RX231 Group

Voice Recognition Demo Board

R12AN0091EJ0100
Rev.1.00
June 29, 2018

Introduction

This application note explains the hardware specifications of Renesas Electronics' voice recognition demo board RTK0EA0002D00001BJ, which uses RX231.

Target Device

RX231 Group

Related Documents

1. RX231 Group Voice Recognition Sample Software (R11AN0308EJ0100)

Contents

1. Outline

The RTK0EA0002D00001BJ is a demo board for a voice recognition remote control using RX231. This product provides the following features.

- Compact, lightweight (60mm x 40mm, less than 20 grams) *not including battery
- Infrared remote control which recognizes voice activity
- Remote control transmission format: can be modified by rewriting software
- Supports Zoom Voice (sound collection software produced by Techno Mathematical Co., Ltd.)
- Supports AmiVoice voice recognition software
- Built-in MEMS microphone
- Easy setup (can be powered by USB connection or battery)
- Simple settings (setup AmiVoice using two built-in switches)
- Multiple built-in transmission interfaces (USB, BLE, interface)

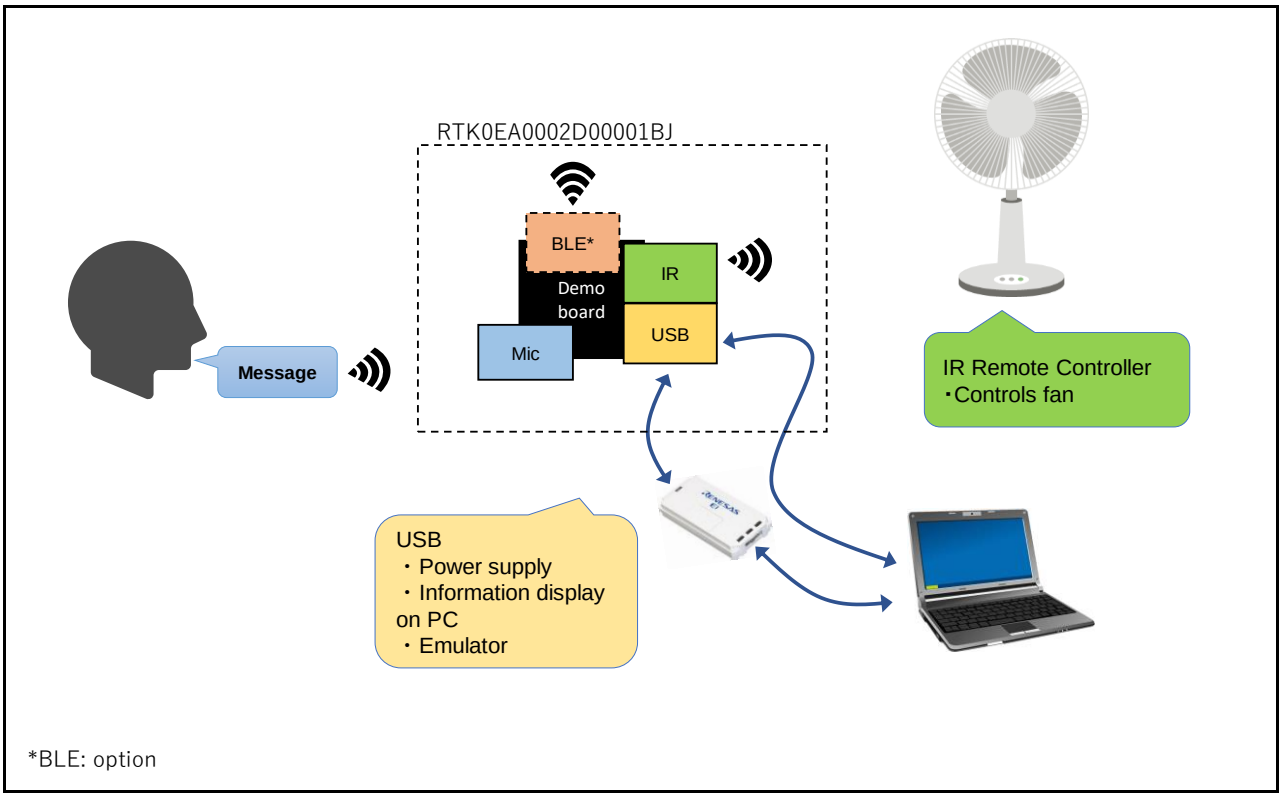

Figure 1-1 RX231 Voice Recognition Remote Control Demo Set

2. Product External Appearance

Figure 2-1 shows a photo of the demo board and provides the names of the key components.

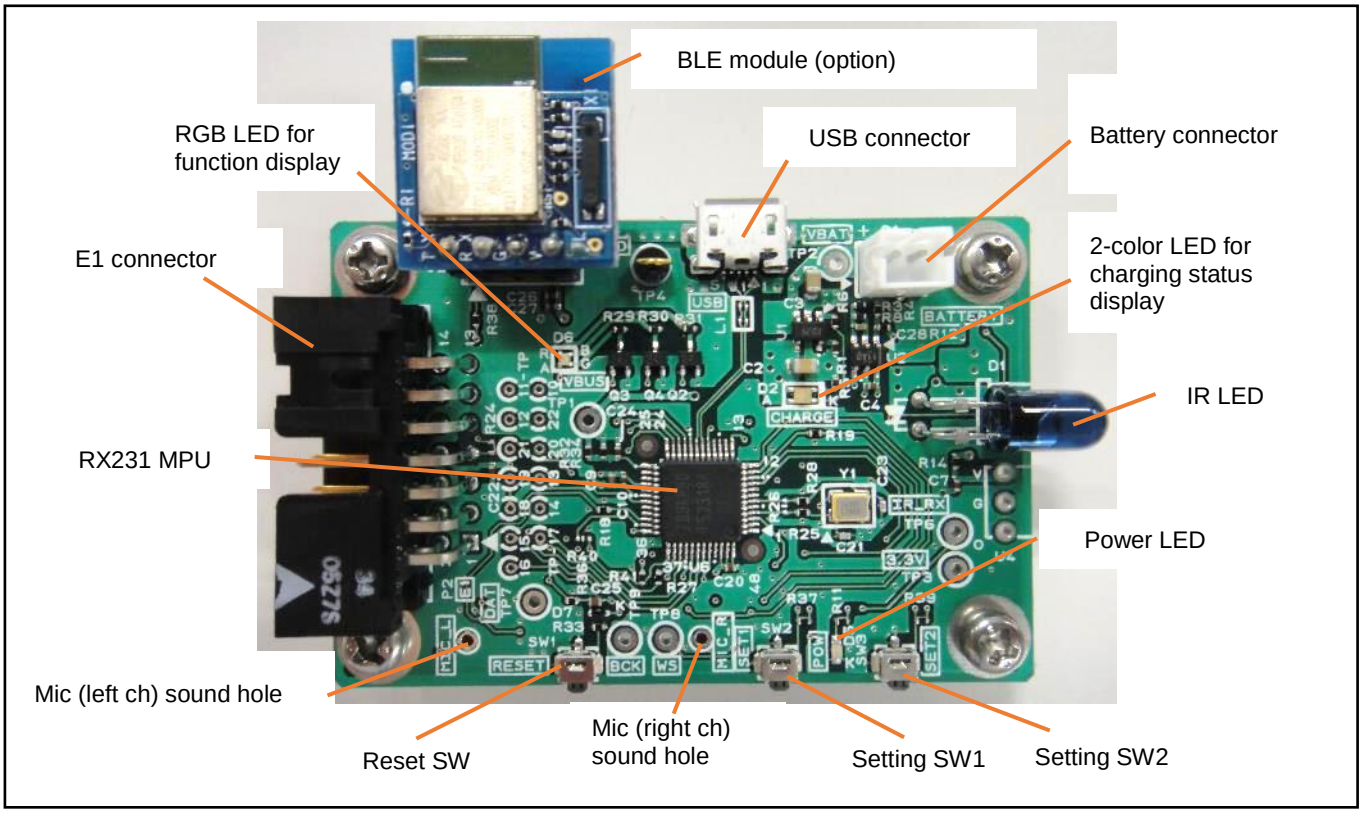

Figure 2-1 Product External Appearance

3. Hardware Specifications

Table 3-1 Hardware Specifications (1/2)

Item	Description	Remarks
Board size	60.0 x 40.0[mm]	
MCU	RX231 (R5F52318ADFL)	ROM: 512KB, RAM: 64KB Data flash: 8KB Package: 48-pin LQFP (0.5mm pitch) Operating ambient temperature: -40～85℃
Clock	MCU main clock: external 16MHz	Crystal unit
	AUDIO_MCK: external 12.2880MHz	Crystal oscillator
Microphone	TDK InvenSense, Inc. ICS-43434: 2 pcs.	MEMS Microphone, omnidirectional Sensitivity -26dBFS (94dBSPL), I2S output
Battery	Lithium ion battery pack: Data Power Technology, LLC DTP401525	Capacity: 110mAh Voltage: 3.7V (nominal), 4.2V (max)
LED	Power supply: Orange LED 1 pc.	
	Function display: 3-color (RGB) LED 1 pc.	MCU port control Lights up in 5 colors (red, green blue, white, yellow)
	Charging status display: 2-color (RG) LED 1 pc.	USB not connected: LED off Charging: orange light on All other times: green light on
Remote control transmission	Infrared LED (IR LED): 950nm, viewing angle ±22°	Carrier frequency: 38kHz Compliant format: NEC format
Remote control reception (option)	Infrared receiver module: 950nm, viewing angle ±45°	Carrier frequency: 38kHz
Switch	Push switch: 3 pcs.	・MCU reset switch ・Setting switch 1, setting switch 2 (MCU port control)

Table 3-2 Hardware Specifications (2/2)

Item	Description	Remarks
Wireless module (option)	RL78/G1D built-in module: RY7011A0000DZ00 Conversion board: RTK0EN0013A01001BJ	Bluetooth v4.1 specification (Low Energy, Single mode)
USB interface	USB Micro B connector	Full speed transfer
Debugging interface	E1 14-pin box header	
Power supply input	Power supply input 1: USB bus power (VBUS): 5 V Power supply input 2: battery	
Weight	Under 20g	Not including battery

4. Block Diagram

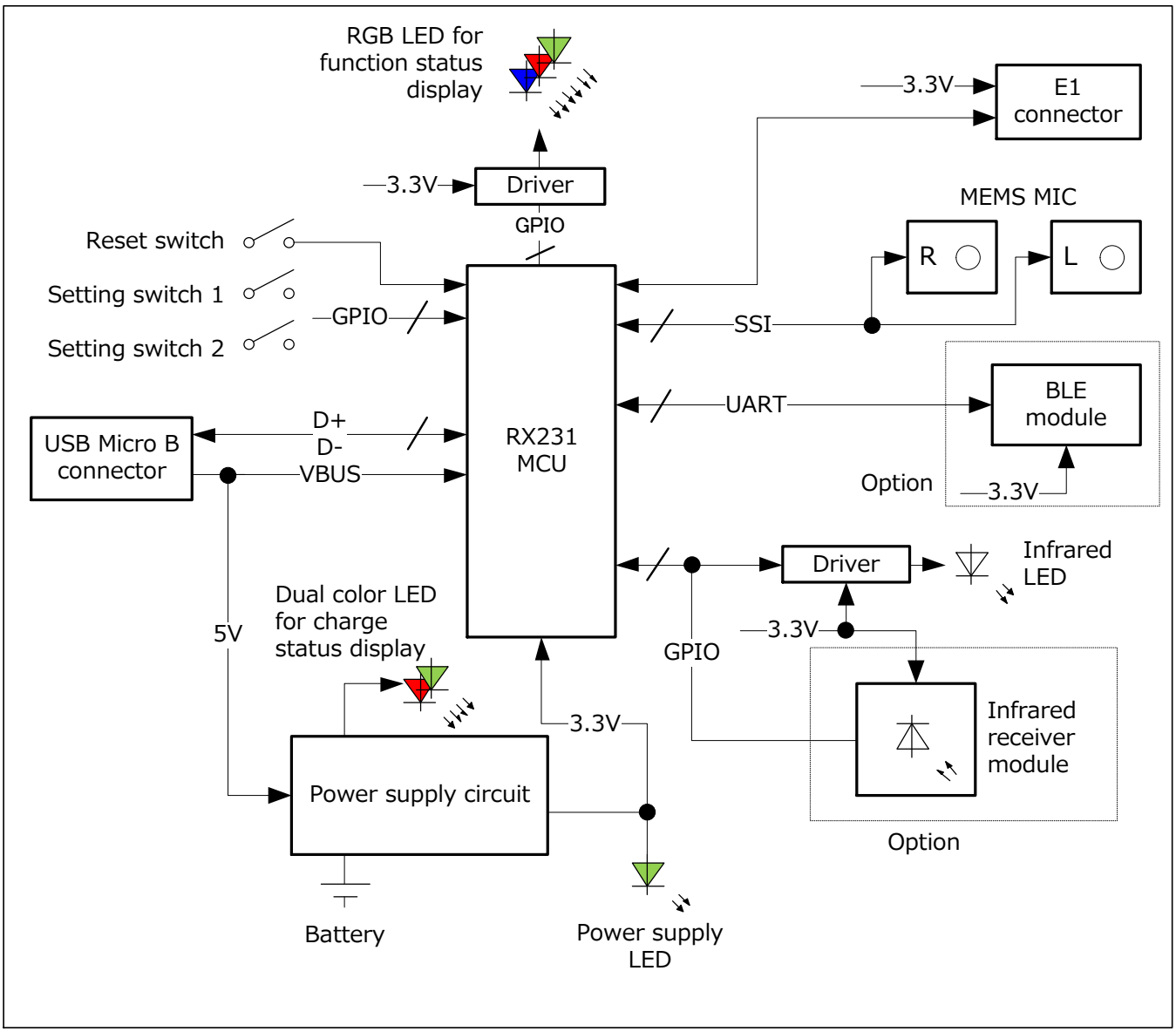

Figure 4-1 Block Diagram

5. Circuit Diagram

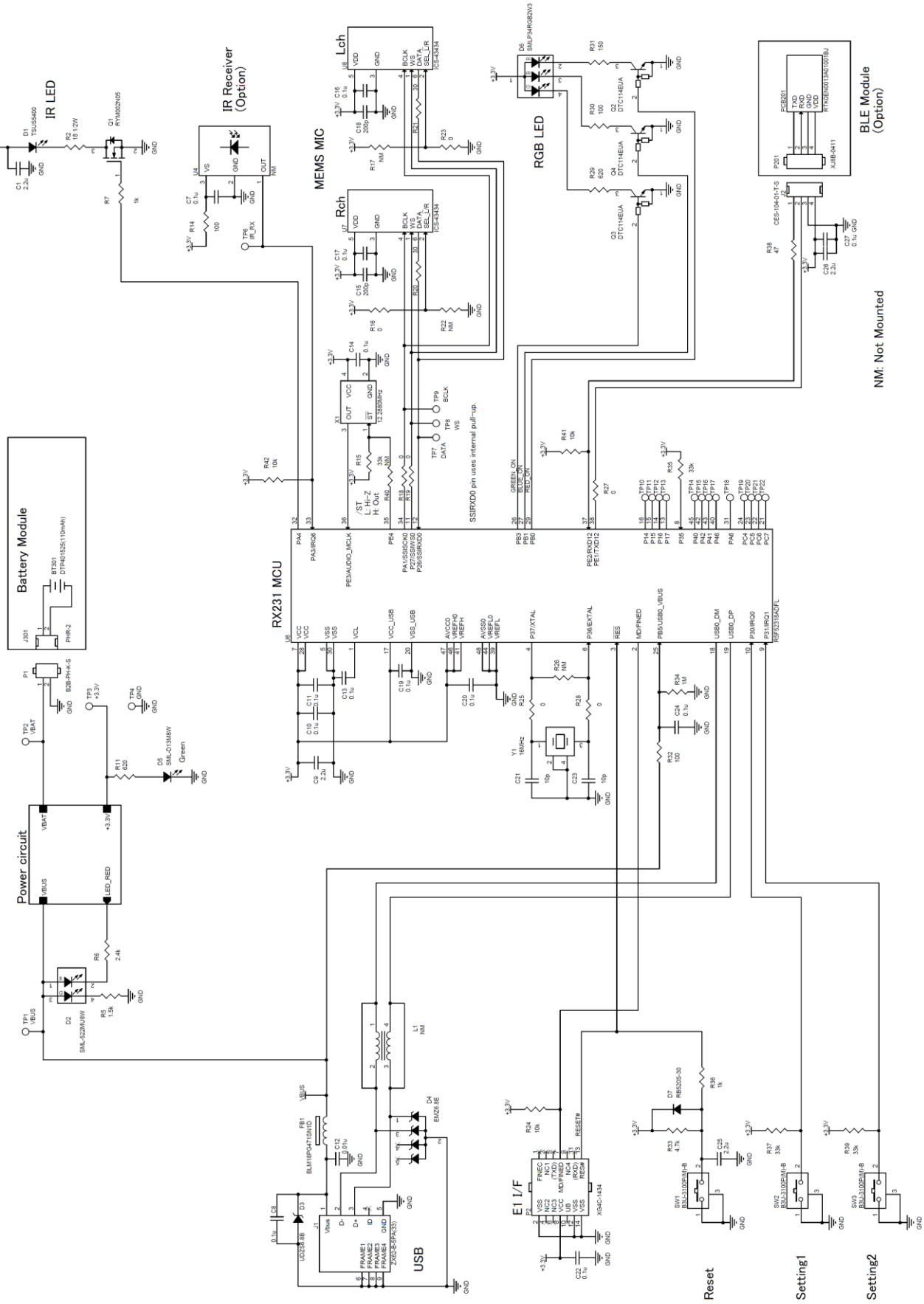

Figure 5-1 RTK0EA0002D00001BJ Circuit Diagram

6. Board Layout Diagram

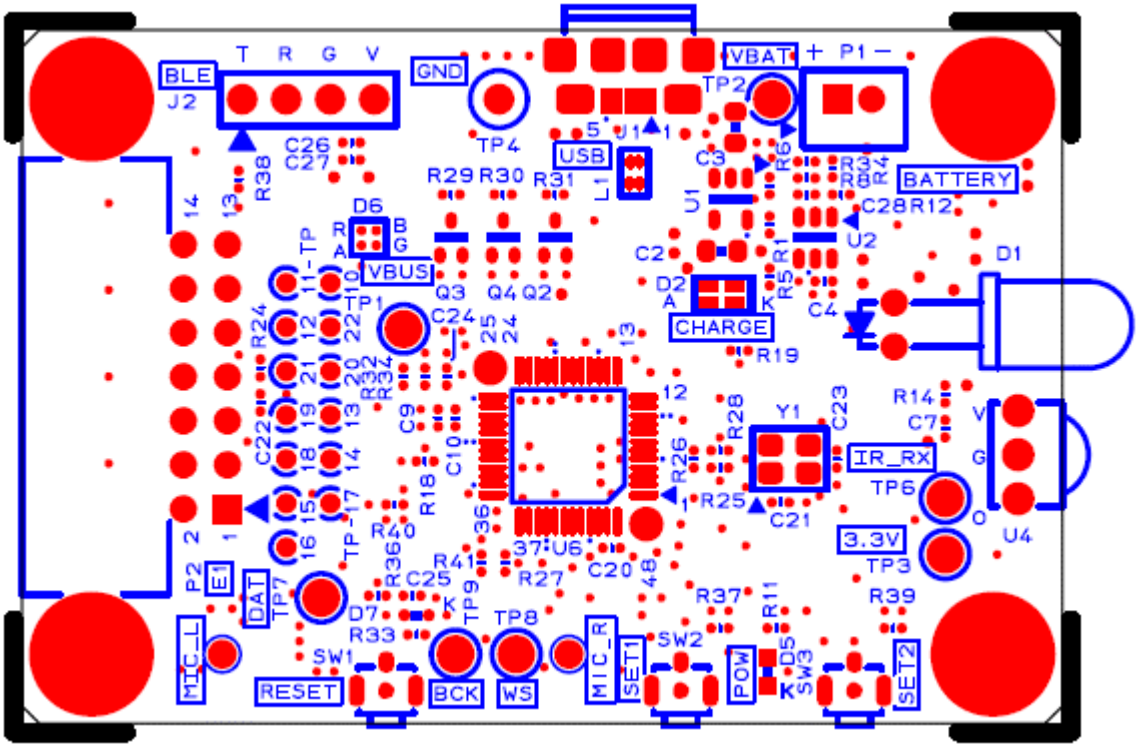

Figure 6-1 Component Side Silkscreen (top view)

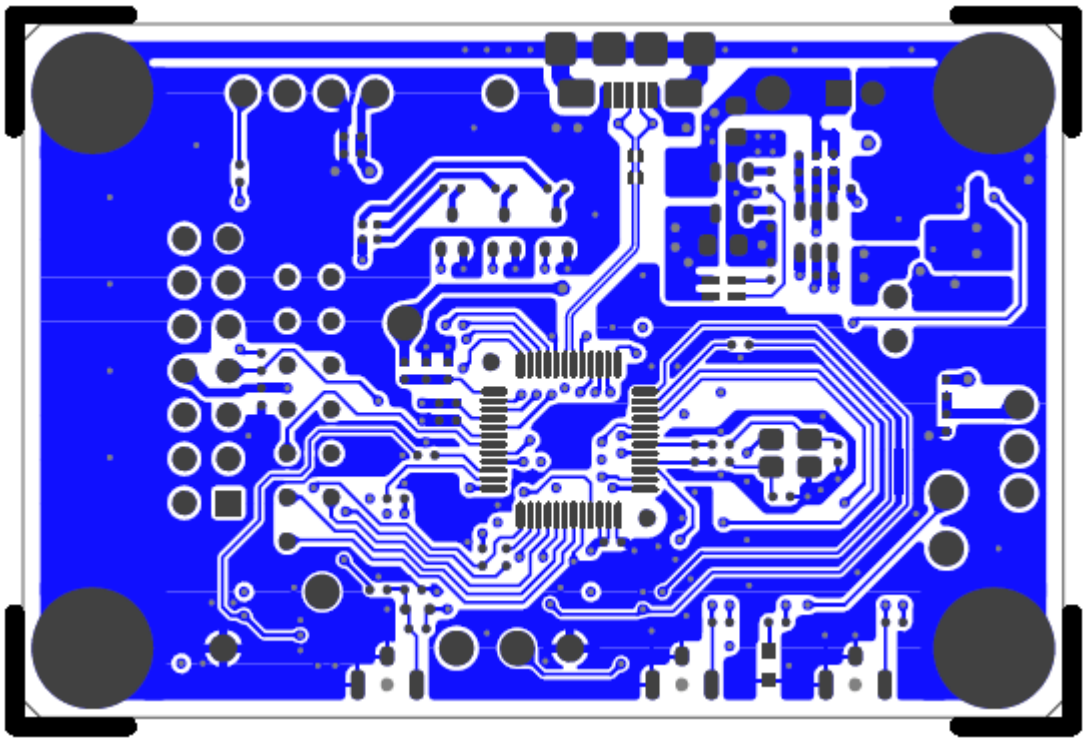

Figure 6-2 1st Layer Pattern (top view)

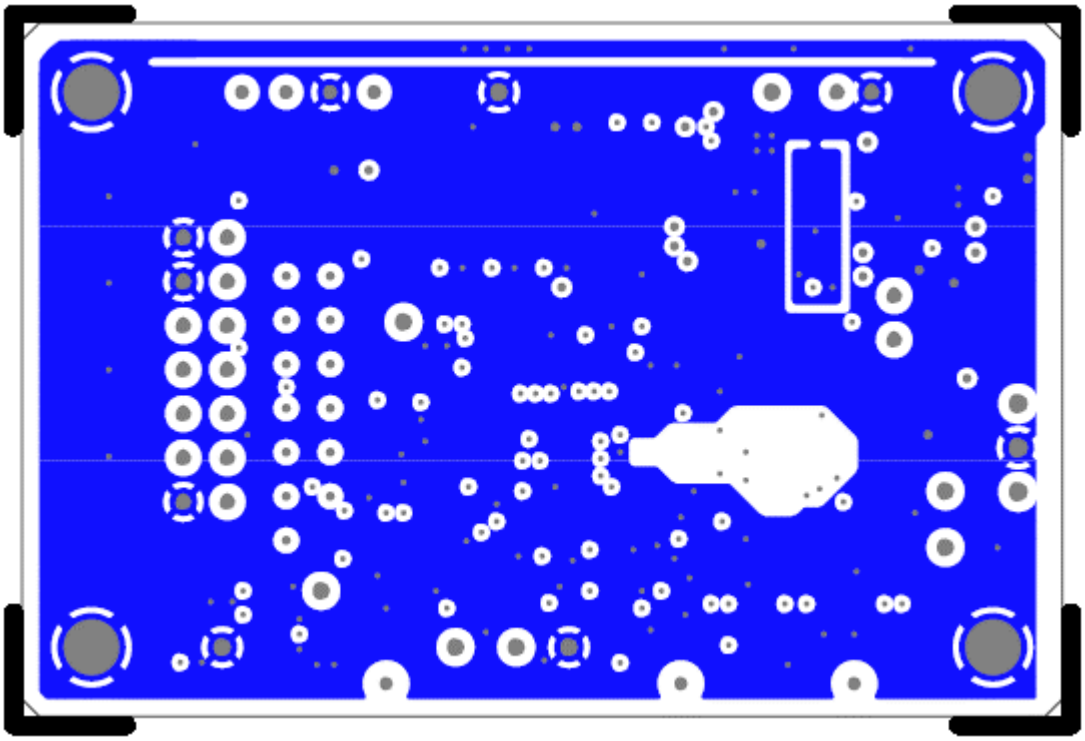

Figure 6-3 2nd Layer Pattern (top view)

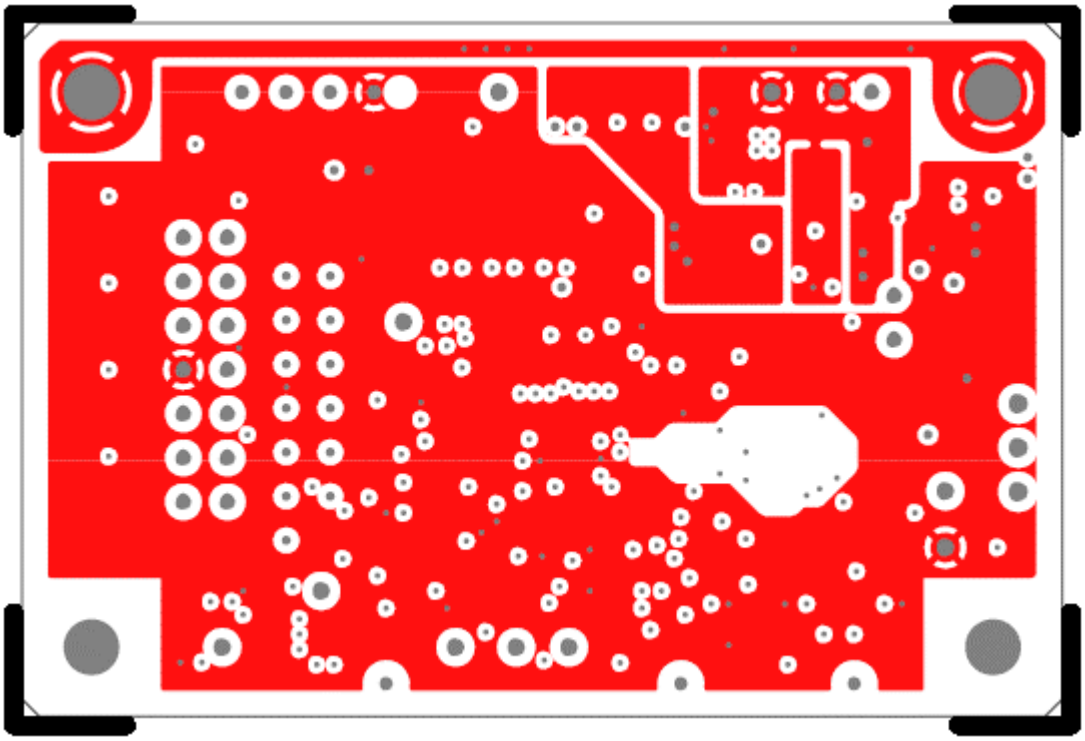

Figure 6-4 3rd Layer Pattern (top view)

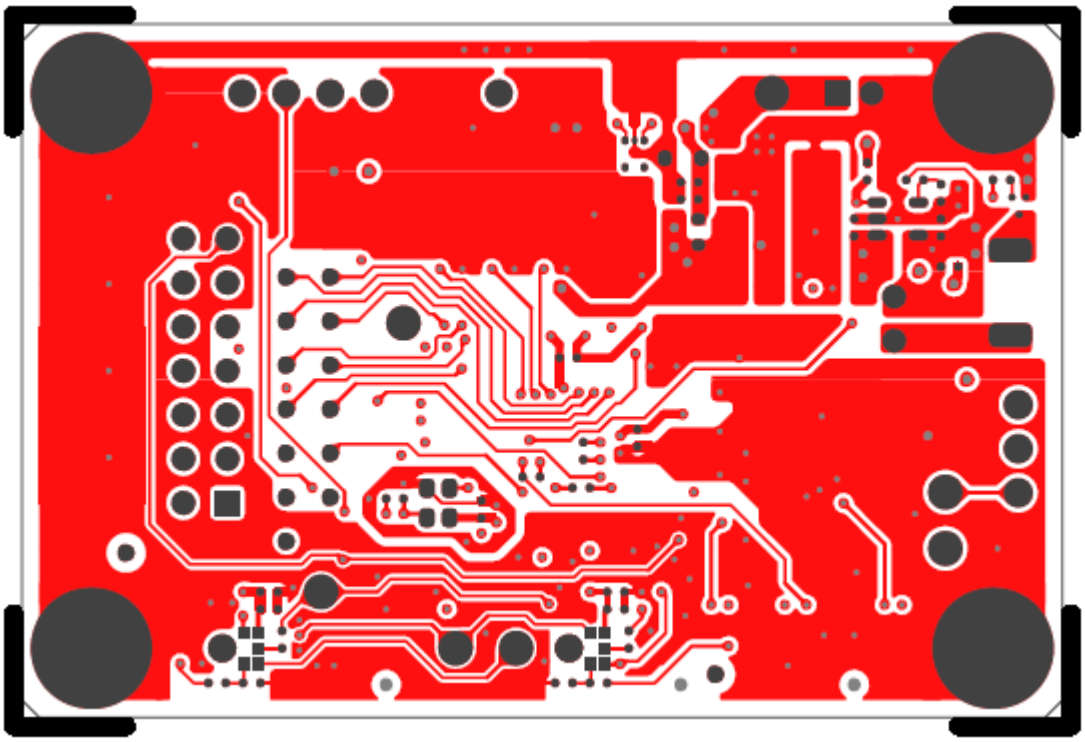

Figure 6-5 4th Layer Pattern (top view)

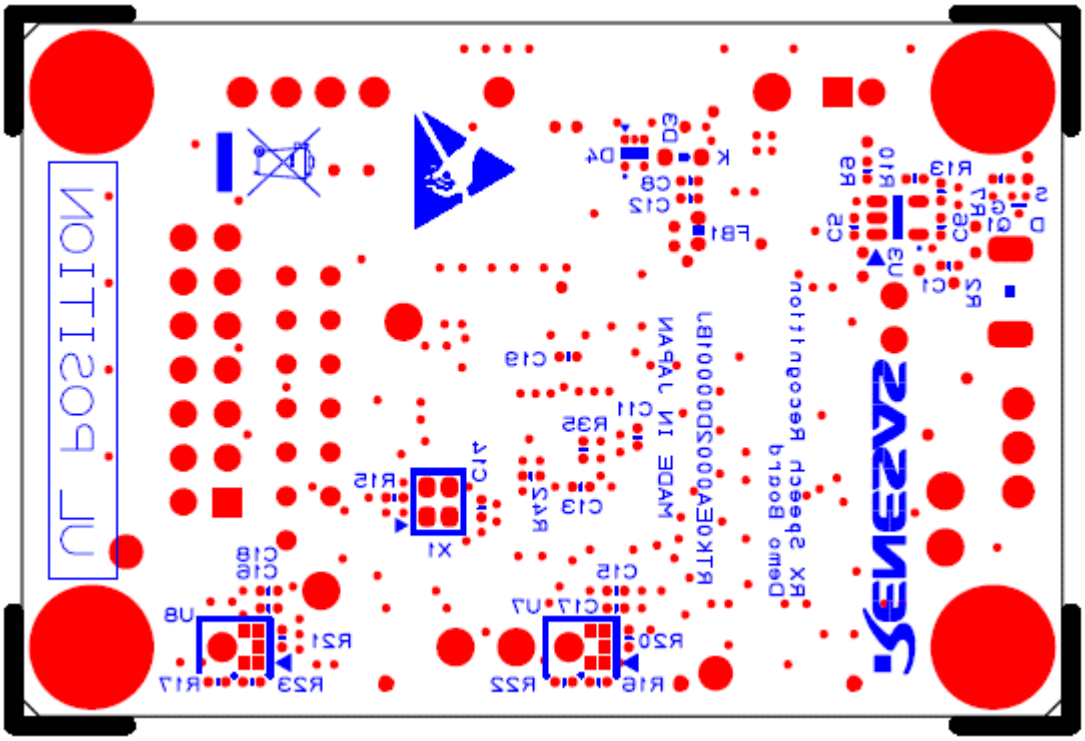

Figure 6-6 Solder Side Silkscreen (top view)

7. BOM (parts list)

Table 7-1 BOM (1/3)

Item	Qty	Reference	Part	Manufacturer	Part number	Remarks
1	1	BT301	DTP401525(110mAh)	DATA POWER TECHNOLOGY	DTP401525(110mAh)	Polymer Li-ion Recharged Battery Module
2	4	C1,C9,C25,C26	2.2u	MURATA	GRM155C81E225ME11D	CAP CER 2.2UF 20% 25V X6S 0402(1005MM)
3	13	C7,C8,C10,C11,C13, C14,C16,C17,C19,C20,C22,C24,C27	0.1u	MURATA	GRM155R61H104ME14D	CAP CER 0.1UF 20% 50V X5R 0402(1005MM)
4	1	C12	0.01u	MURATA	GRM155R71H103KA88J	CAP CER 0.01UF 10% 50V X7R 0402(1005MM)
5	2	C15,C18	200p	MURATA	GRM1555C1H201JA01D	CAP CER 200PF 5% 50V C0G 0402(1005MM)
6	2	C21,C23	10p	MURATA	GRM1555C1H100JA01J	CAP CER 10PF 5% 50V C0G 0402(1005MM)
7	1	D1	TSUS5400	VISHAY	TSUS5400	EMITTER IR 950NM 150MA RADIAL
8	1	D2	SML-522MU8W	ROHM	SML-522MU8WT86	LED GREEN/RED 0605(1513MM)
9	1	D3	UDZS6.8B	ROHM	UDZSTE-176.8B	DIODE ZENER 6.8V 200MW UMD2
10	1	D4	EMZ6.8E	ROHM	EMZ6.8ET2R	DIODE ZENER ARRAY 6.8V EMD5
11	1	D5	SML-D13M8W	ROHM	SML-D13M8W	LED GREEN 0603(1608MM)
12	1	D6	SMLP34RGB2W3	ROHM	SMLP34RGB2W3	LED RGB 0404(1010MM)
13	1	D7	RB520S-30	ROHM	RB520S-30TE61	DIODE SCHOTTKY 30V 200MA EMD2
14	1	FB1	BLM18PG471SN1D	MURATA	BLM18PG471SN1D	FERRITE BEAD 470 OHM 0603(1608MM)
15	1	J1	ZX62-B-5PA(33)	HIROSE	ZX62-B-5PA(33)	MICRO USB B CONNECTOR SMD RIGHT ANGLE
16	1	J2	CES-104-01-T-S	SAMTEC	CES-104-01-T-S	CONN RCPT 4POS 2.54MM SIP
17	1	J301	PHR-2	JST	PHR-2	BATTERY MODULE
18	1	L1	NM	MURATA	DLP11SN900HL2L	COMMON MODE CHOKE COIL 150MA 90 OHM SMD
19	1	PCB201	RTK0EN0013A01001BJ	RENESAS	RTK0EN0013A01001BJ	RL78/G1D CONVERSION BOARD
20	1	P1	B2B-PH-K-S	JST	B2B-PH-K-S	CONN HEADER PH TOP 2POS 2MM SIP
21	1	P2	XG4C-1434	OMRON	XG4C-1434	CONN PLUG 14POS 2.54MM RIGHT ANGLE DIP
22	1	P201	XJ8B-0411	OMRON	XJ8B-0411	JUMPER PLUG 4POS 2.54MM SIP, BLE MODULE

Table 7-2 BOM (2/3)

Item	Qty	Reference	Part	Manufacturer	Part number	Remarks
23	1	Q1	RYM002N05	ROHM	RYM002N05	MOSFET N-CH 50V 0.2A VMT3
24	3	Q2,Q3,Q4	DTC114EUA	ROHM	DTC114EUAT106	DTR 200MW UMT3
25	1	R2	18 1/2W	ROHM	MCR50JZHJ180	RES SMD 18 OHM 5% 1/2W 2010(5025MM)
26	1	R5	1.5k	ROHM	MCR01MZPJ152	RES SMD 1.5K OHM 5% 1/16W 0402(1005MM)
27	1	R6	2.4k	ROHM	MCR01MZPJ242	RES SMD 2.4K OHM 5% 1/16W 0402(1005MM)
28	2	R7,R36	1k	ROHM	MCR01MZPJ102	RES SMD 1K OHM 5% 1/16W 0402(1005MM)
29	2	R11,R29	620	ROHM	MCR01MZPJ621	RES SMD 620 OHM 5% 1/16W 0402(1005MM)
30	3	R14,R30,R32	100	ROHM	MCR01MZPJ101	RES SMD 100 OHM 5% 1/16W 0402(1005MM)
31	4	R15,R35,R37,R39	33k	ROHM	MCR01MZPJ333	RES SMD 33K OHM 5% 1/16W 0402(1005MM)
32	7	R16,R18,R19,R23,R25 ,R27,R28	0	ROHM	MCR01MZPJ000	RES SMD 0 OHM JUMPER 1/16W 0402(1005MM)
33	4	R17,R22,R26,R40	NM	-	-	0402(1005MM) RES PAD
34	2	R20,R21	30	ROHM	MCR01MZPJ300	RES SMD 30 OHM 5% 1/16W 0402(1005MM)
35	3	R24,R41,R42	10k	ROHM	MCR01MZPJ103	RES SMD 10K OHM 5% 1/16W 0402(1005MM)
36	1	R31	150	ROHM	MCR01MZPJ151	RES SMD 150 OHM 5% 1/16W 0402
37	1	R33	4.7k	ROHM	MCR01MZPJ472	RES SMD 4.7K OHM 5% 1/16W 0402(1005MM)
38	1	R34	1M	ROHM	MCR01MZPJ105	RES SMD 1M OHM 5% 1/16W 0402(1005MM)
39	1	R38	47	ROHM	MCR01MZPJ470	RES SMD 47 OHM 5% 1/16W 0402(1005MM)
40	3	SW1,SW2,SW3	B3U-3100P(M)-B	OMRON	B3U-3100P(M)-B	SWITCH TACT RIGHT ANGLE SMD
41	1	TP1	VBUS	-	-	1mm DIA TH, SILK"VBUS"
42	1	TP2	VBAT	-	-	1mm DIA TH, SILK"VBAT"
43	1	TP3	+3.3V	-	-	1mm DIA TH, SILK"3.3V"
44	1	TP4	GND	SUNHAYATO	SLC-22G-K	TEST POINT, SILK"GND"
45	1	TP6	IR_RX	-	-	1mm DIA TH, SILK"RX"
46	1	TP7	DATA	-	-	1mm DIA TH, SILK"D"
47	1	TP8	WS	-	-	1mm DIA TH, SILK"WS"
48	1	TP9	BCLK	-	-	1mm DIA TH, SILK"BK"
49	13	TP10,TP11,TP12,TP1 3,TP14,TP15,TP16,T P17,TP18,TP19,TP20, TP21,TP22	TP	-	-	0.5mm DIA TH
50	1	U4	NM	VISHAY	TSOP4138	Remote Receiver Sensor, 38kHz Through Hole
51	1	U6	R5F52318ADFL	RENESAS	R5F52318ADFL#30	RX231 MCU 32BIT 512KB FLASH 48LFQFP
52	2	U7,U8	ICS-43434	TDK InvenSense	ICS-43434	MIC MEMS DIGITAL I2S OMNI -26DB

Table 7-3 BOM (3/3)

Item	Qty	Reference	Part	Manufacturer	Part number	Remarks
53	1	X1	12.2880MHz	SEIKO EPSON	SG-210STF 12.2880ML	OSC XO 12.288MHZ CMOS SMD
54	1	Y1	16MHz	SEIKO-EPSON	FA-238 16.0000MB	CRYSTAL 16.00 MHZ 10PF SMD
55	1	-	RTK0EA0002D00001BJ	-	-	PCB
56	4	-	-	Hirosugi-Keiki	AS-306	Hexagonal spacer, female-female, Duracon, length 6mm
57	4	-	-	Hirosugi-Keiki	UM-0306	Stainless steel screw, M3, screw length 6 mm

NM: Not Mounted

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Revision History

Rev.	Date	Description	
		Page	Summary
1.00	June 29, 2018		First edition issued

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

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1. Handling of Unused Pins

   Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.
   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

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   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

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   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

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