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ROHM Co., Ltd. ("ROHM"), on the 1st day of April, 2024,
has absorbed into merger with 100%-owned subsidiary of LAPIS Technology Co., Ltd.

Therefore, all references to "LAPIS Technology Co., Ltd.", "LAPIS Technology"
and/or "LAPIS" in this document shall be replaced with "ROHM Co., Ltd."
Furthermore, there are no changes to the documents relating to our products other than
the company name, the company trademark, logo, etc.

Thank you for your understanding.

ROHM Co., Ltd.
April 1, 2024

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Therefore, all references to "LAPIS Semiconductor Co., Ltd.", "LAPIS Semiconductor" and/or "LAPIS" in this document shall be replaced with "LAPIS Technology Co., Ltd."

Furthermore, there are no changes to the documents relating to our products other than the company name, the company trademark, logo, etc.

Thank you for your understanding.

LAPIS Technology Co., Ltd.
October 1, 2020

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ROHM GROUP
LAPIS
SEMICONDUCTOR

FEBL62Q1602RB-03

ML62Q1602 Reference Board
User's Manual

Issue Date: October 10, 2017

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Preface

This manual describes about the ML62Q1602 Reference Board: RB-D62Q1602TB48.

Refer to following documents when necessary.

- ML62Q1000 User's Manual
  Describes about the microcontroller ML62Q1000 series.

- EASE1000 User's Manual
  Describes about the On-chip emulator EASE1000.

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1. Overview

1.1 Features

ML62Q1602 Reference Board is for learning how to use the ML62Q1602, on which adding external user components if necessary. Using ML62Q1602 Reference Board with LAPIS Semiconductor's on-chip emulator EASE1000 delivered with the software development environments, help user's software development and debugging and programming the Flash.

1.1.1 ML62Q1602 Reference Board features

- The board delivered with ML62Q1602 48pin TQFP .
- The connector linked to ESE1000 is mounted.
- Through-holes for connecting the pins of LSI to external pheripheral boards.
- The power supply is selectable, supplied from the on-chip emulator EASE1000 or CN1_3pin / CN2_2pin.
- Crystal oscillator is mounted (32.768kHz)
- LED is mounted (P20, P21, P22)

1.1.2 ML62Q1602 Reference Board Hardware specifications

The hardware specification of ML62Q1602 Reference Board is indicated to Table 1.

Table.1 ML62Q1602 Reference Board Hardware specifications

Mounted LSI	U1 : ML62Q1602 48pin TQFP
Other Mounted components	PWR: Jumper for selecting the power supply input (3pin pin-header and short pin)
	J1: Jumper for selecting RESET_N pin (3pin pin-header and short pin)
	J2: Jumper for selecting P00/TEST0 pin (3pin pin-header and short pin)
	P20-P22: LEDs
	R1-R3: Resistors for LEDs by P20 to P22
	J3-J5: Jumper Chip for connecting LEDs
	X1, C3, C4: Crystal Oscillator(32.768kHz) and capacitors
	C5-C8: Capacitors for LCD
	CNE: Connector for EASE1000 (14pin connector)
	C1-C2: Capacitors for V_{DD} and V_{DDL}
	R4: Pull-up resistor for RESET_N
Pads (or/and) Through holes for mounting components	CN1-CN2: Connectors for user application system (25pin, 2.54mm pitch, ϕ 0.8mm)
Power check pin	VDD, VSS, UVDD: ϕ 0.8mm
Operating voltage	+1.6V to +5.5V
Board size	55.88 mm x 93.98 mm

See the schematic for more detail about connection of the mounted components.

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1.2 ML62Q1602 Reference Board Outline Drawing

The Figure.1 show the ML62Q1602 Reference Board.

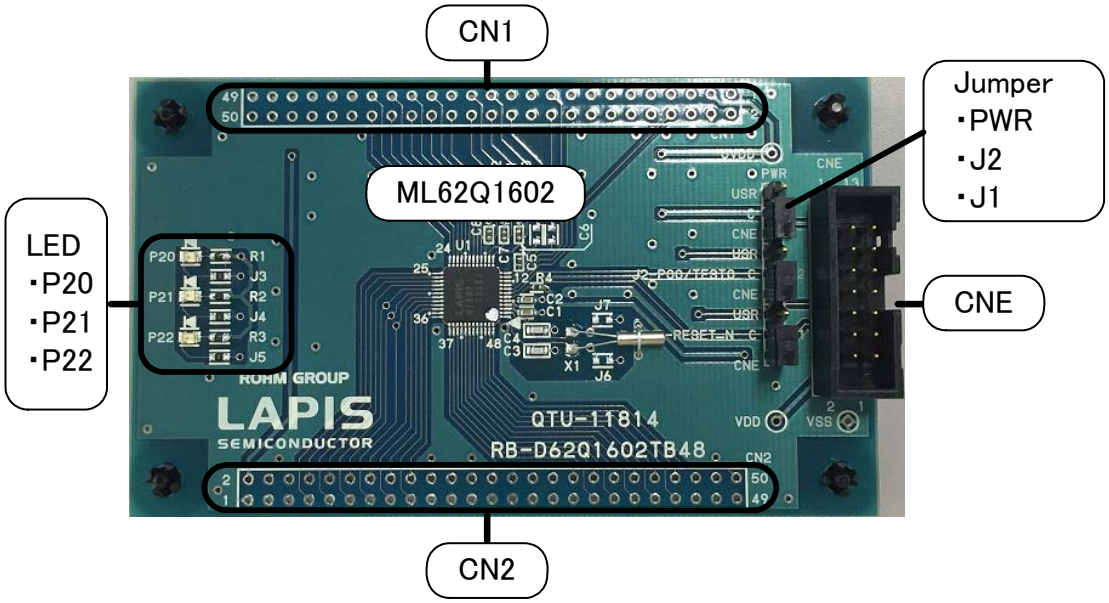


Fig.1 ML62Q1602 Reference Board Outline Drawing

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2. Function of ML62Q1602 Reference Board

2.1 Power Circuit

V_{DD} can select the input from 3.3VOUT of EASE1000 or CN1_3pin / CN2_2pin by PWR jumper.

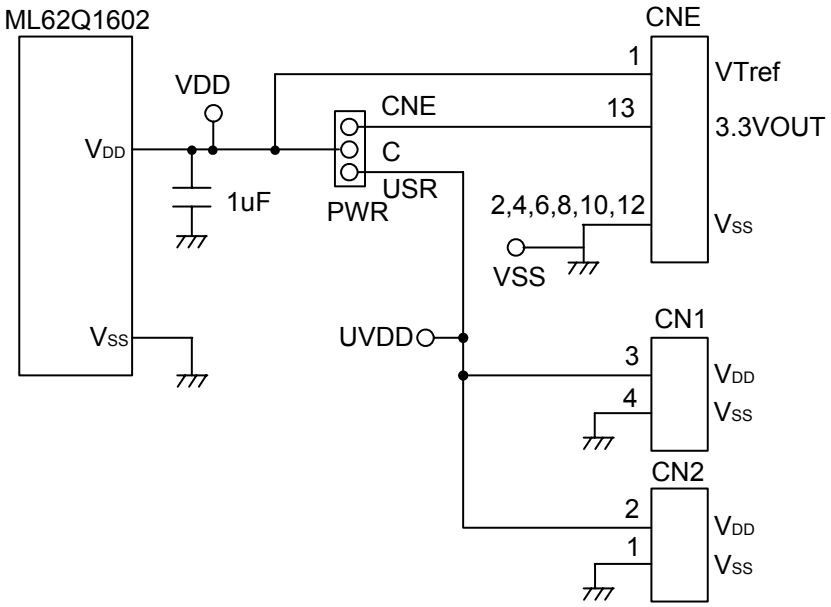


Fig.2 Power Circuit

[Note]

The power supply ON/OFF procedure in case of setting PWR jumper to the USR-side, and using EASE1000

- The procedure of power supply ON
  1. The USB cable of EASE1000 is connected.
  2. The power supply of user target system is turned on..

- The procedure of power supply OFF
  1. The power supply of user target system is turned off
  2. The .USB cable of EASE1000 is removed

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2.2 Connector for EASE1000 (CNE)

EASE1000 can be used if J1 and J2 jumper are set to "CNE" .

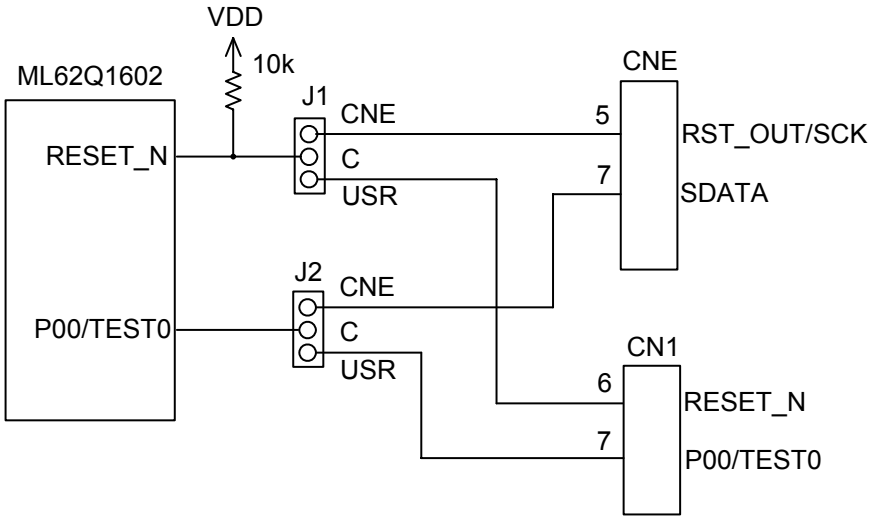


Fig.3 EASE1000 Interface

[Note]

P00/TEST0 pin:

P00/TEST0 pin of ML62Q1602 is initially set as the pulled-up input mode.

When using EASE1000 do not set it as an output mode by the application program, otherwise EASE1000 cannot communicate with the ML62Q1602.

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2.3 LED (P20, P21, P22)

P20-P22 of the ML62Q1602 are ports that can directly drive a LED. The Ports are connected to the LEDs through jumper-chip. Remove the jumper-chip when not using the LEDs or using SEGMENT pin.

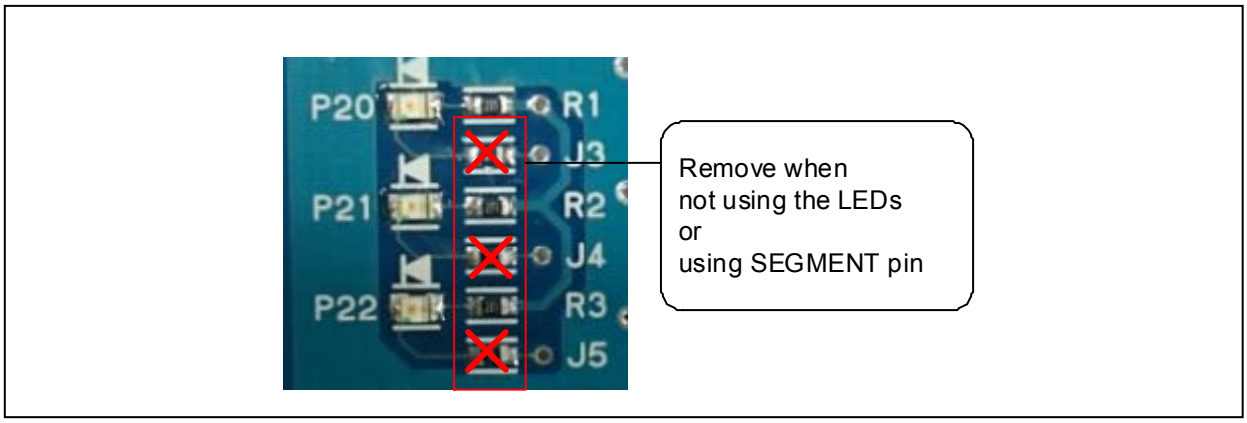


Fig.4 Jumper-chip removal of LEDs

2.4 XT0/PIO0, XT1/PIO1

ML62Q1602 Reference Borad can mount cylinder type or SMD type crystal oscillator.

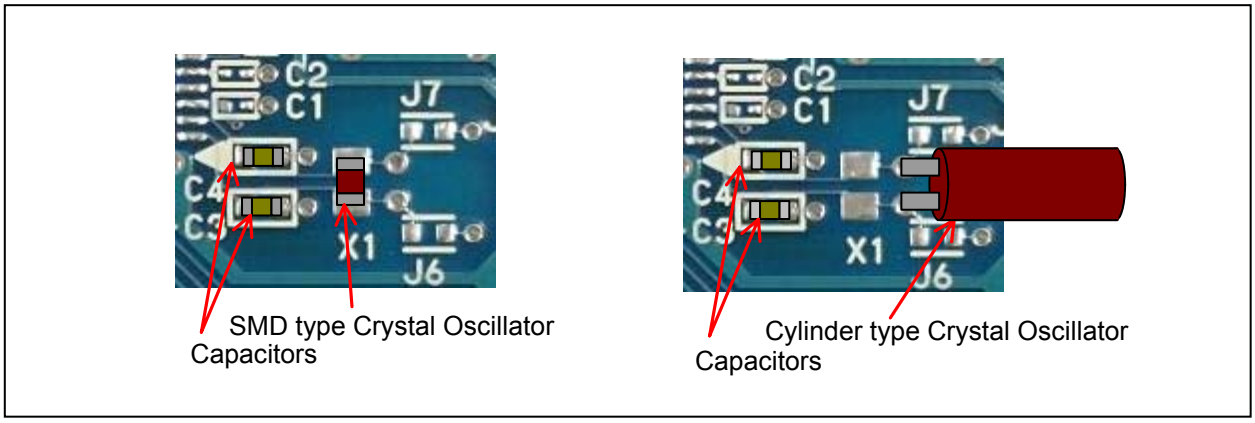


Fig.5 Example of processing of Crystal Oscillator

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2.5 C1, C2, VL1, VL2, VL3

The Capacitors for LCD are connected to C1 pin, C2 pin, VL1 pin, VL2 pin and VL3 pin.
And it can be connected with CN1 via J8-J12.
ML62Q1602 Reference Board can no use J8-J12.
Therefore please do not mount various parts on J8-J12.

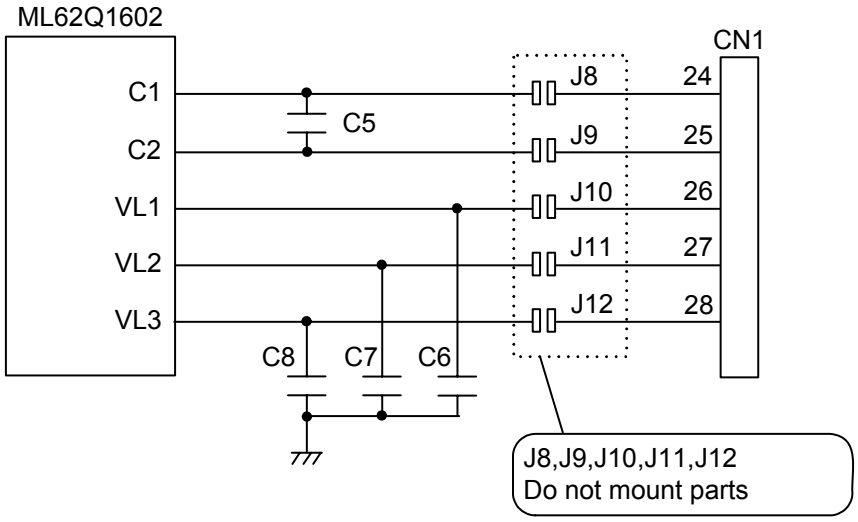


Fig.6 LCD bias generation Circuit

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. User Interface

Table 2. show the pin list of the ML62Q1602 Reference Board user interface connector CN1 and CN2.

Table 2. ML62Q1602 Reference Board CN1/CN2

CN1	NAME	CN1	NAME	CN2	NAME	CN2	NAME
1	XT0/PIO0	26	N.C.	1	V_{SS}	26	N.C.
2	XT1/PIO1	27	N.C.	2	V_{DD}	27	N.C.
3	V_{DD}	28	N.C.	3	N.C.	28	N.C.
4	V_{SS}	29	N.C.	4	N.C.	29	N.C.
5	N.C.	30	P04/COM0	5	N.C.	30	N.C.
6	RESET_N	31	P05/COM1	6	N.C.	31	N.C.
7	P00/TEST0	32	P06/COM2	7	P14/SEG22	32	N.C.
8	P01	33	P07/COM3/SEG0	8	P15/SEG23	33	N.C.
9	N.C.	34	P10/COM4/SEG1	9	P16/SEG24	34	P30/SEG49
10	N.C.	35	P11/COM5/SEG2	10	P17/SEG25	35	P31/SEG50
11	N.C.	36	P12/COM6/SEG3	11	P20/SEG26	36	P32/SEG51
12	N.C.	37	P13/COM7/SEG4	12	P21/SEG27	37	P33/SEG52
13	N.C.	38	P50/SEG5	13	P22/SEG28	38	P60/SEG53
14	N.C.	39	N.C.	14	P23/SEG29	39	P61/SEG54
15	N.C.	40	N.C.	15	P24/SEG30	40	P62/SEG55
16	N.C.	41	N.C	16	P25/SEG31	41	P63/SEG56
17	N.C.	42	N.C.	17	P26/SEG32	42	P64/SEG57
18	N.C.	43	N.C.	18	P27/SEG33	43	P65/SEG58
19	P02	44	N.C.	19	N.C.	44	P66/SEG59
20	P03	45	N.C.	20	N.C.	45	N.C.
21	N.C.	46	N.C.	21	N.C.	46	N.C>
22	N.C.	47	N.C.	22	N.C.	47	N.C.
23	N.C.	48	N.C.	23	N.C.	48	N.C.
24	N.C.	49	N.C.	24	N.C.	49	N.C.
25	N.C.	50	N.C.	25	N.C.	50	P43

N.C. : Non-Connection

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4. Precaution for use

(1) The ML62Q1602 Reference Board is an unfinished product and intended for research and development and for expert use in the research and development facility only. The ML62Q1602 Reference Board is not intended for use for volume production or parts thereof.
(2)Since the content specified herein is subject to change for improvement without notice, confirm the content is the latest when using the board.
(3) See another documents ML62Q1000 series user's manual and EASE1000 user's manual when using the ML62Q1602 Reference Board.
(4) Confirm the final electrical characteristics by using the mass production parts on your mass production boards.
(5) LAPIS support replacing the board for an initial failure soon after the shipment, can not support reparing the board.
(6) ML62Q1602 Reference Board have signal patterns on the underside, it might work in abnormal if using on conductive materials. Use it on insulating materials or having any preventable parts.

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5. PCB specification, BOM and Schematic

5.1 ML62Q1602 Reference Board PCB specification

Figure 5. shows the Reference Board PCB dimensional outline drawing and layout of components.

PCB part number:
RB-D62Q1602TB48

Dimension:
55.88 mm x 93.98 mm

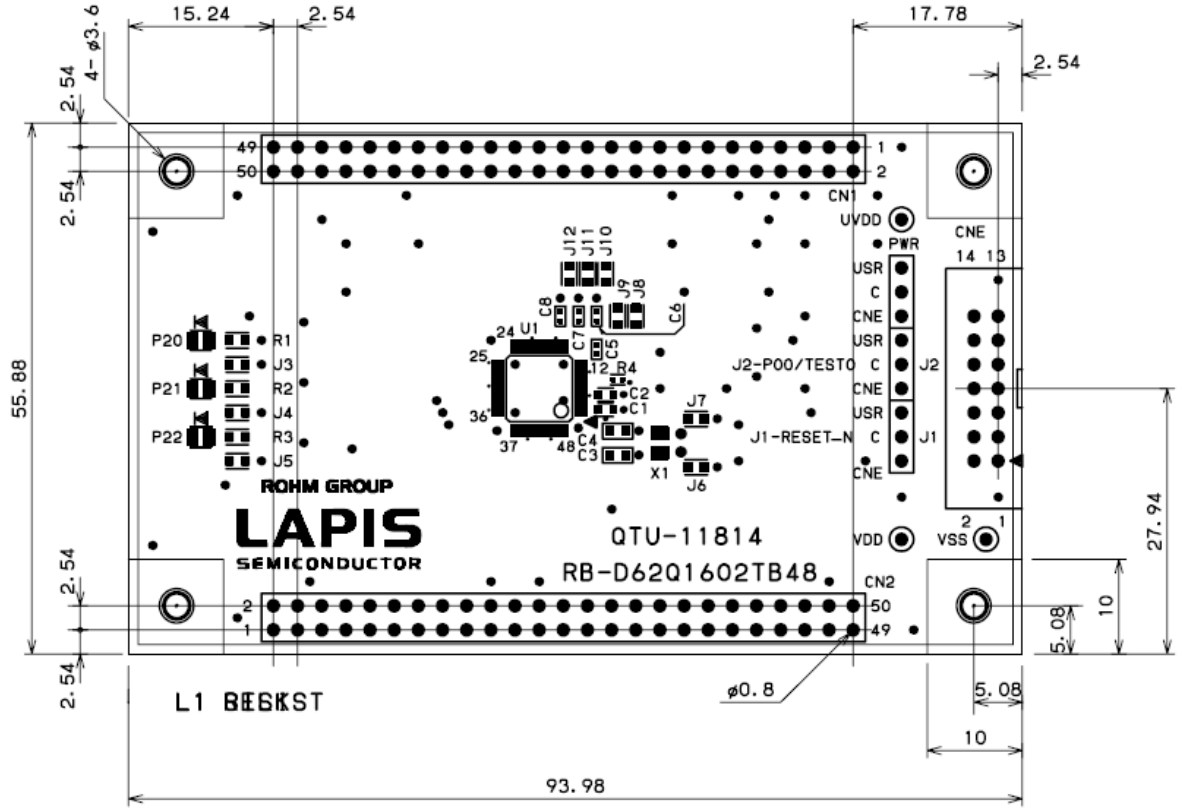


Fig.7 Reference Board PCB dimensional outline drawing and layout of components (Top view)

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5.2 ML62Q1602 Reference Board BOM

Table 3. Reference Board BOM

	Parts Number	Silk	Contents	Package Type	Qty.	Maker
1	QTU-11814	RB-D62Q1602TB48	PCB	-	1	LAPIS
2	ML62Q1602TQFP48	U1	ML62Q1602TQFP48	TQFP48	1	LAPIS
3	MCR03ERTJ000	J3, J4, J5	Jumper Chip	1608(1.6x0.8mm)	3	ROHM
4	SML-210PT	P20, P21, P22	ChipLED（Green）	2012(2.0x1.2mm)	3	ROHM
5	MCR03EZHJ271	R1, R2, R3	Chip Resistor 270Ω	1608(1.6x0.8mm)	3	ROHM
6	MCR01MZPJ103	R4	Chip Resistor 10kΩ	1005(1.0x0.5mm)	1	ROHM
7	GRM188R7YA105KA12D	C1, C2, C5, C6, C7, C8	Ceramic Capacitor 1uF/35V	1608(1.6x0.8mm)	6	MURATA
8	GRM1885C1H1160FA01D	C3, C4	Ceramic Capacitor 16pF/50V	1005(1.0x0.5mm)	2	MURATA
9	HIF3FC-14PA-2.54DSA	CNE	14pin Connector	14pin DIP	1	HIROSE
10	VT-200-F	X1	32.768kHz	2pin DIP	1	SII
11	A2-3PA-2.54DSA	J1, J2, PWR	3pin Pin Header	3pin DIP Straight	3	HIROSE
12	HIF3GA-2.54SP	-	Short pin	-	3	HIROSE
13	FF013-AR79	-	Rubber leg	-	4	KOYO FASTENER
14	P3555	-	Push rivet	-	4	KOYO FASTENER
15	A1-50PA-2.54DSA (Un-mounting)	CN1, CN2	50pin 2.54pitch φ0.8 ㎜	50pin Straight	2	HIROSE
16	Check Pin (Un-mounting)	VDD, VSS	φ0.8 ㎜	-	2	-

[Note]

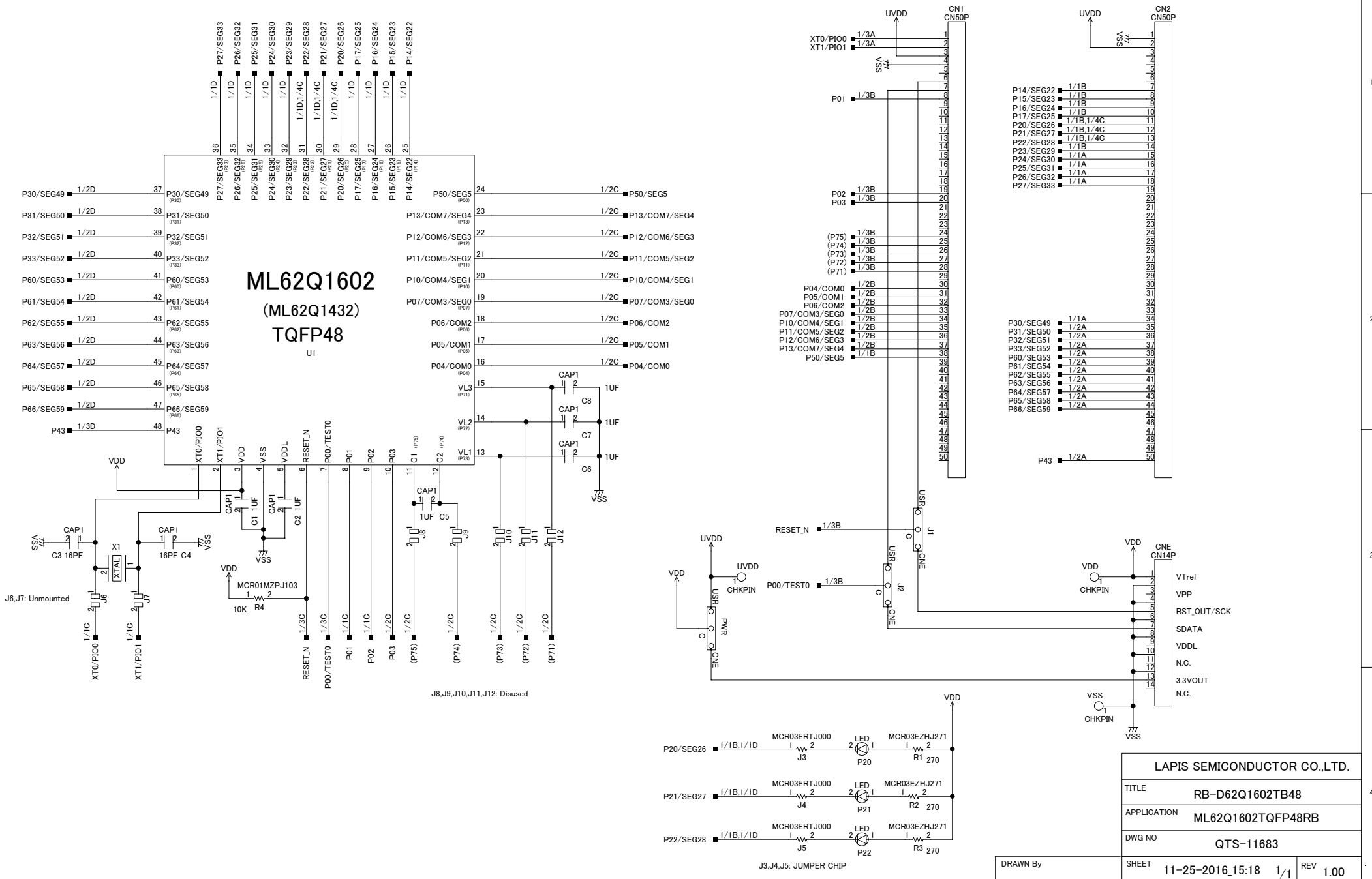
- The diameter of through hole of CN1 and CN2 is 0.8 mm.
  Using CN1 and CN2, the diameter of connector pin should use the connector below 0.8mm, such as 0.5mm.

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

5.3 ML62Q1602 Reference Board Schematic

The next page shows the schematic of ML62Q1602 Reference Board

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REVISION HISTORY

Document No.	Date	Page		Description
		Previous Edition	Current Edition	
FEBL62Q1602RB-01	April 7, 2017	-	-	First Edition
FEBL62Q1602RB-02	Aug. 1, 2017	4	4	Fig.1 changed
		11	11	Fig.7 changed
		12	12	Table3 Cap changed
FEBL62Q1602RB-03	October 10,2017	12	12	Table3 Corrected C1, C2

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