Dear customer

LAPIS Semiconductor Co., Ltd. ("LAPIS Semiconductor"), on the 1st day of October, 2020, implemented the incorporation-type company split (shinsetsu-bunkatsu) in which LAPIS established a new company, LAPIS Technology Co., Ltd. (“LAPIS Technology”) and LAPIS Technology succeeded LAPIS Semiconductor’s LSI business.

Therefore, all references to "LAPIS Semiconductor Co., Ltd.", "LAPIS Semiconductor" and/or "LAPIS" in this document shall be replaced with "LAPIS Technology Co., Ltd."

Furthermore, there are no changes to the documents relating to our products other than the company name, the company trademark, logo, etc.

Thank you for your understanding.

LAPIS Technology Co., Ltd.
October 1, 2020

ROHM GROUP
LAPIS
SEMICONDUCTOR

FEBL22Q53xRB-03

RB-S22Q53xTB48
User's Manual

Issue Date: March 26, 2020

ROHM
SEMICONDUCTOR

Notes

1) The information contained herein is subject to change without notice.

2) Although LAPIS Semiconductor is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors. Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. LAPIS Semiconductor shall have no responsibility for any damages arising out of the use of our Products beyond the rating specified by LAPIS Semiconductor.

3) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

4) The technical information specified herein is intended only to show the typical functions of the Products and examples of application circuits for the Products. No license, expressly or implied, is granted hereby under any intellectual property rights or other rights of LAPIS Semiconductor or any third party with respect to the information contained in this document; therefore LAPIS Semiconductor shall have no responsibility whatsoever for any dispute, concerning such rights owned by third parties, arising out of the use of such technical information.

5) The Products are intended for use in general electronic equipment (i.e. AV/OA devices, communication, consumer systems, gaming/entertainment sets) as well as the applications indicated in this document.

6) The Products specified in this document are not designed to be radiation tolerant.

7) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a LAPIS Semiconductor representative: transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.

8) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

9) LAPIS Semiconductor shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.

10) LAPIS Semiconductor has used reasonable care to ensure the accuracy of the information contained in this document. However, LAPIS Semiconductor does not warrant that such information is error-free and LAPIS Semiconductor shall have no responsibility for any damages arising from any inaccuracy or misprint of such information.

11) Please use the Products in accordance with any applicable environmental laws and regulations, such as the RoHS Directive. For more details, including RoHS compatibility, please contact a ROHM sales office. LAPIS Semiconductor shall have no responsibility for any damages or losses resulting non-compliance with any applicable laws or regulations.

12) When providing our Products and technologies contained in this document to other countries, you must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the US Export Administration Regulations and the Foreign Exchange and Foreign Trade Act.

13) This document, in part or in whole, may not be reprinted or reproduced without prior consent of LAPIS Semiconductor.

LAPIS Semiconductor Co.,Ltd.

2-4-8 Shinyokohama, Kouhoku-ku,
Yokohama 222-8575, Japan
http://www.lapis-semi.com/en/

Table of Contents

1. Overview

This instruction manual is for the RB-S22Q53xTB48 which is the ML22Q532/ML22Q533/ML22Q535 reference board.

Combining the board with a Sound Device Control Board 3 (hereinafter referred to as "SDCB3") enables the following functions to be implemented:

- Voice playback by ML22Q532/ML22Q533/ML22Q535.
- Writing voice data into ML22Q532/ML22Q533/ML22Q535.

2. Operational notes

The following describes the precautions to follow when handling the RB-S22Q53xTB48.

- Turn off the power when attaching the RB-S22Q53xTB48 to the SDCB3.
- Turn off the power when loading devices into the RB-S22Q53xTB48. Be sure to orient the device correctly. Pin 1 direction is toward the lower left side when the lid is opened. The Figure 1 shows the setting directions of devices.
- The ML22Q532/ML22Q533/ML22Q535 supply voltages are 2.7 to 3 6V / 3.3 to 5 5V. Use the RB-S22Q53xTB48 with a power supply voltage of 3. 0V.
- RB-S22Q53xTB48 is a device used only by experts in R&D facilities for research and development purposes. RB-S22Q53xTB48 is not intended to be used in mass-produced products or parts thereof.
- The information in this document is subject to change without notice due to product improvement and technological improvement. Prior to use, please ensure that the information is up to date.
- LAPIS Semiconductor does not provide any RB-S22Q53xTB48 support. Replace only in case of initial failure.

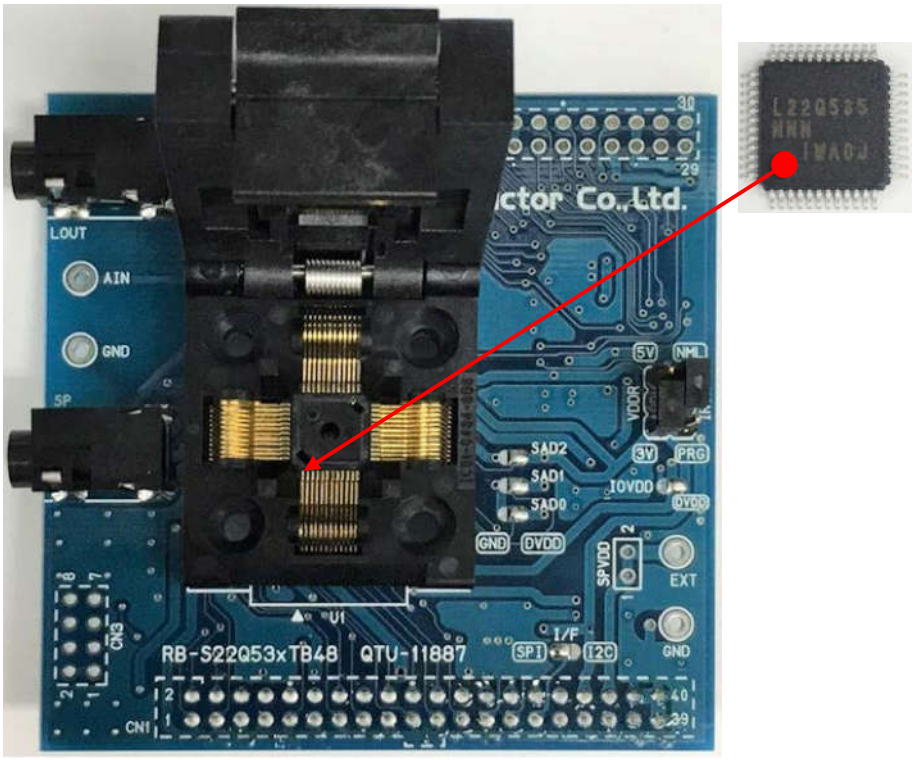


Figure 1 Outline Diagram

3. Specification

3.1. Jumper Pin Setting

Table 1 shows the RB-S22Q53xTB48 jumper pin settings.

Table 1

Jumper Pin Name	Setting
VDDR	Fixed on the 3V side
IRON	Fixed on the NML side

3.2. PCB layout

Figure 2 shows the RB-S22Q53xTB48 PCB layout.

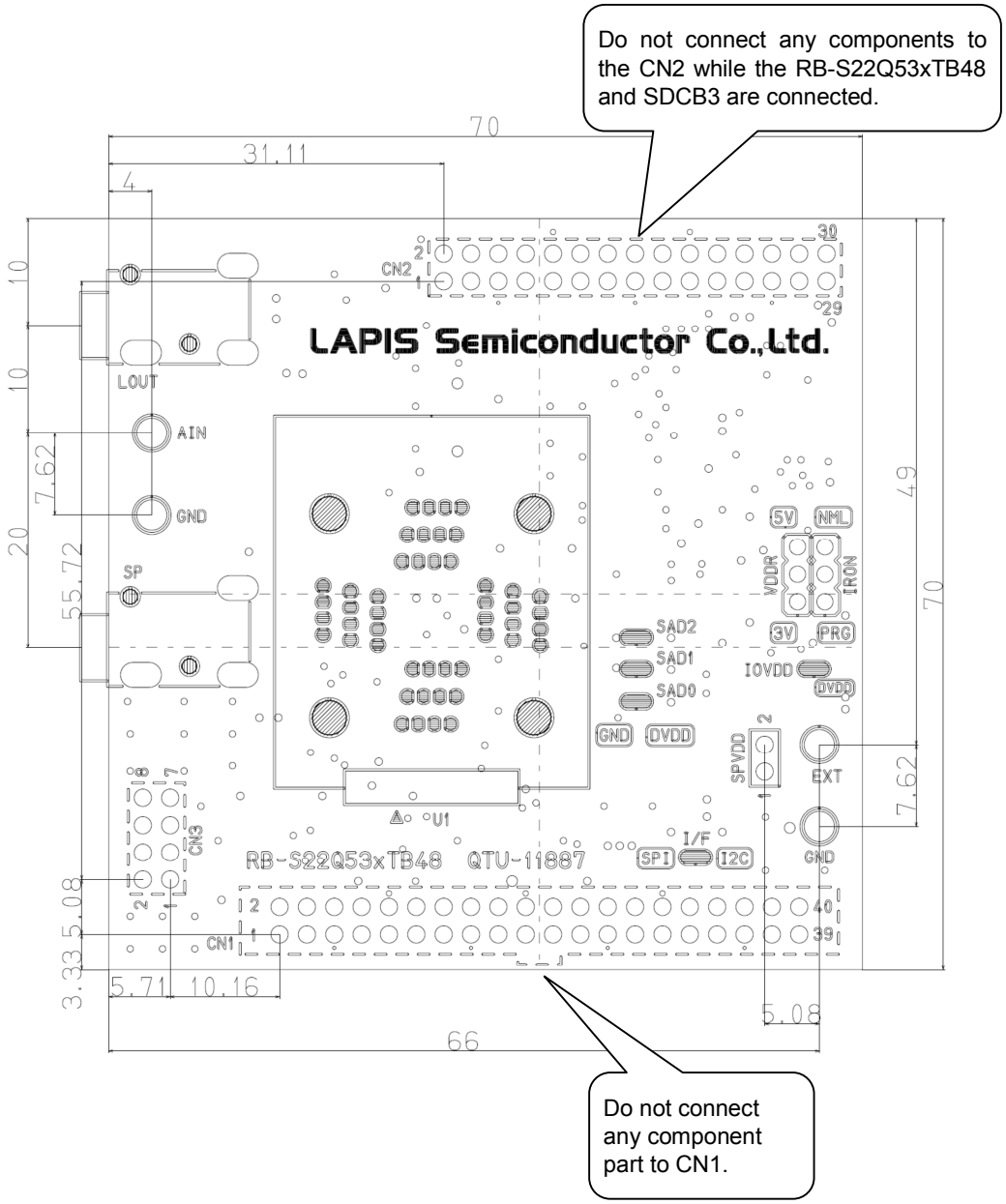
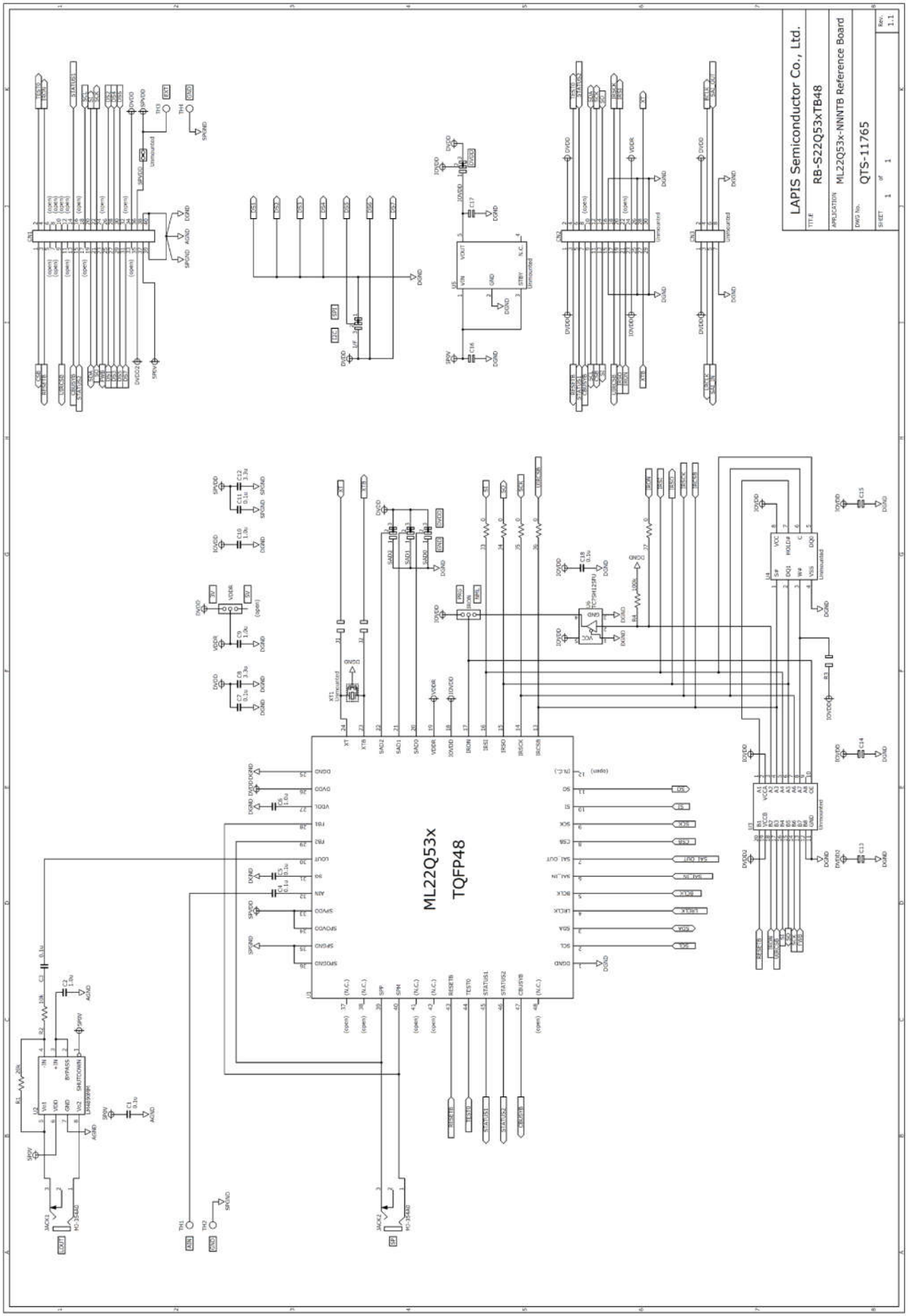


Figure 2 PCB layout

3.3. BOM list, Schematic

	Parts Number	Symbol	Contents	Qty.	Vendor
1	QTU-11887	RB-S22Q53xTB48	PCB	1	LAPIS Semiconductor Co., Ltd.
2	CGA3E2X7R1E104K080AA	C1,C3,C4,C5, C7,C11	Ceramic Capacitor 0.1μF/25V X7R	6	TDK Corporation
3	CGA3E1X7R1C105K080AC	C2,C6,C9,C10, C18	Ceramic Capacitor 1.0μF/16V X7R	5	TDK Corporation
4	C1608X5R1C335K080AC	C8,C12	Ceramic Capacitor 3.3μF/16V X5R	2	TDK Corporation
5	HIF3FB-40DA-2.54DSA(71)	CN1	40pin Receptacle	1	Hirose Electric Co., Ltd.
6	A2-3PA-2.54DSA	IRON,VDDR	3pin Pin Header	2	Hirose Electric Co., Ltd.
7	-	I/F,IOVDD	Select pad	2	-
8	MCR03EZPJ000	J3,J4,J5,J6,J7	Resistor 0Ω	5	Rohm Co., Ltd.
9	MJ-354A0	JACK1,JACK2	2-Conductor Miniature Jack	2	MARUSHIN ELECTRIC MFG. CO., LTD.
10	MCR03EZPJ203	R1	Resistor 20kΩ ±5%	1	Rohm Co., Ltd.
11	MCR03EZPJ103	R2	Resistor 10kΩ ±5%	1	Rohm Co., Ltd.
12	MCR03EZPJ104	R4	Resistor 100kΩ ±5%	1	Rohm Co., Ltd.
13	-	SAD0,SAD1,SAD2	Select pad	3	-
14	IC51-806.A106725-001	U1	TQFP P0.50 48P Socket	1	YAMAICHI ELECTRONICS Co., Ltd.
15	LM4890MM/NOPB	U2	Audio Power Amplifier	1	Texas Instruments Incorporated
16	TC7SH125FU	U6	Bus Buffer with 3-State Output	1	Toshiba Corporation
17	HIF3GA-2.54SP	-	Short Pin	2	Hirose Electric Co., Ltd.
18	-	C13,C14,C15,C16, C17	1608	5	-
19	-	CN2	Unmounted	1	-
20	-	CN3	Unmounted	1	-
21	-	J1,J2	Unmounted	2	-
22	-	SPVDD	Unmounted	1	-
23	-	R3	Unmounted	1	-
24	-	TH1,TH2,TH3,TH4	Unmounted	4	-
25	-	U3	Unmounted	1	-
26	-	U4	Unmounted	1	-
27	-	U5	Unmounted	1	-
28	-	XT1	Unmounted	1	-



3.4. CN1

CN1 is a 40-pin connector that is used to connect to the SDCB3.

3.5. CN2

CN2 is a 30-pin connector to which ML22Q532/ML22Q533/ML22Q535 terminals are connected.

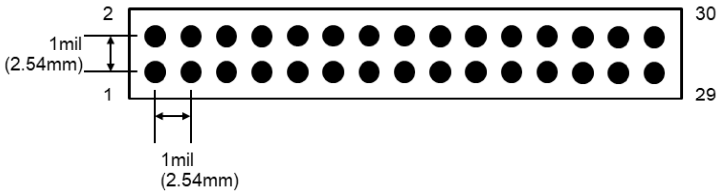


Figure 3 CN2 connectors hole pattern

Table 2 CN2 connector pin connections

CN2 Pin No		Connect LSI	LSI Pin No	LSI Pin Name
1	VDD (3V)	ML22Q532/ML22Q533/ML22Q535	26	DVDD
2	VDD (3V)	ML22Q532/ML22Q533/ML22Q535	26	DVDD
3	I/O	ML22Q532/ML22Q533/ML22Q535	43	RESETB
4	I/O	ML22Q532/ML22Q533/ML22Q535	44	TEST0
5	I/O	ML22Q532/ML22Q533/ML22Q535	45	STATUS1
6	I/O	ML22Q532/ML22Q533/ML22Q535	46	STATUS2
7	I/O	ML22Q532/ML22Q533/ML22Q535	47	CBUSYB
8	I/O	-	-	-
9	I/O	ML22Q532/ML22Q533/ML22Q535	2	SCL
10	I/O	ML22Q532/ML22Q533/ML22Q535	3	SDA
11	I/O	ML22Q532/ML22Q533/ML22Q535	8	CSB
12	I/O	ML22Q532/ML22Q533/ML22Q535	9	SCK
13	I/O	ML22Q532/ML22Q533/ML22Q535	10	SI
14	I/O	ML22Q532/ML22Q533/ML22Q535	11	SO
15	GND	ML22Q532/ML22Q533/ML22Q535	1, 25	DGND
16	GND	ML22Q532/ML22Q533/ML22Q535	1, 25	DGND
17	I/O	ML22Q532/ML22Q533/ML22Q535	13	IRCSB
18	I/O	ML22Q532/ML22Q533/ML22Q535	14	IRSCK
19	I/O	ML22Q532/ML22Q533/ML22Q535	15	IRSO
20	I/O	ML22Q532/ML22Q533/ML22Q535	16	IRSI
21	I/O	ML22Q532/ML22Q533/ML22Q535	17	IRON
22	I/O	-	-	-
23	IOVDD	ML22Q532/ML22Q533/ML22Q535	18	IOVDD
24	VDDR	ML22Q532/ML22Q533/ML22Q535	19	VDDR
25	GND	ML22Q532/ML22Q533/ML22Q535	1, 25	DGND
26	GND	ML22Q532/ML22Q533/ML22Q535	1, 25	DGND
27	I/O	ML22Q532/ML22Q533/ML22Q535	23	XTB
28	I/O	ML22Q532/ML22Q533/ML22Q535	24	XT
29	GND	ML22Q532/ML22Q533/ML22Q535	1, 25	DGND
30	GND	ML22Q532/ML22Q533/ML22Q535	1, 25	DGND

3.6. CN3

The CN3 is an 8-pin connector to which the ML22Q532/ML22Q533/ML22Q535 serial audio interface terminals are connected.

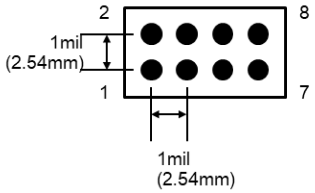


Figure 4 CN3 connectors hole pattern

Table 3 CN3 connector pin connections

CN3 Pin No		Connect LSI	LSI Pin No	LSI Pin Name
1	VDD (3V)	ML22Q532/ML22Q533/ML22Q535	26	DVDD
2	VDD (3V)	ML22Q532/ML22Q533/ML22Q535	26	DVDD
3	I/O	ML22Q532/ML22Q533/ML22Q535	4	LRCLK
4	I/O	ML22Q532/ML22Q533/ML22Q535	5	BCLK
5	I/O	ML22Q532/ML22Q533/ML22Q535	6	SAI_IN
6	I/O	ML22Q532/ML22Q533/ML22Q535	7	SAI_OUT
7	GND	ML22Q532/ML22Q533/ML22Q535	1, 25	DGND
8	GND	ML22Q532/ML22Q533/ML22Q535	1, 25	DGND

3.7. LOUT jack

LOUT is a jack to which the ML22Q532/ML22Q533/ML22Q535 line-amp outputs are connected via a speaker amplifier.

3.8. SP jack

SP is the jack to which ML22Q532/ML22Q533/ML22Q535 speaker amplifier outputs are connected.

3.9. AIN, GND terminal

This terminal is connected to the ML22Q532/ML22Q533/ML22Q535 speaker amplifier input terminal. Input a speaker amplifier input signal between the AIN pin and GND pin.

3.10. Ceramic resonator, External Clock

Ceramic resonator can be mounted on a XT1. Table 4 table shows the ceramic resonators used.

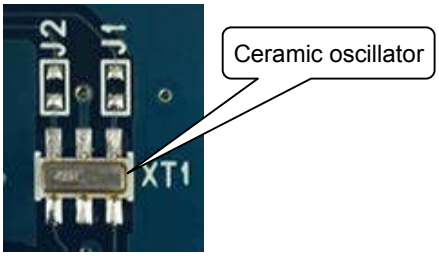


Figure 5 Ceramic resonator

Table 4 Ceramic resonator

Vendor	Frequency[Hz]	Parts Number
Murata Manufacturing Co., Ltd.	4M	CSTCR4M00G55B-R0
Murata Manufacturing Co., Ltd.	4.096M	CSTCR4M09G55B-R0

External clocks can be entered from the CN2's 28 pins. Connect between J1 terminals.

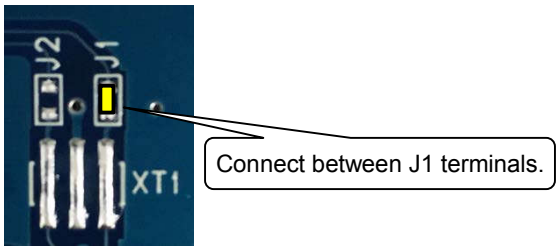


Figure 6 External clock

Revision History

Document No.	Issue Date	Page		Description
		Previous Edition	New Edition	
FEBL22Q53xRB-01	October 31, 2019	–	–	First edition.
FEBL22Q53xRB-03	March 26, 2020	3	3	3.3. BOM list, Schematic