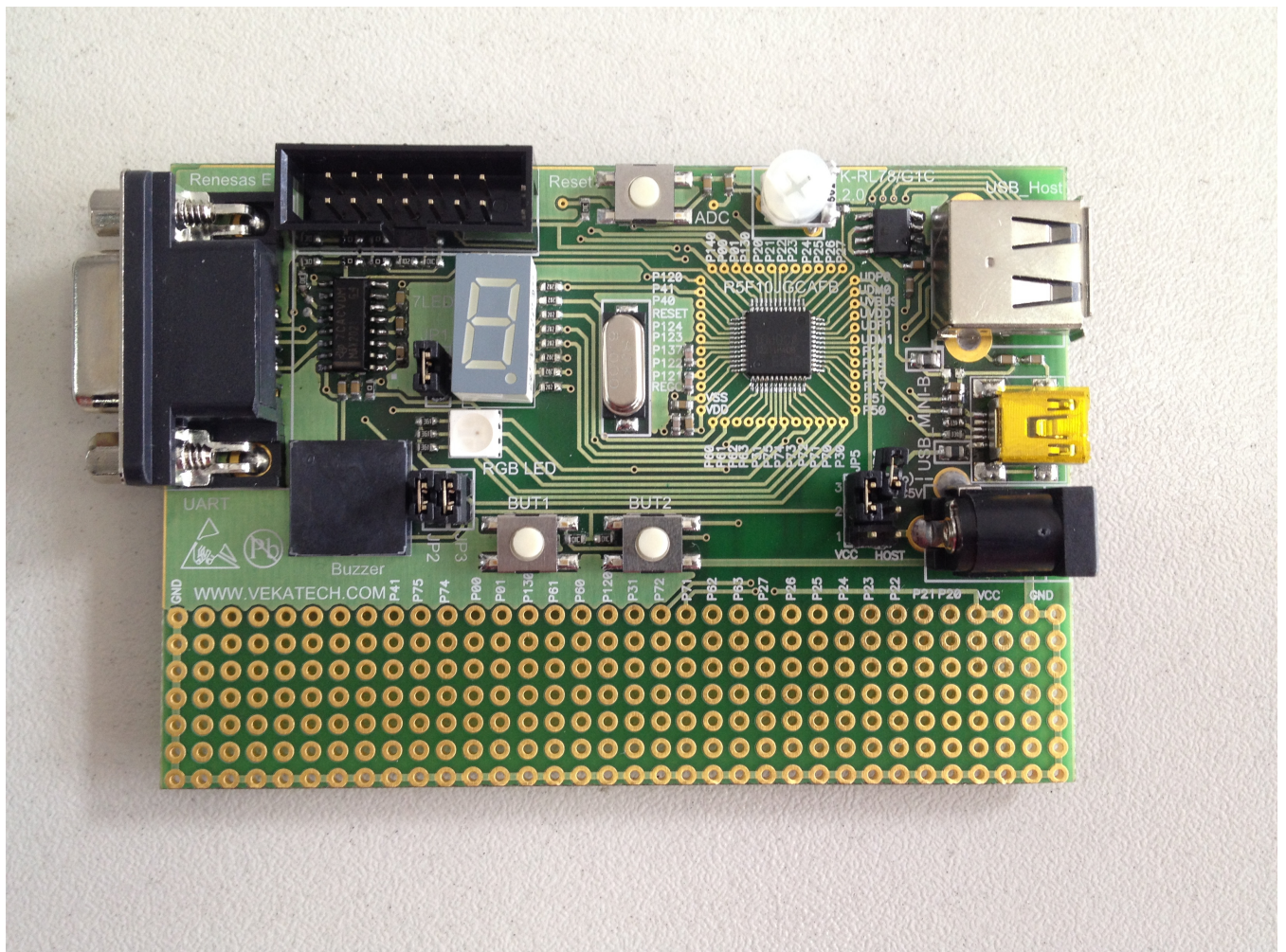


[Draft Rev. 0, October 21, 2013]



The document is intended to guide users with background in embedded systems to use VK-RL78/G1C Development Board in their applications.

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Chapter 1: Introduction

VK-RL78/G1C is a development board, which uses MCU R5F10JGC from Renesas Electronics. This 16bit MCU supports serial interfaces such as USB HOST/FUNCTION, Serial array unit (SPI/UART/simplified I²C), I²C etc.. In addition, you will find 14 pins interface for E1 debugging, user push buttons, RGB LED, 7 Seg LED indicator, buzzer, . All this, with power supply connector connected to pin headers, unused pins of R5F10JGC, allow you to build a diversity of user applications, which could be used in a wide range of embedded tasks.

1.1 Main features of VK-RL78/G1C

- MCU: RL78/G1C – R5F10JGC
- 1-USB HOST interface
- 1-USB FUNCTION interface
- 1-RS232 interface (MAX232)
- 14 pins Debug E1 connector.
- User 1 RGB LED and 7 segment LED.
- User 2 push buttons and RESET button.
- Power connector for External 5V Power supply.
- **FR-4, 1.6 mm**, Green/White solder mask, component print.
- Dimensions: 95,3mm x 65,8mm

1.2 Electrostatic warning

The VK-RL78/G1C board is shipped in protective anti-static packaging. The board must not be subject to high electrostatic potentials. General practice for working with static sensitive devices should be applied when working with this board.

1.3 Processor Features

The VK-RL78/G1C board use 16bit RL78/G1C MCU R5F10JGC from Renesas Electronics with the following features:

ROM:	32 KB Flash
Data Flash:	2 KB
RAM:	5632 B
Operating Voltage:	2.4 V to 5.5 V
Max. Frequency:	24 MHz
Package:	48 LFQFP
CPU:	RL78G1C core
Safety Functions:	Flash CRC, RAM parity, RAM & SFR guard, Invalid memory access, Frequency detection, A/D test, Digital output signal level
DMA:	2 channels
Main oscillator :	1 - 20 MHz
Low speed internal oscillator:	15 kHz typ.
High speed internal oscillator:	48/24 MHz typ.
PLL:	x6/x8 or 48 MHz max when using USB.
I/O port:	42 (CMOS I/O: 32 + CMOS I: 5 + CMOS O: 1 + N-ch open drain I/O: 4)
A/D Converter:	9 channels

Timers :

- Timer Array Unit: 16-bit x 1 unit x 4 channels
- Window watchdog timer: 1 channel
- Real-time clock: 1 channel
- Interval timer: 12-bit 1 unit x 1 channel

Serial Interface :

- SERIAL ARRAY UNIT:
CSI x 2 channels / UART x 1 channel / Simplified I²C x 2 channel
- I²C: 1 channel

Interrupt:

- Maskable: External 10

Power on Reset

Voltage Detector

Key interrupt: 6 channels

Clock output / Buzzer output

BCD correction

On-chip debugg function

Operating temperature:-40 to +85 °C

For more information, please visit www.renesas.eu

1.4 System requirements

Host PC: A PC for CubeSuite+ V2.0.00.00 demo-version supporting Windows 2000, Windows XP, Windows Vista or Windows 7.

Adobe Acrobat Reader.

1.5 Package contents

VK-RL78/G1C board.

3M glue legs.

CD with demo projects.

1.6 Trademarks

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Chapter 2: VK-RL78/G1C System Configuration.

VK-RL78/G1C can be used in general USB, UART/SPI/I²C, communications environment and other embedded task.

2.1 Power supply circuit

VK-RL78/G1C is supplied by one of the following interfaces listed below.
Power consumption may varies and the maximum is 60 mA.

Please note the position of jumper **JP5**:

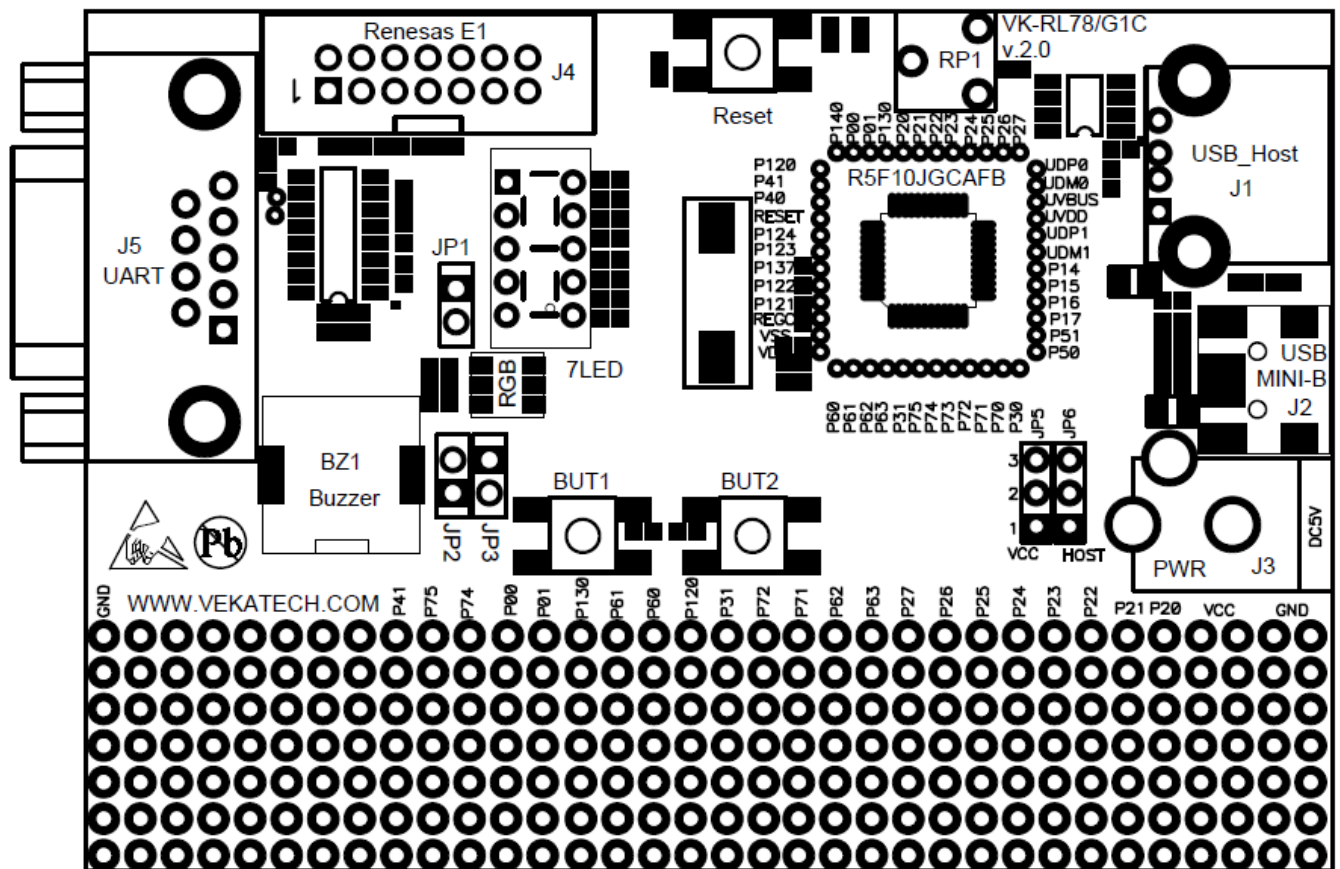
Via DC Power Adapter:

VK-RL78/G1C is powered by 5V DC applied at the power jack J3. (shorting **JP5_1** & **JP5_2**)

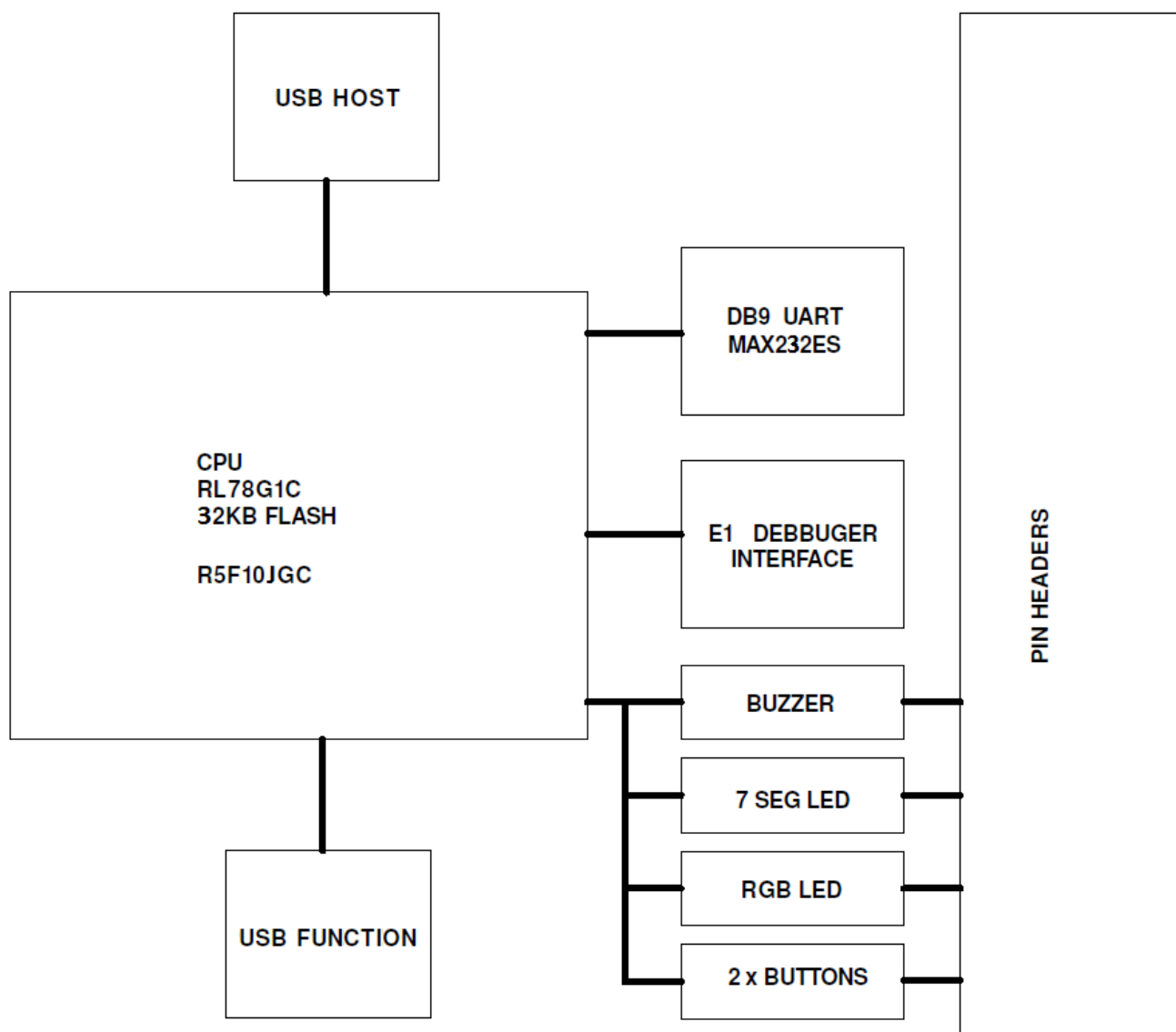
Via “USB Mini-B Function Device” interface:

VK-RL78/G1C is powered by USB Mini connector J2. (shorting **JP5_2** & **JP5_3**)

Chapter 3: Hardware



3.1 Block Diagram



3.2 Hardware Components

3.2.1 Clock Circuits:

Quartz crystal 8.000 MHz is connected to R5F10JGC (X1) 45 pin and (X2) 44 pin.

3.2.2 LED's:

RGB LED

Component	Signal name	Pin name	MCU pin
D4 Red	R_PWM	P3_1	5 pin (R5F10JGC)
D4 Green	G_PWM	P7_2	9 pin (R5F10JGC)
D4 Blue	B_PWM	P7_1	10 pin (R5F10JGC)

3.2.3 7 SEG LED:

Kingbright SA36-11SRWA

Signal Name	Pin name	Pin #
SEG_A	P4_1	38
SEG_B	P6_0	1
SEG_C	P7_5	6
SEG_D	P13_0	33
SEG_E	P0_1	34
SEG_F	P6_1	2
SEG_G	P7_4	7
SEG_DP	P0_0	35

3.2.4 Piezo buzzer:

Murrata PKLCS 1212E4001-R1

Component	Signal name	Pin name	MCU pin
BZ1	BUZZER	P140	36

3.2.5 Push buttons:

Component	Signal name	Pin name	MCU pin
SW1	T_RESET_N	RESET	40
SW2	BUT1	P62	3
SW3	BUT2	P63	4

3.2.6 ADC Potentiometer:

Component	Signal name	Pin name	MCU pin
RP1	ADC_POT	P120	37

3.2.7 Connectors Description:

USB host – USB A jack connector J1

Pin#	Signal Name	Pin#	Signal Name
2	UDMH	4	GND
3	UDPH		

Note: Pin#1 supplys the devices connected to the USB host:

- **Power** for USB devices is drawn **form** PWR jack J3 (shorting **JP6_1** & **JP6_2**)
- **Power** for USB devices is drawn **from** **USB MINI B** J2 (shorting **JP6_2** & **JP6_3**)

UDMH

- UDM1 pin 19 of R5F10JGC

UDPH

- UDP1 pin 20 of R5F10JGC

USB device – USB MINI B connector J2

Pin#	Signal Name	Pin#	Signal Name
1	+V_USB	3	UDPF
2	UDMF	5	GND

Note: Pin#4 ID is unconnected.

+V_USB Output USB device power.

- VBUS pin 22 of R5F10JGC

UDMF

- UDM0 pin 23 of R5F10JGC

UDPF

- UDP0 pin 24 of R5F10JGC

PWR - connector J3

Pin#	Signal Name	Pin#	Signal Name
1	Positive power	2,3	Negative power

The power input should be +(5VDC)

E1 debugger interface - 14 pins connector J4:

Pin#	Signal Name	Pin#	Signal Name
1	NC/R.F.U.	2	GND
3	NC/R.F.U.	4	NC/R.F.U.
5	TOOL0	6	TRESET (in)
7	NC/R.F.U.	8	VDD
9	EMVDD	10	RESET (out)
11	NC/R.F.U.	12	GND
13	RESET (out)	14	GND

UART– 9 pins DB9F connector J5

Pin#	Signal Name	Description
2	TX_RS	14 pin MAX232SA
3	RX_RS	13 pin MAX232SA
4	loopback	
5	GND	
6	loopback	
7	RTS_RS	7 pin MAX232SA
8	CTS_RS	8 pin MAX232SA

TXDB0 - P5_1 pin 14 of R5F10JGC

RXDB0 - P5_0 pin 13 of R5F10JGC

RTS_B0 - P7_0 pin 11 of R5F10JGC

CTS_B0 - P3_0 pin 12 of R5F10JGC

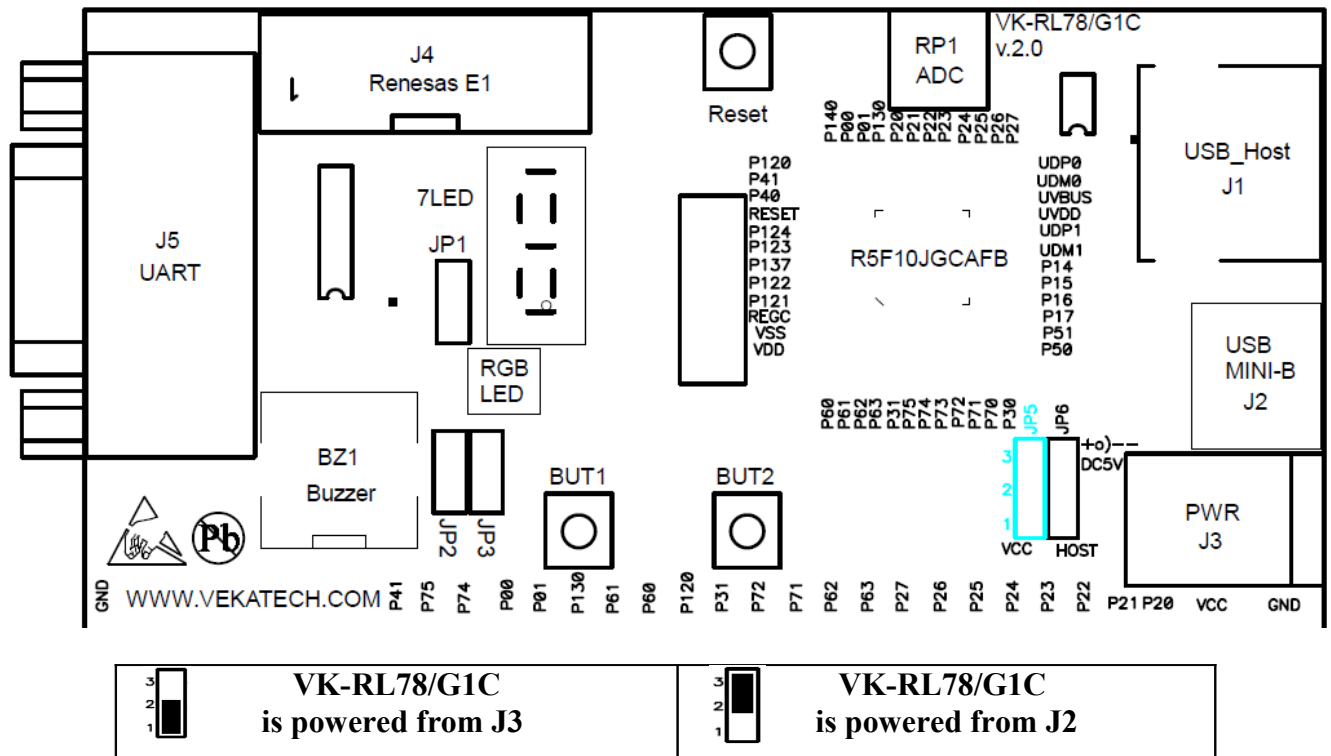
Unused Pin Headers

From left to right

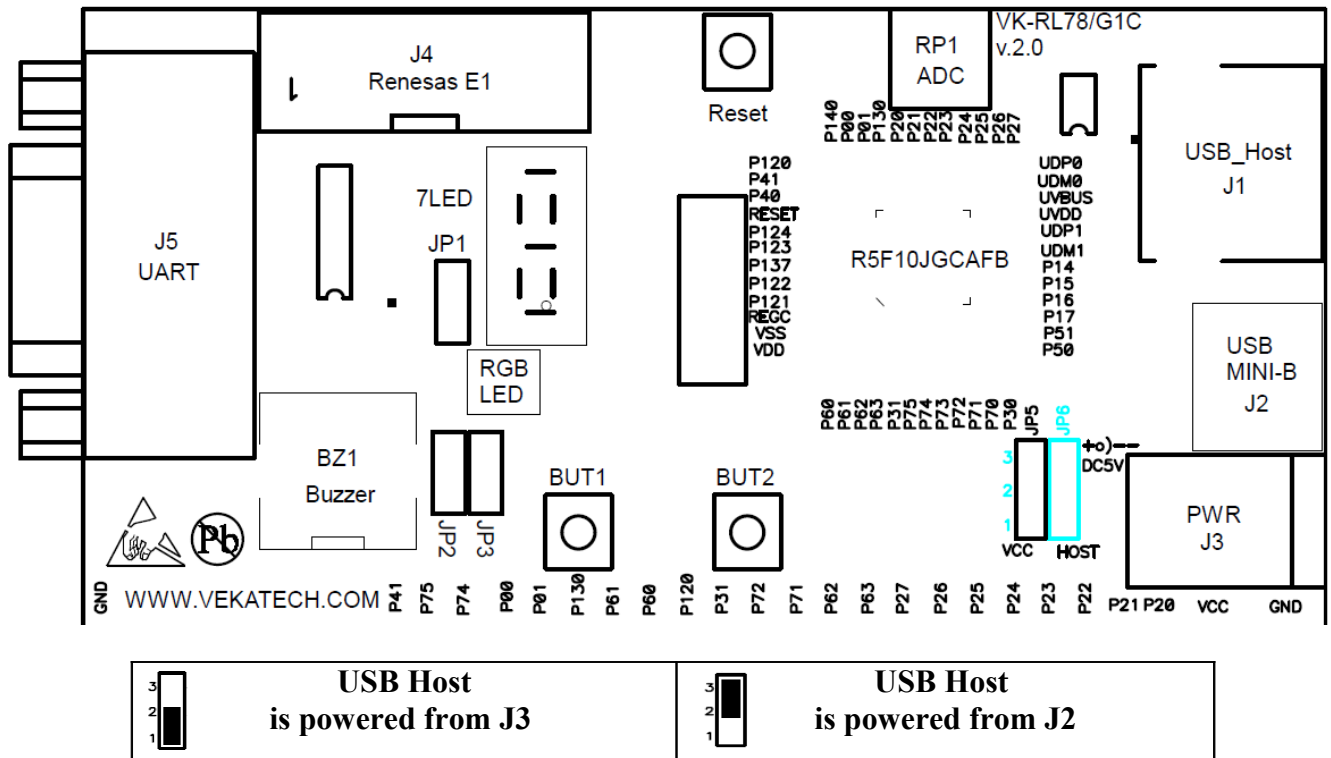
Pin#	Signal Name	Pin#	Signal Name
1	P14_0	2	P4_1
3	P7_5	4	P7_4
5	P0_0	6	P0_1
7	P13_0	8	P6_1
9	P6_0	10	P12_0
11	P3_1	12	P7_2
13	P7_1	14	P6_2
15	P6_3	16	P2_7
17	P2_6	18	P2_5
19	P2_4	20	P2_3
21	P2_2	22	P2_1
23	P2_0	24	VCC
25	VCC	26	GND
27	GND		

3.3 Jumper's Configuration

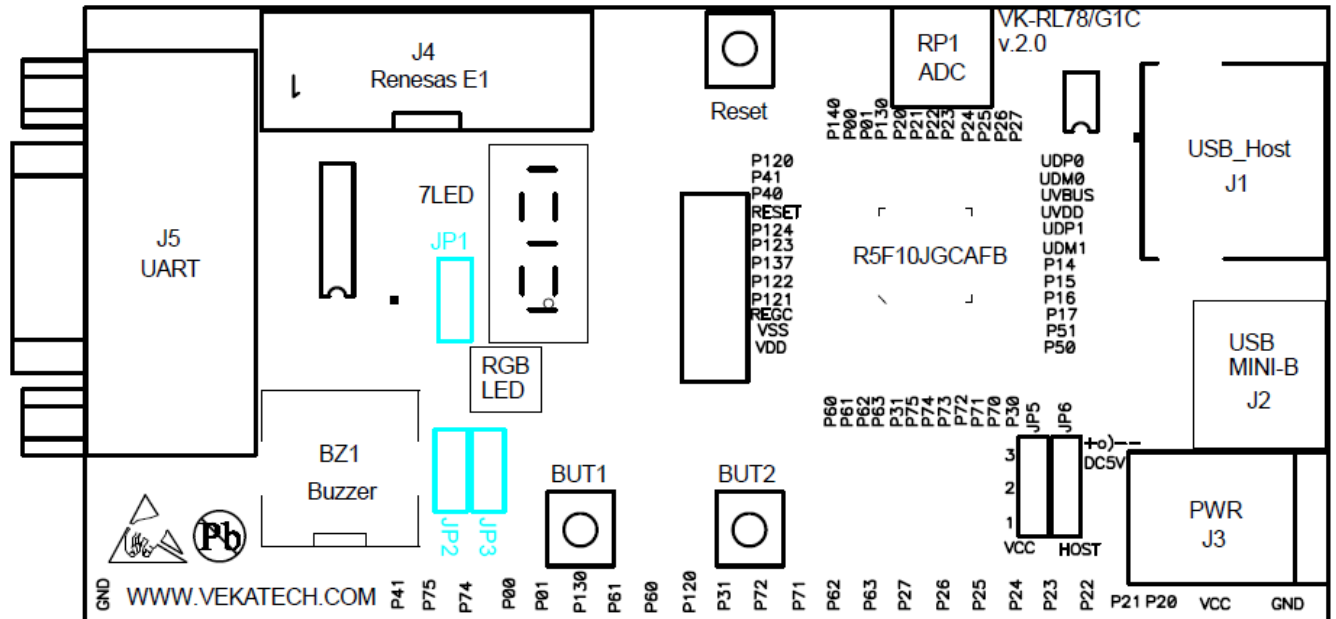
3.3.1 System power source



3.3.2 Host power source



3.3.3 Power supply for BUZZER, RGB LED and 7 SEG LED



JP1 powers the 7 SEG LED	JP2 powers the BUZZER	JP3 powers the RGB LED
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Chapter 4: On-Chip Debugging and Flash Program

4.1 OCD via E1 Debbuger

E1 Debugger can be connected to J4 to debug user applications. Renesas Electronics Flash Programmer 2.00 can be used as Flash programming tool.

Chapter 5: Software Installation

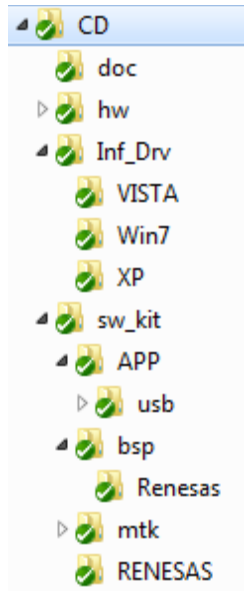
This manual is not intended to guide you through installation procedures of any development or application software. Please refer to the relevant sources.

Chapter 6: Demo Project

It contains sample application which tests the periphery of the kit VK- RL78\G1C. The test includes: RP1, 7 SEG LED, RGB LED, BUZZER, UART, USB FUNCTION, USB HOST, BUT1, BUT2.

The available project is prepared to compile with **Cubesuit+** tool chain.

The project is located in **CD \ sw_kit \ RENESAS **



Files from the project follows the organization:

CD \ sw_kit \ APP	- demo project's source & header files.
CD \ sw_kit \ bsp	- board support package's source & header files.
CD \ sw_kit \ bsp \ Renesas	- startup, option bytes, security ID & header files.
CD \ sw_kit \ mtk	- multi task kernel's source & header files.
CD \ sw_kit \ APP \ usb	- source & header files of Renesas USB PCDC & HCDC drivers using USB Basic Mini Firmware.
CD \ doc	- reference documents for mcu R5F10JGC.
CD \ hw	- .sch and .pcb files of VK-RL78/G1C board.
CD \ Inf_Drv	- Usb driver for XP, VISTA, 7.

6.1 Test of RP1 & 7 SEG LED

General introduction

This test is default performed as soon as you **load the demo project**. (Build mode: **PCDC_rel**):

- When you twist RP1, 7 SEG LED shows digits from 0 to 9.
- Blinking dot of the 7 SEG LED shows that demo project works properly.

6.2 Test of RGB LED & BUZZER

General introduction.

This test is launched as soon as you **load the demo project and press BUT1**:

- only LED R turns on. Now red brightness can be adjusted twisting RP1.
- pressing BUT1 once again, LED R is off and only LED G is on. Now green brightness can be adjusted twisting RP1.
- pressing BUT1 once again, LED G is off and only LED B is on. Now blue brightness can be adjusted twisting RP1.
- pressing BUT1 once again, you will return to RP1 & 7 SEG LED test, but now the tuned brightnesses of the R, G, B colors are remembered and mixed, forming one RGB particular color. If you keep pressing BUT1 you can set different color, setting brightness levels separately.
- Every time you press BUT1, the BUZZER will emit sound as long as you keep the button pressed.

6.3 Test of UART & USB Function

General introduction.

This test is launched as soon as you **load the demo project**. This test needs a PC application such as (Terminal, PUTTY, Hyper terminal, etc.) and mini usb cable. PC recognizes VK-RL78/G1C as virtual COM port. To perform the test please connect pin2 and pin3 of the DB9F connector (to build loop back connection).

- **USB <=> UART**: performs echo on virtual COM port. When this port is open with default configuration (9600 bps, 8 bit data, No parity, 1 stop) comport application should read the same data that was sent. If everything's right (see the same as what you are typing) it means that USB Function and UART works properly.

6.4 Test of USB Host

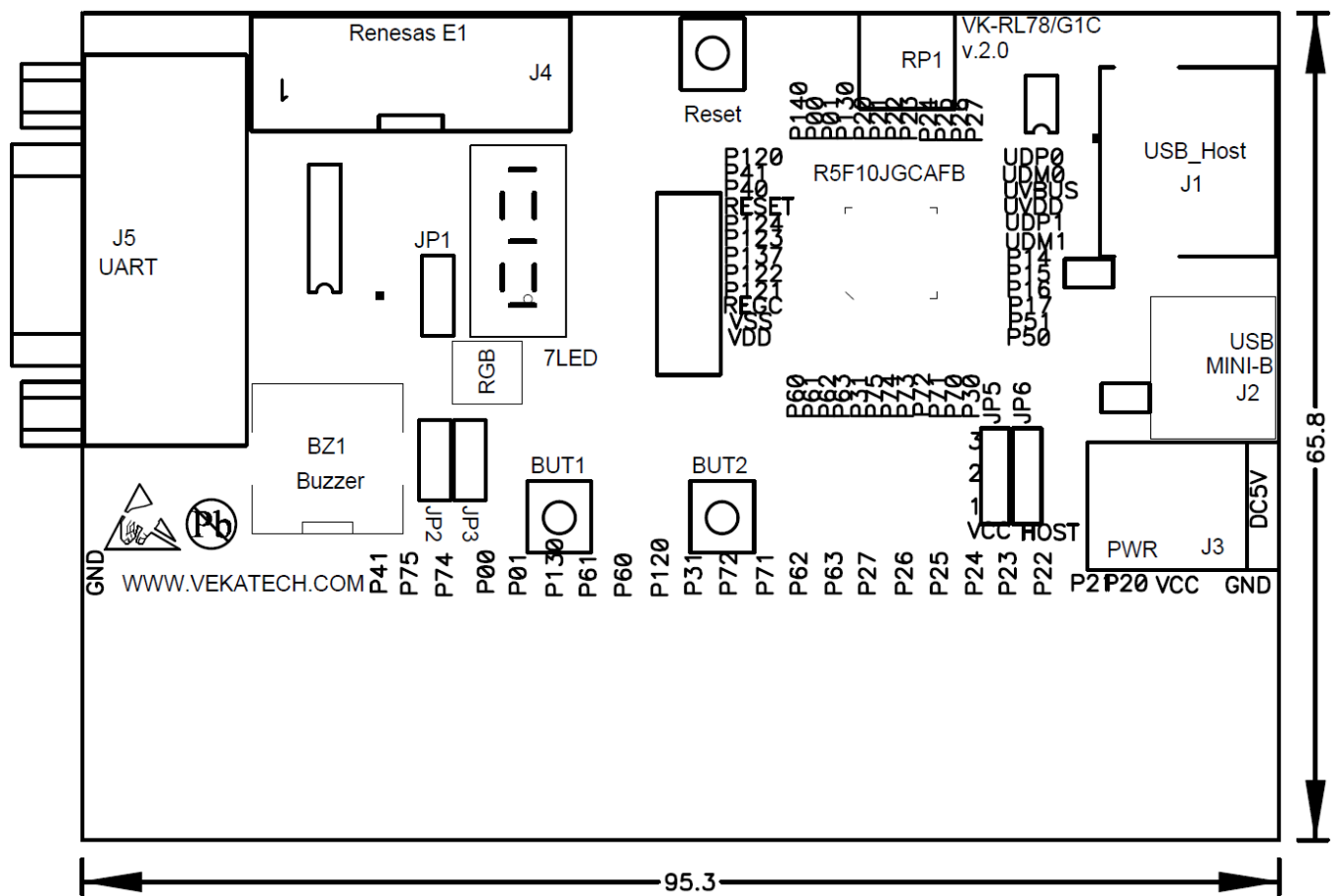
General introduction.

This test is launched as soon as you **load the demo project**. (Build mode: **HCDC_rel**):

This test needs another VK-RL78/G1C board (programmed with Build mode: **PCDC_rel**) or any other USB <=> UART converter (**using Abstract Control Model Serial Emulation Device CDC Class**), a PC application (such as Terminal, PUTTY, Hyper terminal, etc.), a serial cable and com port.

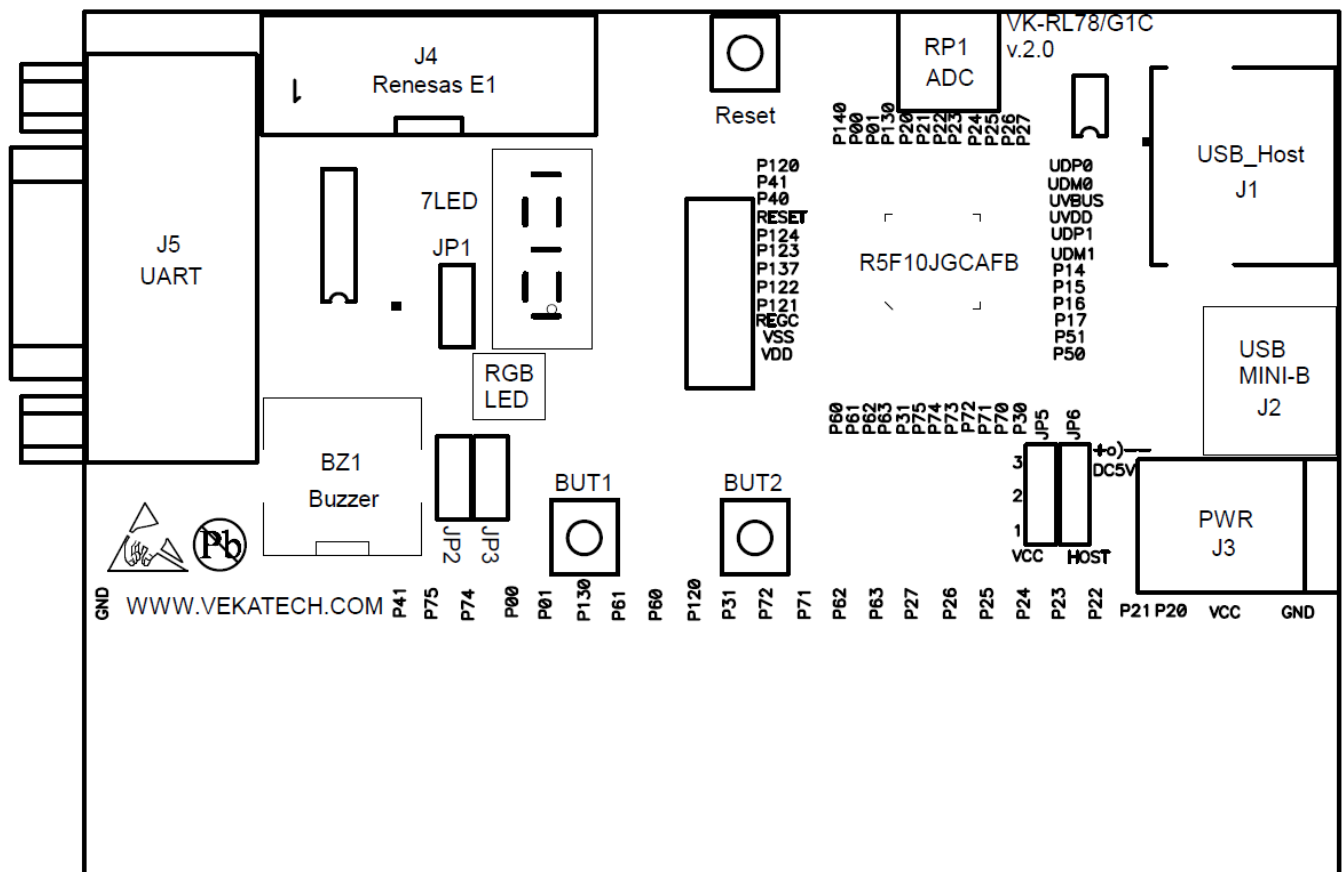
- **USB Host**: performs echo of the incoming characters from VK-RL78/G1C usb function board USB <=> UART converter. Default configuration after reset is **9600 bps, 8 bit data, No parity, 1 stop**.
- pressing BUT1, the 7 SEG LED shows 'b'. which means baud rate can be changed. Pressing BUT2 frequently, the 7 SEG LED shows '0', '1', '2', '3', '4', '5', '6', '7', '0', ... which means **1200bps, 2400bps, 4800bps, 9600bps, 14400bps, 19200bps, 38400bps, 57600bps, 1200bps ...** is selected. Pressing BUT1 applies the selected baud rate and turns the LED R on. Now red brightness can be adjusted twisting RP1.
- pressing BUT1 frequently, the behavior is the same as Build mode: **PCDC_rel**. You can read the position of the RP1, set the brightnesses of R, G, B colors separately or change the baud rate. Every press of BUT1 will make the BUZZER to emit sound. The sound will last as long as BUT1 is kept pressed.

Chapter 7: Mechanical Dimensions

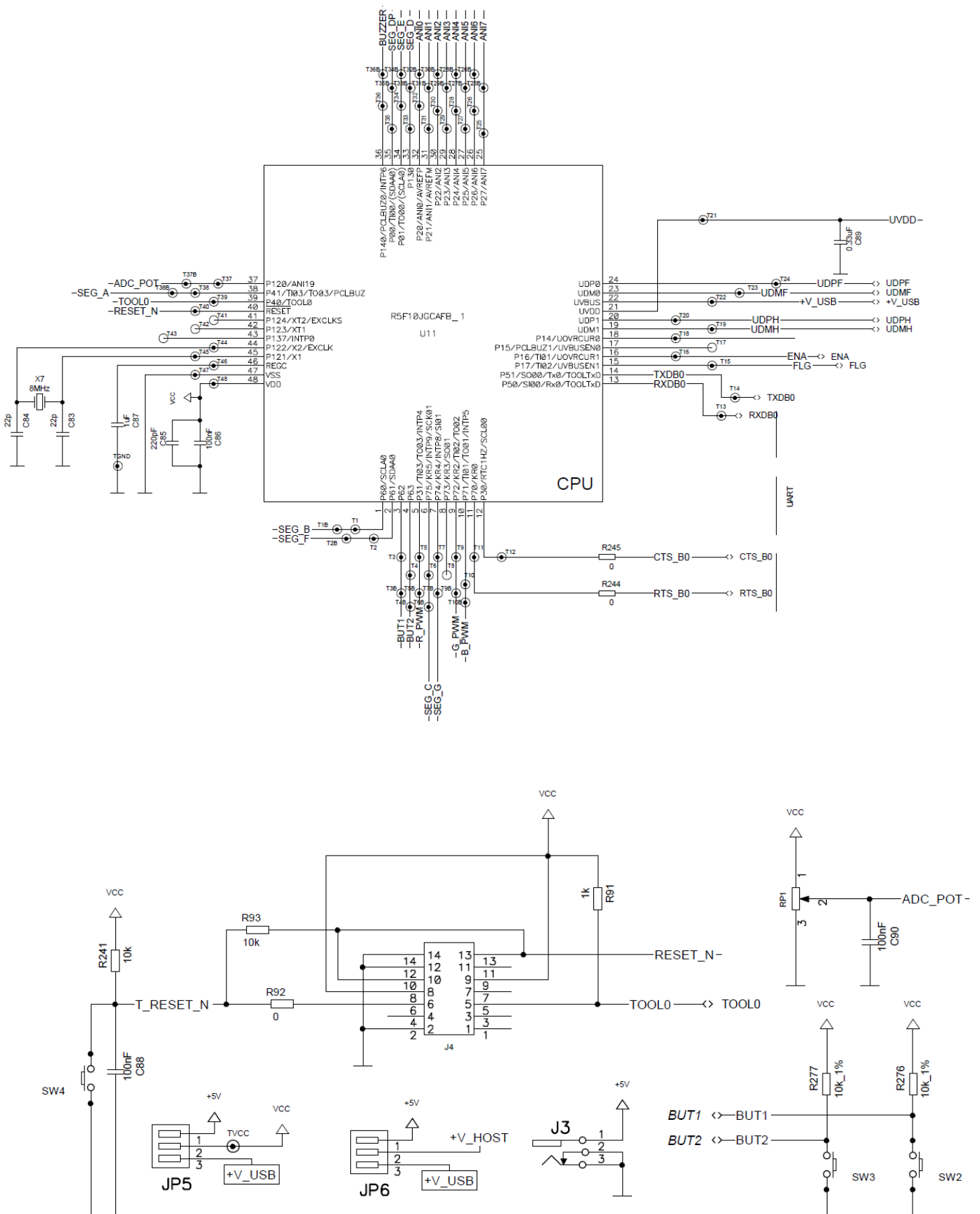


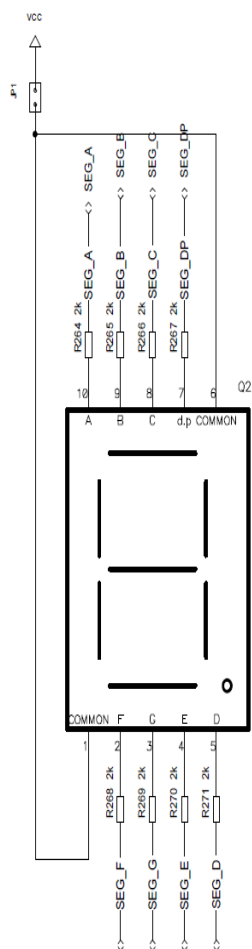
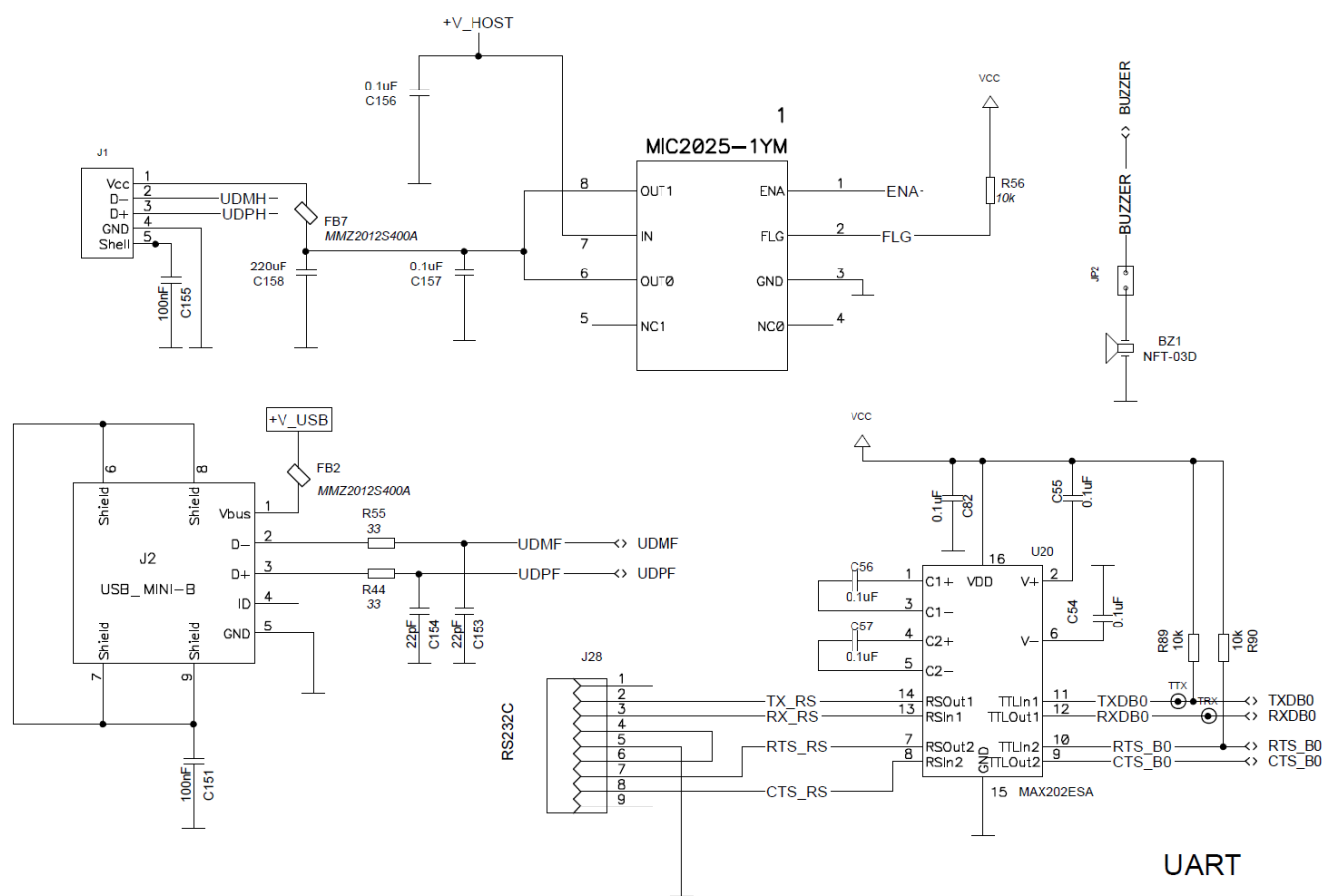
All measures are in mm.

Chapter 9: Reference Designators



Chapter 10: Schematics





Chapter 11: Troubleshooting

Chapter 12: End