

RX111 Group

Renesas Promotional Board Design Manual

RENESAS MCU
RX Family / RX100 Series

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Precautions

The following precautions should be observed when operating any RPB product:

This Renesas Promotional Board is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures;

- ensure attached cables do not lie across the equipment
- reorient the receiving antenna
- increase the distance between the equipment and the receiver
- connect the equipment into an outlet on a circuit different from that which the receiver is connected
- power down the equipment when not in use
- consult the dealer or an experienced radio/TV technician for help NOTE: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken;

- The user is advised that mobile phones should not be used within 10m of the product when in use.
- The user is advised to take ESD precautions when handling the equipment.

The Renesas Starter Kit does not represent an ideal reference design for an end product and does not fulfil the regulatory standards for an end product.

How to Use This Manual

1. Purpose and Target Readers

This manual is designed to provide the user with information about the hardware design and components of the RPB. The RPB is not intended as a reference design, and attention is drawn to the notice page at the front of this manual.

Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section, and in the Usage Notes section.

The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

The following documents apply to the RX111 Group and this board. Make sure to refer to the latest versions of these documents. The newest versions of the documents listed may be obtained from the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
Tutorial Manual	Describes the RPB hardware, sample software and capabilities.	RPBRX111 Tutorial Manual	R20UT2699EG
Quick Start Guide	Provides simple instructions to setup the RPB and run the first sample, on a single A4 sheet.	RPBRX111 Quick Start Guide	R20UT2700EG
Design Manual	Layout diagrams and Bill of Materials (BoM) for the RPB.	RPBRX111 Design Manual	R20UT2698EG
Schematics	Full detail circuit schematics of the RPB.	RPBRX111 Schematics	R20UT2697EG
Hardware Manual	Provides technical details of the RX111 microcontroller.	RX111 Group Hardware Manual	R01UH0365EJ

2. List of Abbreviations and Acronyms

Abbreviation	Full Form
ADC	Analog-to-Digital Converter
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
GUI	Graphical User Interface
IRQ	Interrupt Request
LED	Light Emitting Diode
MCU	Micro-controller Unit
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
n/a	Not applicable
NC	Not connected
J-Link OB	J-Link On-board debugger
PC	Personal Computer
PLL	Phase Locked Loop
ROM	Read Only Memory
RPB	Renesas Promotional Board
RSK	Renesas Starter Kit
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus

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1. Overview

1.1 Purpose

This RPB is a promotional board for Renesas microcontrollers. This manual describes the circuit board layout and the components used.

1.2 Features

This RPB provides an evaluation of the following features:

- Renesas microcontroller programming
- User code debugging
- User circuitry such as switches, LEDs and a potentiometer
- USB Host/Function connectivity
- Board-wide low power design for energy harvesting applications
- MCU current measurement

This product is not intended or supported for user solution development, and is designed solely for demonstration and evaluation. A Renesas Starter Kit (RSK) for the RX111 is available from your Renesas distributor.

1.3 Package Contents

- MCU current measurement
- YRPBRX111 Board
- USB Type A / Mini-B cable
- Potentiometer shaft to adjust the potentiometer voltage
- Mini DVD containing all the software, tools and documentation needed to quickly start evaluating the product.

2. Circuit Board Layout

This section should be read in conjunction with the board schematics.

2.1 Board Dimensions

Figure 2-1 below gives the board dimensions and connector positions.

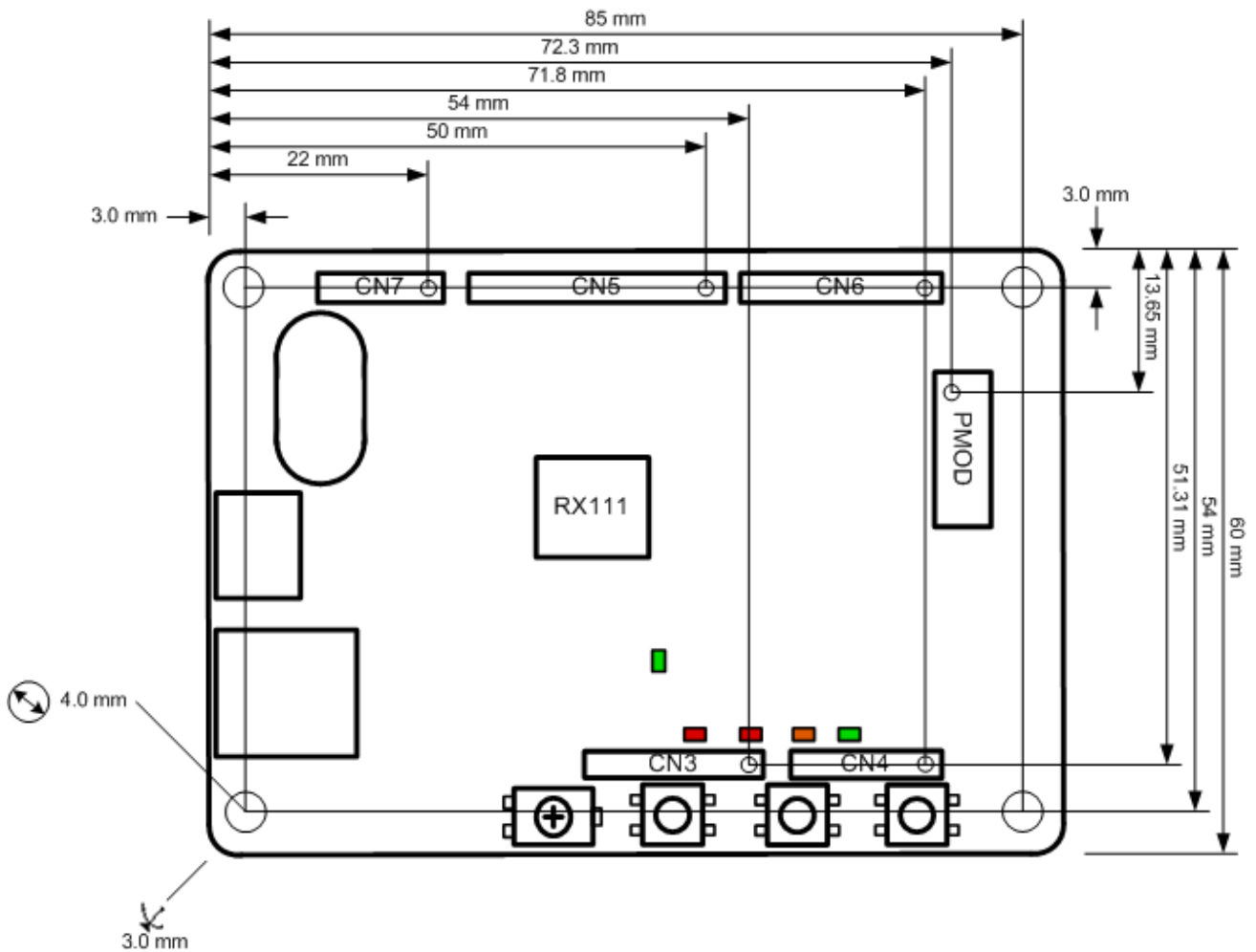


Figure 2-1 Board component layout

2.2 Component Placement Diagrams

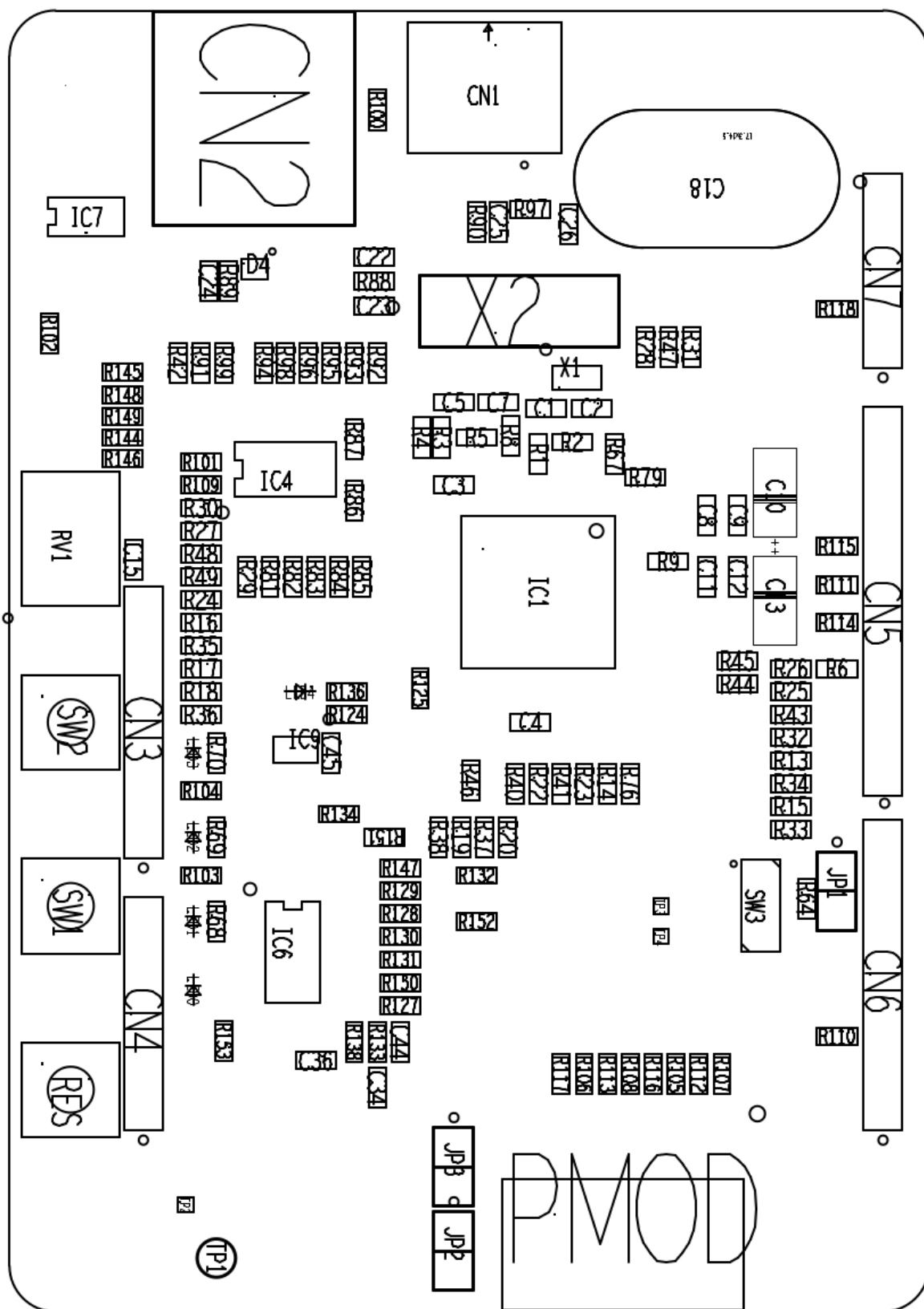


Figure 2-2 Top side component placement

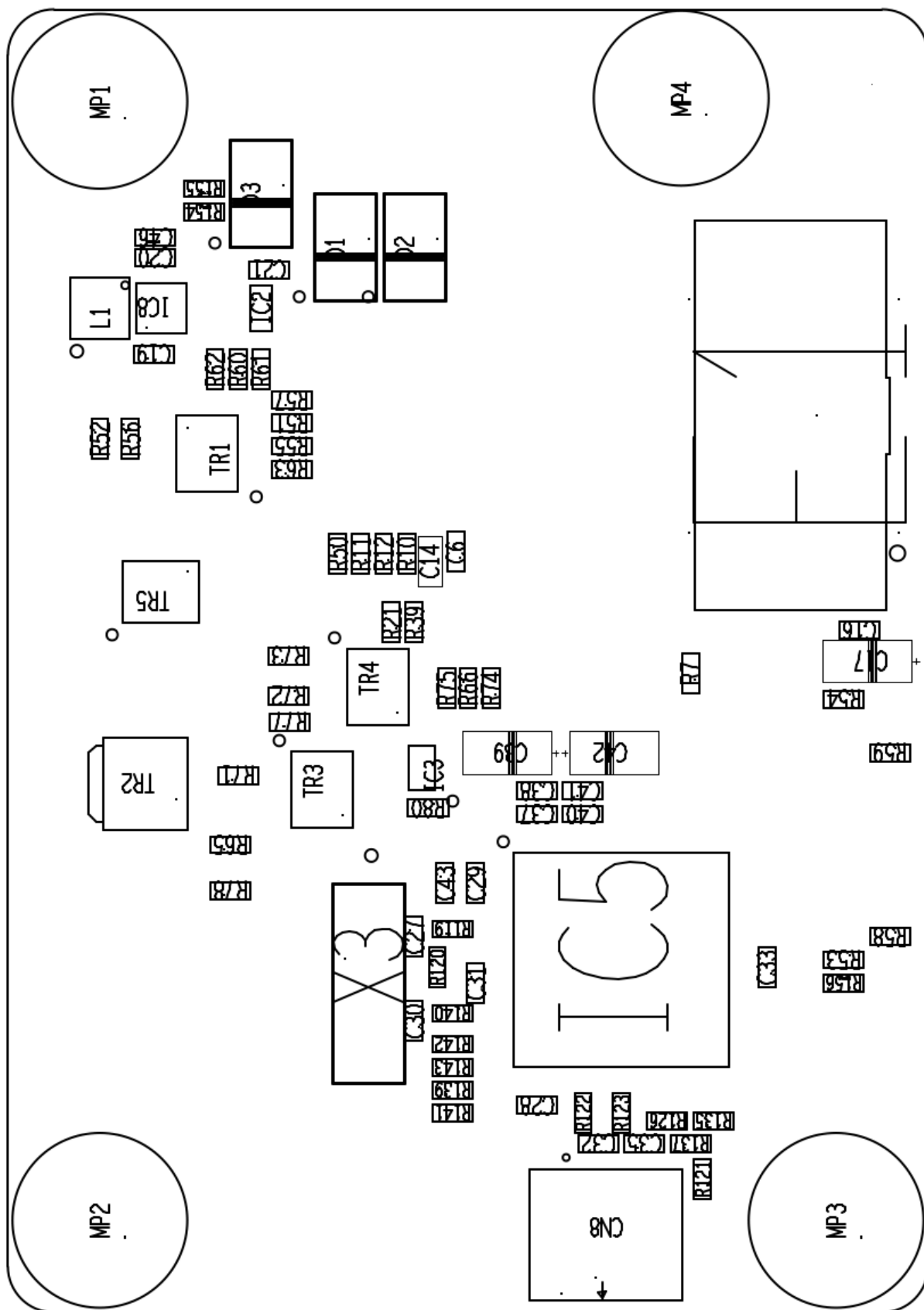


Figure 2-3 Bottom side component placement

2.3 Circuit Routing Diagrams

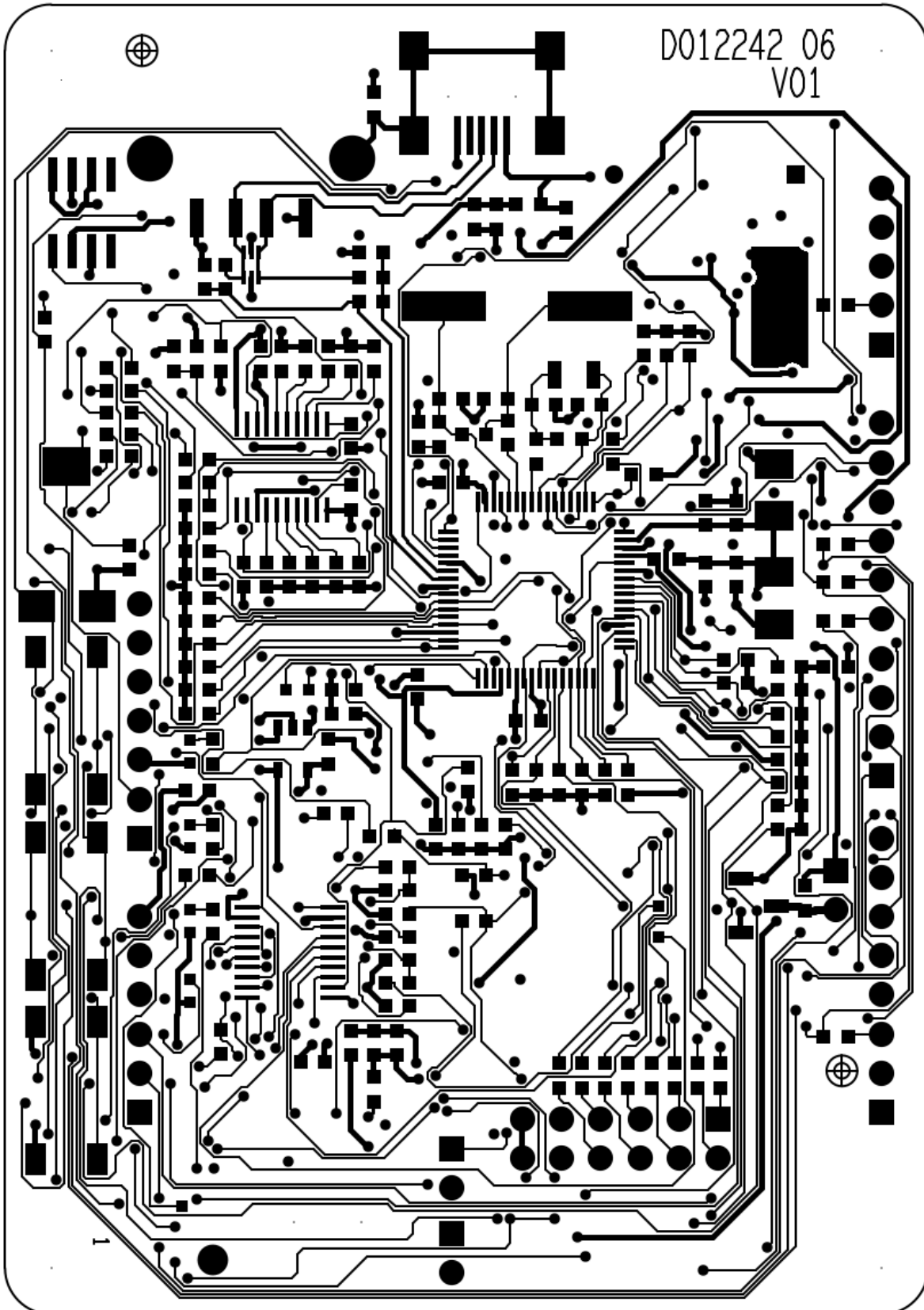


Figure 2-4 Top layer routing diagram

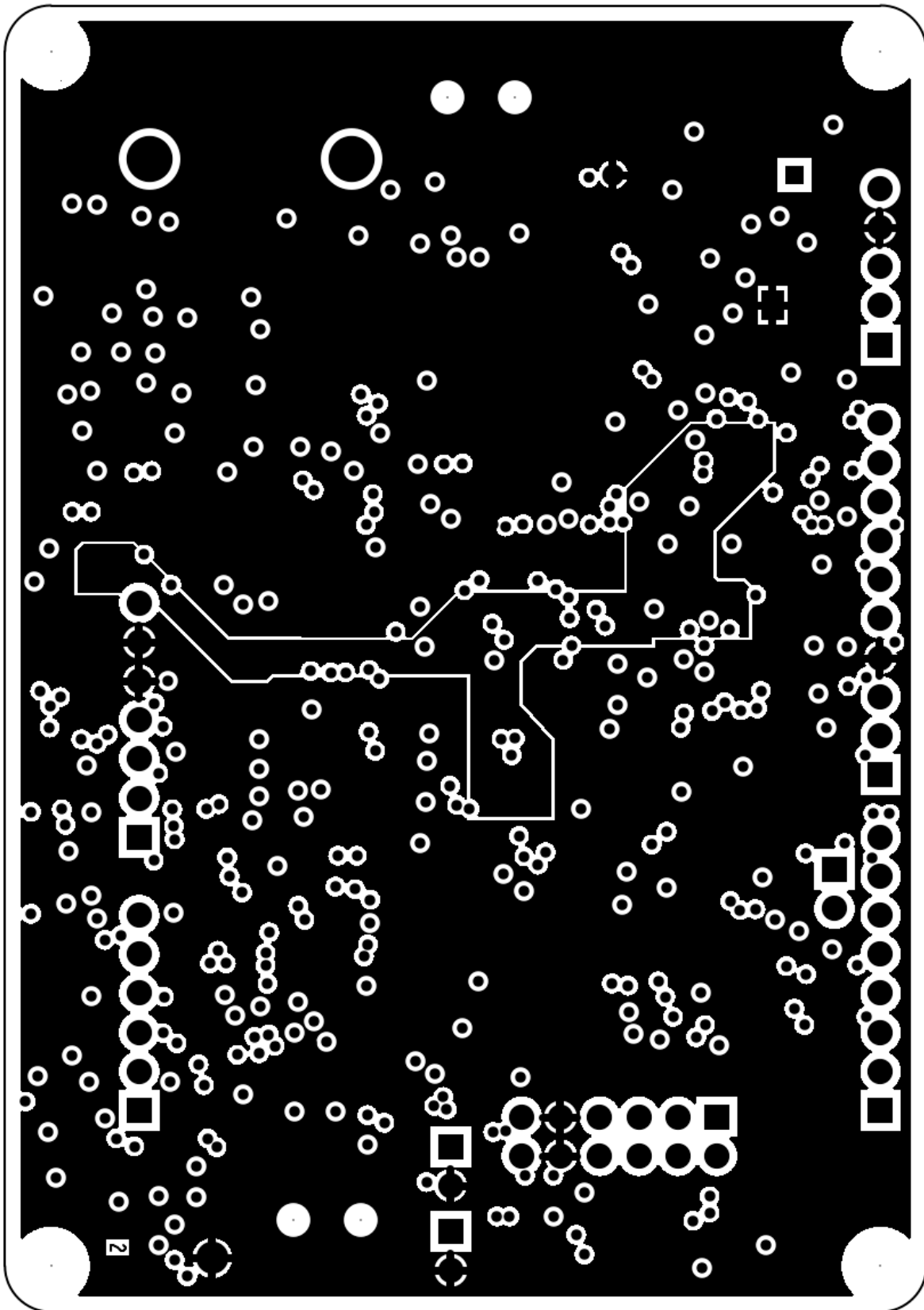


Figure 2-5 Layer 2 (Ground plane) routing diagram

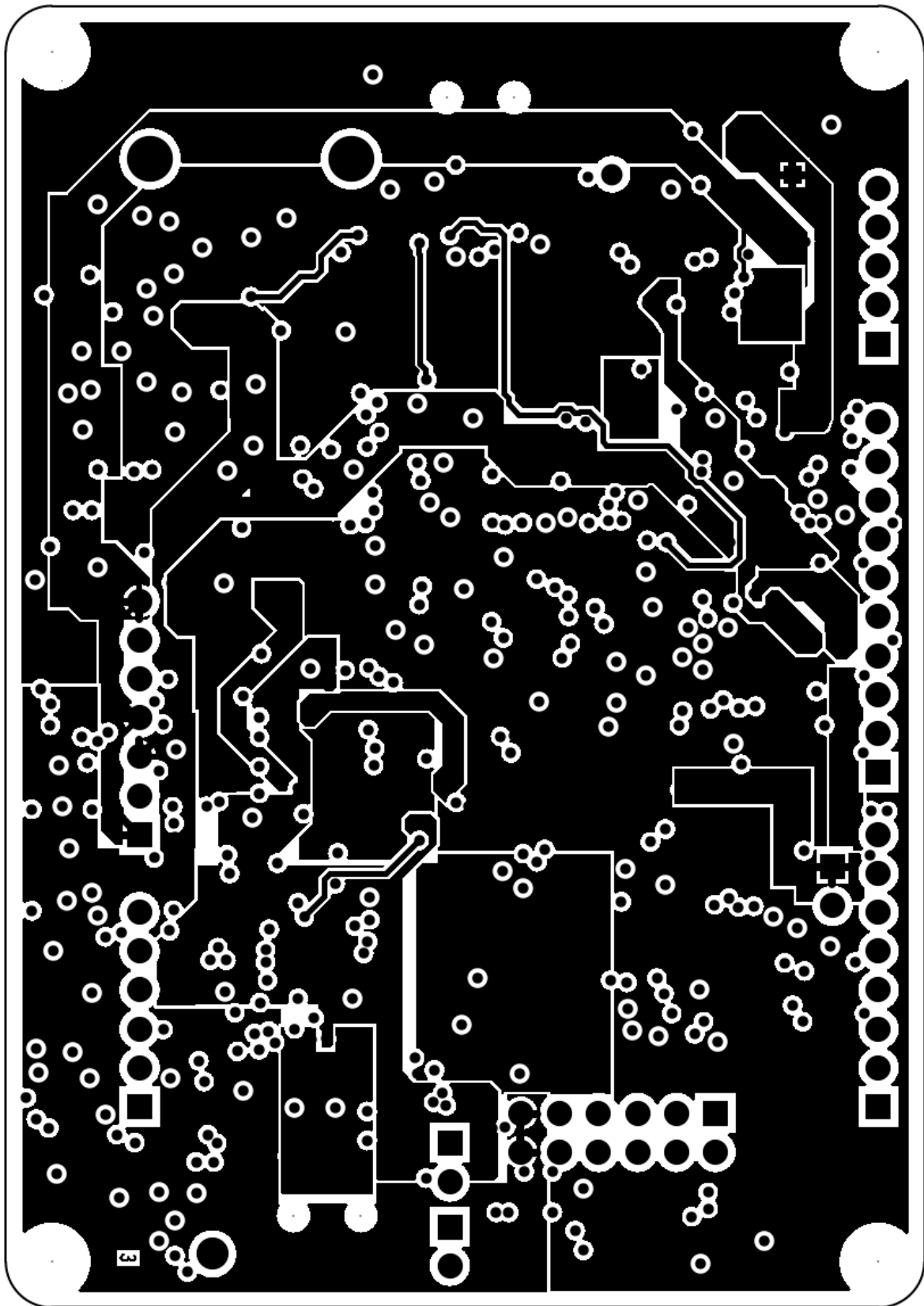


Figure 2-6 Layer 3 (Power plane) routing diagram

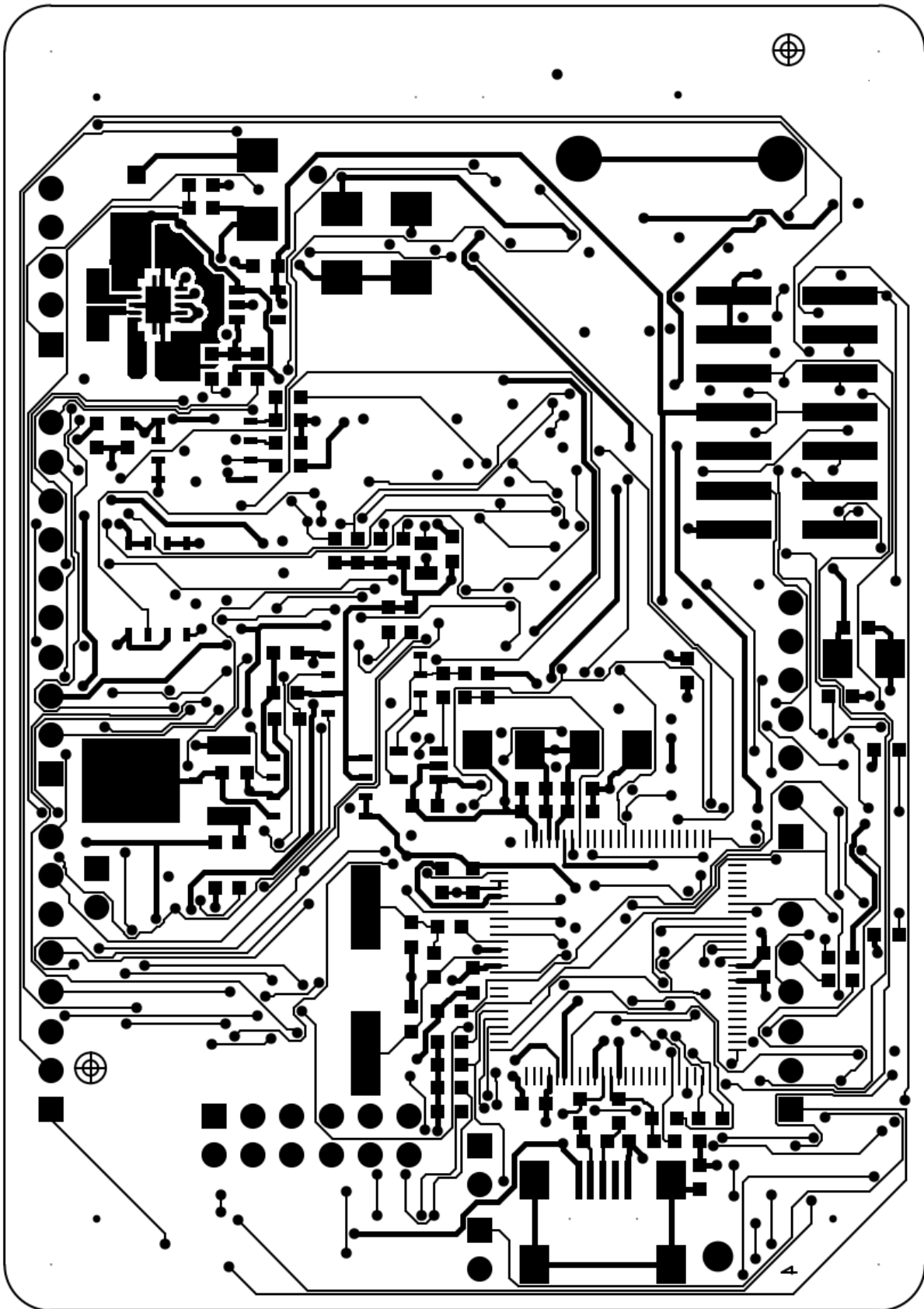


Figure 2-7 Bottom layer routing diagram (as seen from below)

3. Bill of Materials

Table 3-1 below shows the components used on the board.

Part Number/Value	Quantity	Component References	Manufacturer Order Code
SN74CBTLV3245APWR	1	IC4	SN74CBTLV3245APWR
RX111_64LQFP	1	IC1	R5F51115ADFM
TXS0108EPWRG4	1	IC6	TXS0108EPWRG4
RX621_100LQFP	1	IC5	R5F56218BDFP
LT6106	1	IC3	LT6106CS5#TRMPBF
MCP6401U	1	IC9	MCP6401UT-E/OT
XC6210B332MR	1	IC2	XC6210B332MR
TPS63002DRCT	1	IC8	TPS63002DRCT
MIC2025-1YM	1	IC7	MIC2025-1YM
Orange LED	1	LED1	LO L29K-H2L1-24-Z
Red LED	2	LED2,LED3	SML-310LTT86
Green LED	2	LED0,LED4	SML-310MTT86
MBRS130LT3G	3	D1,D2,D3	MBRS130LT3G
USBLC6-2P6	1	D4	USBLC6-2P6
NP28N10SDE-E1-AY	1	TR2	NP28N10SDE-E1-AY
uPA1770	4	TR1,TR3,TR4,TR5	UPA1770G-E1-A
0	17	R1,R6,R7,R8,R9,R57,R61, R62,R64,R100,R101,R102, R109,R118,R121,R124,R125	RC0603JR-070RL
11	1	R55	RC0603FR-0711RL
22	4	R88,R89,R122,R123	RC0603FR-0722RL
33	1	R73	RC0603FR-0733RL
150	10	R105,R106,R107,R108,R112, R113,R116,R117,R134,R135	RC0603FR-07150RL
330	1	R75	RC0603FR-07330RL
1K5	10	R67,R68,R69,R70,R72,R97,R126, R136,R138,R153	RC0603FR-071K5L
3K3	2	R80,R119	RC0603FR-073K3L
4K7	41	R4,R10,R11,R12,R30,R51,R58,R59, R65,R71,R76,R77,R78,R79,R81,R82, R83,R84,R85,R86,R87,R91,R92,R93, R94,R95,R96,R98,R99,R127,R128, R129,R130,R131,R132,R137,R139, R140,R141,R142,R143	RC0603FR-074K7L
33K	3	R56,R60,R154	RC0603FR-0733KL
68K	7	R52,R53,R54,R63,R90,R133,R155	RC0603FR-0768KL
10k	1	RV1	N6L50T7S-103R
6p	2	C1,C2	C1608C0G1H060C080AA

Table 3-1 Bill of Materials (continued on following page)

Part Number/Value	Quantity	Component References	Manufacturer Order Code
10n	5	C9,C12,C16,C38,C41	CC0603KRX7R9BB103
100n	15	C3,C4,C6,C8,C11,C15,C28,C29,C31, C33,C36,C37,C40,C43,C45	CC0603KRX7R9BB104
2.2u	2	C21,C26	CC0603KRX7R6BB225
4.7u	1	C14	GRM21BC81E475KA12L
22p	4	C5,C7,C27,C30	CC0603GCNPO9BN220
10u	5	C19,C20,C25,C44,C46	C1608X5R0J106M
470m	1	C18	PB-5R0V474-R
10u	5	C10,C13,C17,C39,C42	TPSB106K016R0800
2.2u	1	L1	VLF4012AT-2R2M1R5
5-way header	1	CN7	613 005 111 21
2-way header	1	JP2	613 002 111 21
KUSB-SMT-AS1N-B	1	CN2	KUSBX-SMT-AS1N-B
MUSB-05-S-AB-SM-A	2	CN1,CN8	MUSB-05-S-AB-SM-A
12.000 MHz	2	X2,X3	9C-12.000MAAJ-B
32.768 kHz	1	X1	NX3215SA-32K-EXS00A- MU00158
Button	3	RES,SW1,SW2	DTSMW-69R
Switch SPDT	1	SW3	CJS-1201TA1
Rubber Foot 11.1mm x 5 mm	4	MP1,MP2,MP3,MP4	SJ 5003

Table 3-1 Bill of Materials (continuation)

Due to changing availability of components some boards contain different, but functionally equivalent parts.

4. Troubleshooting

Can't Connect the J-Link Debugger to the RX111

Driving PA0_LDOEN low will turn off the Power Supply to the RX111. If this is done without supplying power through VCC_HARVEST on CN7 pin 5, then there will be no power applied to the RX111 and the J-Link debugger will not be able to communicate with the RX111.

To recover a board in this state either:

1. Supply 3.6V through VCC_HARVEST on CN7 pin 5, or
2. Remove R61 from the reverse side of the board as indicated below.

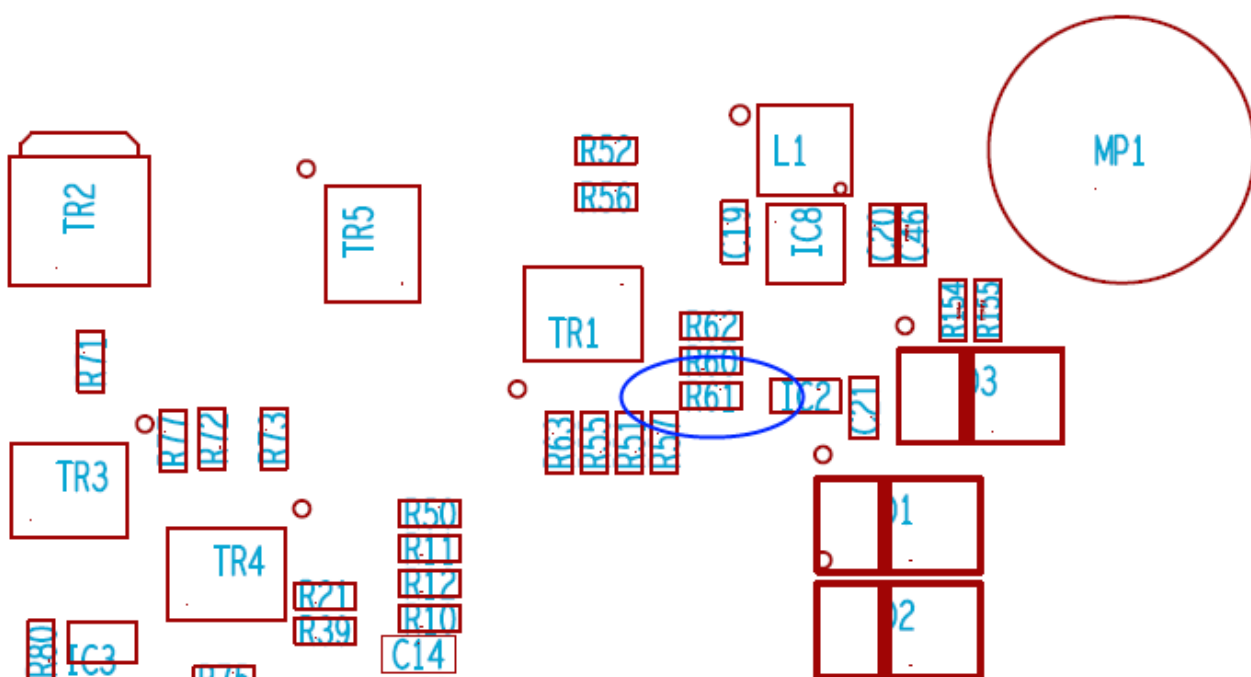


Figure 4-1: Location of R61

5. Additional Information

Technical Support

For information about the RX111 series microcontrollers refer to the RX111 Group Hardware Manual.

For information about the RX assembly language, refer to the RX Series Software Manual.

Technical Contact Details

Please refer to the contact details listed in section 10 of the “Quick Start Guide”

General information on Renesas Microcontrollers can be found on the Renesas website at:

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