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ROHM Co., Ltd.
April 1, 2024

ROHM GROUP
LAPIS TECHNOLOGY

FEBL22120RB-02

RB-D22120TB32
User's Manual

Issue Date: September 26, 2022

ROHM SEMICONDUCTOR

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Table of Contents

1. Overview

This instruction manual is for the RB-D22120TB32 which is the reference board for ML22120 (hereinafter referred to as "Speech Synthesis LSIs").

This board can be combined with Sound Device Control Board 3 (hereinafter referred to as "SDCB3") to do the following:

- Voice playback by ML22120.
- Writing sound code data into serial FLASH memory.

By connecting a flash writer to the RB-D22120TB32, sound code data can be written to the serial flash memory.

2. Operational notes

The following describes the precautions to follow when handling the RB-D22120TB32.

- Turn off the power when attaching the RB-D22120TB32 to the SDCB3.
- The ML22120 supply voltages are 2.7 to 3.6V. Use the RB-D22120TB32 with a power supply voltage of 3.0V.
- Connect LOUT jack(AMP->LOUT) and SAI jack(AMP->SAI R/AMP->SAI L) to the monaural speaker.

- RB-D22120TB32 is a device used only by experts in R&D facilities for research and development purposes. RB-D22120TB32 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 Technology does not provide any RB-D22120TB32 support. Replace only in case of initial failure.

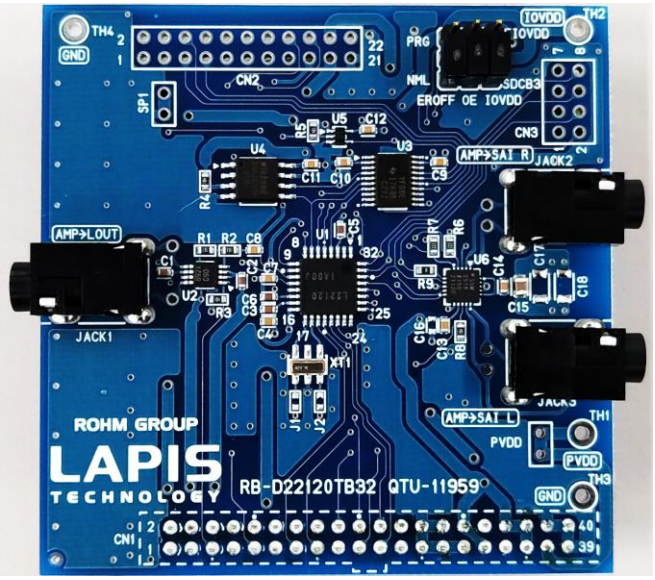


Figure 1 Outline Diagram

3. Specification

3.1. EROFF jumper pin

EROFF jumper pin is a jumper pin that switch the connection of EROFF pin of Speech Synthesis LSIs.

EROFF	Contents
NML	EROFF pin is connected to CN1,CN2.
PRG	EROFF pin is connected to IOVDD.

Set to NML when connecting to SDCB3 for use. EROFF pin is controlled from SDCB3.
When this board is used by itself, setting PRG enables the serial flash memory interface of Speech Synthesis LSIs.

3.2. OE jumper pin

OE jumper pin is a jumper pin that enables or disables the signal input/output of CN1(SDCB3) pins to the serial flash memory pins.

OE	Contents
NML	Enable: The pins of the serial flash memory are input/output to/from the pins of CN1.
PRG	Disable: The pins of the serial flash memory are not input/output to/from the pins of CN1.

Set to NML when connecting to SDCB3 for use.
When this board is used by itself, the serial flash memory interface signal of Speech Synthesis LSIs and CN2 signal are input/output to the serial flash memory when OE jumper pin is set to PRG.

3.3. IOVDD jumper pin

IOVDD jumper pin is a jumper pin that switch the connection of IOVDD pin of Speech Synthesis LSIs.

IOVDD	Contents
SDCB3	IOVDD pin is connected to DVDD (3.0V) supplied from CN1 (SDCB3).
EIOVDD	IOVDD pin is connected to 15pin of CN2.

Set to SDCB3 when connecting to SDCB3 for use.
When this board is used by itself, power can be supplied to IOVDD terminal of the speech synthesis LSI from 15pin of CN2 when IOVDD jumper pin is set to CN2.

3.4. LOUT(AMP->LOUT) jack

LOUT(AMP->LOUT) jack inputs the output of LOUT pin of the speech synthesis LSI to an external amplifier (ML4890 made by TI) and connects the output of the external amplifier.
Enable LOUT(AMP->LOUT) jack by selecting a combination that enables LOUT with the Mode radio button in the Output control dialog of the SDCB Controller. (Refer to Speech LSI Utility User's Manual.)
Connect a monaural speaker.

3.5. SAI(AMP->SAI R/AMP->SAI L) jack

SAI(AMP->SAI R/AMP->SAI L) jack inputs the output of STATUS1/MCLKO, BCLK, LRCLK and SAI_OUT pins of the speech synthesis LSI to an external amplifier (SSM2518 made by ANALOG DEVICES) and connects the output of the external amplifier.
Enable SAI(AMP->SAI R/AMP->SAI L) jack by selecting a combination that enables SAI with the Mode radio button in the Output control dialog of the SDCB Controller. (Refer to Speech LSI Utility User's Manual.)
Connect a monaural speaker.

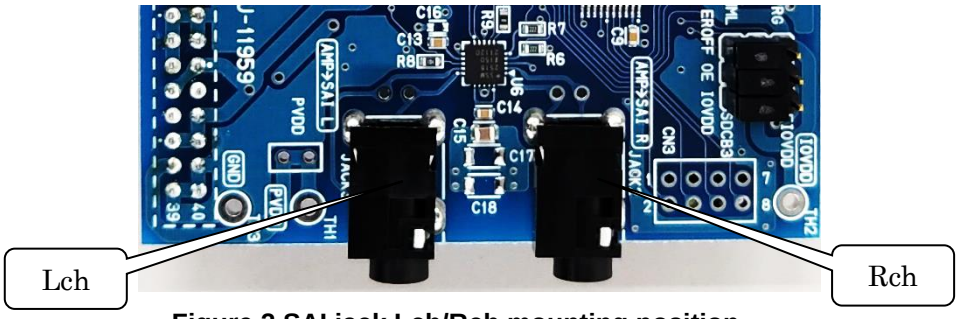


Figure 2 SAI jack Lch/Rch mounting position

3.6. PVDD jumper terminal, PVDD through hall

PVDD jumper terminal is used to switch the destination of PVDD pin of the RB-D22120TB32.
When supplying from SDCB3, connect 1-2pin of SPVDD jumper terminal.
To supply from an external source, cut the pattern between 1 and 2 pins of PVDD jumper terminal and input PVDD from the EXT throughhole(TH1).

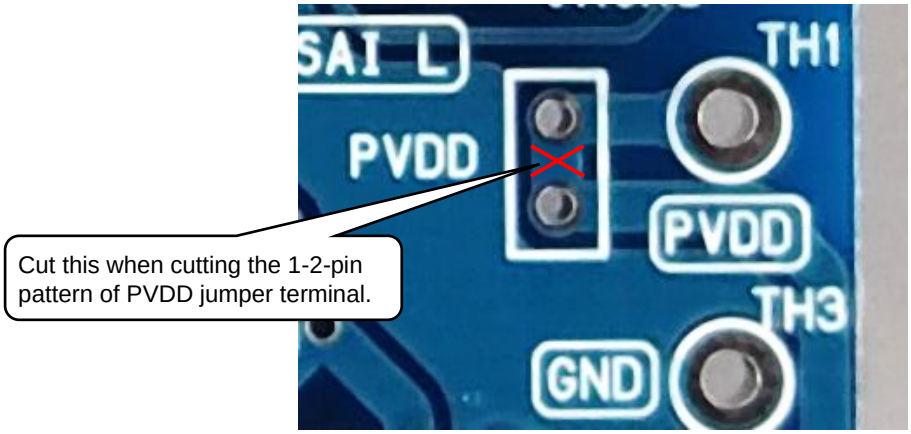


Figure 3 PVDD jumper terminal

3.7. XT1 land, J1 land

XT1 land is used to mount the Ceramic resonator.
When using a ceramic resonator for the clock of Speech Synthesis LSIs, mount the components.
When no component is mounted, Speech Synthesis LSIs operates with built-in RC oscillation.

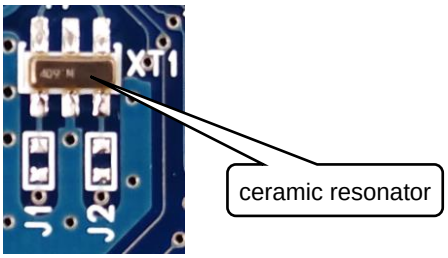


Figure 4 Ceramic resonator

A typical example of a ceramic resonator that matches XT1 land foot pattern is shown below.

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

J1 land is land connecting the XT pin of speech synthesis LSIs to the 1pin (XT) of CN2.
To use an external clock for Speech Synthesis LSIs clock, remove XT1, connect the J1 land pin and input them from the 1pin (XT) of CN2.

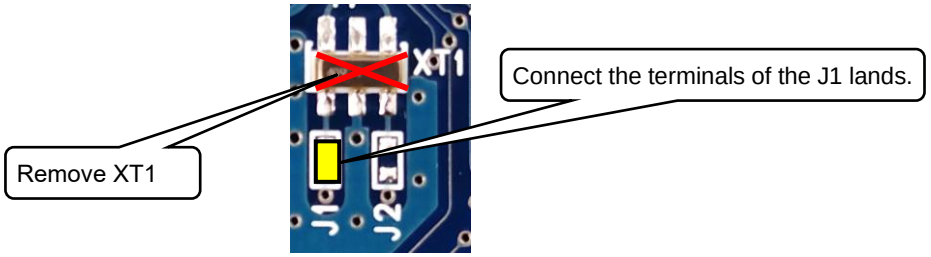


Figure 5 J1 land

3.8. CN1 connector

CN1 connector is used to connect to SDCB3.

3.9. CN2 connector

CN2 connector is used to connect to the pins of Speech Synthesis LSIs. The diameter of the through hole is 1.0mm.

CN2 Pin No	LSI		I/O		
	Pin No	Pin Name	SDCB3 connection	Single unit serial flash memory interface: Enable	Single unit serial flash memory interface: Disable
1	17	XT*1	O	O	O
2	18	XTB*1	O	I	I
3	19	TEST0	O	I	I
4	20	STATUS0	O	O	O
5	21	SCK/SAD0	O	I	I
6	22	SO/SAD1	O	O	O
7	25	SI/SDA	O	I	I
8	26	CSB/SCL	O	I	I
9	28	STATUS2	O	O	O
10	4	ERCSB	O	O	I
11	5	ERSCK	O	O	I
12	6	ERSI	O	O	O
13	7	ERSO	O	O	I
14	8	EROFF*2	O	O	O
15	3	EIOVDD*3*4	O	I	I
16	9	RESETB	O	I	I
17	11	LOUT	O	O	O
18	12	SG	O	O	O
19	14	VDDL	O	O	O
20	15	DVDD*4	O	I	I
21	-	DGND	-	-	-
22	-	-	-	-	-

*1 When the J1 and J2 lands are connected, the XT and XTB pins of Speech Synthesis LSIs are input and output.
*2 Connecting to the NML signal of CN1, Not pin of Speech Synthesis LSIs.
*3 Supply IOVDD externally when IOVDD jumper pin is set to CN2.
*4 Do not supply DVDD,IOVDD from CN2 when connecting SDCB3.

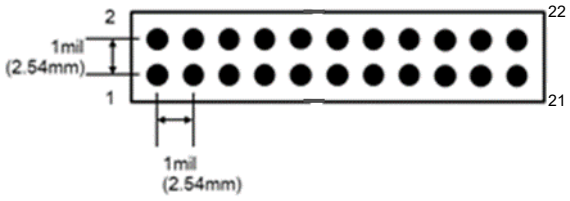


Figure 6 CN2 connectors hole pattern

3.10. CN3 connector

CN3 connector is used to connect to the serial audio interface pin of Speech Synthesis LSIs. The diameter of the through hole is 1.0mm.

CN3 Pin No	LSI		I/O
	Pin No	Pin Name	
1	-	DGND	P
2	29	STAUST1/MCLKO	O
3	-	DGND	P
4	30	BCLK	O
5	-	DGND	P
6	31	LRCLK	O
7	-	DGND	P
8	32	SAI_OUT	O

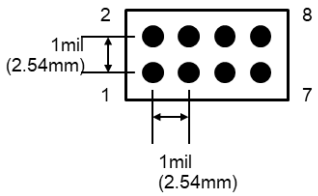


Figure 7 CN3 connectors hole pattern

4. Appendix

4.1. PCB layout

Figure 8 shows the RB-D22120TB32 PCB layout.

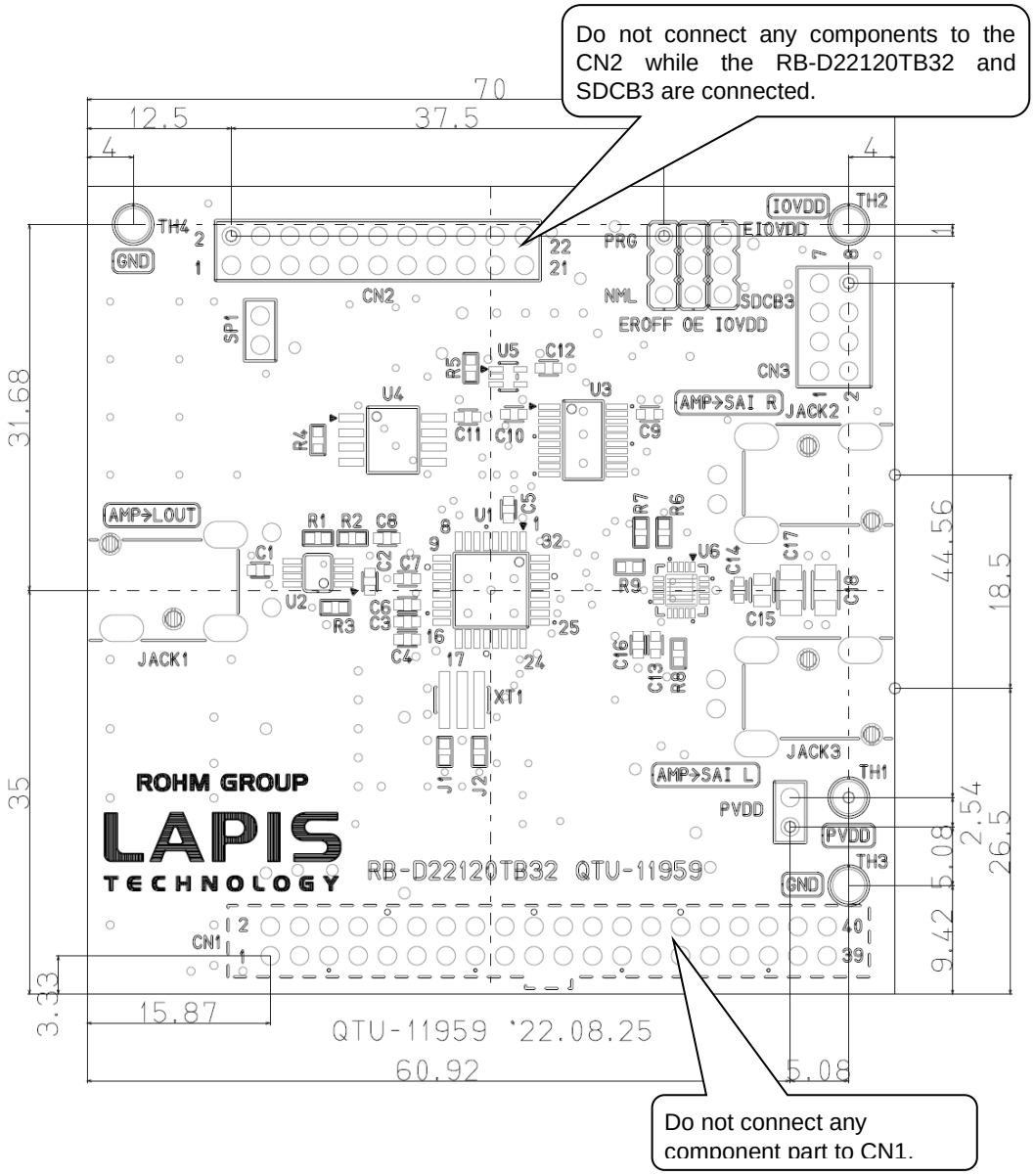


Figure 8 PCB layout

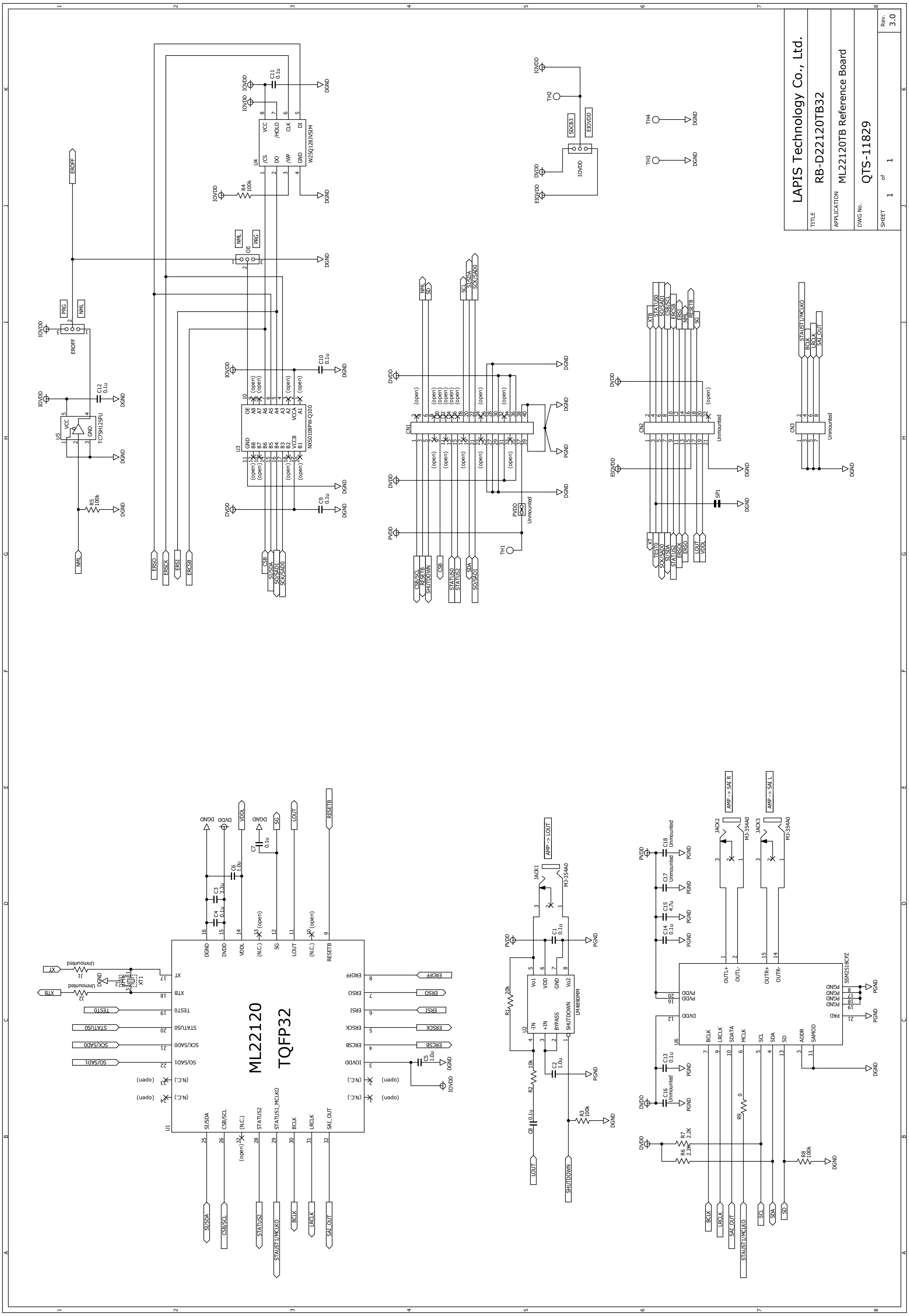
4.2. BOM list, Schematic

	Parts Number	Symbol	Contents	Qty.	Vendor
1	QTU-11959	RB-D22120TB32	PWB	1	LAPIS Technology Co., Ltd.
2	CGA3E2X7R1E104K080AA	C1,C4,C7,C8,C9,C10, C11,C12,C13,C14	Ceramic Capacitor 0.1μF/25V X7R	10	TDK Corporation
3	CGA3E1X7R1C105K080AC	C2,C5,C6	Ceramic Capacitor 1.0μF/25V X7R	3	TDK Corporation
4	C1608X5R1C335K080AC	C3	Ceramic Capacitor 3.3μF/16V X5R	1	TDK Corporation
5	CGA4J3X7R1C475K125AE	C15	Ceramic Capacitor 4.7μF/16V X7R	1	TDK Corporation
6	HIF3FB-40DA-2.54DSA(71)	CN1	40pin Receptacle	1	Hirose Electric Co., Ltd.
7	A2-3PA-2.54DSA	EROFF,IOVDD,OE	3pin Pin Header	3	Hirose Electric Co., Ltd.
8	MJ-354A0	JACK1,JACK2,JACK3	Monaural Speaker Jack	3	MARUSHIN
9	MCR03EZPJ203	R1	Resistor 20kΩ ±5%	1	Rohm Co., Ltd.
10	MCR03EZPJ103	R2	Resistor 10kΩ ±5%	1	Rohm Co., Ltd.
11	MCR03EZPJ104	R3,R4,R5,R8	Resistor 100kΩ ±5%	4	Rohm Co., Ltd.
12	MCR03EZPJ222	R6,R7	Resistor 2.2kΩ ±5%	2	Rohm Co., Ltd.
13	MCR03EZRJ000	R9	Resistor 0Ω	1	Rohm Co., Ltd.
14	ML22120TB (32-pin TQFP)	U1	Speech Synthesis LSI with pitch control function for Automotive	1	LAPIS Technology Co., Ltd.
15	LM4890MM/NOPB	U2	Audio Power Amplifier	1	Texas Instruments Incorporated
16	NXS0108PW-Q100	U3	Voltage level translation	1	Nexperia B.V.
17	W25Q128JVSIM	U4	128Mb Serial NOR Flash Memory	1	Winbond Electronics Corp.
18	TC7SH125FU	U5	Bus Buffer with 3-State Output	1	Toshiba Corporation
19	SSM2518CPZ	U6	Audio Power Amplifier 2 W, Class-D	1	Analog Devices Inc.
20	CSTCR4M09G55B-R0	XT1	Ceramic Resonator 4.096MHz ±0.50%	1	Murata Manufacturing Co., Ltd.
21	-	C16,C17,C18	Unmounted	3	-
22	-	CN2, CN3	Unmounted	2	-
23	-	J1,J2	Unmounted	2	-
24	-	PVDD	Unmounted	1	-
25	-	SP1	Unmounted	1	-
26	-	TH1,TH2,TH3,TH4	Unmounted	4	-

Replacement Parts

16	TXS0108EPWR	U3	Voltage level translation	1	Texas Instruments Incorporated
17	MT25QL128ABA1ESE	U4	128Mb Serial NOR Flash Memory	1	Micron Technology, Inc.

Note
- CN2 and CN3 through-hole diameter is 1.0mm. When mounting a connector, use a connector with a pin diameter of 0.64 mm or less, such as 0.6 mm.
- Parts may be replaced with parts with equivalent performance.


LAPIS Technology Co., Ltd.
TITLE
RB-D22120TB32
APPLICATION
ML22120TB Reference Board
DWG No.
QTS-11829
SHEET 1 of 1
Rev. 3.0
ML22120
TQFP32

5. Revision History

Document No.	Issue Date	Page		Description
		Previous Edition	New Edition	
FEBL22120RB-01	September 20,2022	–	–	First edition.
FEBL22120RB-02	September 26,2022	8	8	4.2 BOM list, Schematic Correction of errors