

WMI2-15W-W167 WMI2-15W-W205 (Wireless Mobile Interface2-15W) Test setup description



Valid for Valeo Peiker product:

Model: WMI2-15W-W205
Type : M1
Model : WMI2-15W-W167
Type : M1
Type : M2
Type : M3

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1. INTRODUCTION

1.1 SCOPE

This document gives an overview about electrical, mechanical and functional details of the Valeo peiker WMI2-15W-W167 and WMI2-15W-W205 wireless mobile interface.

1.2 AUDIENCE

Information to integrate the module in some other applications.

1.3 CONTACT INFORMATION, SUPPORT

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2. PRODUCT OVERVIEW

2.1 PRODUCT VARIANTS

The WMI2-15W-W167 module family consists of 3 variants:

Model-name : WMI2-15W-W167

Type :

- M1
- M2
- M3

The WMI2-15W-W205 module family consists of 1 variants:

Model-name : WMI2-15W-W205

Type :

- M1

2.2 TECHNOLOGIES

- Wireless charging equal to Qi Standard
- Connecting to device via NFC
- Device-Detection will be done by ping algorithm

2.3 SUPPORTED TECHNOLOGY/FREQUENCY BANDS

2.3.1 Frequencies

NFC	13,56 MHz
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Magnetic, modulated, according Qi Standard 1.0	125 kHz
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- Downlink (from cell-phone/test receiver to WMI)
 - the receiver is using load modulation of 125kHz modulated with 2kHz to send information to the WMI.
- Uplink (from WMI to cell phone/test receiver)
 - The WMI is using frequency modulation of the 125kHz to send information to the receiver.
- Concerning wireless charging there is no other communication channel.

2.3.2 Data Rates

- CAN:
 - 250kBaud
- NFC:
 - Modulated 115kBaud
 - Modulated 230kBaud
 - Modulated 440kBaud

2.3.3 Interfaces, customizable

- CAN
 - SPI (internal)
- Contact information, Support

2.3.4 Power level

- Charging mode
 - The device charges the mobile device with a power of 15 Watts
 - The transfer system includes 3 coils. This includes charging systems that have three coils and clients that are able to detect and allow coupling only between individual pairs of coils
 - Only one coil is active
 - Max power consumption less than 32 Watts at a single coil
- Ping mode
 - Max power consumption 0,25 Watts

2.3.5 Data Rates

- CAN:
 - 250kBaud
- NFC:
 - Modulated 115kBaud
 - Modulated 230kBaud
 - Modulated 440kBaud

2.3.6 Dimension and Weight

- Dimensions: 160mm x 95mm x 27mm
- Weight ~ 270 grams

2.3.7 Application

- Only vehicular environment
- The system is installed only in vehicles

2.3.8 Power

- Nominal voltage: 12V
- Max. current consumption: ~ 2,5 A at 12 V (max. 5 A worst case)
- Operating Voltage Range: 8V – 16V

2.4 FEATURES

2.4.1 FBS (exchange of relevant security information)

2.4.2 Charging

2.4.3 Couple Function, passive communication only

- Powerful application processor from NXP may contain and run complete application software and CAN-software
- The GSM couple antenna is for passive communication only

2.4.4 Supply Voltage

Absolute minimum/maximum supply voltages	8V – 16V
Nominal supply voltage	12V
Recommended supply voltage	12V
Voltage drop @ GSM power burst (33dBm)	< 100mV

2.4.5 Power Consumption

$T_A = +25^{\circ}\text{C}$, $P < 32\text{ W}$ approx

2.4.6 Environmental Specification

2.4.7 Temperature Range

Range		
Operating temp. range	-20°C ... +60°C	Wireless Charging
Extended operating temp. range	-20°C ... +80°C	Operational CAN communication
Storage temp. range	-40°C ... +85°C	

2.4.8 Connectors, *external interfaces*

The WMI is connected with a permanent 12V, the CAN bus and the Fakra blind, various control signals from the CAN bus control the WMI and thus bring it into different working modes. In terms of driving readiness, the WMI represents an interface between the head unit (Can with 250kBaud) and a standard mobile phone from the driver of the vehicle. To support NFC telematics functions including identification and data transmission to the vehicle head unit, for example for data exchange with NFC vCards.

To support these functions, there is a coupling antenna in WMI that fulfills the following functions:

- Interface to the mobile phone via the coupling antenna
- Interface to the NFC enabled mobile phone via the internal NFC antenna
- Interface to the vehicle antenna via the GSM plug connection

2.4.9 NFC vs. Charging

While entering the vehicle and putting down the mobile on to the WMI the mobile will initiate to the WMI (start of system), while transferring some CAN commands from the car to the WMI.

During the misalignment of the NFC-antenna, no specific NFC-Commands will be send.

Once activated, the WMI tries to detect any device if an object was placed on the surface. After a successful detection of a Qi device, the system switches to Qi-detection-mode.

If the detection-mode has found a mobile with Qi-standard charging possibility on the WMI, the power contract is established, and a charging process will start. If the mobile is removed during charging from the WMI, charging process is stopped immediately.

The WMI was designed following the Qi standard to charge mobiles prepared for Qi-charging.

2.4.10 Module Pin-out

Table 1 Module Pin-out

MWCT1014S		Signal name (used in the schematic)	Description
Port / Pin	Selected function		
PTB4 / 28	PTB4	μC2NFC-DWL-REQ	Active state: High level After a reset the NFC controller NCF3340 starts the download mode sequence. Passive state: Low level After reset no download sequence will be started by the NFC controller
PTD10 / 36	PTD10	LED-ON-FEHLER	Active state: High level The LED on the Debug PCB is switched on Passive state: Low level The LED on the Debug PCB is switched off
PTD11 / 35	PTD11	LED-ON-LADEN	Active state: High level The LED on the Debug PCB is switched on Passive state: Low level The LED on the Debug PCB is switched off
PTE3 / 18	PTE3	μC2NFC-ANT-CTRL	Active state: High level The RF input of the NCF controller NCF3340 (IC16) is connected to the external NFC antenna Passive state: Low level The RF input of the NCF controller NCF3340 (IC16) is connected to the internal NFC antenna
PTE14 / 17	PTE14	SW-MODE	Default state: High level Alternative state: Low level

Note: Pins should be grounded when not used in design.

4. OPERATING MODES

The system controller of the SBC manages register configuration and controls the internal functions. The system controller is a state machine. The SBC operating modes and the state transitions are shown in Figure 4-1. A detailed hardware characterization of the SBC operating modes by functional block is listed in the following Table 4-1.

Block	Operating mode							
	Off	Forced Normal	Standby	Normal	Sleep	Reset	Overload	FSP
V1	off	on	on	on	off	on	off	on
V2/VEXT	off	on	V2C ^[1]	V2C ^[1]	V2C ^[1]	V2C ^[1]	off	V2C ^[1]
HVION ^[2]	off	off	HVION control register; low-side drivers disabled ^[3]	HVION control register ^[3]	HVION control register; low-side drivers disabled ^[3]	HVION control register; low-side drivers disabled ^[3]	fail-safe state ^[4]	HVION control register; low-side drivers disabled ^[3]
SMPS	off	on (default voltage)	SMPS control register ^[5]	SMPS control register ^[5]	SMPS control register ^[5]	on	off	on
CAN	CAN Off	CAN Active/ CAN Listen-only	CAN Offline/ CAN Offline Bias/ CAN Listen-only ^[6]	CAN Active/ CAN Offline/ CAN Offline Bias/ CAN Listen-only/ CAN Off if CAN shut down condition true ^[6]	CAN Offline/ CAN Offline Bias	CAN Offline/ CAN Offline Bias	CAN Off	CAN Offline/ CAN Offline Bias
LIN1/ LIN2 ^[7]	LIN Off	LIN Active	LIN Offline/ LIN Listen-only ^[8]	LIN Active/ LIN Listen-only/ LIN Offline ^[9]	LIN Offline	LIN Offline	LIN Off	LIN Offline
EN	off	off	ENC/ENDC ^[9]	ENC/ENDC ^[9]	ENC/ ENDC ^{[9][10]}	ENC/ ENDC ^[9]	off	ENC/ ENDC ^[9]
RSTN	LOW	HIGH	HIGH	HIGH	LOW	LOW	LOW	LOW
LIMP	floating	floating	LHC ^[11]	LHC ^[11]	LHC ^[11]	LHC ^[11]	LHC = 1	LHC = 1
RXDC	pull-up to V1	CAN status	pull-up to V1; LOW if CAN wake-up; CAN status if CMC = 11	CAN status if CMC = 01/10; otherwise same as Standby	pull-up to V1	pull-up to V1/LOW if CAN wake-up	pull-up to V1	pull-up to V1
RXDL1/ RXDL2 ^[7]	pull-up to V1	LIN status	pull-up to V1; LOW if LIN wake-up; LIN status if LMC = 11	LIN status if LMC = 01/10; otherwise same as Standby	pull-up to V1	pull-up to V1/LOW if LIN wake-up	pull-up to V1	pull-up to V1
SPI	disabled	limited access	active	active	disabled	disabled	disabled	disabled
Watchdog	off	off	WMC ^[12]	WMC ^[12]	WMC ^[12]	off	off	off

- [1.] Determined by the setting of bits V2C in the regulator control register
- [2.] HVIO availability depends on the device variant
- [3.] Determined by the settings in the relevant HVIO control register
- [4.] See data sheet of the UJA1131HW/3V3, Determined by the settings in the SMPS control register
- [5.] Determined by the setting of bits CMC in the CAN control register
- [6.] Availability of LIN2 depends on the device variant
- [7.] Determined by the setting of bits LMCn in the LIN control register
- [8.] Determined by the settings of bits ENC and ENDC in the fail-safe control register
- [9.] Since V1 is off, EN can only operate as open-drain output in Sleep mode
- [10.] Determined by the setting of bit LHC in the Fail-safe control register
- [11.] Determined by the setting of bits WMC in the Watchdog control register

Table 4-1: Hardware characterization by functional block

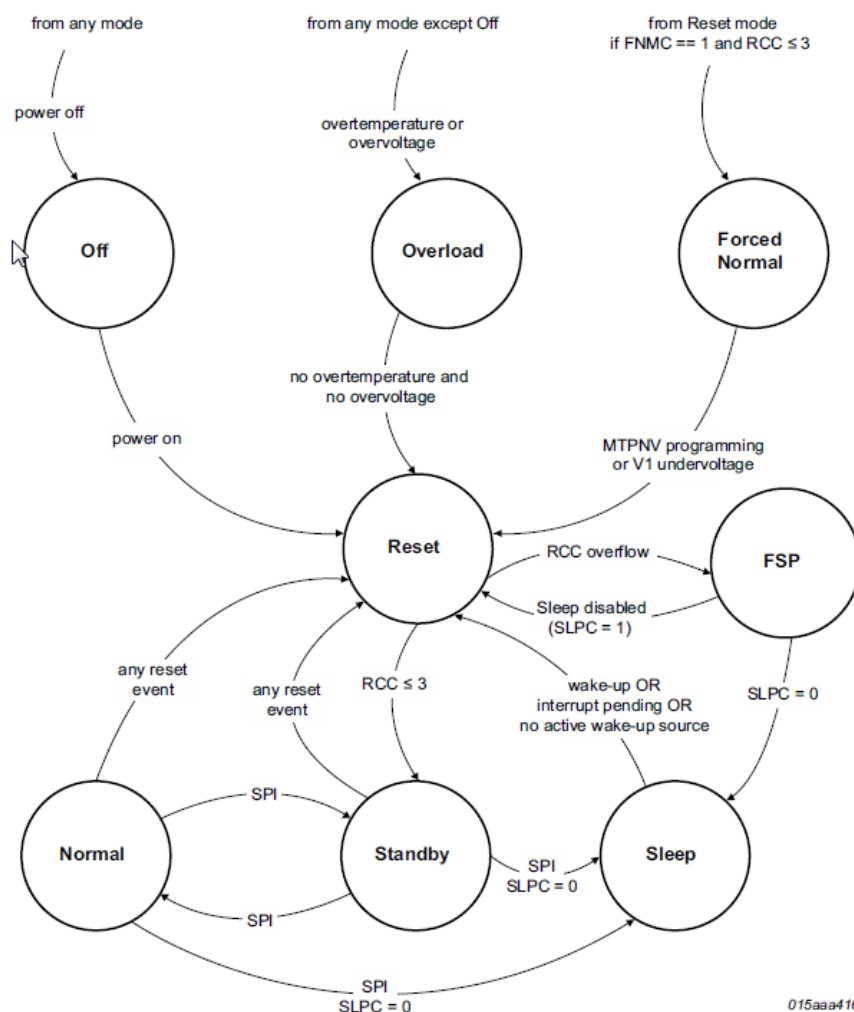


Figure 4-1: Operating modes of the System Basis Chip UJA1131HW/3V3

Via SPI2 interface the MWCT1014S is able to sent commands to the SBC so that the SBC can change the operating mode. The operating mode is selected via bits MC in the Mode Control register, see Table 4-2.

SPI address of the Mode Control register: **0x01**

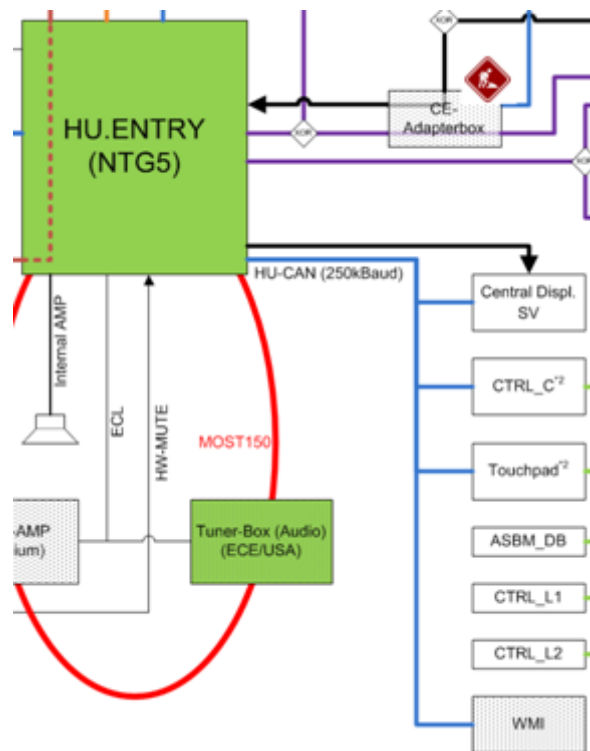
Bit	Symbol	Access	Value	Description
7:3	reserved	R	-	
2:0	MC	RW	001	Sleep mode
			100	Standby mode
			111	Normal mode

Table 4-2: Mode Control register

The SBC operating modes are described in the data sheet of the UJA1131HW/3V3, section 7.1.1, page 12.

4.1 OPERATIONAL MODES DEVICE DETECTION – Qi

After putting the mobile on the WMI surface, the WMI will start up exchanging some CAN commands from the car.



After initial start the WMI tries to detect via WLC, if an object was placed on the surface (at this time the process does not send out WLC-Commands)

When the device detection was successful, the system switch to Qi-detection-mode. If the Qi-detection-mode has found a mobile (acc. Qi-standard) then charging process will start. The WMI was designed following the Qi standard to charge mobiles prepared for Qi-charging.

If you remove the mobile during charging from the WMI, charging process is stopped immediately.

5. SAFETY RECOMMENDATIONS

The WMI2-15W-W167 and WMI2-15W-W205 devices must be supplied by a limited power source according to EN 62368-1. RED / FCC / IC Regulatory Notices

5.1 MODIFICATIONS

WARNING: peiker acustic GmbH has not approved any changes or modifications to the WMI2-15W-W167 and WMI2-15W-W205 device by the user. Any changes or modifications could void the user's authority to operate the equipment.

AVERTISSEMENT: peiker acustic GmbH n'a approuvé aucun changement ou modification de l'appareil WMI2-15W-W167 et WMI2-15W-W205 par l'utilisateur. Tout changement ou modification peut annuler l'autorité de l'utilisateur à utiliser l'équipement.

5.2 INTERFERENCE

This devices WMI2-15W-W167 and WMI2-15W-W205, complies with Part 15 of the FCC Rules and with Industry Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil, WMI2-15W-W167 et WMI2-15W-W205, sont conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

5.3 FCC CLASS B DIGITAL DEVICE

The WMI2-15W-W167 and WMI2-15W-W205 have been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the transmitting antenna.
- Consult the dealer or an experienced radio/TV technician for help.

Les modèles WMI2-15W-W167 et WMI2-15W-W205 ont été testés et jugés conformes aux limites d'un appareil numérique de classe B, conformément à la partie 15 des règles de la FCC. Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles dans une installation résidentielle. Cet équipement génère, utilise et peut émettre de l'énergie radiofréquence et, s'il n'est pas installé et utilisé conformément aux instructions, peut causer des interférences nuisibles aux communications radio. Cependant, il n'y a aucune garantie que des interférences ne se produiront pas dans une installation particulière. Si cet équipement cause des interférences nuisibles à la réception radio ou télévision, ce qui peut être déterminé en éteignant et en rallumant l'équipement, l'utilisateur est encouragé à essayer de corriger l'interférence par une ou plusieurs des mesures suivantes :

- Réorienter ou déplacer l'antenne d'émission.
- Consulter le revendeur ou un technicien radio / TV expérimenté pour obtenir de l'aide.

5.4 OEM RESPONSIBILITIES

Antenna / Coils

- The systems antenna(s) / coils must be installed such that 11 cm is maintained between the antenna(s) and the body of the user or nearby persons.
- La ou les antennes / bobines du système doivent être installées de telle sorte qu'il soit maintenu une distance de 11 cm entre la ou les antennes et le corps de l'utilisateur ou de personnes proches.

Power Supply

- The power supply of the host device embedding a WMI2-15W-W167 or WMI-15W-W205, must fulfill the following requirements:
 - o Nominal supply voltage: 12V
 - o Operating voltage range: 8V – 16V
 - o The above operating voltage range MUST never, under any circumstances (including overshoot voltage and voltage drop), be exceeded.

5.5 EU DECLARATION OF CONFORMITY

- Hereby, peiker acustic GmbH declares that the radio equipment type GRG2501 is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address:
<https://www.valeo.com/declaration-of-conformity/>

5.6 FURTHER NOTES

This device is intended to be used only in vehicles (cars).

This device will be installed in the vehicles in the factory when the vehicle will be manufactured by the professional workers.

This device is not intended for resale or for 3rd parties.

5.7 WARNING STATEMENTS

To Whom It May Concern:

FCC ID WMI2-15W-167: QWY-WMI2W167W15
IC WMI2-15W-167: 6588A-WMI2W167W15

FCC ID WMI2-15W-205: QWY-WMI2W205W15
IC WMI2-15W-205: 6588A-WMI2W205W15

FCC § 15.19 Labeling requirements

This device complies with part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC § 15.21 Information to user

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC §15.105 statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

RF EXPOSURE INFORMATION (MPE)

This model device meets the government's requirements for exposure to radio waves. This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the U.S. Government.

Ce modèle répond aux exigences du gouvernement en matière d'exposition aux ondes radio. Cet appareil est conçu et fabriqué pour ne pas dépasser les limites d'émission de radiofréquences (RF) définies par la Federal Communications Commission du gouvernement des États-Unis.

INDUSTRY CANADA Statements

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Canada Class B statement

This Class B digital apparatus complies with Canadian ICES-003
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

MPE COMPLIANCE

This product has been tested and found to comply with the following standards:

- For the used worst case positions, the desktop application Ci70 is in compliance with the IC RSS 102 Issue 5 [RSS 102] for uncontrolled exposure. MPE assessment in body worn was conducted with a distance of 50 mm between the housing of the handheld and the user.
- For the used worst case positions, the desktop application Ci70 is in compliance with the Federal Communications Commission (FCC) Guidelines [OET 65] for uncontrolled exposure. MPE assessment in body worn was conducted with a distance of 150 mm between the housing of the handheld and the user.
- EN 62311:2008: assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz – 300 GHz).

Ce produit a été testé et déclaré conforme aux normes suivantes:

- Pour les pires cas utilisés, l'application de bureau Ci70 est conforme à la norme IC RSS 102 Issue 5 [RSS 102] pour une exposition non contrôlée. L'évaluation MPE dans le corps porté a été réalisée à une distance de 50 mm entre le boîtier de l'ordinateur de poche et l'utilisateur.
- Pour les pires cas utilisés, l'application de bureau Ci70 est conforme aux directives de la FCC (Federal Communications Commission) [OET 65] en matière d'exposition non contrôlée. L'évaluation MPE dans le corps porté a été réalisée à une distance de 150 mm entre le boîtier de l'ordinateur de poche et l'utilisateur.
- EN 62311: 2008: évaluation des équipements électroniques et électriques en relation avec les restrictions d'exposition humaine aux champs électromagnétiques (0 Hz - 300 GHz).

5.8 TAIWAN REGULATORY INFORMATION(NCC)

低功率電波輻射性電機管理辦法

第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Mercedes-Benz is informed, that the mentioned statements and paragraphs in this document should be placed in a prominent location in the final user manual.