LAPIS SEMICONDUCTOR

FEBL610Q411/412RB-03

# ML610Q411/412 Reference Board User's Manual

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# Preface

This manualdescribes the ML610Q411/412 Reference Board.

The following manuals are also available. Read them as necessary.

- ML610Q411/Q412/Q415 User's Manual
  Description on the ML610Q411/ML610Q412/ML610Q415

- uEASE User's Manual
  Description on the on-chip debug tool uEASE.

# 1. Overview

## 1.1 Features

ML610Q411/412ReferenceBoard is a board for evaluating the function of ML610Q411 or ML610Q412. This board can connect the pin of ML610Q411/412 with a user application system, it can perform the check of a system of operation easily.
By using the board with "on-chip debug emulator" (hereinafter referred to "uEASE") not only Software debugging but also writing Flash ROM in the devices are capable.

The hardware specification of this board is shown below.

| | |
|---|---|
| Embedded microcontroller | ・ U1: ML610Q411 or ML610Q412<br>(The part name is labeled on the solder side of the board.) |
| Embedded parts | ・ X1, C3, C4: 32.768KHz resonator and capacitors |
| | ・ PWR: Jumper for input power supply switch ( 3pin pin-header and short pin ) |
| | ・ CNUE: Connector for uEASE ( 14pin connector ) |
| | ・ C2, C5-C13: Capacitors for power supply |
| Pads for mounting | ・ CNU1 to CNU4: Pads for peripheral board connectors ( 34pin x 4、2.54mm pitch ) |
| | ・ IN0, CS0, RCT0, RS0, RT0, CVR0, IN1, CS1, RS1, RT1, CVR1:<br>Pads for RC oscillation type ADC parts |
| | ・ SP1 to SP15: Pads for opening or short ( 1608 type ) |
| | ・ X2, C0, C1: Pads for mounting high-speed clock oscillation circuit parts( Don't use) |
| Power supply pads | ・ DVDD, GND, AVDD, VREF,AGND |
| AIN0,AIN1 pads | ・ AIN0, AIN1 |
| Monitor pads | ・ RCM: RC oscillation monitor |
| Operating voltage | ・ +1.1V to +3.6V |
| Board size | ・ 71.12 x 60.96 mm |

The high-speed clock oscillation circuit of this board don't use.
Please don't mount with parts to X2, C0 and C1.

This board is made on the assumption that it is used mounting in the user application board.
There is a possibility of short the circuit when using it on electroconductive so that the board may have the pattern on the solder side.
Therefore, please use the board on nonconductivity or put the protection parts on the solder side if necessary.

## 1.2 PCB outline drawing

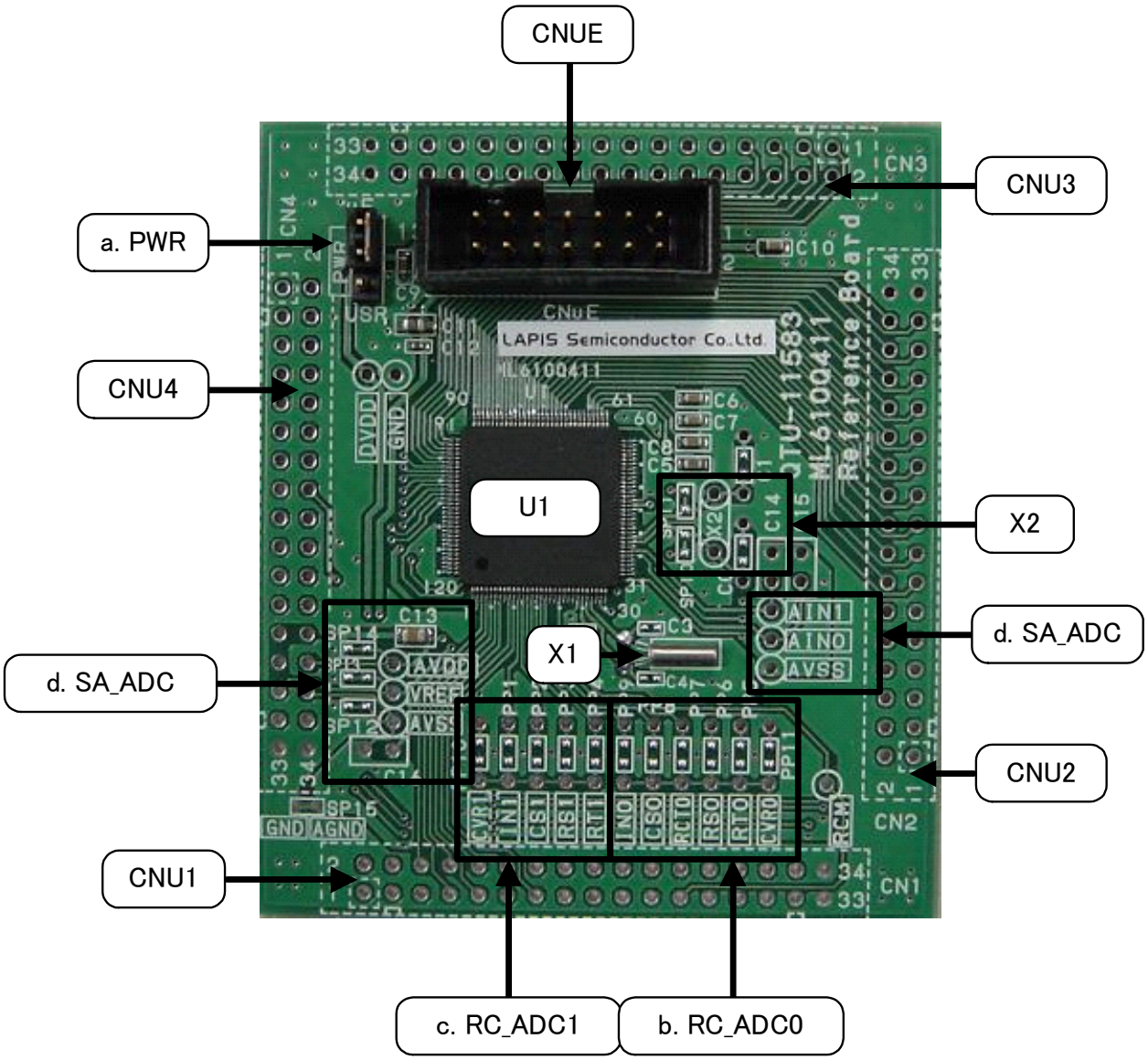



Fig.1 PCB outline drawing

# 2. Function

## 2. 1 PWR Jumper ( a. PWR )

This is a jumper which input power supply.
When supplying from uEASE, PWR jumper is set to the uE side.
The ability to supply power of the uEASE is +3.3V/100mA.
When supplying from CNU4_1pin and CNU4_2pin, PWR jumper is set to the USR side.

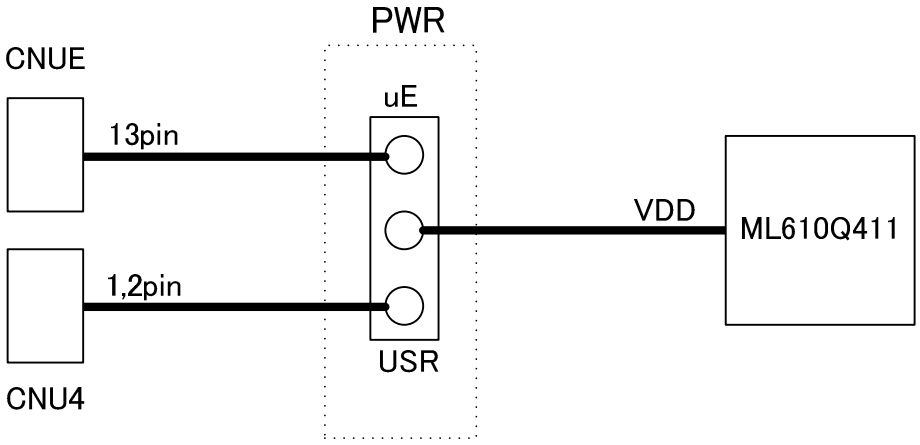



Fig.2 The connection of PWR jumper

**【Note】**
Notes when the PWR jumper is set to USR side and the uEASE is connected.
Turn on the power supply of the peripheral board after starting the uEASE.
Moreover, Stop the uEASE after turning off the power supply of the peripheral board.

## 2. 2 When you use RC_ADC0 (b. RC_AADC0)

Please cut each short pattern of SP5, SP6, SP7, SP8 and SP9 that is on the back side of this board.
If each short pattern is not cut, the RC-ADC0 converter may not have accurate conversion result under the influence of the noise. Please be sure the cut each short pattern.

Please mount parts on the each pad of the IN0, CS0, RCT0, RS0, RT0 and CVR0 pads.
Refer to ML610Q411/Q412/Q415 User's Manual for the parts to mount.

The example of processing is shown below.

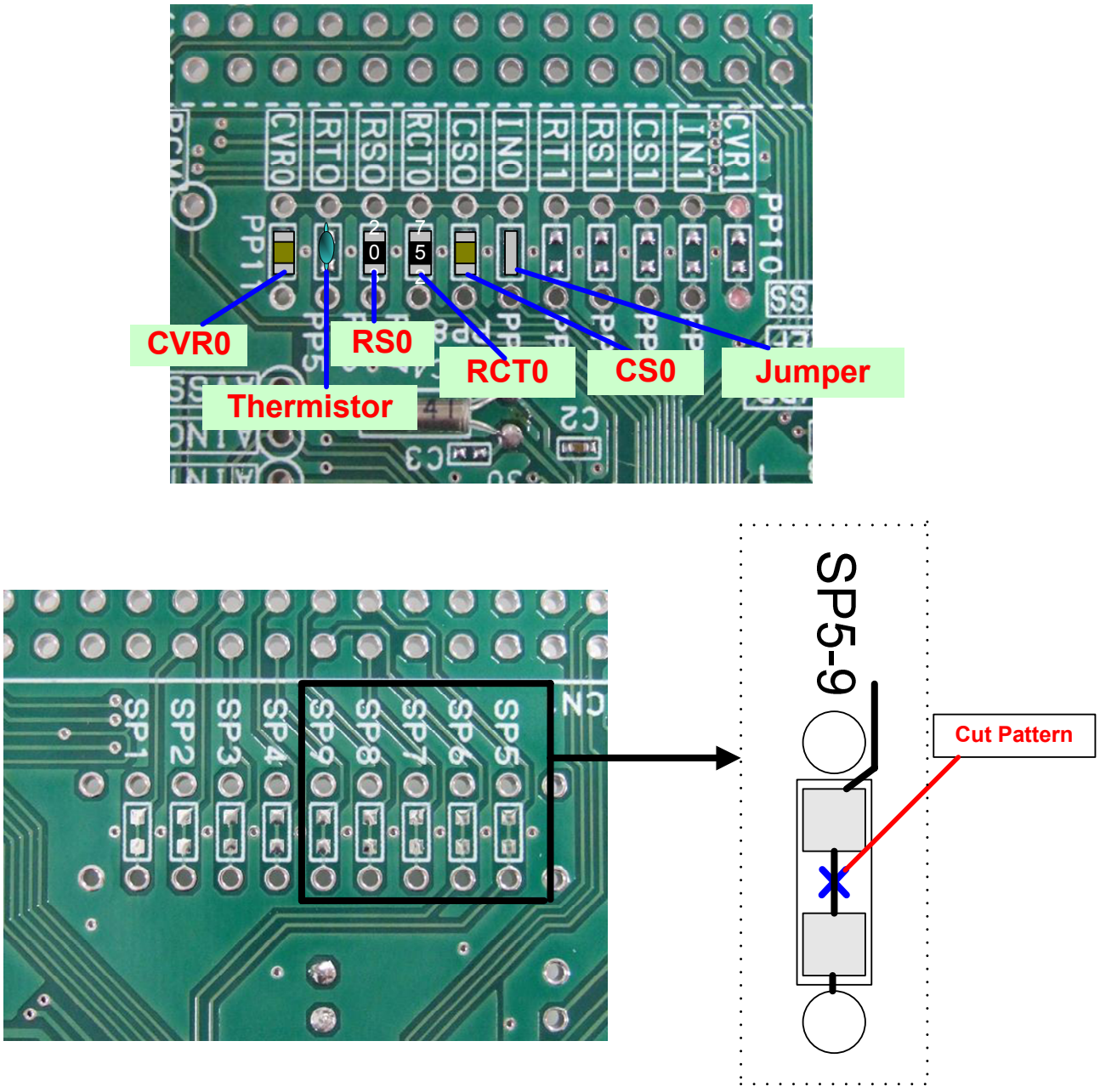


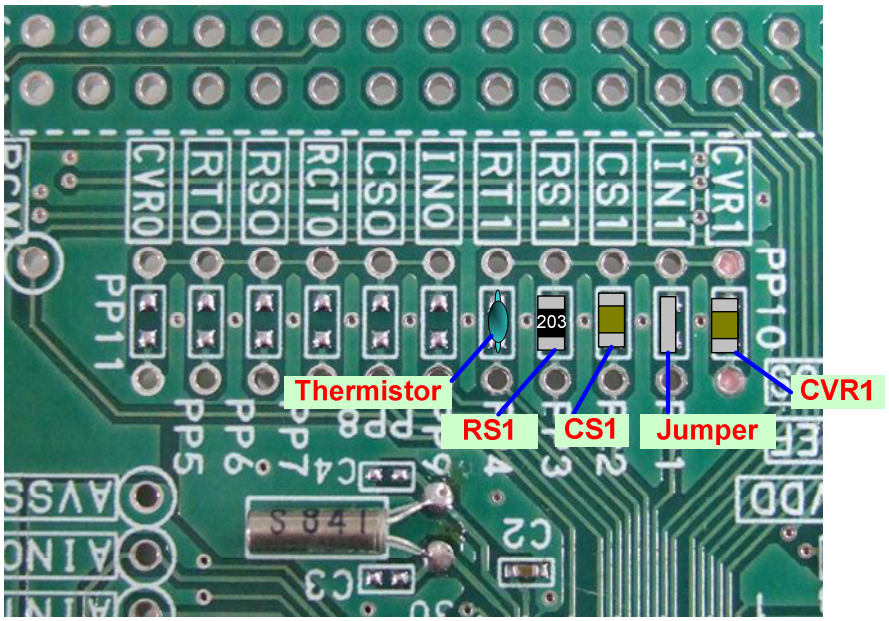

Fig.3 The example of processing of RC_ADC0

## 2. 3 When you use RC_ADC1 ( c. RC_ADC1 )

Please cut each short pattern of SP1, SP2, SP3 and SP4 that is on the back side of this board.
If each short pattern is not cut, the RC-ADC1 converter may not have accurate conversion result under the influence of the noise. Please be sure the cut each short pattern.

Please mount parts on the each pad of the IN1, CS1, RS1, RT1 and CVR1 pads.
Refer to ML610Q411/Q412/Q415 User's Manual for the parts to mount.

The example of processing is shown below.



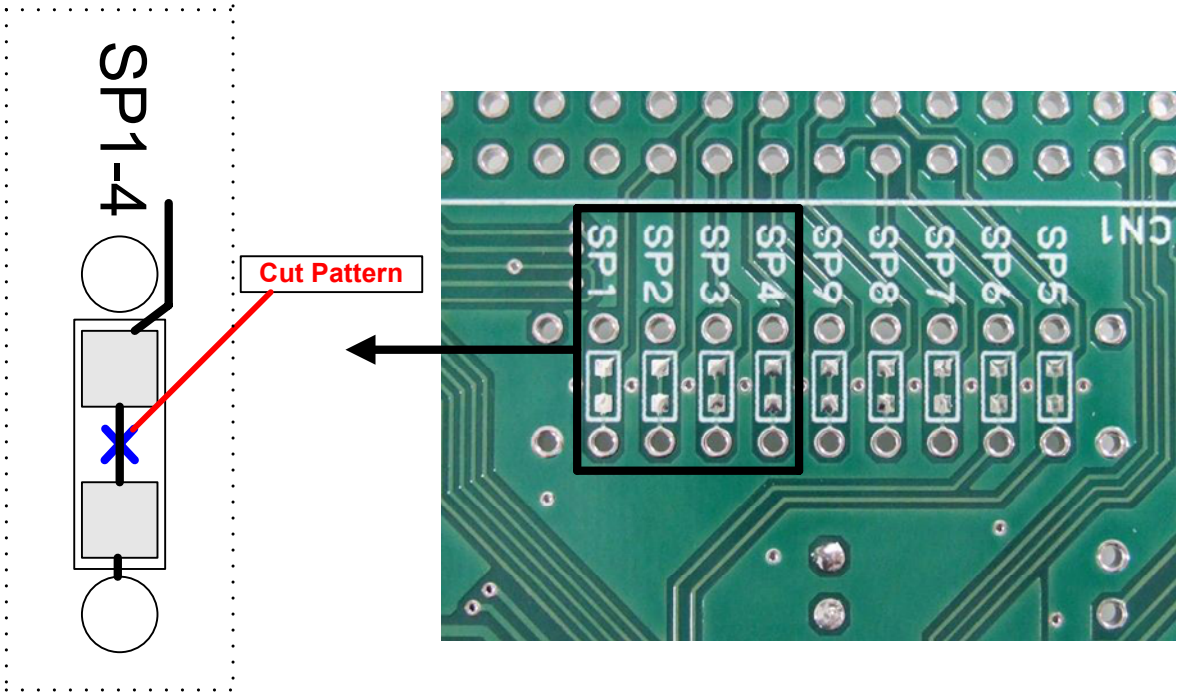




Fig.4 The example of processing of RC_ADC1

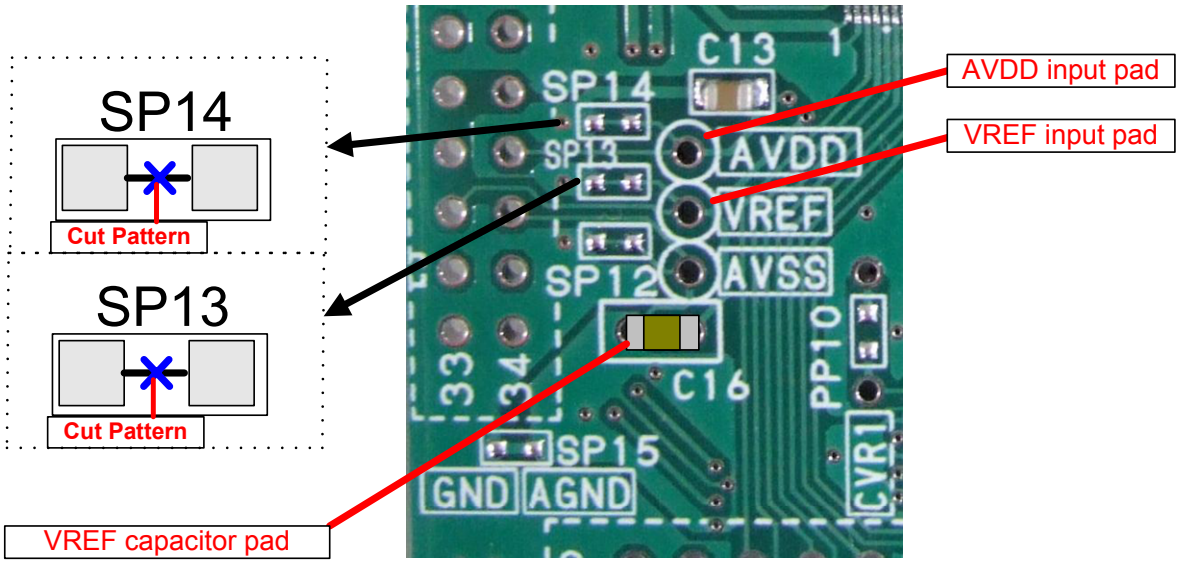
## 2. 4 When you use SA_ADC ( d. SA_ADC )

The AVDD pin and VREF pin of this board are connected to AGND.
Please cut each short pattern of SP14 and SP13, and it separates from AGND.

The suitable voltage for AVDD input pad, VREF input pad, AGND input pad, AIN0 input pad and AIN1 input pad is supplied.
Please mount noise decrease capacitor for AIN0 capacitor pad, AIN1 capacitor pad and VREF capacitor pad if you need.

**【NOTE】**
**When you supply voltage to AVDD and VREF, please be sure to cut the short pattern ofSP14 and SP13.**

The example of processing of SA_ADC is shown below.



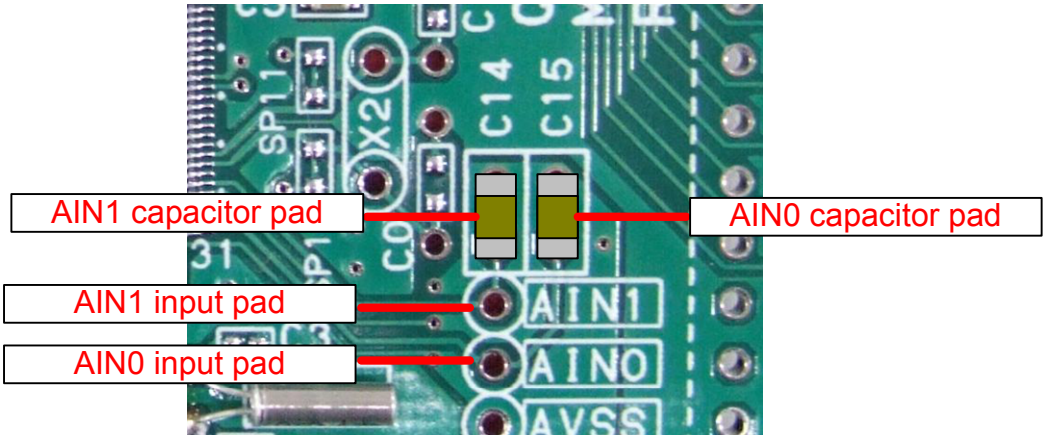




Fig.5 The example of processing of SA_ADC

## 2. 5 RESET_N control

If you use the uEASE, open RESET_N signal pin (CNU3_32pin).
When uEASE is connected, since reset is controlled from uEASE.
Please do not input reset signal from RESET_N signal pin (CNU3_32pin).

# 3. User Interface

## 3. 1 The user interface of ML610Q411ReferenceBoard

Table1 shows the user interface of reference board which mounted ML610Q411.

Table 1 CNU1-4 of ML610Q411ReferenceBoard

| Pin | CNU1 | CNU2 | CNU3 | CNU4 |
|---|---|---|---|---|
| 1 | P03 | PA0 | SEG20 | VDD |
| 2 | P02 | PA1 | SEG21 | VDD |
| 3 | P01 | PA2 | SEG22 | N.C |
| 4 | P00 | PA3 | SEG23 | N.C |
| 5 | NMI | PA4 | SEG24 | N.C |
| 6 | P20 | PA5 | SEG25 | N.C |
| 7 | P21 | PA6 | SEG26 | N.C |
| 8 | P22 | PA7 | SEG27 | N.C |
| 9 | P40 | N.C | SEG28 | N.C |
| 10 | P41 | N.C | SEG29 | N.C |
| 11 | N.C | N.C | SEG30 | N.C |
| 12 | P42 | N.C | SEG31 | N.C |
| 13 | P43 | SEG0 | SEG32 | N.C |
| 14 | P44 | SEG1 | SEG33 | N.C |
| 15 | P45 | SEG2 | SEG34 | N.C |
| 16 | P46 | SEG3 | SEG35 | COM0 |
| 17 | P47 | SEG4 | N.C | COM1 |
| 18 | P30 | SEG5 | N.C | COM2 |
| 19 | P31 | SEG6 | N.C | COM3 |
| 20 | P32 | SEG7 | N.C | N.C |
| 21 | P33 | SEG8 | N.C | N.C |
| 22 | P34 | SEG9 | N.C | N.C |
| 23 | P35 | SEG10 | N.C | N.C |
| 24 | N.C | SEG11 | N.C | N.C |
| 25 | N.C | SEG12 | N.C | N.C |
| 26 | N.C | SEG13 | N.C | N.C |
| 27 | N.C | SEG14 | N.C | N.C |
| 28 | N.C | SEG15 | N.C | AVDD |
| 29 | N.C | SEG16 | N.C | VREF |
| 30 | N.C | SEG17 | N.C | AVSS |
| 31 | P10 | SEG18 | N.C | AIN0 |
| 32 | P11 | SEG19 | RESET_N | AIN1 |
| 33 | VSS | VSS | VSS | VSS |
| 34 | VSS | VSS | VSS | VSS |

## 3. 2 The user interface of ML610Q412ReferenceBoard

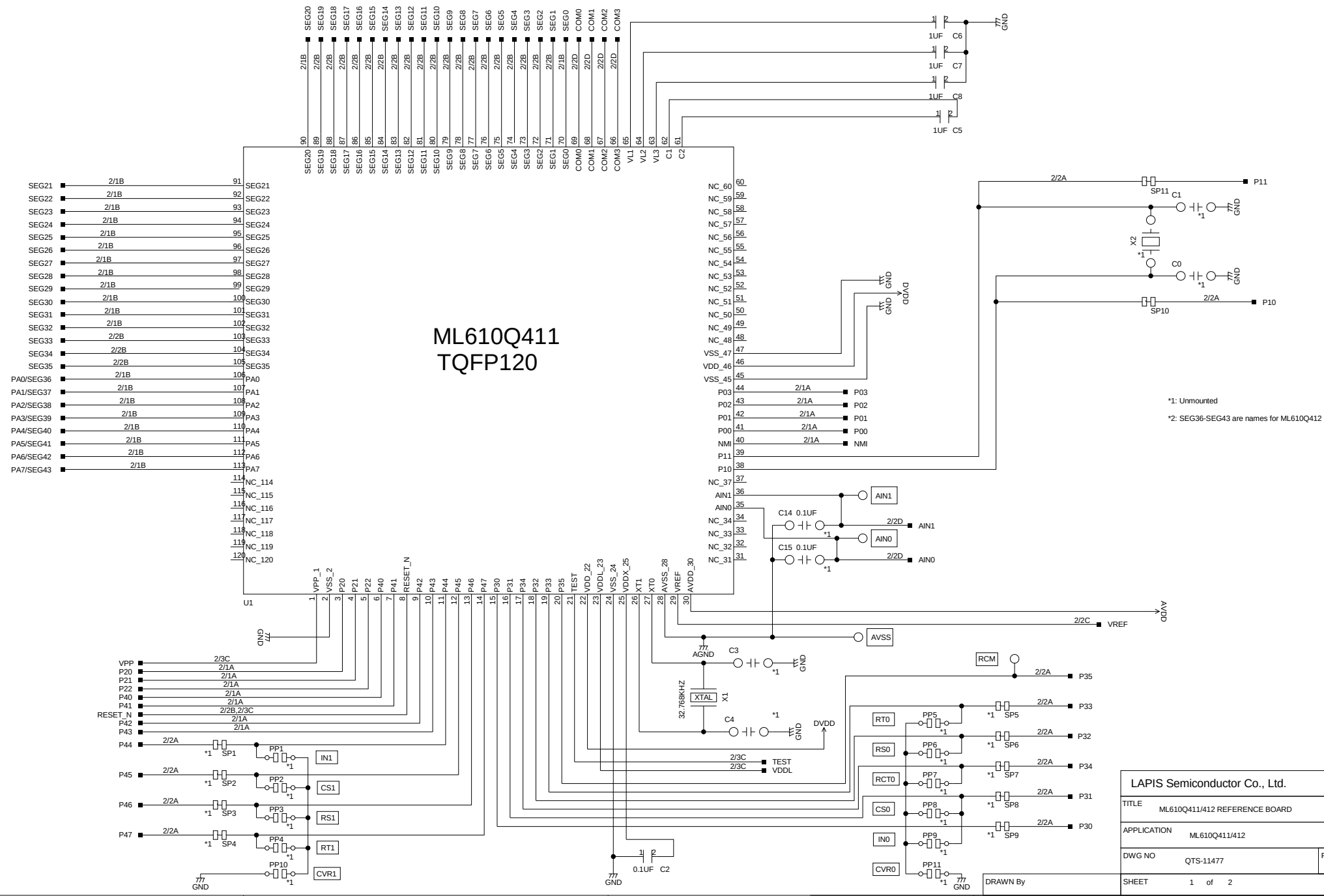
Table2 shows the user interface of reference board which mounted ML610Q412.

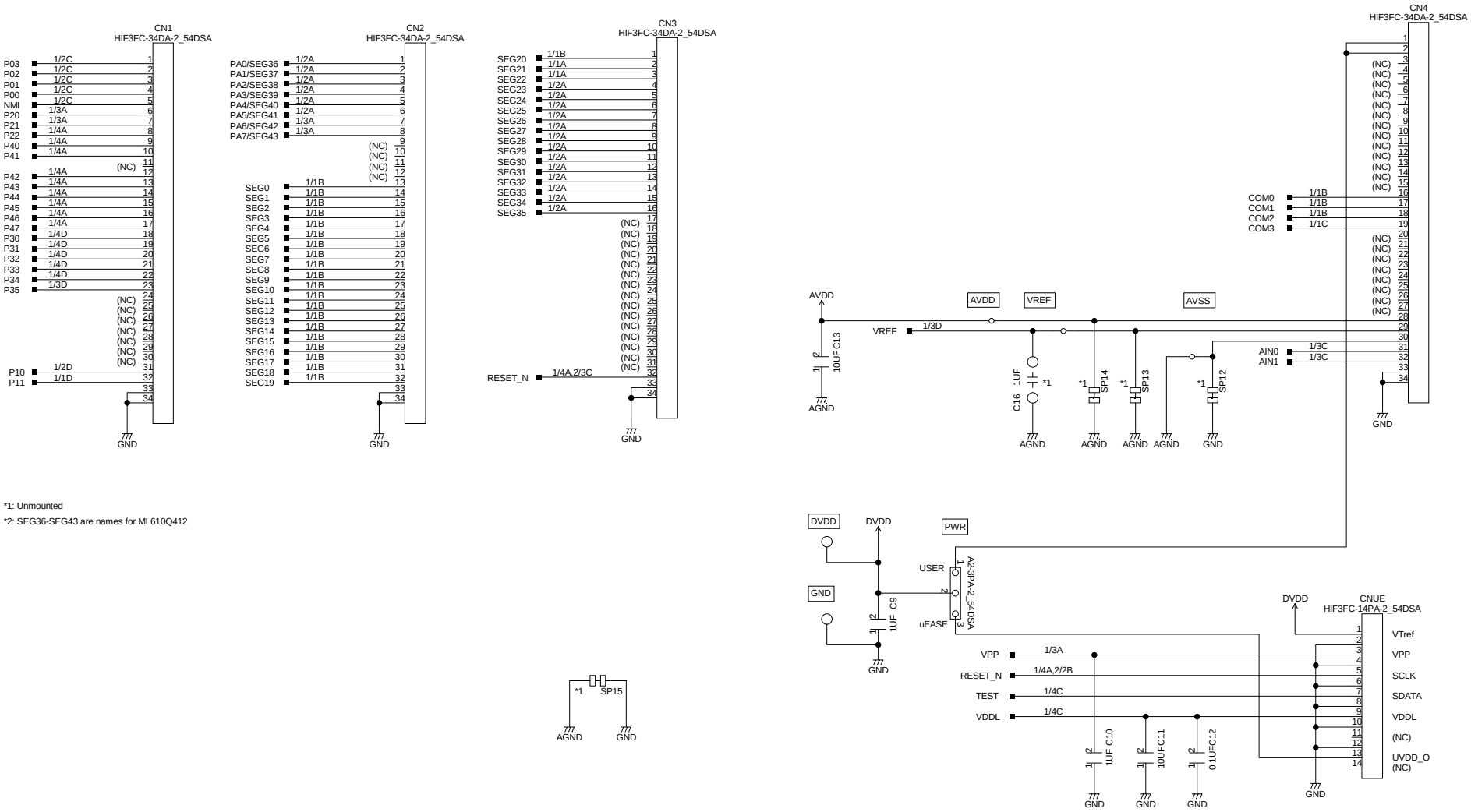
Table 2 CNU1-4 of ML610Q412ReferenceBoard

| Pin | CNU1 | CNU2 | CNU3 | CNU4 |
|---|---|---|---|---|
| 1 | P03 | SEG43 | SEG20 | VDD |
| 2 | P02 | SEG42 | SEG21 | VDD |
| 3 | P01 | SEG41 | SEG22 | N.C |
| 4 | P00 | SEG40 | SEG23 | N.C |
| 5 | NMI | SEG39 | SEG24 | N.C |
| 6 | P20 | SEG38 | SEG25 | N.C |
| 7 | P21 | SEG37 | SEG26 | N.C |
| 8 | P22 | SEG36 | SEG27 | N.C |
| 9 | P40 | N.C | SEG28 | N.C |
| 10 | P41 | N.C | SEG29 | N.C |
| 11 | N.C | N.C | SEG30 | N.C |
| 12 | P42 | N.C | SEG31 | N.C |
| 13 | P43 | SEG0 | SEG32 | N.C |
| 14 | P44 | SEG1 | SEG33 | N.C |
| 15 | P45 | SEG2 | SEG34 | N.C |
| 16 | P46 | SEG3 | SEG35 | COM0 |
| 17 | P47 | SEG4 | N.C | COM1 |
| 18 | P30 | SEG5 | N.C | COM2 |
| 19 | P31 | SEG6 | N.C | COM3 |
| 20 | P32 | SEG7 | N.C | N.C |
| 21 | P33 | SEG8 | N.C | N.C |
| 22 | P34 | SEG9 | N.C | N.C |
| 23 | P35 | SEG10 | N.C | N.C |
| 24 | N.C | SEG11 | N.C | N.C |
| 25 | N.C | SEG12 | N.C | N.C |
| 26 | N.C | SEG13 | N.C | N.C |
| 27 | N.C | SEG14 | N.C | N.C |
| 28 | N.C | SEG15 | N.C | AVDD |
| 29 | N.C | SEG16 | N.C | VREF |
| 30 | N.C | SEG17 | N.C | AVSS |
| 31 | P10 | SEG18 | N.C | AIN0 |
| 32 | P11 | SEG19 | RESET_N | AIN1 |
| 33 | VSS | VSS | VSS | VSS |
| 34 | VSS | VSS | VSS | VSS |

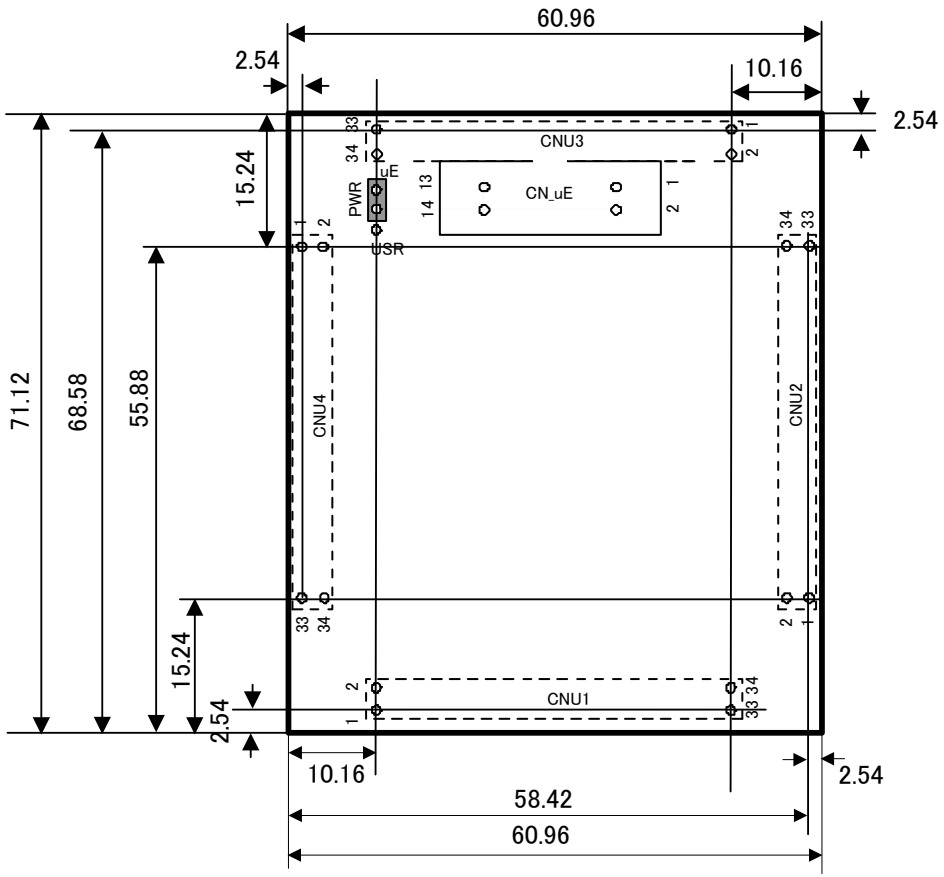
# 4. Schematics and PCB dimensional drawing

The this board schematics and the demensional drawing are shown as follows.


ML610Q411
TQFP120
U1
*1: Unmounted
*2: SEG36-SEG43 are names for ML610Q412
LAPIS Semiconductor Co., Ltd.
TITLE ML610Q411/412 REFERENCE BOARD
APPLICATION ML610Q411/412
DWG NO QTS-11477
REV 1.0
SHEET 1 of 2
DRAWN By




| | |
|---|---|
| LAPIS Semiconductor Co., Ltd. | |
| TITLE | ML610Q411/412 REFERENCE BOARD |
| APPLICATION | ML610Q411/412 |
| DWG NO | QTS-11477 |
| REV | 1.0 |
| DRAWN By | |
| SHEET | 2 of 2 |




**ML610Q4xx Reference Board TOP_VIEW**

| LAPIS Semiconductor Co.,Ltd. |
| --- |
| ML610Q4xx Reference Board<br>Dimensional drawing |

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