

Wireless LAN Module

IEEE802.11b/g/n

GT WYSAVKXY

User Manual

In case you adopt this module and design some appliance, please ask for the latest specifications from the local sales office.

Document constituent list

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Rev. record

16-Jan.-2014> Ver.0.1

14-Feb-2014> Ver.0.2

26-Feb-2014> Ver.0.3

Release

General Items up date

General Items up date

vi)-b) and vii)-c) minimum separation distance: corrected from 5.9cm to 52mm

Control No. HD-AG-A131203 (1/6)	Control name General Items
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(1) Scope

適用

This specification ("Specification") applies to the hybrid IC "WYSAVKXY" for use **Wireless LAN** Module ("Product") manufactured by TAIYO YUDEN CO.,LTD. ("TAIYO YUDEN")

本仕様書は、太陽誘電株式会社(“弊社”)により製造される **Wireless LAN** 用ハイブリッド IC “WYSAVKXY” (“本製品”)に適用する。

(2) Description

内容

① Part Number : WYSAVKXY
品名 : WYSAVKXY

② Function : Radio frequency transceiver Module (**IEEE802.11bgn** standard conformity)
機能 : 無線通信モジュール (**IEEE802.11bgn** 規格準拠)

③ Structure : Hybrid IC loaded with silicon and Gallium arsenide monolithic semiconductor
構造 : ガリウムヒ素 モノリシック半導体を用いた混成集積回路

Containment of hazardous substance in this Product

*This product conforms to RoHS Directive (2002/95/EC).

本製品内の環境物質含有

*RoHS 指令(2002/95/EC)に適合しています。

④ Country of origin : JAPAN
製造国 : 日本

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- ⑤ Notes :
その他 :

a. Limitation of Warranty

保証

- i) TAIYO YUDEN provide warranties only if the Product is operated under the condition set forth in this Specification.

Please note that TAIYO YUDEN shall not be liable for any defect and/or malfunction arising from use of the Product under the terms and conditions other than the operating conditions hereof. In addition when this Product is used under environmental conditions such as over voltage which are not guaranteed, it may be destroyed in short mode. To ensure the security of customer's product, please add an extra fuse or/and a protection circuit for over voltage.

本製品の保証使用条件は本仕様書の通りです。
本保証条件以外の条件で御使用になった結果発生した不良・不具合につきましては、弊社は責任を負い兼ねますので御了承下さい。また、過電圧等本保証条件以外の条件で御使用になった場合、ショートモードで破壊する場合があります。安全性の確保のために、フューズや過電流保護回路等の追加をお願い致します。

- ii) This Product is designed for use in products which comply with **IEEE802.11bgn** Specifications.

TAIYO YUDEN disclaims and is not responsible for any liability concerning infringement by this Product under any intellectual property right owned by third party in case the customer uses this Product in any product which does not comply with **IEEE802.11bgn** Specifications (the "non-complying products"). Furthermore, TAIYO YUDEN warrants only that this Product complies with this Specification and does not grant any other warranty including warranty for application of the non-complying products.

本製品は**IEEE802.11bgn**の規格に従って製造された製品であり、本製品の用途が**IEEE802.11bgn**規格以外もしくは当該規格に従わない製品への使用の場合、弊社は第三者の知的財産権の侵害に基づくいかなる責任を負いません。また、弊社は本製品が本仕様書に準拠することのみを保証するもので、上記**IEEE802.11bgn**規格外製品への応用についての保証等いかなる保証を行うものではありません。

b. Instruction for Use (CAUTION)

使用上の注意事項

- i) Because Product is not designed for radiation durability, please refrain from exposing Product to radiation in the use.

本製品は、耐放射線設計をしておりませんので、放射線のストレスを受ける環境下での使用は避けて下さい。

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- ii) Communication between this Product and other might not be established nor maintained depending upon radio environment or operating condition of this Product and other products with wireless technology.

本製品と本製品又は他製品の通信は、周囲の電波環境及び機器環境により確立又は維持し難くなることがあります。

- iii) This Product operates in the unlicensed ISM band at 2.4GHz. In case this Product is used around the other wireless devices which operate in same frequency band of this Product, there is a possibility that interference occurs between this Product and such other devices. If such interference occurs, please stop the operation of other devices or relocate this Product before using this Product or do not use this Product around the other wireless devices.

本製品は 2.4GHz 帯の周波数を使用しています。本製品を本製品と同じ周波数を使用した他の無線機器の周辺でご使用になりますと、本製品とかかる他の無線機器との間で電波干渉が発生する可能性があります。電波干渉が発生した場合、他の無線機器を停止するか、本製品の使用場所を変えるなど電波干渉の生じない環境でご使用下さい。

- iv) This Product mentioned in this Specification is manufactured for use in PC peripheral and Handy terminal. Before using this Product in any special equipment (such as medical equipment, space equipment, air craft, disaster prevention equipment), where higher safety and reliability are duly required, the applicability and suitability of this Product must be fully evaluated by the customer at its sole risk to ensure correct and safety operation of those special equipments. Also, evaluation of the safety function of this Product even for use in general electronics equipment shall be thoroughly made and when necessary, a protective circuit shall be added in design stage, all at the customer's sole risk.

本仕様書に記載されている本製品は、PC 周辺機器、ハンディターミナル向けとして製造されております。従って、高度の安全性や信頼性が求められる医療用機器、宇宙用機器、あるいは防災機器等にお使いになるときには、本製品の適合性をお客様の独自の責任で十分に評価、検討され、判断下さい。又、一般機器において御使用になる場合にも、お客様の独自の責任で十分な安全性評価を実施され、必要に応じて設計時に保護回路等を追加してください。

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v) Japan Regulatory Information

日本規制情報

This product with a specific antenna is a radio system approved for Type Approval.

Please follow the instructions below on designing your product.

本製品は、特定アンテナとの組み合わせにおいて工事設計認証を受けた無線設備です。御社製品に搭載される場合、下記内容を遵守願います。

- a) This module is certified by Type Approval as the device which has SDIO Interface.

Please do not use other purposes except that of certified.

Please contact TAIYO YUDEN for more details of purposes of this product.

本モジュールの用途は、SDIO インターフェイスを持つ装置として工事設計認証を受けています。

規定されている用途以外の機器へは使用しないで下さい。

用途の詳細につきましては、弊社までお問い合わせ願います。

- b) Please notify clearly below sentences, on your product or in the product manual.

御社製品あるいはマニュアルに下記文言を明示願います。

This product has a radio system which was approved as a radio station in a low power data communication system based on the Radio Law.

Name of the radio system: 001-A02398

本製品には、電波法に基づく小電力データ通信システムの無線局として、工事設計認証を受けた無線設備を内蔵しています。

無線設備名：001-A02398

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vi) IC Regulatory Information

IC 規制情報

- a) This device complies with Industry Canada licence-exempt RSS standards.

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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

本装置は IC ライセンスを免除された RSS 標準に準じております。

動作は下記の 2 条件に従います。

(1) 本装置は、妨害波の原因とはなりません。

(2) 本装置は、好ましくない装置動作の原因となるどのような妨害波を受信した場合も受け入れます。

- b) This product is certified as type of portable device with usage limitation at 52mm minimum separation distance between radiator and human body.

To maintain compliance with human exposure requirement, please use and install this product into your product within the scope of the limitation.

If you intend usage of this product with any construction closer than the limited distance, please contact Taiyo Yuden.

本製品は人体と放射器の最小分離距離を 52mm に制限したポータブルデバイスとして認可されております。

人体被曝要件への適合を維持する為、本製品の使用、および御社製品への組み込みは使用制限内で行って下さい。

制限距離以下の構造での本製品の使用される場合には、弊社までお問合せ願います。

- c) Please notify certified ID by either one of the following method on your product.

Specifiez ID certifiée dans votre produit par une de méthode suivante.

本製品を組み込む製品には、認証 ID を下記いずれかの方法で記載をお願いいたします。

-Contains Transmitter module IC : 4389B-WYSAVKXY

-Contains IC : 4389B-WYSAVKXY

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vii) FCC Regulatory Information
FCC 規制情報

a) This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

本装置は FCC 規則第 15 章に準拠しています。動作は下記の 2 条件に従います。

- (1) 本装置は、有害な妨害波の原因とはなりません。
- (2) 本装置は、好ましくない装置動作の原因となるどのような妨害波を受信した場合も受け入れます。

b) CAUTION: changes or modifications not expressly approved by the party responsible for compliance could void the use's authority to operate the equipment

適合に責任を持つ当事者によって承認されていない変更や改造は、装置運用の認定が無効となります。

c) This product is certified as type of portable device with usage limitation at 52mm minimum separation distance between radiator and human body.

To maintain compliance with human exposure requirement, please use and install this product into your product within the scope of the limitation.

If you intend usage of this product with any construction closer than the limited distance, please contact Taiyo Yuden.

本製品は人体と放射器の最小分離距離を 52mm に制限したポータブルデバイスとして認可されております。

人体被爆要件への適合を維持する為、本製品の使用、および御社製品への組み込みは使用制限内で行って下さい。

制限距離以下の構造での本製品の使用される場合には、弊社までお問合せ願います。

d) Please notify certified ID by either one of the following method.

本製品を組み込む製品には、認証ID を下記いずれかの方法で記載をお願いします。

-Contains Transmitter Module FCC ID: RYY WYSAVKXY

-Contains FCC ID: RYY WYSAVKXY

e) Product installs this device must be ensured compliance to all regulations to which the product applied, e.g. requirements for unintentional radiator.

本装置を組み込んでいる製品は、その製品に適用される全ての規制に準拠する必要があります。(非意図放射器に対する規制等)

GT WYSAVKXY

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Control No. HD-AM-A131203	(1/1)	Control name Absolute maximum ratings
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Absolute maximum ratings

Item	Symbol	Rating				Remark
		Min.	Typ.	Max.	Unit	
Supply voltage 1	VIO_0	-		4.0	V	
Supply voltage 2	VIO_1	-		4.0	V	
Supply voltage 3	VIO_2	-		4.0	V	
Supply voltage 4	V33I	-		3.6	V	
Storage temperature range	Tstg	-40		85	Degrees C	
Operation temperature range	Topr	-40	25	85	Degrees C	

Recommendation operating range

Item	Symbol	Rating				Remark
		Min.	Typ.	Max.	Unit	
Supply voltage 1	VIO0	1.62/3.0	1.8/3.3	1.98/3.6	V	
Supply voltage 2	VIO1	1.62/3.0	1.8/3.3	1.98/3.6	V	
Supply voltage 3	VIO2	3.0	3.3	3.6	V	
Supply voltage 4	V33I	3.0	3.3	3.6	V	

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Control No. HD-AE-A131203	(1/11)	Control name Electrical characteristics
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DIGITAL IO FEATURES**Inter-Integrated Circuit(I2C)**

The I2C bus interface complies with the common I2C protocol and can operate in standard mode(with data rates up to 100Kb/s), fast mode(with data rate up to 400Kb/s) and high-speed mode(with data rate up to 2Mb/s). Additionally, high-speed mode devices and fast mode devices are downward compatible. It also supports DMA capability. WYSAVKXY-XZ module includes three I2C interfaces: I2C0, I2C1 and I2C2, all identical in function.

The I2C bus interface unit has the following features:

- Three I2C serial interfaces consisting of a serial data line (SDL) and serial clock (SCL)
- Three speeds:
 - Standard mode (up to 100Kb/s)
 - Fast mode (up to 400Kb/s)
 - High-speed mode (2Mb/s)
- Clock synchronization
- Master or Slave I2C operation, Multi-master, multi-slave operation, and arbitration support
- 7- or 10-bit addressing and General Call
- 7- or 10-bit combined format transfers
- Bulk transmit mode in slave
- 16 * 32 bits deep transmit and receive buffers, respectively
- interrupt operation
- DMA function support

Synchronous Serial Protocol(SSP)

The SSP port is a synchronous serial controller that can be connected to a variety of external Analog-to-Digital converters (ADC), audio and telecommunication CODECs, and many other devices that use serial protocols for data transfer.

The SSP ports are configurable to operate in Master mode (the attached peripheral function as a slave) or Slave mode (the attached peripheral functions as a master). The SSP ports support serial bit rates from 6.3Kbps (minimum recommended speed) up to 25 Mbps. Serial data sample size can be set to 8, 16, 18 or 32 bits in length. A FIFO is provided for Transmit data and a second, independent FIFO is provided for Receive data. The two FIFOs are both 16 x 32 bits wide or both 32 x 16 bits wide. The FIFOs can be loaded or emptied by the Cortex M3 Processor or by DMA burst transfers.

The enhanced SSP port features are as follows:

- Directly supports Texas Instruments Synchronous Serial Protocol (SSP), and Motorola Serial Peripheral Interface (SPI)
- The I2S protocol is supported by programming the PSP
 - I2S Phillips standard
 - MSB-justified standard (left justified)
 - Master or Slave mode operation
 - Data transfer up to 25 Mbps
 - Programmable data frame size: 8, 16, 18, 32 bits
 - Separate FIFO for transmit and receive with 16 x 32 or 32 x 16 bit length
 - Receive-without-Transmit operation
 - Network mode with as many as eight time slots for PSP formats

- Independent transmit/receive in any, all, or none of the time slots
- Supports DMA transfer

Control No.	Control name
HD-AE-A131203 (2/11)	Electrical characteristics

Universal Asynchronous Receiver Transmitter (UART)

- Programmable FIFO access mode for 16 x 8 bits transmit and receive FIFO
- DMA request capability
- Auto flow control support
- Programmable data format:
 - 5-8 data bits plus parity
 - Odd, even, no parity
 - One, one-and-a-half, or two stop bits
- Six interrupt type with flags:
 - Receiver line status
 - Receiver Data Available
 - Character Timeout (in FIFO mode only)
 - Transmitter Holding Register Empty or FIFO at/below threshold (Programmable THRE interrupt mode enable)
 - Modem Status
 - Busy Detect Indication
- Seven additional shadow registers to be used to reduce the software overhead
- Additional FIFO status registers
- IrDA 1.0 SIR mode support wit up to 115200 baud rate and pulse duration (width) of 3/16x bit
- IrDA 1.0 SIR low-power reception capabilities

USBOTG Interface Controller

USB interface includes one USB OTG-capable dual-role host/device controller that is compliant with the USB 2.0 specification.

- Full USB OTG functionality with integrated transceiver, allowing support for an Enhanced Host Controller Interface (EHCI) host or a device
- Supports Full-Speed/Low-Speed USB 2.0 Host/Device/OTG modes
- Up to 16 configurable bi-directional endpoints for device mode
 - Transfer types support: Control, Interrupt, Bulk or Isochronous
 - Endpoint
 - 0 – dedicated for control endpoint
- Control signals for external power supply and detection of voltages for OTG signaling
- Capability to respond as self- or bus-powered device and control to allow charging from bus
- Full 1KB TxFIFOs for each endpoint, which can hold the largest USB2 packet
- 2KB shared Rx buffer for all incoming data

Control No. HD-AE-A131203	(3/11)	Control name Electrical characteristics
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Analog Digital Converter (ADC)

The ADC is a second order sigma-delta converter with up to 16-bit resolution. It includes an analog multiplexer (AMUX) and a programmable gain amplifier (PGA) with configurable channels and a reference voltage generator. The conversion results can be written to memory through DMA. Several mode of operation are available for the ADC.

- Selectable decimation rates with also set the effective resolution (10 to 16 bits)
- Throughput rate as fast as 4us (250KHz)
- Single-ended and differential conversions from 8 external and 6 internal sources
- PGA setting support: 2x, 1x and 0.5x
- Selectable reference voltage (Vref)
 - Internal reference 1.2V (Vref_12)
 - VDDA_18
 - External reference (do not exceed 1.8V)
- Offset and gain calibration
- Embedded temperature sensor with internal or external diode options
- DAC dual inputs
- Interrupt generation and/or DMA request
- Internal GPT trigger on ADC conversion
- Battery measurement capability

Digital Analog Converter (DAC)

The main features of DAC are:

- Register string-based DAC with 10-bit resolution
- Throughput rate as fast as 2us (500KHz)
- Capable of directly driving a piezo speaker with 1000-ohm load
- Flexible waveform generator (sinusoidal, triangle, noise, etc.) at various frequency range
- Selectable output mode: single-ended or differential
- Internal or external reference voltage
- Interrupt generation and/or DMA request
- Three selectable output ranges
- Supports event trigger from GPT or GPIO

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Analog Comparator (ACOMP)

ACOMP_EDGE_PULSE and ACOMP_GPIO_OUT are designed to have true rail-to-rail inputs and operate over the full voltage range of the power supply V33I. The comparator outputs are latched and can be used as interrupts.

The main features of the analog comparator are as follows:

- Six selectable external positive inputs
- Six selectable external negative inputs
- Internal positive inputs
 - DAC output
- Four selectable internal negative inputs
 - DAC output
 - V33I scaled by 4 selectable factors
 - Internal reference 1.2V (Vref_12)
 - GND
- Selectable positive and negative hysteresis between 0 and 70mV with 10mV step
- Selectable response time as fast as 100ns
- Interrupt generation on selectable edges (rising edge and/or falling edge) or levels
- Configurable output when inactive
- Comparator output on GPIOs through alternate functionality, output inversion available

Control No. HD-AE-A131203	(5/11)	Control name Electrical characteristics
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DC Specifications

Peak Current / Power consumption

The Specification applies for Topr.= 25 degrees C, Supply voltage=Typical voltage

No.	Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
1	Peak Current	V33I	Ip1	-		500	mA	
2	Power consumption3	Burst Tx (72.2Mbps)	Pc3	-	480	-	mW	Duty 4.2%
3	Power consumption4	Continuous Rx (72.2Mbps)	Pc4	-	462	-	mW	
4	Power consumption5	Burst Tx (54Mbps)	Pc5	-	500	-	mW	Duty 25.4%
5	Power consumption6	Continuous Rx (54Mbps)	Pc6	-	456	-	mW	
6	Power consumption7	Burst Tx (11Mbps)	Pc7	-	680	-	mW	Duty 43.4%
7	Power consumption8	Continuous Rx (11Mbps)	Pc8	-	453	-	mW	
8	Power consumption9	Sleep (MPU: Stand By (PM2) WLAN: Deep sleep)	Pc9	-	7	-	mW	VIO_0=1.8V VIO1_=3.3V VIO1_=3.3V VIO1_=3.3V

Digital Pad Ratings

No.	Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
1	Input high voltage		VIH	0.7*VIO	-	VIO+0.4	V	
2	Input low voltage		VIL	-0.4	-	0.3*VIO	V	
3	Output high current	@VIO-0.4V	IOH1	4	-	-	mA	VIO=3.3V
4	Output high current	@VIO-0.2V	IOH2	2	-	-	mA	VIO=1.8V
5	Output low current	@0.4V	IOL1	4	-	-	mA	VIO=3.3V
6	Output low current	@0.2V	IOL2	2	-	-	mA	VIO=1.8V

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ADC Electrical Characteristics

	Parameter	Condition	Min	Typ	Max	Unit	Remark
1	ADC conversion range		-vref ⁽¹⁾	-	vref	V	
2	Absolute Input Voltage		0	-	V33I	V	
3	Input Voltage Range	Single-ended with input buffer gain=1x or bypass gain buffer	0	-	Vref	V	
4		Single-ended with input buffer gain=0.5x	0	-	+2*vref or +(V33I-0.2)		
5		Differential with input buffer gain=1x or bypass input gain buffer	-vref	-	vref		
6		Differential with input buffer gain=0.5x	-2*vref or -(V33I-0.2)	-	2*vref or +(V33I-0.2)		
Reference Voltage							
7	Internal Reference Voltage		1.19	1.20	1.21	V	
8	External Reference Voltage	Single-ended	0	-	1.8	V	
9		Differential	-1.8	-	1.8		
Conversion Rate							
10	ADC Operation Clock Frequency	Fast Mode		8		MHz	
11		Low Power Mode		1			
12	Conversion Time in ADC clocks	10-bit setting		32		clocks	
13		12-bit setting		64			
14		14-bit setting		128			
15		16-bit setting		256			
DC Accuracy							
16	Resolution	Single-ended			15	bits	
17		Differential			16		

(1) vref stands for the voltage reference of ADC. It could be an internal 1.2V, 1.8V, or external voltage (<1.8V).

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ACOMP Electrical Characteristics

No.	Parameter	Condition	Min	Typ	Max	Unit	Remark
Analog Response Time							
1	Absolute Analog Input Voltage	Any Pin (in Analog Input Mode)	0	-	V33I	V	
2	Common Mode Input Range		0	-	V33I	V	
DC Offset							
3	Offset Voltage		-9.7		+8.2	mV	
Reference Voltage							
4	Internal Reference Voltage	-40 to 85°C	1.18	1.20	1.22	V	
5	External Reference Voltage	Comparator Negative Input	0	-	V33I	V	

DAC Electrical Characteristics

No.	Parameter	Condition	Min	Typ	Max	Unit	Remark
1	Voltage Conversion Range		0	-	VREF	V	
2	Supply Voltage (1.8V)		1.62	1.8	1.98	V	
3	Supply Voltage (3.3V)			3.3		V	
Reference Voltage							
4	Internal Reference Voltage	-40 to 85°C	0.8		1.6	V	
5	External Reference Voltage				V33I	V	
Conversion Rate							
6	Clock source	Divided down from 32 MHz or 16MHz		16		MHz	
7	Conversion Time in second	10-bit settling			2	uS	
DC Accuracy							
8	Resolution	Single-ended			10	bits	
9		Differential			10		
10	Offset Error			10		mV	
11	Gain Error			5		%	

Control No. HD-AE-A131203	(8/11)	Control name Electrical characteristics
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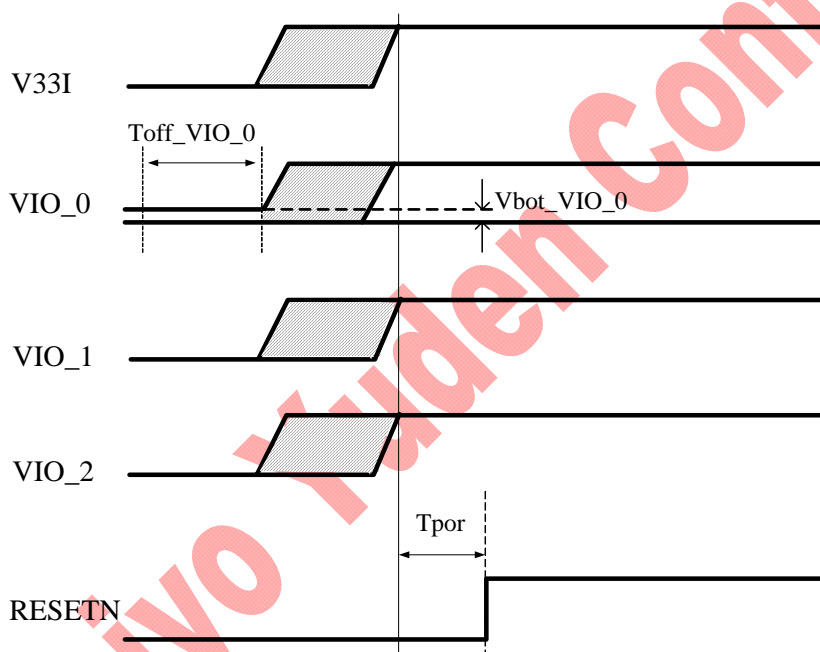
AC Specifications

Power-on timing

	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	Valid Power to RESETN de-asserted		Tpor	300	-	-	mS	
2	V33I Ramp Rate		V33I_ramp	1	-	25	mV/uS	
3	VIO_0 Ramp Rate		VIO_0_ramp	0.16	-	25	mV/uS	
4	VIO_1 Ramp Rate		VIO_1_ramp	-	-	25	mV/uS	
5	VIO_2 Ramp Rate		VIO_2_ramp	-	-	25	mV/uS	
6	VIO_0 Off Time		Toff_VIO_0	100	-	-	mS	
7	VIO_0 Off Voltage		Vbot_VIO_0	0.1	-	-	V	

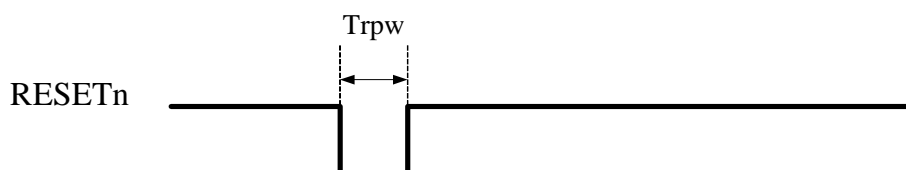
<Power-on sequence>

RESETn must remain asserted for minimum of Tpor after V33I and VIO_0,1,2 are stable.



RESETn Pulse Width

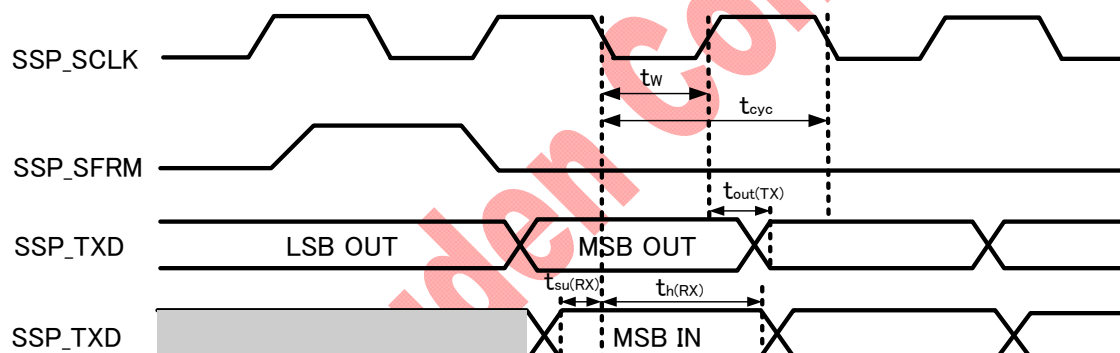
	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	RESETn pulse width		Trpw	300			ms	



Control No. HD-AE-A131203	(9/11)	Control name Electrical characteristics
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SSP timing specification

	Parameter	Symbol	Condition	Min	Typ	Max	Unit	Remark
1	TX delay time	$t_{out(TX)}$	Master of Clock	1.6	-	-	ns	
			Slave to Clock	12	-	-		
2	Set up time RX valid before clock low	$t_{su(RX)}$	Master of Clock	10	-	-	ns	
			Slave to Clock	2.2	-	-		
3	Hold time, RX Data valid after clock low	$t_h(RX)$	Master of Clock	0	-	-	ns	
			Slave to Clock	3.7	-	-		
4	Serial Bit Clock cycle time	T_{cyc}	Master of Clock	40	-	-	ns	
			Slave to Clock	40	-	-		
5	Serial Clock high/low time	t_w	Master of Clock	$T_{cyc}/2-13$	-	-	ns	
			Slave to Clock	$T_{cyc}/2-13$	-	-		



Control No. HD-AE-A131203	(10/11)	Control name Electrical characteristics
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RF Specifications (WLAN 11n/72.2Mbps, OFDM)

The Specification applies for Ta=25 degrees C, Supply voltage =Typical voltage.

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	RF frequency range		FREQ	2412		2472	MHz	
2	TX Power		Po		12		dBm	
3	Spectrum Mask	1 st Side Lobe	M1	-		-20	dBc	
		2 nd Side Lobe	M2	-		-28	dBc	
		3 rd Side Lobe	M3	-		-45	dBc	
4	Symbol clock tolerance		Ft	-25		25	ppm	
5	Frequency tolerance		Ft	-25		25	ppm	
6	EVM	rms	EVM	-		-28	dB	
7	TX Out of band spurious1	30MHz to 1GHz	TOS1	-		-36	dBm	
8	TX Out of band spurious2	1GHz to 12.75GHz	TOS2	-		-30	dBm	
9	TX Out of band spurious3	1.8GHz to 1.9GHz 5.15GHz to 5.3GHz	TOS3	-		-47	dBm	
10	Rx sensitivity	PER<10%	SEN	-	-69	-64	dBm	
11	Maximum Input Level	PER<10%	MIL	-20		-	dBm	
12	RX Out of band spurious1	30MHz to 1GHz	ROS1	-		-57	dBm	
13	RX Out of band spurious2	1GHz to 12.75GHz	ROS2	-		-47	dBm	

Control No. HD-AE-A131203	(11/11)	Control name Electrical characteristics
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RF Specifications (WLAN 11g/54Mbps, OFDM)

The Specification applies for Ta=25 degrees C, Supply voltage =Typical voltage

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	RF frequency range		FREQ	2412		2472	MHz	
2	TX Power		Po		13		dBm	
3	Spectrum Mask	1 st Side Lobe	M1	-		-20	dBc	
		2 nd Side Lobe	M2	-		-28	dBc	
		3 rd Side Lobe	M3	-		-40	dBc	
4	Symbol clock tolerance		Ft	-25		25	ppm	
5	Frequency tolerance		Ft	-25		25	ppm	
6	EVM	rms	EVM	-		-25	dB	
7	TX Out of band spurious1	30MHz to 1GHz	TOS1	-		-36	dBm	
8	TX Out of band spurious2	1GHz to 12.75GHz	TOS2	-		-30	dBm	
9	TX Out of band spurious3	1.8GHz to 1.9GHz 5.15GHz to 5.3GHz	TOS3			-47	dBm	
10	Rx sensitivity	PER<10%	SEN	-	-72	-65	dBm	
11	Maximum Input Level	PER<10%	MIL	-20		-	dBm	
12	RX Out of band spurious1	30MHz to 1GHz	ROS1	-		-57	dBm	
13	RX Out of band spurious2	1GHz to 12.75GHz	ROS2	-		-47	dBm	

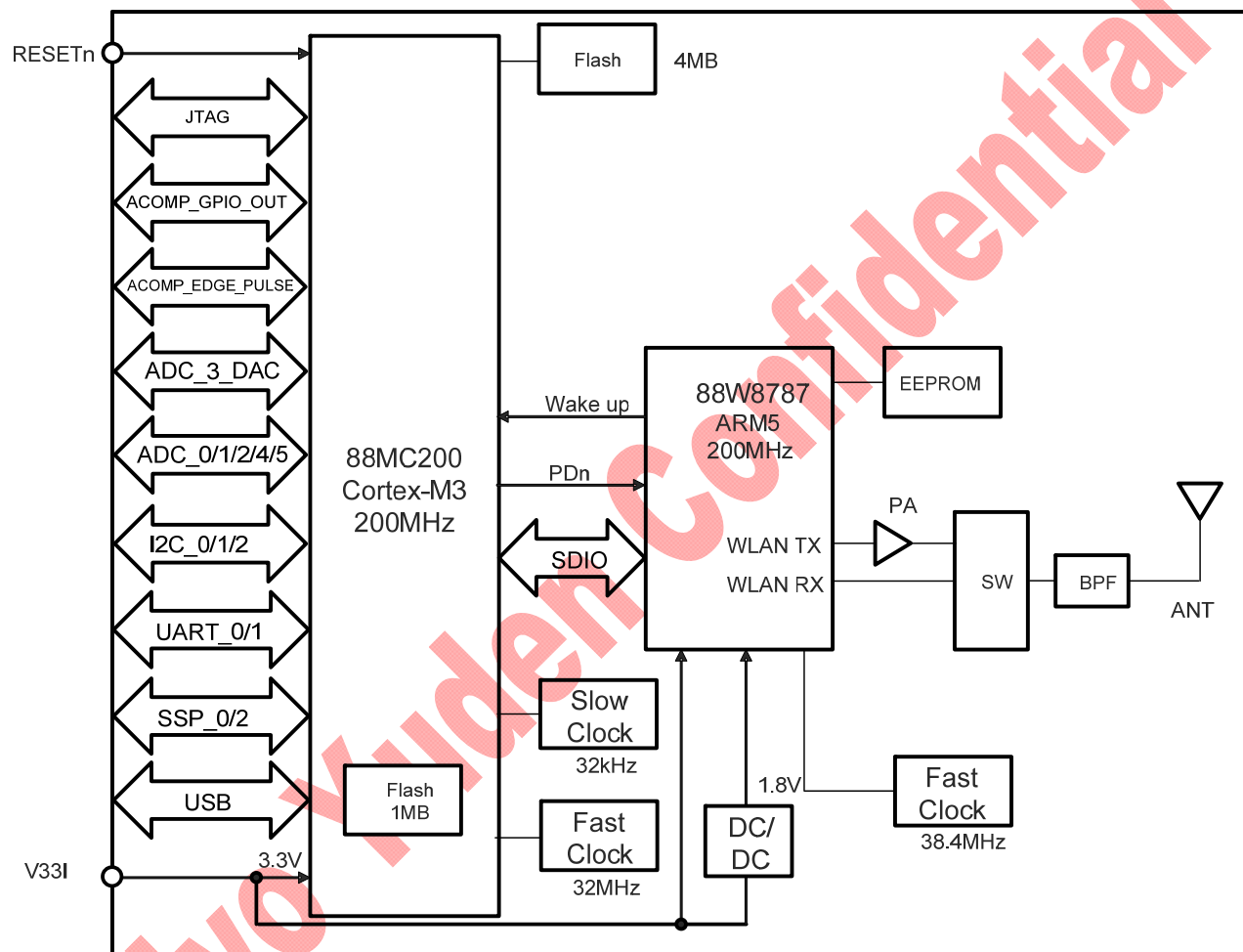
RF Specifications (WLAN 11b/11Mbps, CCK)

The Specification applies for Ta=25 degrees C, Supply voltage=Typical voltage

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	RF frequency range		FREQ	2412		2472	MHz	
2	TX Power		Po		17		dBm	
3	Spectrum Mask	1 st Side Lobe	M1	-		-30	dBc	
		2 nd Side Lobe	M2	-		-50	dBc	
4	Power up-down rump	Power up	TU	-		2	us	
		Power down	TD	-		2	us	
5	Frequency tolerance		Ft	-25		25	ppm	
6	EVM	Peak	EVM	-		35	%	
7	TX Out of band spurious1	30MHz to 1GHz	TOS1	-		-36	dBm	
8	TX Out of band spurious2	1GHz to 12.75GHz	TOS2	-		-30	dBm	
9	TX Out of band spurious3	1.8GHz to 1.9GHz 5.15GHz to 5.3GHz	TOS3			-47	dBm	
10	Rx sensitivity	PER<8%	SEN		-86	-76	dBm	
11	Maximum Input Level	PER<8%	MIL	-10			dBm	
12	RX Out of band spurious1	30MHz to 1GHz	ROS1	-		-57	dBm	
13	RX Out of band spurious2	1GHz to 12.75GHz	ROS2	-		-47	dBm	

Control No. HD-MC-A131203	(1/1)	Control name Circuit Schematic
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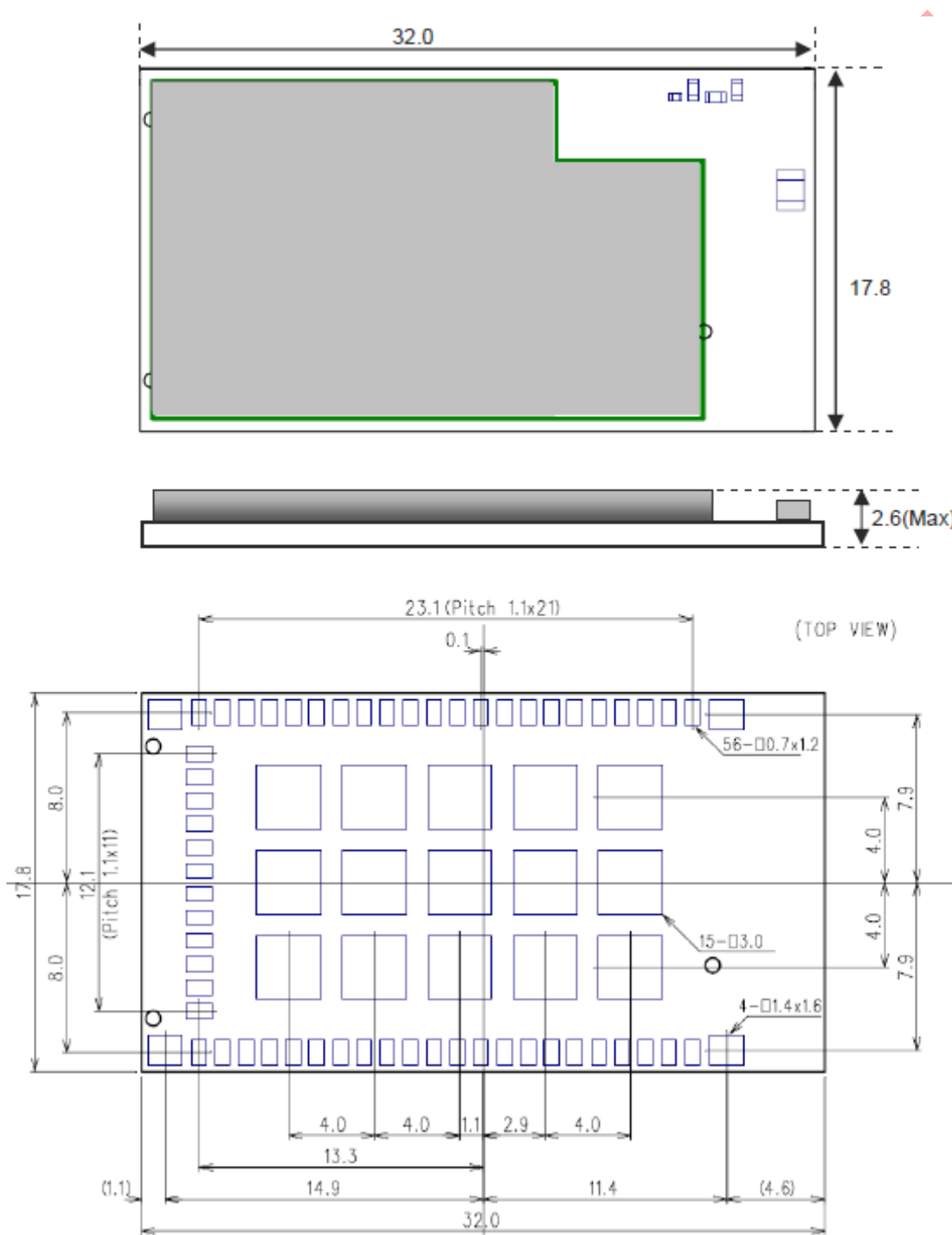
Block Diagram



Control No. HD-AD-A131203	(1/2)	Control name Circuit Schematic
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OUTLINE

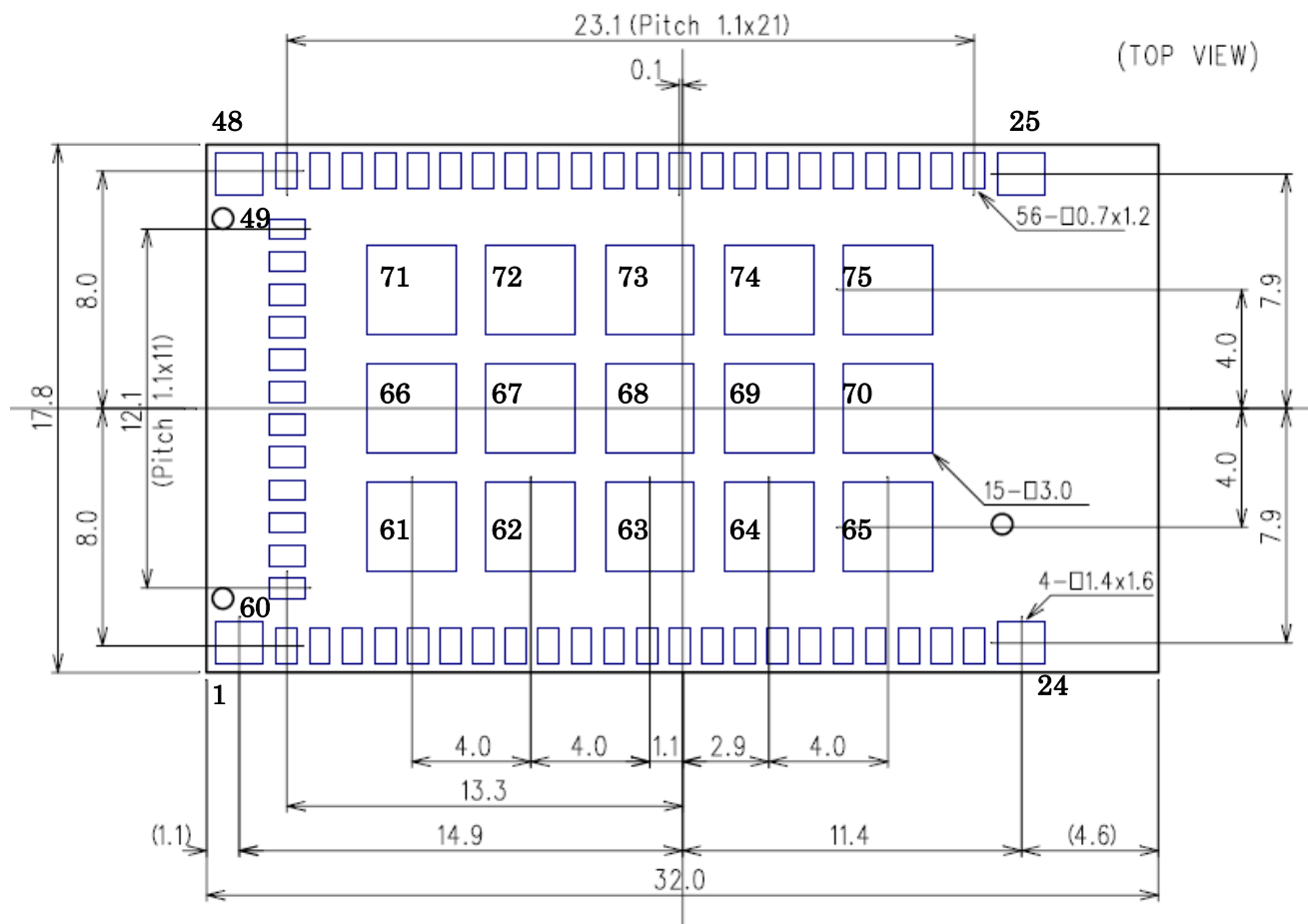
Unit: mm, Tolerances unless otherwise specified: +/-0.2mm



Control No. HD-AD-A131203	(2/2)	Control name Circuit Schematic
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Module Pad Dimension

Unit:mm



(TOP VIEW)

Taiyo

GT WYSAVKXY

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Control No. HD-BA-A131203	(1/2)	Control name Pin Layout
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No.	Pin Name	I/O	Type	Pwr Domain	Description	88MC200 GPIO Pin No.
1	GND	P	Ground	GND	-	-
2	JTAG_TDO	O	-	VIO_0	TDO for JTAG	GPIO_20
3	JTAG_TCK	O	-	VIO_0	TCK for JTAG	GPIO_21
4	JTAG_TMS	I/O	-	VIO_0	TMS for JTAG	GPIO_22
5	JTAG_TDI	I	-	VIO_0	TDI for JTAG	GPIO_23
6	JTAG_TRST	I	-	VIO_0	TRSTn for JTAG	GPIO_24
7	RESETn	I	-	VIO_0	Active low chip reset	-
8	RSVD	-	-	-	No connect. Should be left open.	-
9	M_WAKEUP	I	-	VIO_0	Wake up signal	GPIO_26
10	RSVD	-	-	-	No connect. Should be left open.	-
11	ACOMP_GPIO_OUT	O	-	VIO_1	ACOMP output synchronous or asynchronous level signals	GPIO_29
12	ACOMP_EDGE_PULSE	O	-	VIO_1	Output pulse aligned with Synchronized comparison result	GPIO_30
13	SSP0_CLK	I/O	-	VIO_1	Clock for SSP0	GPIO_32
14	SSP0_FRM	I/O	-	VIO_1	Frame for SSP0	GPIO_33
15	SSP0_RXD	I	-	VIO_1	RXD for SSP0	GPIO_34
16	SSP0_TXD	O	-	VIO_1	TXD for SSP0	GPIO_35
17	SSP2_CLK	I/O	-	VIO_1	Clock for SSP2	GPIO_40
18	SSP2_FRM	I/O	-	VIO_1	Frame for SSP2	GPIO_41
19	SSP2_RXD	I	-	VIO_1	RXD for SSP2	GPIO_42
20	SSP2_TXD	O	-	VIO_1	TXD for SSP2	GPIO_43
21	SDIO_LED	O	-	VIO_1	LED for SDIO	GPIO_50
22	RSVD	-	-	-	No connect. Should be left open.	-
23	GND	P	Ground	GND	-	-
24	N.C.	-	-	-	No connect. Should be left open.	-
25	N.C.	-	-	-	No connect. Should be left open.	-
26	GND	P	Ground	GND	-	-
27	N.C.	-	-	-	No connect. Should be left open.	-
28	GND	P	Ground	GND	-	-
29	RSVD	-	-	-	No connect. Should be left open.	-
30	RSVD	-	-	-	No connect. Should be left open.	-
31	USB_VBUS	I/O	Power	-	VBUS selection input in device mode; unused in host mode; input/output for OTG mode to supply +5V@10mA during session negotiation	-
32	USB_ID	I	-	-	USB OTG IDPIN pad	-
33	USB_DP	I/O	-	-	USB D+ pad	GPIO_57
34	USB_DM	I/O	-	-	USB D- pad	GPIO_58
35	VIO_0	I	Power	VIO_0	IO power	-
36	VIO_1	I	Power	VIO_1	IO power	-
37	VIO_2	I	Power	VIO_2	IO power	-
38	RSVD	-	-	-	No connect. Should be left open.	-
39	V33I	I	Power	V33I	3.3V power supply	-

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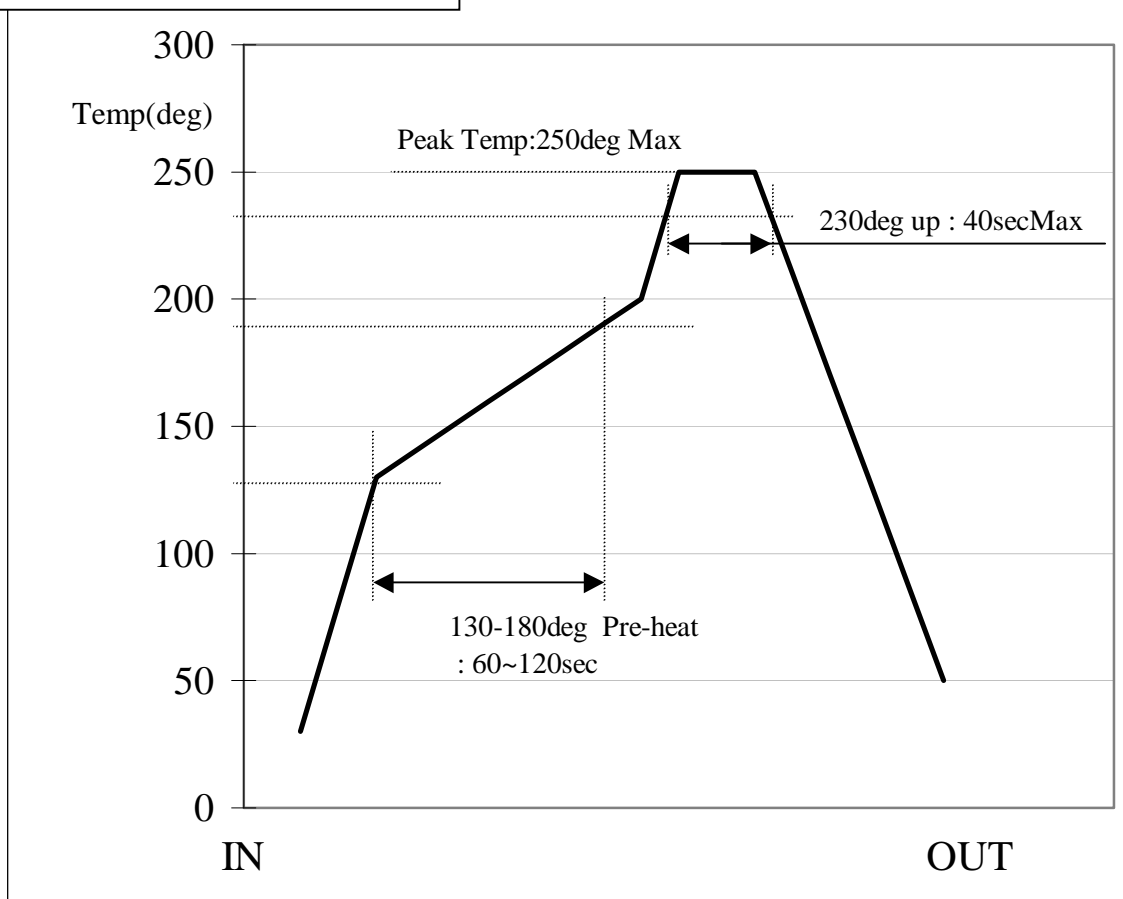
Control No. HD-BA-A131203	(2/2)	Control name Pin Layout
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No.	Pin Name	I/O	Type	Pwr Domain	Description	88MC200 GPIO Pin No.
40	GND	P	Ground	GND	-	-
41	I2C0_SCL	I/O	-	VIO_1	SCL for I2C0	GPIO_45
42	I2C0_SDA	I/O	-	VIO_1	SDA for I2C0	GPIO_44
43	UART1_CTSn	I	-	VIO_2	CTS _n for UART1	GPIO_59
44	UART1_RTSn	O	-	VIO_2	RTSn for UART1	GPIO_60
45	UART1_TXD	O	-	VIO_2	TXD for UART1	GPIO_61
46	UART1_RXD	I	-	VIO_2	RXD for UART1	GPIO_62
47	GND	P	Ground	GND	-	-
48	GND	P	Ground	GND	-	-
49	UART0_TXD	O	-	VIO_2	TXD for UART0	GPIO_74
50	UART0_RXD	I	-	VIO_2	RXD for UART0	GPIO_75
51	ADC_5	I/O	-	VIO_0	ADC channel 5 or Analog comparator Channel 5	GPIO_2
52	ADC_4	I/O	-	VIO_0	ADC channel 4 or Analog comparator Channel 4	GPIO_3
53	ADC_3_DAC	I/O	-	VIO_0	ADC channel 3 or Analog comparator Channel 3 or DA Ref or ADC Vref or DAC output	GPIO_4
54	ADC_2	I/O	-	VIO_0	ADC channel 2 or Analog comparator Channel 2	GPIO_5
55	ADC_1	I/O	-	VIO_0	ADC channel 1 or Analog comparator Channel 1	GPIO_6
56	ADC_0	I/O	-	VIO_0	ADC channel 0 or Analog comparator Channel 0	GPIO_7
57	I2C1_SDA	I/O	-	VIO_0	SDA for I2C1	GPIO_8
58	I2C1_SCL	I/O	-	VIO_0	SCL for I2C1	GPIO_9
59	I2C2_SDA	I/O	-	VIO_0	SDA for I2C2	GPIO_10
60	I2C2_SCL	I/O	-	VIO_0	SCL for I2C2	GPIO_11
61	GND	P	Ground	GND	-	-
62	GND	P	Ground	GND	-	-
63	GND	P	Ground	GND	-	-
64	GND	P	Ground	GND	-	-
65	GND	P	Ground	GND	-	-
66	GND	P	Ground	GND	-	-
67	GND	P	Ground	GND	-	-
68	GND	P	Ground	GND	-	-
69	GND	P	Ground	GND	-	-
70	GND	P	Ground	GND	-	-
71	GND	P	Ground	GND	-	-
72	GND	P	Ground	GND	-	-
73	GND	P	Ground	GND	-	-
74	GND	P	Ground	GND	-	-
75	GND	P	Ground	GND	-	-

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Control No. (1/1)	Control name Reflow profile
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Recommended Reflow Profile



Taiyo Yuden