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Report

on the

Certificate

Z10 088989 0023 Rev. 00

of the

Safety Component
RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843

Applicant

Texas Instruments Incorporated

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Report No.: TD98072C

Version 1.0 of 2022-01-18

Testing Laboratory for Safety Components

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Modification History

Rev.	Status	Date	Author	Modification / Description
1.0	Active	2022-01-18	Axel Köhnen	

Table 1: Modification history

1 Target of Evaluation (ToE)

In August 2018 Texas Instruments Incorporated requested TÜV SÜD Rail GmbH to test and certify the RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 up to ASIL B according to ISO 26262:2018. Additionally, the systematic capability for ASIL D according to ISO 26262:2018 was requested to be tested. The project number related to this Technical Report is 717518286. It covers the ASIC hardware as well as the software. The ToE is a product used in safety related applications. The following devices are covered:

- AWR1243
- AWR1642
- AWR1843
- AWR2243
- AWR6443
- AWR6843

2 Scope of Testing

2.1 Test Specimen

The mission of the RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 based application is to identify an object in a specified range. When used in conjunction with MCU/Processor that implements radar signal processing algorithms, Radar front end sensors are used to measure the object's

1. Range
2. Velocity (Relative)
3. Angle of Arrival

The above three information's about the object opens up scope for many automotive applications.

2.2 Nomenclature and Identification of RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843

The RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 tested is identified by hardware and software version as follows:

2.2.1 Nomenclature and Identification of Front End SensorAWR1243

Name	Silicon Rev.	Package	Datasheet
AWR1243FBIGABLQ1	2	FCBGA-161	SWRS188
AWR1243FBIGABLRQ1			

Table 2: HW Identification of AWR1243

Name	Date	SW	Remarks
RadarSS Firmware	2020-06-11	ROM: 2.0.0.1 PATCH: 1.2.6.11	Binary delivered as part of the Device Firmware Package, version 01.02.06.03
MSS Firmware (ES3.0 only)	2020-06-11	ROM: 1.10.0.20 PATCH: 1.2.6.12	MD5 for DFP 01.02.06.03: ace1d018571487691e8bfbb255df4beb *mmwave_dfp_01_02_06_03_win32.exe

Table 3: SW Identification of AWR1243

2.2.2 Nomenclature and Identification of Single Chip Sensor AWR1642

Name	Silicon Rev.	Package	Datasheet
AWR1642ABIGABLQ1	2	FCBGA-161	SWRS203
AWR1642ABIGABLRQ1			
AWR1642ABISABLQ1			
AWR1642ABISABLRQ1			

Table 4: HW Identification of AWR1642

Name	Date	SW	Remarks
RadarSS Firmware	2020-06-11	ROM: 2.0.0.1 PATCH: 1.2.6.11	Binary delivered as part of the Device Firmware Package, version 01.02.06.03
MSS Firmware	2020-06-11	ROM: 1.10.0.20 PATCH: 1.2.6.12	MD5 for DFP 01.02.06.03: ace1d018571487691e8bfbb255df4beb *mmwave_dfp_01_02_06_03_win32.exe

Table 5: SW Identification of AWR1642

2.2.3 Nomenclature and Identification of Single Chip Sensor AWR1843

The RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 tested is identified by hardware and software version as follows:

Name	Silicon Rev.	Package	Datasheet
AWR1843ABGABLQ1	2	FCBGA-161	SWRS222
AWR1843ABGABLRQ1			
AWR1843ABSABLQ1			
AWR1843ABSABLRQ1			

Table 6: HW Identification of AWR1843

Name	Date	SW	Remarks
RadarSS Firmware	2020-06-11	ROM: 2.0.0.1 PATCH: 1.2.6.11	Binary delivered as part of the Device Firmware Package, version 01.02.06.03 MD5 for DFP 01.02.06.03: ace1d018571487691e8bfbb255df4beb *mmwave_dfp_01_02_06_03_win32.exe
MSS Firmware	2020-06-11	ROM: 1.10.0.20 PATCH: 1.2.6.12	

Table 7: SW Identification of AWR1843

2.2.4 Nomenclature and Identification of Front End Sensor AWR2243

Name	Silicon Rev.	Package	Datasheet
AWR2243ABGABLQ1	2	FCBGA-161	SWRS223
AWR2243ABGABLRQ1			
AWR2243APBGABLQ1			
AWR2243APBGABLRQ1			

Table 8: HW identification of AWR2243

Name	Date	SW	Remarks
RadarSS Firmware	2021-05-21	ROM: 2.2.0.13 PATCH: 2.2.3.3	Binary delivered as part of the Device Firmware Package, version 02.02.03.01 MD5 for DFP 02.02.03.01: 4085eed2f300ad8e1e33577985d64767 *mmwave_dfp_02_02_03_01_win32.exe 31cedf3ec7b3f0a2e79978925ae1f52d *mmwave_dfp_02_02_03_01.zip
MSS Firmware	2021-05-21	ROM: 2.2.1.7 PATCH: 2.2.2.0	

Table 9: SW identification of AWR2243

2.2.5 Nomenclature and Identification of Single Chip Sensor AWR6x43

Name	Silicon Rev.	Package	Datasheet
AWR6443ABGABLQ1	2	FCBGA-161	SWRS248
AWR6443ABGABLRQ1			
AWR6843ABGABLQ1			
AWR6843ABGABLRQ1			
AWR6843ABSABLQ1			
AWR6843ABSABLRQ1			

Table 10: HW Identification of AWR6x43

Name	Date	SW	Remarks
RadarSS Firmware	2020-09-02	RAM 6.3.2.6	Binary delivered as part of the Device Firmware Package, version 06.03.02.01 MD5 for DFP 06.03.02.01: 2a094955e9b96e516fb3e3aeb53d274d (Windows) 4761f2e4e44c65feed58b7b0a8766e03 (Linux)
Bootloader	See device identification in Table 10		

Table 11: SW identification of AWR6x43

3 Certification Requirements

The certification of the RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 will be according to the regulations and standards listed in clause 4 of this document. This will certify the successful completion of the following test segments.

I. Functional Safety including
- Functional safety management (FSM) and safety lifecycle
- Avoidance of systematic faults / Systematic capability
- Hardware safety requirements (including assumptions of use)
- Analysis of the device structure (IP/Element FMAs)
- Software Safety Requirements
- Analysis of the device structure (IP FMAs)
- Dependent Failure Analysis (DFA)
- Criteria for coexistence of elements
- Quantitative analysis of the hardware (FMEDA)
- Fault injection and simulation
- Hardware functional test and design verification
- Hardware qualification
- Software functional test and design verification
- Development tool qualification

II. Safety information in the product documentation (safety manual, user manual, installation and operating instructions).

III. Product-Related Quality Assurance in Manufacture and Product Development

Certification is dependent on successful completion of all above listed test segments. The testing follows the basic certification scheme for Safety Components of TÜV SÜD Rail GmbH.

3.1 Certification Documentation

The detailed technical evaluation is documented in the most recent version of the Technical Report:

Document No.	Description	Project No.
TD97730T	Technical Report AWR1243 Hardware	717518286
TD97859T	Technical Report AWR1642/1843 Hardware	717518286
TD95756T	Technical Report DFP 01.02.06.03 Software	717518286
TD97175T	Technical Report AWR2243 Hardware	717518286
TD97177T	Technical Report DFP 02.02.03.01 Software	717518286
TD96309T	Technical Report AWR6x43 Hardware	717518286
TD96416T	Technical Report DFP 06.03.02.01 Software	717518286
Safety related requirements, conditions and restrictions can be found in the following user documentation		
-	xWR_Front_End_Sensor_Safety_Manual.pdf	717518286
-	xWR_Single_Chip_Sensor_Safety_Manual.pdf	717518286

Table 12: Technical Reports and User Documents

Based on the specified purpose of use of the RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 in safety critical applications, the certification is based on the set of standards listed in clause 4 of this document. The issuance of the certificate states compliance with these references unless specifically noted otherwise.

4 Standards and Guidelines

The regulations and guidelines which form the basis of the type testing are listed below.

4.1 Functional Safety Standards

No.	Reference	Description
/N1/	ISO 26262-2:2018 (ASIL B, Systematic Capability ASIL D)	Road vehicles — Functional safety — Part 2: Management of functional safety
/N2/	ISO 26262-5:2018 (ASIL B, Systematic Capability ASIL D)	Road vehicles — Functional safety — Part 5: Product development at the hardware level
/N3/	ISO 26262-6:2018 (ASIL D)	Road vehicles — Functional safety — Part 6: Product development at the software level
/N4/	ISO 26262-7:2018 (ASIL B, Systematic Capability ASIL D)	Road vehicles — Functional safety — Part 7: Production and operation
/N5/	ISO 26262-8:2018 (ASIL B, Systematic Capability ASIL D)	Road vehicles — Functional safety — Part 8: Supporting processes
/N6/	ISO 26262-9:2018 (ASIL B, Systematic Capability ASIL D)	Road vehicles — Functional safety — Part 9: Automotive Safety Integrity Level (ASIL)-oriented and safety-oriented analyses

Table 13: Functional safety standards

4.2 Quality Management System

No.	Reference	Description
[M1]	QMS	Quality Management System TÜV SÜD Rail GmbH
	TR_RA_P_04.50	Test Program Functional Safety TR_RA_P_04.51 Definition Scope of testing TR_RA_P_04.07 Product Modification TR_RA_P_04.52 Concept Phase & Safety Lifecycle TR_RA_P_04.53 Detail Phase Hardware TR_RA_P_04.54 Detail Phase Software TR_RA_P_04.55 Safety Manual TR_RA_P_04.56 Result of Testing
[M2]	D-IS-11190-01-00	DAkkS accreditation according to DIN EN ISO/IEC 17020:2012; inspection body type A
[M3]	D-PL-11190-08-00	DAkkS accreditation according to DIN EN ISO 17025:2018 / EN ISO/IEC 17025:2017

Table 14: Quality Management System

5 Results

5.1 Functional Safety

The tests performed and quality assurance measures implemented by Texas Instruments Incorporated have shown that the RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 complies with the tailored testing criteria specified in clause 4 subject to the conditions defined in clause 6.

The RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 was proven to meet the systematic capability for ASIL D according to ISO 26262:2018. The RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 provides safety mechanisms implemented on-chip and safety mechanisms to be implemented by the system integrator. By using the different safety mechanisms, the Safety MCUs can be used to support safety functions up to ASIL B in accordance with ISO 26262:2018.

6 Implementation Conditions and Restrictions

The use of the RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 in a safety related application shall comply with the safety manual, and the following implementation and installation requirements have to be followed if the RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 is used in safety-related systems:

- The guidelines and requirements specified in the user documentation shall be followed. Especially the requirements of the system integration section of the safety manual have to be regarded.
- The impact on the overall safety concept and the safety function has to be well understood and analyzed if a safety mechanism described in the safety manual is not used.
- All safety mechanisms implemented by the system integrator have to be developed and verified according to the targeted safety standards.
- All specific characteristics and behaviors of the RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 required by the final safety function have to be developed and verified according to the targeted safety standards. This includes also timing aspects like reaction times, test intervals or test execution times.
- The system integrator has to understand the conditions and restrictions defined in the documentation of the RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843.

7 Certificate Number

This report specifies technical details and implementation conditions required for the application of RADAR ASIC AWR1243, AWR1642, AWR1843, AWR2243, AWR6443, AWR6843 to the certificate:

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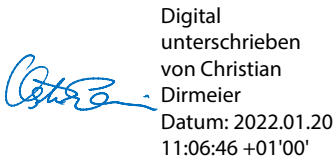
Munich, 2022-01-18



Christian Dirmeier
(Technical Certifier)

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