Title:	RD45 Reference Integration Note

Project:	RD45	Doc-ID:	RD45 Reference Integration Note
Author:	Richard Barbier	Version:	a01
Date:	25/11/2011	Status:	Reviewed

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Chief Architect	P. Le Mouzer	
CoC BT group leader	C. Ambrosino	

Purpose:

Purpose:

The purpose of this document is to describe RD45 multimedia radio end user product, in order to get Bluetooth qualification.

Scope (validity area & date, replaced documents):

This document forms the Reference Integration Note for “RD45 RADIO” end user product w, which is registered under Bluetooth Qualify Design ID (QD ID) B018123.

Audience:

The intended readers of this document are all Members of Bluetooth BQE.

Maintenance:

This is the first version (Rev. a01) of this document. It shall be released before Bluetooth Qualification finalization. It will be updated on major changes.

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1. PREFACE

Disclaimer and Copyright Notice

1.1 RIN Template Instructions

This document is a basic template for use by Bluetooth Members who Qualified Designs are intended to be further integrated to create other Bluetooth product implementations. The Bluetooth SIG is providing this document as a reference guide for a Member in creating a Reference Integration Note (RIN). This document, or one of similar content, is required for Component manufacturers and optional for manufacturers of other Bluetooth product types.

1. Fill out the fields as detailed below. This form may be modified and additional sections, photographs, charts, tables may be added as needed. Where bolded brackets denoted in blue color exist, fill in Company information as requested.
2. Add any additional requirements necessary for the integration of the Qualified Design and as required to demonstrate the requirements met in the Design's qualification.
3. Save a copy of this RIN to Adobe PDF naming it as required by your Company documentation policy.
4. Upload this document onto the Qualification Listing Interface (QLI) Web site prior to qualification of this Design.

1.2 What is a Reference Integration Note

This section explains the requirement of a RIN and has been placed within this document solely to provide further understanding of the requirements of a RIN as a part of the Bluetooth Qualification Program. The definition within Bluetooth PRD 2.0 states that a RIN is the instructions from the Member manufacturing the Bluetooth

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Component Product on how the Bluetooth Component Product is integrated.

1.2.1 Minimum Requirements for a RIN

Prior to the qualification of a Bluetooth Qualified Design, a RIN document is required for any Bluetooth Components and optional for any other Bluetooth product type. A completed RIN document published on the QDL is required to have sufficient detail so that a Member or their BQE can evaluate the applicability of a Component's pre-tested functionality toward the qualification of an End product design.
Additionally, for other Bluetooth product types the use of a RIN may be a necessary document to further describe the integration of such product type into new Bluetooth implementations, such as a Subsystem's Compliant Portion toward the conformance test requirements of a System Under Test (ref. PRD 2.0).

A Member or their BQE who will subsequently use this RIN Design to qualify a complete Bluetooth solution consisting of a pre-tested and qualified Bluetooth Component should not need more information than what is available on the Web site and should be able to list their product without any further questions to either the Member or their BQE who has listed the Bluetooth Component on the Web site.

The following information shall be included in the Reference Integration Note:

Test setup (hardware / software reference platform) for upper and lower tester:
Hardware / software reference platform for upper and lower tester
Hardware (e.g. PC, type, processor, version, memory, used radio part / module)
Software (Kind of software, e.g. operating system, version)
Interface description
Component
Description of the component
Interface description to the lower layers (if applicable)
Interface description to the upper layers (if applicable)
Note: If a special interface is used a detailed description is required.

Note: The contents of a RIN stated above are required for Bluetooth Component product types and optional for other Bluetooth product types. However, the use of the RIN should be utilized by Members who product type is likely to be further integrated into other Bluetooth product implementations. Doing so would further protect the Member from questions from the Bluetooth SIG regarding their design and decrease the likelyhood that a subject design will be audited by the Bluetooth SIG in accordance with the PRD and Qualification Enforcement Program.

1.3 Who should read this RIN guide

This guide provides user information about the Bluetooth «RD45 RADIO» system. Anyone interested in understanding or modifying this hardware and software design should read this guide.

Additionally, include this statement;
"This guide is targeted to help a Bluetooth Member or their BQE understand the role of the **"RD45 end product CAR Radio"** in a complete Bluetooth wireless product being integrated for qualification. The Bluetooth Program Reference Document requires that all Bluetooth Components have a Reference Integration Note (RIN) as a pre-requisite for qualification. This RIN has been uploaded to the Bluetooth SIG Qualification Listing Interfaces for the **Qualified Design ID B018123** prior to qualification of this design."

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2 PRODUCT OVERVIEW

2.1 HARDWARE FEATURES

2.1.1 Product Type Declaration

This design is listed as a Bluetooth End Product on the Bluetooth SIG Qualified Design List (QDL) B018123. Further use of this design to create subsequent Bluetooth implementations can be achieved without further qualification provided that the resulting implementation has no negative material impact on the Bluetooth performance or functionality of the design, and the subsequent implementation is listed on the Bluetooth End Product List (EPL) by the integrator of this design. There is no charge for listing your product on the EPL and you do not desire to have this listing publicly displayed, you can choose to not

2.1.2 Hardware Features

Radio Controller:	Texas Instrument TMS 470
	CarDSP NXP Dirana2 SAF 7730
Bluetooth & DAB Host:	Analog Device BF525
Bluetooth controller	CSR BlueCoreC6 Rom
Power supply	
Class D Audio amplifier	
Radio tuner FM/AM	
USB controller	
CD drive	

2.1.3 Standard Operating Conditions

This product is for automotive market.

Operating Voltage supply is 12 V.

Operating temperature range is -20 to +70 °C

2.1.4 Application

The system is a “Car radio and infotainment system”. It is made of HW modules with embedded SW.

2.1.5 System Overview

RD45 Car radio product is mainly composed of 4 modules.

- Radio Controller is master module of the system, it is called Host; It drives AM/FM tuner for analog radio features
- Audio processor based on a car Digital Signal Processor; also to provides audio settings and ambiance
- Multimedia controller for CD, USB and iPod features;
- Bluetooth Core is included in ADI BF 525 processor connected to Host processor, it is called CoDSP. It includes BT stack and profiles (provided by a 3rd party supplier iAnywhere). It is connected to a HCI controller to provide BT connectivity features
- DAB Core (optional) is also included in ADI BF 525 processor. It is connected to DAB tuner to provide radio digital features.

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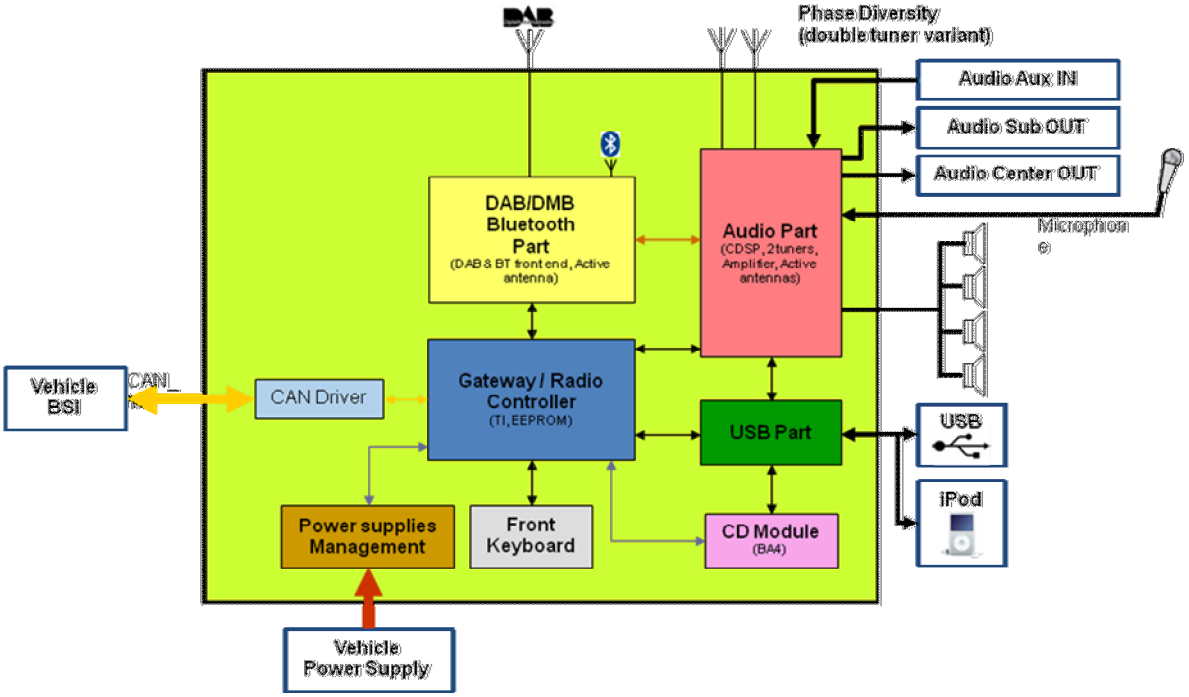
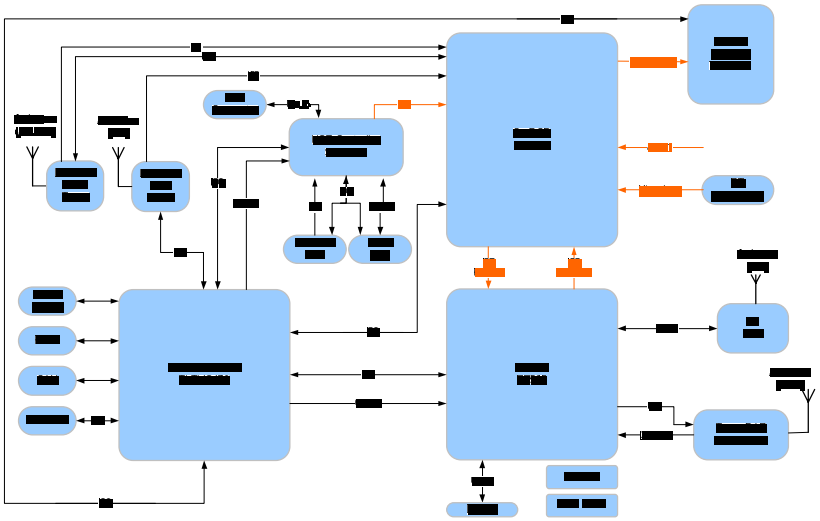


2.1.6 Detailed system architecture



2.1.7 External and Internal Interfaces

External Interface: CAN interface to connect the system to the vehicle network.

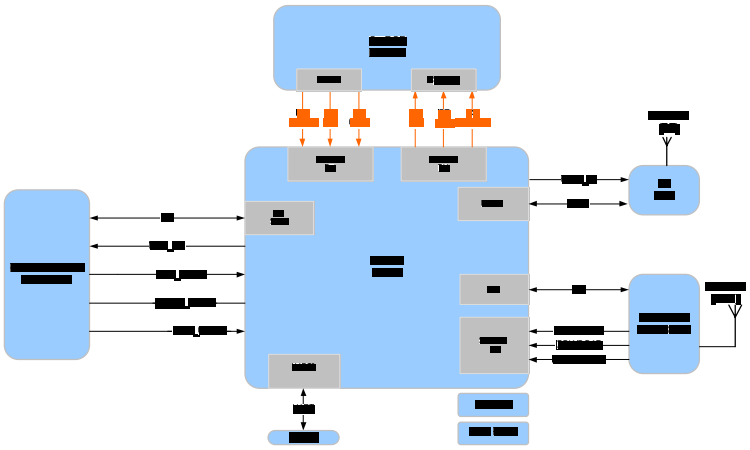
Internal interfaces: SPI/RTP interface between Radio controller and CoDSP module

UARTHCI interface between Bluetooth core and Bluetooth controller

I2C interfaces for Multimedia, CDSP, AM/FM Tuner, DAB tuner, audio Class D amplifier communications.

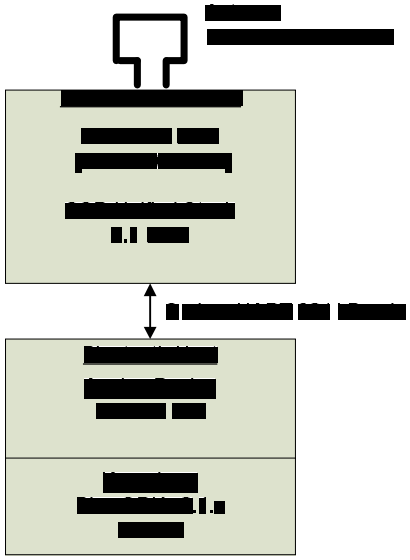
I2S interfaces for audio features

2.1.8 Bluetooth detailed architecture



2.1.9 Bluetooth components

RD45 product integrates the following components Bluetooth component:
CSR Blue Core 6 ROM (QD ID B014082)
Single radio and baseband IC for Bluetooth 2.4 GHz system.



2.1.10 Interfaces

External Interface: CAN interface to connect the system to the vehicle network.
Internal interfaces: SPI/RTP interface between Radio controller and CoDSP module

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UART interface between Bluetooth core and Bluetooth controller

I2C interfaces for Multimedia, Tuner, DAB tuner, audio Class D amplifier communications

2.2 SOFTWARE FEATURES

2.2.1 Product Type Declaration

This design is listed as a *Bluetooth* **End Product** on the Bluetooth SIG Qualified Design List (QDL) **B018123**. Further use of this design to create subsequent Bluetooth implementations can be achieved without further qualification provided that the resulting implementation has no negative material impact on the Bluetooth performance or functionality of the design and the subsequent implementation is listed on the Bluetooth End Product List (EPL) by the integrator of this design. There is no charge for listing your product on the EPL and if you do not desire to have this listing publicly displayed, you can choose to not have it listed on the public database while filling out the EPL form. You can find the EPL at https://bluetooth.org/EPL.
Please note that if the design has been changed, the design is required to be re-assessed by the Member Integrating the design to assert that the change does not result in a different Bluetooth design and that there has been no changes within the PICS selections from the this design (as listed on the Bluetooth QDL). If you have changed or modified this product such that the Bluetooth functionality or performance is affected, further qualification and listing is required in accordance with the Bluetooth Qualification Process (ref. PRD 2.0). To start the process for a new qualification, please visit https://bluetooth.org/TPG

2.2.2 Software Overview

The software is embedded in the hardware. It is specific to this end user product, it cannot be ported to any other environment

2.2.3 Application

The system is a “Car radio multimedia connectivity system”. It is mainly composed of hardware modules combined with embedded SW

2.2.4 SW Features

Radio controller HOST main SW features are:

- Power Supply control: switch-on, switch –off
- Audio amplifier control bu the system user
- Analog Radio tuner AM/FM
- Digital Radio tuner DAB
- USB controller
- CD drive control
- CAN bus driver and interface
- I2S, I2C, SPI .. bus driver and interface
- Handling of user inputs via remote keyboard
- Handling of remote display

Bluetooth SW feature are:

- Device inquiry
- Pairing
- Handfree call, 3-ways calls
- Phonebook and call lists

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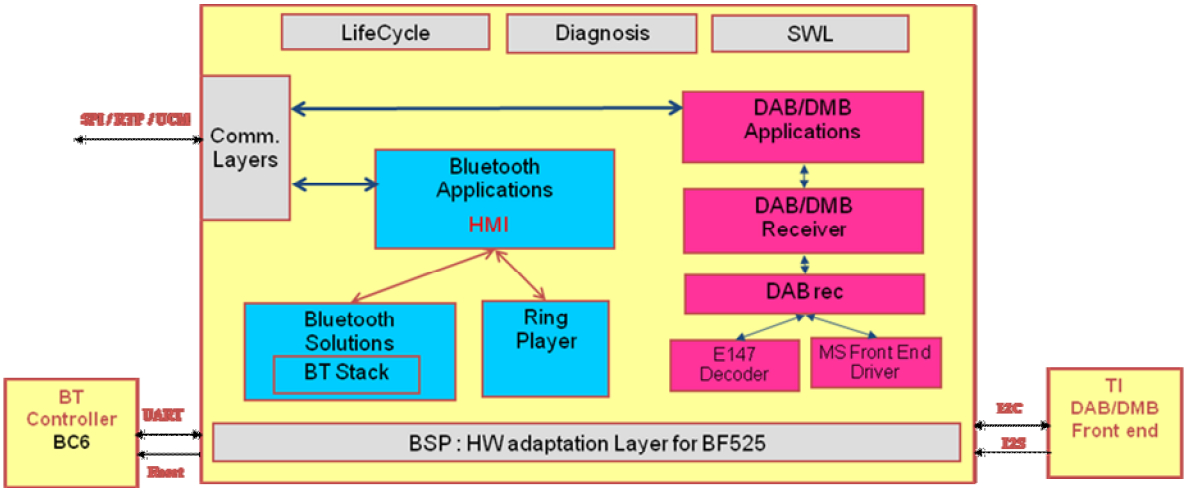
Ø Audio streaming with basic control commands next, previous and metadata title and artist display.

2.2.5 CoDSP SW Architecture



2.2.6 Bluetooth SW Architecture

Bluetooth SW architecture includes the following Bluetooth SW component

- CSR unified stack 2.1 EDR :
  - QDID B013295 unified Stack 2.1 EDR
- iAnywhere BT stack:
  - QDID B014592 BlueSDK 3.x and profiles (AV SDK, MT OBEX, BNEP, HFP, HID,PBAP, SAP)
  - QDID B015048 BlueSDK profiles (AVRCP, A2DP, BIP, BPP, HCRP, HSP, SAP, BNEP)

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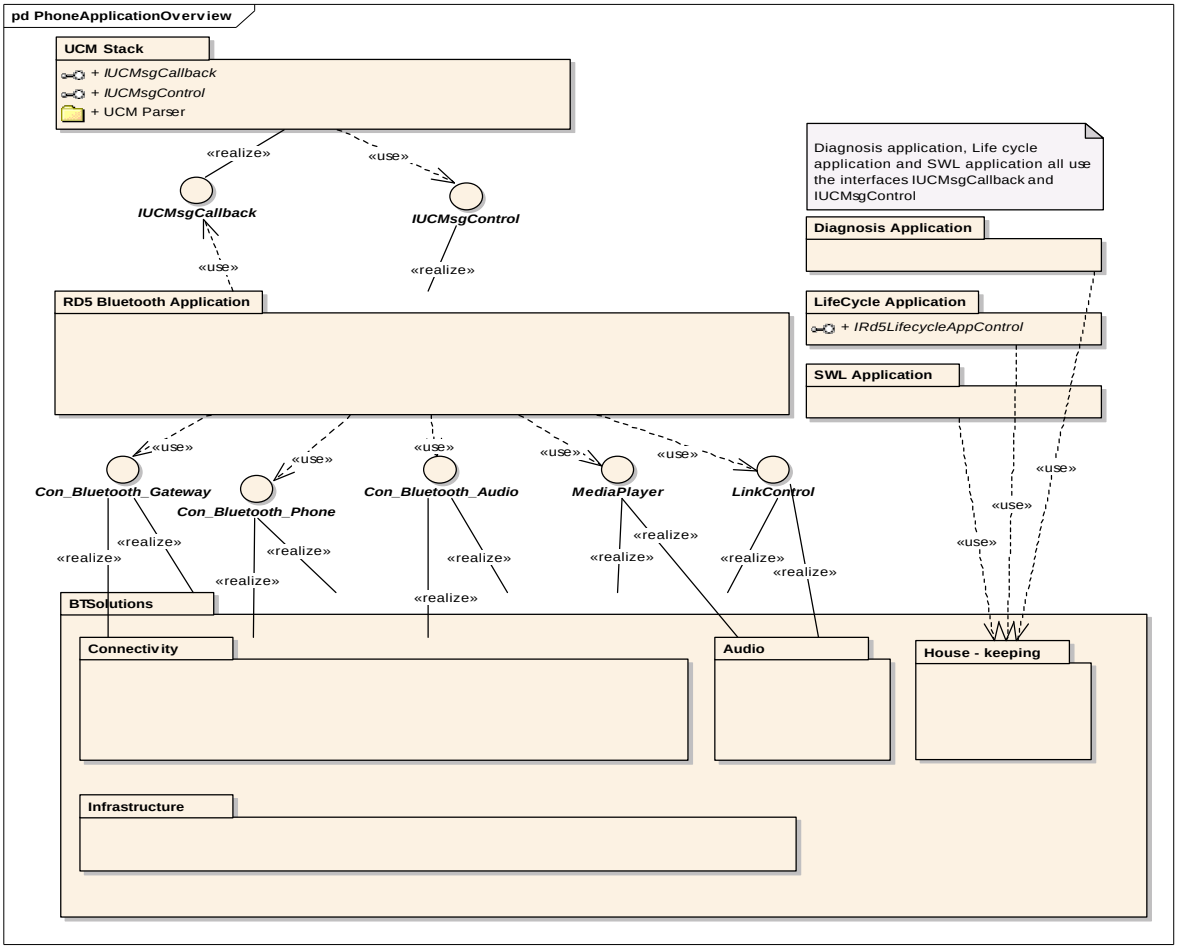

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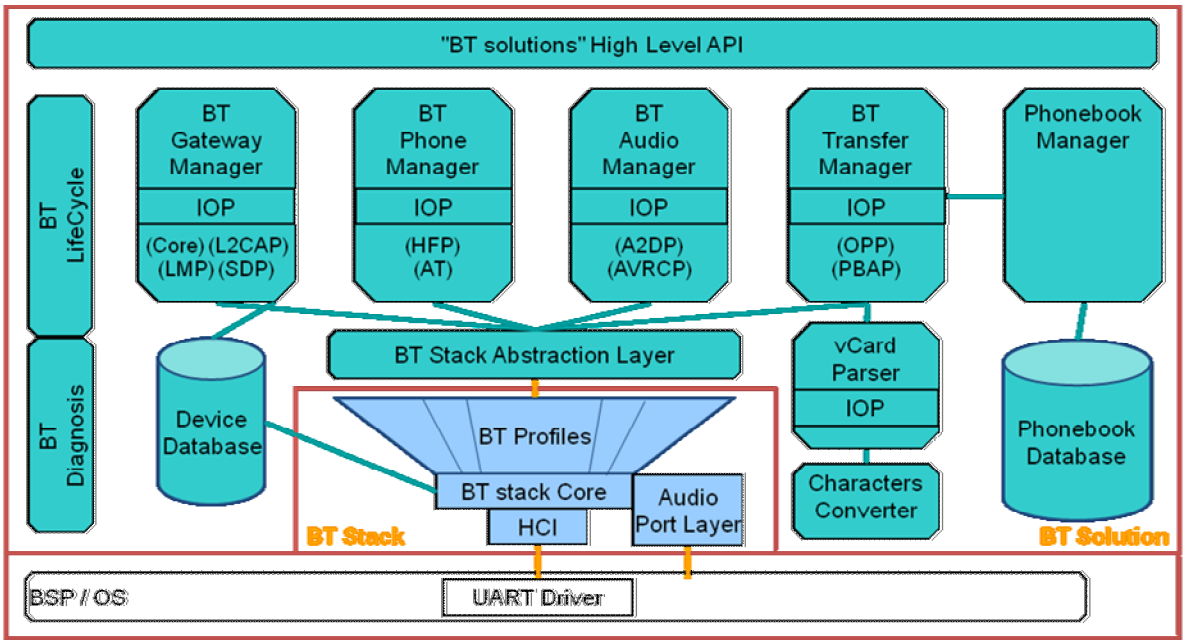
2.2.8 Bluetooth Core SW architecture Overview



2.2.9 Interfaces

External interface : CAN messages use a proprietary OEM protocol.

Internal interface : UART and I2S interface between main controller and Infineon BT module

2.2.10 Sample Portings

SW embedded is specific on RD45 end product HW design, it cannot be ported to an other environment.

3 Contact Information

[This section identifies important contact information relevant to the support of this design.]

Email: richard.barbier@continental-corporation.com

Terminology, Definitions and Abbreviations

Use SV I IS common Glossary of Abbreviations, Terms & Definitions (GATD) – P300002L02.
For additional definitions or abbreviations use CR for Glossary - P300002F02.

Acronyms and Abbreviations

Specific acronyms / abbreviations, used only in this document:

AAS	Aide Au Stationnement (Car park system)
AD	Architecture Document
AS	Architecture Specification
BT	BlueTooth
CAN	Controller Area Network
CANIF	Controller Area Network InterFace
CD	Compact Disk
CDP	Compact Disk Player
CDSP	Car Digital Sound Processor
CPU	Central Processing Unit
CSD	Component Specification and Design
CSV	Commande Sous Volant (Under wheel command)
DAB	Digital Audio Broadcasting
EMF	Ecran Multi Fonctions (Car display)
FMUX	Front MultipeXed
FSM	Finite State Machine
HFCK	Hands Free Car Kit, sometime called in French "KML"
HW	Hardware
JDD	"Journal des défauts"
KML	"Kit Main Libre" in french, means "Hand Free Car Kit"
MBX	MailBoX
MMI	Man Machine Interface
OS	Operating System
PAL	Platform Abstraction Layer
PCB	Printed Circuit Board
PERDU	PERsistent Data Unit
SMADD	System Module Architecture Design Document
SW	SoftWare
SWL	SoftWare Loading
UCM	Unified Communication Mechanism
UML	Unified Modelized Language
USB	Universal Serial Bus
VMF	Volant Moyeu Fixe (Many functions wheel)

Definitions

Specific Definitions, used only in this document:

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SW Module	A single source file together with possibly necessary header files or a small collection of source files
SW Package	A group of SW modules that implement a certain set of functionality. Typical SW Packages will be created by a single SW developer or a small team of SW developers. A typical SW Design Document covers exactly one SW Package.
SW Component	A group of SW Packages. Can be the whole SW of a HW Component, can be a layer function such as SALSA or JAMAICA in TLA, can be a functional part such as Audio Functions for a specific project.

3 Related documents

3.1 Related upstream documents

[U-1]	Doc1_ID	SW Requirements Document, SV I IS	
[U-2]	P730006L54	SW Engineering Procedure, SV I IS	
[U-3]	P730006LXY	Engineering Traceability Procedure, SV I IS	
[U-4]	P730006L10	SW Lifecycle Principles Engineering, SV I IS	
[U-5]	P730006LAX	System and SW Architecture Modeling Tool Guideline, SV I IS	
[U-6]	P730006L56	SW - C Coding Standard	
[U-7]	RD45_RM_SE_MDC_0057	Development Rules Conformity Matrix	
[U-8]	RD45_TS_SW_AD_0031	RD45 SW Architecture Document	
[U-9]	RD45_PM_SW_MET_0072	MemoryFollowUp metric	
[U-10]	DMOV_ELE06_0050 Règles_de_développement_pour_logiciel_embarqué	CRD And MDC RD45_RM_SE_MDC_0057	PSA:

3.2 Further related documents

[R-1]	P730006F55	SE Architecture Decision Matrix, SV I IS