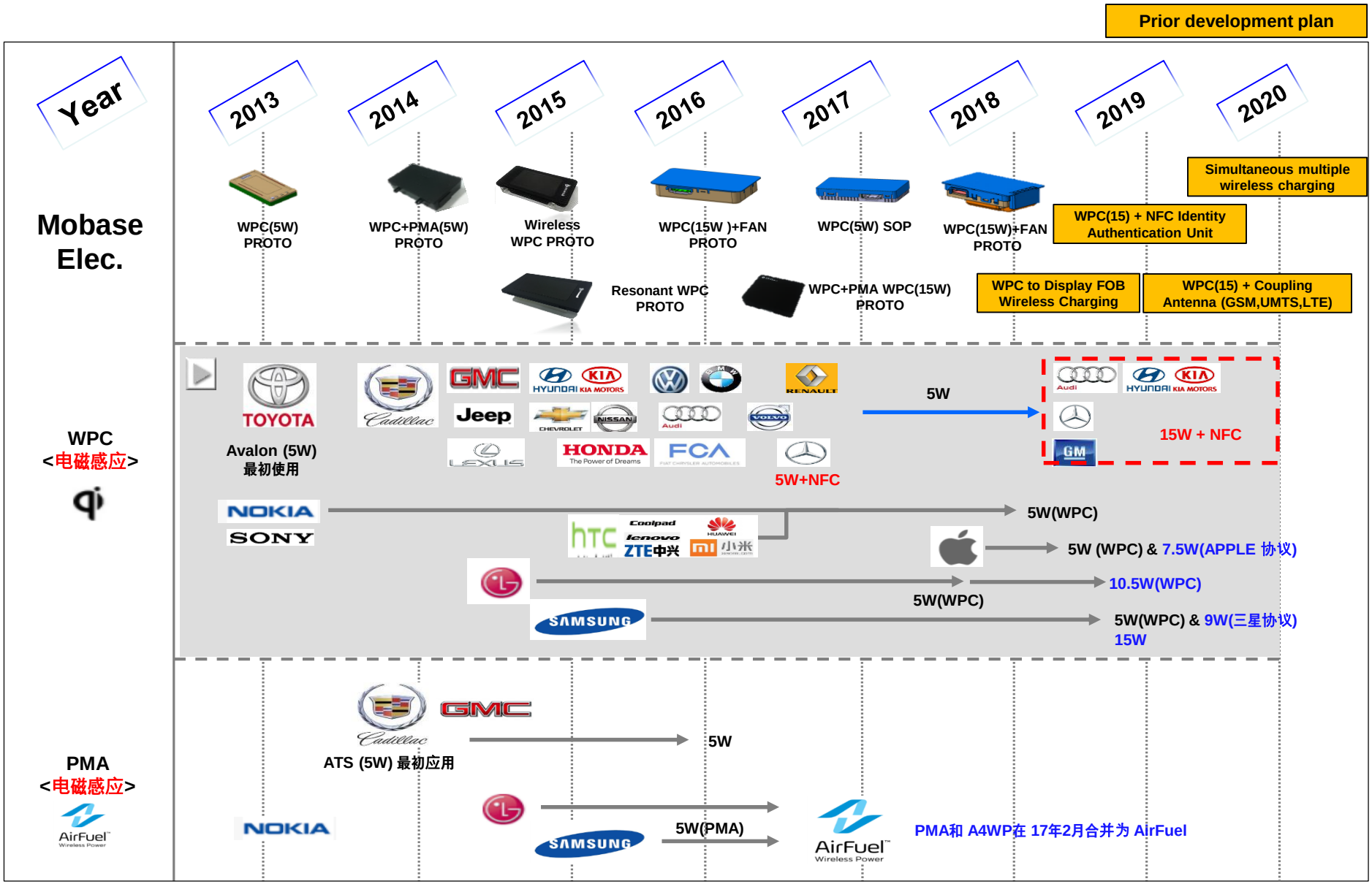
1 Mobase Elec. Road Map & Market Trend



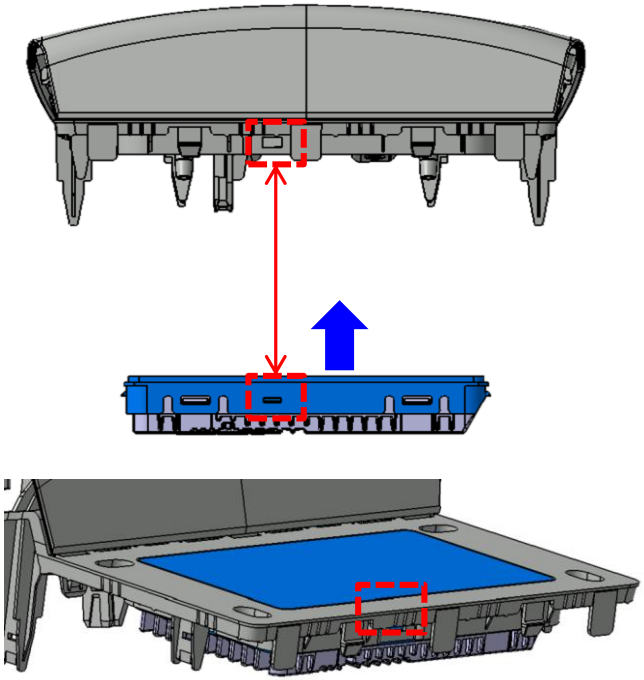
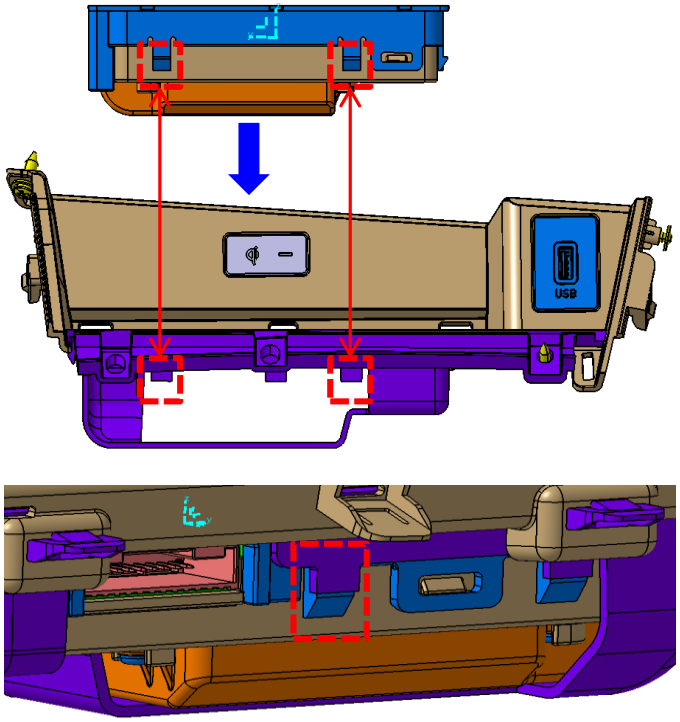
2 Main Product Specification

2-1. Wireless Charging Unit Specification

*** LP : Low Power** *** MP : Middle Power**

Specification	区分	Product specifications		Remark
		LP(5W)	MP(15W)	
electric	Operating Voltage	9V ~ 16V		
	Operating temperature	-40℃ ~ 85℃		
	Storage temperature	-40℃ ~ 85℃		
	Dark current	1mA 以下		
	Charging area	66 x 27 mm (Pad 内 充电领域 ：83 x 173 mm)		
	Charging efficiency LP (5W)	**50 %**	**58 %**	
	Charging efficiency MP (15W)	**-**	**65 %**	
	working frequency	115~205 KHz	115~205 KHz	
	Coil	LP - A13 (3Coil)	MP - A13 (3Coil)	
	NFC PEPS	Does not support	Does not support	
	NFC Recognition distance	-	-	
	Heat dissipation structure	ADC	ADC + FAN	Automotive FAN
Exterior	size	124 x 70 x 25.2 mm	139.6 × 83.8 × 41.25 mm	
	weight	230 g	340 g	
	Connector	MG645877 (KET)		

2-2. Wireless Charging Unit Mounting Structure

LP(5W)	MP(15W)
➢ Bottom-Top Mounting Structure 	➢ Top-down Mounting Structure 

2-3. History of Wireless Charging Unit Development

■ Current production ■ Future production

Grade	Project Name	Car Maker	S.O.P	Car/Year (10,000)	specifications		Function Specifications						Body-CAN Comm. Speed
					LP (≤5W)	MP (≤15W)	NFC	Card burn-out prevention	Foreign Object Detection	Charging Display	SMK interference prevention	Cell phone neglect alarm	
Small Cars	KONA	HMC	Jun.2017	4.6	●	-	-	-	●	●	●	●	500kbps
	Veloster		Nov.2017	1.6	●	-	-	-	●	●	●	●	100kbps
	KONA EV		Apr.2018	0.5	●	-	-	-	●	●	●	●	500kbps
	New Car	KMC	Apr.2019	1.0	-	●	●	●	●	●	●	●	
	New Car(i)		Jul.2019	1.6	-	●	●	●	●	●	●	●	
Midsize Cars	Sorrento		Jul.2017	5.5	●	-	-	-	●	●	●	●	100kbps
	Santa Fe	HMC	Feb.2018	7.4	●	-	-	-	●	●	●	●	500kbps
	Santa Fe(a)		Aug.2018	8.5	●	-	-	-	●	●	●	●	
	Sorrento(a)	KMC	Jan.2018	9.9	●	-	-	-	●	●	●	●	100kbps
	Carnival		Feb.2018	2.1	●	-	-		●	●	●	●	500kbps
	Hydrogen Car	HMC	Mar.2018	0.3	●	-	-		●	●	●	●	
	Sonata		Mar.2019	6.2	-	●	●	●	●	●	●	●	
	Sonata(a)		Sep.2019	5.5	-	●	●	●	●	●	●	●	
	Optima	KMC	Sep.2019	6.5	-	●	●	●	●	●	●	●	
	Optima(a)		Jan.2020	1.5	-	●	●	●	●	●	●	●	
FullSize Cars	Genesis	HMC	Sep.2019	5.0	-	●	●	●	●	●	●	●	
	Genesis(a)		Mar.2020	3.3	-	●	●	●	●	●	●	●	
	Genesis SUV		Nov.2019	2.9	-	●	●	●	●	●	●	●	
Total				**73.9**									

2-3. History of Wireless Charging Unit Development_china

■ Future production

Project Name	Car Maker	S.O.P	Car/Year (10,000)	specifications		Function Specifications						Body-CAN Comm. Speed
				LP (≤5W)	MP (≤15W)	NFC	Card burn-out prevention	Foreign Object Detection	Charging Display	SMK interference prevention	Cell phone neglect alarm	
SU2	BHMC	Sep.2019	6	-	●	-	-	●	●	●	●	500kbps
SP2C	DYK	Oct.2019	0.1	-	●	-	-	●	●	●	●	500kbps
DN8C	BHMC	Mar.2018	8.5	-	●	-	-	●	●	●	●	500kbps
DU2	BHMC	Nov.2020	3.75	-	●	-	-	●	●	●	●	500kbps
DL3C	DYK	Jul.2020	5	-	●	-	-	●	●	●	●	500kbps
KU	BHMC	Jun.2021	0.3	-	●	-	-	●	●	●	●	500kbps
NP FL	DYK	Mar.2021	6.8	-	●	-	-	●	●	●	●	500kbps
NQ5C	DYK	Aug.2022	1.5	-	●	-	-	●	●	●	●	500kbps
VF35	VIN FAST	Sep.2019	9	-	●	-	-	●	●	●	●	LIN
Total			**40.95**									

量产时间 SP2C (SOP 19.3Q~)

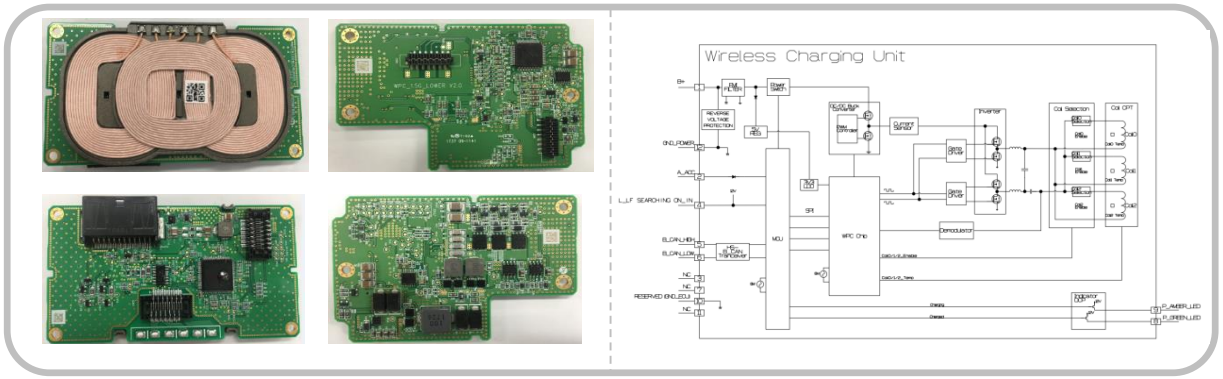
北京现代 SU2 (ix25后续车型, SOP 19.3Q~)

2-4. Status of LP(5W) Development

☑ Current production ☑ Future production

VEHICLE	HMC	Kona, Kona EV, Veloster , Santa Fe , Hydrogen Car
	KMC	Sorrento, Carnival
Wireless Charging		LP(5W)

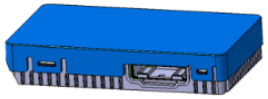
Wireless Charger Description



▶ Main Function

- (FOD) Foreign object detection
- SMK interference prevention
- Cell phone neglect alarm
- Over Temperature protection

◆ UNIT

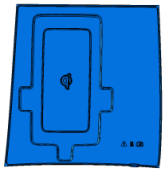


◆ INDICATOR

◆ PAD

<Kona>

<Kona EV>



<Veloster>

<Santa Fe(a)>

※ Developed by models

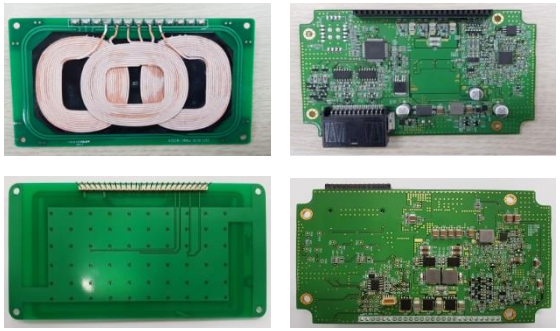
2-5. Status of MP(15W) Development

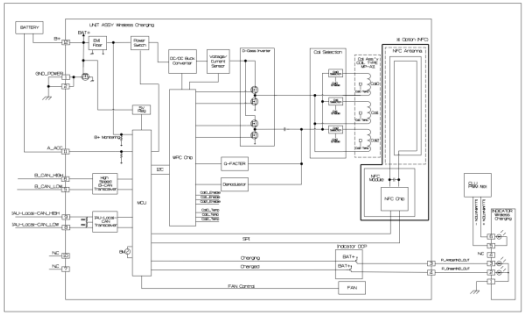
☑ Current production ☑ Future production

VEHICLE	HMC	Sonata, Genesi, Genesis SUV(NEW)
	KMC	Optim, New Small Car
Wireless Charging		MP(15W)

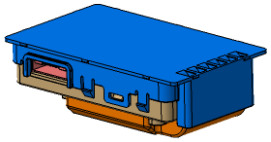
To be Developed

Wireless Charger Description





◆ UNIT



◆ INDICATOR

◆ PAD

<Sonata 下一代>

※ Development of other models

▶ Main Function

- (FOD) Foreign object detection
- SMK interference prevention
- Cell phone neglect alarm
- Over Temperature protection
- **Card burn-out prevention**
- **(NFC) Vehicle Key Authentication**
- **Mobile phone heat sink FAN**

3-1. System Function – Wireless charging

-. Wireless Charging Status

➢ Working sequence (normal wireless charging)

Start button ON

ACC ON
&
Door Close

Cell phone on the WPC pad

Cell phone charging status
(LED lights during charging time)

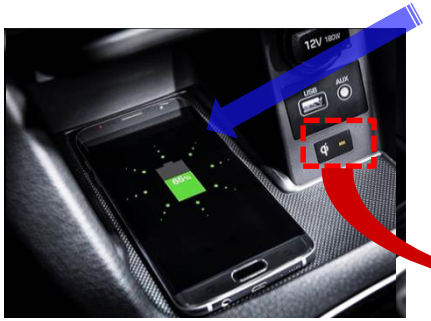
3-2. System Function - Foreign Object Detection

-. Foreign Object Detection Status

➢ Working sequence (abnormal wireless charging)

Start button ON

ACC ON
&
Door Close



Cell phone on
the Wireless Charging Pad

FO(FOREIGN OBJECT)
- Metal Case
- Coin
- Card Key

Object Detection status
(AMBER Blanking
for 10 seconds)

3-3. System Function - Cell phone neglect alarm

-. Cell phone neglect alarm Status

➢ **Cell phone neglect alarm**

ACC OFF

Cell phone on the Wireless Charging Pad

Door Open

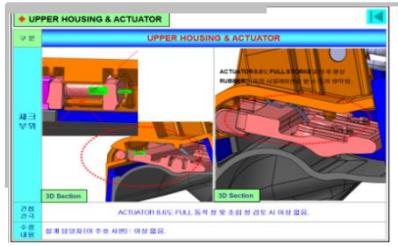
4 Design Process & Verification Capability

4-1. R&D Development Equipment – For Design, Verification and Analysis

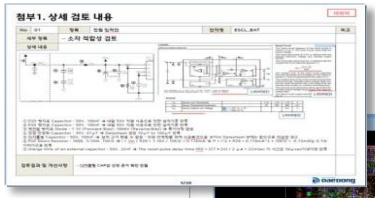
◇ To pursue High Performance and High Quality

◇ To make Robust Design

❖ **Mechanical Analysis**



DMU/CAE

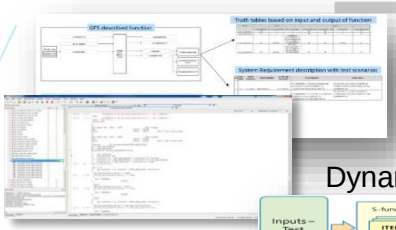


Circuit Verification

PCB Verification

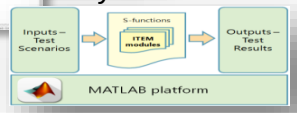
❖ **H/W Verification**

❖**Software Analysis**

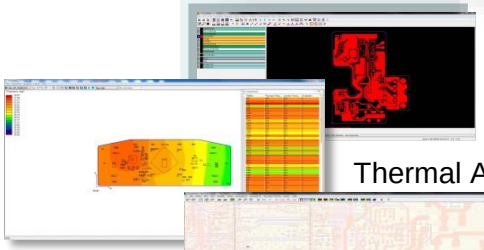


Test Scenario

Dynamic Verification



SILs



DFM

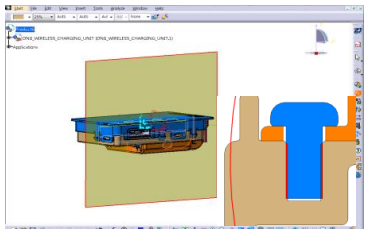
Thermal Analysis

Signal Analysis

❖**Electronic Analysis**

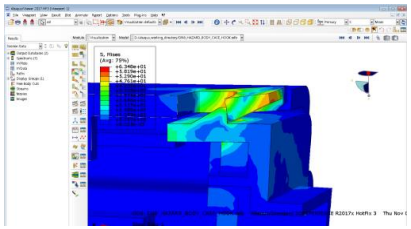
4-2. Mechanical & Hardware Verification

Mechanical Analysis



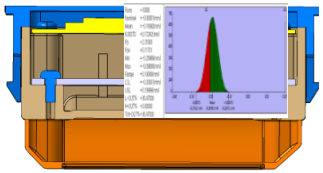
Digital Mock-up

- Check Interference of Assembly with Mating Parts
- TOOL : CATIA DMU



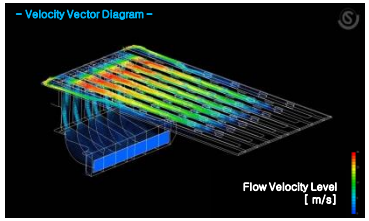
Structural Analysis

- Check Requirement and Specification of Customer
- Strength, Dynamics, Vibration
- TOOL : ABAQUS



Tolerance Analysis

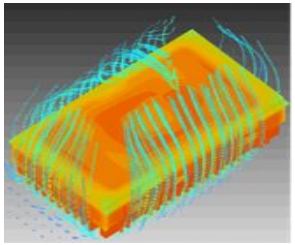
- Sensitivity Analysis
- TOOL : 3DCS



Flow Analysis

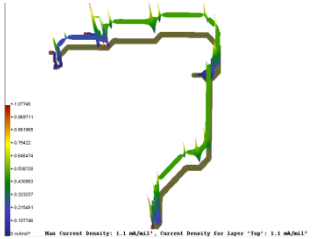
- Calculation Grid Used for Analysis
- SCRYU/Tetra V13

Electronic Analysis



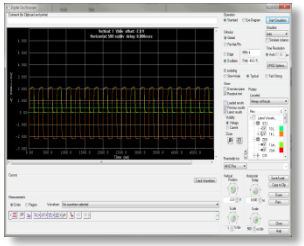
Heat Flow Analysis

- Heat Characteristic and Heat Transfer Analysis
- Tool : FloTHERM



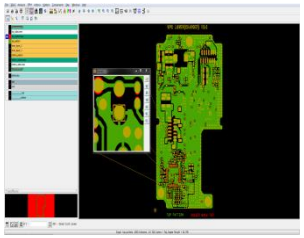
Power Integrity

- Voltage Drop, Current Density Analysis
- Tool : HyperLynx PI



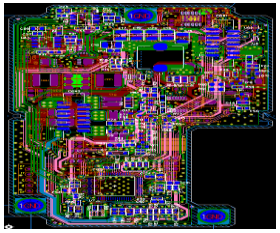
Signal Integrity

- Signal Phase and Frequency Modulation Analysis
- Tool : HyperLynx SI



DFM

- Verification of Circuit Design
- Tool : Valor NPI

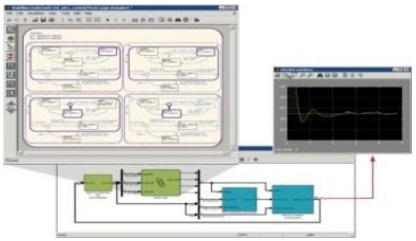


PCB Verification

- PCB Circuit Verification, Power Transfer and Connection
- Tool : PADS

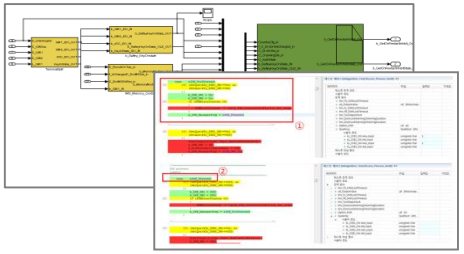
4-3. Software & System Verification

Software Tests



MIL (Model-In-the-Loop)

- Validation of Software Design based on Software Model
- TOOL : MATLAB & SIMULINK



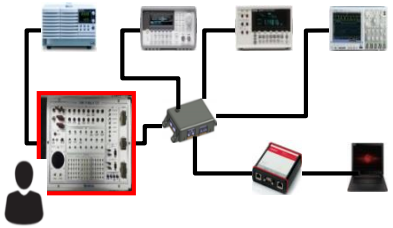
SIL (Software-In-the-Loop)

- Test Implemented Code to confirm Unit Design and Interfaces
- TOOL : VECTORCAST

PIL (Processor-In-the-Loop)

- Confirm Software Operation after downloading to real MCU
- TOOL : MATLAB & SIMULINK

System Tests

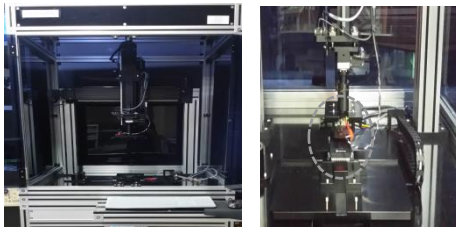


Simulation Test

- To test each functions in virtual environment of vehicle

In-Vehicle Test

- To measure input/output of vehicle which can be possible to occur at real vehicle environment



Automated Functional Test

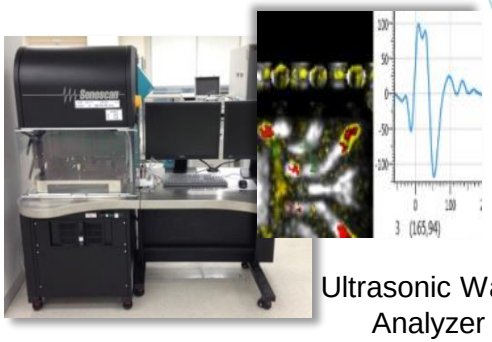
- To test automatic function by each controllers
- Automated Fault-injection testing

4-4. Test & Measurement Equipment in R&D Test Lab. (1/2)

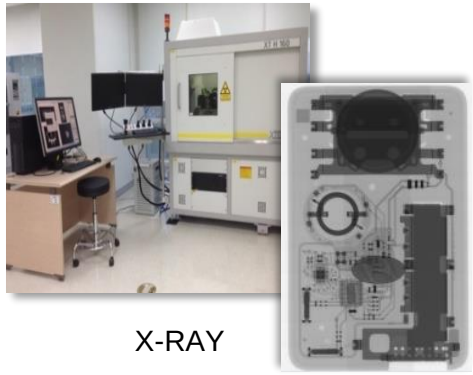
◇ High Performance and Quality

◇ Robust Design , Flawless Launch, Zero Defect

❖ **Test (32 EA)**



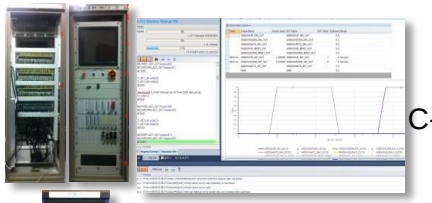
Ultrasonic Wave Analyzer



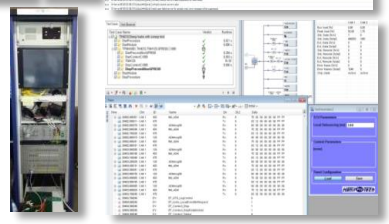
X-RAY

High Performance and Quality

❖ **Evaluation (3 EA)**



C-TIMS



CAN TEST

❖**Other Measurement Equipment (219 EA)**

5-1. EMC Test Lab. (Certified by KOLAS and HKMC)

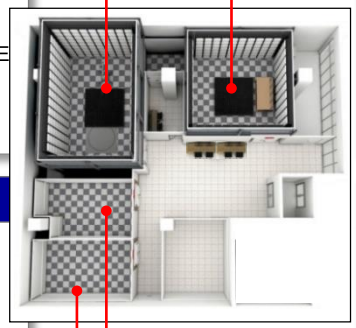
EMI (Electro-Magnetic Interference) Test System

▪ The intensity of electromagnetic noise generated from the controller is measured in a facility having a characteristic of blocking / absorbing external electromagnetic noise

- ✓ Test items : RE (Radiated emission), CE (Conduction emission), MFE (Magnetic field emission)
- ✓ Equipment Specifications (Measurable range)
  - RE : Maximum 7 ㎓ / CE : Maximum 200 ㎒

EMS (Electro-Magnetic Susceptibility) Test System

- Test in a facility that has the property of intercepting / absorbing internal / external electromagnetic noise with resistance to external noise from the outside
- ✓ Test items : RI (Radiation immunization), GSM
- ✓ Equipment Specifications (Test coverage)
  - Frequency : Maximum 6 ㎓ / Field strength : Maximum 200 V/m



Shield room #1

- Resistance to low-frequency noise introduced from the outside is tested in a facility having external noise blocking and internally generated low-frequency noise absorption characteristics
- ✓ Test items : BCI (Total Current Injection), MFI (Magnetic field immunity)
- ✓ Equipment Specifications (Measurable range)
  - BCI : 300 ㎃ / MFI : 190 ㏈μA/m

Shield room #2

▪ Resistance to noise such as static electricity or surge that flows into the product from the outside is tested in a facility having external noise blocking characteristics

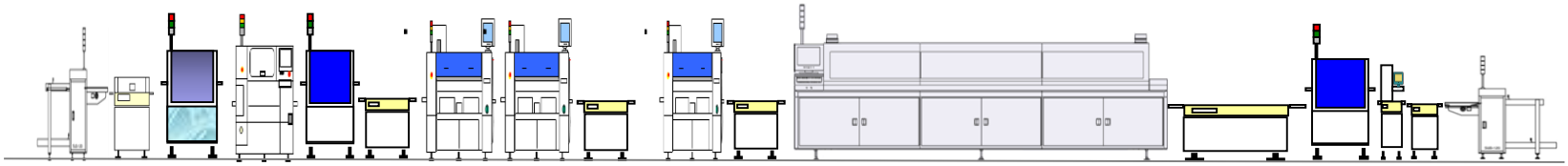
- ✓ Test items : ESD (Static), TI (Surge), TE (conducted emission)
- ✓ Equipment Specifications (Measurable range)
  - ESD : Maximum 30㎸ / TI : ISO7637-2

6 Production Process

6-1. Wireless Power Charging Unit Process

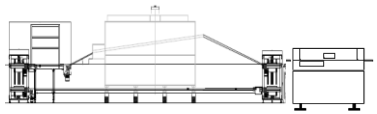
SMD → WAVE → Assembly → Inspection

SMD Process



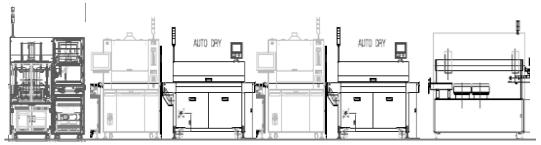
PCB Supply (In Loader) → PCB Cleaning (PCB Cleaner) → 2D Code Marking (Laser Marking) → Lead Printing (Screen Printer) → Printing Inspection (SPI) → Chip Mounting (Chip mounter 1, 2) → Component Mounting → Soldering (Reflow) → Soldering Inspection (AOI) → PCB Load (Un loader)

WAVE Process



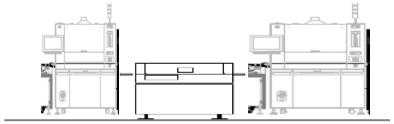
Manual Soldering → Soldering (WAVE) → Vision Inspection

ICT/Writing/Coating/Router Process



Circuit Test (ICT) → Writing → Coating → Router

Assembly/Final Process



Assembly → Final Inspection

This device complies with Part 15 of the FCC Rules. 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

NOTE: 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.

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

Radiation Exposure Statement
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.