

S4E16400/S4E16401

Technical Manual

Read this manual carefully and use the product correctly.

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1. OVERVIEW

1.1 Overview

This product is a wireless power transmission system used for charging lithium-ion battery or other secondary batteries, consisting of the primary module (a module on the primary side) used for power transmission and the secondary module (a module on the secondary side) used for power reception.

Prior to starting power transmission, the primary module and the secondary module exchange ID to ensure that they are the predefined combination permitted to transmit/receive power.

Note that assurance of quality and safety is ensured only for combined use of the S4E16400 and S4E16401, i.e., as the primary module used for power transmission and as the secondary module used for power reception respectively. Total quality assurance including safety will not be applied to environments other than this combination. If any of the modules is modified, the assurance will also not be applied. For precautions when using this product, read Chapter 4 carefully to use this product correctly.

1.2 Features

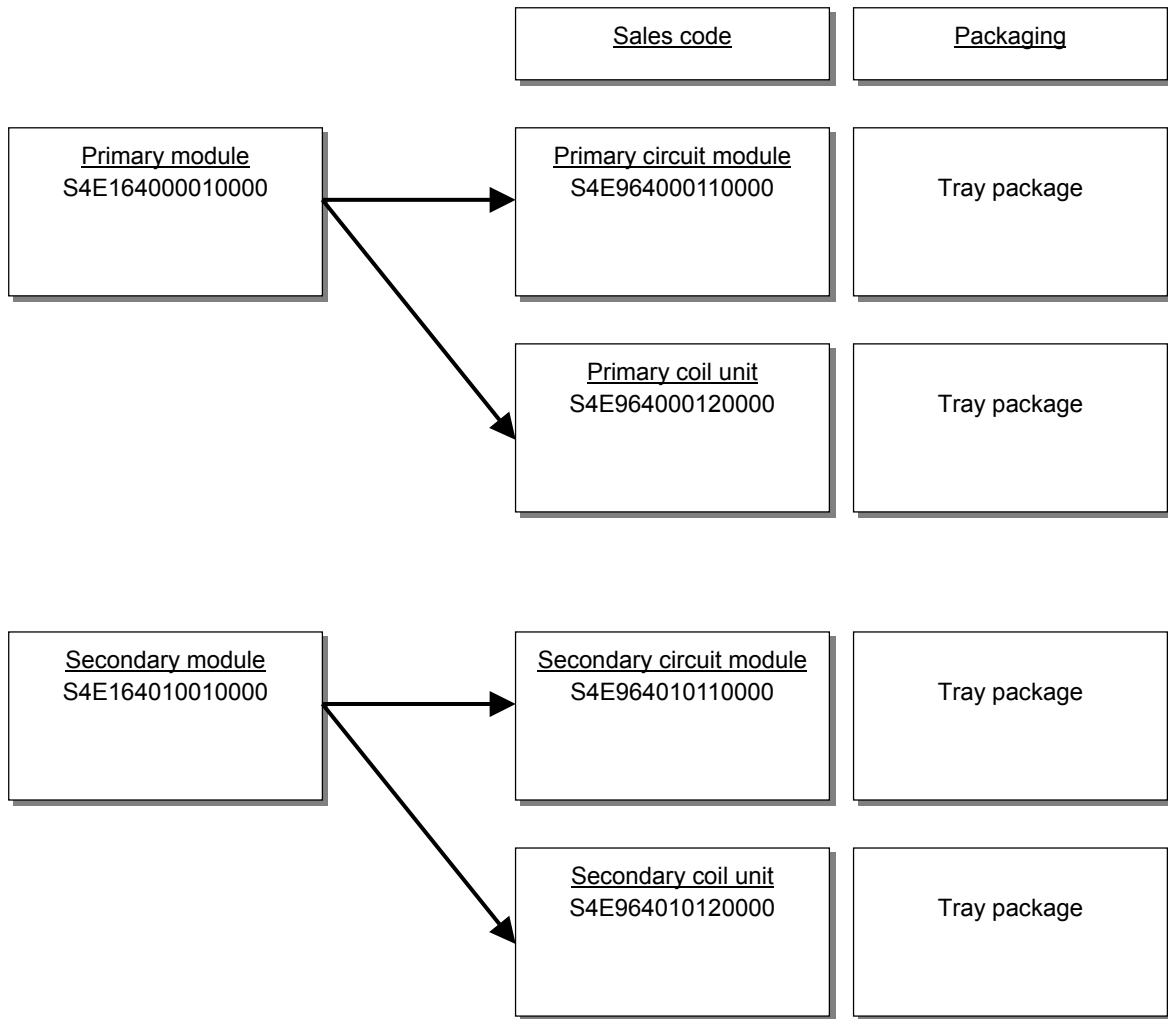
This product uses following functions to provide a reliable safety wireless power supply system that allows for reducing charge pins, improving waterproof feature, and preventing an accident due to unpermitted power supply process.

- | | |
|---|------------------------------------|
| ⊙Transmission current: 500 mA typical *1 | ⊙Standby power: 50 mW or less |
| ⊙Transmission efficiency: 70% maximum. *1 | ⊙Recharge function |
| ⊙After ID authentication | ⊙Detection of removal of secondary |
| ⊙Oscillation frequency: 121.21kHz | ⊙Detection of foreign object |
| ⊙Detection of landing | ⊙Detection of abnormal temperature |
| ⊙Power save after fully charged | ⊙Detection of AC adapter |

*1 Specification depends on operating conditions. For details, see Section 2.3.5 describing electrical conditions.

1. OVERVIEW

1.3 Product Codes and Packaging



2. SPECIFICATIONS

2.1 System Configuration

2.1.1 System Configuration

The following diagram shows an example of system configuration for the noncontact power transmission modules.

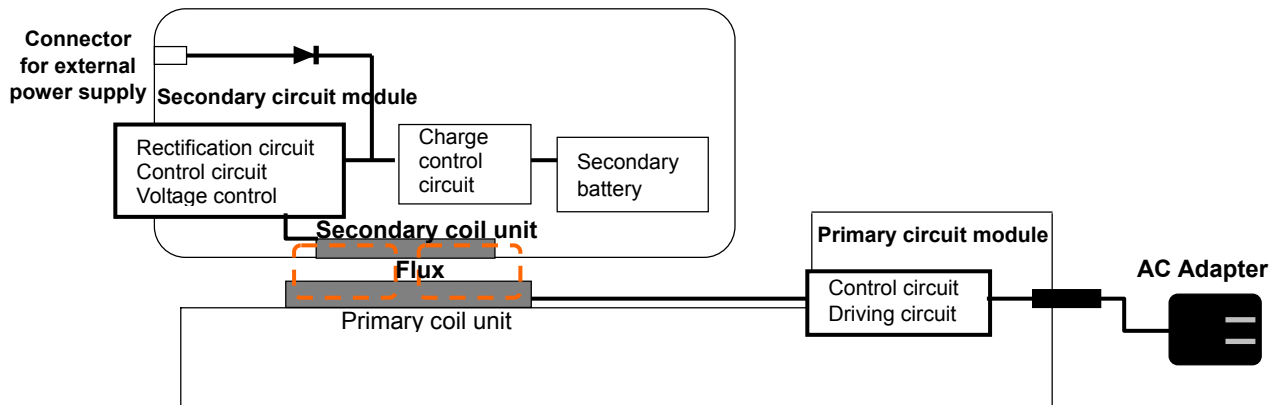


Fig.1 Example of System Configuration

2. SPECIFICATIONS

The operation of modules on the primary side and the secondary side must satisfy overall specifications described in Section 2.4. Operations sequence is specified in the same section, whereas the system operation sequence of Start - Charge - Finish is as outlined in the following:

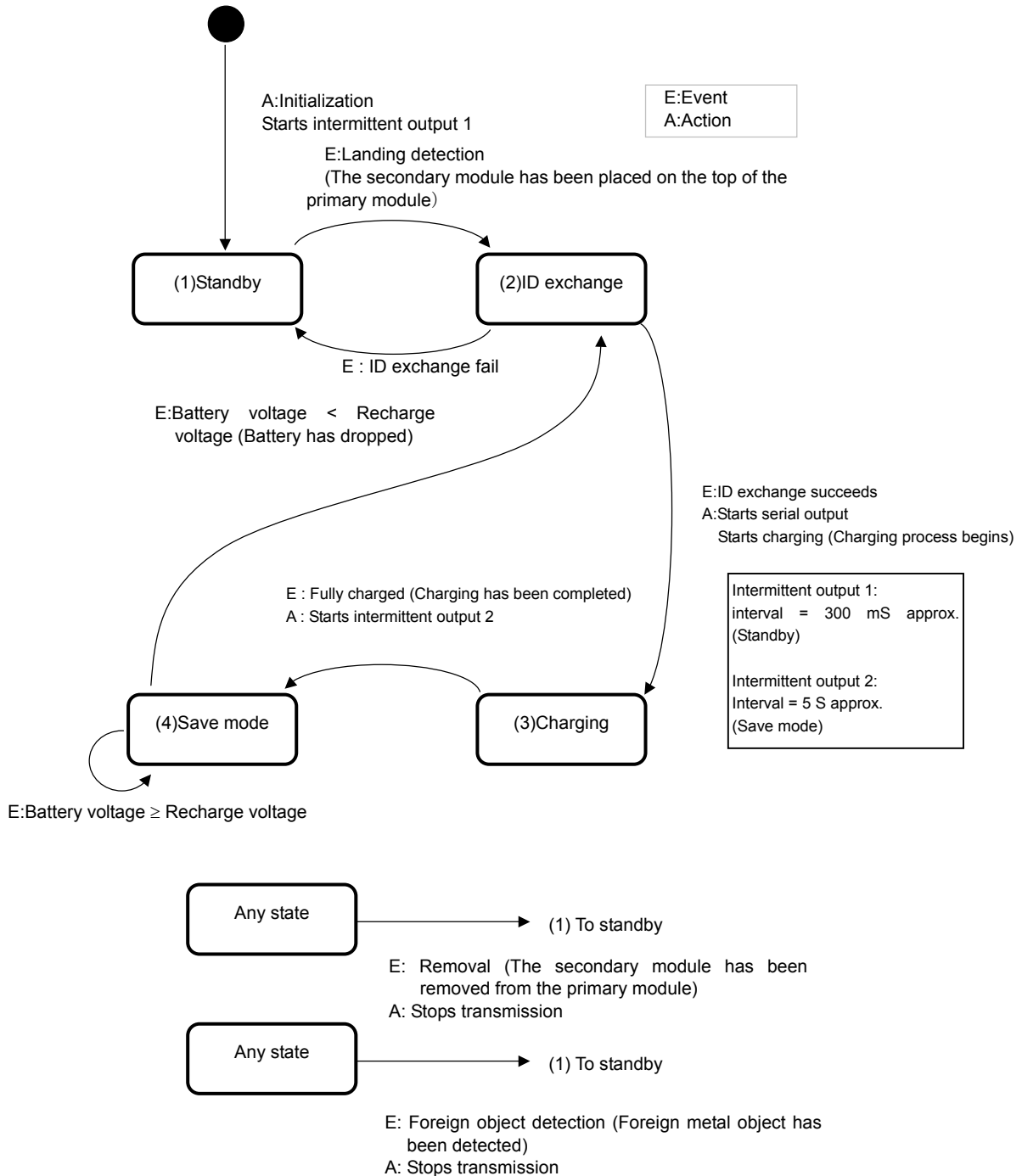


Fig.2 Sequence (Outline)

2.2 Specifications of Secondary Module

2.2.1 Overview of Specifications

This chapter describes the specifications of the primary module (module on the primary side) that belongs to the noncontact power transmission modules.

The main function of the primary module is to convert power supplied by AC adapter into magnetic energy and transmit it to the secondary module (module on the secondary side).

The module has the following functions allowing for safety charging process.

- ◆ Detection of foreign metal objects
- ◆ Detection of abnormal temperature

2.2.2 Block Diagram

The block diagram of the primary module is shown in the next page. The primary module consists of (1) Coil unit and (2) Circuit module, and the following explains each of the functional blocks.

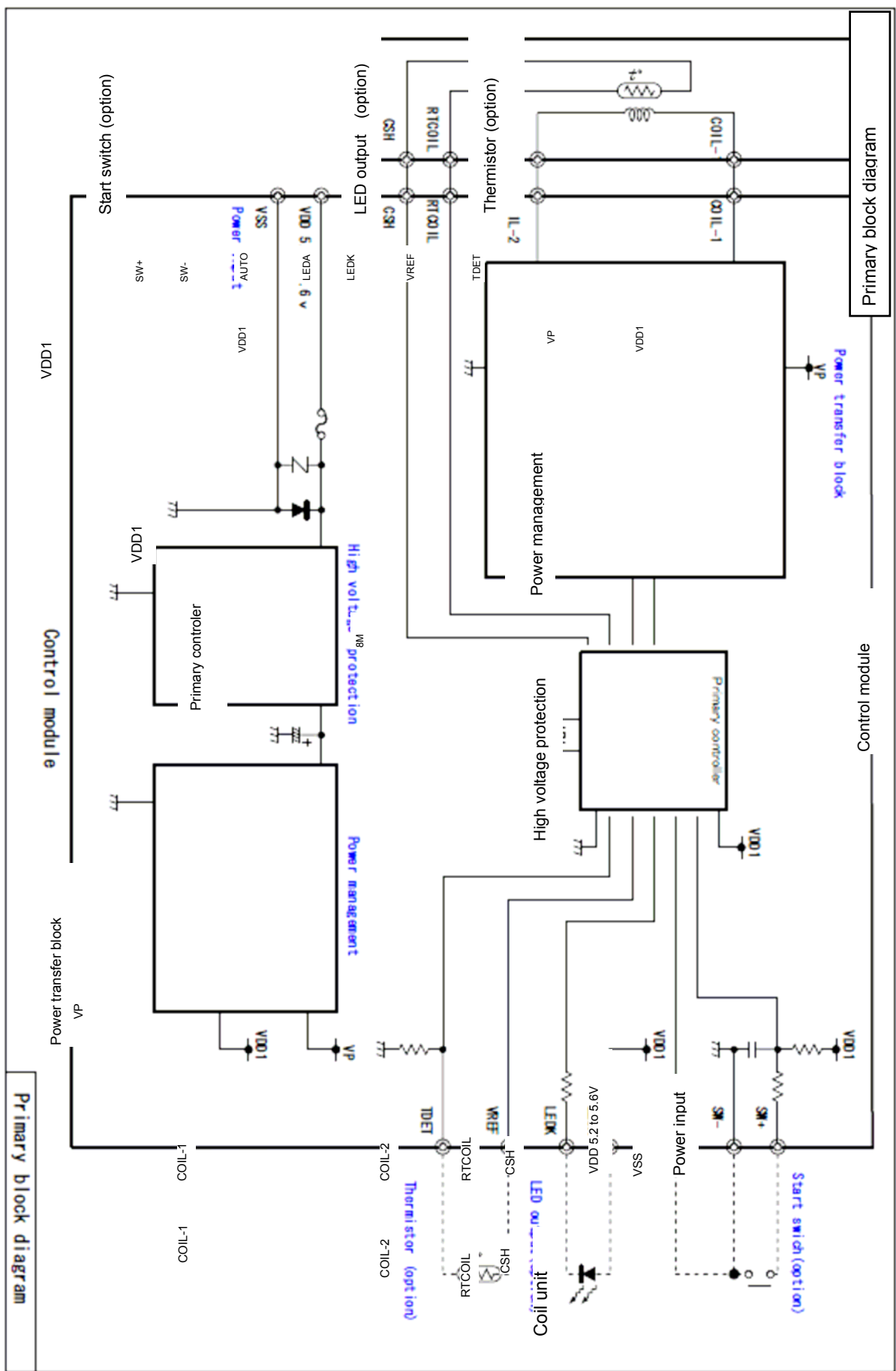
(1) Primary coil unit

- ◆ Coil and magnet sheet for inducing electromagnetic field
- ◆ Thermistor for detecting abnormal temperature

(2) Primary circuit module

- ◆ Control IC IC specifically for the module (S1F8811) manufactured by Seiko Epson
- ◆ Driving block Switching driver consisting of power MOSFET family.
- ◆ Overvoltage protection block Overvoltage protection circuit for input voltage using a voltage monitoring circuit and transistor
- ◆ Power management block Generates VDD1 power supply for control IC and VP power supply for driver.

2. SPECIFICATIONS



2.2.3 Pin Description

Pin Description Table for Primary Coil Unit (4 pins Connector)

No.	Pin Name	Description
1	* RTC	A thermistor pin. Connect this with the RTCOIL pin on the circuit module connector -2.
2	SH	A thermistor pin. Connect this with the CSH pin on the circuit module connector -2.
3	COIL-2	A coil connection pin. Connect this with the COIL-2 pin on the circuit module connector -2.
4	COIL-1	A coil connection pin. Connect this with the COIL-1 pin on the circuit module connector -1.

Pin Description Table for Primary Circuit Module
Connector - 1

No.	Pin Name	In/Out	Description
1	VDD	I	Power pin
2	VSS	I	GND pin

Connector - 2

No.	Pin Name	Description
1	COIL-1	A coil connection pin. Connect this with the COIL-1 pin on the coil unit.
2	COIL-2	A coil connection pin. Connect this with the COIL-2 pin on the coil unit.
3	SH	A thermistor pin. Connect this with the CSH pin on the coil unit.
4	* RTC	A thermistor pin. Connect this with the RTCOIL pin on the coil unit.

Pins for Soldering -1

No.	Pin Name	In/Out	Description
1	VDD	—	Power pin
2	VSS	—	GND pin
3	SW+	I	When SW mode is selected, install a momentary switch between SW+ and SW-.When auto-start mode is selected, leave these pins open.
4	SW-	O	
5	AUTO	I	When selecting SW mode, short between this pin and SW-.Leave this pin open for auto-start mode.
6	LEDA	—	For driving the LED used for displaying primary module status.
7	LEDK	—	
8	VREF	—	External thermistor can be added. Leave these pins open when no external thermistor is used.
9	TDET	—	

2. SPECIFICATIONS

Pins for Soldering -2

No.	Pin Name	In/Out	Description
1	TEST1	—	Test pin. Leave this pin open.
2	TEST2	—	Test pin. Leave this pin open.
3	TEST3	—	Test pin. Leave this pin open.
4	TEST4	—	Test pin. Leave this pin open.
5	TEST5	—	Test pin. Leave this pin open.
6	TEST6	—	Test pin. Leave this pin open.

2.2.4 Absolute Maximum Ratings

Item	Symbol	Standard	Unit	Remarks
Supply voltage	VDD	-0.3 to +7.0	V	
Input current	Iin	Max. 800	mA	
Input pin voltage	Vin	-0.3 to +7.0	V	
Performance assurance temperature	Top	-10 to +45	°C	
Operating humidity	Hop	Max. 90	%RH	
Storage temperature	Tst	-20 to +60	°C	
Storage humidity	Hst	Max. 90	%RH	

[Caution] Using with a condition exceeding the above absolute maximum rating may result in malfunction or unrecoverable damage. Moreover, normal function may be achieved temporarily but its reliability may be significantly low.

2.2.5 Electrical Characteristics

The following describes the electrical characteristics of the primary circuit module.

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage	VDD		5.2	5.4	5.6	V
Input current	Iin				700	mA
Standby power	Pstb	Excluding AC adapter			50	mW
Low input voltage detection	Vlow	For continuous 5 sec.	3.8	4.0	4.2	V
Transmission frequency	F1	During power transmission		121.21		kHz
Transmission frequency	F2	During authentication (Approx. 500 msec)		129.03		kHz
Transmission frequency	F3	During detection of a foreign material (including a metal) (Approx. 1 msec)		114		kHz

[Caution] Do not use the product over the range of the power voltage or input current. The authentication function and various detection functions may not properly operate and cause a functional failure.

[Caution] Only the coil unit specified by Epson must be connected for use. When using a coil unit or circuit module other than specified, or using a modified coil unit or circuit module, safety and other functions may not operate normally. Using such items results nonconformity of technical standards related to the radio law.

Electrical Characteristics of Primary Coil Unit

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Inductance	L1c			19.6		uH
Resistance	R2c			203		mΩ

2.2.6 Functional Description

The following describes the functions of the primary module.

Item	Description
Detection of landing	Monitors intermittently to check whether the secondary module is placed on the top of the primary module. Fig. 3 shows the timing of the landing detection.
Detection removal	Detects removal of the secondary module from the primary module, and enters standby status.
Authentication	Reciprocal process of authentication between the primary module and secondary module. The process ensures that the power transmission is permitted only between the predefined combination. The authentication procedure will be defined separately.
Detection of foreign metal objects	Monitors constantly to check whether any foreign metal object is inserted. If detected, the module stops power transmission. However some metals objects may not be detected depending on the method of embedding the module into chassis or characteristics of the object. Therefore, this function is not assured to detect every bit of the foreign objects. After the foreign metal object is removed, the module resumes the initial state.
Detection of foreign metal objects	<p>Detects the temperature of the center of coil, and when it becomes 70 °C or higher, stops the power transmission. Power-on reset is required to resume the transmission.</p> <p>Installing thermistor between VREF and TDET as shown in the following diagram enables you to detect temperature at any position.</p> <p>Detected temperature: 60°C (absolute temperature, recommended component is used)</p> <p>Recommended component Murata Manufacturing NCP15WF104F03RC (100KΩ ±1%/4250K±1%)</p>
Overvoltage protection	Stops power supply to the subsequent overvoltage protection blocks immediately when input voltage exceeds 6.2 ± 0.2V. When the input voltage returns to normal level, the module resumes the initial state.
Detection of low voltage	Stops power transmission when input voltage drops below 4.0 V during the transmission. Power-on reset is required to resume the transmission.
Detection of low voltage	Can display the state of primary module by connecting LED with the LEDA and LEDK pins.

State	LED
Standby	Off
During power transmission	On
Standby after fully charged	Off
When detecting abnormal temperature	Blinking
When detecting low voltage	Blinking

2. SPECIFICATIONS

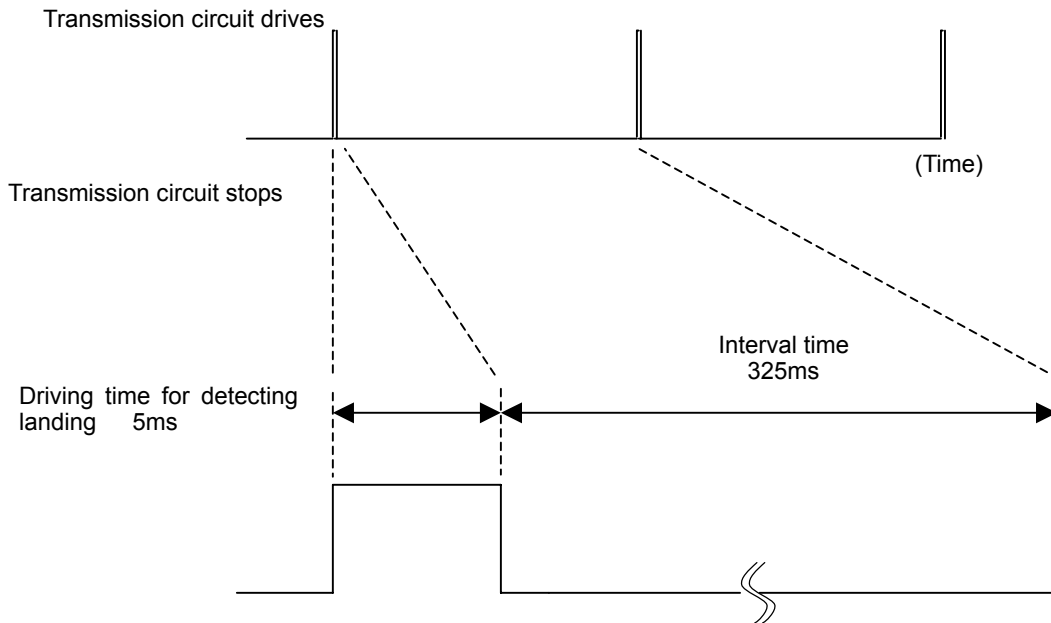


Fig.3 Landing Detection Timing

2.2.7 Embedding Conditions

This section describes conditions required to embed the primary module.

To connect the primary coil unit and the primary circuit module, be sure to use the cable with specifications shown in the following (1) or (2).

Connector: Model number SHR-04V-S manufactured by JST
Line: AWG#28

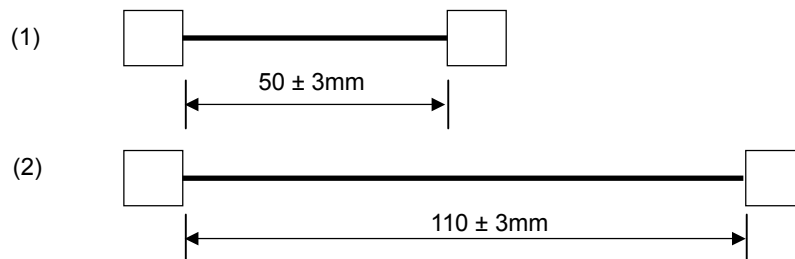


Fig.4 Specification of Cable

[Caution] If cables having different specifications are used, they may violate the technical standards related to the radio law.

The following shows an example of embedding the primary coil unit.

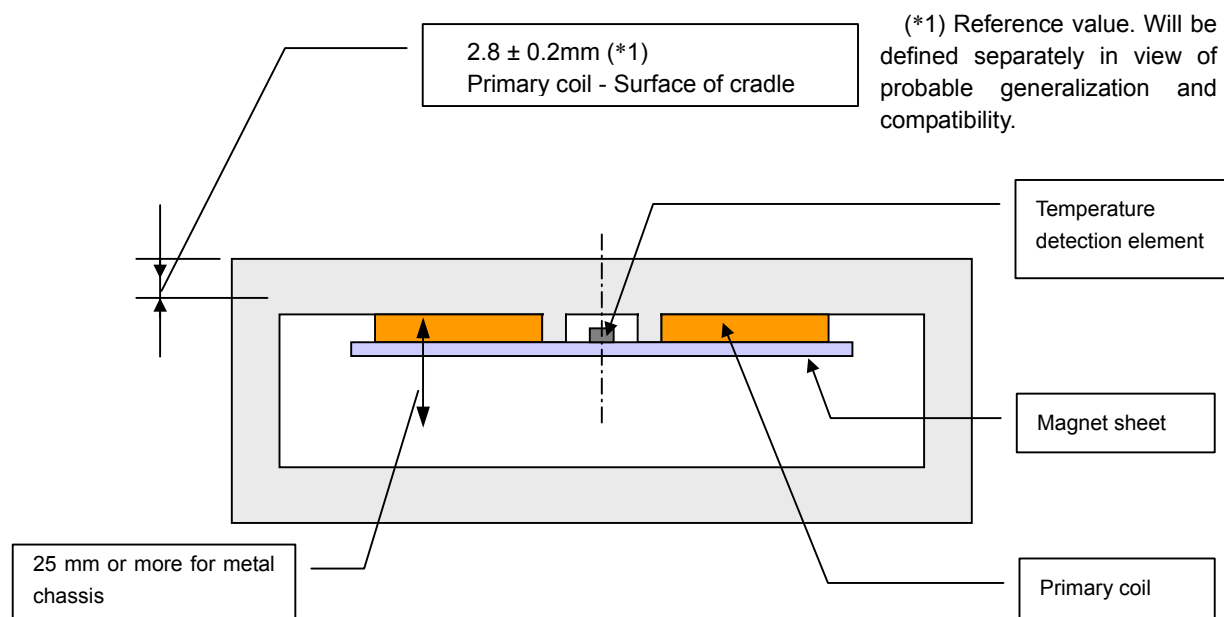


Fig.5 Section of Primary Module (Coil Unit)

- Material
Resin must be used for the material of chassis.

[Caution] In order to prevent the temperature detection element from being damaged by shock, consider installing “escape” on a chassis or other solution when designing the chassis.

2.3 Specifications of Secondary Module

2.3.1 Overview of Specifications

This chapter describes the specifications of circuit on the secondary side that belongs to the noncontact power transmission modules.

The main function of the circuit on the secondary side is to convert flux supplied from the primary module into direct-current power and supply it to the charge control circuit.

The circuit also has the function of detecting fully charged state for the purpose of power saving, as well as the recharging function.

2.3.2 Block Diagram

The block diagram of the circuit on the secondary side is shown in the next page. The secondary module consists of (1) Coil unit and (2) Circuit module. The following explains each of the functional blocks.

(1) Primary coil unit

- ◆ Coil and magnet sheet for inducing electromagnetic field

(2) Secondary circuit module

- ◆ Control IC IC specifically for the module (S1F8820B) manufactured by Seiko Epson
- ◆ Rectification unit Rectification circuit
- ◆ Load modulation unit For transmit information to the primary side.
- ◆ Voltage control unit For regulating output voltage.
- ◆ Output control unit Output gate using power MOSFET.

2.3.3 Pin Description

Pin Description Table for Secondary Coil Unit (Pins for Soldering)

No.	Pin Name	Description
1	COIL-2	A coil connection pin. Connect this with the COIL pin on the circuit module.
2	COIL-1	A coil connection pin. Connect this with the COIL pin on the circuit module.

Pin Description Table for Secondary Circuit Module (20 Pins Connector)

No.	Pin Name	In/Out	Description						
1,3	COIL1	I	A coil connection pin. Connect this with the COIL pin on the coil unit.(*)						
2,4	COIL2	I	A coil connection pin. Connect this with the COIL pin on the coil unit.(*)						
5,6,7,8	NC	—	A NC pin. Leave this pin open.						
9,10	VOUT+	O	DC output (+)						
11,12	VOUT-	O	DC output (-)						
13	ACIN	I	An AC adapter detecting pin. Output from VOUT ± is stopped when AC adapter is detected. Leave these pins open if the function of detecting AC adapter is not used.						
14	VBAT	I	A battery voltage monitoring pin. Leave this pin open if the recharging function is not used.						
15	ICUT	O	A load reduction signal used for periodical authentication.						
16	LEDRI	I	A full charge detection pin. Charging process is determined to be completed when H level state continues for 5 seconds, and the module enters full charge standby state. Connect this pin with VOUT- if the function of detecting full charge state is not used.						
17	TEST1	—	Test pin. Connect this with VOUT-.						
18	TEST2	—	Test pin. Connect this with VOUT-.						
19	LEDG	O	For outputting the state of the secondary module. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>State</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>During power output</td> <td>L level (-10 mA max.)</td> </tr> <tr> <td>During stop of power output</td> <td>Open</td> </tr> </tbody> </table>	State	Output	During power output	L level (-10 mA max.)	During stop of power output	Open
State	Output								
During power output	L level (-10 mA max.)								
During stop of power output	Open								
20	NC	—	A NC pin. Leave this pin open.						

(*) For the coil connection pin, the coil connection land (2 positions) that supports soldering can be used in addition to the 20 pins connector.

2. SPECIFICATIONS

2.3.4 Absolute Maximum Ratings

Item	Symbol	Standard	Unit	Remarks
Input pin voltage	Vin	Vout - 0.3 to Vout + 0.3	V	VBAT, LEDRI, ACIN
Performance assurance temperature	Top	-10 to 45	°C	
Operating humidity	Hop	Max. 90	%RH	
Storage temperature	Tst	-40 to 80	°C	
Storage humidity	Hst	Max. 90	%RH	

[Caution] Using with a condition exceeding the above absolute maximum rating may result in malfunction or unrecoverable damage. Moreover, normal function may be achieved temporarily but its reliability may be significantly low.

2.3.5 Electrical Characteristics

The following describes the electrical characteristics of the secondary circuit module.

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output voltage	Vout	unloaded	4.9	5.2	5.5	V
Output voltage ripple		Loaded with 100 mA			100	mV
		With maximum load			150	mV
Voltage detected by LEDRI	VLEDRI		2.2	2.5	2.8	V
ICUT output current	ICUTH	High, VICUT=Vout-0.1V	0.2			mA
	ICUTL	Low, VICUT=0.1V	0.3			mA
Detected voltage by ACIN	VACIN		4.0	4.1	4.2	V
Detected voltage by VBAT	VVBAT		3.8	3.9	4.0	V
LEDG current	ILEDG		-6			mA

[Caution] Only the coil unit specified by Epson must be connected for use.

[Caution] Do not connect a load that drops Vout to 3V or less. Doing so may cause secondary circuit module to reset.

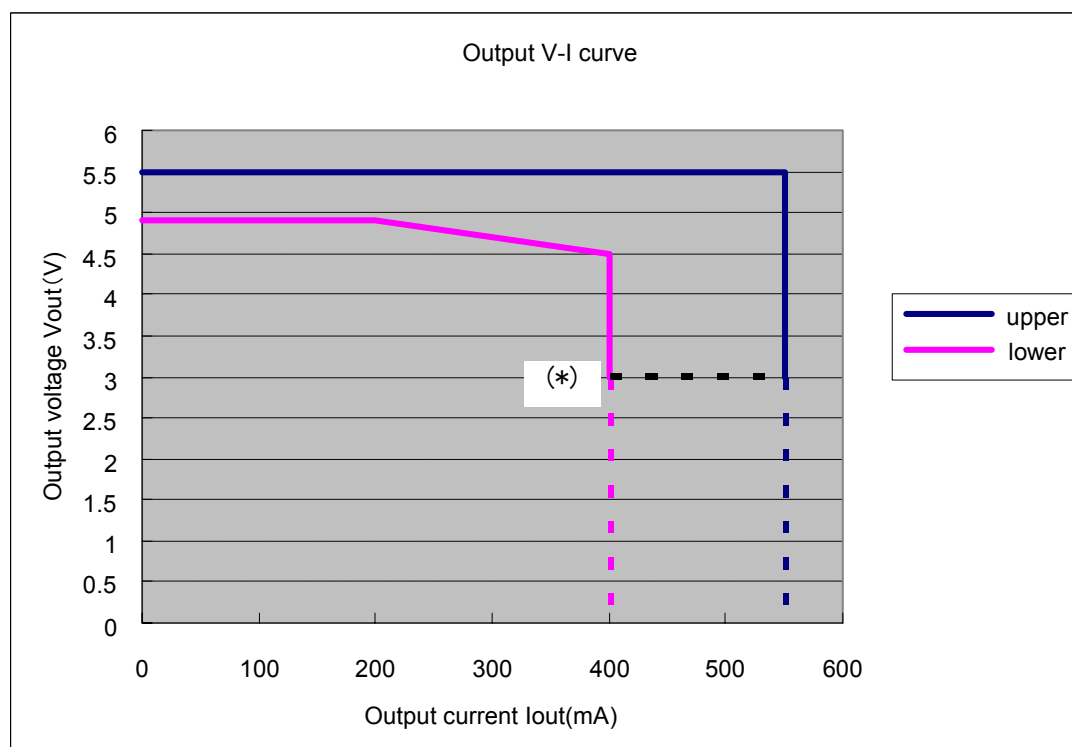
Electrical Characteristics of Secondary Coil Unit

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Inductance	L2c			11.68		uH
Resistance	R2c			196		mΩ

Output Voltage - Current Characteristics

The following shows the characteristics of output voltage to output current. The characteristics vary greatly depending on positional relation between coils on the primary side and the secondary side. If you consider a design with large deviation, therefore, be sure to check whether the design can supply necessary power.

When you determine the location where the power greater than the 4.5V voltage and 400mA current can be output, refer to Section 2.4.6 "Embedding Conditions".



[Conditions] Input power : $V_{in}=5.4V$ $I_{in}\leq 680mA$, Positional deviation: $z=3.3$ to $4.3mm$ / $x=0.0$ - $5.0mm$

(*) Do not use in a $V_{out} < 3.0V$ condition. Doing so may cause the control circuit on the secondary side to reset.

Fig.6 Output Voltage and Current Characteristics

2.3.6 Functional Description

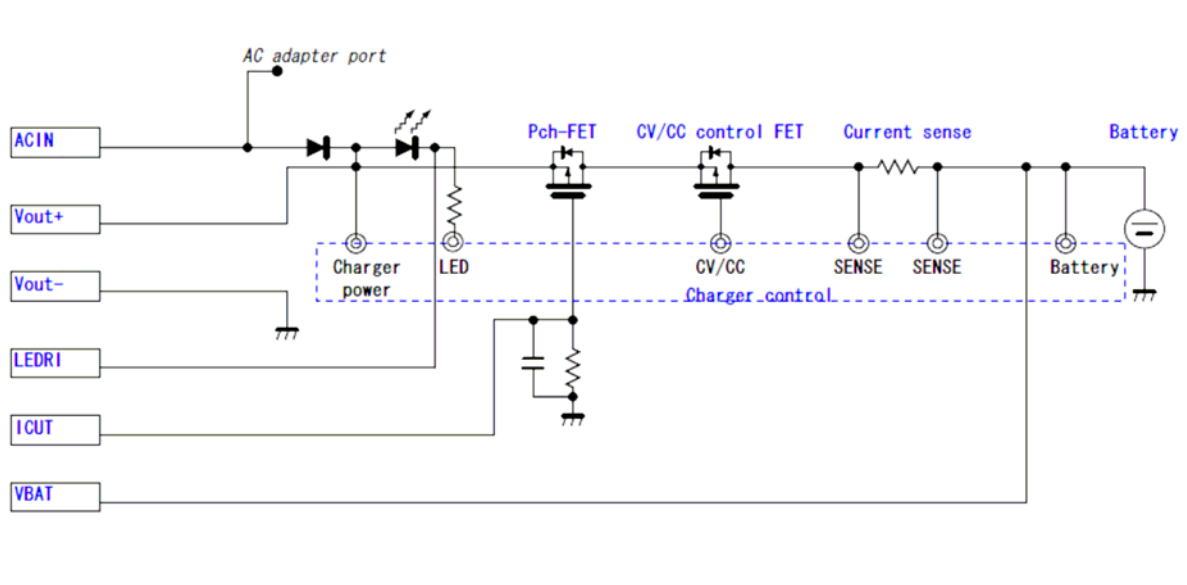
This section describes functions of circuit on the secondary side.

Item	Description
Detection of fully charged state	Stops power supply to the charge control circuit by turning the LEDRI pin $L \geq H$ when fully charged state stops the charging process, and transmits the power save mode command to the primary module. Connect the LEDRI pin with VOUT- if this function is not used.
Recharge function	Starts recharging process if the battery voltage becomes recharge voltage ($3.9 \pm 0.1V$) or less when the module enters power save mode due to fully charged state. If this function is not used, leave the VBAT pin open.
Detection of AC adapter	Prioritizes AC adapter to supply power to the charge control circuit if the power is currently supplied direct from the AC adapter. If this function is not used, leave the VBAT pin open.
Authentication	Reciprocal process of authentication between the primary module and secondary module. The process ensures that the power transmission is permitted only between the predefined combination. The authentication procedure will be defined separately.

2. SPECIFICATIONS

2.3.7 External Connection Examples (Reference)

Example of Application to Charging Circuit



[Caution] Circuit examples described above show connection examples for peripheral circuits of this product and do not guarantee charging operation. Make a full evaluation on the actual application to select parts. When you charge the battery, secure the service range and conditions recommended by the battery manufacturer by detecting the battery condition (voltage, current, temperature) outside the battery and build in protective circuits and control devices that operate when they detect a problem to assure safety.

2.3.8 Embedding Conditions

This section describes examples of embedding the secondary module.

This product is designed on the premise of a metal shield being placed on the top of the secondary coil unit. Place an aluminum, copper or another metal sheet with the size of approx. 35 × 35 mm on a position 0 to 5 mm away from the surface of the secondary coil unit. If the metal shield and the battery pack are not mounted, the accuracy of the foreign metal detection function drops. Also, if a metallic housing or another metallic or magnetic part is placed in the non-metal area of Figure 8, the leaked flux is absorbed by those metals and the authentication range may become smaller. If the leaked flux is absorbed by the metal, the input current to the primary module increases. Therefore, you can determine whether the leaked flux is absorbed by the metal or not by simply measuring an increase of input current to the primary module without connecting the secondary module to a load. The following shows the permissible value of increased input current to the primary module that does not affect on the authentication range.

You can also check the authentication range using the special jig.

Permissible value of increased input current to the primary module caused by shield and other metal (*): 5 - 15mA

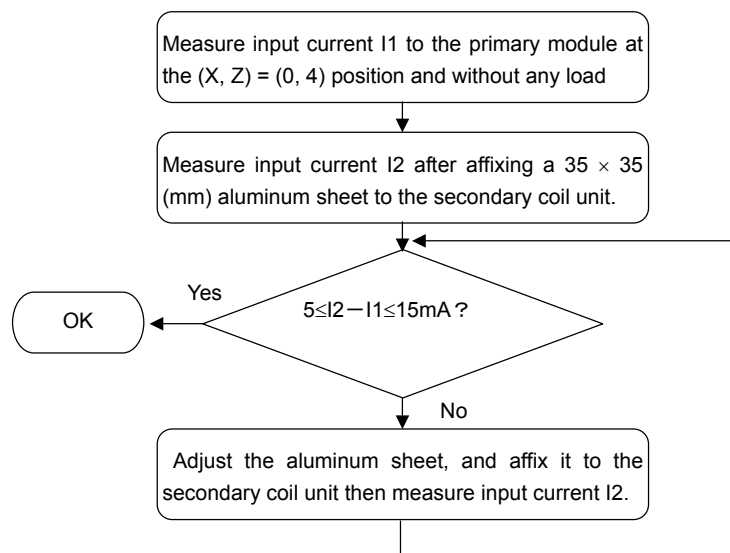
(Vertical distance from the primary coil: 4.0 mm)

(Vertical distance from the primary coil: 0.0mm)

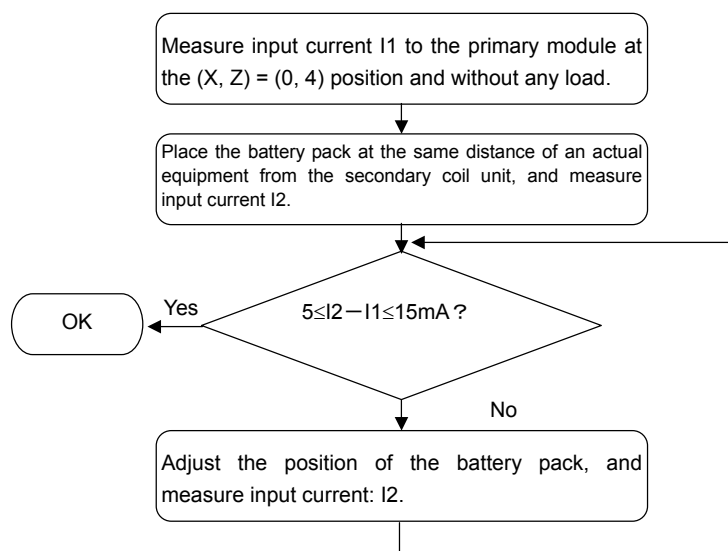
The following describes checking procedure when the top of the secondary coil unit is in situation (1) - (4) as shown below.

(1) No metal, (2) Battery pack, (3) Circuit board, (4) Metal or magnetic component

(1) When no metal is placed on the secondary coil unit

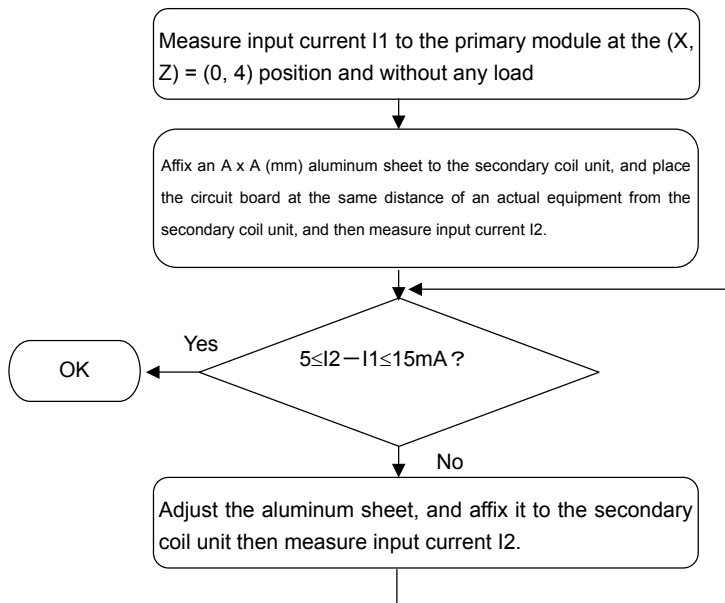


(2) When a battery pack is placed on the secondary coil unit.

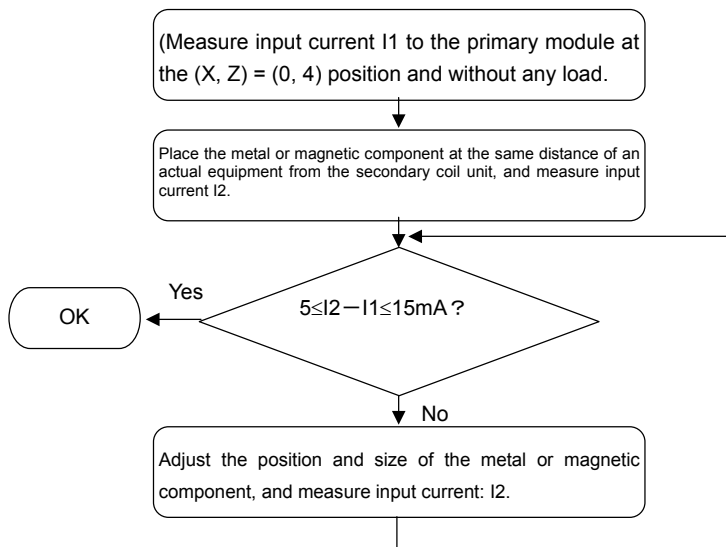


2. SPECIFICATIONS

(3) When a circuit board is placed on the secondary coil unit.



(4) When metal or magnetic component is placed on the secondary coil unit.



The secondary coil unit and the secondary circuit module must be connected using a 50 to 200-mm long wire lead or conductive pattern.

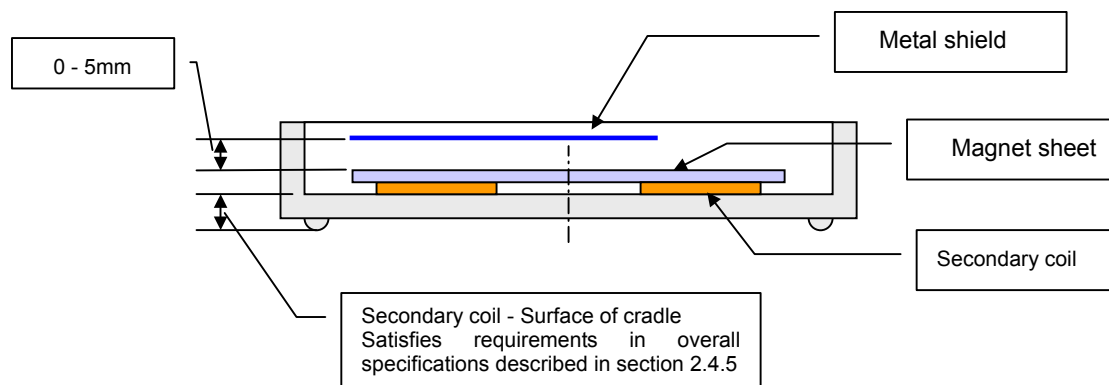


Fig.7 Section of Secondary Module (Coil Unit)

- Material
Resin must be used for the material of chassis.

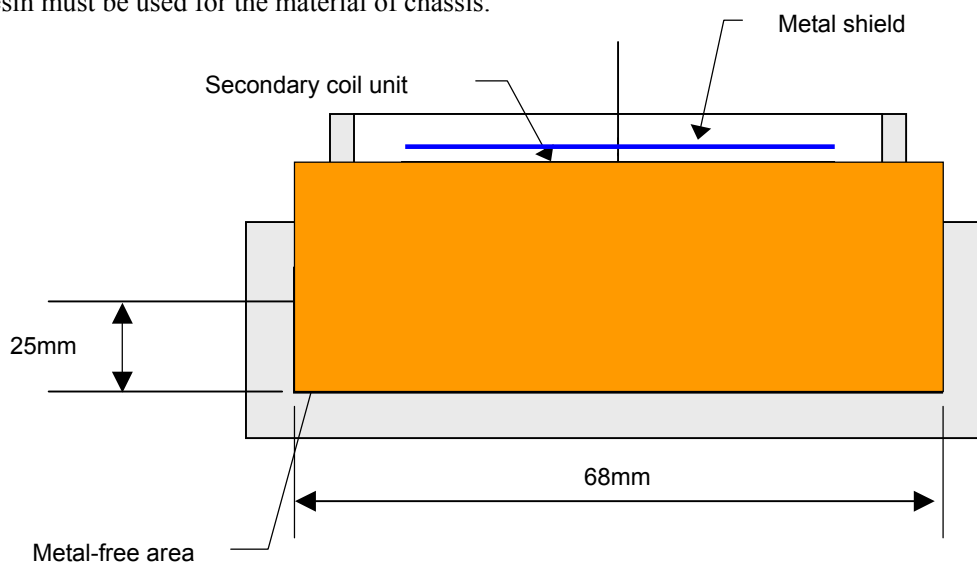


Fig.8 Metal-Free Area

[Caution] The description in Section 2.3.8 may be subject to change.(The specification is not final.)

2. SPECIFICATIONS

2.4 Overall Specifications

2.4.1 Overview of Specifications

This chapter describes the overall specifications of the primary module (a module on the primary side) and the secondary module (a module on the secondary side), consisting of the noncontact power transmission modules.

The primary module drives intermittently while in standby state to keep detecting the landing of the secondary module. If the primary module detects the secondary module, they execute reciprocal authentication to ensure that they are the predefined combination permitted for the power transmission. If they pass the authentication process, then the transmission can begin.

When the secondary module detects the fully charges state, it communicates with the primary module to enter save mode, and shifts itself to save mode. If the secondary module maintains the landing state, the secondary module detects that the battery voltage drops below the voltage defined to start recharging, and transmits the information to the primary module to start recharging. If the recharging function is not used, the secondary module continues to wait for the detection of removal.

During charging process, the secondary module reduces load periodically, and the primary module checks whether the eddy-current loss occurs on the secondary side, caused by foreign metal objects. If any foreign metal object is detected, the primary module stops power transmission.

2.4.2 Functional Description

The following describes the functions available when the primary module and the secondary module are combined.

Item	Description
Authentication	Reciprocal process of authentication between the primary module and secondary module. The process ensures that the power transmission is permitted only between the predefined combination. The authentication procedure will be defined separately.
Transmission monitoring	Monitors constantly to check whether any foreign metal object is inserted. If detected, the power transmission is stopped. For this purpose, the secondary module reduces load periodically, and the primary module checks whether the eddy-current loss occurs on the secondary side, caused by foreign metal objects. However some metals objects may not be detected depending on the method of embedding the module into chassis or characteristics of the object. Therefore, this function is not assured to detect every bit of the foreign objects.

2.4.3 Transmission monitoring

The noncontact power transmission module uses the following detection method assuming that metal objects may erroneously be inserted into transmitter area during transmission. The secondary module enters unloaded state at the timing shown in the following diagram, and flows load modulation current for a certain period of time. The primary module monitors that load is changed between low and high state periodically. For example, the primary module determines the eddy-current caused by foreign metal objects by detecting in low state the higher load than standard value. When the primary module detects a foreign object, it stops transmission and enters standby state.

The output current from the secondary module must be synchronized with the output from the ICUT pin of secondary control IC (see the secondary circuit block diagram), and it must be above 5mA (inclusive) but below 40 mA (inclusive) in the low load state.

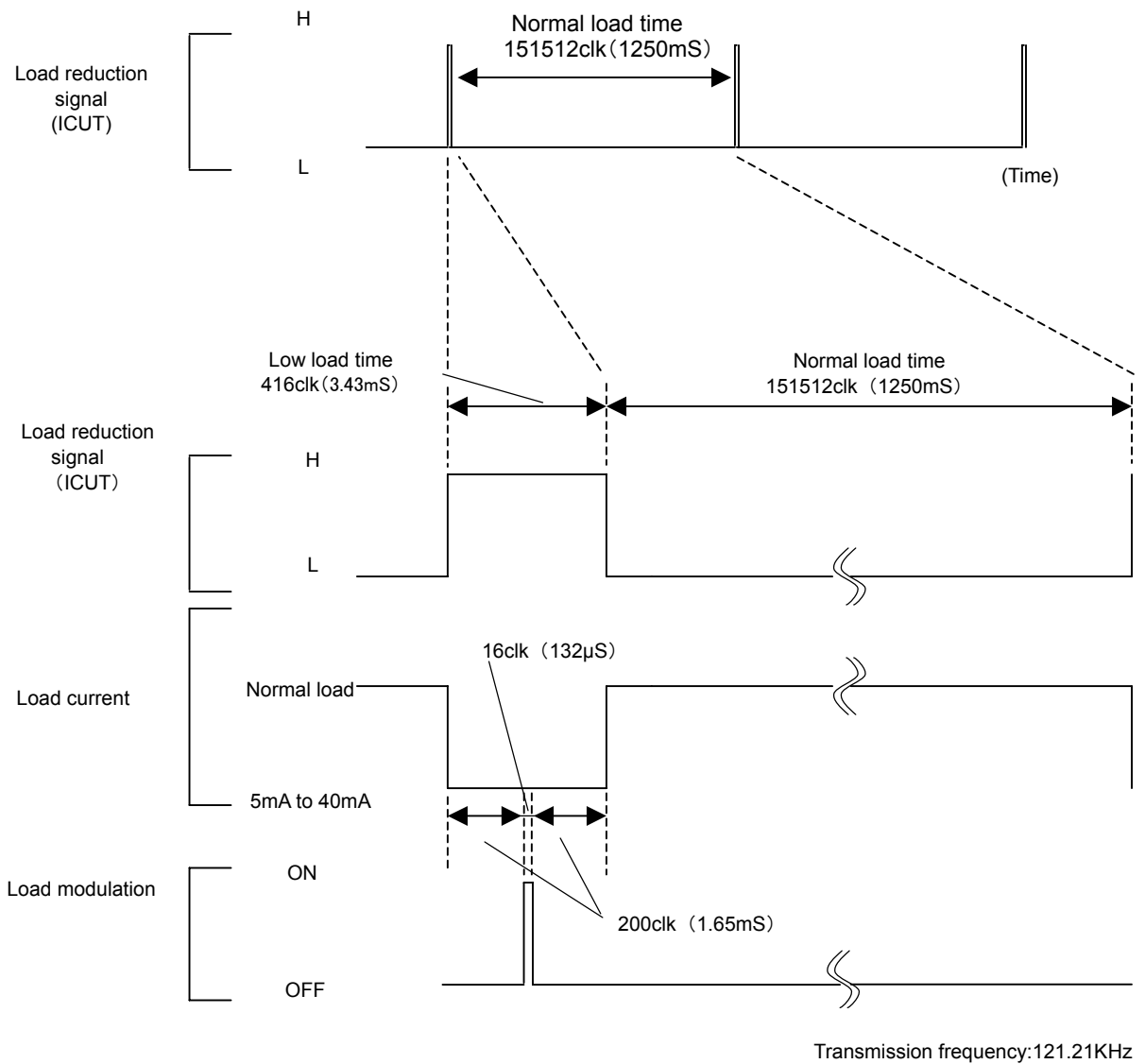


Fig.9 Transmission Monitoring Timing

2. SPECIFICATIONS

2.4.4 Sequence

This section describes the operations sequence of the noncontact power transmission modules.

However, ID code system will be defined separately because it will include items that should be handled as confidential.

The following state transition diagrams show the sequence of the primary module and of the secondary module.

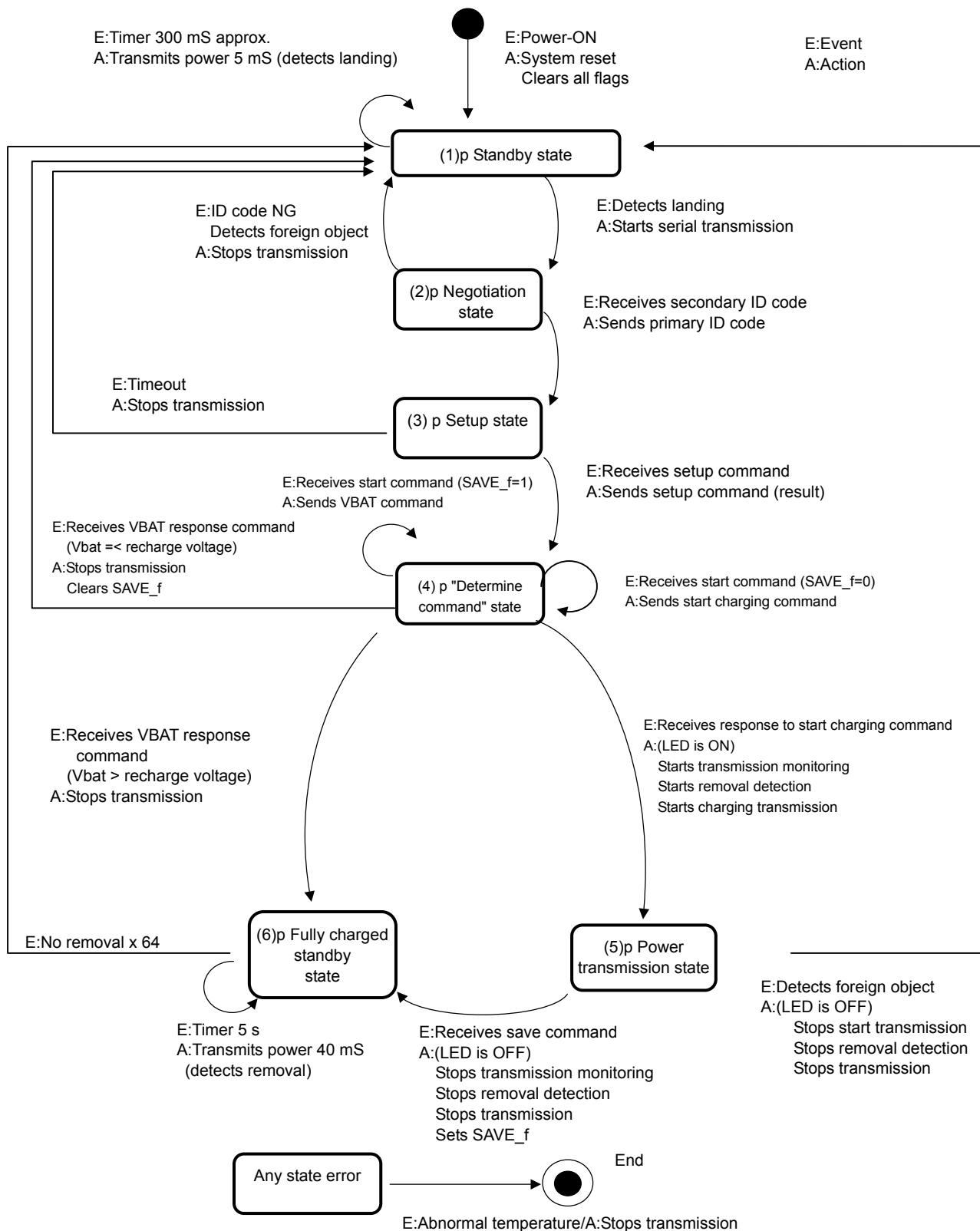


Fig.10 Primary Module

2.4.5 Safety against Foreign Metal Objects

As this system uses electromagnetic induction for power transmission, metal placed on the primary coil may generate heat due to induction heating. The following design is incorporated into the modules against heat generation of metal.

<Before ID authentication>

If a foreign metal object placed before authentication is detected, the system does not execute authentication process and does not start power transmission.

<After ID authentication>

If a foreign metal object inserted after the authentication and during power transmission is detected by the primary side, the system stops transmission and execute authentication process again. A metal object with material and size that cannot be detected before and after the authentication must not rise its temperature higher than 55 deg C under room temperature (25°C).

[Caution] The detecting ability may vary depending on the condition that the module is built on the product. Make a full evaluation on it and check that there is nothing inconvenient before using. If it doesn't properly detect foreign matters, they may generate heat due to induction heating and reach dangerous temperature.

[Caution] The detecting ability is not assured to detect all heat generating metals. Add safety circuits if necessary and secure safety before using.

2. SPECIFICATIONS

2.4.6 Embedding Conditions

Output voltage on the secondary side depends on the position of primary coil unit and secondary coil unit. Therefore the following defines the horizontal distance (X) and the vertical distance (Z) of the center of each coil. Consider the following positional relation when you design a chassis for your product into which the coil unit is embedded.

Item	Recommended Value	Allowable value
Transmission distance (vertical distance)	4.0mm	See Figure 12.
Deviation of the center of coil (to horizontal)	0.0mm	See Figure 12.

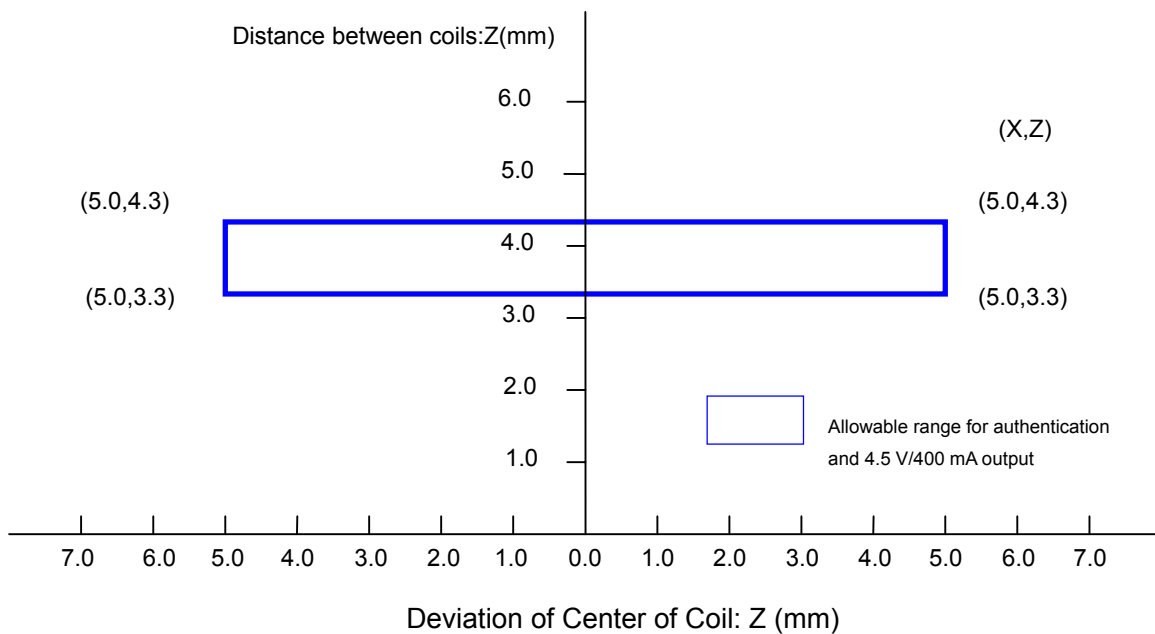


Fig.12 Allowable Range for Authentication and 4.5 V/400 mA Output
(Deviation of position between the primary coil unit and secondary coil unit.)

[Caution] The value shown above may vary depending on the condition that the module is built on the product. Make a full evaluation on it and check that there is nothing inconvenient before using

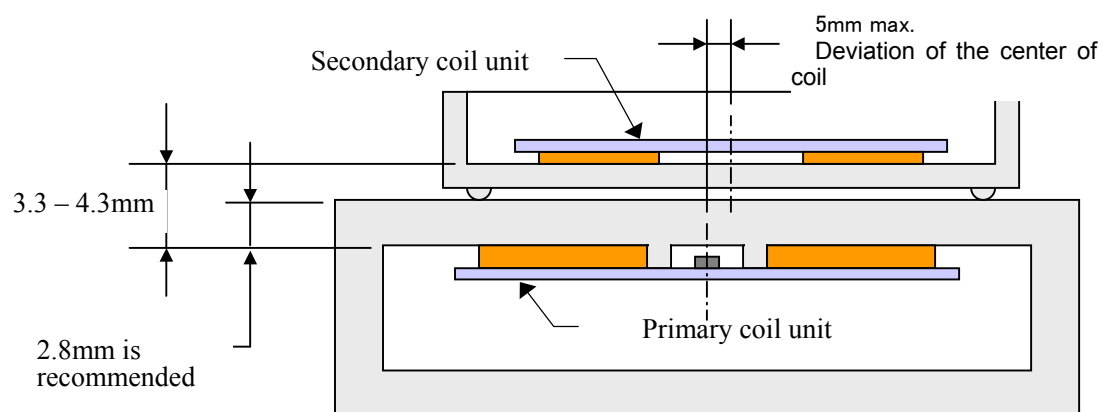


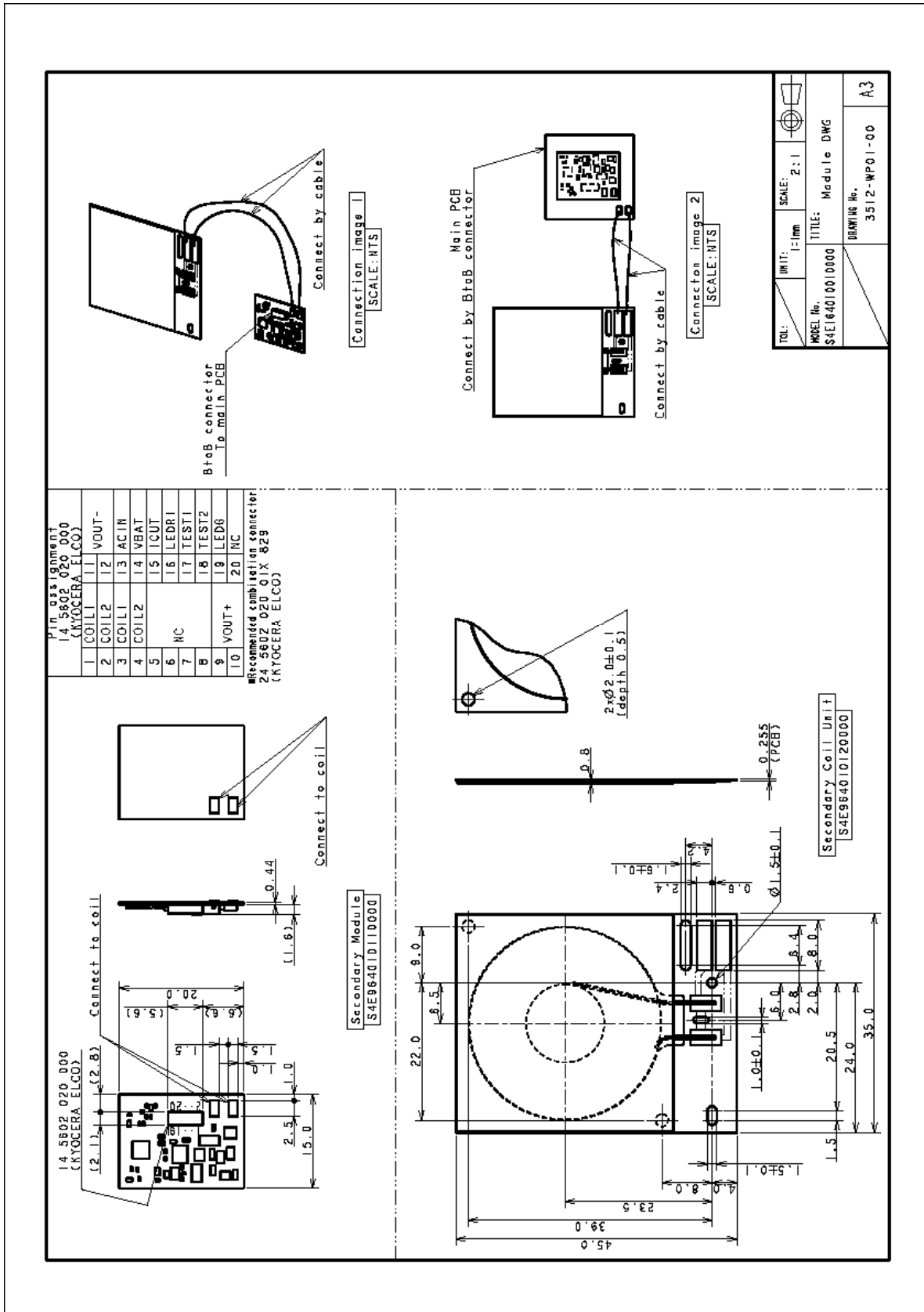
Fig.13 Section of Primary Coil Unit and Secondary Coil Unit

[Caution] The description in Section 2.4.5 may be subject to change.(The specification is not final.)

3. EXTERNAL DIMENSIONS

◆ Module on the secondary side

S4E164010010000 Product diagram



4. PRECAUTIONS

4. PRECAUTIONS

4.1 General precautions

- ◆ This product is designed and manufactured for general consumer use and is not designed for an application for any life-support or other devices that require a very high degree of reliability. We are not responsible for any results caused by the use of this product or those devices for such application.
- ◆ The content of this document is subject to change without prior notice.
- ◆ Neither a part or the whole of this document may be transferred, reproduced, or used for any other purpose without our permission
- ◆ Application circuits, programs and usage contained in this document are reference information. We do not provide any guarantee on the right (including intellectual property right and know-how, hereafter intellectual property) of a third party infringement or generation of damage. This document may not be construed as granting anyone a license of the intellectual property right of us or any other third parties.
- ◆ Characteristics, large and small, indicate magnitude relationships on the number line.
- ◆ Of the products referred to in this document, the export of those falling under the strategic material category stipulated in the Foreign Exchange and Foreign Trade Control Law shall require the granting of an export license according to said law.
- ◆ The warranty period of this product is one year after shipment of the product. Though we shall be responsible for replacing the product due to a trouble within the scope of this specification, we shall not be liable for other damages. We do not guarantee products for which 1 year has passed since the shipment.

4.2 Precautions on Handling

- ◆ Provide full safety measures to the system and devices using this product.
- ◆ Metal placed on the primary coil may generate heat due to induction heating. We recommend that you describe the following points in the instruction manual and the finished product case.

- (Do not place other products than the specified secondary products on the primary side. They may cause heat and a trouble.
- (Do not place metal such as coins and clips on the primary product (charger) when they are live and on standby as they are in danger of generating heat.

- ◆ Do not allow input exceeding the maximum rating and DC characteristics. It can cause troubles of various detecting functions including generation of overheat and detection of foreign matters, authentication function and permanent damage. We recommend that you describe the following points in the instruction manual and the finished product case.

- (Manufacturer providing built-in finished products) Use the specified AC adapter.
- (Using other ones than is specified can cause heat, smoke and a trouble.

- ◆ Some adapters may generate a noise. In this case, install a ferrite core to prevent it.
Example of taking measures: Ferrite core Kitagawa Kogyo RFC-8 3 turns Mounting location: Near the module
- ◆ As transmission characteristics of a noncontact power transmission module changes due to the usage environment (size of the housing, material, phase position of the primary and secondary coils, environment with metal parts) of this module, we cannot guarantee operation in all usage environments. Check the operating condition and safety in the actual usage environment. Add protective circuits and redundant circuits in necessary and secure safety before using.
- ◆ If you find a trouble such as smoke, abnormal smell and overheating during operation (charging) and standby, stop using it immediately.
- ◆ Be careful of the following when you install a module.
 - Install a module properly to the case device, jigs and tools in order not to add stress such as

warping and distortion. Generation of deformation, flaking and damage may cause a functional trouble and imperfect condition.

- Be careful not to rub the coil with a sharp edge and damage it by rubbing it. Damage on the insulating coating may cause a functional trouble and imperfect condition.
- Make a full evaluation on physical stress including deformation and shock with your product before using.
- Design the layout so that the product may not be exposed to liquid leakage when you install this module.
- Each module has a part where wiring is exposed such as a coil terminal. So take full care against short-circuit to other parts or leak when you handle the unit.
- Be careful so that conductive material such as metal fragments may not enter and interfere with the circuit area of this product. They may cause malfunction and damage.
- Water entered into this product can cause malfunction of instruments and damage. We do not guarantee operation if condensation is caused.
- As this module may cause flaking, floating and lysis due to organic solvent, be careful enough to wipe it using organic solvent.
- Use the material that doesn't generate high-voltage leak for the equipment, tools and workers and make a ground when you assemble this module.
- We recommend that you assemble the module in the environment that is not directly exposed to dust, corrosive gas, direct sunlight and strong ultraviolet where the temperature and humidity is appropriate.
- ◆ Do not use the product under the following environment.
 - The place where corrosive gas is generated
 - The place where strong radio wave and magnetic force are generated
 - The environment where strong shock and vibration are produced
 - Do not put this product in a microwave and on an electromagnetic cooking device. It may cause heat, smoke and a fire.
- ◆ Be careful of the following as this product emits radio wave.
 - If you find this product causing radio wave interference with other wireless devices, use it apart from them or turn off the power on the primary side to prevent radio wave interference.
 - Do not place a magnetic card near the product and have it caught by it. Magnetic data may be lost.
 - Turn off the power on the primary side near a electronic device that handles high control and faint signals. Electronic devices may malfunction. Check the effect by the radio wave interference when you use the product for those device or use it near them.
 - Example . . . Heart pacemaker, audiophone, fire alarm, automatic door and other electro-medical apparatus
 - Do not use the product in a medical institution and a aircraft. Turn off the power on the primary side and abstain from the use of the product in a place where use of wireless devices is generally restricted.

4.3 Precautions on radio laws and regulations

This product (module) is scheduled to support the following standards related to the radio law. If you disassemble and modify this product, you may receive punishment based on nonconformity of standard of each country. Never modify the product. Contact our sales division for the latest standard support status.

- Japan: Radio law enforcement regulations Article 100 paragraph one number one and Article 44 paragraph two (1)
 - United States: FCC Part 15 Subpart C
 - Europe: (R&TTE member nations): EN300330-1V1.3.1 and -2 V1.3.1 (Receiver class 3, Product class 1, Duty class 4)
 - Taiwan: Administrative Regulations on Low Power Radio Waves Radiated Devices
- ◆ Please handle this product or built-in products according to regulations of the country to which you export or put them on sale.
 - ◆ Take note that you may need to take various procedures due to regulations for exporting and sales to other countries than is specified.

5. SATISFIED LAWS AND REGULATIONS

5. SATISFIED LAWS AND REGULATIONS

5.1 Japan

This product is compliant with the Radio law enforcement regulations article 100 paragraph one number one and article 44 paragraph two (1). We recommend that you clearly specify describe notes on the following points in the instruction manual of built-in products.

- This product is compliant with the Radio law enforcement regulations article 100 paragraph one number one and article 44 paragraph two (1).
Carrier wave frequency 121.2kHz
- As this product is designed based on domestic regulations, use it only in Japan.
- If you disassemble and modify this product, you may receive punishment based on nonconformity of the Radio law enforcement regulations. Never modify the product.
- (If you find this product causing radio wave interference with other wireless devices, use it apart from them or turn off the power on the primary side to prevent radio wave interference.
- (Make an inquiry on the use of the product to the contact described below.

Contact: To the company name providing the finished

5.2 The United States of America

This product is compliant with the following standard.

Intentional radiation device standard FCCpart15 Subpart C
FCC ID: BKMDGE001

Attach the label showing the following contents to the built-in product.

“Contains Transmitter Module FCC ID: BKMDGE001” or “Contains FCC ID: BKMDGE001”

Precautions

FCC WARNING

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

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

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.

5.3 Europe (R&TTE member nations)

This product is compliant with the following standard.

Wireless device technical standard: EN300330-1 V1.3.1 and EN300330-2 V1.3.1

Receiver class 3
Product class 1
Duty class 4

R&TTE member nations (As of February, 2008)

Austria, Belgium, Bulgaria, Cyprus, Czech, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Lichtenstein, Lithuania, Latvia, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, England, Rumania

5.4 Taiwan

This product (or module) is compliant with the “Administrative Regulations on Low Power Radio Waves Radiated Devices” and “Low-power Radio-frequency Devices Technical Regulations (LP0002)”.

The following device handling instructions shall be followed.

Article 12. Without permission granted by the DGT, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power or alter original characteristic as well as performance to a approved low power radio-frequency devices.

Article 14. The low power radio-frequency devices shall not influence aircraft security and interfere legal communications; if found, the user shall cease operating immediately until no interference is achieved. The said legal communications means radio communications is operated in compliance with the Telecommunications Act. The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices.

We recommend that you clearly specify describe notes on the following points in the instruction manual of built-in products.

Example of the sentence:

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。

Permission No.



CCAB08LPxxxOTY

6. EXPORTING

6.1 Notes on Exporting to US

The primary and built-in products of this product (module) fall under the category of intentional and unintentional radiation devices regulated in US. Check that the product is compliant with the following standards before exporting it for the sale in US.

- ◆ Required approval As of February, 2008
Finished devices embedded with this product require approval from FCC authorities concerned as intentional and unintentional radiation devices. You need to have an official authentication authority certify that the product conforms to the following standard to get a license.
 - (1) Intentional radiation device standard FCCpart15 Subpart C
 - (2) Unintentional radiation device standard FCCpart15 Subpart B
 - (3) Product Safety Standard UL standard (varies depending on the device)

Since this product has already acquired the certificate of conformance of (1), you do not need to acquire a new certificate of conformance of (1) for finished goods containing this product (except for the case where a technology to which the Intentional radiation device standard applies). You need to clearly describe notes on (1) in the specified method on the finished goods or in the instruction manual.

6. EXPORTING

FCC WARNING

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

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

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.

Also, attach the label showing the following contents to the finished goods.

“Contains Transmitter Module FCC ID: BKMDGE001” or

“Contains FCC ID: BKMDGE001”

If you use a module for which certificate of conformance of (1) has been acquired by us, and you need the certificate conformance, please contact with us accordingly.

Customers who sell finished goods need to acquire certificate of conformance as finished built-in goods for (2) to (3). The information to be provided on the finished goods or in the instruction manual must follow the applicable standards and regulations.

- ◆ (Unauthorized export) Regulations as of February, 2008
You can export up to 200pcs per model with the Form740 document (have it prepared by a US importer and present it according to a request by an inspector to pass customs) to export the product for evaluation and exhibition. You need to acquire FCC ID to prepare Form740.
Post a notice to show that this product is not in conformity to the standard (example shown below) to introduce and evaluate the product in public places such as an exhibition. You may need to make a special application by the guidance of the regulating authority. Observe the guidance of the authority in that case.
You may not export the product for the purpose of putting it on sale in US.

This device has not been authorized as required by the rules of the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased, until authorization is obtained.

6.2 Notes on exporting to R&TTE member nations

The primary and built-in products of this product fall under the category of wireless devices regulated in R&TTE member nations. Check that the product is compliant with the following standards before exporting it.

- ◆ Required approval As of February, 2008
You can sell finished devices embedding this product as electric equipment with a wireless function provided that you have acquired a CE mark.
You need to have an official authentication authority certify that the finished devices conform to the following standard to get a CE mark.
 - (1) Wireless device technical standard EN300330-1 V1.3.1 and EN300330-2 V1.3.1
 - (2) Wireless device EMC standard EN301489-1 V1.6.1 and EN301489-3 V1.4.1
 - (3) Product safety standard (Example) EN60950-1 (appropriate standard selection by application)
 - (4) Electric product leakage magnetic field standard EN50366 : 2003 version
 - (5) Home electric equipment EMC standard EN55014(1) to (5) are standards required to acquire a CE mark as wireless devices or electric equipment with a wireless function.
 - (1) The certificate of conformance of (1) is scheduled to be acquired by this product (module).
Customers who sell finished goods need to acquire certificate of conformance as finished built-in goods for (2) to (5)

You do not need to acquire a new certificate of conformance of (1) for finished goods embedded with a module for which certificate of conformance of (1) has been acquired. As the certificate of conformance of (1) (such as the test report, technical documents, and other documents required to acquire the certificate of conformance of customer's products) is required for application of CR markings, consult us for details.

You can use products compliant with all standards described above outside a car. Do not use it in a car. You need to acquire an additional standard (ISO7637-1 and ISO7637-2) if you are supposed to use it in a car.

- ◆ Export before acquiring a CE mark As of February, 2008
You may not use the product to put it on the market in R&TTE member countries. Include precautionary notes describing the following points and give users a guidance in advance before exporting the product. Post a notice to show that this product is not in conformity to the standard in an exhibition. You may need to make a provisional application by the guidance of the regulating authority. Observe the guidance of the authority in that case.

Example of the sentence:

This equipment falls under the category of wireless equipment. You may import the equipment for experiment, research or display in an exhibition and may not use it for sales.

This device has not been authorized as required by the rules of the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased, until authorization is obtained.

- ◆ Export after acquiring a CE mark As of February, 2008
The following markings are required on the equipment.
 - ◇ Manufacturer Manufacturer name of the equipment for which a CE mark has been acquired
 - ◇ Trademark Trademark of the equipment for which a CE mark has been acquired
 - ◇ Equipment name Name of the equipment for which a CE mark has been acquired
 - ◇ Clear indication of the receiver class It is class 3.

For subassemble shipment, markings described above on the package can be alternative.

You can export the product to put in on the market in R&TTE member countries. The product need to be compliant with the regulation in the final demand country (the country in which the product is sold) if you export the product to a third country via the member country.

As other UE nations than R&TTE member nations have their own regulations, you need to check if the product conforms to the regulation per country.

6.3 Notes concerning export to Taiwan

This product (or module) is controlled by the “Administrative Regulations on Low Power Radio Waves Radiated Devices” and “Low-power Radio-frequency Devices Technical Regulations (LP0002)”. Check that the product is compliant with these standards before exporting it for the sale in Taiwan. For details, consult with the Taiwan authority.

The following device handling instructions shall be followed.

Article 12. Without permission granted by the DGT, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power or alter original characteristic as well as performance to a approved low power radio-frequency devices.

Article 14. The low power radio-frequency devices shall not influence aircraft security and interfere legal communications; if found, the user shall cease operating immediately until no interference is achieved. The said legal communications means radio communications is operated in compliance with the Telecommunications Act. The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices.

We recommend that you clearly specify describe notes on the following points in the instruction manual of built-in products.

Example of the sentence:

低功率電波輻射性電機管理辦法

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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。

REVISION HISTORY

Date	Page	Esstab./Rev.	Description
2008/05/27	Full page	New	
2008/08/05	All	Revised	Major modification

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