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ROHM Co., Ltd.
April 1, 2024

RB-D610Q327TB48
User's Manual

Issue Date: January 13, 2022

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Table of Contents

1. Overview

This instruction manual is for the RB-D610Q327TB48 which is the reference board for ML610Q327 (hereinafter referred to as "MCU") that is 8-bit microcontroller with voice output function.

This board can be combined with on-chip debug tool EASE1000 V2 and software development enviroment(DUT8 and MWU16) to do the following:

- – Development and debugging of the MCU control software.
- – Programing control and sound code data to the MCU internal Flash-ROM.
- – Voice playback by the MCU.

2. Operational notes

The following describes the precautions to follow when handling the RB-D610Q327TB48.

- – Turn off the power when inserting and removing jumper socket from PWR/SPVDD/VREF Jumper pin on the RB-D610Q327TB48.
- – Turn off the power when attaching and deattaching external board, device and cable from CN1/CN2/CNE Connector on the RB-D610Q327TB48.
- – Connect only monaural speakers to the jack on the RB-D610Q327TB48.

- – RB-D610Q327TB48 is a device used only by experts in R&D facilities for research and development purposes. RB-D610Q327TB48 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-D610Q327TB48 support. Replace only in case of initial failure.

3. Hardware specifications

Table 1 shows the hardware specifications of RB-D610Q327TB48. For more information about the connection of the mounted components, see the schematic.

Table 1　Hardware specifications

Mounted LSI	・ U1: ML610Q327 48pin TQFP
Other Mounted components	・ PWR(J1): Jumper for selecting the power supply input (3pin pin-header and short pin)
	・ VREF(J2): Jumper for selecting VREF(3pin pin-header and short pin)
	・ SPVDD(J3): Jumper for selecting SPVDD(3pin pin-header and short pin)
	・ C1-C4: Capacitors for Powers
	・ P22-P24: LEDs
	・ R1-R3: Resistors for LEDs
	・ R4-R6: Jumper Chip for connecting LEDs
	・ R7-R10: Resistors for Successive Approximation Type A-D Converter
	・ JACK: Jack for connecting Speakers
	・ CNE: Connector for EASE1000 V2(14pin connector)
Pads (or/and) Through holes for mounting components	・ C5-C8: Capacitors for Successive Approximation Type A-D Converter
	・ CN1-CN2: Connectors for user application system (32pin, 2.54mm pitch, φ0.8mm)
	・ SP1: Land for ferrite beads(1608)
Power check pins/pads	・ VDD、SPVDD、UVDD、USPVDD、VSS、SPVSS、AIN4-AIN7 (φ0.8mm)
Operating voltage	・ +2.0～+5.5V
Board size	・ 55.88 mm x 93.98 mm

4. Board Outline Diagram

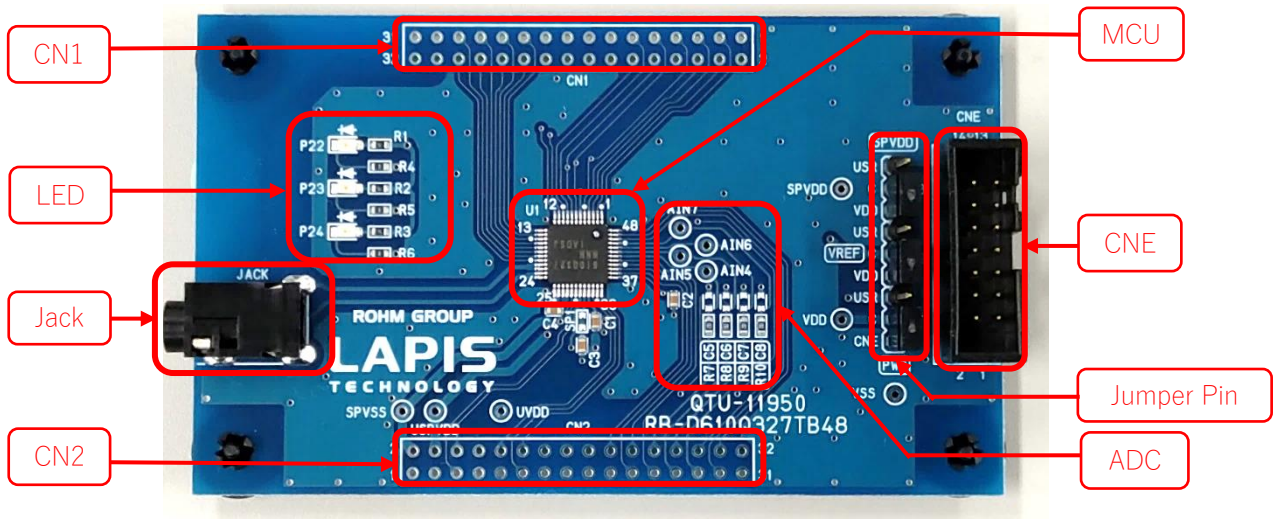Figure 1 shows an outline diagram of the RB-D610Q327TB48.

Figure 1 Board Outline Diagram

5. Specification

5.1. Power Circuit

Figure 2 shows a power curcuit of the RB-D610Q327TB48.The RB-D610Q327TB48 has junper pins that can switch the supply source of the VDD / VREF / SPVDD pins of MCU. Each is explained below.
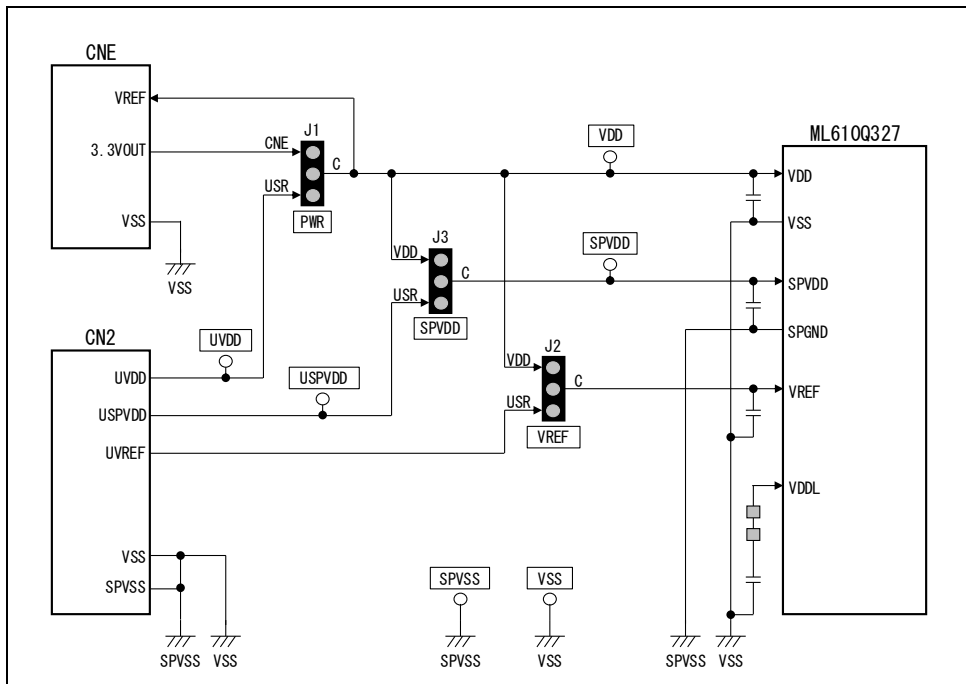

Figure 2 Power circuit

・PWR jumper pin(J1)

PWR jumper pin can switch the supply source of VDD pin of MCU.

PWR	Contents
CNE	VDD pin is connected to 13pin of CNE.
USR	VDD pin is connected to 9pin (UVDD) of CN2.

When attaching "EASE1000 V2" on the board, PWR jumper pin set to "EASE" if power supply from 13pin of CNE connector. PWR jumper pin set to "USR" if power supply from CN1 connector.

・VREF jumper pin(J2)

VREF jumper pin can switch the supply source of VREF pin of MCU.

VREF	Contents
VDD	VREF pin is connected to 2pin of PWR jumper pin.
USR	VREF pin is connected to 19pin (UVREF) of CN2.

VREF jumper pin set to "VDD" if power supply from VDD as same as selecting PWR jumper pin. VREF jumper pin set to "USR" if power supply from CN2 connector.

・SPVDD jumper pin(J3)

SPVDD jumper pin can switch the supply source of SPVDD pin of MCU.

SPVDD	Contents
VDD	SPVDD pin is connected to 2pin of PWR jumper pin.
USR	SPVDD pin is connected to 3/4pins (USPVDD) of CN2.

SPVDD jumper pin set to "VDD" if power supply from VDD as same as selecting PWR jumper pin. SPVDD jumper pin set to "USR" if power supply from CN1 connector.

5.2. LED(P22-P24)

P22-24 pins of MCU on the RB-D610Q327TB48 allow direct LEDs drive. Enable to use LEDs connecting these pins when the N-channel open drain output is selected. Unmount register on the board indicated by "R4-R6" when not using LEDs. Figure 3 shows the LED circuit processing example.
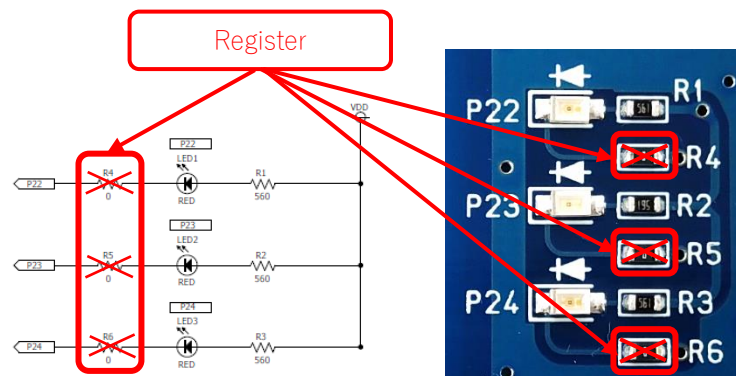

Figure 3 LED circuit processing example

5.3. ADC(AIN4-AIN7)

The RB-D610Q327TB48 has registers indicated by "R7-R10" and capacitors indicated by "C5-C8" (not mounted) so that P44-P47 pins of MCU are enable to use as AIN4-AIN7 which are Succesive Approximation type A-D Converter functions. Mount a noise reduciton capacitor on board land indicated by "C5-C8" if necessary. Figure 4 shows the ADC circuit processing example.

When using the Succesive Approximation type A-D Converter functions without using resistors, apply a voltage to the through hole.
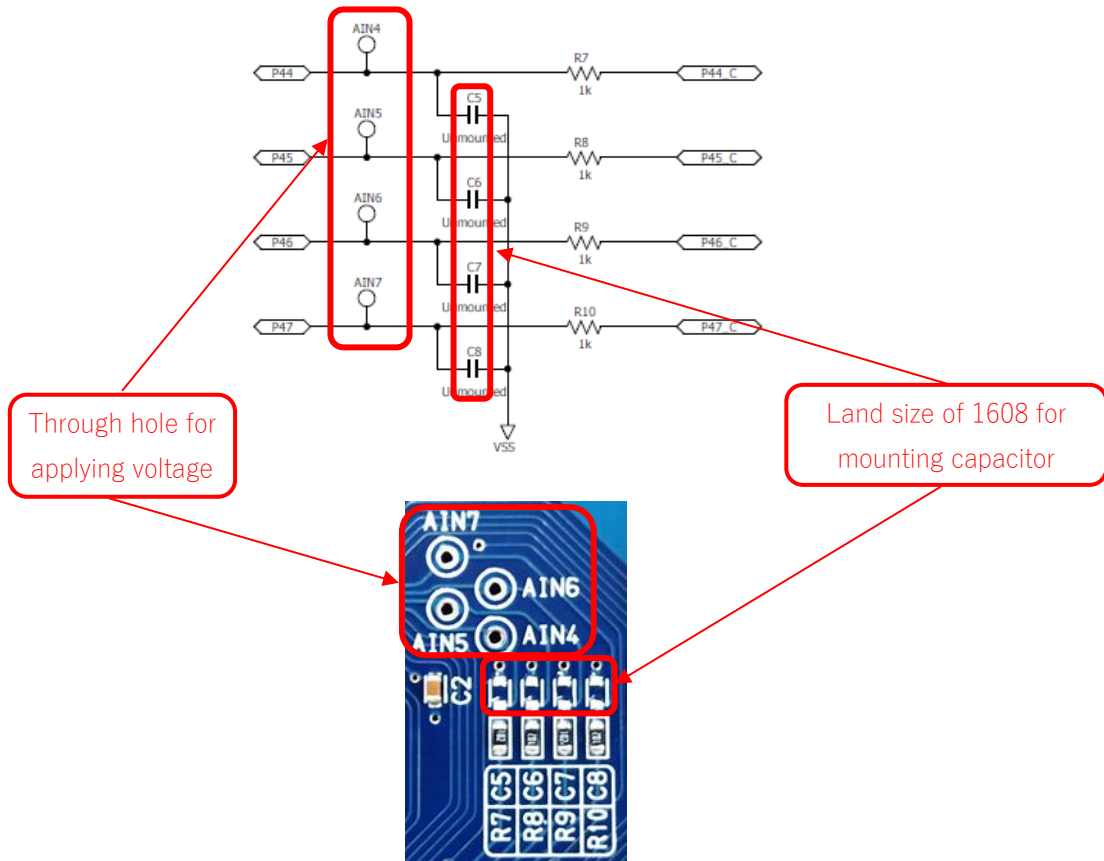

Figure 4 ADC circuit processing example

5.4. Jack

Jack is connnected to SPP/SPM pins of the MCU.
Connect only monaural speakers to the jack.

5.5. CN1 Connector

The through hole indicated by "CN1" is enable to mount connector that specification is double row, 16 positions and 2.54mm(0.1mil) pich.
Table 2 shows a CN1 connector pin assignment.

Table 2 CN1 connector pin assignment

CN1	Connected to			Remarks
Pin number	Part Symbol	Number	Pin name	
1	-	-	-	
2	-	-	-	
3	U1	1	P80/EXI0	
4	U1	2	P81/EXI1	
5	U1	3	P20/LED0	
6	U1	4	P21/LED1	
7	U1	5	P22/LED2	
8	VSS	-	VSS	
9	U1	7	P23/LED3	
10	U1	8	P24/LED4	
11	U1	9	P25/LED5	
12	U1	10	P91	
13	-	-	-	
14	-	-	-	
15	VSS	-	VSS	
16	VSS	-	VSS	
17	-	-	-	
18	-	-	-	
19	-	-	-	
20	-	-	-	
21	U1	13	P82/EXI2	
22	U1	14	P83/EXI3	
23	U1	15	PA3	
24	U1	16	PA2	
25	U1	17	PA1	
26	U1	18	PA0	
27	U1	19	P90	
28	U1	20	RESET_N	
29	U1	21	SPP	
30	U1	22	SPP	
31	U1	23	SPM	
32	U1	24	SPM	

5.6. CN2 Connector

The through hole indicated by "CN2" is enable to mount connector that specification is double row, 16 positions and 2.54mm(0.1mil) pich.
Table 3 shows a CN2 connector pin assignment.

Table 3 CN2 connector pin assignment

CN2	Connected to			Remarks
Pin number	Part Symbol	Number	Pin name	
1	U1	27	SPVSS	
2	U1	28	SPVSS	
3	J3	3	USPVDD	J3:SPVDD jumper
4	J3	3	USPVDD	J3:SPVDD jumper
5	U1	29	P84/EXI4	
6	U1	30	P92	
7	VSS	-	VSS	
8	VSS	-	VSS	
9	J1	3	UVDD	J1:PWR jumper
10	U1	34	PB0	
11	U1	35	PB1/TIA0A	
12	U1	36	PB2/TIA0C	
13	-	-	-	
14	-	-	-	
15	-	-	-	
16	-	-	-	
17	-	-	-	
18	-	-	-	
19	J2	3	UVREF	J2:VREF jumper
20	U1	38	P40/AIN0/HPC0	
21	U1	39	P41/AIN1/HPC1	
22	U1	40	P42/AIN2/TIAOUT	
23	U1	41	P43/AIN3	
24	U1	42	P44/AIN4	
25	U1	43	P45/AIN5	
26	U1	44	P46/AIN6	
27	U1	45	P47/AIN7	
28	U1	46	P85/EXI5	
29	U1	47	P86/EXI6	
30	U1	48	P87/EXI7	
31	-	-	-	
32	-	-	-	

5.7. CNE connector

CNE connector is used to connect the on-chip debug tool EASE1000 V2 manufactured by LAPIS Technology Co.,Ltd.
Refer to the "EASE1000 V2 User's Manual" for details.

6. PCB specification, BOM list and Schematic

6.1. PCB specification

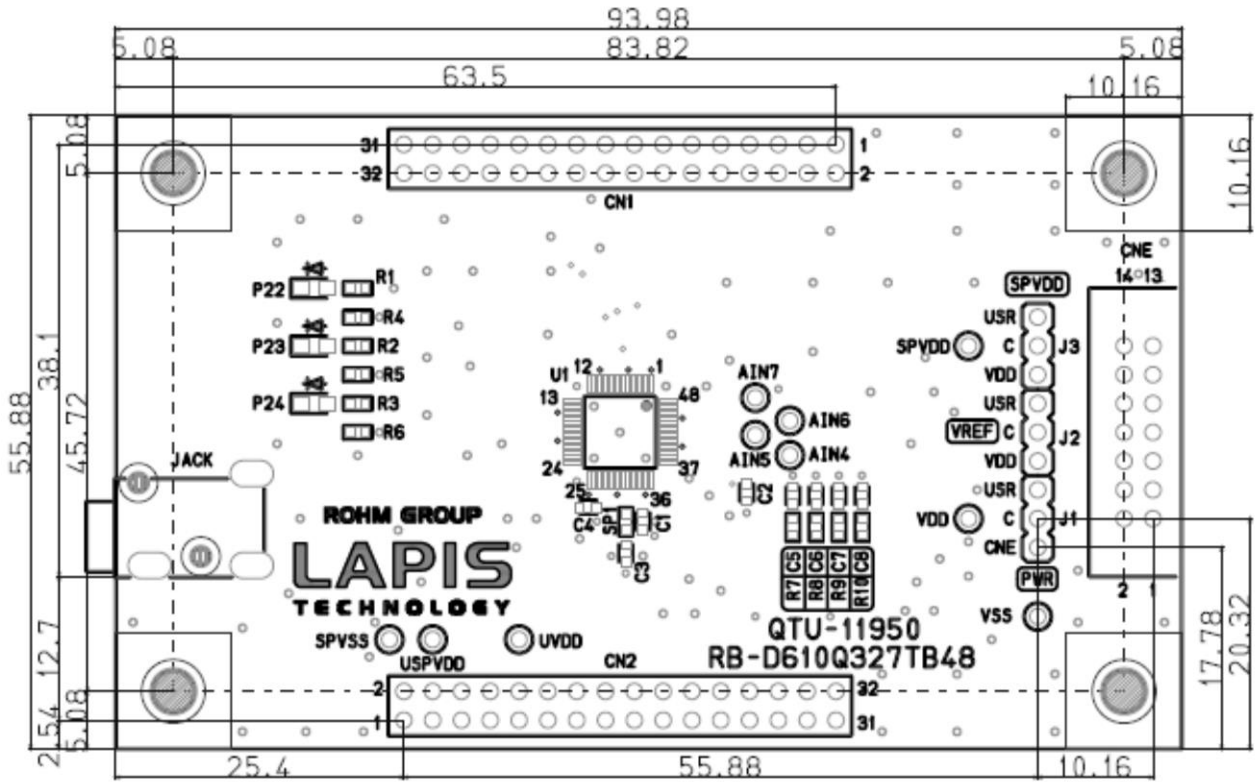Figure 5 shows the PCB dimensional outline diagram and layout of components.

Figure 5 PCB dimensional outline diagram and layout of components (Top view)

6.2. BOM list

Table 4 BOM list

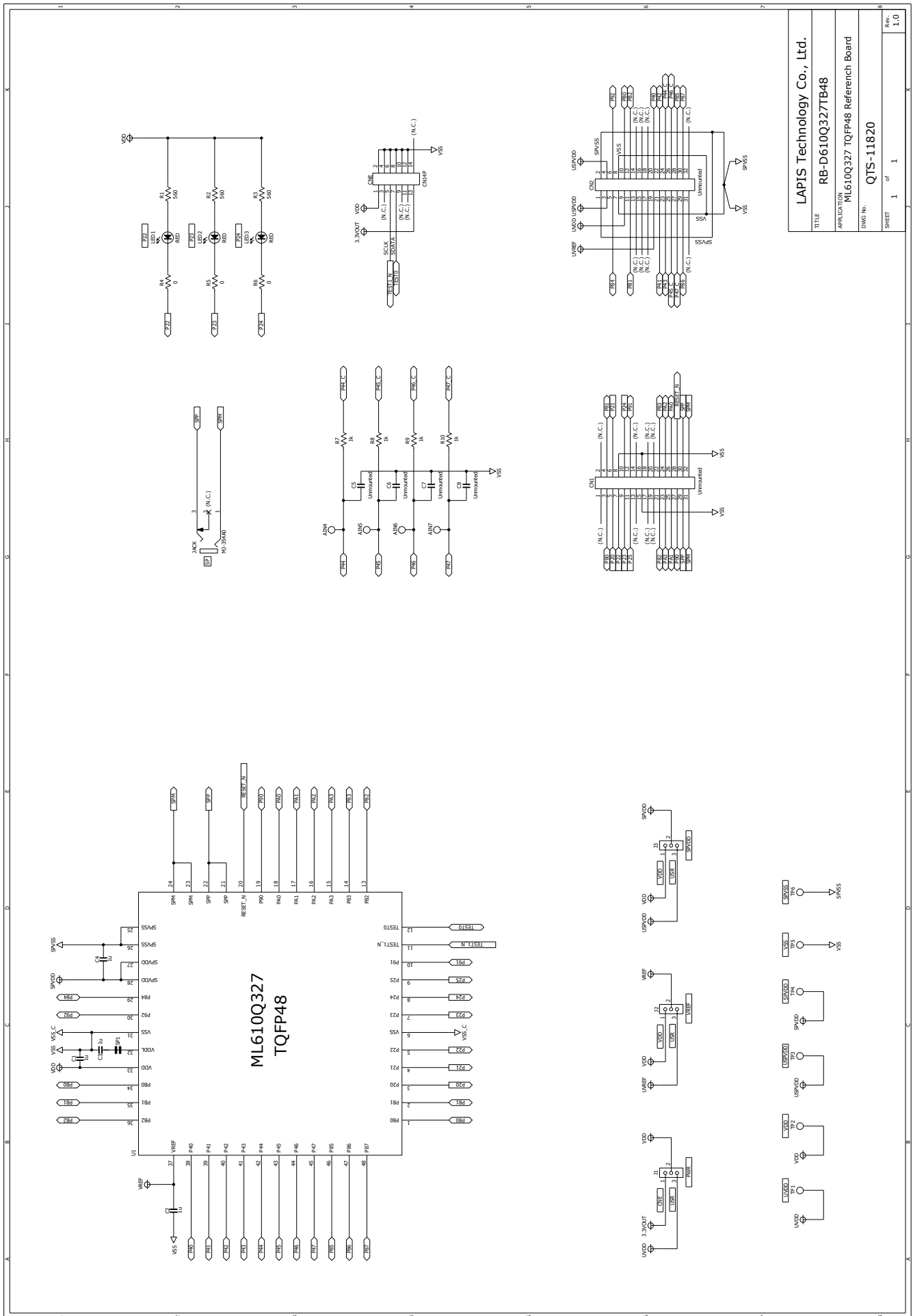|	Parts Number	Symbol	Contents	Qty.	Vendor
1	QTU-11950	RB-D610Q327TB48	PWB	1	LAPIS Technology Co., Ltd.
2	C1608X7R1E105K080AB	C1,C2,C3,C4	Ceramic Capacitor 1uF/25V X7R	4	TDK
3	-	C5,C6,C7,C8	Unmounted	4	-
4	-	CN1,CN2	Unmounted	2	-
5	HIF3FC-14PA-2.54DSA	CNE	14pin Header	1	HIROSE
6	MJ-354A0	JACK	Monaural Speaker Jack	1	MARUSHIN
7	SML-M13UT	LED1,LED2,LED3	LED Red	3	ROHM
8	MCR03EZPJ561	R1,R2,R3	Resistor 560Ω ±5%	3	ROHM
9	MCR03EZRJ000	R4,R5,R6	Resistor 0Ω	3	ROHM
10	MCR03EZPJ102	R7,R8,R9,R10	Resistor 1kΩ ±5%	4	ROHM
11	A2-3PA-2.54DSA(71)	J1,J2,J3	3pin Header	3	HIROSE
12	HIF-3GA-2.54SP	-	Jumper Socket	3	HIROSE
13	-	TP1,TP2,TP3,TP4,TP5,TP6	Unmounted	6	-
14	-	AIN4,AIN5,AIN6,AIN7	Unmounted	4	-
15	ML610Q327-NNNTB	U1	MCU	1	LAPIS Technology Co., Ltd.
16	FF013-P3555-AR791	-	Rubber leg, Push rivet	4	KOYO FASTENER

[Note]

- The diameter of through hole of CN1 and CN2 is 0.8mm.

  Using CN1 and CN2, the diameter of connector pin should use the connector below 0.8mm, such as 0.5mm.

- The parts may be changed into another parts with equivalent part special quality.

6.3. Schematic

The schematic of RB-D610Q327TB48 is shown below.

LAPIS Technology Co., Ltd.

RB-D610Q327TB48

TITLE
APPLICATION
ML610Q327 TQFP48 Referench Board

DWG No.
QTS-11820

SHEET   1   of   1

Rev.
1.0

ML610Q327
TQFP48

7. Revision History

Document No.	Issue Date	Page		Description
		Previous Edition	New Edition	
FJBL610Q327RB-01	Jan 13, 2022	–	–	First edition.