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# **ML610Q411/412 Reference Board User's Manual**

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## Preface

This manual describes 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	<ul style="list-style-type: none"> <li>U1: ML610Q411 or ML610Q412 (The part name is labeled on the solder side of the board.)</li> </ul>
Embedded parts	<ul style="list-style-type: none"> <li>X1, C3, C4: 32.768KHz resonator and capacitors</li> </ul>
	<ul style="list-style-type: none"> <li>PWR: Jumper for input power supply switch ( 3pin pin-header and short pin )</li> </ul>
	<ul style="list-style-type: none"> <li>CNUE: Connector for uEASE ( 14pin connector )</li> </ul>
	<ul style="list-style-type: none"> <li>C2, C5-C13: Capacitors for power supply</li> </ul>
Pads for mounting	<ul style="list-style-type: none"> <li>CNU1 to CNU4: Pads for peripheral board connectors ( 34pin x 4, 2.54mm pitch )</li> </ul>
	<ul style="list-style-type: none"> <li>IN0, CS0, RCT0, RS0, RT0, CVR0, IN1, CS1, RS1, RT1, CVR1: Pads for RC oscillation type ADC parts</li> </ul>
	<ul style="list-style-type: none"> <li>SP1 to SP15: Pads for opening or short ( 1608 type )</li> </ul>
	<ul style="list-style-type: none"> <li>X2, C0, C1: Pads for mounting high-speed clock oscillation circuit parts( Don't use)</li> </ul>
Power supply pads	<ul style="list-style-type: none"> <li>DVDD, GND, AVDD, VREF, AGND</li> </ul>
AIN0, AIN1 pads	<ul style="list-style-type: none"> <li>AIN0, AIN1</li> </ul>
Monitor pads	<ul style="list-style-type: none"> <li>RCM: RC oscillation monitor</li> </ul>
Operating voltage	<ul style="list-style-type: none"> <li>+1.1V to +3.6V</li> </ul>
Board size	<ul style="list-style-type: none"> <li>71.12 x 60.96 mm</li> </ul>

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

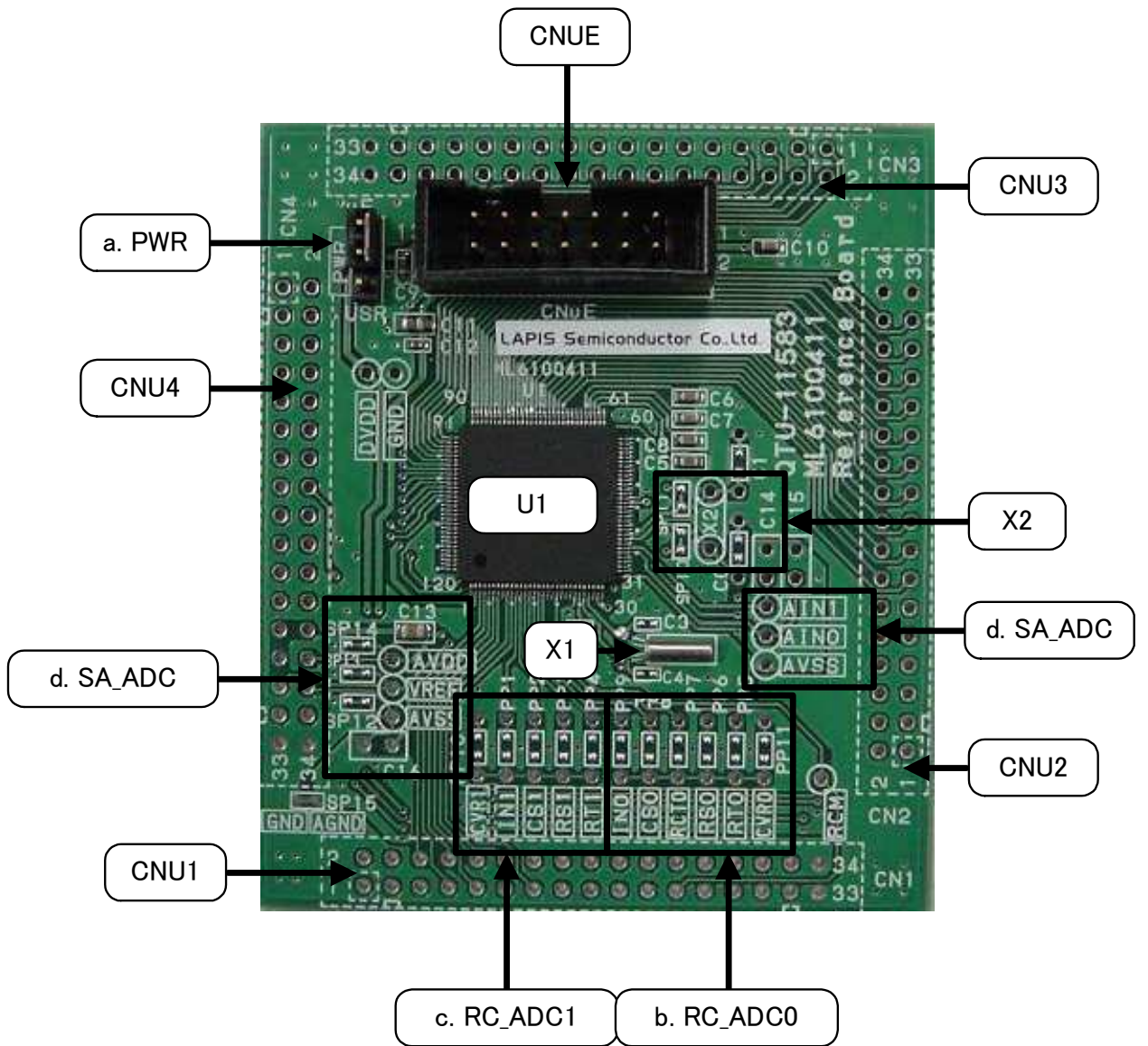


Fig.1 PCB outline drawing

## 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.

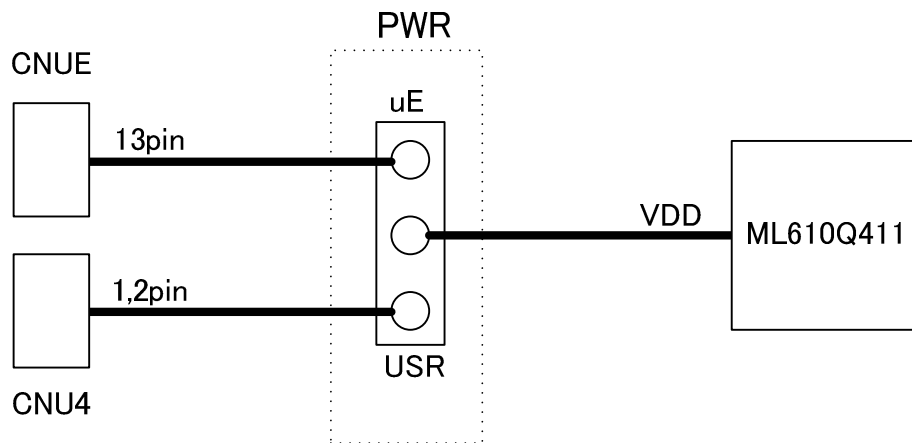


Fig.2 The connection of PWR jumper

#### **【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.

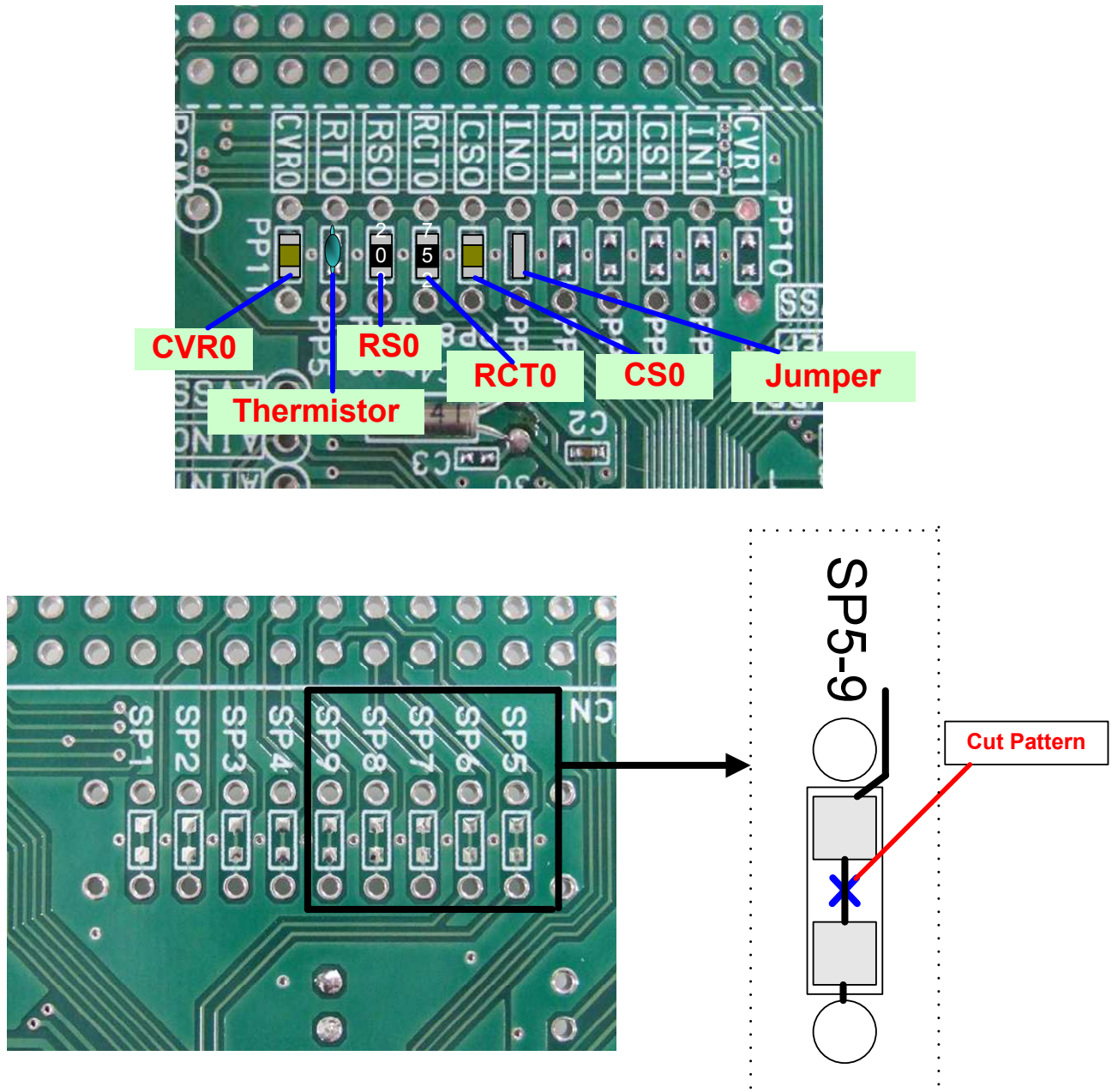


Fig.3 The example of processing of RC\_ADC0



### 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.

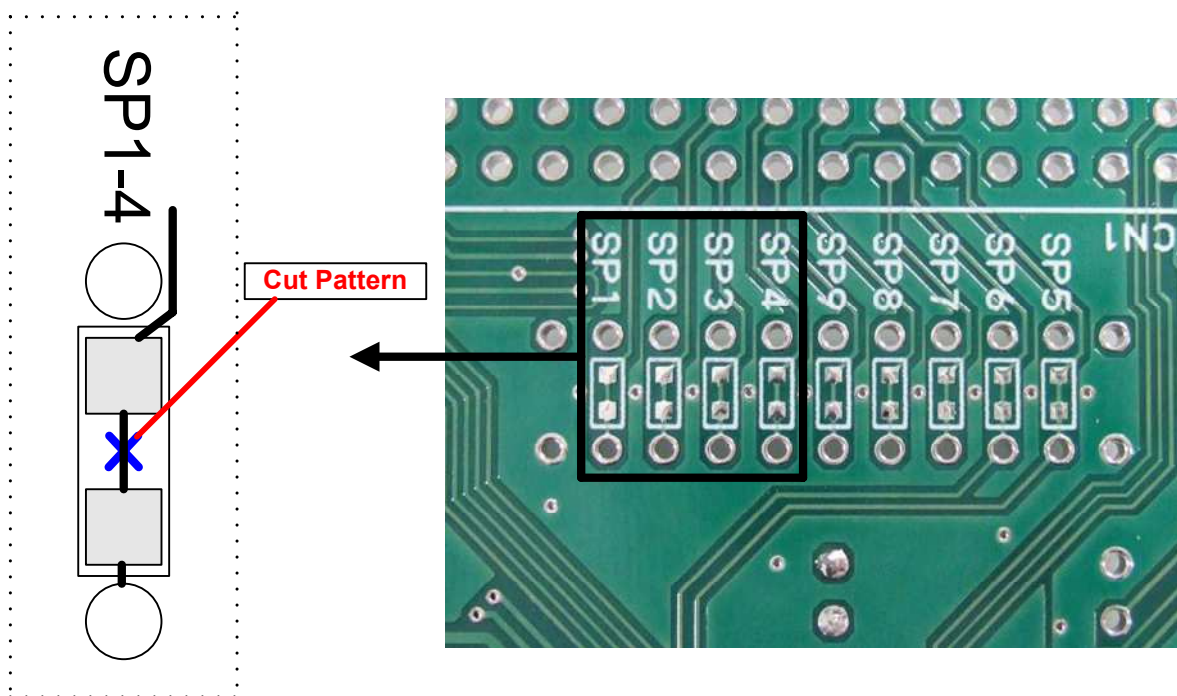
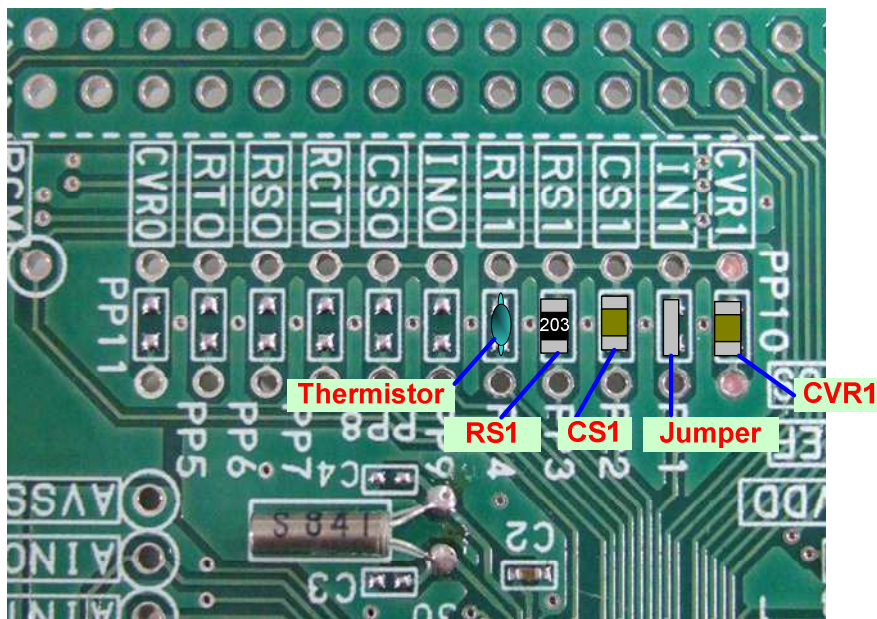


Fig.4 The example of processing of RC\_ADC1

## 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 of SP14 and SP13.

The example of processing of SA\_ADC is shown below.

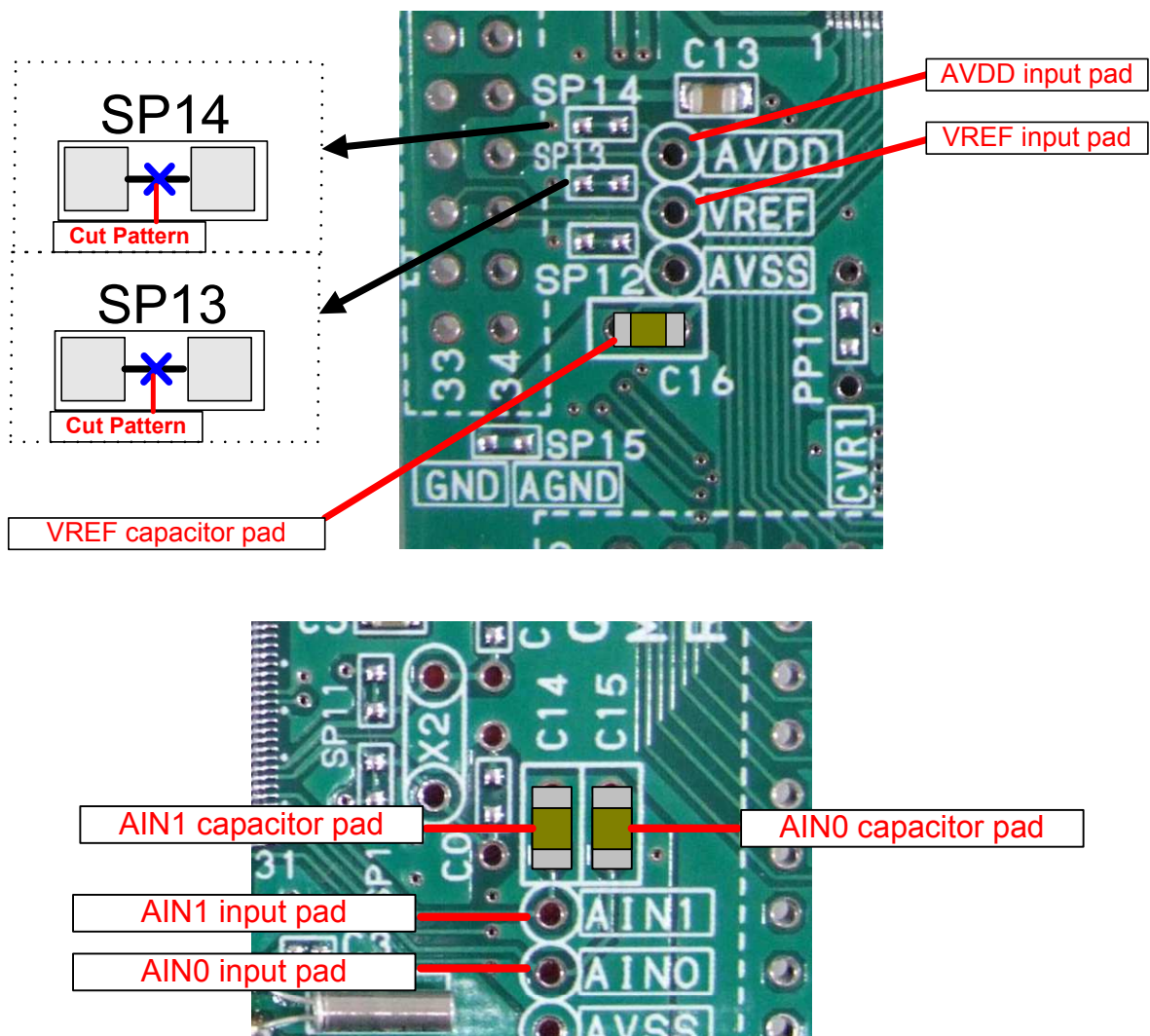


Fig.5 The example of processing of SA\_ADC

## 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).

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### 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.

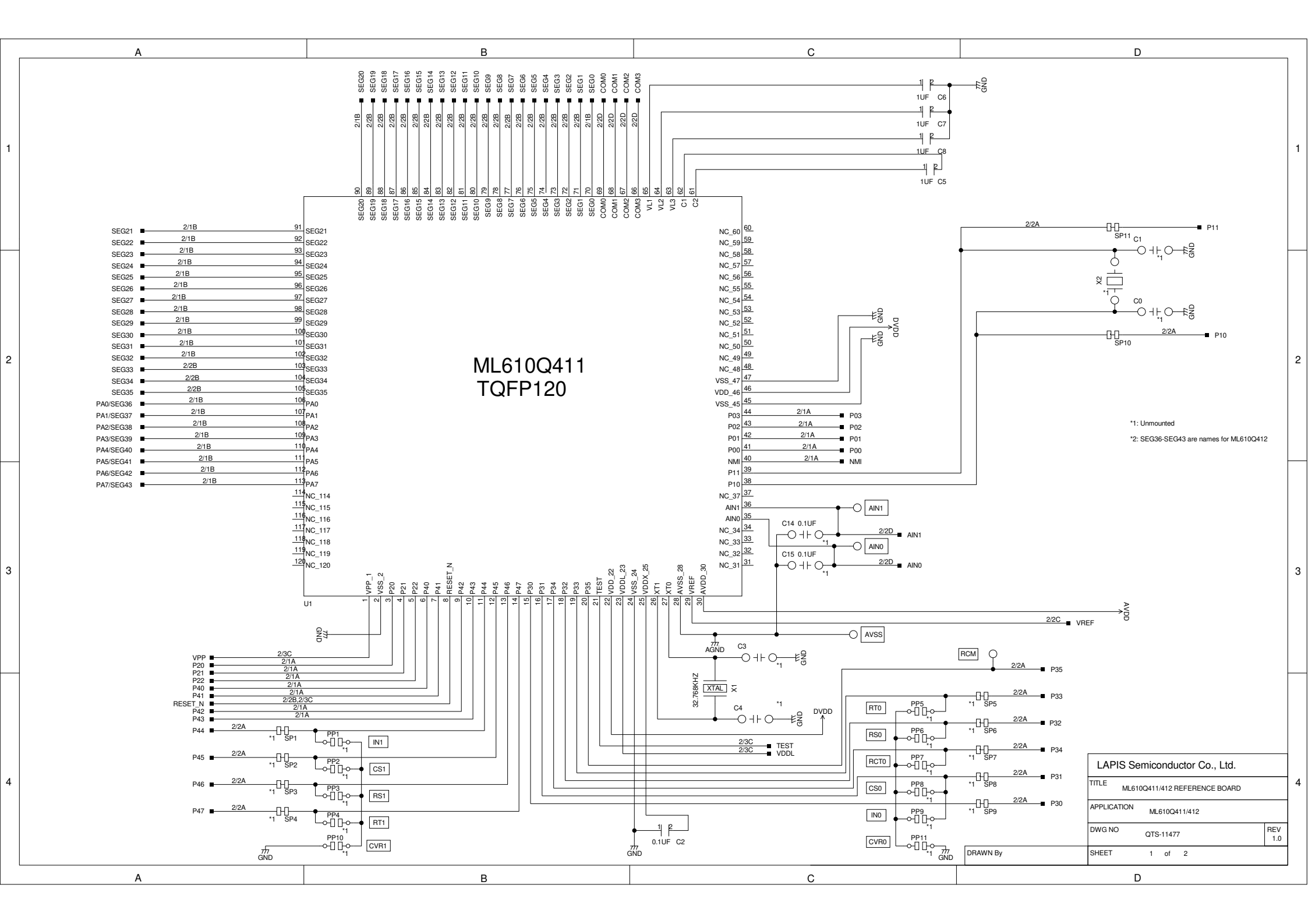
Table 2 CNU1-4 of ML610Q412ReferenceBoard

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**

- SEG21 2/1B 91
- SEG22 2/1B 92
- SEG23 2/1B 93
- SEG24 2/1B 94
- SEG25 2/1B 95
- SEG26 2/1B 96
- SEG27 2/1B 97
- SEG28 2/1B 98
- SEG29 2/1B 99
- SEG30 2/1B 100
- SEG31 2/1B 101
- SEG32 2/1B 102
- SEG33 2/2B 103
- SEG34 2/2B 104
- SEG35 2/2B 105
- PA0/SEG36 2/1B 106
- PA1/SEG37 2/1B 107
- PA2/SEG38 2/1B 108
- PA3/SEG39 2/1B 109
- PA4/SEG40 2/1B 110
- PA5/SEG41 2/1B 111
- PA6/SEG42 2/1B 112
- PA7/SEG43 2/1B 113

- NC\_60 60
- NC\_58 59
- NC\_58 58
- NC\_57 57
- NC\_56 56
- NC\_55 55
- NC\_54 54
- NC\_53 53
- NC\_52 52
- NC\_51 51
- NC\_50 50
- NC\_49 49
- NC\_48 48
- VSS\_47 47
- VDD\_46 46
- VSS\_45 45
- P03 44 2/1A
- P02 43 2/1A
- P01 42 2/1A
- P00 41 2/1A
- NMI 40 2/1A
- P11 39
- P10 38
- NC\_37 37
- AIN1 36
- AIN0 35
- NC\_34 34
- NC\_33 33
- NC\_32 32
- NC\_31 31

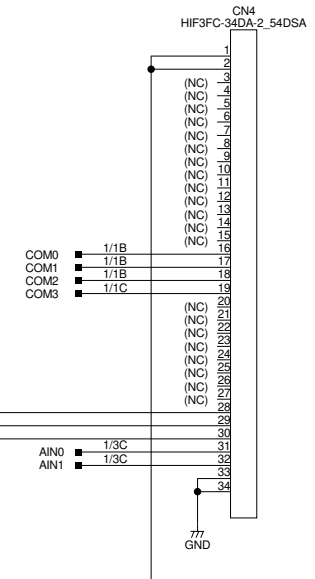
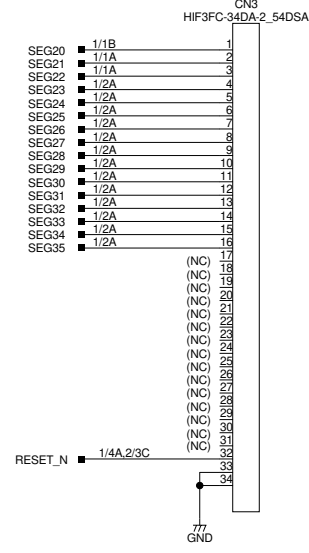
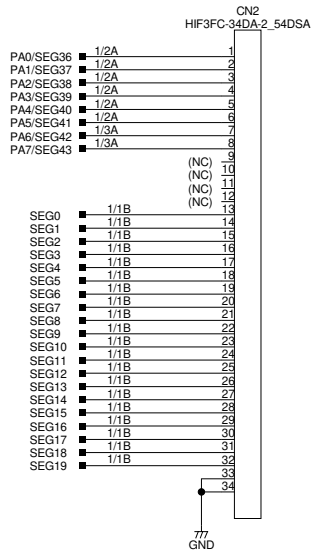
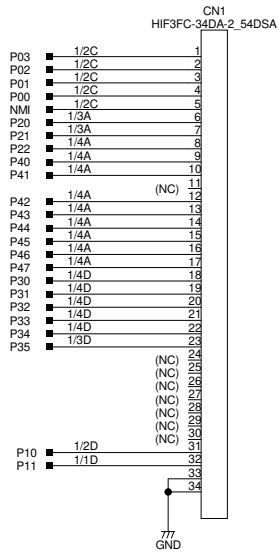
LAPIS Semiconductor Co., Ltd.	
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APPLICATION ML610Q411/412	
DWG NO QTS-11477	REV 1.0
DRAWN By	
SHEET 1 of 2	

A

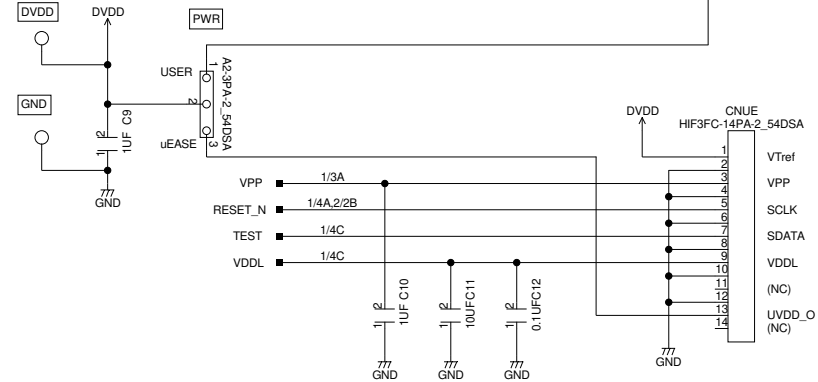
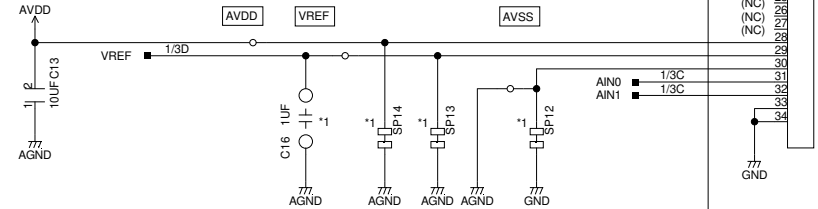
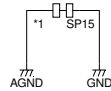
B

C

D



\*1: Unmounted  
 \*2: SEG36-SEG43 are names for ML610Q412



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APPLICATION	ML610Q411/412
DWG NO	QTS-11477
SHEET	2 of 2
REV	1.0

DRAWN By

A

B

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