ROHM GROUP
LAPIS
SEMICONDUCTOR

FEBL620Q504H_RB-01

ML620Q504H
Reference Board
User's Manual

Issue Date: AUG 31, 2015

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Preface

This manual describes the operation of the ML620Q504H Reference Board, which the ML620Q504H, LAPIS SEMICONDUCTOR's ultra low-power 16-bit microcontroller is mounted.
ML620Q504H is carried as MCU in ML620Q504H Reference Board.
This board can be used as ML620Q503H.
When using ML620Q503H, select ML620503F to target MCU.
When using ML620Q504H, select ML620504F to target MCU.

The following manuals are also available. Please read them as necessary.

- ML620Q503H/Q504H User's Manual
  Description on the ML620Q503H/Q504H hardware

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

1. Hardware overview

The ML620Q504H Reference Board is prepared for having you study the operations of the ML620Q503H/ Q504H by connecting the on-chip debug emulator uEASE (hereafter "uEASE") , the ML620Q504H Reference Board enables software development, debug and Flash programming into the device with using the software development tool bundled with the uEASE.
This board also works in stand-alone mode without uEASE bus supplying power externally.
Before starting work with this board, please read below carefully and understand notices.

1.1 Features

- On-chip debugging and Flash programming are supported by using the TEST0 pin and TEST1_N pin,
- Power supply can be provided from the uEASE or the customer's target board.

1.2 Hardware Specifications

The hardware specifications of this reference board are shown in the following table.

Embedded microcontroller	ML620Q504H Reference Board U1: ML620Q504H
Embedded components	JP1: Jumper for selecting power supply (3pin pin-header and short pin)
	JP2: Jumper for selecting reference voltage for SA-ADC (VREF) (3pin pin-header and short pin)
	CNuE: Connector for on-chip debug emulator (14pins)
	SW1: Switch for reset input (tact switch)
	SW2: Switch for P51 input (tack switch)
	SW3: Switch for hardware re-mapping *
	LED1-2: LED (LED1 and LED2 are connected with P52 and P53 respectively)
	XT1: 32.768kHz crystal
	XT3: 16MHz ceramic oscillator
Operating Voltage	+1.8V ～ +5.5V
Size	71.12 mm x 53.34 mm

1.3 View of the ML620Q504H reference board

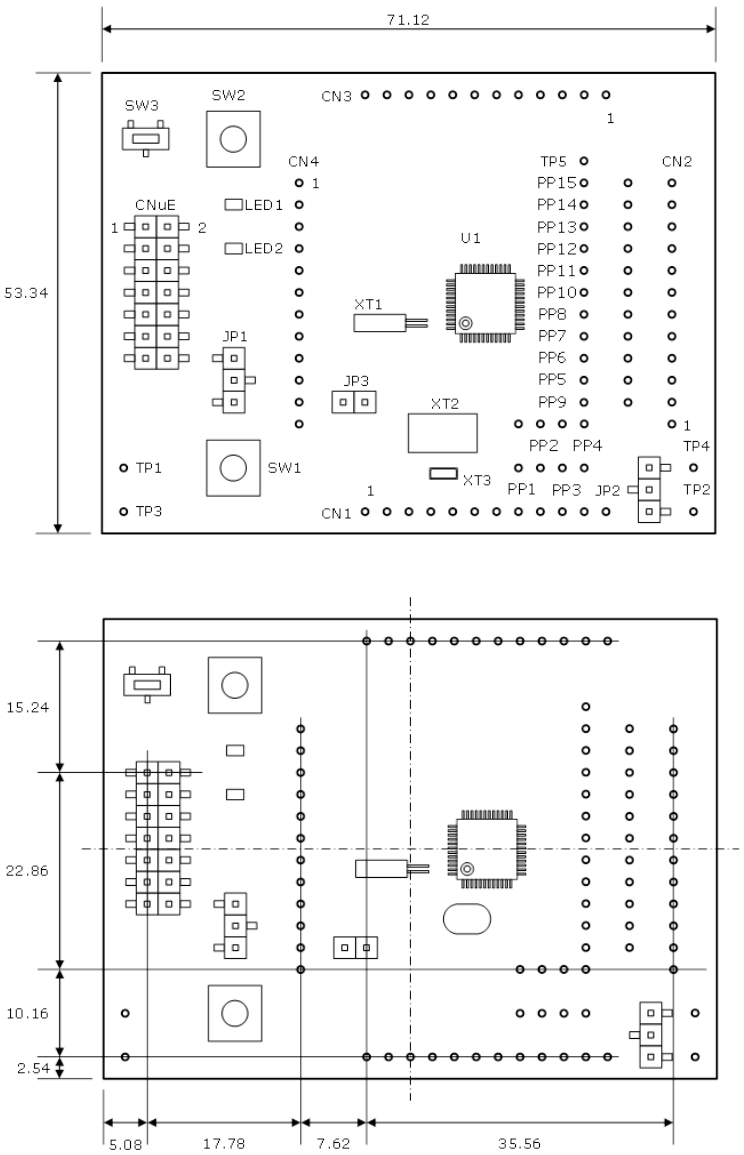
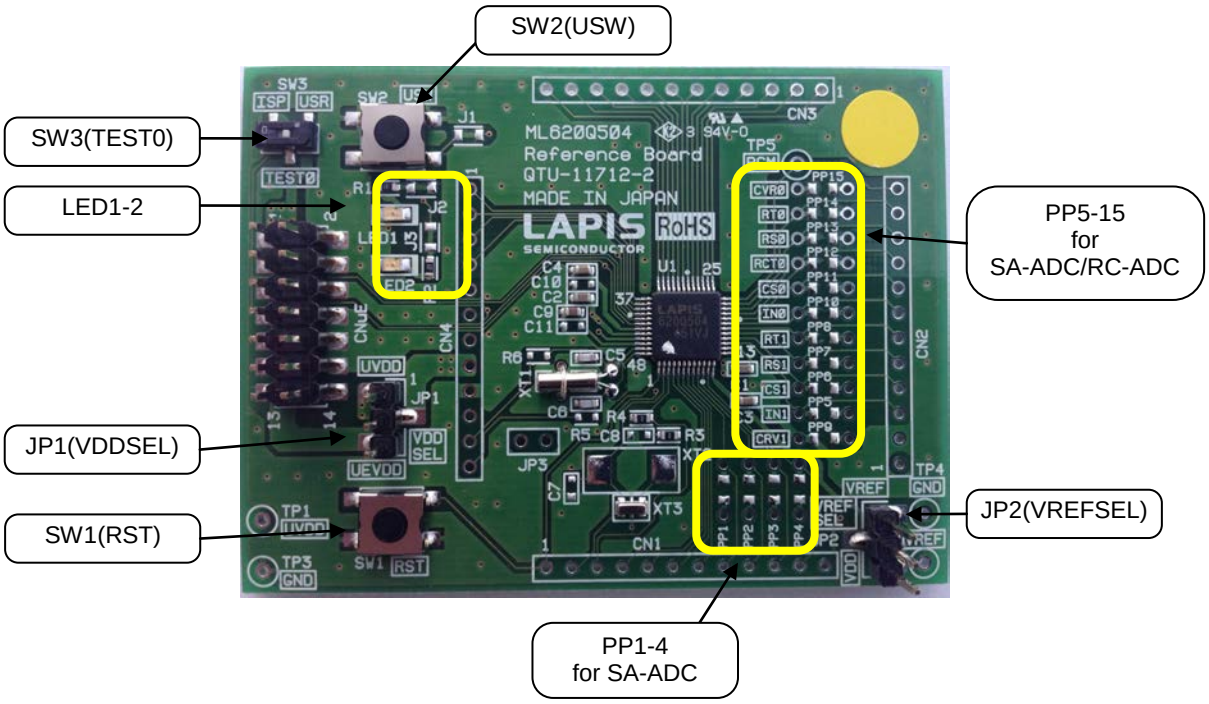


Figure 1 The ML620Q504H reference board size and external components

2. Function



2.1 Jumper for Power Supply

	Connect between ① and ② ① ② ③	Connect between ②and ③ ① ② ③
JP1(VDDSEL)	Supply power from TP1(UVDD)	Supply power from the uEASE. The current supply capability of the uEASE is 100mA @3.3V.
JP2(VREFSEL)	VREF is provided from TP1(UVDD) .	VREF is provided from TP2(VREF).

[Note]

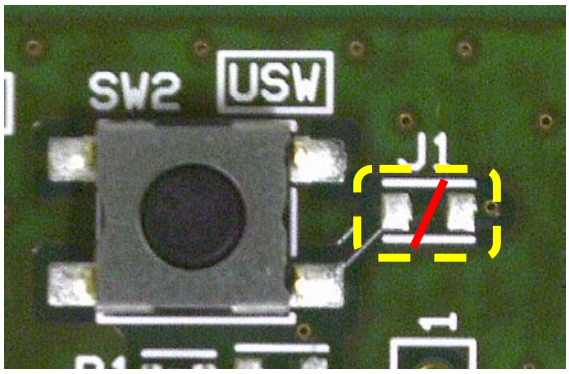
When supplying LSI with power supply from outside, please connect TP1 to UVDD.(Connect between ① and ②)

2.2 SW1(RST)

SW1 is a tack switch connected to the RESET_N pin.
By pressing this SW1, the ML620Q504H causes reset.

2.3 SW2(USW)

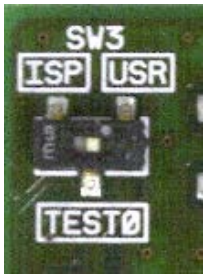
SW2 is a tack switch connected to the P51 pin.
When use the P51 pin, please connect the pull-up resister by setting SFR of the ML620Q504H.
When remove this SW2, please cut the PCB pattern at J1 as shown in the below picture.



Cut the PCB pattern at J1

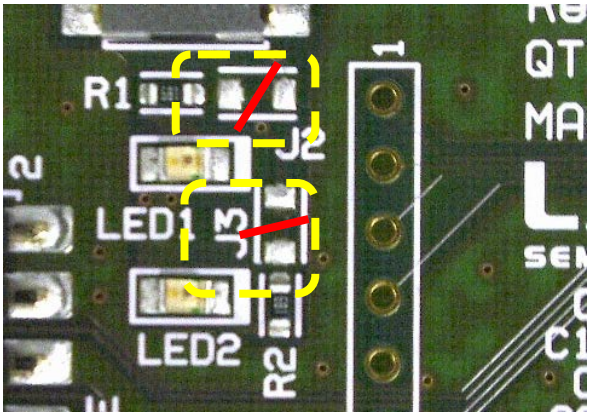
2.4 SW3(TEST0)

SW3 is used for selecting hardware re-mapping.
When use hardware re-mapping, please set this SW3 to "ISP".
When do not use hardware re-mapping, please set this SW3 to "USR".



2.5 LED1-2

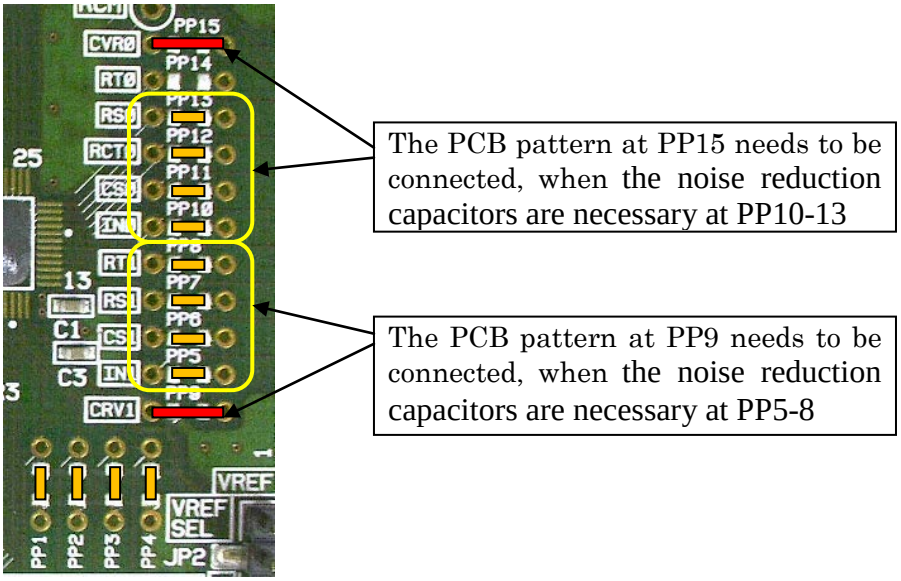
LED1 and LED2 are connected with P52 and P53 respectively.
When use LED, please set the P52 and P53 into N-ch open-drain output by setting SFR of the ML620Q504H. By output "0" at P52 and P53, LED1 and LED2 turns on respectively.
When do not use LED1 and LED2, please cut the PCB pattern at J2 and J3 as shown in the below picture.



Cut the PCB pattern at J2 and J3

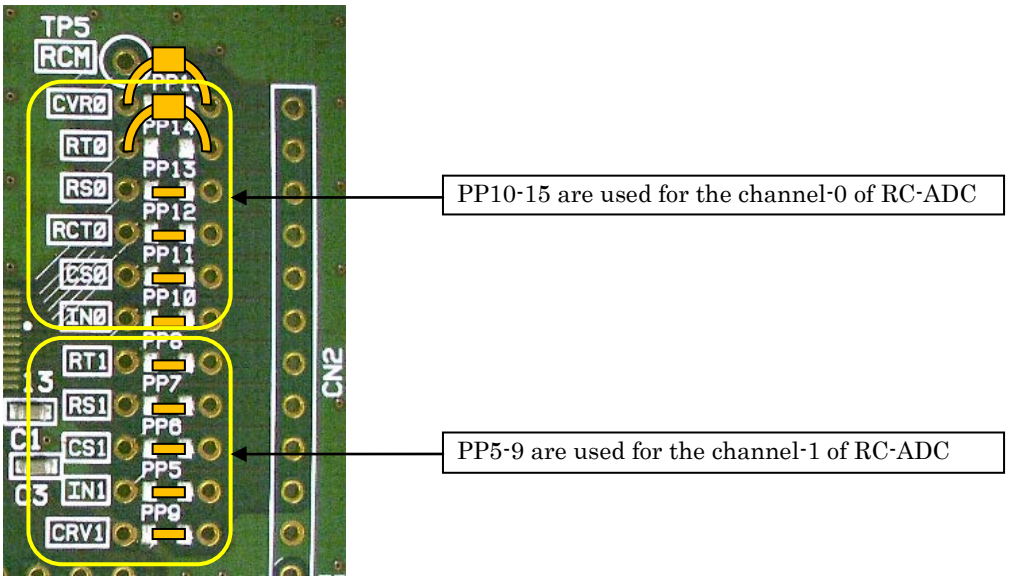
2.6 SA-ADC

When use the SA-ADC, please connect the input to be measured at the P34-37(AIN0-3), P20-23(AIN4-7) or P00-03(AIN8-11). When use the noise reduction capacitor for AIN0-11, please connect at PP1-4, PP5-8 or PP10-13. And please note that the PCB pattern at PP9 needs to be connected, when the noise reduction capacitors are necessary at PP5-8, and also the PCB pattern at PP15 needs to be connected, when the noise reduction capacitors are necessary at PP10-13.



2.7 RC-ADC

When use the channel-0 of RC-ADC, please connect capacitors and resisters at PP10-15.
When use the channel-1 of RC-ADC, please connect capacitors and resisters at PP5-9.
RC oscillation can be monitored at TP5(RCM).



3. Important notice

(1) Please read and understand the ML620Q503H/Q504H user's manual and uEASE user's manual, before using the ML620Q504H reference board.

(2) The reference board may sometime use the engineering sample of the ML620Q504H. Therefore please use the mass production part of the ML620Q504H for final evaluation of the customer's system.

(3) When set the JP1 jumper to use UVDD and connect the uEASE to the ML620Q504H reference board, please power on the customer's target board fist before activate the uEASE. And also power-off the uEASE first before power off the customer's target board.

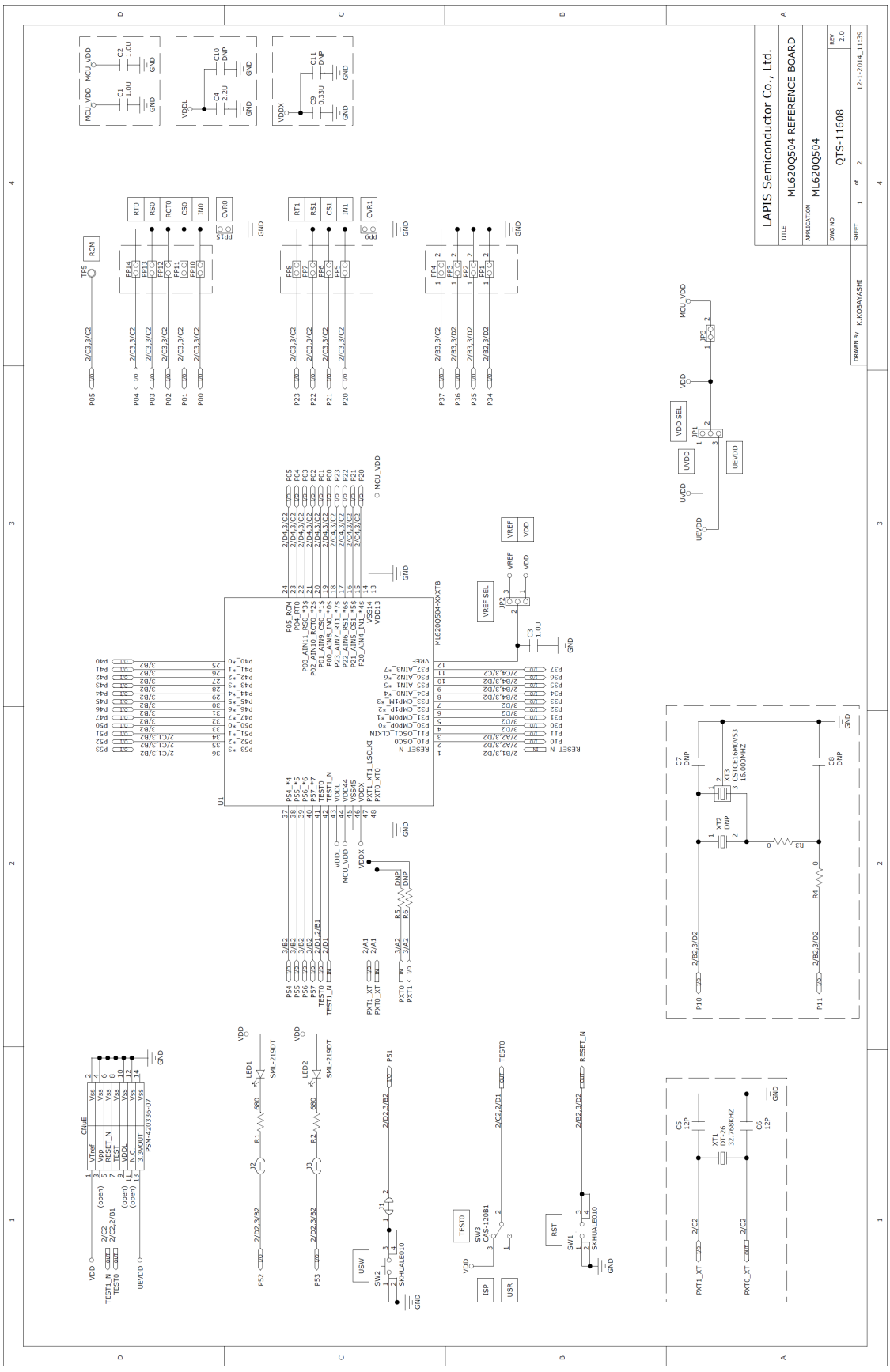
(4) When set the JP1 jumper to use UVDD, the current supply capability of the uEASE is 100mA @3.3V.

(5) The ML620Q504H has PCB layout in back surface. Therefore when put this board on a conductive material, it may cause malfunction due to causing a short circuit. Please use an insulation sheet or attach legs to prevent a short circuit.

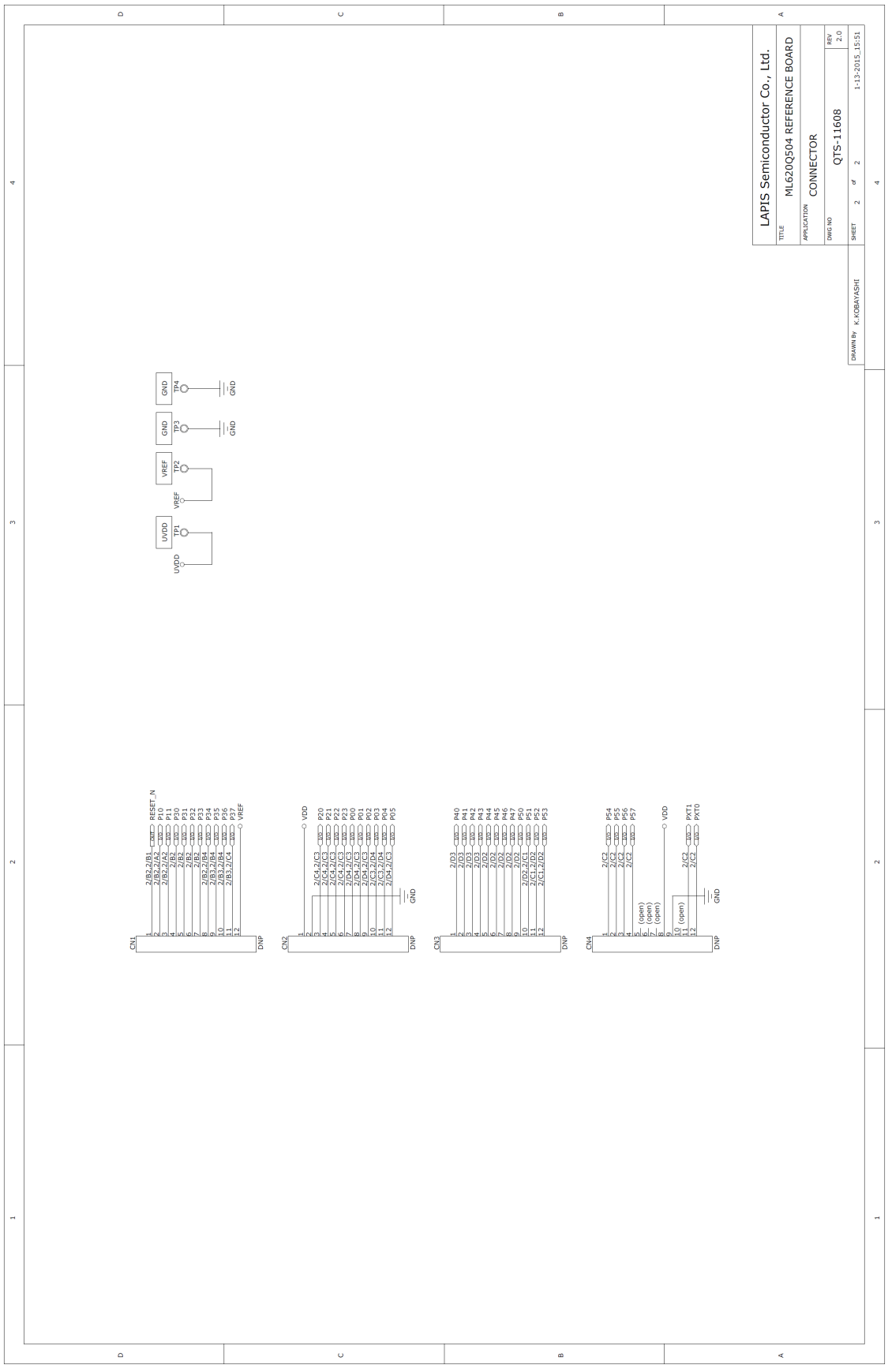
(6) LAPIS Semiconductor will not provide any support for this board, but the board can be exchanged with a new product only when it has an initial failure.

4. Circuit diagram

(1/2)



(2/2)


LAPIS Semiconductor Co., Ltd.
TITLE
ML620Q504 REFERENCE BOARD
APPLICATION
CONNECTOR
DWG NO
QTS-11608
REV
2.0
SHEET
2
of
2
1-13-2015 15:51
DRAWN By
K.KOBAYASHI
UVDD
VREF
GND
GND
GND
TP1
TP2
TP3
TP4
CN1
CN2
CN3
CN4
DNP
RESET_N
VDD
(open)
VREF

5. Parts list

	Parts Number	Silk	Contents	Package Type	Qty.	Maker
1	GRM188B31C105K	C1-3	Ceramic Capacitor 1.0μF/16V B	1608	3	MURATA
2	GRM188B31C225K	C4	Ceramic Capacitor 2.2μF/16V B	1608	1	MURATA
3	GRM1882C1H120J	C5-6	Ceramic Capacitor 12pF/50V CH	1608	2	MURATA
		C7-8	Do Not Place	1608	2	MURATA
4	GRM188B11A334K	C9	Ceramic Capacitor 3.3μF/10V B	1608	1	MURATA
5	GRM188B316xxxK	C10-11	Do Not Place	1608	2	-
6	A2-12PA-2.54DSA(71)	CN1-4	Do Not Place	12PIN	4	HIROSE
7	PSM-420336-07	CNuE	14pin Header	14PIN	1	HIROSUGI
8	J1608	J1-3	Do Not Place	2012	3	-
9	PSM-410336-03	JP1-2	3pin Header	3PIN	2	HIROSUGI
11	XJ8C-0211	JP3	Do Not Place	2PIN_S	1	OMRON
12	SML-219DT	LED1-2	LED Orange	2012	2	ROHM
13	TH	PP1-15	Do Not Place	2PIN	15	-
14	MCR03EZPJ681	R1-2	Resistor 680Ω	1608	2	ROHM
15	MCR03EZPJ000	R3-4	Resistor 0Ω	1608	2	ROHM
		R5-6	Do Not Place	1608	2	ROHM
16	SKHUALE010	SW1-2	Tact Switch	4PIN	2	ALPS
17	CAS-120B1	SW3	Jumper Switch	3PIN	1	COPAL
18	LC-2-G(R)	TP1-2	Do Not Place	TH	2	MAC EIGHT
19	LC-2-G(B)	TP3-4	Do Not Place	TH	2	MAC EIGHT
20	LC-2-G(Y)	TP5	Do Not Place	TH	1	MAC EIGHT
21	ML620Q504H-nnnTB	U1	MCU	48PQFP	1	LAPIS
22	DT-26 CL=6pF	XT1	Crystal Unit 32.768KHz	2PIN	1	DAISHINKU
23	NX8045GB-16.000M-STD-CSF-6	XT2	Do Not Place	2PIN	1	NDK
24	CSTCE16M0V53	XT3	Ceramic Resonator 16.000MHz	3PIN	1	MURATA
25	QTU-11712-2	-	PCB	-	1	LAPIS
26	JS-41060	-	Short Socket	-	3	HIROSUGI
27	B-P40	-	Anti-Vibration Feet	-	4	TAKACHI

6. Revision History

Document No.	Date	Page		Description
		Previous Edition	Current Edition	
FEBL620Q504H_RB-01	AUG.31,2015	-	-	Formally Edition 1.0