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Production Part Approval Process

Commodity : Real Time Clock Module
Model : RA-4565SA

SEIKO EPSON CORPORATION
TD･CS QUALITY ASSURANCE DPARTMENT

№ : QA-Q17-041

DATA : 12. Mar. 2018

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Confidential Until: Permanent

RECIPIENT

SPECIFICATIONS

PRODUCT No.: **Q41A46551000300**

MODEL : **RA-4565SA**

SPEC. No. : **Q17-140-4B**

DATE: **Mar. 9. 2018**

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SPECIFICATION

1. Application

1) This document is applicable to the real time clock module RA-4656SA that are delivered to from Seiko Epson Corp. 2) RoHS compliant

RA-4565SA contains lead in high melting type solder which is exempted in RoHS directive.

3) This Product supplied (and any technical information furnished, if any) by Seiko Epson Corporation shall not be used for the development and manufacture of weapon of mass destruction or for other military purposes. Making available such products and technology to any third party who may use such products or technologies for the said purposes are also prohibited.
4) This product listed here is designed as components or parts for electronics equipment in general consumer use. We do not expect that any of these products would be incorporated or otherwise used as a component or part for the equipment, which requires an systems, and medical equipment, the functional purpose of which is to keep extra high reliability, such as satellite, rocket and other space life.

This RA-4565SA is authorized for Battery Management System for automobile only.

2. Product No. / Model

The product No. of this real time clock module is Q41A46552000300.
The model is RA-4565SA.

3. Packing

It is subject to the packing standard of Seiko Epson Corp.

4. Warranty

Defective parts which are originated by us are replaced free of charge in case defects are found within 12 Months after delivery.

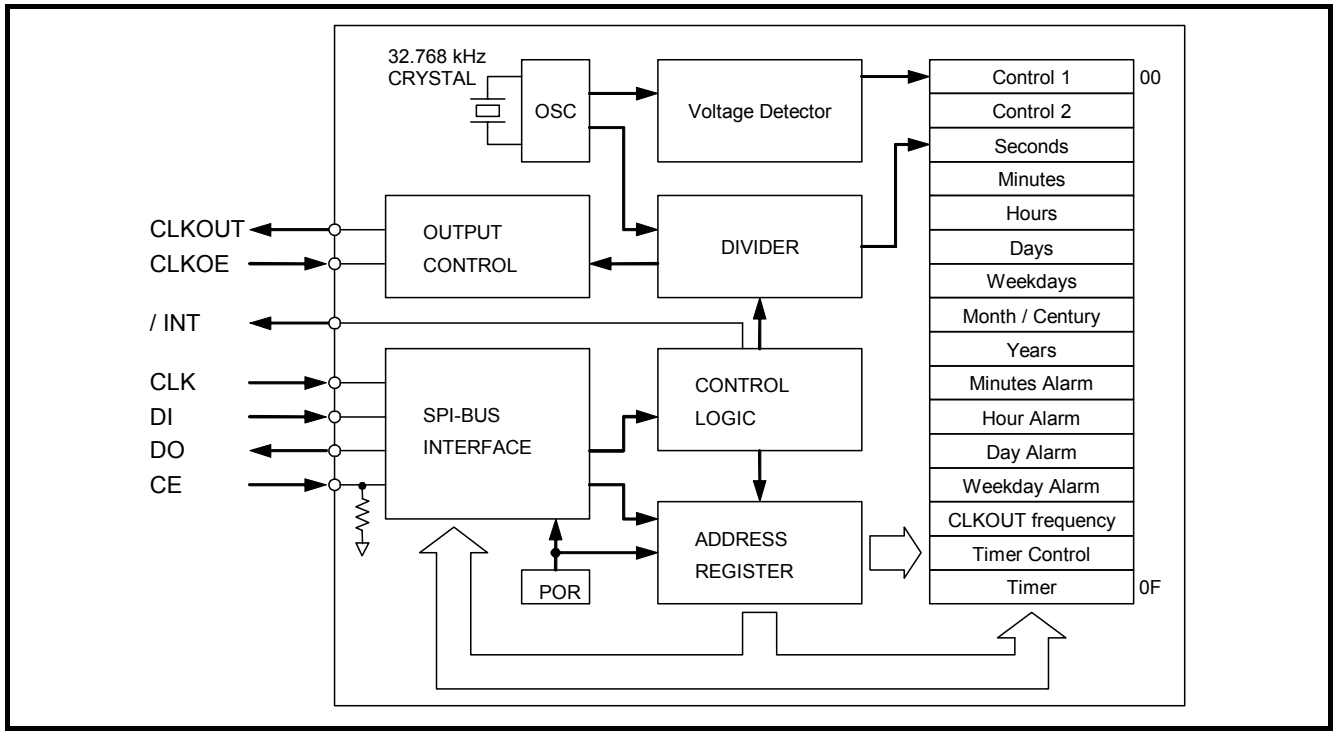
5. Amendment and abolishment

Amendment and/or abolishment of this specification are subject to the agreement of both parties.

6. Contents

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1. Block Diagram



2.Register table

Address [h]	Function	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0	note
00	Control 1	TEST	×	STOP	×	TEST	×	×	×	∗3 , ∗4
01	Control 2	×	×	×	TI / TP	AF	TF	AIE	TIE	∗4
02	Seconds	VL	40	20	10	8	4	2	1	∗1
03	Minutes	×	40	20	10	8	4	2	1	∗4
04	Hours	×	×	20	10	8	4	2	1	∗4
05	Days	×	×	20	10	8	4	2	1	∗4
06	Weekdays	×	×	×	×	×	4	2	1	∗4
07	Months	×	×	×	10	8	4	2	1	∗4
08	Years	80	40	20	10	8	4	2	1	
09	Minute Alarm	AE	40	20	10	8	4	2	1	
0A	Hour Alarm	AE	×	20	10	8	4	2	1	∗4
0B	Day Alarm	AE	×	20	10	8	4	2	1	∗4
0C	Weekday Alarm	AE	×	×	×	×	4	2	1	∗4
0D	CLKOUT frequency	×	×	×	×	×	×	FD1	FD0	∗2 , ∗4
0E	Timer control	TE	×	×	×	×	×	TD1	TD0	∗4
0F	Timer	128	64	32	16	8	4	2	1	

Note) During the initial power-on (from 0 V) and if the value of the VL bit is "1" when the VL bit is read, be sure to initialize all registers before using them.
When doing this, be careful to avoid setting incorrect data as the date or time, as timed operations cannot be guaranteed if incorrect date or time data has been set.

∗1. During the initial power-on (from 0 V), the power-on reset function sets "1" to the VL bit.
∗ Since the value of other registers is undefined at this time, be sure to reset all registers before using them.

∗2. During the initial power-on (from 0 V), the power-on reset function resets the FD1 and FD0 bits to "0".
∗ If the CLKOE input pin is at high level ("H"), output from the CLKOUT output pin is at 32.768(kHz.

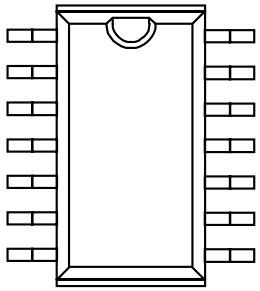
∗3. The two TEST bits for address 00 (Control(1)(are for use by Epson Toyocom Corporation.
When initializing, be sure to write "0". Afterward, be sure to write "0" whenever writing to these bits.
(This device's operations are not guaranteed if "1"(has been set to any of these bits.

∗4. The ' × ' mark indicates when "0" should be set.
The ' × ' mark is undefined when read. This bit should be masked after being read.

3. Terminal description

3.1. Terminal connections

RA – 4565 SA



SOP – 14pin

3.2. Pin Functions

Signal name	I/O	Function
CE	Input	This is the chip enabled input pin. It has a built-in pull-down resistance. When CE pin is at the "H" level, access to this RTC becomes possible.
CLK	Input	This is the shift clock input pin for serial data transfer. In the write mode, it takes in data from the DI pin using the CLK signal rise edge. In the read mode, it outputs data from the DO pin using the fall edge.
D I	Input	This is the data input pin for serial data transfer.
DO	Output	This is the data output pin for serial data transfer. ∗ When access, please give pull-up treatment to DO pin with high resistance.
CLKOUT	Output	The CLKOUT pin is a clock output (open drain output) pin with control output. The CLKOE pin is an input pin used to control the output mode of the CLKOUT output pin. The CLKOE input pin can be used in combination with the FD1 bit and FD0 bit to select the output frequency from the CLKOUT output pin (32.768 kHz, 1024 Hz, 32 Hz, or 1 Hz) or to stop output. When output is stopped, the CLKOUT output pin is at high impedance.
CLKOE	Input	During the initial power-on (when power is applied from 0 V), if the CLKOE input pin is at high level (= H), the power-on reset function selects 32.768 kHz as the frequency.
/INT	Output	This pin outputs alarm signals, fixed timer interrupt signals, and other interrupt signals at low level (= " L "). This pin is an open drain pin.
VDD	–	This pin connects to the plus side of the power.
GND	–	This pin connects to the minus side (ground) of the power.
N.C.	–	This pin is not connected internally. Be sure to connect using OPEN, or GND or VDD.

CLKOE pin input	FD1 bit	FD0 bit	CLKOUT pin output
" H "	0	0	32768 Hz Output (open-drain output)
	0	1	1024 Hz Output (open-drain output)
	1	0	32 Hz Output (open-drain output)
	1	1	1 Hz Output (open-drain output)
" L "	X	X	OFF (high impedance)

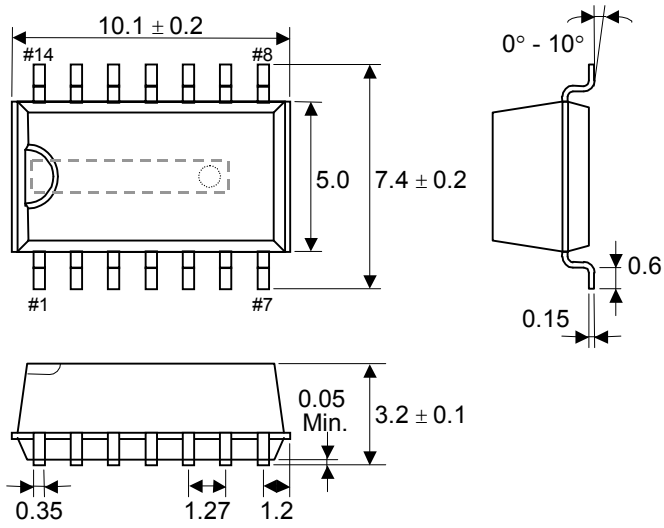
Note : Be sure to connect a bypass capacitor rated at least 0.1 μF between VDD and GND.

4. Dimensions / Marking Layout

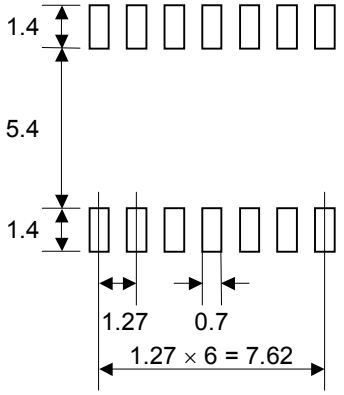
4.1. External dimensions

RA - 4565 SA (SOP-14pin)

• External dimensions



• Recommended soldering pattern

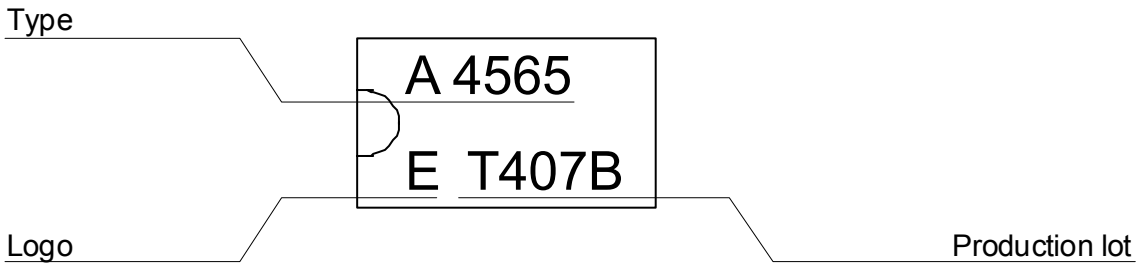


Unit : mm

∗ The cylinder of the crystal unit can be seen in this area (front), but it has no affect on the performance of the device.

4.2. Marking layout

RA - 4565 SA (SOP-14pin)



∗ Contents displayed indicate the general markings and display, but are not the standards for the fonts, sizes and positioning.

5. Absolute Maximum Ratings

GND = 0 V

Parameter	Symbol	Condition	Rating	Unit
Supply Voltage	V_{DD}	Between V_{DD} and GND	−0.5 to +6.5	V
Supply Voltage	I_{DD}	V_{DD} pin	−50 to 50	mA
Input Voltage	V_I	CE, CLK, DI pins	GND−0.5 ~ +6.5	V
		CLKOE pin	GND−0.5 ~ V_{DD}+0.5	V
Output Voltage	V_O	CLKOUT, /INT pins	GND−0.5 ~ 6.5	V
		DO pin	GND−0.5 ~ V_{DD}+0.5	V
DC Input Current	I_I		−10 to 10	mA
DC Output Current	I_O		−10 to 10	mA
Storage Temperature Range	T_{STG}	Stored bare product after unpacking	−55 to +125	°C

6. Recommended operating conditions

GND = 0 V

Item	Symbol	Condition	Rating	Unit
Operating supply voltage	V_{DD}		1.6 to 5.5	V
Clock supply voltage	V_{CLK}		1.5 to 5.5	V
Operating temperature	T_{OPR}	No condensation	−40 to +125	°C

7. Frequency Characteristics

* Unless otherwise specified, GND = 0 V , V_{DD} = 3.0 V , Ta = +25 °C

Item	Symbol	Comments		Min.	Typ.	Max.	Unit
Output frequency	fo				32.768 (Typ.)		kHz
Frequency precision	Δ f / f	Ta = +25 °C V_{DD} = 3.0 V			B : 5 ± 23 (*1)		× 10^{-6}
Frequency voltage characteristics	f / V	Ta = +25 °C V_{DD} = 2.0 V to 5.5 V			± 2 (Max.)		× 10^{-6} / V
Frequency temperature characteristics	Top	V_{DD} = 3.0 V Reference at +25 °C	Ta = −40 °C to +125 °C	−600		+10	× 10^{-6}
			Ta = −40 °C to +85 °C	−240		+10	× 10^{-6}
			Ta = −20 °C to +70 °C	−120		+10	× 10^{-6}
Oscillation startup-up time	t_{STA}	V_{DD} = 1.6 V	Ta = −40 °C ~ +125 °C			3.0	s
			Ta = +25 °C		0.5	1.5	s
Aging	fa	Ta = +25 °C , V_{DD} = 3.0 V ; first year		−5		+5	× 10^{-6} / year

*1) This difference is 1 minute by 1 month. (excluding offset)

8. Electrical Characteristics

8.1. DC characteristics

8.1.1. DC characteristics (1)

* Unless otherwise specified, GND = 0 V , V_{DD} = 1.6 V to 5.5 V , Ta = –40 °C to +125 °C

Item	Symbol		Condition	Min.	Typ.	Max.	Unit
Current consumption ∗ interface inactive (f_{CLK} = 0 Hz) ∗ CLKOUT = disabled (CLKOE = GND)	I_{DD}	V_{DD} = 5.0 V	Ta = +125 °C		1.0	2.0	μA
			Ta = –40 °C to +85 °C		0.6	1.2	
		V_{DD} = 3.0 V	Ta = +125 °C		0.8	1.6	
			Ta = –40 °C to +85 °C		0.5	1.0	
		V_{DD} = 2.0 V	Ta = +125 °C		0.8	1.5	
			Ta = –40 °C to +85 °C		0.5	0.9	
Current consumption ∗ interface inactive (f_{CLK} = 0 Hz) ∗ CLKOUT = 32 kHz output (CLKOE = V_{DD})	I_{DD32K}	V_{DD} = 5.0 V	Ta = +125 °C		1.5	4.0	μA
			Ta = –40 °C to +85 °C		1.1	2.2	
		V_{DD} = 3.0 V	Ta = +125 °C		1.1	2.2	
			Ta = –40 °C to +85 °C		0.7	1.4	
		V_{DD} = 2.0 V	Ta = +125 °C		0.9	1.8	
			Ta = –40 °C to +85 °C		0.6	1.2	
"L" output current	I_{OL} (DO)		V_{OL} = 0.4 V, V_{DD} = 5 V	–1.5			mA
	I_{OL} (/INT)		V_{OL} = 0.4 V, V_{DD} = 5 V	–2			
	I_{OL} (CLKOUT)		V_{OL} = 0.4 V, V_{DD} = 5 V	–2			
	I_{OL} (DO)		V_{OL} = 0.4 V, V_{DD} = 3 V	–1			
	I_{OL} (/INT)		V_{OL} = 0.4 V, V_{DD} = 3 V	–1			
	I_{OL} (CLKOUT)		V_{OL} = 0.4 V, V_{DD} = 3 V	–1			
Leakage current	I_{LO}		V_O = V_{DD} or GND	–1	0	1	μA

8.1.2. DC characteristics (2)

* Unless otherwise specified, GND = 0 V , V_{DD} = 1.6 V to 5.5 V , Ta = –40 °C to +125 °C

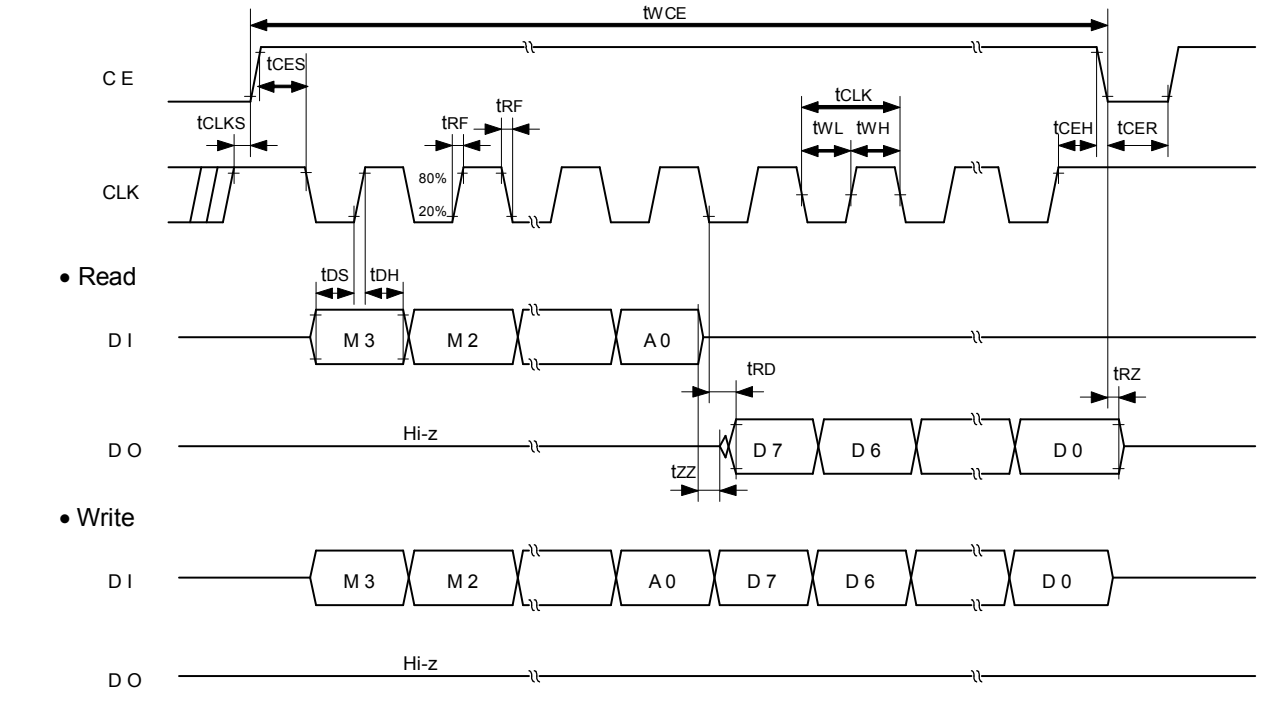
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
"L" input voltage	V_{IL}		GND – 0.3		0.3 × V_{DD}	V
"H" input voltage	V_{IH} (CE, CLK, DI)		0.7 × V_{DD}		6.5	V
	V_{IH} (CLKOE)		0.7 × V_{DD}		V_{DD} + 0.5	V
Input resistance	R_{DWN} (CE)			240	550	kΩ

8.2. AC electrical characteristics

* Unless otherwise specified, GND = 0 V , V_{DD} = 1.6 V to 5.5 V , Ta = −40 °C to +125 °C

Parameter	Symbol	V_{DD} = 1.6 V < 2.7 V		V_{DD} = 3 V ± 10 %		V_{DD} = 5 V ± 10 %		V_{DD} = 5.5 V		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
CLK clock frequency	f_{CLK}		2.00		3.33		4.34		4.76	MHz
clock cycle CLK	t_{CLK}	500		300		230		210		ns
CLK pulse width high	t_{WH}	180		130		120		110		ns
CLK pulse width low	t_{WL}	320		170		110		100		ns
CLK rise and fall time	t_{RF}		100		100		100		100	ns
CLK setup time	t_{CLKS}	0		0		0		0		ns
CE setup time	t_{CES}	50		50		50		50		ns
CE hold time	t_{CEH}	70		40		40		30		ns
CE recovery time	t_{CER}	50		50		50		50		ns
Pulse width CE	t_{WCE}		0.99		0.99		0.99		0.99	s
DI setup time	t_{DS}	30		30		30		30		ns
DI hold time	t_{DH}	100		60		40		40		ns
DO read dely time ∗1	t_{RD}		320		170		120		110	ns
DO disable time ∗2	t_{RZ}		50		30		30		25	ns
Bus conflict avoidance time	t_{ZZ}	0		0		0		0		ns

Timing chart



Note: Please make finish one access to this device within 0.95 second (Refer to tWCE).
If more than 1 seconds is taken, time correction may not be done properly.

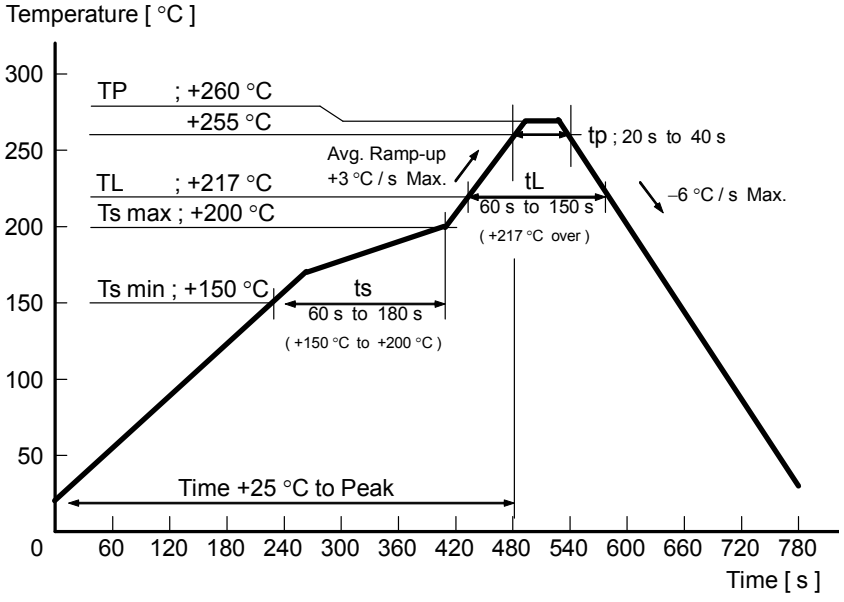
9. Environmental and mechanical characteristics

(The company evaluation condition　We evaluate it by the following examination item and examination condition.)

No.	Item	Value *1		Test Conditions
		$\Delta f / f$ [1×10^{-6}] *2	Electrical characteristics	
1	High temperature storage	*3　± 20	Satisfy item 【5】after test (Includes frequency characteristics)	+125 °C × 1 000 h
2	Low temperature storage	*3　± 20		-55 °C × 1 000 h
3	High temperature bias	*3　± 20		+125 °C × 5.5 V × 1 000 h
4	Low temperature bias	*3　± 20		-40 °C × 5.5 V × 1 000 h
5	Temperature humidity bias	*3　± 20		+85 °C × 85 %RH × 5.5 V × 1 000 h
6	Temperature cycle	*3　± 10		-40 °C ⇔ +125 °C 30 min at each temp. 1 000 cycles
7	Resistance to soldering heat	± 8		For convention reflow soldering furnace (3 times)　JEDEC J-STD-020C
8	Drop	± 5		Free drop from 750 mm height on a hard wooden board for 3 times (Board is thickness more than 30 mm)
9	Vibration	± 5		10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz　acceleration 98 m/s^2 10 Hz → 500 Hz → 10 Hz 15min./cycle 6 h (2 hours , 3 directions)
10	Solderability	Termination must be 95 % covered with fresh solder		Dip termination into solder bath at +235 °C ± 5 °C for 5 s (Using Rosin Flux)

1. *1 Each test done independently.
2. *2 Measuring 2 h to 24 h later leaving in room temperature after each test.
3. *3 Pre conditionings
    1. +125 °C × 24 h to +85 °C × 85 % × 168 h → reflow 3 times
    2. Initial value shall be after 24 h at room temperature.
4. *4 After each Test,satisfy item 7.Frequency characteristics(exclude Aging) and item 8.Electrical Characteristics.

♦ Air-reflow (JEDEC J-STD-020C)



10. Matters that demand special attention on use

10.1. Restrictions on Access Operations During Power-on Initialization and Recovery from Backup

- The RA-4565 SA does not allow access (read or write) when there is no internal oscillation (= stopped oscillation).
  Therefore, we recommend that the first access during power-on initialization or backup and restore operations (i.e., when the power supply voltage is recovered after oscillation has stopped due to a voltage drop, etc.) should be performed after starting internal oscillation and waiting for the oscillation stabilization time (see tSTA standard) to elapse.

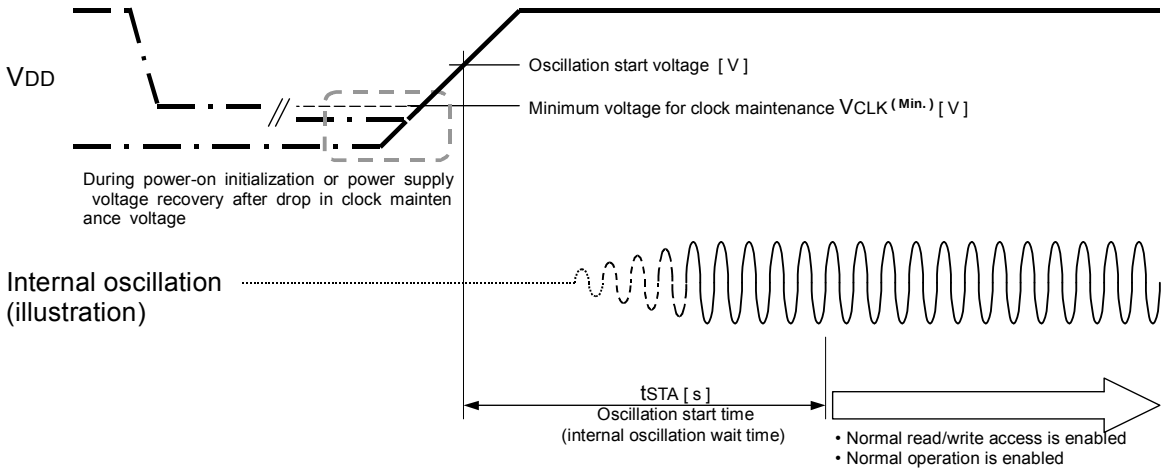
- Note the following caution points concerning access operations during power-on initialization or when restoring the power supply voltage from backup mode (hereafter referred to as "switching to the operating voltage").

  1) Before switching to the operating voltage, read the VL-bit (which indicates the RTC error status).

  2) Initialization is required when the value read from the VL-bit is "VL = 1 (error status)".
  Initialize after the oscillation stabilization time has elapsed.

Initialization is required when the status after reading a VL-bit value of "1" is any of the following. (Status 1) During power-on initialization (Status 2) When only "VL = 1" can be read since internal oscillation is stopped and normal access is disabled (Status 3) When normal access is enabled but the clock setting is invalid due to a voltage drop during backup, etc.

  ∗ Access timing during power-on initialization and when recovering the power supply voltage after a drop in the voltage used to maintain the clock



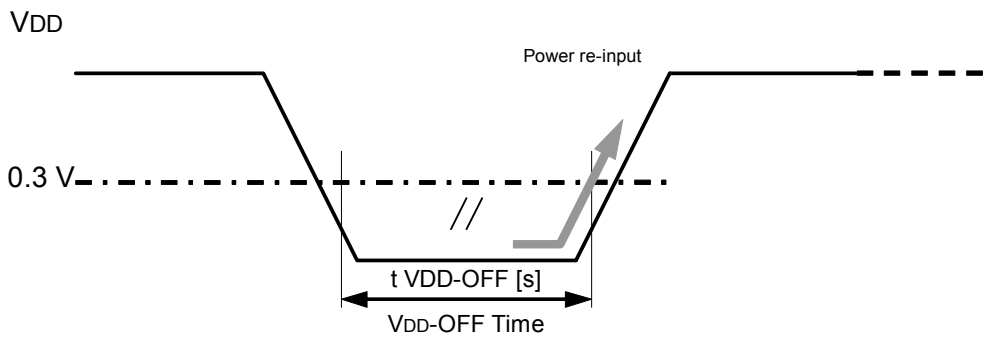
  3) When the read VL-bit value is "VL = 0 (normal status)", access is enabled without waiting for stabilization of oscillation.

Normal operation is enabled under the following two statuses when "0" is read as the VL-bit value. (Status 1) When correct operation is enabled (except for settings errors while in use) (Status 2) When data is retained normally while switching to the operating voltage from backup mode

Note)
When access, please give pull-up treatment to DO pin with high resistance.
* If read out when input initial power and when 「Without internal oscillation = Stop oscillation」 for example back up recovery error, misjudgment that has no pull up resistance on DO pin (originally it should be VL-bit = “1”) and misreading with VL-bit of “0” may be happened.

10.2 Notes to make movement of power-on reset function when re-input power.

Please secure power OFF time (tVDD-OFF [s]) to make movement of power-on reset function.



Before power re-input, please surely keep OFF time tVDD-OFF[s] of VDD which can get [VDD ≤ 0.3 V] for 5 seconds。

[If there is already power OFF time more than 5 seconds] for example when input initial power etc. the above-mentioned time is no needed.

10.3 Notes when use CLKOUT output function and fixed cycle timer interrupting function.

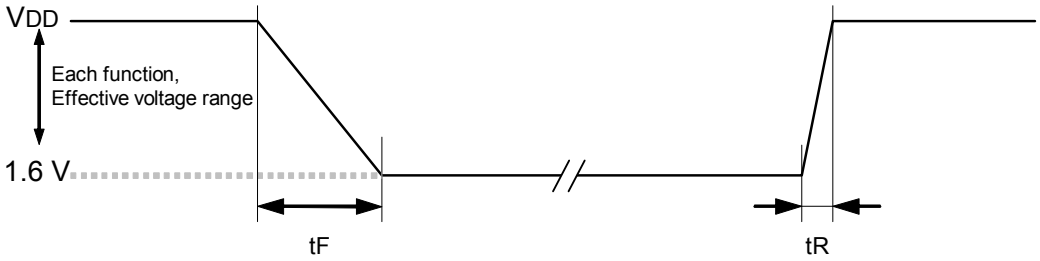
Notes 1) Power voltage range with effective CLKOUT output function and fixed cycle timer interrupt function.

Power voltage range with effective CLKOUT output function and fixed cycle timer interrupt function is 1.6 V to 5.5 V. (Please refer to movement power voltage rule)

Notes 2) Power voltage change under the condition of using CLKOUT output function and fixed cycle timer interrupt output function.

If power voltage is largely changed, each output may be stopped for several ms due to such change. If it is also necessary to keep each output condition when change power voltage, please make consideration to get slow change of power.

If change power voltage during output of each function
(Soon after switching over to backup, or soon after returning from backup etc.), please make consideration the followings.



If it is necessary to keep each output condition, please make consideration to get slow power decreasing with over 10ms/V.

If it is necessary to keep each output condition, please make consideration to get slow power increasing with over 1ms/V.

11. Application notes

1) Notes on handling

This module uses a C-MOS IC to realize low power consumption. Carefully note the following cautions when handling.

(1) Static electricity

While this module has built-in circuitry designed to protect it against electrostatic discharge, the chip could still be damaged by a large discharge of static electricity. Containers used for packing and transport should be constructed of conductive materials. In addition, only soldering irons, measurement circuits, and other such devices which do not leak high voltage should be used with this module, which should also be grounded when such devices are being used.

(2) Noise

If a signal with excessive external noise is applied to the power supply or input pins, the device may malfunction or "latch up." In order to ensure stable operation, connect a filter capacitor (preferably ceramic) of greater that 0.1 μF as close as possible to the power supply pins (between VDD and GNDs). Also, avoid placing any device that generates high level of electronic noise near this module.

* Do not connect signal lines to the shaded area in the figure shown in Fig. 1 and, if possible, embed this area in a GND land.

(3) Voltage levels of input pins

When the input pins are at the mid-level, this will cause increased current consumption and a reduced noise margin, and can impair the functioning of the device. Therefore, try as much as possible to apply the voltage level close to VDD or GND.

(4) Handling of unused pins

Since the input impedance of the input pins is extremely high, operating the device with these pins in the open circuit state can lead to unstable voltage level and malfunctions due to noise. Therefore, pull-up or pull-down resistors should be provided for all unused input pins.

(5) This product is qualified at JEDEC J-STD -020C Moisture Sensitive Level 1.

After open the packing, we recommend to keep it less than +30 °C and 85 %RH of Humidity,and use it less than 6 months.

2) Notes on packaging

(1) Soldering heat resistance.

If the temperature within the package exceeds +260 °C, the characteristics of the crystal oscillator will be degraded and it may be damaged. The reflow conditions within our reflow profile is recommended. Therefore, always check the mounting temperature and time before mounting this device. Also, check again if the mounting conditions are later changed.

* See Fig. 2 profile for our evaluation of Soldering heat resistance for reference.

(2) Mounting equipment

While this module can be used with general-purpose mounting equipment, the internal crystal oscillator may be damaged in some circumstances, depending on the equipment and conditions. Therefore, be sure to check this. In addition, if the mounting conditions are later changed, the same check should be performed again.

(3) Ultrasonic cleaning

Depending on the usage conditions, there is a possibility that the crystal oscillator will be damaged by resonance during ultrasonic cleaning. Since the conditions under which ultrasonic cleaning is carried out (the type of cleaner, power level, time, state of the inside of the cleaning vessel, etc.) vary widely, this device is not warranted against damage during ultrasonic cleaning.

(4) Mounting orientation

This device can be damaged if it is mounted in the wrong orientation. Always confirm the orientation of the device before mounting.

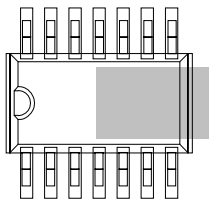
(5) Leakage between pins

Leakage between pins may occur if the power is turned on while the device has condensation or dirt on it. Make sure the device is dry and clean before supplying power to it.

Fig. 1 : Example GND Pattern

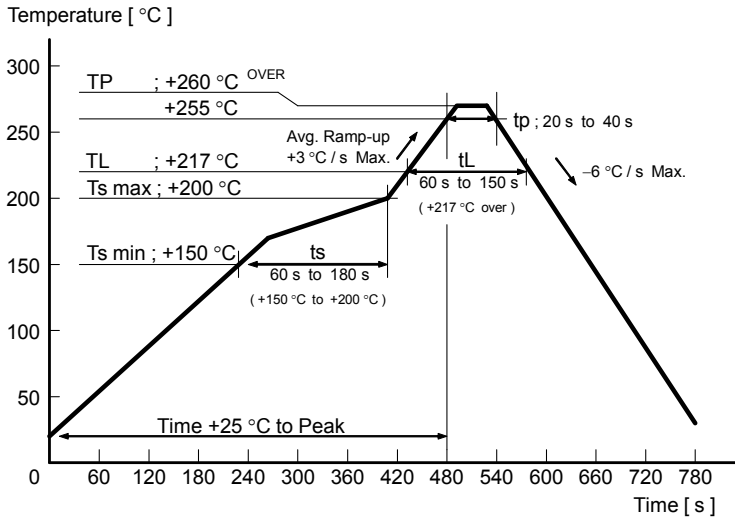
RA – 4565 SA

(SOP – 14 pin)



* The shaded part ( ) indicates where a GND pattern should be set without getting too close to a signal line

Fig. 2 : Reference profile for our evaluation of Soldering heat resistance.



TAPING SPECIFICATION
テープ梱包基準書

1. APPLICATION 適用範囲

This document is applicable to SOP 14 pin package.

本基準書は、SA(SOP 14pin)パッケージのテーピング梱包について規定する。

2. CONTENTS 目次

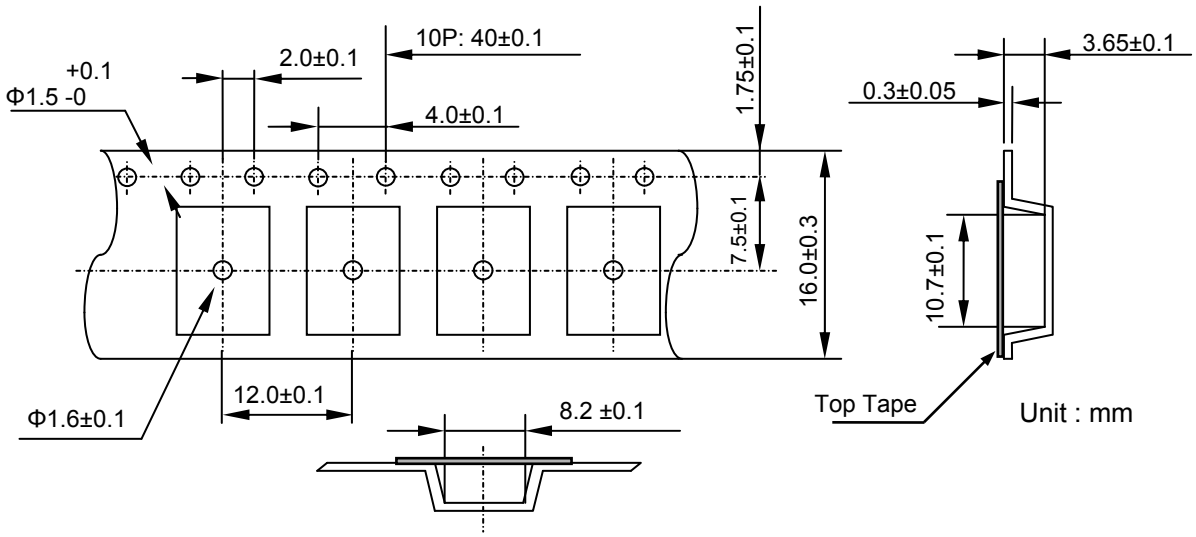
Item No.	Item	Page
[1]	**Taping specification** テーピング仕様	2 to 3
[2]	**Shipping carton** 外装箱への収納	4
[3]	**Marking** 表示	
[4]	**Quantity** 収納数量	5
[5]	**Storage environment** 保管環境	
[6]	**Handling** リール取扱い	

[1] Taping specification テーピング仕様

Subject to EIA-481 , IEC 60286 , JIS C0806.
「EIA-481」「IEC 60286」「JIS C0806」に準拠する。

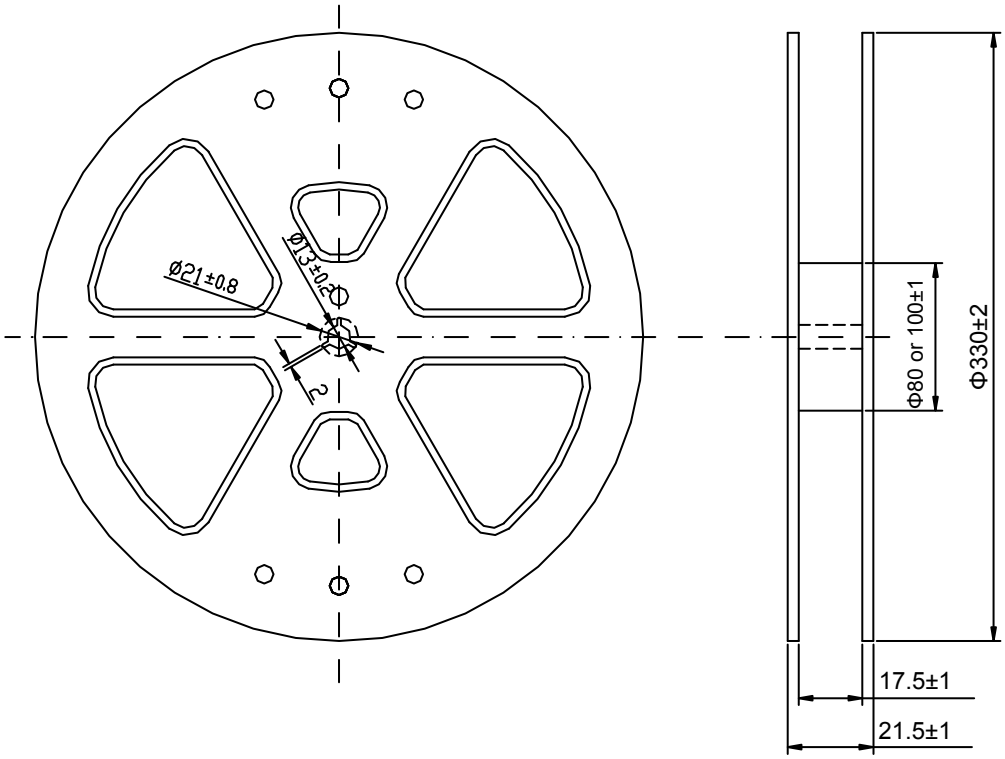
(1) Tape dimensions TE1612L

Material of the Carrier Tape キャリアテープ材質: PS (Electrically conductive)
Material of the Top Tape トップテープ材質 : PET



(2) Reel dimensions

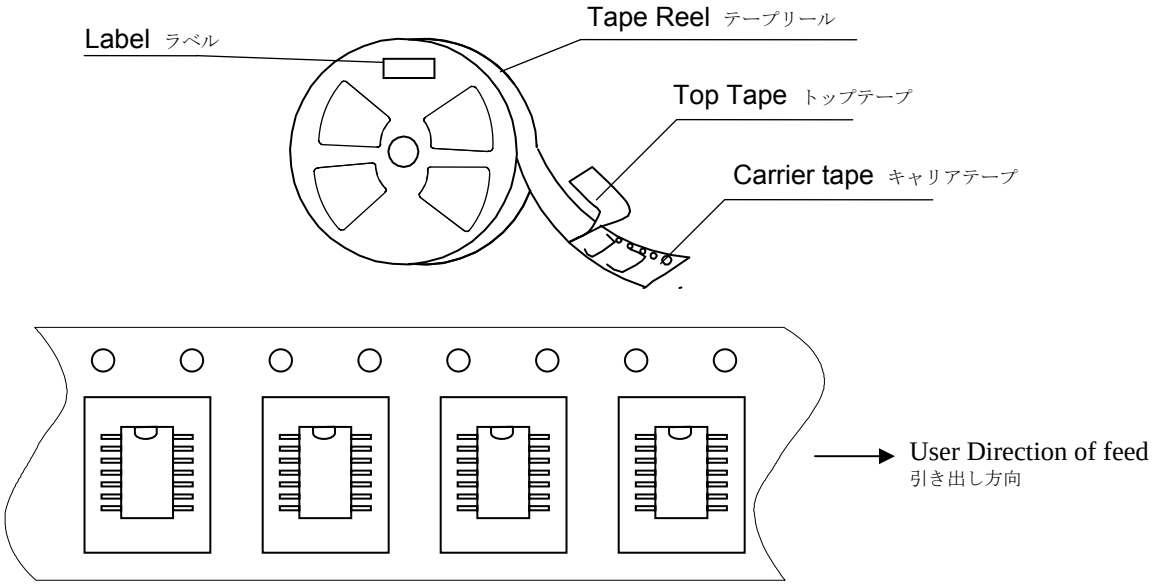
Material of the Reel リール材質: PS (Electrically conductive)



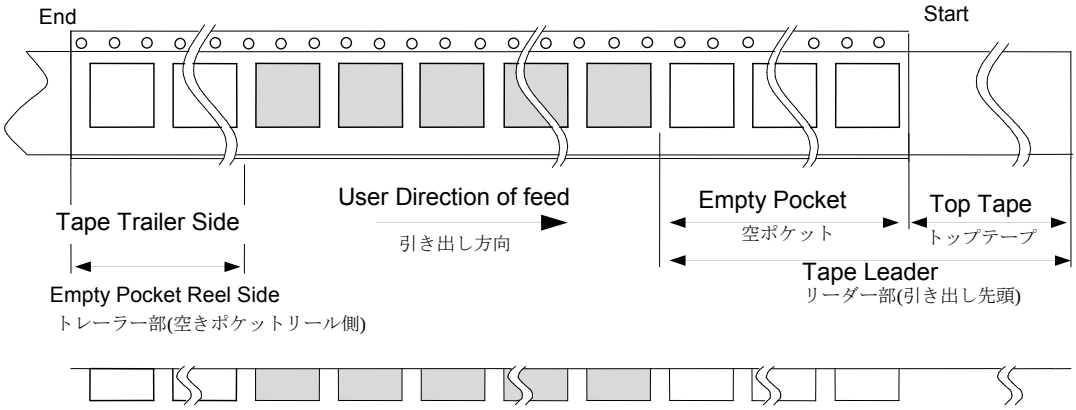
Form and Size of reel window shows are one of the example
リールの窓の形状は代表例を掲載。

(3) Packing 収納形態

(a) Tape & Reel デバイス収納方法



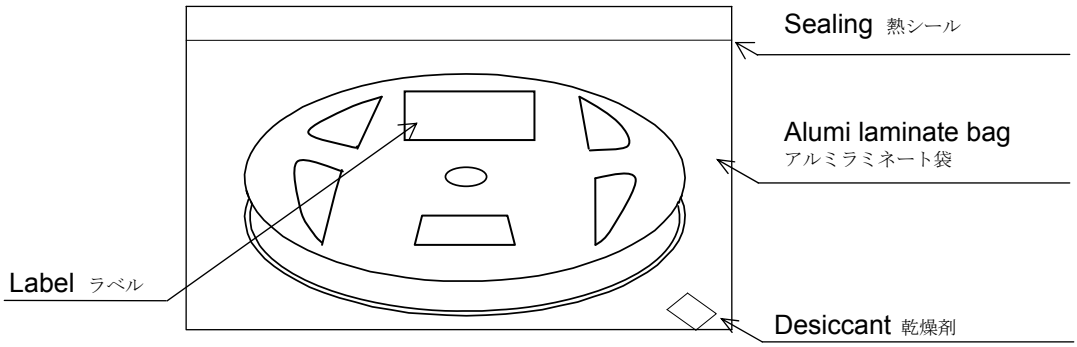
(b) Start & End Point 引き出し先頭側及びリール側の処理



Item		Empty Space 空きスペース	Note 備考
Tape Leader (引き出し先頭側)	Top Tape	Min. 1 000 mm	**Feeding in the Top tape, the tip is fixed with tape.** トップテープ単独で繰り出し、先端はテープにより固定。
	Carrier Tape	Min. 120 mm	**Winding method is a diagram of the above** リールへの巻き取り方法は、上図の通り。
Tape Trailer (リール側)	Top Tape	Min. 0 mm	**Tip is fixed to the reel.** 先端はリールに固定。
	Carrier Tape	Min. 120 mm	

[2]Shipping Carton 外装箱への収納

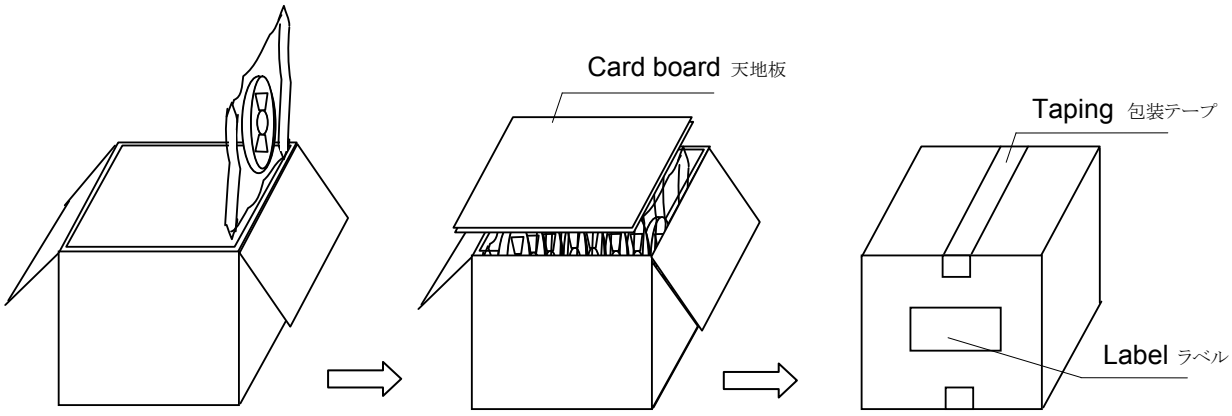
a) Packing to Alumi laminate bag 袋への収納



b) Packing to shipping carton 外装箱への収納

If there is space in the outer box, material is put in a shock absorbing together.

空間ができた時は、クッション材を入れる。



[3] Marking 表示

(1) Reel marking リールへの表示

- Reel marking shall consist of

下記内容をリール表面に表示できるラベルを貼る。:

1) Parts name 製品名称
2) Quantity 製品数量
3) Manufacturing Date or symbol 製品の製造年月又はこれを示す記号
4) Manufacturer's Date or symbol 製品の製造業者又はその略号
5) Others (if necessary) その他必要事項

(2)Alumi laminate bag marking

- Same as reel marking.

リールへの表示と同一内容

(2) Shipping carton marking 外装箱への表示

- Shipping carton marking shall consist of :

下記内容を外装箱表面に表示できるラベルを貼る。:

1) Parts name 製品名称
2) Quantity 製品数量

[4] Quantity 収納数量

- 1 000 pcs./reel (Standard)

However it is not the limit, in case that the order quantity does not fill with 1000 pieces.
Packing quantity is defined by 14th and 15th digit of product number.
但し、注文数量が 1 000 pcs に満たない場合は、その限りではない。
収納数量は、製品型番の 14 桁、15 桁による。

14th and 15th digit of product number. 製品型番の 14 桁、15 桁	Quantity
00	1 000 pcs
01	Vinyl Bag(Bulk)
11	Any Quantity
12	250 pcs
13	500 pcs

[5] Storage environment 保管環境

(1) Before open the packing, we recommend to keep less than +30 °C and 85 %RH of Humidity, and to use it less than 6 months after delivery.
開梱前の製品は、温度 +30 °C、湿度 85 %RH 以下での保管をして下さい。
貴社納入後、袋未開封で 6 ヶ月以内の実装を推奨します。

(2) We recommend to open Package in immediately before use. After open Package, We recommend to keeps less than 6 month. No need dry air before soldering work if it is less than temperature +30 °C, 85 humidity %RH.
使用直前まで開梱せず、袋開封後は 6 ヶ月以内の実装を推奨します。
温度 +30 °C、湿度 85 %RH 以下では、はんだ付け作業前に乾燥不要です。

(3) Not to storage with some erosive chemicals.
化学薬品類との同居を避ける。

(4) Nothing is allowed to put on the reel or carton to prevent mechanical damage
外装箱がゆがまないようまた、外圧がかからないように保管して下さい。

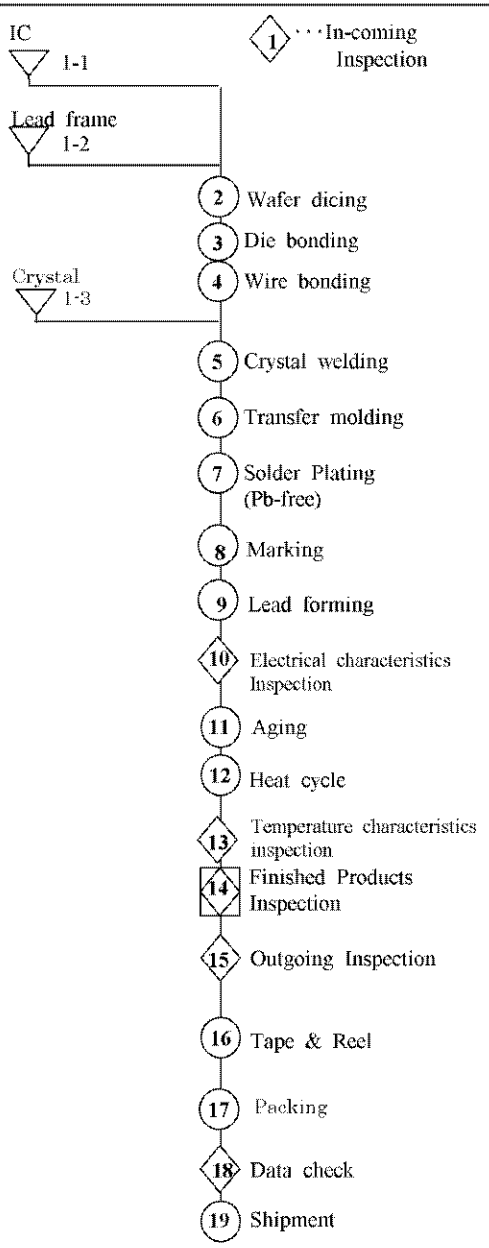
[6] Handling リール取扱い

To handle with care to prevent the damage of tape, reel and products.
リールの取扱いについては、中のテープ・製品を変形させないようにして下さい。

- PROCESS QUALITY CONTROL -

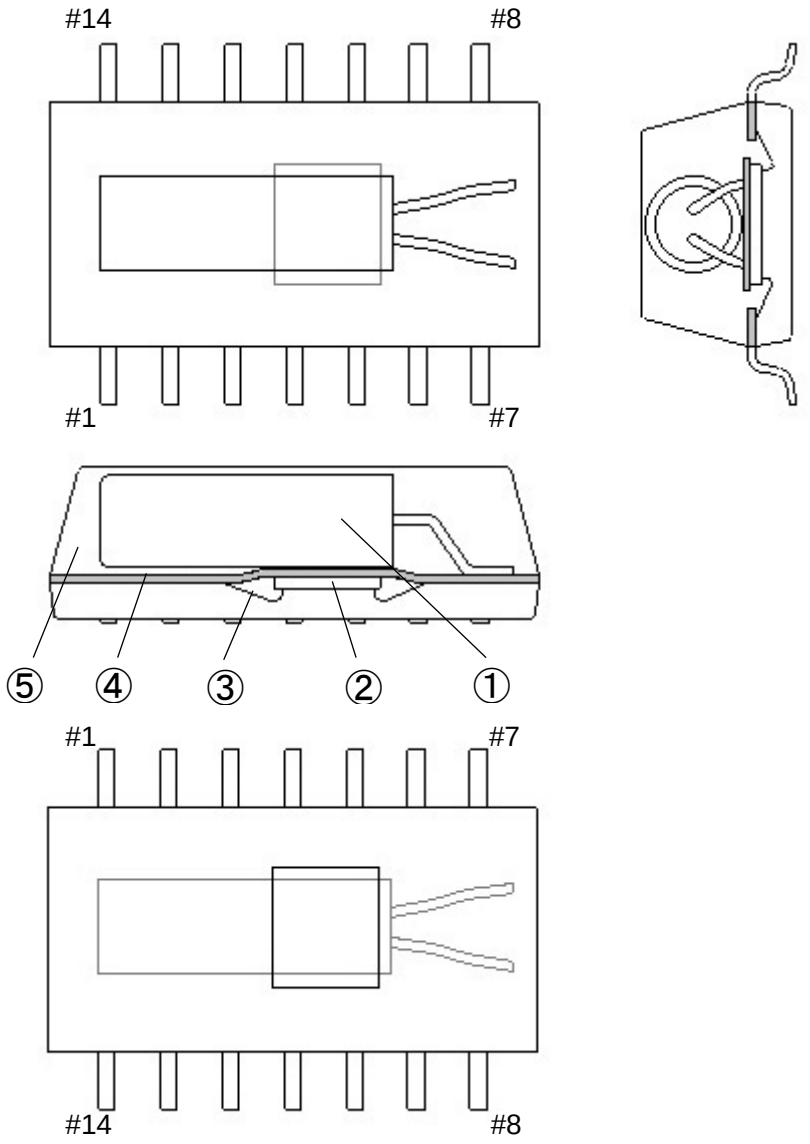
No. SOP14-RB-PbF-ATE-1 **Real Time Clock Module SOP 14pin**

2015.05.14
RASA_Q_0001



No.	Section In charge	Standards & Specifications	Inspection & Control Item	Inspection Instruments	Inspection methods	Record
1	QA section	Purchasing specification Incoming Inspection standard	Appearance Dimension	Microscope	Sampling	Data Sheet
1-1	Subcontractor	Incoming Inspection standard	Model,Quantity	Visual inspection	Sampling	Data sheet
1-2	Subcontractor	Incoming Inspection standard	Model,Quantity, Appearance	Visual inspection	Sampling	Data sheet
2	Subcontractor	Assemble specification	Appearance	Visual inspection	Sampling	Data sheet
3	Subcontractor	Assemble specification	Appearance (chip/paste) Die shear strength Baking temperature,time	Microscope ,Visual inspection Pull-Gsuge Thermometer,Timer	Sampling	Data sheet
4	Subcontractor	Assemble specification	Wire-pull strength Bonding strength U.S.power Temperature,Force Appearance	Pull-tester Ball-share tester Thermometer,Gauge Dial-gauge Microscope	Sampling	Data sheet
1-3	Subcontractor	Incoming inspection standerd	Model,Quantity	Visual inspection	Sampling	Data sheet
5	Subcontractor	Assemble specification	Welding-power Pressure,Crystal position	Power-measure Gauge	Sampling	Data sheet
			Appearance	Microscope	100% Inspection	
6	Subcontractor	Assemble specification	Shape of bonded wire Mould Die-temperature Curing-Temperature,Time	Surface-thermometer Thermometer,Timer X-ray	Sampling	Data sheet
			Appearance	Visual Inspection	100% Inspection	
7	Subcontractor	Assemble specification	Belt speed, Time,Tact Plating thickness, Solder ability	Timer,Thermometer Fluorescent X-ray Microscope	Sampling	Data sheet
			Appearance	Visual inspection		
8	Subcontractor	Assemble specification	Appearance	Visual inspection	Sampling	Data sheet
9	Subcontractor	Assemble specification	Appearance Outer Dimention	Microscope	Sampling	Data sheet
10	Subcontractor	Manufacturing Instruction Sheet	Electrical characteristics	Measuring equipment	100% Inspection	Data sheet
11	Subcontractor	Manufacturing Instruction Sheet	Temperature,Time	Thermometer,Timer	Every lot	Data sheet
12	Subcontractor	Manufacturing Instruction Sheet	Temperature,Time	Thermometer,Timer	Every lot	Data sheet
13	Subcontractor	Manufacturing Instruction Sheet	Frequency Temperature characteristics	Measuring equipment	100% Inspection	Data sheet
14	Subcontractor	Manufacturing Instruction Sheet	Electrical characteristics	Measuring equipment	100% Inspection	Data sheet
15	Subcontractor	Inspection standard	Electrical characteristics Appearance	Measuring equipment Visual inspection	Sampling	Data sheet
16	Subcontractor	Assemble specification	Tape peel strength	Peel strength tester	Sampling	Data sheet
			Products direction	Camera detection	100% Inspection	
17	Subcontractor	Assemble specification	------	------	------	------
18	QA section	Specification sheet	Specification Appearance	------	Every lot	------
19	Production control section	Manufacturing Instruction sheet Daily shipping list	Customers Type Quantity	------	------	------

Structure Diagram 構造図	Rev.01
Model 型式	RTC / RX / RA / SG series
Document No. 管理№	SA_D_0001



No.	Name of Part 部品名
①	Crystal Unit 水晶振動子
②	IC
③	Bonding wire ボンディングワイヤ
④	Lead Frame リードフレーム
⑤	Transfer Molding Compound モールド

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RELIABILITY TEST DATA

Product Name : RA-SA Series J-STD-020C

The Company evaluation condition

We evaluate environmental and mechanical characteristics by the following test condition . No. F-G-0622-04-005E

No.	ITEM	TEST CONDITIONS	VALUE *1		TEST Qty [n]	FAIL Qty [n]
			Δ f / f *2 [1 × 10^{-6}]	Electrical characteristics		
1	High temperature storage	+125 °C × 1 000 h	*3 ± 20	Satisfy specification after test	22	0
2	Low temperature storage	-55 °C × 1 000 h	*3 ± 20		22	0
3	High temperature bias	+125 °C × 5.5 V × 1 000 h	*3 ± 20		22	0
4	Low temperature bias	-40 °C × 5.5 V × 1 000 h	*3 ± 20		22	0
5	Temperature humidity bias	+85 °C × 85 %RH × 5.5 V × 1 000 h	*3 ± 20		22	0
6	Temperature cycle	-40 °C ⇔ +125 °C 30 min at each temp. 1 000 cycles	*3 ± 20		22	0
7	Resistance to soldering heat	**Reflow furnace with the condition 3times JEDECJ-STD-020C**	± 8		22	0
8	Drop	Free drop from 750 mm height on a hard wooden board for 3 times (Board is thickness more than 30 mm)	± 5		22	0
9	Vibration	10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz acceleration 98 m/s2 10 Hz → 500 Hz → 10 Hz 15 min/cycle 6 h (2 h × 3 directions)	± 5		22	0
10	Solderability	Dip termination into solder bath at +235 °C ± 5 °C for 5 s (Using Rosin Flux)	Termination must be 95 % covered with fresh solder		11	0

Notes

*1 Each test done independently.

*2 Measuring 2 h to 24 h later leaving in room temperature after each test.

*3 Pre-conditions (Dry +125℃x24h→ high temp & humidity +85℃x85%RHx168h→Reflow 3times) should be performed before each tests. Pre conditionings Initial value shall be after 24 h at room temperature.

Qualification Data

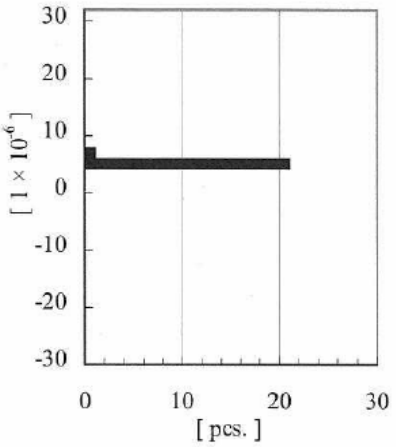
EPSON
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Product Name : RA-SA Series J-STD-020C

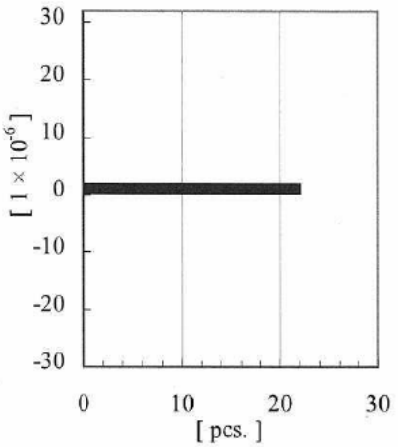
Frequency Shift Rate Δ f / f

No. F-G-0622-04-006E

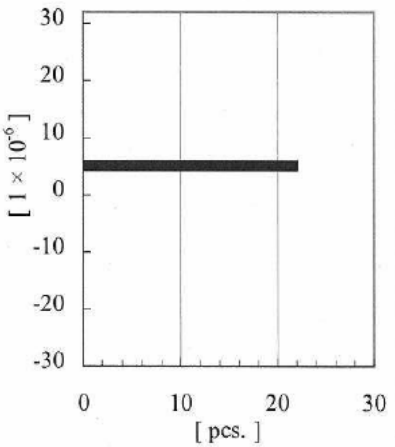
1. High temp. storage
+125 °C × 1 000 h



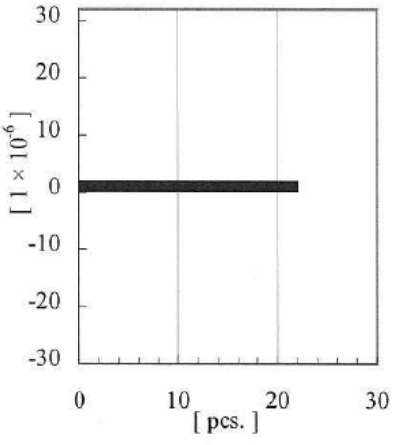
2. Low temp. storage
-55 °C × 1 000 h



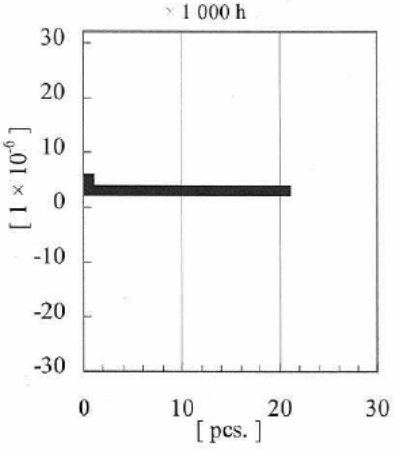
3. High temp. bias
+125 °C × 5.5 V × 1 000 h



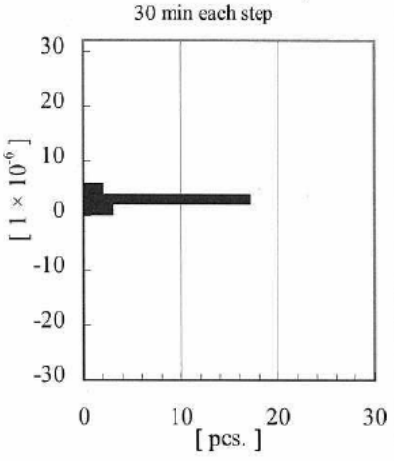
4. Low temp. bias
-40 °C × 5.5 V × 1 000 h



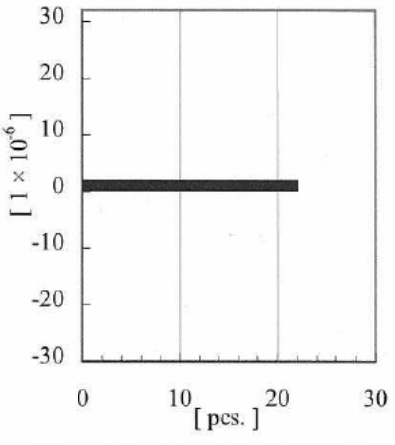
5. Temp. humidity bias
+85 °C × 85 %RH × 5.5 V
× 1 000 h



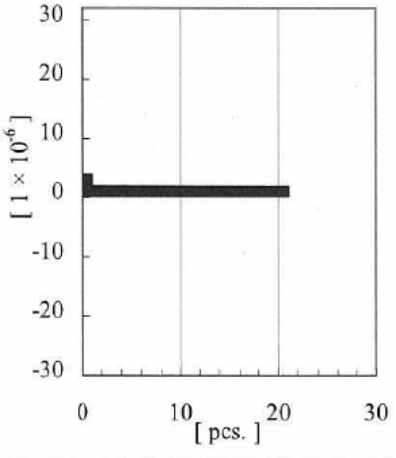
6. Temp. cycle
-40 °C ⇔ +125 °C × 1 000 cycles
30 min each step



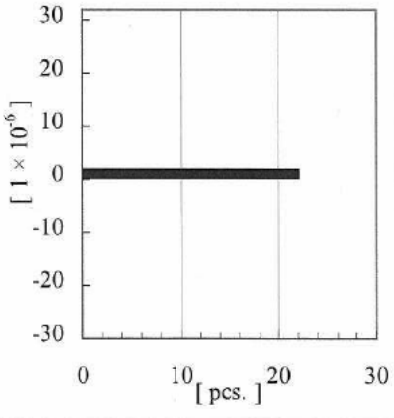
7.Resistance to soldering heat
For convention reflow
soldering furnace (3 times)



8. Drop
750 mm x 3Times



9. Vibration
10 Hz to 55 Hz amplitude 0.75 mm
55 Hz to 500 Hz 98 m/s²
15 min / cycle 6 h (2 h × 3 directions)



Qualification Data

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RELIABILITY TEST DATA

Product Name : RA-SA series Conforms to AEC-Q200

The Company evaluation condition

We evaluate environmental and mechanical characteristics by the following test condition. No.F-Q200-RA-SA PKG-001E

AEC -Q200 No.	ITEMS	TEST CONDITIPNS	VALUE *1 *2 $\Delta f/f[1\times10^{-6}]$	TEST Quantity [n]	FAIL Quantity [n]
3	High Temperature Exposure (Storage)	+85 ℃ × 1 000 hours	*3*4 ± 20	77	0
4	Temperature Cycling	−40 ℃ ⇔ +85 ℃ 1 000 cycles	*3*4 ± 20	77	0
7	Biased Humidity	+85 ℃ × 85 %RH × 5.5 V × 1 000 hours	*3*4 ± 20	77	0
8	Operational Life	+85 ℃ × 5.5 V × 1 000 hours	*3*4 ± 20	77	0
9	External Visual	—	Thing that abnormality is not found in externals.	30	0
10	Physical Dimension	—	Per Spec.	30	0
11	Terminal Strength (Leaded)	N/A	—	—	—
12	Resistance to Solvents	N/A	—	—	—
13	Mechanical Shock	100 G × 6 m secods 6 directions × 3 times	*3*4 ± 5	30	0
14	Vibration	10 to 40 Hz, 1.5 mm 40 to 2000 Hz, 5 G 20 minutes /cycles 12 cycles × 3 directions	*3*4 ± 5	30	0
15	Resistance to Soldering Heat	JEDEC J-STD-020C	*4 ± 8	30	0
18	Solderability	JESD22-B1002E	Termination must be 95 % covered with fresh solder.	15	0
19	Electrical Characterization	Ta = +25 ℃	Per Spec.	30 × 3Lot	0
20	Flammability	N/A	—	—	—
21	Board Flex	Bend width reaches 2 mm and hold for 60 s × 1 time	Thing that abnormality is not found in externals.	30	0
22	Terminal Strength	20 N for 60 seconds.	Thing that abnormality is not found in externals.	30	0

*1. Each test done independently.

*2. Measuring 2 hours to 24 hours later leaving in room temperature after each test.

*3. Pre conditionings Conforms to JEDEC-STD-020C MSL-1

1) +125 ℃ × 24 hours to +85 ℃ × 85 %RH × 168 hours → reflow 3 times

2) Initial value shall be after 24 hours at room temperature.

*4. Satisfy specifiation after test.

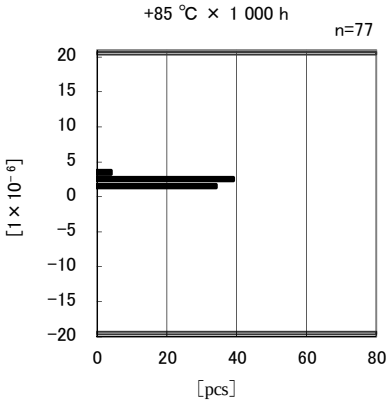
Qualification Data

EPSON
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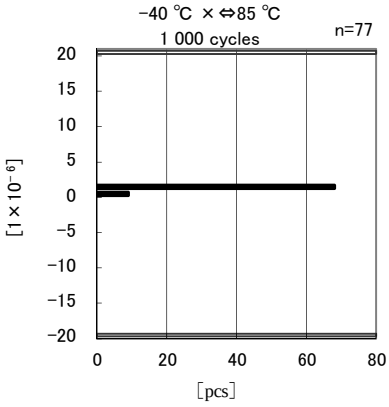
Product Name : RA-SA series Conforms to AEC-Q200

Frequency Shift Rate Δf/f

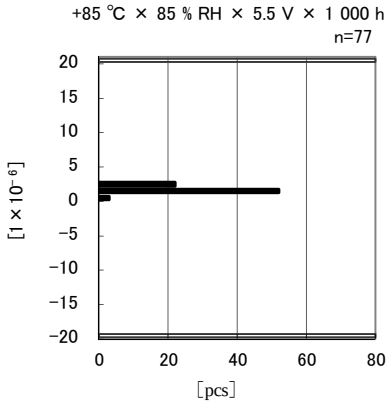
No.F-Q200-RA-SA PKG-002E



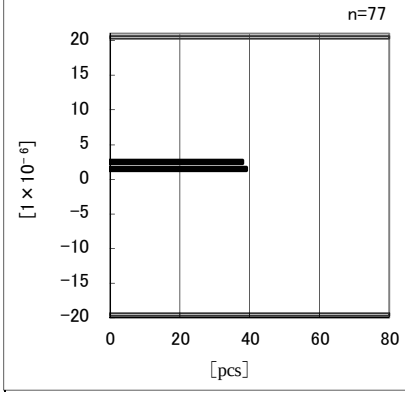
Average: 2.08
Stdev: 0.416
cpk: 14.36



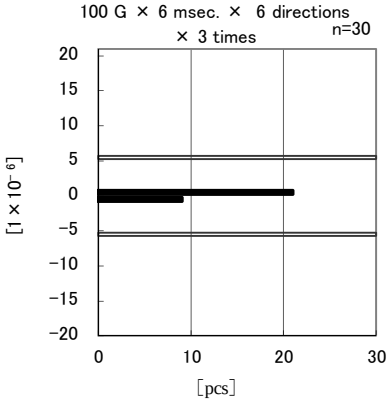
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Stdev: 0.342
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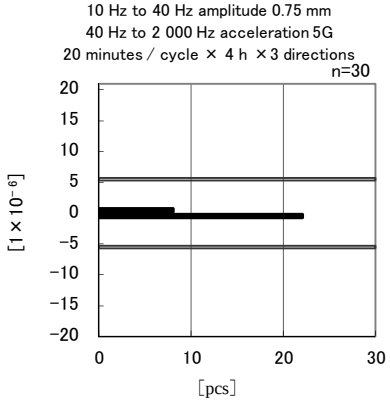
Average: 1.84
Stdev: 0.337
cpk: 17.99



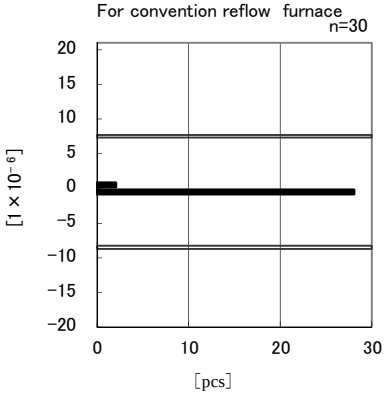
Average: 2.02
Stdev: 0.260
cpk: 23.08



Average: 0.02
Stdev: 0.256
cpk: 6.49



Average: -0.060
Stdev: 0.103
cpk: 15.97



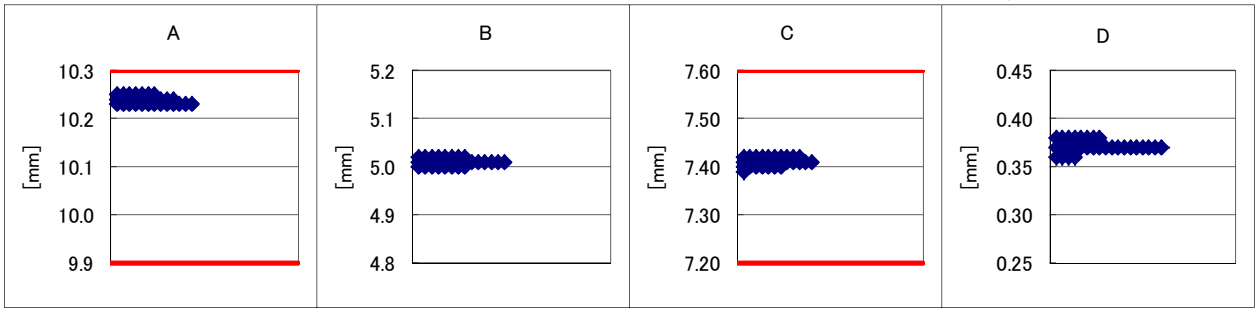
Average: -0.31
Stdev: 0.223
cpk: 11.51

Qualification Data

Product Name : RA-SA series Conforms to AEC-Q200

10.Dimension n=30

No.F-Q200-RA-SA PKG-003E

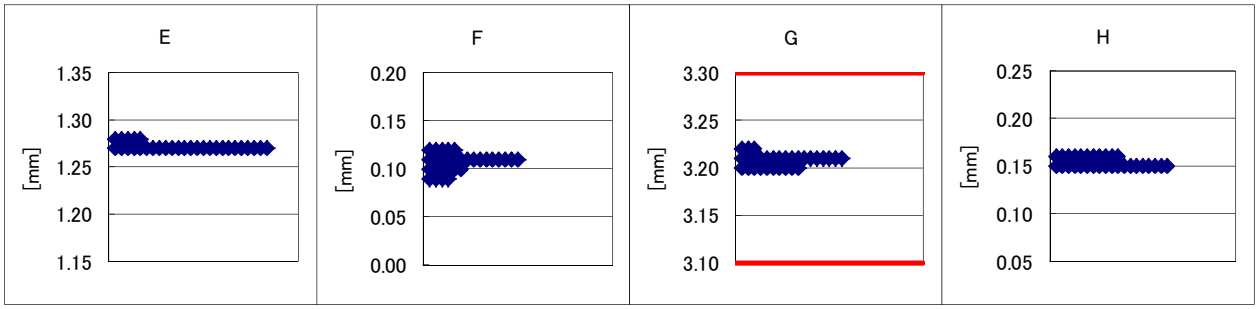


Average: 10.24
Stdev: 0.007
cpk: 2.87

Average: 5.01
Stdev: 0.006

Average: 7.41
Stdev: 0.008
cpk: 7.49

Average: 0.37
Stdev: 0.006

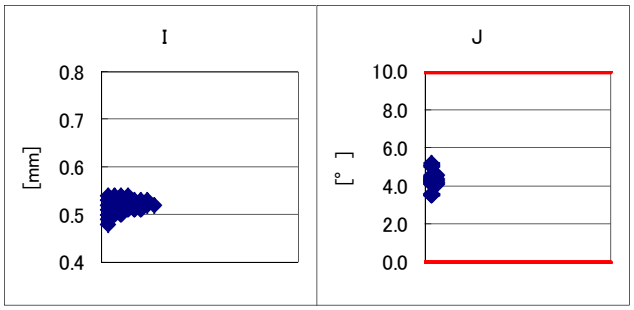


Average: 1.27
Stdev: 0.003

Average: 0.11
Stdev: 0.009
cpk: 2.09

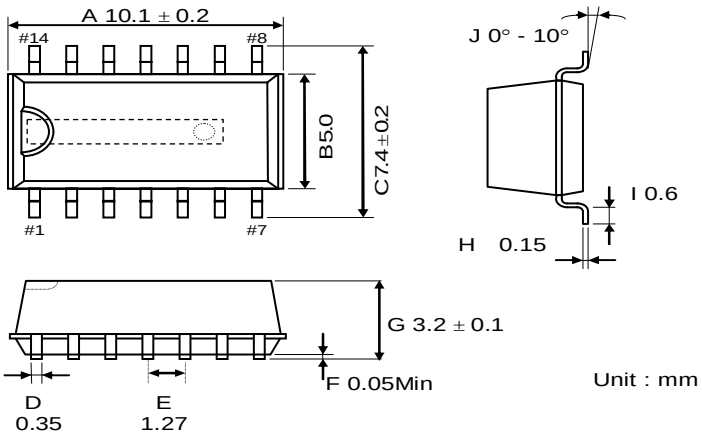
Average: 3.21
Stdev: 0.006
cpk: 1.76

Average: 0.15
Stdev: 0.004



Average: 0.52
Stdev: 0.015

Average: 4.29
Stdev: 0.445
cpk: 3.21

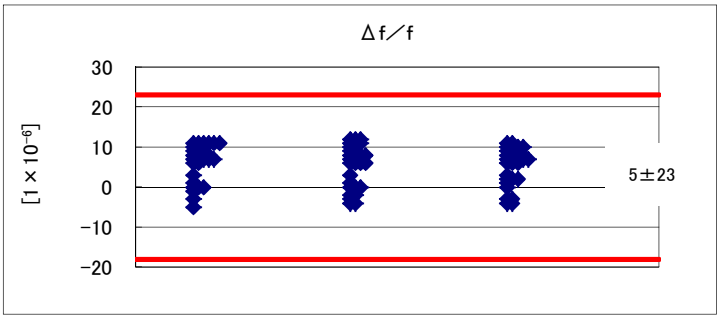


Unit : mm

Product Name : RA-SA series Conforms to AEC-Q200

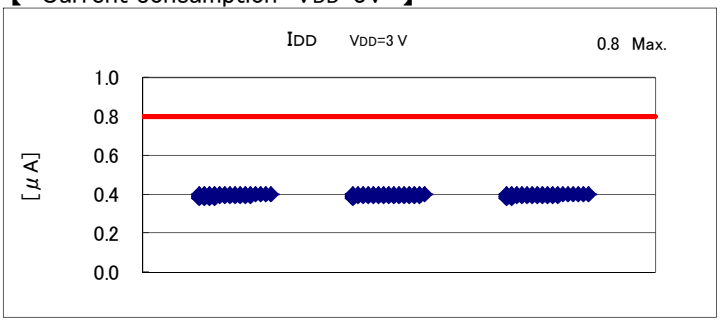
19.Electrical Characterization n=30 ×3 Lot No.F-Q200-RA-SA PKG-004E

【 Frequency tolerance Δf／f 】



Average:	6.23	5.47	5.34
Stdev:	4.618	5.235	4.585

【 Current consumption VDD=3V 】



Average:	0.39	0.39	0.40
Stdev:	0.007	0.006	0.006

Systemシステム

Subsystemサブシステム

Component組立品

Model Year(s)/ Vehicle(s)機種 : RA-4565SA

Core Teamﾁｰﾑﾒﾝﾊﾞｰ : M.Oka, T.Shirotori, K.Shimodaira, M.Wakamori , H.Koike , T.Tonouchi , S.Takemura, T.Nishimura, M.Shirotori

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS
(DESIGN FMEA) FMEA（設計）

Design Responsibility責任者 : M.Oka (Design Manager)

Key Date : 2006.10.05

Prepared By作成者 : M.Takemura (Design)

FMEA Date(Orig.)日付 （初版）2006/10/05 (Rev.3)（改訂） 2012/03/21

[①PKG関係] RA'SA-PKGの、実装・形状 等
[①PKG concerned] Mounting, Shape etc. of RA'SA-PKG

RPNが100以上の場合は推奨処置を取ること

Item 品目 Function 機能	Item 品目 Function 機能	Potential Failure Mode 潜在的 故障ﾓｰﾄﾞ	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (S) クラス	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因／メカニズム	Occur(O) 発生頻度	Current Design Controls 現行の設計管理 予防 Prevention	Current Design Controls 現行の設計管理 検出 Detection	Detec(D) 検出可能性	R.P.N. リスク優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と完了目標期日	Action Results是正処置実施結果 Actions Taken 取られた処置	Sev 厳しさ (S)	Occ 発生頻度 (O)	Det 検出可能性 (D)	R.P.N. リスク優先数 SxOxD
【部品 Parts:フレーム Frame】	・ICと水晶の電気的接続 IC and crystal electrical connection	導通不良 conduction failure		6		ﾘｰﾄﾞﾌﾚｰﾑの寄生容量により周波数がﾊﾞﾗﾂｸ Frequency is uneven due to parasitic capacity of lead frame.	2	水晶CLとIC_CLとのマッチングをとる Get matching with crystal CL and IC_CL.	ﾘｰﾄﾞﾌﾚｰﾑでのﾏｰｼﾞﾅﾙｻﾝﾌﾟﾙ評価・ﾘｰﾄﾞﾌﾚｰﾑの寄生容量評価 Marginal sample evaluation with lead-frame, parasitic capacity evaluation of lead-frame.	3	36	NONE						
【部品 Parts:フレーム Frame】	・ICと水晶の電気的接続 IC and crystal electrical connection	導通不良 conduction failure		6		Agﾒｯｷが薄い・範囲が狭いためAuﾜｲﾔｰがﾌﾚｰﾑに付かない。 Au wire does not stick to frame because Ag plating is thin and area	3	Agﾒｯｷ範囲(Min公差)・厚みの指定 Designate Ag plating range (Min.common diference) and thickness.	AWB条件範囲の評価 Evaluation of AWB cpndition range	2	36	NONE						
【部品 Parts:フレーム Frame】	・ICと水晶の電気的接続 IC and crystal electrical connection	導通不良 conduction failure	時計が狂う DATA通信・時計/ｶﾚﾝﾀﾞｰ機能・32Khz出力等の機能が動作しない The clock is wrong. Data communication, clock/calendar function, 32Khz output etc. are not	6		WBでの2nd位置が悪くAuﾜｲﾔｰが他のﾌﾚｰﾑにｼｮｰﾄ 2nd position on WB is bad and therefore there is a short in Au wire and other frame.	1	ﾌﾚｰﾑ2nd配線部はAuﾜｲﾔｰと垂直に設計 Design 2nd wiring part of frame vertically to Au wire.	AWB条件範囲の評価 Evaluation of AWB cpndition range	2	12	NONE						
【部品 Parts:フレーム Frame】	・ICと水晶の電気的接続 IC and crystal electrical connection	導通不良 conduction failure		6		WBでの2nd部がﾊﾞﾀﾂｷ超音波が伝わらない 2nd part on WB is fluttered and ultrasonic wave does not transmit.	3	ﾌﾚｰﾑﾊﾞﾀﾂｷ量の設定(ﾌﾚｰﾑ板厚以内) Setting of frame flutterring volume (within frame plate thickness).	AWB条件範囲の評価 Evaluation of AWB cpndition range	2	36	NONE						
【部品 Parts:フレーム Frame】	・ICと水晶の電気的接続 IC and crystal electrical connection	ﾌﾚｰﾑ間ｼｮｰﾄ Short circuit in frame		6		ﾘｰﾄﾞが左右に変形しｼｮｰﾄする Lead is transformed to left and right, and short-circuit.	4	ﾘｰﾄﾞ間隔･ﾘｰﾄﾞ幅は板厚以上とする Lead distance and lead width shall be more than plate thickness.	x線での内部観察評価（ﾓｰﾙﾄﾞ条件範囲） Internal observation evaluation with an X-ray (mold condition range)	2	48	NONE						
【部品 Parts:フレーム Frame】	・ICと水晶の電気的接続 IC and crystal electrical connection	ﾌﾚｰﾑ間ｼｮｰﾄ Short circuit in frame		4		水晶溶接のバクヒでステージ吊りリードとショートし発せず No oscillation because of burst of crystal welding and stage hanging lead and lead are short-circuit	3	水晶溶接ﾌﾚｰﾑとｽﾃｰｼﾞ間隔を0.3mm（端子幅以上確保する） Distance between crystal welded frame and stage shall be 0.3mm (keep distance over terminal width)	水晶溶接条件範囲の評価 Evaluation of crystal welding condition range	2	24	NONE						

Item 品目 Function 機能	Item 品目 Function 機能	Potential Failure Mode 潜在的 故障モード	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (S) クラス	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因／ メカニズム	Occur(O) 発生頻度	Current Design Controls 現行の設計管理 予防 Prevention	検出 Detection	Detec(D) 検出 可能性	R.P.N. リスク 優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と 完了目標期日	Action Results 是正処置実施結果 Actions Taken 取られた処置	Sev 厳しさ (S)	Occ 発生 頻度 (O)	Det 検出 可能性 (D)	R.P.N. リスク 優先数 SxOxD
【部品 Parts：フレーム Frame】	・ICと水晶の電気的接続 IC and crystal electrical connection	ﾌﾚｰﾑ間ｼｮｰﾄ Short circuit in frame	発振しない。DATA通信・時計/ｶﾚﾝﾀﾞｰ機能・32Khz出力等の機能が動作しない No oscillation. Data communication, clock/calendar function, 32Khz output etc. are not	4		ICの初期ｸﾗｯｸにより配線層が切断 Wiring layer is cut due to IC initial crack.	3	スクラブラインの幅を80um以上にする（ダイシングブレード25umのため） Set width of scrub-in to over 80um (because dicing blade is 24um).	IC外観評価 IC apperance evaluation	2	24	NONE						
【部品 Parts：フレーム Frame】	・Product connection	ﾌﾚｰﾑ反り Frame bending	製品加工ができない Impossible to have product processing.	5		樹脂とﾌﾚｰﾑの熱膨張差により樹脂側に反る Bend to plastic side due to difference of thermal expansion between plastic and frame	5	製品連結間へ溝を入れ熱収縮の逃がしを設ける Make groove in between product connection to get escape of heat shrink.	応力シミュレーション解析 Stress simulation analysis	2	50	NONE						
【部品 Parts：水晶振動子 Crystal Oscillator】	・発振・周波数精度 Oscillation and frequency accuracy	周波数ずれ Frequency shifting	DATA通信・時計/ｶﾚﾝﾀﾞｰ機能・32Khz出力等の機能が動作しない Data communication, clock/calendar function, 32Khz output etc. are not functioned.	6		ICに対して水晶の周波数がずれている Crystal frequency is shifted against IC	5	ICに適合する水晶ﾗﾝｸを設定する Establish crystal rank conforming to ICI.	ﾗﾝｸによる周波数精度確認 Confirm frequency accuracy with rank	1	30	NONE						
【部品 Parts：水晶振動子 Crystal Oscillator】	・発振・周波数精度 Oscillation and frequency accuracy	周波数ずれ Frequency shifting	DATA通信・時計/ｶﾚﾝﾀﾞｰ機能・32Khz出力等の機能が動作しない Data communication, clock/calendar function, 32Khz output etc. are not	6		封止部へ衝撃が加わり内部真空度が落ち周波数が変化する Shock is given to seaming part and inner vacuum degree is fallen, then frequency is changed.	2	製品の水晶押さえﾋﾟﾝは封止部へ設置しない Do not set up crystal holding pin of product on seaming part.	製品への荷重評価 Load estimation to product	3	36	NONE						
【部品 Parts：水晶振動子 Crystal Oscillator】	・外形形状 External shape	水晶管見え Visible of crystal tube	PKG表面へ水晶管が露出し機能・動作しない Crystal tube is exposed on the surface of PKG and function is not worked	5		水晶押さえﾋﾟﾝがなく高さ規制ができない No height control is possible because of no crystal holding pin.	4	水晶押さえﾋﾟﾝを製品に設置する Set up crystal holding pin on product.	公差計算による水晶押さえ量の最適化 Optimize crystal holding amount with common difference calculation.	2	40	NONE						
【部品 Parts：水晶振動子 Crystal Oscillator】	・外形形状 External shape	水晶管見え Visible of crystal tube	PKG表面へ水晶管が露出し機能・動作しない Crystal tube is exposed on the surface of PKG and function is not worked	5		水晶が押されステージが変形しワイヤーダメージ Stage is transfirmed because crystal is pushed, and wire has damage.	3	水晶ﾘｰﾄﾞ曲げ高さ1.08±0.03により、ｽﾃｰｼﾞ押しを最小限にする Minimize stage pushing with crystal lead bending height of 1.08±0.03.	公差計算による水晶押さえ量の最適化 Optimize crystal holding amount with common difference calculation.	2	30	NONE						
【部品 Parts：水晶振動子 Crystal Oscillator】	・外形形状 External shape	水晶管見え Visible of crystal tube	PKG表面へ水晶管が露出し機能・動作しない Crystal tube is exposed on the surface of PKG and function is not worked	5		水晶がﾋﾟﾝとｽﾃｰｼﾞに挟まれ封止部リーク Crystasl get caught in pin and stage and seaming part get leak.	3	PIN高さ設定±0.02によりpin押はなくなる Pin pushing has gone with setting PIN height of ±0.02	公差計算による水晶押さえ量の最適化 Optimize crystal holding amount with common difference calculation.	2	30	NONE						
【部品 Parts：水晶振動子 Crystal Oscillator】	・外形形状 External shape	水晶管見え Visible of crystal tube	PKG表面へ水晶管が露出し機能・動作しない Crystal tube is exposed on the surface of PKG and function is not worked	5		水晶管周辺へ水分が付着し、IC面まで水分が侵入することで、リフロー時の剥離・水蒸気爆発が起きる Water is stuck around crystal tube and water goes in IC face, so peeling or hydrovolcanic	3	水晶上面へのﾋﾟﾝ設置により水分を逃がす 2箇所設置により、確実にさせる Escape watew by setting up pin on upper face of cryctal. Set up 2 position to make sure.	公差計算による水晶押さえ量の最適化 Optimize crystal holding amount with common difference calculation	2	30	NONE						

Item 品目 Function 機能	Item 品目 Function 機能	Potential Failure Mode 潜在的 故障モード	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (S) クラス	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因／ メカニズム	Occur(O) 発生頻度	Current Design Controls 現行の設計管理 予防 Prevention	Current Design Controls 現行の設計管理 検出 Detection	Detec(D) 検出 可能性	R.P.N. リスク 優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と 完了目標期日	Action Results是正処置実施結果 Actions Taken 取られた処置	Sev 厳しさ (S)	Occ 発生 頻度 (O)	Det 検出 可能性 (D)	R.P.N. リスク 優先数 SxOxD
【部品 Parts：水晶振動子 Crystal Oscillator】	・外形形状 External shape	水晶管見え Visible of crystal tube	PKG表面へ水晶管が露出し機能・動作しない Crystal tube is exposed on the surface of PKG and function is not worked	5		水晶管周辺へ水分が付着し、IC面まで水分が侵入することで、リフロー時の剥離・水蒸気爆発が起きる Water is stuck around crystal tube and water goes in IC face, so peeling or hydrovolcanic	3	低吸水率の樹脂を使用する Use plastic with low water absorption.	EME7030デラミ評価 各信頼性の実施 EME7030 delamination estimation Implement each reliablity test	2	30	NONE						
【部品 Parts：水晶振動子 Crystal Oscillator】	・外形形状 External shape	水晶管見え Visible of crystal tube	PKG表面へ水晶管が露出し機能・動作しない Crystal tube is exposed on the surface of PKG and function is not worked	5		水晶管周辺へ水分が付着し、IC面まで水分が侵入することで、リフロー時の剥離・水蒸気爆発が起きる Water is stuck around crystal tube and water goes in IC face, so peeling or hydrovolcanic	3	IC・ﾌﾚｰﾑへの密着性の高い樹脂選定 Select plastic with heigh adhesion to IC and frame.	EME7030のデラミ評価 各信頼性評価 EME7030 delamination estimation Implement each reliablity test	2	30	NONE						
【部品 Parts：モールド樹脂 Mold Plastic】	・ICの保護 Protection of IC	導通不良・劣化 conduction failure, deterioration	発振しない。DATA通信・時計/ｶﾚﾝﾀﾞｰ機能・32Khz出力等の機能が動作しない No oscillation. Data communication, clock/calendar function, 32Khz output etc. are not	4		成形時の樹脂が硬くAuﾜｲﾔｰが変形しｼｮｰﾄ・断線となる Plastic when shaping is hard and Au wire is transformed which is caused a short circuit and disconnection	4	水晶先端にｹﾞｰﾄを設置する。ｹﾞｰﾄ部にはｲﾝﾅｰﾘｰﾄﾞの吊を設置しない Sets gate on the top of crystal. Never sets catching of inner lead on the gate.	成形条件範囲の評価 X線での内部観察 Evaluation of shape forming condition range. Inner observation with X-rays.	2	32	NONE						
【部品 Parts：モールド樹脂 Mold Plastic】	・ICの保護 Protection of IC	導通不良・劣化 conduction failure, deterioration	発振しない。DATA通信・時計/ｶﾚﾝﾀﾞｰ機能・32Khz出力等の機能が動作しない No oscillation. Data communication, clock/calendar function, 32Khz output etc. are not	4		ワイヤーが高くPKG裏面から露出しワイヤー切れ Wire is too heigh and is exposed from the back of PKG, and wire is broken.	3	ワイヤー高さ規格=0.3 maxとする （裏面からの隙間 min0.27） Wire height std. Shall be 0.3 max. (Gap from the back is min. 0.27)	公差計算・AWB条件範囲の評価 Evaluation of common diference calculation and AWB conditions range.	3	36	NONE						
【部品 Parts：モールド樹脂 Mold Plastic】	・ICの保護 Protection of IC	導通不良・劣化 conduction failure, deterioration	発振しない。DATA通信・時計/ｶﾚﾝﾀﾞｰ機能・32Khz出力等の機能が動作しない No oscillation. Data communication, clock/calendar function, 32Khz output etc. are not	4		高温下でAuﾎﾞｰﾙの共晶が進み剥がれ導通不良 A eutictic of Au ball is progressed in heigh temperature and get peeling conduction failure is occurred.	3	高温かでも共晶が進みづらい[GPG」を使用する Use [GPG」which is hard to progress a eutictic even from heigh temperature.	高温下での共晶進行性評価 Estimation of a eutictic progressive in heigh temperature.	3	36	NONE						
【部品 Parts：モールド樹脂 Mold Plastic】	・ICの保護 Protection of IC	導通不良・劣化 conduction failure, deterioration	発振しない。DATA通信・時計/ｶﾚﾝﾀﾞｰ機能・32Khz出力等の機能が動作しない No oscillation. Data communication, clock/calendar function, 32Khz output etc. are not	4		IC面の樹脂の密着性が悪くワイヤー取れ Adhesion of plastic on IC face is bad and wire is broken.	3	EME7030実績から、IC面の剥離は問題なし Peeling of IC face has no problem from the result of EME7030.	リフローSAT評価 Estimation of reflow SAT.	2	24	NONE						

Item 品目 Function 機能	Item 品目 Function 機能	Potential Failure Mode 潜在的 故障モード	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (S) クラス	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因／ メカニズム	Occur(O) 発生頻度	Current Design Controls 現行の設計管理 予防 Prevention	検出 Detection	Detec(D) 検出 可能性	R.P.N. リスク 優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と 完了目標期日	Action Results 是正処置実施結果 Actions Taken 取られた処置	Sev 厳しさ (S)	Occ 発生 頻度 (O)	Det 検出 可能性 (D)	R.P.N. リスク 優先数 SxOxD
【部品 Parts：モールド樹脂 Mold Plastic】	・ICの保護 Protection of IC	導通不良・劣化 conduction failure, deterioration	発振しない。DATA通信・時計/カレンダー機能・32Khz出力等の機能が動作しない No oscillation. Data communication, clock/calendar function, 32Khz output etc. are not	4		同上で樹脂ｸﾗｯｸにより水分の浸入によりAL酸化腐食 With the same phonemenon as above, AL oxidative corrosion is occurred due to plastic crack and water infiltration.	3	同上のため、水分の浸入は問題なし The same as the above reason, water infiltration has no problem.	リフローSAT評価 Estimation of reflow SAT.	2	24	NONE						
【部品 Parts：モールド樹脂 Mold Plastic】	・ICの保護 Protection of IC	導通不良・劣化 conduction failure, deterioration	発振しない。DATA通信・時計/カレンダー機能・32Khz出力等の機能が動作しない No oscillation. Data communication, clock/calendar function, 32Khz output etc. are not	4		ﾌﾚｰﾑと樹脂の密着が悪く、同上の水分侵入 Adhesion of frame and plastic are bad, and water infiltration of the above is occurred.	3	ｽﾃｰｼﾞｻｲｽﾞを、ICサイズ＋0.2とすることで、剥離をなくす Make stage size to +0.2 of IC size to avoid peeling.	リフローSAT評価 Estimation of reflow SAT.	2	24	NONE						
【部品 Parts：モールド樹脂 Mold Plastic】	・ICの保護 Protection of IC	導通不良・劣化 conduction failure, deterioration	発振しない。DATA通信・時計/カレンダー機能・32Khz出力等の機能が動作しない No oscillation. Data communication, clock/calendar function, 32Khz output etc. are not	4		樹脂内のﾌｨﾗｰがICを傷付け、配線ダメージ　Filler in plastic gives damage to IC and therefore wiring has damage.	6	球状ﾌｨﾗｰを使用する Use spherical filler.	温度サイクル評価 Estimation of temperature cycle.	3	72	NONE						
【部品 Parts：モールド樹脂 Mold Plastic】	・ICの保護 Protection of IC	導通不良・劣化 conduction failure, deterioration	発振しない。DATA通信・時計/カレンダー機能・32Khz出力等の機能が動作しない No oscillation. Data communication, clock/calendar function, 32Khz output etc. are not	4		Tgが低いため高温下での樹脂の膨張が大きくIC・Au線ダメージ Expansion of plastic in heigh temperature is big since Tg is low, therefore IC/Au wire get damage.	5	Tgが使用温度範囲以上の樹脂を選択する Select plastic which Tg has more than using temperature range.	熱重量変化の測定 温度サイクル評価 Measurement of thermogravimetric change Estimation of temperature cycle.	3	60	NONE						
【部品 Parts：モールド樹脂 Mold Plastic】	・ICの保護 Protection of IC	導通不良・劣化 conduction failure, deterioration	発振しない。DATA通信・時計/カレンダー機能・32Khz出力等の機能が動作しない No oscillation. Data communication, clock/calendar function, 32Khz output etc. are not	4		Tgが低いため高温下での樹脂の膨張が大きくIC・Au線ダメージ Expansion of plastic in heigh temperature is big since Tg is low, therefore IC/Au wire get damage.		IC表面への保護幕の設置 Sets over coating on IC surface.	ICプロセスの確認 Confirmation of IC process	1	20	NONE						
【部品 Parts：モールド樹脂 Mold Plastic】	・ICの保護 Protection of IC	導通不良・劣化 conduction failure, deterioration	発振しない。DATA通信・時計/カレンダー機能・32Khz出力等の機能が動作しない No oscillation. Data communication, clock/calendar function, 32Khz output etc. are not	4		ハロゲン系難燃剤の規制により出荷不可 Impossible to deliver due to regulation of halogen system fire retardant.	3	Green材の選定 Select Green material.	信頼性評価 Reliability estimation	2	24	NONE						

Item 品目 Function 機能	Item 品目 Function 機能	Potential Failure Mode 潜在的 故障モード	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (S) クラス	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因／ メカニズム	Occur(O) 発生頻度	Current Design Controls 現行の設計管理 予防 Prevention	 検出 Detection	Detec(D) 検出 可能性	R.P.N. リスク 優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と 完了目標期日	Action Results是正処置実施結果 Actions Taken 取られた処置	Sev 厳しさ (S)	Occ 発生 頻度 (O)	Det 検出 可能性 (D)	R.P.N. リスク 優先数 SxOxD
【部品 Parts：モールド樹脂 Mold Plastic】	・製品外形の形成 Shaping of product external form	外形バリ・表面キズ Burr on external form, scratch on the surface	基板への実装ができない Unable to mount on the circuit board	5		樹脂の浸透性が良くﾌﾚｰﾑと型の隙間に入り薄ﾊﾞﾘとなり端子に残り半田が付かない Due to heigh osmosis of plastic, it gets in a gap between frame and mold, get thin burr then gets in pin, therefore soldering	4	ﾌﾚｰﾑ端子裏面部を一段あげることでﾊﾞﾘ発生を防止する Make the back part of frame pin one step higher to avoid burr.	ﾓｰﾙﾄﾞ条件範囲の評価 Estimation of mold conditions range.	3	60	NONE						
【部品 Parts：モールド樹脂 Mold Plastic】	・製品外形の形成 Shaping of product external form	外形バリ・表面キズ Burr on external form, scratch on the surface	外観不良 Appearance failure	5		型から製品を取り出す時、樹脂とﾌﾚｰﾑが剥がれｸﾗｯｸが起きる。また表面が擦れキズがつく When take out product from mold, plastic and frame peels and gets crack. The surface is rubbed and gets scratch.	3	製品の抜きﾃｰﾊﾟｰを7°つける Gives taper with 7° to escape product.	ﾓｰﾙﾄﾞ時の製品外観評価 Product appearance estimation on molding.	3	45	NONE						
【部品 Parts：モールド樹脂 Mold Plastic】	・製品外形の形成 Shaping of product external form	外形バリ・表面キズ Burr on external form, scratch on the surface	外観不良 Appearance failure	5		型から製品を取り出す時、樹脂とﾌﾚｰﾑが剥がれｸﾗｯｸが起きる。また表面が擦れキズがつく When take out product from mold, plastic and frame peels and gets crack. The surface is rubbed and gets scratch.	3	製品の表面粗さを梨地にする Make the surface roughness of product to stain finished surface.	ﾓｰﾙﾄﾞ時の製品外観評価 Product appearance estimation on molding.	3	45	NONE						
【完成品 Finished Product】	・外形形状の寸法 Measurements of external form	幅･長さの大小 Big or small of width and length	基板への実装ができない Unable to mount on the circuit board	6		側面へのﾊﾞﾘ残りにより製品外形が大きくなる Product external form becomes bigger due to burr leaving on the side	3	ｱｳﾀｰﾘｰﾄﾞの製品外周寸法を制限する Limit product extarnal measurements of outer lead	完成品寸法測定評価 Finished product measurements estimation	2	36	NONE						
【完成品 Finished Product】	・外形形状の寸法 Measurements of external form	幅･長さの大小 Big or small of width and length	基板への実装ができない Unable to mount on the circuit board	6		側面へのﾊﾞﾘ残りにより製品外形が大きくなる Product external form becomes bigger due to burr leaving on the side	3	製品仕様の公差表示(MAX表示) Indicate common difference of product specification (Max indication)	完成品寸法測定評価 Finished product measurements estimation	2	36	NONE						
【完成品 Finished Product】	・外形形状の寸法 Measurements of external form	高さの大小 Big or small height	基板への実装ができない Unable to mount on the circuit board	6		端子が下方向に変形し総厚が高くなる Total height becomes higher due to transformation of pin to lower dirction	3	端子切断部へ予め溝を設置することで切断時の変形を防止する Prevent tranformation when cut by set groove on pin cutting part in	切断面の観察 Observation of cut face	3	54	NONE						
【完成品 Finished Product】	・外形形状の寸法 Measurements of external form	高さの大小 Big or small height	基板への実装ができない Unable to mount on the circuit board	6		端子が下方向に変形し総厚が高くなる Total height becomes higher due to transformation of pin to lower dirction	3	製品仕様の公差表示(MAX表示) Indicate common difference of product specification (Max indication)	完成品寸法測定評価 Finished product measurements estimation	2	36	NONE						
【完成品 Finished Product】	・外形形状の寸法 Measurements of external form	端子形状変形 Transformation of pin shape	基板への実装ができない Unable to mount on the circuit board	6		端子ｶｯﾄで端子が下方向に引張られ変形する Pin is pulled to lower direction due to pin cut and is transformed	2	製品仕様への端子平坦度指示(∩0.1) Indicate pin flatness (∩ 0.1) to product specification	完成品寸法測定評価 Finished product measurements estimation	2	24	NONE						
【完成品 Finished Product】	・外形形状の寸法 Measurements of external form	端子形状変形 Transformation of pin shape	基板への実装ができない Unable to mount on the circuit board	6		端子ｶｯﾄ時のﾌﾚｰﾑ位置精度が悪くｶﾞﾀとなり端子ｶｯﾄ位置がばらつく Frame position accuracy is bad when cut pin and is bumpy, then pin cut position becomes uneven.	2	ｱｳﾀｰﾘｰﾄﾞの穴公差を±0.025とする Make hole common difference of outer lead to ±0.025.	完成品寸法測定評価 Finished product measurements estimation	2	24	NONE						

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【完成品 Finished Product】	・外形形状の寸法 Measurements of external form	端子形状変形 Transformation of pin shape	基板への実装ができない Unable to mount on the circuit board	4		IC裏面電位が水晶に伝わり、水晶ケース露出時に客先シールド板とｼｮｰﾄ IC back potential is transmitted to crystal and short-circuit with customer sealed plate when crystal case exposes.	3	押さえピンからの露出であり、ピン深さ0.06のためショートしない 仕様書に水晶見えの記載を入れる Exposure from holding pin and deth is 0.06, terefore no short-circuit. Include mentioning of crystal visible in specification.	水晶見え品の特性評価 Estimate characteristic of crystal visible product	2	24	NONE						
【完成品 Finished Product】	・外形形状の寸法 Measurements of external form	端子形状変形 Transformation of pin shape	基板への実装ができない Unable to mount on the circuit board	4		露出端子間（水晶端子とｽﾃｰｼﾞ端子）のｼｮｰﾄ Short circuit in exposure pin (crystal pin and stage pin)	3	端子間は0.3mm以上あけた設計であり、実績からショートしない Distance between pins are designed to keep over 0.3mm, therefrore no short circuit is occurred from the result.	高温高湿B評価 Estimate high temperature and high humidity B	2	24	NONE						
【完成品 Finished Product】	・外形形状の寸法 Measurements of external form	端子形状変形 Transformation of pin shape	基板への実装ができない Unable to mount on the circuit board	4		端子ﾒｯｷSn100%によりウイスカの成長で端子間ｼｮｰﾄ Having short circuit in pin due to whisker growing by 100% of pin plating Sn	3	ウイスカ規格50um 端子間隔920um でありショーとの危険性なし ウイスカ評価（温度サイクル）を実施する It is not in danger of getting short circuit because whisker standard is 50um and pin distance is 920um, implement whisker estimation (temperature cycle)	温度サイクル評価 端子部のSEM観察 Estimate temperature cycle SEM observation of pin part	3	36	NONE						
【完成品 Finished Product】	・電気特性 Electric characteristic	周波数ズレ Frequency shifting	時計が狂う クロック出力周波数ずれ The clock is wrong. Shifting of clock	6		ICに対して水晶の周波数がずれている Crystal frequency is shifted against IC	5	ICに適合する水晶ﾗﾝｸを設定する Set crystal rank conforming to IC.	ﾗﾝｸによる周波数精度確認 Confirm frequency accuracy by rank	1	30	NONE						
【完成品 Finished Product】	・電気特性 Electric characteristic	周波数ズレ Frequency shifting	時計が狂う クロック出力周波数ずれ The clock is wrong. Shifting of clock	6		PKG内（水晶振動子のｹｰｽ）に静電気が帯電している Static electricity is taken s charge in PKG (inside	2	水晶ｹｰｽとﾌﾚｰﾑ（GND）を接続する Connect crystal case and frame (GND)	周波数測定評価 Estimate frequency measurement	3	36	NONE						
【完成品 Finished Product】	・電気特性 Electric characteristic	消費電流大 Consumption current big	電池寿命が短く Battery has run down.	6		PKGの熱収縮で反りIC表面へ応力が加わる Stress is given to IC surface by bending due to heat shrink opf PKG	3	IC実装位置(高さ)を製品中央に配置する Arrange IC mounting position (height) to te center of product	応力シミュレーション評価 Esttimate stress simulation	2	36	NONE						
【完成品 Finished Product】	・電気特性 Electric characteristic	消費電流大 Consumption current big	電池寿命が短く Battery has run down.	4		IC表面の樹脂応力によりICダメージ（上下の樹脂差がありすぎ） Get IC damage on IC due to plastic stress on IC surface (Too big difference of uper and lower plastic)	3	IC厚み0.2以上（実績値）で、IC表面の応力は少 IC thickness is more than 0.2 (actual result value) and stress on IC surface is small.	応力シミュレーションにより他機種とのIC表面応力差を確認する Confirm IC surface stress with other model by stress simulatrion	2	36	NONE						
【完成品 Finished Product】	・電気特性 Electric characteristic	消費電流大 Consumption current big	電池寿命が短く Battery has run down.	4		125℃のため部品間の熱膨張差により剥離・ICストレス・溶接部ストレス Get peeling, IC stress and welding part stress due to difference of heat expansion between parts because of 125℃	3	熱膨張係数の小さい樹脂を選定する Select plastic with small heat expansion factor.	温度サイクル3000CYCでの機能評価・試験後の剥離確認 Estimate function and confirm peeling after test with temperature cycle of 3000	2	24	NONE						

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【完成品 Finished Product】	・ﾏｰｷﾝｸﾞ外観 Marking appearance	ﾏｰｷﾝｸﾞ認識不可 Impossible to realize marking	Lot履歴確認ができない Impossible to confirm Lot history	4		水晶露出部へはﾚｰｻﾞｰﾏｰｷﾝｸﾞできない Unable to give laser marking to crystal	4	ﾏｰｷﾝｸﾞﾚｲｱｳﾄを水晶上面からはずす Remove marking layout from crystal upper face.	製品外観評価 Product appearance estimation	1	16	NONE						
【完成品 Finished Product】	・外観 Appearance	PKGｷｽﾞ・ｸﾗｯｸ PKG scratch, Crack	発振しない。DATA通信・時計/ｶﾚﾝﾀﾞｰ機能・32Khz出力等の機能が動作しない Data communication, clock/calendar function, 32Khz output etc. are not functioned.	6		ﾌﾟﾚｽ時に製品を押さえつけｸﾗｯｸ・ｷｽﾞを発生させ、内部にまでｸﾗｯｸが侵攻しIC・Auﾜｲﾔｰへﾀﾞﾒｰｼﾞを及ぼす When pressprocessing, push up product and get crack or scratch, then crack is forced inside and gives damage to IC	5	ｱｳﾀｰﾘｰﾄﾞ設計で製品外周をｸﾗﾝﾌﾟできるｽﾍﾟｰｽmin0.05を確保する With outer lead design, keep space of min. 0.05 to be able to clamp product outer circuference.	リフロー評価 各信頼性評価 Reflow estimation Each reliability estimation	2	40	NONE						
【完成品 Finished Product】	・外観 Appearance	PKGｷｽﾞ・ｸﾗｯｸ PKG scratch, Crack	PKG表面へｷｽﾞがつき外観不良 Appearance failure due to scratch on PKG surface	4		型離れが悪く製品取り出し時表面に擦りｷｽﾞが付く Mold releasing is not done smoothly therefore scratch is given to te surface when remove	3	製品の抜きﾃｰﾊﾟｰをつける Gives taper to pull out product.	ﾓｰﾙﾄﾞ時の製品外観評価 Product appearance estimation when mold	1	18	NONE						
【完成品 Finished Product】	・めっき Plating	実装強度不足 Mounting strength	実装不良 Mount defect	4		めっき密着性 Solder ability	2	めっき条件最適化 Plating condition	試作時実装強度評価/濡れ性評価 Evaluation Mount strengrh & Solder ability	3	24	NONE						
		ウィスカによるショート Whisker short	発振しない。DATA通信・時計/ｶﾚﾝﾀﾞｰ機能・32Khz出力等の機能が動作しない Data communication, clock/calendar function, 32Khz output etc. are not	8		めっき膜厚異常 Abnormal thickness	2	めっき膜厚最適化 Plating thickness condition	試作時ウィスカ評価 Evaluation whisker	5	40	NONE						

[②完成品特有] RA-4565SA特有
[②Finished Product Special] RA-4565SA Special

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RA-4565SA IC+水晶、特有 RA-4565SA IC+Crystal Special	「水晶発振」 Crystal Oscillation	周波数、ズレ Frequency, Shifting	周波数精度が、規格外 Frequency accuracy is out of standard	8	T2	C-002SY、組み合わせ水晶ランク、マッチングせず C-002SY, Combination crystal rank, not matching	3	周波数精度マッチング ／ Fo先行 Frequency accuracy matching/Fo proceding	RA-4565SAに合わせたC-002SYの狙い値設定・作り込み Set target value of C-002SY and making to fit adjusting to RA-4565SA	1	24	NONE						

[③製品機能] ICを主体とした各種機能
[③Product Function] Various model mainly composed of IC

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製品機能 Product Function	基本機能 ① 「水晶発振」 Basic fucntion ① 「Crystal oscillation」	発振、せず No oscillation	発振不可(発振できず) 発振開始、遅い Impossible to oscillate(unable to oscillate) Oscillation start is slow	8	T2	発振余裕度、不足 Oscillation safety margin, not enough	1	発振余裕度の確保 ⇒ 余裕度3倍を確保済み Secure oscillation safety margin⇒Secured 3 times of safety margin	試作品余裕度評価で確認 Confirm through trial product safety margin estimation	2	16	NONE						
製品機能 Product Function	基本機能 ① 「水晶発振」 Basic fucntion ① 「Crystal oscillation」	発振、せず No oscillation	計時停止(計時できず)、32kHzクロック出力停止(出力できず) Timer stops (unable to count time), 32kHz clock output stops (unable to	8	T2	発振回路、IC上の定数バラツキ大 Oscillation circuit, IC constant, Vary widely	2	低バラツキ設計 ／ 工程管理 Low vary widely design/process control	試作品余裕度評価で確認 Confirm through trial product safety margin estimation	3	48	NONE						
製品機能 Product Function	基本機能 ① 「水晶発振」 Basic fucntion ① 「Crystal oscillation」	発振、せず No oscillation	計時停止(計時できず)、32kHzクロック出力停止(出力できず) Timer stops (unable to count time), 32kHz clock output stops (unable to	8	T2	内蔵水晶振動子、CI値大 Built-in crystal oscillator, CI value big	2	低CI値設計 ／工程管理 Low CI value design/Process control	試作品余裕度評価で確認 Confirm through trial product safety margin estimation	2	32	NONE						
製品機能 Product Function	基本機能 ① 「水晶発振」 Basic fucntion ① 「Crystal oscillation」	発振、せず No oscillation	計時停止(計時できず)、32kHzクロック出力停止(出力できず) Timer stops (unable to count time), 32kHz clock output stops (unable to output)	8		実装不良 Mounting failure	2	工程設計・工程管理 Process design/Process control	試作品評価で確認 工程評価で確認 Confirm through trial product safety margin estimation Confirm through process estimation	1	16	NONE						
製品機能 Product Function	基本機能 ② 「出力端子/入力端子の動作」 Basic function ②	出力端子、動作異常 Output pin, Movement error	データの読み出し･書き込みができない ／ クロック出力が出ない ／ 割り込み出力が出ない Unable to reading and writing of data/no clock output/no interrupt output	8		H出力/L出力、能力不足 H output/L output, Poor performance	1	VOH/VOL/IOH/IOL特性の能力・マージン確保 Secure performance margin of VOH/VOL/IOH/IOL characteristic	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本機能 ② 「出力端子/入力端子の動作」 Basic function ②	出力端子、動作異常 Output pin, Movement error	データの読み出し･書き込みができない ／ クロック出力が出ない ／ 割り込み出力が出ない Unable to reading and writing of data/no clock output/no interrupt output	8		レジスタ機能→出力動作、連動できず Register function → Output movement does not interlock.	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 シミュレーション確認を実施 Confirm through trial product estimation Implement simulation confirmation	1	8	NONE						
製品機能 Product Function	基本機能 ② 「出力端子/入力端子の動作」 Basic function ②	出力端子、動作異常 Output pin, Movement error	データの読み出し･書き込みができない ／ クロック出力が出ない ／ 割り込み出力が出ない Unable to reading and writing of data/no clock output/no interrupt output	8		静電気、出力端子破壊 Static electricity, Output pin is destroyed	2	高静電耐圧設計 High electrostatic pressure-resistant design	試作品評価で確認 Confirm through trial product estimation	3	48	NONE						
製品機能 Product Function	基本機能 ② 「出力端子/入力端子の動作」 Basic function ②	出力端子、動作異常 Output pin, Movement error	データの読み出し･書き込みができない ／ クロック出力が出ない ／ 割り込み出力が出ない Unable to reading and writing of data/no clock output/no interrupt output	8		実装不良 Mounting failure	2	工程設計・工程管理 Process design/Process control	試作品評価で確認 工程評価で確認 Confirm through trial product safety margin estimation Confirm through process estimation	1	16	NONE						

Item 品目 Function 機能	Item 品目 Function 機能	Potential Failure Mode 潜在的 故障モード	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (S) クラス	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因／ メカニズム	Occur (O) 発生 頻度	Current Design Controls 現行の設計管理 予防 Prevention	検出 Detection	Detec (D) 検出 可能性	R.P.N. リスク 優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と 完了目標期日	Action Results是正処置実施結果 Actions Taken 取られた処置	Sev 厳しさ (S)	Occ 発生 頻度 (O)	Det 検出 可能性 (D)	R.P.N. リスク 優先数 SxOxD
製品機能 Product Function	基本機能 ② 「出力端子/入力端子の動作」 Basic function ②	入力端子、 動作異常 Input pin, Movement error	クロック制御ができない ／ データの読み出し･書き込みができない Unable to do clock control/unable to read and write data	8		H入力/L入力、認識できず H input/L input, unrecognized	1	VIH/VIL特性の能力・マージン確保 Secure performance margin of VIH/VIL characteristic	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本機能 ② 「出力端子/入力端子の動作」 Basic function ②	入力端子、 動作異常 Input pin, Movement error	クロック制御ができない ／ データの読み出し･書き込みができない Unable to do clock control/unable to read and write data	8		入力動作→レジスタ機能、連動できず Input movement → Register function nit interlocked	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本機能 ② 「出力端子/入力端子の動作」 Basic function ②	入力端子、 動作異常 Input pin, Movement error	クロック制御ができない ／ データの読み出し･書き込みができない Unable to do clock control/unable to read and write data	8		静電気、入力端子破壊 ESD	2	高静電耐圧設計 High electrostatic pressure-resistant design	試作品評価で確認 Confirm through trial product estimation	3	48	NONE						
製品機能 Product Function	基本機能 ② 「出力端子/入力端子の動作」 Basic function ②	入力端子、 動作異常 Input pin, Movement error	クロック制御ができない ／ データの読み出し･書き込みができない Unable to do clock control/unable to read and write data	8		実装不良 Mounting failure	2	工程設計・工程管理 Process design/Process control	試作品評価で確認 工程評価で確認 Confirm through trial product safety margin estimation Confirm through process estimation	1	16	NONE						
製品機能 Product Function	基本機能③ 「データの読み出し･書き込み動作」 Basic function ③ 「Movement of data reaing and writing」	データ書き込み、異常 Data writing, Error	初期設定できない ／ 機能設定できない ／ 計時機能が使用できない Unable to do initial setting/unable to do function setting/unable to use clock function	8		CE,CLK,DI端子、H入力/L入力認識できず CE, CLK, DI pin, H input/L input unrecognized	1	VIH/VIL特性の能力・マージン確保 Secure performance margin of VIH/VIL characteristic	試作品評価で確認 Confirm through trial product estimation	2	16	NONE						
製品機能 Product Function	基本機能③ 「データの読み出し･書き込み動作」 Basic function ③ 「Movement of data reaing and writing」	データ書き込み、異常 Data writing, Error	初期設定できない ／ 機能設定できない ／ 計時機能が使用できない Unable to do initial setting/unable to do function setting/unable to use clock function	8		AC特性、能力不足・マージン無し AC characteristic, Poor performance, No margin	1	AC特性の能力・マージン確保 Secure performance and margin of AC charateristic	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本機能③ 「データの読み出し･書き込み動作」 Basic function ③ 「Movement of data reaing and writing」	データ書き込み、異常 Data writing, Error	初期設定できない ／ 機能設定できない ／ 計時機能が使用できない Unable to do initial setting/unable to do function setting/unable to use clock function	8		書き込みロジック、動作できず Writing logic no movement	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本機能③ 「データの読み出し･書き込み動作」 Basic function ③ 「Movement of data reaing and writing」	データ書き込み、異常 Data writing, Error	初期設定できない ／ 機能設定できない ／ 計時機能が使用できない Unable to do initial setting/unable to do function setting/unable to use clock function	8		RTC側の、データの誤認識 Date on RTC side is falsely recognized	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本機能③ 「データの読み出し･書き込み動作」 Basic function ③ 「Movement of data reaing and writing」	データ読み出し、異常 Data reading, Error	レジスタ情報が把握できない ／ 計時機能が使用できない Unable to grasp register information/unable to use clock function	8		CE,CLK,DI端子、H入力/L入力認識できず CE, CLK, DI pin, H input/L input unrecognized	1	VIH/VIL特性の能力・マージン確保 Secure performance margin of VIH/VIL characteristic	試作品評価で確認 Confirm through trial product estimation	2	16	NONE						

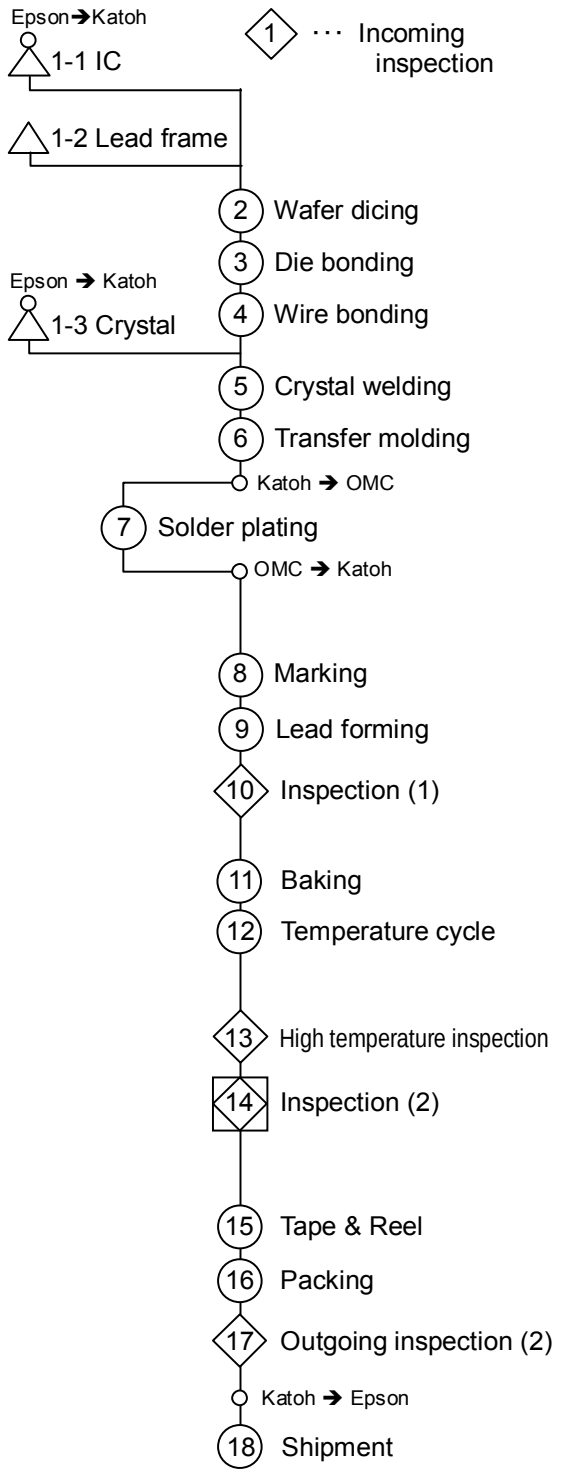
Item 品目 Function 機能	Item 品目 Function 機能	Potential Failure Mode 潜在的 故障モード	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (S) クラス	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因／ メカニズム	Occur (O) 発生 頻度	Current Design Controls 現行の設計管理 予防 Prevention	検出 Detection	Detec (D) 検出 可能性	R.P.N. リスク 優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と 完了目標期日	Action Results是正処置実施結果 Actions Taken 取られた処置	Sev 厳しさ (S)	Occ 発生 頻度 (O)	Det 検出 可能性 (D)	R.P.N. リスク 優先数 SxOxD
製品機能 Product Function	基本機能③ 「データの読み出し・書き込み動作」 Basic function ③ 「Movement of data reaing and writing」	データ読み出し、異常 Data reading, Error	レジスタ情報が把握できない ／ 計時機能が使用できない Unable to grasp register information/unable to use clock function	8		DO端子、L出力 能力不足 DO pin, L output poor performance	1	VOL/IOL特性の能力・マージン確保 Secure performance margin of VOL/IOL characteristic	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本機能③ 「データの読み出し・書き込み動作」 Basic function ③ 「Movement of data reaing and writing」	データ読み出し、異常 Data reading, Error	レジスタ情報が把握できない ／ 計時機能が使用できない Unable to grasp register information/unable to use clock function	8		AC特性、能力不足・マージン無し AC characteristic, Poor performance, No margin	1	AC特性の能力・マージン確保 Secure performance and margin of AC charateristic	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本機能③ 「データの読み出し・書き込み動作」 Basic function ③ 「Movement of data reaing and writing」	データ読み出し、異常 Data reading, Error	レジスタ情報が把握できない ／ 計時機能が使用できない Unable to grasp register information/unable to use clock function	8		読み出しロジック、動作できず Reading logic unable to move	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本機能③ 「データの読み出し・書き込み動作」 Basic function ③ 「Movement of data reaing and writing」	データ読み出し、異常 Data reading, Error	レジスタ情報が把握できない ／ 計時機能が使用できない Unable to grasp register information/unable to use clock function	8		RTCからの誤データの出力 Output of wrong data from RTC	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本動作③ 「計時動作・カレンダ動作 Basic movement ③ 「Clock movement, calendar movement」	計時動作・カレンダ動作、異常 Clock is wrong, Calendar movement, error	・計時が進まない ／ 計時が安定しない ／ カレンダが進まない ／ ありえない桁上げ・カレンダになる Clock does not work/clock does not stablilize/calendar does not work/get unthinkable carried calendar	8		水晶発振停止・異常発振 等 の、水晶発振不良 Crystal oscillation failure such as crystal oscillation stop, abnormal oscillation etc.	1	水晶発振の能力・マージン確保 Secure performance and margin of crystal oscillation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本動作③ 「計時動作・カレンダ動作 Basic movement ③ 「Clock movement, calendar movement」	計時動作・カレンダ動作、異常 Clock is wrong, Calendar movement, error	・計時が進まない ／ 計時が安定しない ／ カレンダが進まない ／ ありえない桁上げ・カレンダになる Clock does not work/clock does not stablilize/calendar does not work/get unthinkable carried calendar	8		水晶発振→計時系カウンタへの連動ミス・カウントミス Crystal oscilation → Interlock failure to clock system counter, wrong counting	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	基本動作③ 「計時動作・カレンダ動作 Basic movement ③ 「Clock movement, calendar movement」	計時動作・カレンダ動作、異常 Clock is wrong, Calendar movement, error	・計時が進まない ／ 計時が安定しない ／ カレンダが進まない ／ ありえない桁上げ・カレンダになる Clock does not work/clock does not stablilize/calendar does not work/get unthinkable carried calendar	8		時・分・秒・年・月・日・曜 の異常計時 Abnormal timer of hour, minute, second, month, date, date of week	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	クロック出力機能 ・CLKOUT機能 ・CLKOE機能 ・周波数選択	クロック出力、出ず Clock output, No output	機器の機能不良 Function failure of instrument	8		FD1,FD0-bit、動作不良 FD1,FD0-bit、movement failure	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	Clock output function ・CLKOUT function ・CLKOE function ・Frequency	異常周波数、出力 Abnormal frequency, Output	機器の機能不良 Function failure of instrument	8		CLKOUT端子の出力バッファ、能力不足 Output of CLOCK pin, Buffer poor performance	1	バッファ能力確保 Secure buffer performance	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						

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製品機能 Product Function	Clock output function ・CLKOUT function ・CLKOE function ・Frequency	Duty、異常 Duty, Abnormality	機器の機能不良 Function failure of instrument	8		CLKOE端子のHorL認識、できず・動作不良 Unable to recognize H or L of CLOCK pin, movement failure	1	VIH/VIL特性の能力・マージン確保 Secure performance margin of VIH/VIL characteristic	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	Clock output function ・CLKOUT function ・CLKOE function ・Frequency	Duty、異常 Duty, Abnormality	機器の機能不良 Function failure of instrument	8		32kHz出力回路、異常 32kHz output circuit, error	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	Clock output function ・CLKOUT function ・CLKOE function ・Frequency	クロック出力停止、不可 Clcok output stops, Impossible	機器の機能不良 Function failure of instrument	8		CLKOE"L"時 出力停止回路、動作不良 Output stops when CLOCK is "L", Circuit movement	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	Clock output function ・CLKOUT function ・CLKOE function ・Frequency	停止時 出力レベル、異常 When stops, output level is wrong	機器の機能不良 Function failure of instrument	8		Hi-z出力での停止、異常 Stop with Hi-z, Error	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	タイマ割り込み機能 Timer interrupt function	/INT出力 Abnormality'/IN Toutput, Error	機器の機能不良 Function failure of instrument	8		/INT端子、"L"出力できず /INT pin unable to output "L".	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	タイマ割り込み機能 Timer interrupt function	/INT出力 Abnormality'/IN Toutput, Error	機器の機能不良 Function failure of instrument	8		/INT端子出力→自動復帰、指定動作モードと違う動作の発生 /INT pin output → Auto recovery, occurred different movement from designated movement	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	タイマ割り込み機能 Timer interrupt function	/INT出力 Abnormality'/IN Toutput, Error	機器の機能不良 Function failure of instrument	8		/INT端子、繰り返し時の自動復帰時間が異常 /INT pin, auto recovery time is	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	タイマ割り込み機能 Timer interrupt function	/INT出力 Abnormality'/IN Toutput, Error	機器の機能不良 Function failure of instrument	8		TIE-bit→/INT出力、制御できず TIE-bit→/INToutput unable to control	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	タイマ割り込み機能 Timer interrupt function	タイマ機能、異常 Timer function, Error	機器の機能不良 Function failure of instrument	8		TE-bitでのタイマスタート＆終了処理、制御できず Timer start and end processing with TE-bit is not controlled.	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	タイマ割り込み機能 Timer interrupt function	タイマ機能、異常 Timer function, Error	機器の機能不良 Function failure of instrument	8		TD1,TD0-bit、ソースクロック選択できず TD1,TD0-bit, unable to select source clock.	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	タイマ割り込み機能 Timer interrupt function	タイマ機能、異常 Timer function, Error	機器の機能不良 Function failure of instrument	8		割り込み発生時、TF-bitが連動発生せず When interrupt, TF-bit cannot be interlocked.	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						

Item 品目 Function 機能	Item 品目 Function 機能	Potential Failure Mode 潜在的 故障モード	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (S) クラス	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因／ メカニズム	Occur (O) 発生 頻度	Current Design Controls 現行の設計管理 予防 Prevention	検出 Detection	Detec (D) 検出 可能性	R.P.N. リスク 優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と 完了目標期日	Action Results 是正処置実施結果 Actions Taken 取られた処置	Sev 厳しさ (S)	Occ 発生 頻度 (O)	Det 検出 可能性 (D)	R.P.N. リスク 優先数 SxOxD
製品機能 Product Function	タイマ割り込み機能 Timer interrupt function	タイマ機能、異常 Timer function, Error	機器の機能不良 Function failure of instrument	8		ダウンカウンタ、カウントダウンできず・自動ループ処理できず Unable to downcount, countdown, unable to process auto loop.	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	アラーム割り込み機能 Alarm interrupt function	/INT出力 Abnormality'/INToutput Error	機器の機能不良 Function failure of instrument	8		/INT端子、"L"出力できず /INT pin, unable to output "L".	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	アラーム割り込み機能 Alarm interrupt function	/INT出力 Abnormality'/INToutput Error	機器の機能不良 Function failure of instrument	8		/INT端子、自動復帰してしまう /INT pin is recovered automatically freely.	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	アラーム割り込み機能 Alarm interrupt function	/INT出力 Abnormality'/INToutput Error	機器の機能不良 Function failure of instrument	8		AF-bit、0クリア時に解除できず Af-bit, when 0 clear, unable to cancel.	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	アラーム割り込み機能 Alarm interrupt function	/INT出力 Abnormality'/INToutput Error	機器の機能不良 Function failure of instrument	8		AIE-bit、機能せず AIE-bit, not functioned	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	アラーム割り込み機能 Alarm interrupt function	アラーム機能、異常 Alarm function, Error	機器の機能不良 Function failure of instrument	8		「分」「時」「日」データおよび AE-bit、アラーム合致判断できず Unable to do conicidence judgment of minute, hour, date data and AE-bit	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	アラーム割り込み機能 Alarm interrupt function	アラーム機能、異常 Alarm function, Error	機器の機能不良 Function failure of instrument	8		割り込み発生時、AF-bitが連動発生せず When interrupt, AF-bit is not interlocked.	1	動作シミュレーション確認を含む 確実な動作回路の設計 Design reliable movement circuit including movement simulation confirmation	試作品評価で確認 Confirm through trial product estimation	1	8	NONE						
製品機能 Product Function	消費電流 Consumption current	消費電流・異常増加 Consumption current, abnormal increasing リーク電流・異常増加 Leak current, abnormal increasing	機器の消費電流増加 機器の機能不良 Consumption current of instrument is increased, Function failure of instrument	8	T2	IC流動時、条件変移 When IC operate, conditions are changed	2	流動条件管理 および IC設計上のプロセスルールの見直し Revision of process rule for operation condition control and IC design.	試作品評価で確認 マージナルサンプル評価 Confirm through trial product estimation Marginal sample estimation	1	16	NONE						

Process flow chart

Product	RA−4565SA, RA−8565SA	Section	TD Production Eng.Dept.
No.	MP−RX−2012−01−1(E)	Date	10-Sep-12



Process No.	Process name	Respons section
1	Incoming inspection	Quality assuarance section
1-1	IC	Katoh Electric
2	Wafer dicing	Katoh Electric
1-2	Lead frame	Katoh Electric
3	Die bonding	Katoh Electric
4	Wire bonding	Katoh Electric
1-3	Crystal	Katoh Electric
5	Crystal welding	Katoh Electric
6	Transfer molding	Katoh Electric
7	Solder plating	OMC
8	Marking	Katoh Electric
9	Lead forming	Katoh Electric
10	Inspection (1)	Katoh Electric
11	Baking	Katoh Electric
12	Temperature cycle	Katoh Electric
13	High temperature inspection	Katoh Electric
14	Inspection (2)	Katoh Electric
15	Tape & Reel	Katoh Electric
16	Packing	Katoh Electric
17	Outgoing inspection	Katoh Electric
18	Shipment	Production control section

△…Incoming ▽…Out going ◇…Inspection □…Storage ○…Process ○…Carry

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS (PROCCESS FMEA) FMEA(工程)

FMEA Number番号 PF-RX-2012-02-4E

Item対象品目 RA-SA(125℃ Spec) PROCCESS Responsibility責任部門 EPSON,Katoh Prepared By作成者 Chiba

Model Year(s)/ Vehicle(s) RA-4565SA/RA-8565SA Key Date完了期限 2013/7/22 FMEA Date(Orig.)日付 (初版) 2013/4/18 (Rev.4)(改訂) 2017/7/18

Core Teamチームメンバー Konno(QA), Miyasaka,Chiba(PE), Yomoda(Sales), Jokura(POG), Watanabe(Katoh)

Proccess Step プロセスステップ Function 作業内容	Requirements 要求事項	Potential Failure Mode 潜在的故障モード	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (C) 分類	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因/メカニズム	Current Design Controls 現行の設計管理 予防 Prevention	Occur(O) 発生頻度	Current Design Controls 現行の設計管理 検出 Detection	Detec (D) 検出	R.P.N リスク優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と完了目標期日	Action Results処置結果 Actions Taken 取られた処置及び完了日	Sev 厳しさ (S)	Occ 発生頻度 (O)	Det 検出可能性 (D)	R.P.N. リスク優先数 SxOxD
Dicing	cutting to IC chip unit	Braking wafer	Bonding inability	7	–	Weak blow pressure	Periodical maintenance	2	Appearance inspection Electrical characteristics inspection	4	56	NONE						
		IC chipping	Lowering mounting and/or product reliability	8	–	Unstable wafer back glinding	Evaluate at PMP	2	Appearance inspection Electrical characteristics inspection	4	64	NONE						
				8	–	Blade quality debasement	Blade control	3	Sensor detection	4	96	NONE						
				8	–	Degradation tape sticking	Life control	2	Appearance inspection	8	128	NONE						
				8	–	Clamp with particle	Jig cleaning	2	Appearance inspection	8	128	NONE						
		Broad cutting width	Function out	8	–	Wrong blade select	Calf check	3	Confirm blade type Electrical characteristics inspection	4	96	NONE						
		Wrong wafer type	Function out	8	–	Wrong wafer select	Recognition error setting	3	Confirm wafer type Electrical characteristics inspection	4	96	NONE						
		Saw line shift	Function out	8	–	Wrong program select	Recognition error setting	3	Appearance inspection Electrical characteristics inspection	4	96	NONE						
		PAD discoloration	Function out	8	–	Water pressure, flow rate problem	Dairy / Periodical check	2	Appearance inspection Electrical characteristics inspection	4	64	NONE						
		ESD damage	Damage product	8	–	DI water resistance out	Dairy / Periodical check	2	Electrical characteristics inspection	4	64	NONE						
Die attach	IC is connected to the lead frame	IC scratching	Function out Lowering reliability	8	–	Si dust remain on IC	Well dicing cleaning	3	Appearance inspection Electrical characteristics inspection	4	96	NONE						
				8	–	Dust remain on nozzle	Noncontact rubber nozzle	3	Appearance inspection	4	96	NONE						
				8	–		Shot contorol	3	Electrical characteristics inspection	4	96	NONE						
				8	–	Clamp with particle	Air blow before IC pick up	2	Appearance inspection Electrical characteristics inspection	4	64	NONE						
				8	–	High nozzle pressure	Dairy / Periodical check	2	Appearance inspection Force control	4	64	NONE						
				8	–	Fly off chip	Well dicing tape	2	Appearance inspection Electrical characteristics inspection	4	64	NONE						
				8	–	Touch wafer surface when setting	Auto loading	2	Appearance inspection Electrical characteristics inspection	4	64	NONE						
				8	–	Drop/Collapse magazine	Work education Fix to Put place	3	Appearance inspection Electrical characteristics inspection	4	96	NONE						
		IC chipping	Function out Lowering reliability	8	–	High nozzle pressure	Dairy / Force periodical check	2	Appearance inspection Force control	8	128	NONE						
				8	–	Pick up position shift	Process start up check	2	Process start up check Appearance inspection	8	128	NONE						
				8	–	Upthrust pin position shift	Process start up check	2	Process start up check Appearance inspection	8	128	NONE						
				8	–	Ware off upthrust pin	Periodical check	2	Appearance inspection	8	128	NONE						
		Remain tape glue	Lowering reliability	6	–	Abnormal upthrust pin	Periodical check /	2	Appearance inspection / Periodical check	8	96	NONE						
				6	–	Upthrust pin position shift	Process start up check	2	Process start up check Appearance inspection	8	96	NONE						
				6	–	Ware off upthrust pin	Periodical check /	2	Appearance inspection / Periodical check	8	96	NONE						
		Frame discoloration	Wire bonding unstick	8	–	Adsorption Ag paste out gus	Evaluate at paste selection	2	Appearance inspection WB inability Electrical characteristics inspection	4	64	NONE						
			Weak adhesion with resin	8	–	Ag plating thickness out	Incoming inspection	2	Appearance inspection Electrical characteristics inspection	4	64	NONE						
				8	–	Ag paste flow out	Evaluate at paste selection	2	Appearance inspection Electrical characteristics inspection	4	64	NONE						
		Frame bending	Wire bonding out	7	–	Miss frame feeding	Dairy / periodical check	2	Appearance inspection WB inability Electrical characteristics inspection	4	56	NONE						
		PAD discoloration	Wire bonding unstick	8	–	Adsorption Ag paste out gus	Evaluate at paste selection	3	Appearance inspection WB inability Electrical characteristics inspection	4	96	NONE						
		No IC	No function	8	–	IC pick up miss	Machine check	3	Appearance inspection WB inability Electrical characteristics inspection	4	96	NONE						

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				8	–	Ag paste shortage	Periodical check	3	Appearance inspection WB inability Electrical characteristics inspection	4	96	NONE						
				8	–	Curering time/temp absence	Periodical check	2	Temperature profile Electrical characteristics inspection	4	64	NONE						
				8	–	No curing	Process data recording	2	Temperature profile Electrical characteristics inspection	4	64	NONE						
		IC direction out	No function	8	–	Wrong frame direction setting	Process start up check	2	Appearance inspection WB inability Electrical characteristics inspection	4	64	NONE						
			Current consumption out	8	–	Wrong wafer direction setting	Process start up check	2	inspection of type change Electrical characteristics inspection	4	64	NONE						
		Wrong IC type	No function	8	–	Wrong wafer select	Process start up check	2	Appearance inspection WB inability Electrical characteristics inspection	4	64	NONE						
		IC position out	WB inability / Lowering reliability	7	–	Machine teaching miss	Process start up check Periodical check	2	Appearance inspection	8	112	NONE						
		Weak bonding strength	WB inability / Lowering reliability	7	–	Ag paste shortage	Process start up check Periodical check	3	Appearance inspection WB inability Electrical characteristics inspection	4	84	NONE						
				7	–	Curering time/temp absence	Dairy / Periodical check	2	Temperature profile Electrical characteristics inspection	4	56	NONE						
				7	–	No curing	Work record	2	Temperature profile Electrical characteristics inspection	4	56	NONE						
		Ag paste stain	Short / Lowering reliability	8	–	Drop Ag paste from kneedle	Dairy / Periodical check	3	Appearance inspection WB inability Electrical characteristics inspection	4	96	NONE						
			WB inability	8	–	Paste stick on machine	Dairy / Periodical check	3	Appearance inspection WB inability Electrical characteristics inspection	4	96	NONE						
				8	–	Too match paste volume	Process start up check Periodical check	3	Appearance inspection Electrical characteristics inspection	4	96	NONE						

Proccess Step プロセスステップ Function 作業内容	Requirements 要求事項	Potential Failure Mode 潜在的 故障モード	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (C) 分類	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因/ メカニズム	Current Design Controls 現行の設計管理 予防 Prevention	Occur(O) 発生頻度	Current Design Controls 現行の設計管理 検出 Detection	Detec (D) 検出	R.P.N リスク 優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と 完了目標期日	Action Results処置結果 Actions Taken 取られた処置 及び 完了日	Sev 厳しさ (S)	Occ 発生頻度 (O)	Det 検出可能性 (D)	R.P.N. リスク 優先数 SxOxD
Wire bonding	IC and the terminal are connected with the wire	1st bonding shift	Lowering reliability	6	–	Machine teaching miss	Process start up check	2	inspection of type change Electrical characteristics inspection	8	96	NONE						
		1st ball out	Function out	8	T2	Wrong Bonding condition	Dairy check	2	Appearance inspection Unstick detecting function Electrical characteristics inspection Strength check	4	64	NONE						
		Ball peel off		8	T2	Window clamper adjustment miss	Dairy / Periodical check Experimental evaluation	3	Appearance inspection Unstick detecting function Electrical characteristics inspection Strength check	4	96	NONE						
		Kirkendall void	Lowering reliability	6	T2	Wrong select Au wire	Process start up check	2	Bar code control	4	48	NONE						
		Ball decentering	Lowering reliability	6	–	Capillary tool stucking	Wrong Bonding condition	2	Appearance inspection / Counter function	8	96	NONE						
				6	–	Miss spark	check of type change Dairy check	2	Machine check	8	96	NONE						
		Wire nekc cut	No function	8	T2	Wrong Bonding condition	Dairy check	2	Appearance inspection Electrical characteristics inspection Electrical characteristics inspection	4	64	NONE						
				8	T2	Ware off capillary tool	Wrong Bonding condition	2	Counter function Appearance inspection Electrical characteristics inspection Strength check	4	64	NONE						
		2nd unstick	No function	8	T2	Miss match force / US power	Process start up check	2	Appearance inspection Electrical characteristics inspection Strength check	4	64	NONE						
				8	T2	Lead clamp adjustment miss	Dairy check	2	Appearance inspection Electrical characteristics inspection Strength check	4	64	NONE						
				8	T2	Inner lead plating unstable	Experimental evaluation	2	Appearance inspection Electrical characteristics inspection Strength check	4	64	NONE						
				8	T2	Stick particl on capillary tool	Wrong Bonding condition	2	Appearance inspection Electrical characteristics inspection Strength check	4	64	NONE						
		Wire scratch	Lowering reliability	6	–	Capillary tool stucking	Shot contorol	2	Counter function	8	96	NONE						
		Wrong wireling	No function	8	–	Wireling setting miss	Process start up check	2	inspection of type change Appearance inspection Electrical characteristics inspection	4	64	NONE						
		Wire shape out / short	Function out / Lowering reliability	8	–	Miss frame feeding	Process start up check	2	Appearance inspection Defect analysis	8	128	NONE						
				8	–	Handling miss	Special trolley	2	Appearance inspection	8	128	NONE						
		Frame bending	Function out / Lowering reliability	8	–	Miss frame feeding	Process start up check	2	Appearance inspection Defect analysis	8	128	NONE						
				8	–	Handling miss	Special trolley	2	Appearance inspection	8	128	NONE						
Crystal welding	Crystal is connected to the lead frame	Spark / G-D short	No oscillation	8	–	Miss match welding pressure / power	Dairy check	3	Automatic abnormal detection Appearance inspection Electrical characteristics inspection	4	96	NONE						
				8	–	Stick particl on crysta lead	Periodical cleaning	3	Camera inspection / Appearance inspection / Electrical characteristics	4	96	NONE						
				8	–	Ware off electrode	Periodical polishing	3	Counter function Electrical characteristics inspection	4	96	NONE						
		Wire bend	Function defect	8	–	Miss frame feeding	Process start up check	3	Appearance inspection Electrical characteristics inspection	4	96	NONE						
				8	–	Handling miss	Special trolley	3	Appearance inspection Electrical characteristics inspection	4	96	NONE						
		Lead frame bend	Function defect / Lowering reliability	8	–	Miss frame feeding	Process start up check	3	Appearance inspection Electrical characteristics inspection	4	96	NONE						
				6	–	Handling miss	Special trolley	3	Appearance inspection Electrical characteristics inspection	4	72	NONE						
		Crystal position shift	Lowering reliability	6	–	Position adjustment miss	Process start up check	3	Appearance inspection / Camera	4	72	NONE						
		Crystal height out	Lowering reliability	6	–	Abnormal crystal lead shape	Evaluation of parts change	2	Appearance inspection dimension measurement	4	48	NONE						
		Weak solder flow	Lowering reliability	6	–	Miss match welding pressure / power	Dairy check	2	Appearance inspection	8	96	NONE						
		Lead floating	No oscillation	8	–	Lead forming punch position out	Evaluation of parts change	2	Appearance inspection Electrical characteristics inspection	4	64	NONE						

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				8	_	Crystal lead shape out	Evaluation of parts change	3	Appearance inspection Electrical characteristics inspection	4	96	NONE						
		Lot interchange at inspection	No function	8	_	Magazine interchange	Bar code control	2	Electrical characteristics inspection	4	64	NONE						
Transfer molding	Packaging by molding resin	Wire sweep / short	Function defect	6		Miss match injection pressure, time, die temperature	Dairy / Periodical check	2	X-ray inspection Electrical characteristics inspection	5	60	NONE						
				6		Degradation mold resin	Life control	3	Time control / X-ray inspection Electrical characteristics inspection	5	90	NONE						
				6		Resin stick at die air bent	Periodical cleaning	3	X-ray inspection Electrical characteristics inspection	5	90	NONE						
		Wire bend	Function defect	4		Miss frame feeding	Dairy / Periodical check	3	X-ray inspection Electrical characteristics inspection	5	60	NONE						
				4		Handling miss	Nonstationary work rule	3	X-ray inspection Electrical characteristics inspection	5	60	NONE						
		Frame bending	Function defect / Lowering reliability	4		Miss frame feeding	Dairy / Periodical check	3	X-ray inspection Electrical characteristics inspection	5	60	NONE						
				4		Handling miss	Nonstationary work rule	3	X-ray inspection Electrical characteristics inspection	5	60	NONE						
		Cavity shift	Dimension out	4		Ware off moldin die	Dairy / Periodical check	2	dimension measurement Appearance inspection	6	48	NONE						
		Crystal seen	Appearance defect	6		Ware off crystal positioning pin	Dairy / Periodical check	2	Appearance inspection	8	96	NONE						
		Void / Molding	Lowering reliability	4		Miss match injection pressure,	Dairy / Periodical check	2	X-ray inspection / Appearance inspection	8	64	NONE						
				4		Degradation mold resin	Life control	3	Time control / X-ray inspection Appearance inspection	8	96	NONE						
				4		Resin stick at die air bent	Periodical cleaning	3	X-ray inspection / Appearance inspection	8	96	NONE						
		Weak adhesion with IC surface	Lowering reliability	4		Skip baking process	Work record	2	Temperature profile	4	32	NONE						
				4		Not enough cure temperature / time	Dairy / Periodical check	2	Temperature profile	4	32	NONE						
		Gate area chipping	Appearance defect Break package	4		Ware off moldin die	Periodical Ware off control	3	Appearance inspection dimension measurement	5	60	NONE						
				4		Gate brake area mulfunction	Periodical check	3	Appearance inspection	8	96	NONE						
		Resin flush	Assemble defect	8		Resin remain on die	Cleaner parts change	2	Appearance inspection	8	128	NONE						

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Solder plating	Solder plated to the terminal	Package chipping	Appearance defect	6	–	Wrong Water jet condition	inspection of type change	2	Appearance inspection of sampling	8	96	NONE						
		Frame bending	Following process problem	6	–	Ware off backup belt	Dairy / Periodical check	2	Appearance inspection of sampling	8	96	NONE						
		Resin burr remain	Assemble defect	8	–	Current / Liquid control out	Dairy check Periodical analysis	2	Appearance inspection of sampling	8	128	NONE						
				8	–	miss much water jet condition	inspection of type change	2	Appearance inspection of sampling	8	128	NONE						
		Plating discoloration	Assemble defect	8	–	Liquid control out	Periodical analysis	2	Appearance inspection of sampling	8	128	NONE						
				8	–	Not enough drying	Dairy / Periodical check	2	Appearance inspection of sampling	8	128	NONE						
		Solder thickness out	Assemble defect	8	–	Liquid control out	Periodical analysis	2	Measurement thickness	4	64	NONE						
				8	–	Current / tim miss match	Dairy / Periodical check	2	Measurement thickness	4	64	NONE						
Marking	The laser marks the product	Unclear marking	Appearance defect	6	–	Degradation laser oscillation unit	Laser power control	2	Process start up check / Camera	4	48	NONE						
		Cut, and rub the character	Appearance defect	6	–	Particle on lens	Periodical cleaning	3	Process start up check / Camera inspection	4	72	NONE						
		Wrong marking	Appearance defect	6	–	Setting miss	input bar code	2	Appearance inspection Run sheet and collation	4	48	NONE						
		Marking position shift / double mark	Appearance defect	6	–	Frame feeding shift	Dairy check	2	Process start up check / Camera inspection	4	48	NONE						
Lead forming	The terminal is formed	Package crack / chipping / scratch	Appearance defect Lower reliability	6	–	Frame feeding miss	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
				6	–	Clamp lead scrap	Die, Cleaner Periodical clearning	2	Appearance inspection / Camera inspection	4	48	NONE						
				6	–	Die break	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
		Lead damage / Lead cut off	Appearance defect Assemble defect	8	–	Frame feeding miss	Dairy check	2	Appearance inspection / Camera	4	64	NONE						
				8	–	Clamp lead scrap	Die, Cleaner Periodical clearning	2	Appearance inspection / Camera inspection	4	64	NONE						
				8	–	Die break	Dairy check	2	Appearance inspection / Camera	4	64	NONE						
				8	–	Die ware off	Dairy check	2	Appearance inspection / Camera	4	64	NONE						
		Remain lead burr	Appearance defect	6	–	Die break	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
				6	–	Die ware off	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
		Gate remain	Appearance defect	6	–	Die break	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
				6	–	Die ware off	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
		Tie-bar remaining	Appearance defect	6	–	Die break	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
				6	–	Die ware off	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
		Pinch lead remaining	Appearance defect	6	–	Die break	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
				6	–	Die ware off	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
		Resin cut remaining	Appearance defect	6	–	Die break	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
				6	–	Die ware off	Dairy check	2	Appearance inspection / Camera	4	48	NONE						
Inspection(1)	Electrical characteristics inspection	Frequency out	Electrical characterisitics defect	7	–	Room temperature out	Dairy check	2	Master sample check	5	70	NONE						
				7	–	Measuring equipment problem	Dairy check	3	Master sample check Alarm by defective test continuousnes Defect quantity check to lot bylot	5	105	NONE						
		Current consumption out	Electrical characterisitics defect	7	–	Measuring equipment problem	Dairy check	3	Master sample check	5	105	NONE						
		ESD damage / Over load voltage	Electrical characterisitics defect / Lowering reliability	7	–	Opposite direction setting	Dairy check	2	Alarm by defective test continuousness	4	56	NONE						
				7	–	Machine earthing out		2	Alarm by defective test continuousness	4	56	NONE						
				7	–	Operator body earthing out	Dairy check	2	Check to working condtion	8	112	NONE						
				7	–	Test board failure	Dairy check	3	Master sample check Defect quantity check to lot bylot	5	105	NONE						
		Defect miss separation	Electrical characterisitics defect	7	–	Channel interchange	inspection of type change	2	Visual check	8	112	NONE						
		Products mix	Electrical characterisitics defect	7	–	Mix of Drop products	Drop products is defect	3	Electrical characteristics inspection	4	84	NONE						
High temperature Storage	Stress application	ESD damage	Electrical characterisitics defect	7	–	Machine earthing out	Dairy / Periodical check	2	Electrical characteristics inspection	4	56	NONE						
		Lead damage	Appearance defect	5	–	Drop products	Work standard	2	Camera inspection by Taping process	4	40	NONE						
Temperature cycle	Stress application	ESD damage	Electrical characterisitics defect	7	–	Machine earthing out	Dairy / Periodical check	2	Electrical characteristics inspection	4	56	NONE						
		Lead damage	Appearance defect	6	–	Drop products	Work standard	2	Camera inspection by Taping process	4	48	NONE						

Proccess Step プロセスステップ Function 作業内容	Requirements 要求事項	Potential Failure Mode 潜在的 故障モード	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (C) 分類	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因/ メカニズム	Current Design Controls 現行の設計管理 予防 Prevention	Occur(O) 発生頻度	Current Design Controls 現行の設計管理 検出 Detection	Detec (D) 検出	R.P.N リスク 優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と 完了目標期日	Action Results処置結果 Actions Taken 取られた処置 及び 完了日	Sev 厳しさ (S)	Occ 発生 頻度 (O)	Det 検出 可能性 (D)	R.P.N. リスク 優先数 SxOxD
High temperature inspection	Electrical characteristics inspection	Frequency out	Electrical characterisitics defect	7		Abnormal heater temperature	Dairy check	2	Master sample check	5	70	NONE						
				7		Measuring equipment problem	Dairy check	3	Master sample check Alarm by defective test continuousnes Defect quantity check to lot bylot	5	105	NONE						
		Current consumption out	Electrical characterisitics defect	7		Measuring equipment problem	Dairy check	3	Master sample check	5	105	NONE						
		ESD damage / Over load voltage	Electrical characterisitics defect / Lowering reliability	7		Opposite direction setting	Dairy check	2	Alarm by defective test continuousness	4	56	NONE						
				7		Machine earthing out		2	Alarm by defective test continuousness	4	56	NONE						
				7		Operator body earthing out	Dairy check	2	Check to working condtion	8	112	NONE						
				7		Test board failure	Dairy check	3	Master sample check Defect quantity check to lot bylot	5	105	NONE						
		Defect miss separation	Electrical characterisitics defect	7		Channel interchange	inspection of type change	2	Visual check	8	112	NONE						
		Products mix	Electrical characterisitics defect	7		Mix of Drop products	Drop products is defect	3	Electrical characteristics inspection	4	84	NONE						

Proccess Step プロセスステップ Function 作業内容	Requirements 要求事項	Potential Failure Mode 潜在的 故障モード	Potential Effect(s) of Failure 潜在的故障影響	Sev (S) 厳しさ	Class (C) 分類	Potential Causes(s)/ Mechanism(s) of Failure 潜在的故障原因/ メカニズム	Current Design Controls 現行の設計管理 予防 Prevention	Occur(O) 発生頻度	Current Design Controls 現行の設計管理 検出 Detection	Detec (D) 検出	R.P.N リスク 優先数 SxOxD	Recommended Action(s) 推奨処置	Responsibility & Target Completion Date 責任者と 完了目標期日	Action Results処置結果 Actions Taken 取られた処置 及び 完了日	Sev 厳しさ (S)	Occ 発生 頻度 (O)	Det 検出 可能性 (D)	R.P.N. リスク 優先数 SxOxD
Inspection(2)	Electrical characteristics inspection	Frequency out	Electrical characterisitics defect	7		Room temperature out	Dairy check	3	Master sample check	5	105	NONE						
				7		Measuring equipment problem	Dairy check	3	Alarm by defective test continuousnes Defect quantity check to lot bylot	4	84	NONE						
		Current consumption out	Electrical characterisitics defect	7		Measuring equipment problem	Dairy check	3	Master sample check Alarm by defective test continuousnes Defect quantity check to lot bylot	4	84	NONE						
		ESD damage / Over load voltage	Electrical characterisitics defect / Lowering reliability	7		Opposite direction setting	Dairy check	2	Alarm by defective test continuousness	4	56	NONE						
				7		Machine earthing out		2	Alarm by defective test continuousness	4	56	NONE						
				7		Operator body earthing out	Dairy check	2	Check to working condtion	8	112	NONE						
				7		Test board failure	Dairy check	3	Master sample check Ddefect quantity check to lot bylot	4	84	NONE						
		Defect miss separation	Electrical characterisitics defect	7		Channel interchange	inspection of type change	2	Visual check	8	112	NONE						
		Package chipping / scratch	Appearance defect	6		Drop products	Drop products is defect	3	Appearance inspection	8	144	NONE						
			Lowering reliability	7		Clamp particle		2	Process start up check / Camera	4	56	NONE						
		Products mix	Electrical characterisitics defect	7		Mix of Drop products	Drop products is defect	3	Electrical characteristics inspection	4	84	NONE						
Tape & Reel	The product is set on the career tape and it seals	Cover tape peel	Assemble defect	4	–	Seeling temperature miss matching	Dairy / Periodical check	3	Appearance inspection pull strength inspection	4	48	NONE						
		Wrong products direction	Assemble defect	4	–	Direction setting miss	Process start up check	3	Camera inspection / Appearance inspection	4	48	NONE						
		Mixing	Wrong spec flow out	8	–	Wrong lot formation	Code check	2	Code check	8	128	NONE						
Outgoing inspection	Outgoing inspection	Frequency out	Electrical characterisitics defect	7	–	Room temperature out	Dairy check	3	Master sample check	5	105	NONE						
				7	–	Measuring equipment problem	Dairy check	3	Abnormal control of Electrical characteristics inspection	8	168	NONE						
		Current consumption out	Electrical characterisitics defect	7	–	Measuring equipment problem	Dairy check	3	Master sample check	5	105	NONE						
		ESD damage / Over load voltage	Electrical characterisitics defect / Lowering reliability	8	–	Opposite direction setting	Work education Worker recognition	2	Electrical characteristics inspection	4	64	NONE						
				6	–	Operator body earthing out	Dairy check	2	Check to working condtion	8	96	NONE						
				6	–	Test board failure	Dairy check	3	Master sample check	5	90	NONE						
		Package chipping / scratch	Appearance defect	6	–	Drop products	Drop products is defect	3	Appearance inspection	4	72	NONE						
			Lowering reliability	6	–	Tweezer handling miss	Work education Worker recognition	2	Visual inspection	8	96	NONE						
Packing	packs it within specification	Mixing	Wrong spec flow ou	8	–	Wrong labeling	Code check	2	Printoutlavel use bar code	8	128	NONE						
Transportation	Keepthe appearance shape	Lead deformation	Customer mounting problem	4	–	Transport accident	Clause exchange with carriers	2	None	10	80	NONE						

CONTROL　PLAN
管理計画書

①

	Prototype プロトタイプ		Pre-launch 量産試作	✔	Production 量産用	⑦Key Contact/Phone 主幹部署／電話	⑩Date(Orig) 日付（初版）	⑪Date(Rev) 日付（改訂版）
②Control Plan Number 管理計画書の番号　MP-RX-2012-02						TD production engineering （SPXO/RTC/TCXO） TEL：0265-70-5741	2012/12/25	
③Part Number/Latest Change Level 部品番号／最新の変更番号 Q********** ／ Rev. 1.0						⑧Core Team Takemura, Tonouchi(PE) Shirotori, Nishimura(QA)	⑫Customer Engineering Approval/Date(If Req'd.) 顧客のエンジニアリングの承認／日付（必要な場合のみ） －－	
④Part Name/Description 部品名／明細 RA-SA Pakage (125℃ Spec)						⑨Supplier/Plant Approval/Date 供給者／工場の承認／日付 KATOH Electric Co.,Ltd	⑬Customer Quality Approval/Date(If Req'd.) 顧客の品質の承認／日付（必要な場合のみ） －－	
⑤Supplier/Plant 供給者／工場 EPSON INA／ KATOH Electric Co.,Ltd		⑥Supplire Code 供給者コード －－				⑭Other Approval/Date(If Req'd.) その他の承認／日付（必要な場合のみ） －－	⑭Other Approval/Date(If Req'd.) その他の承認／日付（必要な場合のみ） －－	

⑮Part/ Process Number 部品／工程の番号	⑯Process Name/ Operation Description 工程の名称／作業明細	⑰Machine, Device, Jig,Tools For Mtg. 製造用の機械・装置・治具・工具	Characteristics 特性			(21) Special Char. Class. 特殊特性の分類	Method 方法					(26) Reaction Plan 対応処置
			⑱ No. 番号	⑲ Product 製品	⑳ Process 工程		(22) Product/Process Specification/ Tolerance 製品／工程の仕様／公差	(23) Evaluation Measurement Tolerance 評価／測定の方法	Sample サンプル (24) Size サイズ	Sample サンプル (24) Freq. 頻度	(25) Control Method 管理方法	
1-1	Incoming inspection (IC)		(1)	Code/ Q'ty		－－		bar code	－	Incoming lot	Process control system	Abnormal quality report
				Appearance		－－	No case broken	Visual	－			
1-2	Incoming inspection (Lead flame)		(1)	Appearance		－－		Visual	－	Incoming lot		Abnormal quality report
				inspection data		－－					inspection data	
1-3	Incoming inspection (Crystal)		(1)	Code / Q'ty		－－		Visual	－	Incoming lot	Process control system	Abnormal quality report
2	Wafer dicing	Taping machine Dicing machine	(1)	Chip appearance		－－	appearance STD	MMS	5point	Lot	record sheet	Abnormal quality report
			(2)		Worn-out blade	－－		Sensor	－	On-line	record sheet	Adjustment
			(3)		Deionezed water resistivity	－－	0.1～0.6MΩ/cm	Resistivity meter	－	Day	record sheet	
			(4)		Deionezed water flow rate	－－	condition sheet	Visual	－	Day	record sheet	
			(5)		N2 pressure	－－	condition sheet	Visual	－	Day	record sheet	
3	Die bonding	Die bonder	(1)	Appearance (Chip,Frame)		－－		MMS	1L/F	Lot	record sheet	Abnormal quality report
			(2)		Ag paste protrution volume	－－	above 90%	Visual	3 IC	Ag paste changing	record sheet	Adjustment
			(3)		Die shear strength	－－	above 800gf	Push Pull tester	1 IC	Day	record sheet	Abnormal quality report
			(4)		Cure temperature	－－	condition sheet	Visual	－	Lot	record sheet	
			(5)		Cure time	－－	150℃±5℃×1H+1/−0H	Visual	－	Lot	record sheet	

⑮Part/ Process Number 部品／工程の番号	⑯Process Name/ Operation Description 工程の名称／作業明細	⑰Machine, Device, Jig,Tools For Mtg. 製造用の機械・装置・治具・工具	Characteristics 特性			(21) Special Char. Class. 特殊特性の分類	Method 方法				(26) Reaction Plan 対応処置
			⑱ No. 番号	⑲ Product 製品	⑳ Process 工程		(22) Product/Process Specification/ Tolerance 製品／工程の仕様／公差	(23) Evaluation Measurement Tolerance 評価／測定の方法	Sample サンプル (24) Size サイズ	Sample サンプル (24) Freq. 頻度	(25) Control Method 管理方法	
4	Wire bonding	Wire bonder	(1)	Appearance (Wire)		－－		MS	1L/F	Magazine	record sheet	Abnormal quality report
			(2)		Temperature	－－	condition sheet	Visual	－	change code Day	record sheet	Adjustment
			(3)		Force	－－	condition sheet	Visual	－	change code Day	record sheet	
			(4)		US power	－－	condition sheet	Visual	－	change code Day	record sheet	
			(5)	Wire pull test		T2	above 5gf	Pull tester	1 IC	Day	record sheet SPC control	Abnormal quality report
			(6)	Bll shear test		T2	above 30gf	Shear tester	1 IC	Day	record sheet SPC control	
5	Crystal welding	Crystal welding machine	(1)	Appearance (Welding point, Wire condition)		－－		Camera inspection	100%	Lot	record sheet	Abnormal quality report
			(2)		Welding power	－－	condition sheet	Power meter	－	Day	record sheet	Adjustment
			(3)		Weld pressure	－－	condition sheet	Tension gage	－	Day	record sheet	
			(4)		Electrode polishing	－－		polishing jig	－	9,600Shot abnormal	record sheet	
			(5)		Weld strength	－－	above 1kg	Push Pull tester	5point	Week	record sheet	
			(6)	Dimension		－－		Depth meter	5point	Week	record sheet	
6	Appearance inspection	Appearance inspection machine	(1)	Appearance (Wire)		－－		MS	100%	Lot	record sheet	Abnormal quality report
7	Transfer molding	Molding press	(1)	Crystal position Wire condition		－－		X-ray machine	1 shot	Clearning	record sheet	Abnormal quality report
			(2)		Die temperature	－－	condition sheet	Thermometer	Once	Day	record sheet	Adjustment
			(3)		Cure temperature	－－	condition sheet	Thermometer	Once	Lot	record sheet	
			(4)		Cure time	－－	condition sheet	Timer	Once	Lot	record sheet	
			(5)	Appearance		－－		Visual	100%	Lot	record sheet	Abnormal quality report
								MS	1 shot	Shift		
8	Solder plating	Horning machine Solder plating line	(1)	Appearance		－－		Visual	Sampling	Lot	record sheet	Abnormal quality report
			(2)		Speed	－－	condition sheet	Stopwatch	－	Month	record sheet	Adjustment
			(3)		Solder fluid temperature	－－	condition sheet	Thermometer	－	Day	record sheet	
			(4)		Solder fluid concentration	－－	condition sheet	Fluid analyze	－	Week	record sheet	
			(5)	Solder thickness		－－	Sn100% 15±5μm	Thichness meter (MSA：1 time)	3point	Day	record sheet SPC control	Abnormal quality report
			(6)	Solderbility		－－	cover by 95%	MS	5pcs	Day	record sheet	

⑮Part/ Process Number 部品／工程の番号	⑯Process Name/ Operation Description 工程の名称／作業明細	⑰Machine, Device, Jig,Tools For Mtg. 製造用の機械・装置・治具・工具	Characteristics 特性			(21) Special Char. Class. 特殊特性の分類	Method 方法					(26) Reaction Plan 対応処置
			⑱ No. 番号	⑲ Product 製品	⑳ Process 工程		(22) Product/Process Specification/ Tolerance 製品／工程の仕様／公差	(23) Evaluation Measurement Tolerance 評価／測定の方法	Sample サンプル (24) Size サイズ	Sample サンプル (24) Freq. 頻度	(25) Control Method 管理方法	
9	B/E・Marking	Laser marking machine	(1)		Marking Spec	－－	marking layout	Visual	－	Lot	record sheet	Abnormal quality report
10	B/E・Lead forming	Trim & Form press	(1)	Appearance		－－	Appearance STD	MS	20pcs	Lot	record sheet	
			(2)	Dimension		－－		Thichness meter (MSA：1 time)	2pcs 1shot	Day	record sheet SPC control	
11	B/E・Inspection Ⅰ	Tester	(1)	Electrical charcteristics		－－	Specifications	Tester (MSA：1 time)	100%	Lot	record sheet	Abnormal quality report
			(2)		Master check	－－	Frequency：±1ppm Current：±0.1μA	Master sample	－	Day	record sheet	information
12	Baking	Oven	(1)		Temeperature	－－	125℃±5℃	Thermometer	－	Lot	record sheet	Abnormal quality report
					Time		24H+1-0	Timer	－			
13	Temperature cycle	Temp. cycle chamber	(1)		Temeperature	－－	-55℃⇔125℃	Thermometer	－	Lot	record sheet	Abnormal quality report
					Time		30min 100cycle	Timer	－			
14	Hight Temperature inspection	Hight temp Tester	(1)	Electrical charcteristics		－－	Specifications	Tester (MSA：1 time)	100%	Lot	record sheet	Abnormal quality report
			(2)		Temeperature	－－	125℃±5℃	Thermometer		Lot	record sheet	Adjustment
			(3)		Master check	－－	Frequency：±1ppm Current：±0.1μA	Master sample	－	Day	record sheet	Adjustment
15	B/E・Inspection Ⅱ	Tester	(1)	Electrical charcteristics		－－	Specifications	Tester (MSA：1 time)	100%	Lot	record sheet	Abnormal quality report
			(2)		Master check	－－	Frequency：±1ppm Current：±0.1μA	Master sample	－	Day	record sheet	information
16	B/E・Tape & Reel	Taping machine	(1)	Appearance		－－	Appearance STD	Camera inspection	100%	Lot	record sheet	Abnormal quality report
			(2)		Peel off strength	－－	10g～70g	Peel off strength tester	－	Day	record sheet	Abnormal quality report
17	Outgoing inspection	Tester, MS	(1)	Appearance		－－	Appearance STD	MS	Sampling	Lot	record sheet	Abnormal quality report
			(2)	Electrical charcteristics		－－		Tester (MSA：1 time)	Sampling	Lot	record sheet	Abnormal quality report
			(3)		Master check	－－	Frequency：±1ppm Current：±0.1μA	Master sample	－		record sheet	information
			(4)	Dimension		－－	Specifications	MMS (MSA：1 time)	5pcs	Day	record sheet	Abnormal quality report
18	Packing ・ Shipment		(1)	Packing style Quantity		－－		Bar code	1time	Lot		

Measurement System Analysis Studies

測定システム解析

GR&R

SUPPLIER : SEIKO EPSON CORPORATION （供給者） SEIKO EPSON CORPORATION				PART NUMBER 部品番号	-	
NAME OF LABORATORY : （試験所） SEIKO EPSON CORPORATION				PART NAME 部品名	RA-4565SA	
Process Name 工程名	Characteristics 特性	Measurement Equipment 測定器	R&R(%) 10%≧	ndc 5≦	Judgment OK	Judgment NG
Electrical Characteristic Inspection 電特	Frequency 周波数	Inspection M/C	1.64	85	✓	
	Standby current 消費電流		3.13	5	✓	
Outgoing Inspection 出検	Frequency 周波数	Outgoing Inspection M/C	2.61	53	✓	
	Standby current 消費電流		6.31	5	✓	
	Package Dimension 寸法	Tool Microscope 工具顕微鏡	6.03	23	✓	

SIGNATURE	TITLE	DATE
S.Takemura	Assistant Manager	21/Sep/2012

【C73-A-0307-ETC 用紙D(02)】

Production Part Approval
Material Test Results

ORGANIZATION : SEIKO EPSON CORP SUPPLIER/VENDOR CODE :	PART NUBER: PART NAME: RA-45665SA DESIGN RECORD CHANGE LEVEL: － ENGINEERRING CHANGE DOCUMENTS: －
MATERIAL SUPPLIER : *CUSTOMER SPECIFIED SUPPLIER/VENDER CODE : *If source approval is req'd, include the Supplier (Source)&Customer assigned code.	NAME of LABORATORY:
MESSUREMENT INSTRUMENT NAME :	CONTROL No.:

MATERIALSPEC.NO. / REV/DATE	SPECIFICATION / LIMITS	TEST DATE	QTY TESTED	SUPPLIE TEST RESULTS (DATA)	OK	NOT OK
Lead Frame						
Electrode Plating thickness	Ag : 3.0um (min)	30. May, 2012	8	5.11um (ave) 4.32um (min)	レ	
Plating Area	X1 : 1.95 – 2.35um X2 : 1.95 – 2.35um Y1 : 2.75 – 3.15um Y2 : 3.15 – 3.55um	30. May, 2012	5	X1 : 2.21 – 2.24um X2 : 2.17 – 2.22um Y1 : 3.04 - 3.07um Y2 : 3.28 – 3.34um	レ	
Appearance	Good / No good	30. May, 2012	12	Passed	レ	
Heat Test	Good / No good after 300 deg C, 3min baking	30. May, 2012	12	Passed	レ	
Bend Test	Good / No good	30. May, 2012	12	Passed	レ	
Dimension	L : 229.70 – 229.90mm Total pitch : 206.95 – 207.05mm Down set of die pad : 0.05 – 0.15mm	30. May, 2012	5	L : 229.793 – 229.817 Total pitch : 206.994 – 207.002 Down set of die pad : 0.097 – 0.108mm	レ	
Mold Resin						
Color	Black	17. Aug, 2012	1	Passed	レ	
Spiral Flow	70 – 100 CM	17. Aug, 2012	2	88	レ	
Gel Time @ 175 deg C	20 – 45 sec	17. Aug, 2012	2	28	レ	
Acetone insoluble	≦ 0.010%	17. Aug, 2012	1	0.000	レ	
Thermal Expansion 1	≦ 1.5 x 1e-5 (1/deg C)	17. Aug, 2012	1	0.9	レ	
Thermal Expansion 2	≦ 6.0 x 1e-5 (1/deg C)	17. Aug, 2012	1	4.1	レ	
Tg	≧ 110℃	17. Aug, 2012	1	123	レ	
Specific gravity	1.940 – 2.020	17. Aug, 2012	1	1.984	レ	
Water absorption	≦0.30	17. Aug, 2012	1	0.13	レ	
Volume Resistivity	≧0.1 x 1e11 (ohm-cm)	17. Aug, 2012	1	29.0	レ	
Na+	≦5.0 (ppm)	17. Aug, 2012	1	1.6	レ	
Cl-	≦50.0 (ppm)	17. Aug, 2012	1	2.9	レ	

Blanket statements of conformance are unacceptable for any test results.

SIGNATURE	TITLE	DATE
S.Takemura	Assistant Manager	21/Sep/2012

Production Part Approval

Performance Test Result

ORGANIZATION: EPSON TOYOCOM CORP SUPPLIER/VENDOR CODE:SUPPLIER NAME of LABORATORY: INA *CUSTOMER SPECIFIED SUPPLIER/VENDER CODE: *If source approval is req'd, include the Supplier (Source)&Customer assigned code.	PART NUBER: PART NAME: RA-4565SA DESIGN RECORD CHANGE LEVEL: － ENGINEERRING CHANGE DOCUMENTS: －

TEST SPECIFICATION/ REV/DATE	REQUIREMENTS	TEST DATE	QTY. TESTED	SUPPLIE TEST RESULTS AND TEST CONDITIONS	OK	NOT OK
Frequency precision Ta＝+25 ℃ VDD=3.0 V	Δf/f [$\times 10^{-6}$] ＝5±23	22 May 2008	80	-5.6×10^{-6} to $+15.1\times10^{-6}$	✓	
Current consumption (1) ＊interface inactive (f_{CLK}= 0 Hz) ＊CLKOUT = disabled (CLKOE = GND) Ta＝+25 ℃ V_{DD} = 3.0 V	Max. 1.0 μA	22 May 2008	80	0.41 μA to 0.51 μA	✓	
Current consumption (1) ＊interface inactive (f_{CLK}= 0 Hz) ＊CLKOUT = disabled (CLKOE = GND) Ta＝+25 ℃ V_{DD} = 5.0 V	Max. 1.2 μA	22 May 2008	80	0.57 μA to 0.69 μA	✓	

March
2006 CFG-1005

Blanket statements of conformance are unacceptable for any test results.

SIGNATURE	TITLE	DATE
Y.HIRAIZUMI	QA Manager	14.Sep.2012

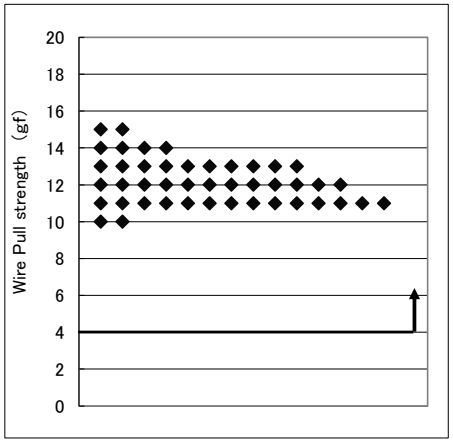
Initial Process Studies

PART NAME: RA-4565SA

Section	ﾜｲﾔﾎﾞﾝﾃﾞｨﾝｸﾞ / Wire Bonding
Evaluation item	ﾜｲﾔﾌﾟﾙ / Wire Pull strength
Upper specification limit	—
Lower specification limit	4 gf

N＝50

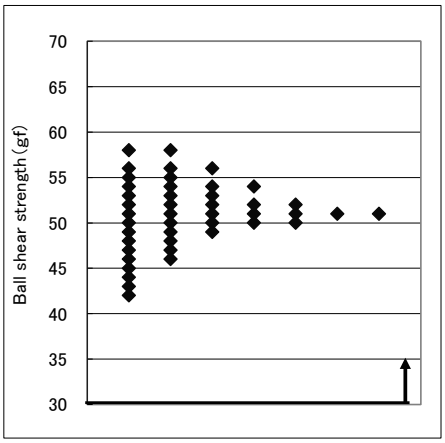
Mean	12.12
Sigma	1.1880
Cp	2.28



Section	ﾜｲﾔﾎﾞﾝﾃﾞｨﾝｸﾞ / Wire Bonding
Evaluation item	ｼｪｱｰ強度 / Ball shear strength
Upper specification limit	—
Lower specification limit	30 gf

N＝50

Mean	50.84
Sigma	3.751
Cp	1.85



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bsi.

By Royal Charter

Certificate of Registration

QUALITY MANAGEMENT SYSTEM - ISO/TS 16949:2009

This is to certify that: OKURA ELECTRONICS CO.,LTD.
PKG Factory K1
6125 Funatsu,
Fujikawaguchiko-machi,
Minamitsuru-gun,
Yamanashi
401-0301
Japan

大蔵電気株式会社
PKG工場K1
〒401-0301
山梨県
南都留郡富士河口湖町
船津6125

Holds Certificate No: TS 562262-002

and operates a Quality Management System which complies with the requirements of ISO/TS 16949:2009 for the following scope:

Manufacture of semiconductor devices

Permitted Exclusions: Product Design

For and on behalf of BSI:

President, Naoyuki Takeo

Issue Date: 2015/04/23 Latest Issue: 2015/04/23 Expiry Date: 2018/04/22

IATF Number: 0208159

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This certificate was issued electronically and remains the property of BSI and is bound by the conditions of contract.
An electronic certificate can be authenticated online.
Printed copies can be validated at www.bsigroup.com/ClientDirectory or telephone +81 (0)3 6890 1171

IATF Contracted Office: BSI Group Americas Inc., 12110 Sunset Hills Road, Suite 200, Reston, VA20190, USA.

Seizan Bldg. 5F, 2-12-28 Kita-Aoyama Minato-ku, Tokyo 107-0061, Japan
BSI Group Japan K.K.
A Member of the BSI Group of Companies.

COPY

Certificate No: TS 562262-002

Location	Registered Activities
OKURA ELECTRONICS CO.,LTD. PKG Factory K1 6125 Funatsu, Fujikawaguchiko-machi, Minamitsuru-gun, Yamanashi 401-0301 Japan 大蔵電気株式会社 PKG工場K1 〒401-0301 山梨県 南都留郡富士河口湖町 船津6125	Manufacture of semiconductor devices Including the following remote support functions: KATOH Electric Co., Ltd. Tokyo Sales Office Hachiojinakacho Bldg., 5-1 Naka-cho, Hachioji-shi, Tokyo 192-0085 Sales KATOH Electric Co., Ltd. 6392 Kamiyoshida Fujiyoshida-shi, Yamanashi 403-0005 Policy making, Corporate Quality, Engineering, Purchasing and Training

Issue Date: 2015/04/23 Latest Issue: 2015/04/23 Expiry Date: 2018/04/22

IATF Number: 0208159

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BSI Group Japan K.K.
A Member of the BSI Group of Companies.

Part Submission Warrant

Part Name Real Time Clock Module RA-4565SA Cust. Part Number —

Shown on Drawing No. Q17-140-4B Org. Part Number Q41A46551000300

Engineering Change Level — Dated —

Additional Engineering Changes — Dated —

Safety and/or Government Regulation ☐Yes ■No Purchase Order No. — Weight (kg) 0.00031

Checking Aid No. — Checking Aid Engineering Change Level — Dated —

ORGANIZATION MANUFACTURING INFORMATION

SEIKO EPSON CORPORATION
(KATOH Electric Co., Ltd)
Organization Name & Supplier / Vendor Code
Minowa-machi Nakaminowa 8543
(6125 Funatsu)
Street Address
Kamiitna-gun Nagano-ken Japan
(Fujikawaguchhiko-machi Yamanashi-ken Japan)
City Region Postal Code State

CUSTOMER SUBMISSON INFORMATION

Customer Name/Division NingDe Amperex Technology Limited
Buyer/Buyer Code —
Application Car

MATERIAL REPORTING

Has customer-required Substances of Concern information been reported ■Yes ☐No ☐n/a

Submitted by IMDS or other customer format Provide if requested

Are polymeric parts identified with appropriate ISO marking codes ☐Yes ■No ☐n/a

REASON FOR SUBMISSION (Check at least one)

■ Initial Submission
☐ Engineering Change(s)
☐ Tooling: Transfer, Replacement, Refurbishment, or additional
☐ Correction of Discrepancy
☐ Tooling inactive>that 1 year
☐Change to Optional Construction or Material
☐Supplier or Material Source Change
☐Change in Part Processing
☐Parts Produced at Additional Location
☐Other—please specify

REQUESTED SUBMISSION LEVEL (Check one)

☐ Level1—Warrant only (and for designated appearance items, an Appearance Approval Report)submitted to customer.
☐ Level2—Warrant with product samples and limited supporting data submitted to customer.
■ Level3—Warrant with product samples and complete supporting data submitted to customer.
☐ Level4—Warrant and other requirements as defined by customer.
☐ Level5—Warrant with product samples and complete supporting data reviewed at organization's manufacturing location.

SUBMISSION RESULTS

The results for
■dimensional measurements ■material and functional tests ☐appearance criteria ☐statistical process package

These results meet all drawing and specification requirements: ■Yes ☐No (if "NO" —Explanation Required)

Mold / Cavity / Production Process Single

DECLARATION

I affirm that the samples represented by this warrant are representative of our parts which were made by a process that meet all production parts Approval Process Manual 4th Edition Requirements. I further affirm that these samples were produced at the production rate of 400pcs / 1 hours. I also certify that documented evidence of such compliance is on file and available for review.
I have noted any deviations from this declaration below.

EXPLANATION/COMMENTS: SEIKO EPSON CORPORATION warrant that the part meet the specification

Is each Customer Tool properly tagged numbered? ☐Yes ☐No ■n/a

Organization Authorized Signature 大橋浩朗 Date 12.Mar.2018

Print Name Ohashi Hiroaki Phone No. 81-265-70-6507 FAX No. 81-265-79-8409

Title General Manager E-mail Ohashi.Hiroaki2@exc.epson.co.jp

FOR CUSTOMER USE ONLY (IFAPPLICABLE)

PPAP Warrant Disposition ☐Approved ☐Rejected ☐Other

Customer Signature Date

Print Name Customer Tracking Number (optional)