RN5T618

PCB Layout Guide

Version 1.1

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Abstract

This document describes the constraints and points when designing the PCB layout with RN5T618.
This guide provides examples to explain of how it can be done.
The PCB layout example is helpful to achieve optimal RN5T618 performance.

Contents

1. Basic Policy and Examples of Board Pattern

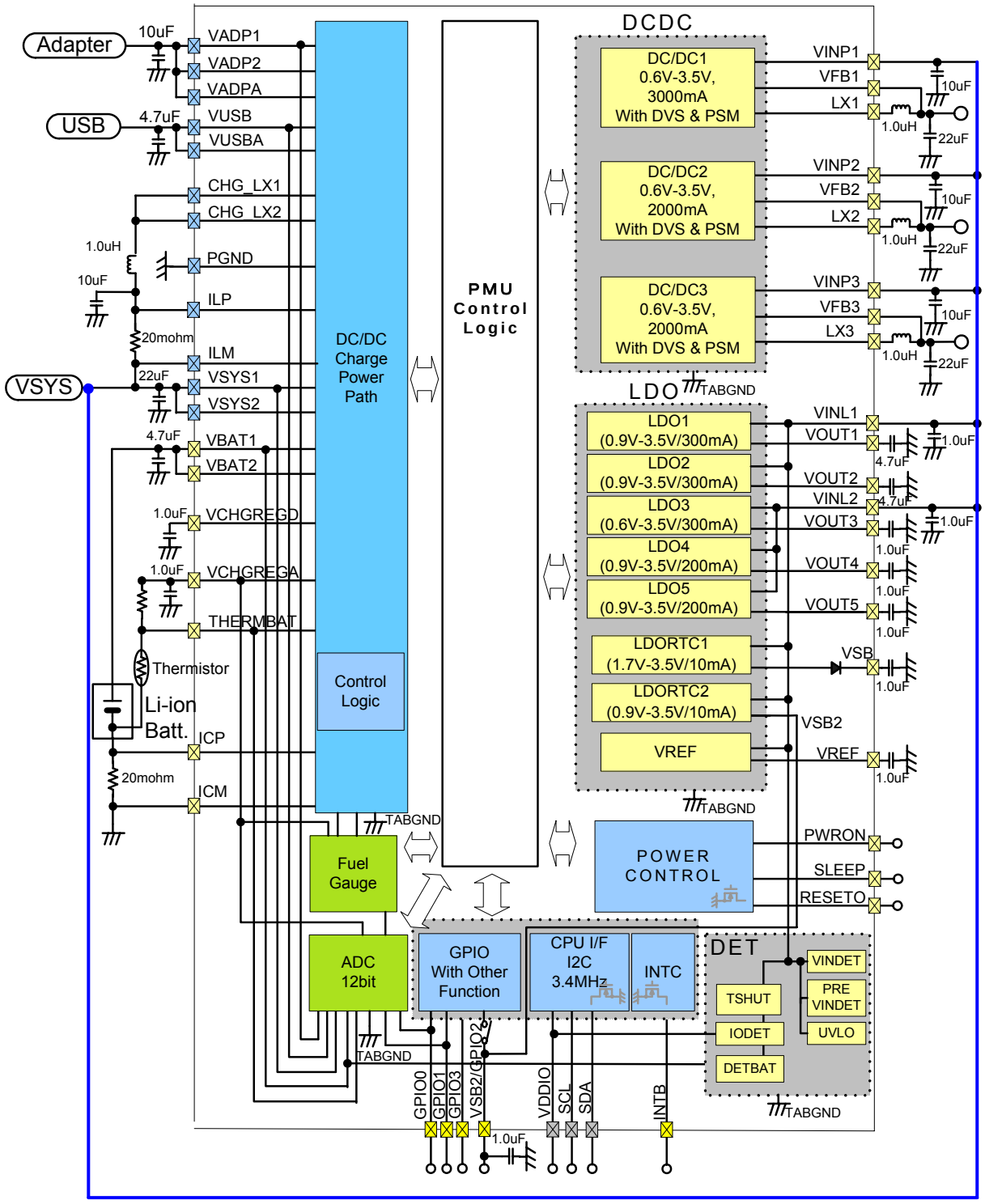

Fig. 1: RN5T618 Block Diagram

1.1 <DCDC Block>

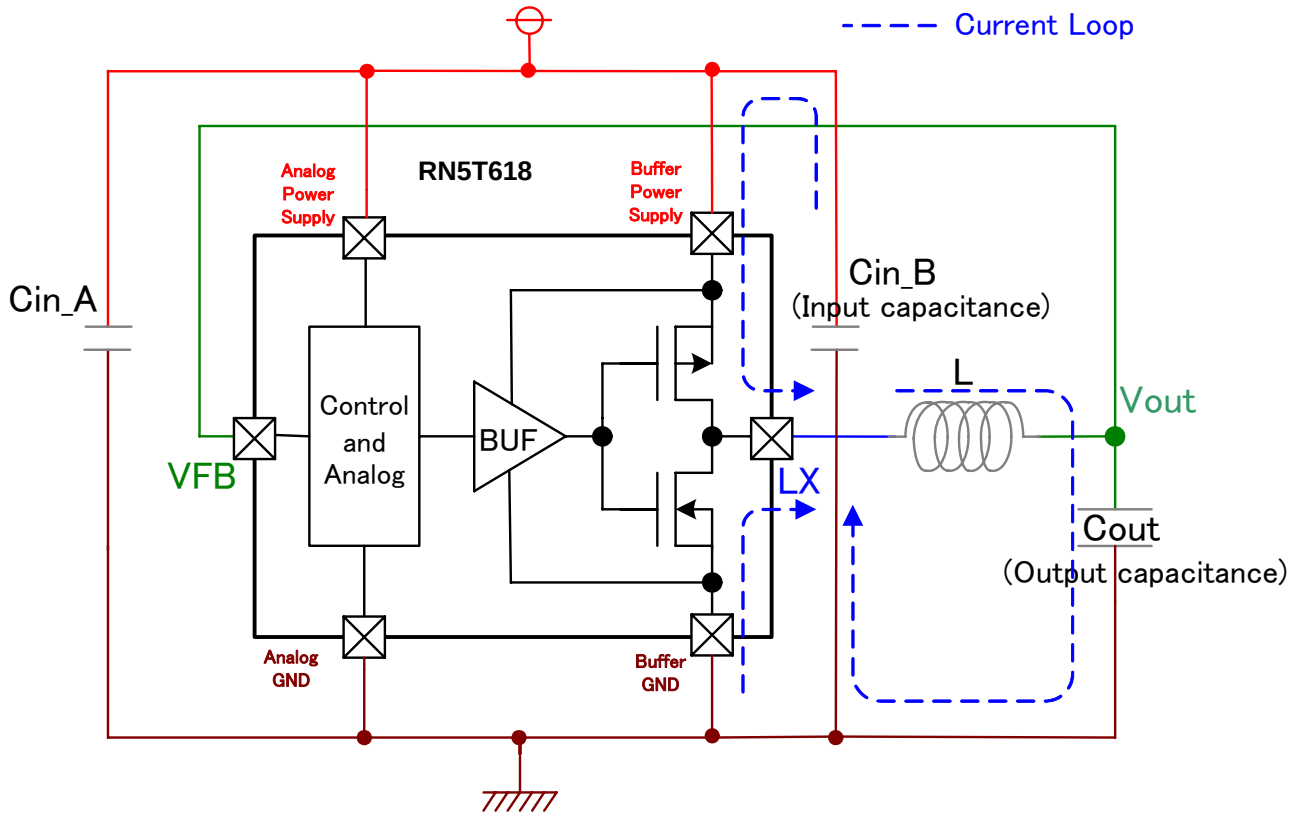

Fig. 1-1: Simplified Schematic for DCDC1, DCDC2, and DCDC3

RN5T618 Pin Names

	DCDC1	DCDC2	DCDC3
Analog Power Supply	VINL1		
Buffer Power Supply	VINP1	VINP2	VINP3
VFB	VFB1	VFB2	VFB3
LX	LX1	LX2	LX3

Table 1-1: RN5T618 Pin Names

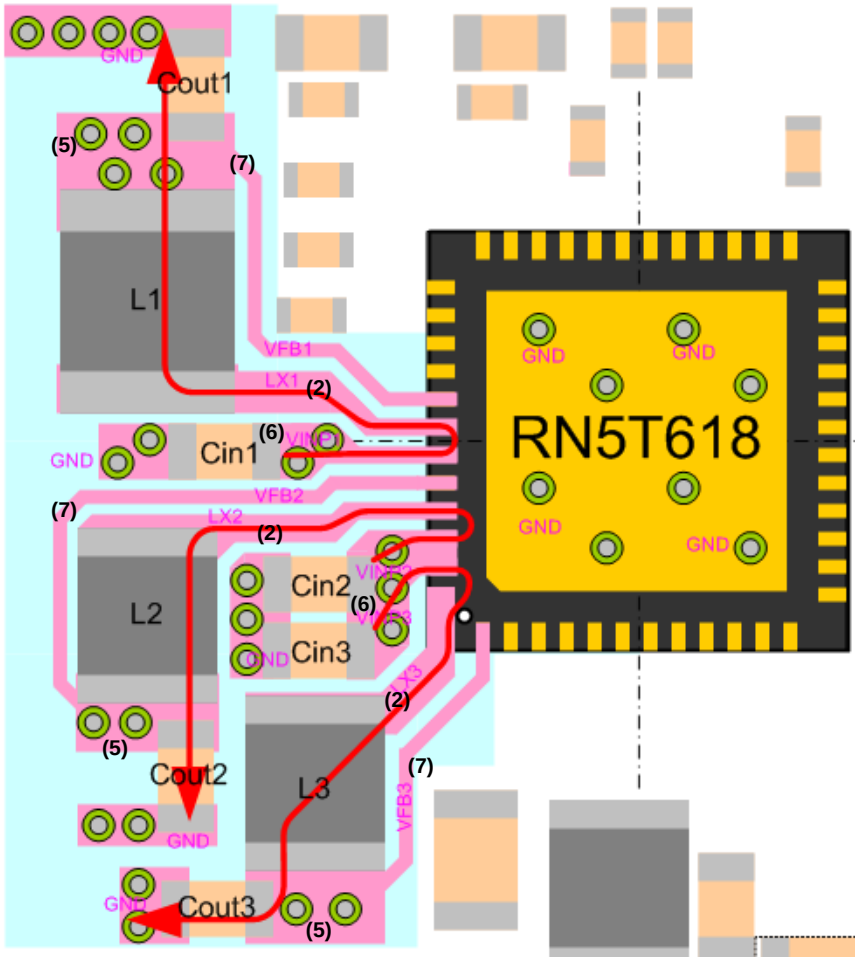

Fig. 1-2: Example of DCDC Block Board Pattern (Top Layer)

(1) Place the parts to minimize the switching current loop (Figure 1-1: blue line, Figure 1-2: red line).
(2) Route the LX line as short and wide as possible between RN5T618 and an inductor, and prohibit adding other redundant lines on it.
(3) Connect the ground line of “Cout” directly to the internal ground plane with multiple vias, in order to reduce impedance as small as possible. (Target: 50mΩ or less)
(4) Connects TABGND* of RN5T618 to ground plane with very low impedance.
*) TABGND is thermal pad in the bottom of QFN package.
(5) Pull out the output of DCDC from near not “L” but “Cout”.
(6) Place “Cin” as close as possible to RN5T618. (Higher priority level is “Cin” < L < “Cout” in the close distance order with RN5T618.)
(7) Keep VFB line away from noise and route the line trying not to interfere each other's DCDC.
It is no need to widen the feedback line to RN5T618 because the current is little flown.
But, derive from nearby COUT to monitor accurate voltage.
And it's preferable to route the VFB line in the different layer from noise source.
In addition, it should not pass under the Inductors.

1.2 <Charger Block>

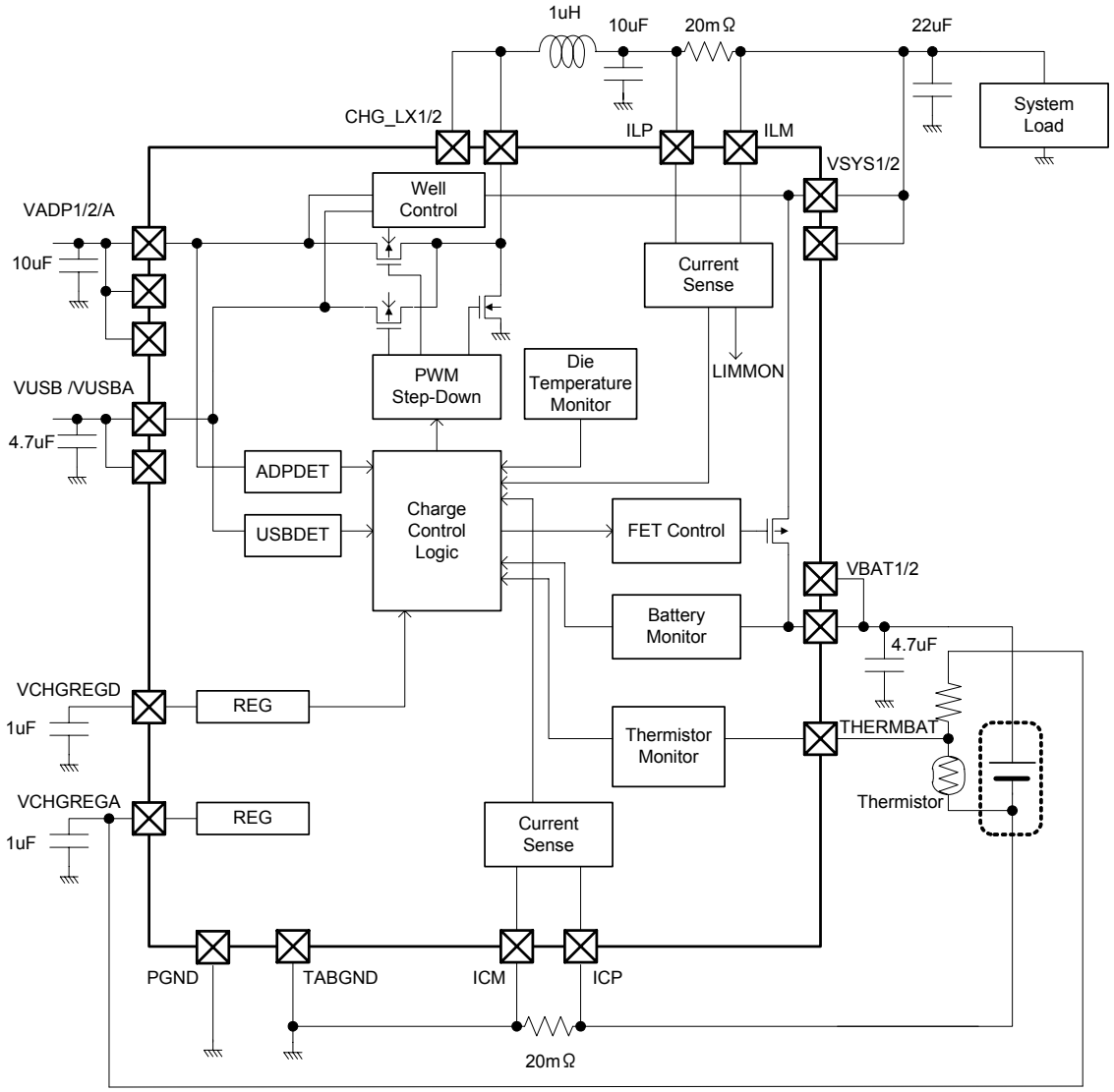

Fig. 1-3: Simplified Schematic for Charger Block

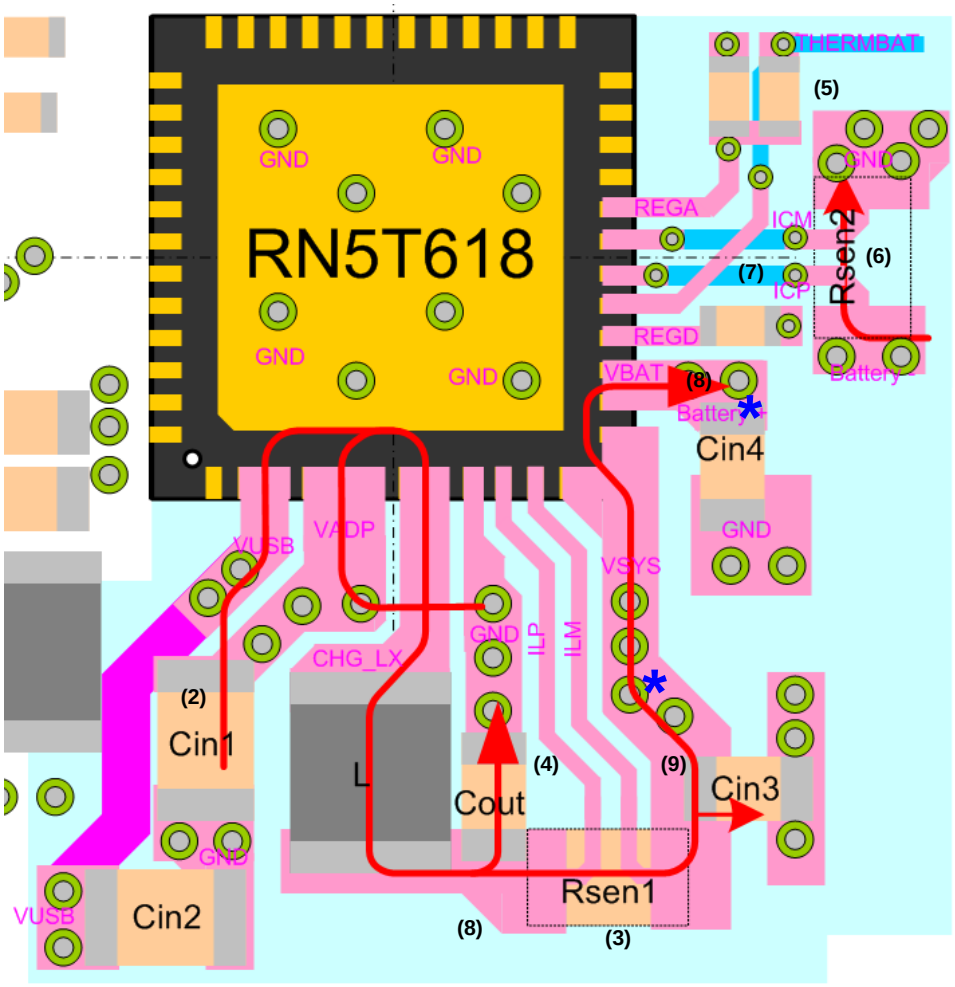

Fig. 1-4: Example of Charger Block Pattern (Top Layer)

*: Pull out point for system

(1) Place the parts to minimize the switching current loop. (Figure 1-4: red line)
(2) Place "VADP" capacitor as close as possible to RN5T618, and route the line to RN5T618 short and widely in order to minimize resistance.
(3) Because "R_{SEN1}" Is the resistance which fixes accuracy of the current, use the high accuracy it as possible. (Refer to the "Recommended External Parts List" on P.8)
In addition, connect R_{SEN1} to "Cout" with very low impedance.
(4) Pull out "ILP" and "ILM" from the PAD of "R_{SEN1}", and route the isometric lines because of the differential signal. Furthermore, prevent from routing the lines parallel to the source of noise.
(Refer to (7) of the DCDC's explanation in P.5)
(5) Connect the terminal of thermister of battery to the port of "THERMBAT" with very low impedance to avoid reducing the accuracy of temperature detection.
(6) Because "R_{SEN2}" is the resistance which fixes the charging current, use the high accuracy it as possible. (Refer to the "Recommended External Parts List" on P.8)
In addition, connect R_{SEN2} to the minus terminal of battery with very low impedance.
(7) Pull out "ICP" and "ICM" from the PAD of "R_{SEN2}", and route the isometric lines because of the differential signal. Furthermore, prevent from routing the lines parallel to the source of noise.
(8) Because the lines from "CHG_LX" to "VSYS", from "VBAT" to the plus terminal of battery and from "ICP" and to the minus of battery flow large current, route them short and widely to become low impedance.
(9) Place the capacitor after passing through "R_{SEN1}" on ILM side, not "VSYS" side.

2. Recommended External Parts List

Block	Pin Name	RN5T618 External Parts								
		Parts	回路記号	Model value	Vender	Num	Parts Size [mm]			
							X Size	Y Size	Z Size	[mm2]
PMU	-	-	DUT1	RN5T618QFN	RICOH	1	6.00	6.00	0.85	36
CHG	VUSBA	-	C49	-	-	0	1.00	0.50	0.50	0
	VUSB	4.7uF	C1	GRM21BB31E475KA75B	Murata	1	2.00	1.25	1.25	2.5
	VADPA	-	C50	-	-	0	1.00	0.50	0.50	0
	VADPB1	10uF	C2	EMK212ABJ106KG	TAIYO	1	2.00	1.25	1.25	2.5
	VADPB2									
	CHG_LX1	1.0uH	L4	DFE252012C-1R0N	TOKO	1	2.50	2.00	1.20	5
	CHG_LX2									
	PGND	-	-	-	-	0	0.00	0.00	0.00	0
	ILP	10uF	C4	LMK107BBJ106MALT	TAIYO	1	1.60	0.80	0.80	1.28
	ILP/ILM	20mohm	R1	ERJ6BWFR020V	Panasonic	1	2.00	1.25	0.60	2.5
	VSYS1	22uF	C5	JMK107BJ226MA-TD	TAIYO	2	1.60	0.80	0.80	2.56
	VSYS2									
	VBAT1	4.7uF	C6	C1608JB0J475K	TDK	1	1.60	0.80	0.80	1.28
	VBAT2									
	VCHGREGD	1.0uF	C7	GRM155B31A105KE15	murata	1	1.00	0.50	0.50	0.5
	THERMBAT	10kohm	R19	RGC1/16SC103DTH	KAMAYA	1	1.00	0.50	0.35	0.5
	ICP	Thermistor	R6	TH05-3H103F	MITSUBISHI	1	1.00	0.50	0.50	0.5
	ICP/ICM	20mohm	R2	ERJ6BWFR020V	Panasonic	1	2.00	1.25	0.60	2.5
	VCHGREGA	1.0uF	C8	GRM155B31A105KE15	murata	1	1.00	0.50	0.50	0.5
OTHER	GPIO0	-	-	-	-	0	0.00	0.00	0.00	0
	GPIO1	-	-	-	-	0	0.00	0.00	0.00	0
	SDA	-	-	-	-	0	0.00	0.00	0.00	0
	SCL	-	-	-	-	0	0.00	0.00	0.00	0
	VDDIO	0.1uF	C9	GRM155R11C104KA88B	murata	1	1.00	0.50	0.50	0.5
	GPIO3	-	-	-	-	0	0.00	0.00	0.00	0
	INTB	-	-	-	-	0	0.00	0.00	0.00	0
	SLEEP	-	-	-	-	0	0.00	0.00	0.00	0
	PWRON	-	-	-	-	0	0.00	0.00	0.00	0
	RESETO	-	-	-	-	0	0.00	0.00	0.00	0
	GPIO2	1.0uF	C11	GRM155B31A105KE15	murata	1	1.00	0.50	0.50	0.5
LDO	VSB	1.0uF	C10	GRM155B31A105KE15	murata	1	1.00	0.50	0.50	0.5
		100ohm	R5	RK73H1ETTP101F	KOA	1	1.00	0.50	0.50	0.5
		-	BAT1	-	-	0	5.00	5.00	1.00	0
	VREF	1.0uF	C20	GRM155B31A105KE15	murata	1	1.00	0.50	0.50	0.5
	VOUT1	4.7uF	C21	C1608JB0J475K	TDK	1	1.60	0.80	0.80	1.28
	VINL1	1.0uF	C12	GRM155B31A105KE15	murata	1	1.00	0.50	0.50	0.5
	VOUT2	4.7uF	C22	C1608JB0J475K	TDK	1	1.60	0.80	0.80	1.28
	VOUT3	1.0uF	C23	GRM155B31A105KE15	murata	1	1.00	0.50	0.50	0.5
	VINL2	1.0uF	C14	GRM155B31A105KE15	murata	1	1.00	0.50	0.50	0.5
	VOUT4	1.0uF	C24	GRM155B31A105KE15	murata	1	1.00	0.50	0.50	0.5
	VOUT5	1.0uF	C25	GRM155B31A105KE15	murata	1	1.00	0.50	0.50	0.5
DCDC	VINP1	10uF	C15	C1608JB0J106M	TDK	1	1.60	0.80	0.80	1.28
	LX1	1.0uH	L1	DFE322512C-1R0N	TOKO	1	3.20	2.50	1.20	8
	VFB1	22uF	C31	JMK107BJ226MA-TD	TAIYO	1	1.60	0.80	0.80	1.28
	VINP2	10uF	C16	C1608JB0J106M	TDK	1	1.60	0.80	0.80	1.28
	LX2	1.0uH	L2	DFE252012C-1R0M	TOKO	1	2.50	2.00	1.20	5
	VFB2	22uF	C32	JMK107BJ226MA-TD	TAIYO	1	1.60	0.80	0.80	1.28
	VINP3	10uF	C17	C1608JB0J106M	TDK	1	1.60	0.80	0.80	1.28
	LX3	1.0uH	L3	DFE252012C-1R0M	TOKO	1	2.50	2.00	1.20	5
	VFB3	22uF	C33	JMK107BJ226MA-TD	TAIYO	1	1.60	0.80	0.80	1.28
					Total Num	35			Total Parts size	91.36

dummy pattern

Table 2-1: Recommended external parts list

3. *Example of Parts Layout*

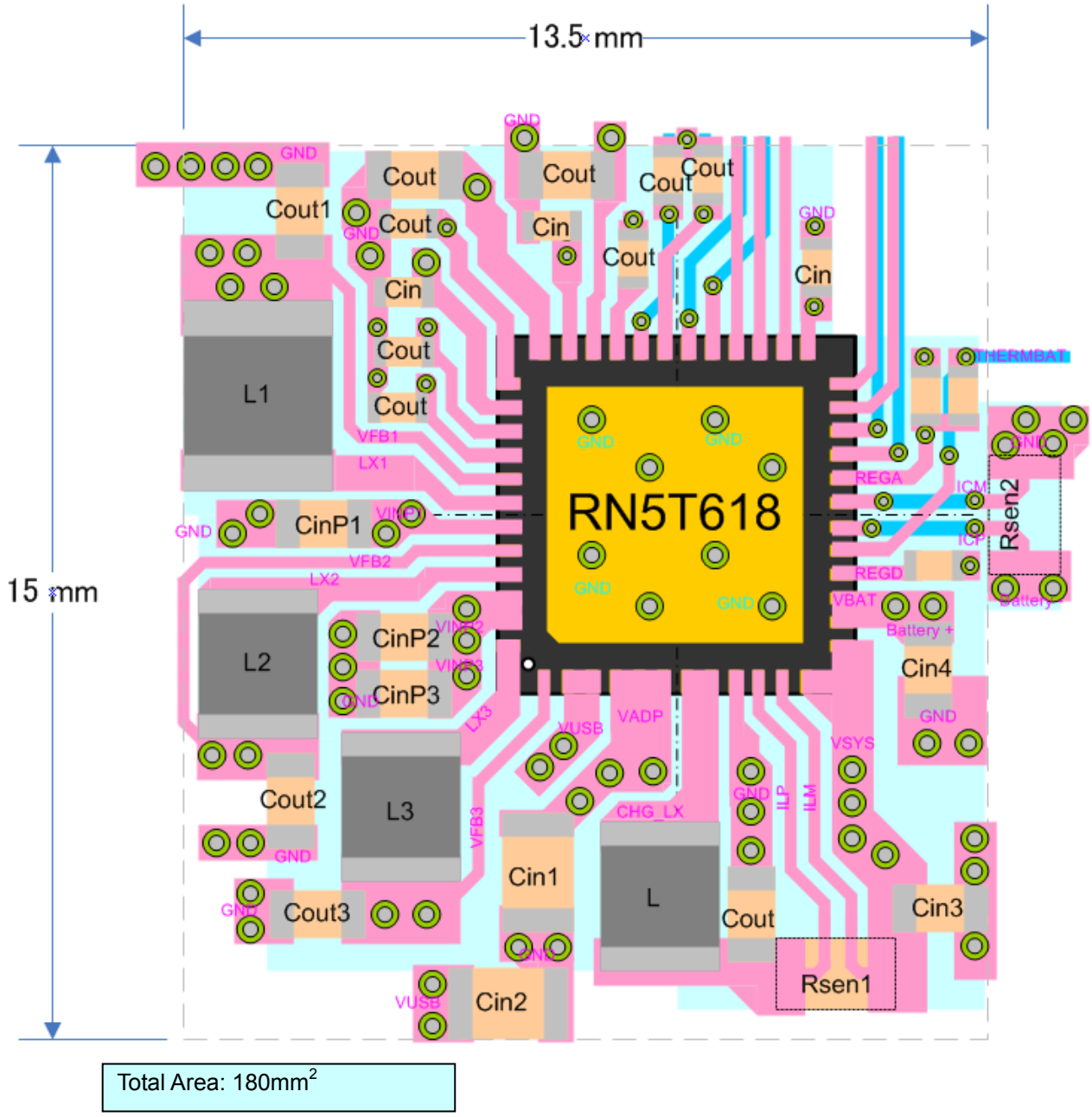

Fig. 3-1: Example PCB Parts Layout