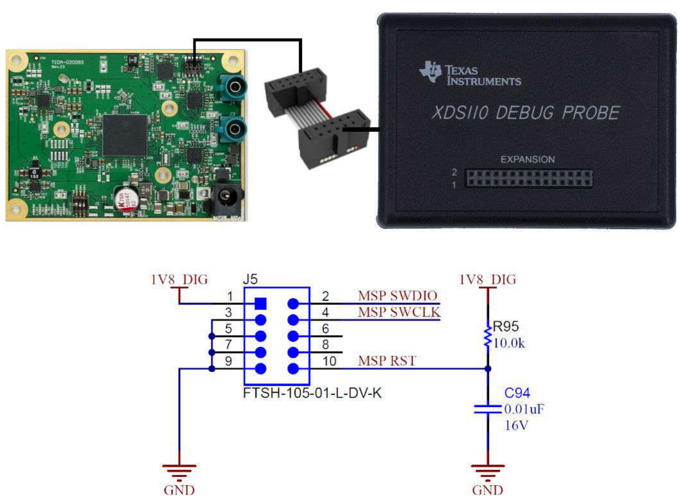


Figure 4-1. MSPM0G3519-Q1 Programming

4.3 Test Setup

4.3.1 Precautions

WARNING

Hot surface! Contact can cause burns. Do not touch!

Some components can reach high temperatures > 55°C when the board is powered on. Do not touch the board at any point during operation or immediately after operating, as high temperatures can be present.

4.3.2 Data Capturing Approach

Figure 4-2 shows the capturing approach with the DCA2000EVM.

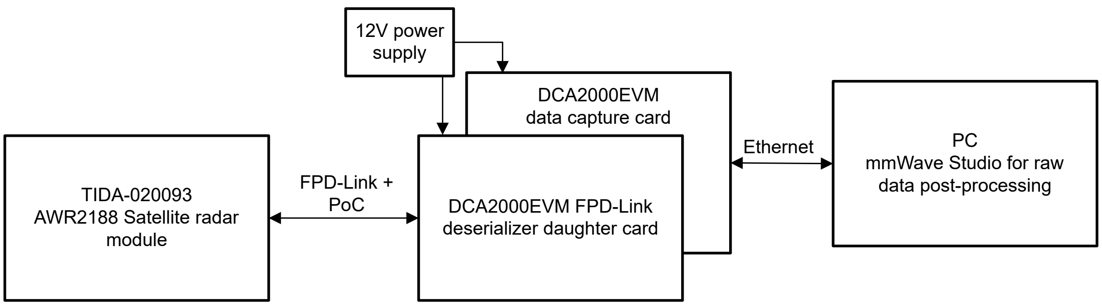


Figure 4-2. DCA2000EVM Radar Data Capturing Setup

The reference design is connected with a coax cable for data transmission to the DCA2000EVM FPD-Link deserializer daughter card. This daughter card includes the DS90UB9724S-Q1 FPD-Link deserializer. The daughter card connects the CSI-2 from the deserializer to the DCA2000EVM through Samtec high-speed connectors. The DCA2000EVM stores the radar data from the AWR2188 on an attached SSD and is able to transmit the recorded data to a PC through a standard Ethernet interface.

5 Design and Documentation Support

5.1 Design Files

5.1.1 Schematics

To download the schematics, see the design files at TIDA-020093.

5.1.2 BOM

To download the bill of materials (BOM), see the design files at TIDA-020093.

5.1.3 PCB Layout Recommendations

5.1.3.1 Launch on Package (LOP Antenna)

This reference design is based on TI’s AWR2188 radar chip which utilizes TI's LoP technology. The radiating element directly radiates into the 3D antenna through a waveguide through the PCB. TI's LoP technology enables direct signal transfer from the package to the antenna, contrasting with the traditional MMIC packages which first transition a signal to the PCB and then to the antenna. The launch is embedded into the package bottom layer and the BGA balls around the launch provide RF shielding of the signals as the signals are propagated into the 3D antenna through the PCB waveguide holes. To check the dogbone cutout of the PCB as well as the mounting hole, positioning holes and borders of the waveguide module, see the TIDA-020093 design files.

5.1.3.2 Power over Coax (PoC)

The PoC filter is placed close to the Fakra connector and consists of multiple inductors to separate the data and power signal. Chose the trace width to provide 50Ω, single-ended characteristic impedance (microstrip or stripline). Approximately 8mils to 10mils is an acceptable recommendation for the trace width to match the impedance and be able to withstand the current drawn. Keep the distance between the Fakra connector and the first inductor of the PoC filter as short as possible.

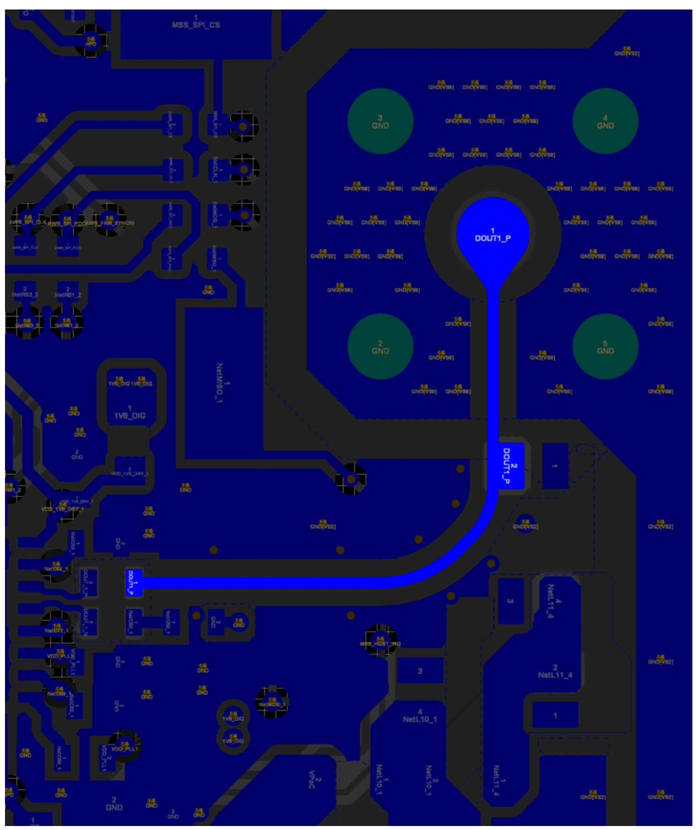


Figure 5-1. FPD-Link™ DOUT1_P PoC Trace

5.1.3.3 PCB Layer Stackup

The following information are PCB layer stackup recommendations. Because the target application is automotive, there are a few extra measures and considerations to take, especially when dealing with high-speed signals and small PCBs:

- Use at least a four-layer board with a power and ground plane. Locate LVCMOS signals away from the differential lines to prevent coupling from the LVCMOS lines to the differential lines
- If using a four-layer board, layer 2 must be a ground plane. Because most of the components and switching currents are on the top layer, this reduces the inductive effect of the vias when currents are returned through the plane.
- Two additional layers are used in this board to simplify BGA fan out and routing. Figure 5-2 shows the stackup used in this six-layer board:

#	Name	Material	Type	Weight	Thickness	Dk	Copper Orientation
	Top Overlay		Overlay				
	Top Solder	Solder Resist	Solder Mask		0.5mil	3.5	
1	Layer 1 - Top Layer		Signal	1oz	1.378mil		Above
	Dielectric 1	FR-4 High Tg	Prepreg		7.992mil	4.4	
2	Layer 2 - GND		Signal	1oz	1.181mil		Above
	Dielectric 2	FR-4 High Tg	Core		0.984mil	4.2	
3	Layer 3 - CSI and Power	CF-004	Signal	1oz	1.181mil		Below
	Dielectric 6	PP-006	Prepreg		7.992mil	4.4	
	Dielectric 4	FR-4 High Tg	Prepreg		4.213mil	4.2	
	Dielectric 7	PP-006	Prepreg		7.992mil	4.4	
4	Layer 4 - GND	CF-004	Signal	1oz	1.378mil		Above
	Dielectric 5	FR-4 High Tg	Core		0.984mil	4.2	
5	Layer 5 - Signal		Signal	1oz	1.378mil		Below
	Dielectric 3	FR-4 High Tg	Prepreg		7.992mil	4.4	
6	Layer 6 - Bottom Layer		Signal	1oz	1.378mil		Below
	Bottom Solder	Solder Resist	Solder Mask		0.5mil	3.5	
	Bottom Overlay		Overlay				

Figure 5-2. PCB Layer Stackup

5.1.3.4 Board Photos

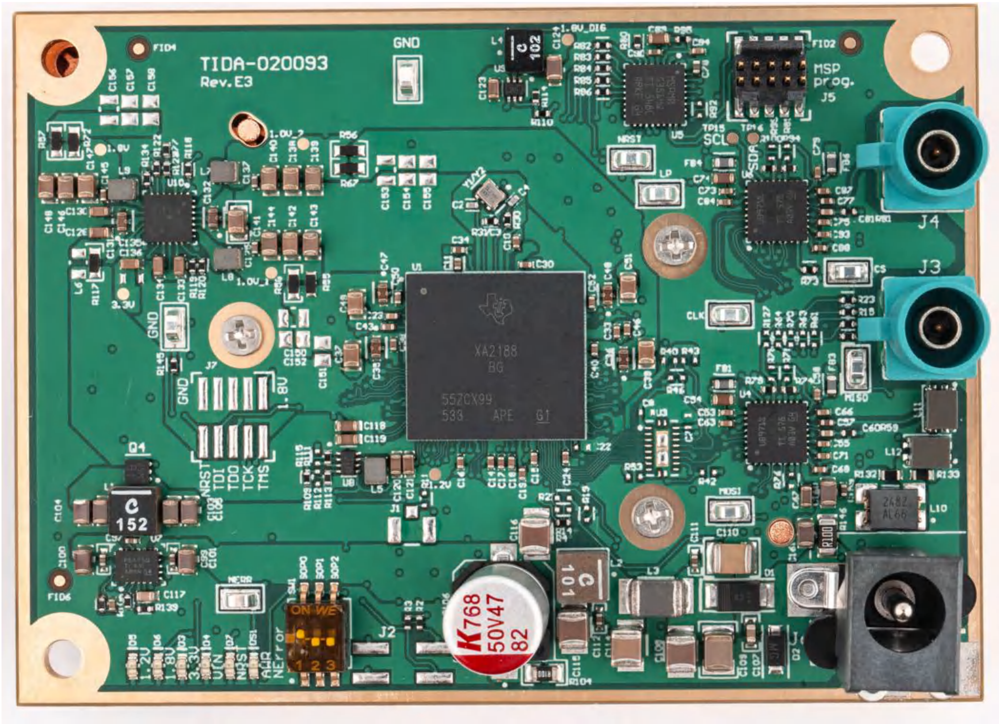


Figure 5-3. Board Side A

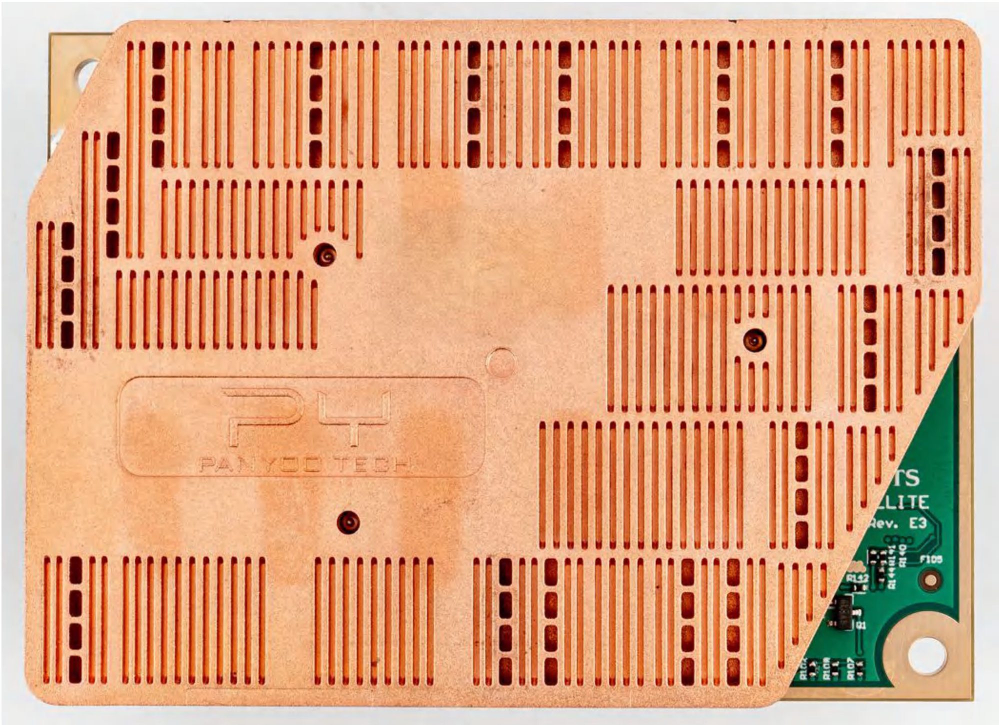


Figure 5-4. Board Side B

5.2 Tools and Software

Tools

DCA2000EVM	Data-capture adapter for radar sensing evaluation module
LP-XDS110, TMDSEMU110-U	XDS110 JTAG Debug Probe
LP87725Q1EVM	LP87725-Q1 evaluation module
DS90UB9724S-Q1EVM	DS90UB9724S-Q1 evaluation module
DS90UB971S-Q1EVM	DS90UB971S-Q1 evaluation module

Software

MMWAVE-STUDIO	mmWave studio
UNIFLASH	UniFlash flash programming tool
CCSTUDIO	Code Composer Studio™ integrated development environment (IDE)
MSPM0-SDK	MSPM0 software development kit (SDK)

5.3 Documentation Support

1. Texas Instruments, *Getting Started with mmWave Sensors Application Note*
2. Texas Instruments, *Design Guide for Functional Safety Compliant Systems Using mmWave Radar Sensors Functional Safety Information*
3. Texas Instruments, *Advancements in mmWave Technology: Launch on Package for Automotive Radars Technical White Paper*
4. Texas Instruments, *FPD-Link ADAS Power-Over-Coax Design Guidelines Application Note*
5. Texas Instruments, *Cybersecurity Enablers in MSPM0 MCUs Technical White Paper*
6. Texas Instruments, *The Fundamentals of Millimeter Wave Radar Sensors Marketing White Paper*
7. Texas Instruments, *Programming Chirp Parameters in TI Radar Devices Application Note*
8. Texas Instruments, *mmWave Device Firmware Package (DFP)*

5.4 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

5.5 Trademarks

FPD-Link™, TI E2E™, LaunchPad™, Code Composer Studio™, and are trademarks of Texas Instruments.
Arm® and Cortex® are registered trademarks of Arm Limited.
All trademarks are the property of their respective owners.

6 About the Author

YANNIK MUENDLER is a systems engineer on Texas Instruments' Automotive ADAS Systems Engineering and Marketing team. He specializes on external ADAS sensors such as radar and high-performance compute units. He also focuses on high speed interfaces such as single-pair Ethernet and FPD-Link™. Yannik holds a master of engineering in electrical engineering from Landshut University of Applied Science in Germany.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale, TI’s General Quality Guidelines, or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.