

Product Analysis **Sample** Report

Glucose Meter

Manufacturer:	XXXXXX
PCB Size:	4.1cm x 8.2cm = 33.62 cm ²
No. of Layers:	4
Objective:	PCB Circuit Analysis

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Component Specifications

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Printed Circuit Board (PCB) Summary

Table.1 PCB

PCB area : 4.1cm × 8.2cm = 33.62cm²

Number of layers: 4

PCB Summary	
1.New Ideas Found on PCB	
	LED lamp on the sample insertrion side (D002,D003), low-profile side-emitting LED is used for LCD backlight. High brightness, white LED is used.
	USB port, LI-ion battery, charged via 5V USB.
	Moisture-proofing between the EEPROM (U036 Peripheral IC1)) and the transistor (Q70). We believe this is to prvent data from being erased, the product being unintentionally turned on and to prvent battery discharge while power is OFF.
	The serial flash memory (U038)is designed for read only. R/W selection terminal (pin3) can be pulled up by resistor (R171 100K Ω); however, there is no test pad to to modify the data on board.
	The following test pads (TP) are laid out in a single row: TP071 ~ TP079, main inner power, Li-ion battery temperature sense terminal (TS), MPU reset, and watch-dog timer.
	Conventional type USB I/F IC (U082) is used to control the IC (U068 Peripheral IC 3). We believe that this IC is either to reset of for use as watch-dog timer (WDT).
	Thre systems- and two in-line-style serial I/O is used to connect MPU (U032) and other ICs (U058 LED driver, U082 USB, U016, U036, and U039).
	The analog signal for glucose measurement is input into the MPU (U032) from amplified outputs having different gains (U023, U024. The differenc in gains is set by approximately 5 times interval.
2.New ideas concerning PCB pattern	
	L1 is sourrounded by gold-plated ground patterns and through-holes. We believe this is for common mode noise suppression.
	L2 is GND, and it is divided for analog and control. We believe this is also for common mode noise suppression.
	L3 is for power and signal. It is divided for analog and control.
	L4 is sourrounded by gold-plated ground patterns and through-holes. We believe this is for EMI and noise suppression. There are many test pads. We believe they are used for test and adjustment after assembly.
3.Other	
	Anisotropically conductive sheet is used for connecting the LCD terminal and push-switch terminals to the PCB (CN213, CN214), instead of a conventional connector,

Component Count

Table 2. Number of Mounted Components

Component	Count
Capacitor	75
Connector	5
Crystal	1
Battery	0
Diode	2
Zener Diode	0
Fuse	0
IC	23
Inductor	0
LED	2
Variable Resistor	0
Resistor	92
Switch	0
Thermistor	0
Transformer	0
Transistor	14
Total	214

Overview



Photo.1 Outside Appearance

Overview

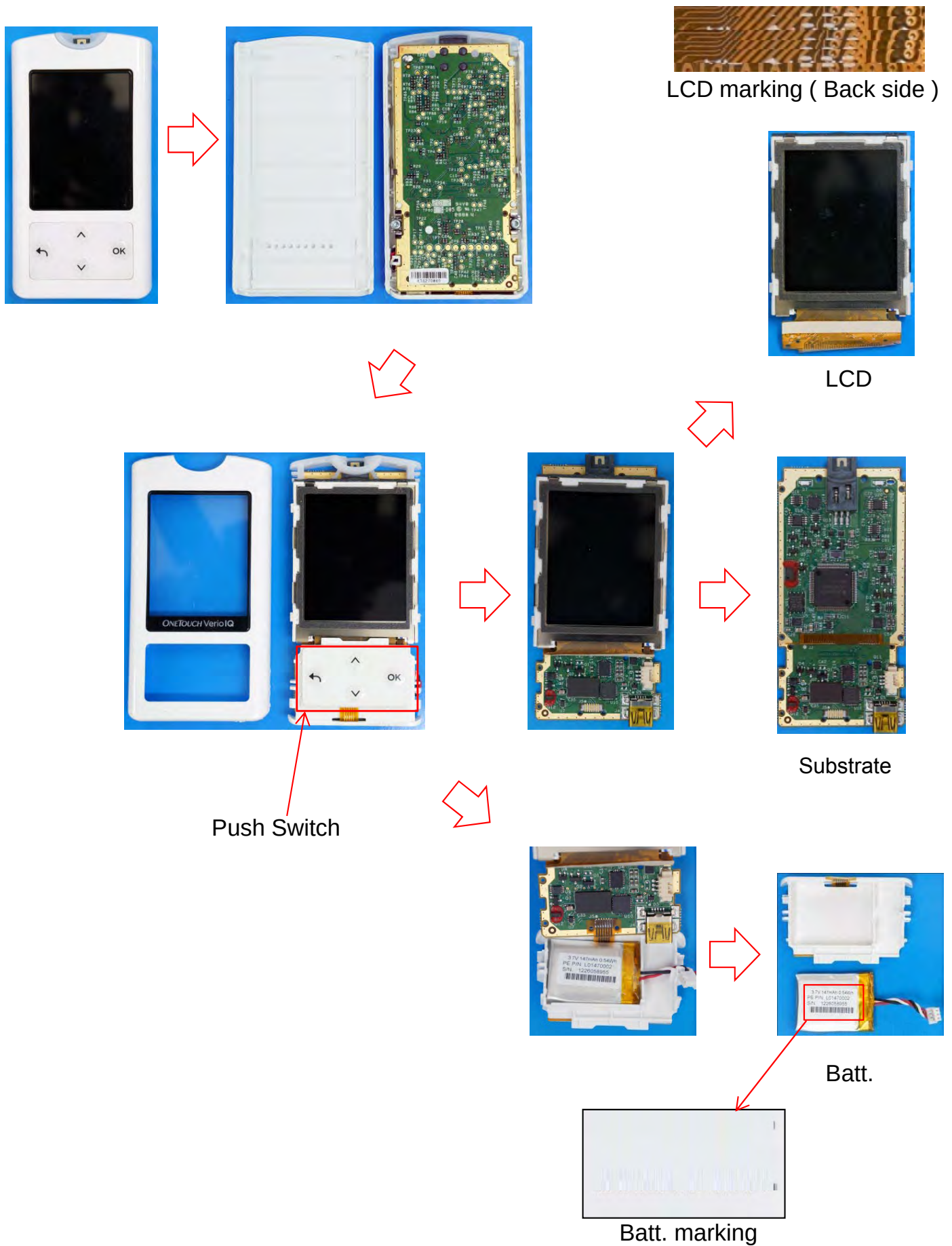


Photo.2 Disassembly

Overview

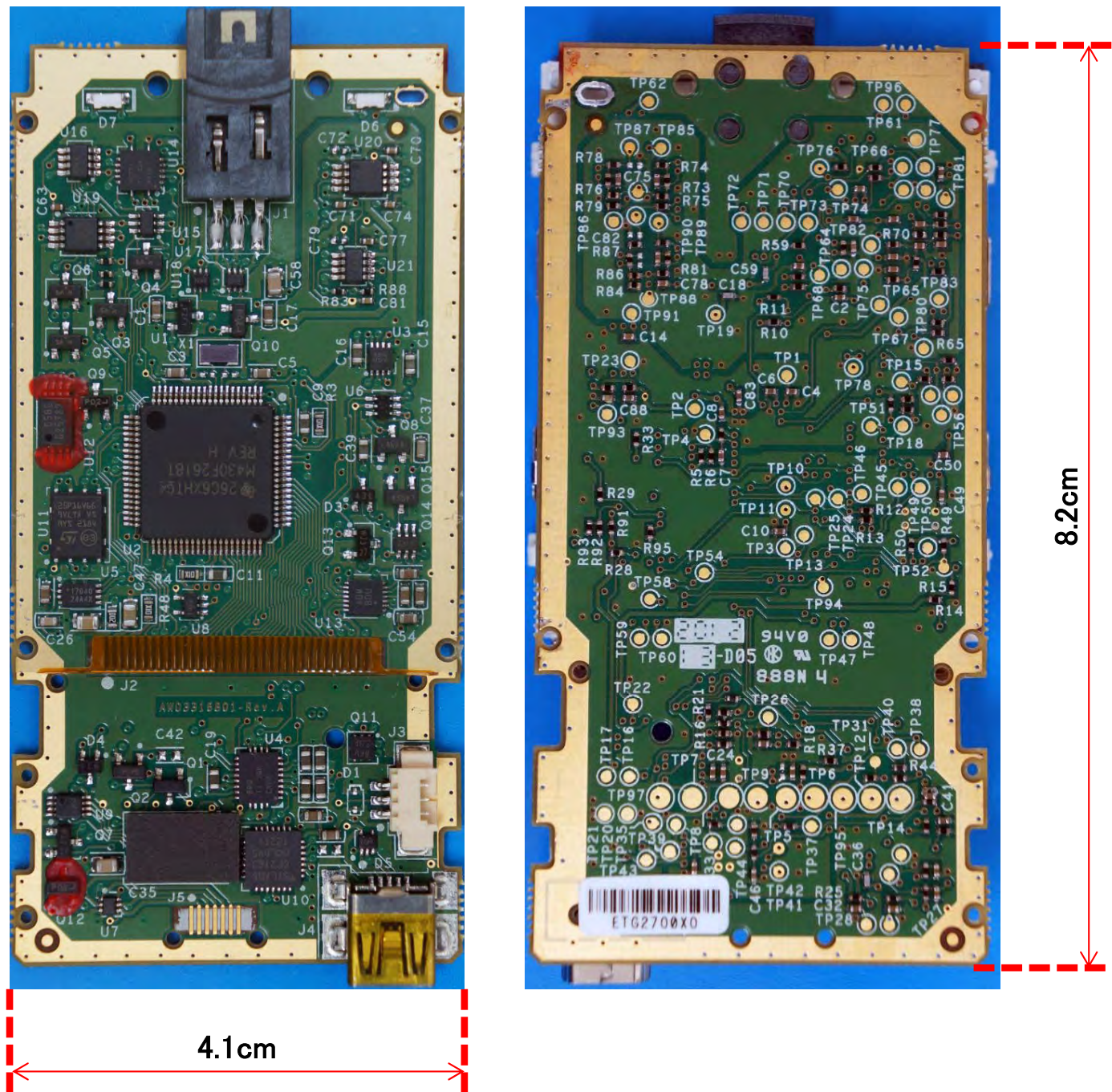
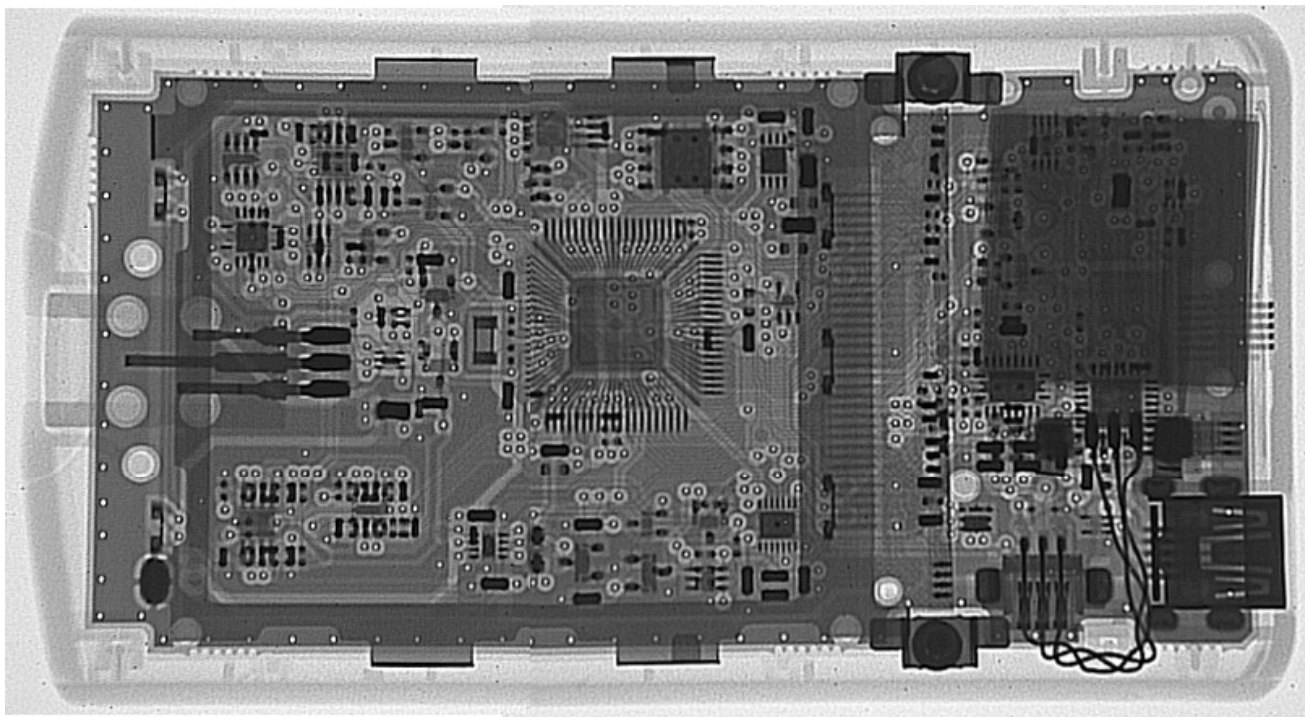
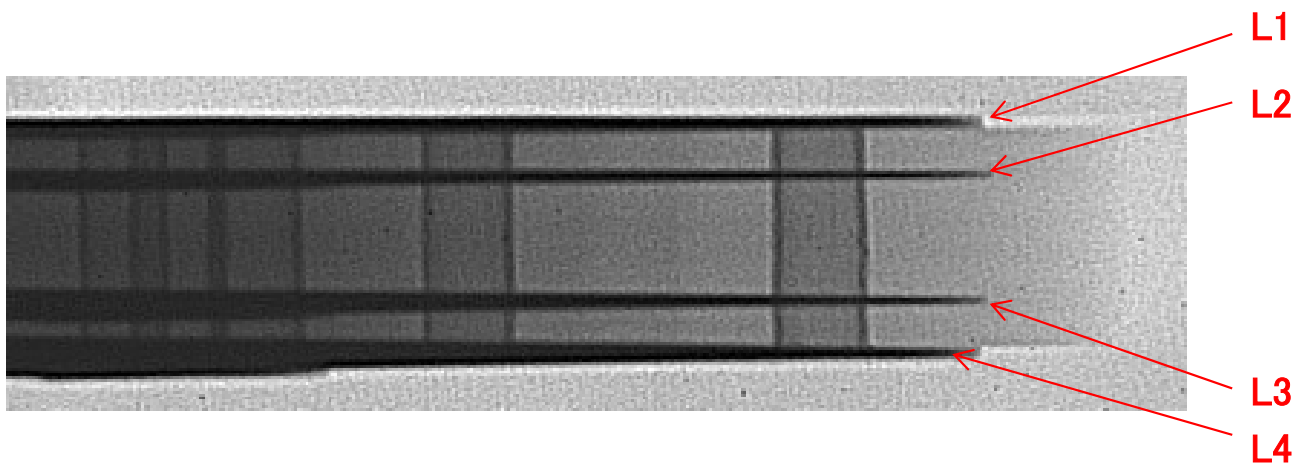


Photo.3 PCB Appearance

Overview



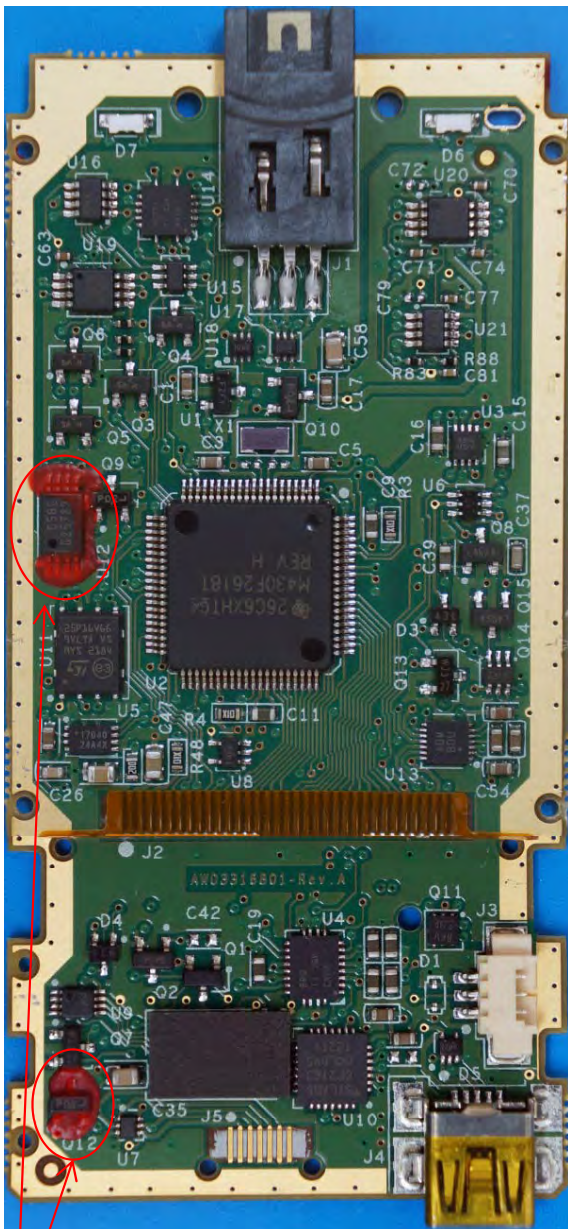
Top View



Side View (enlarged)

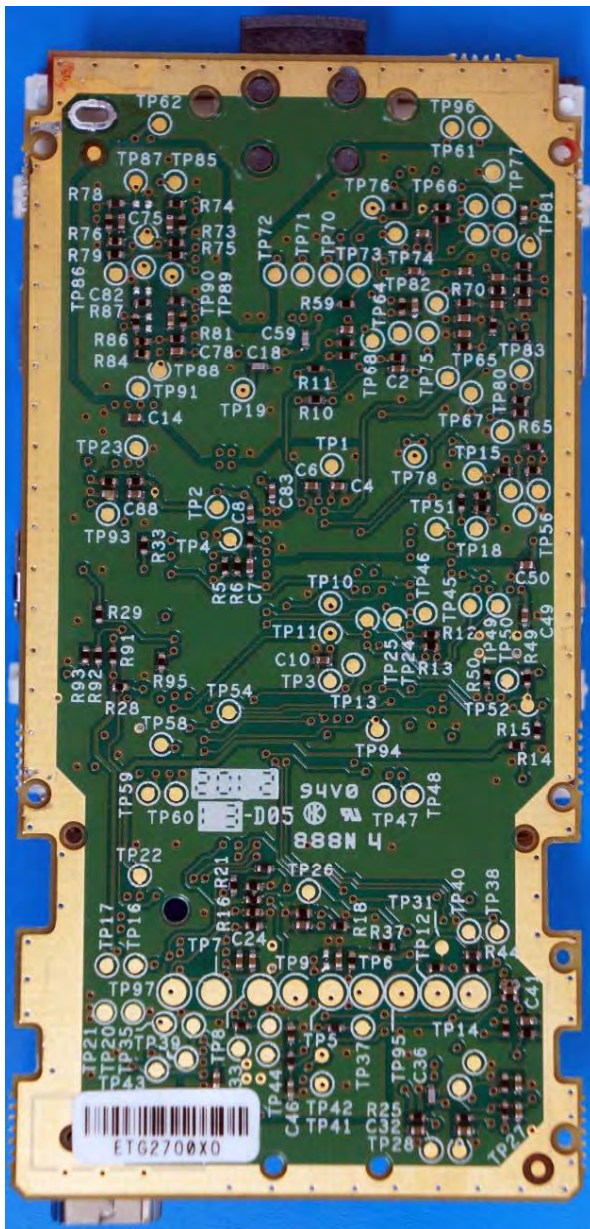
Photo.4 X-Ray

Overview



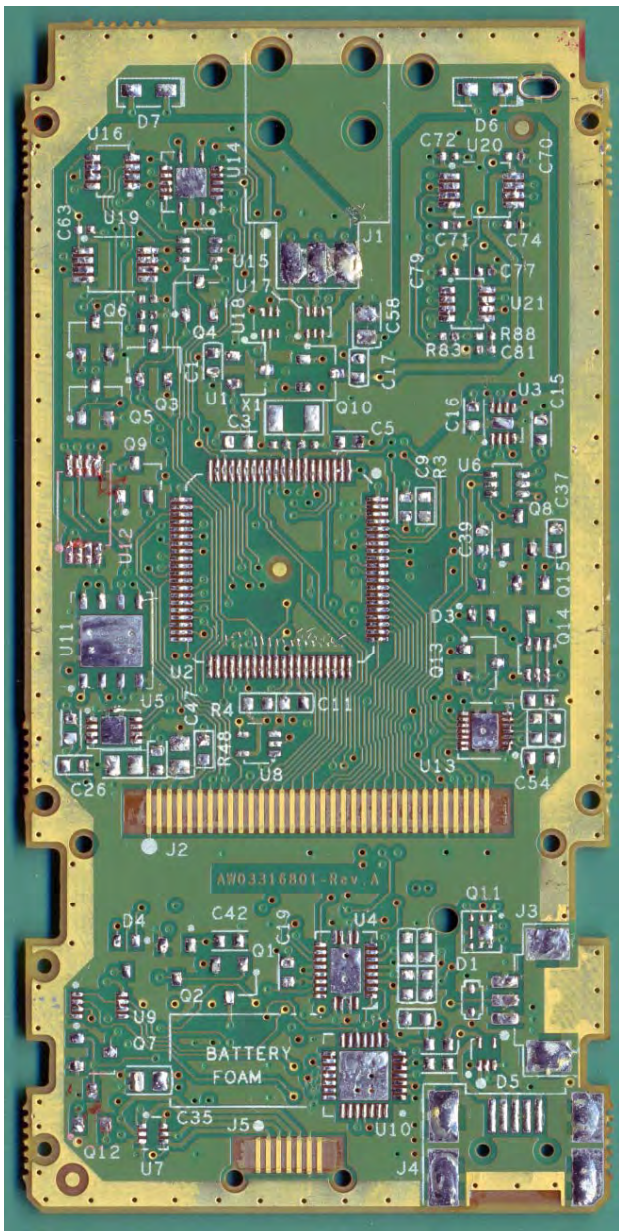
Moisture Processing

Top View

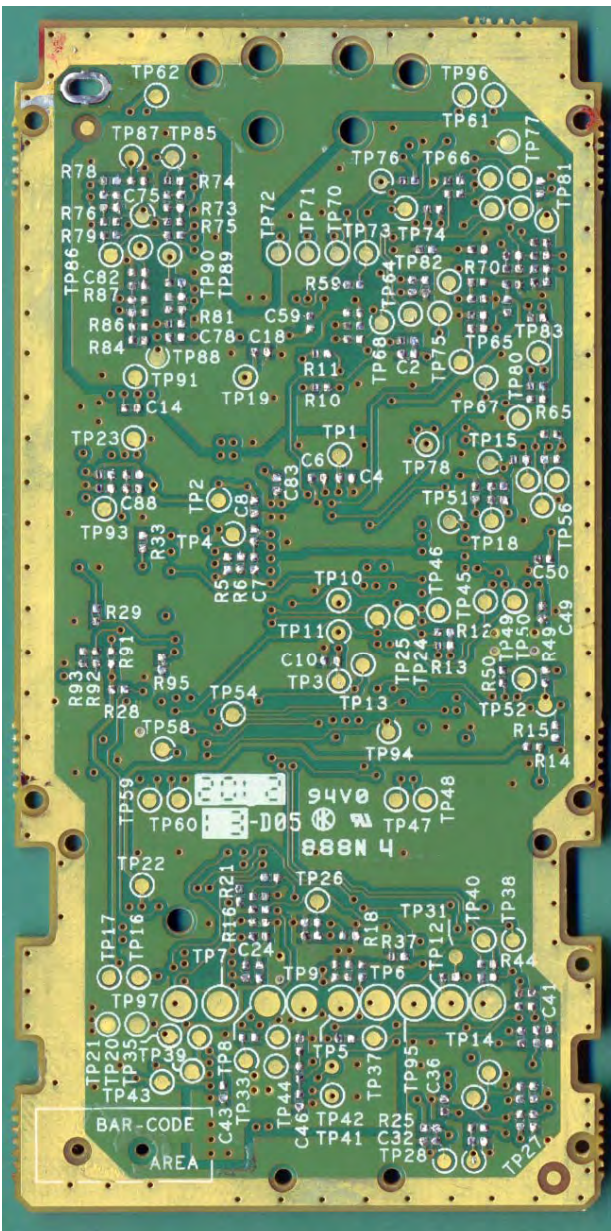


Bottom View

Photo.5 Before removing components



Top View



Bottom View

Photo.6 After removing components

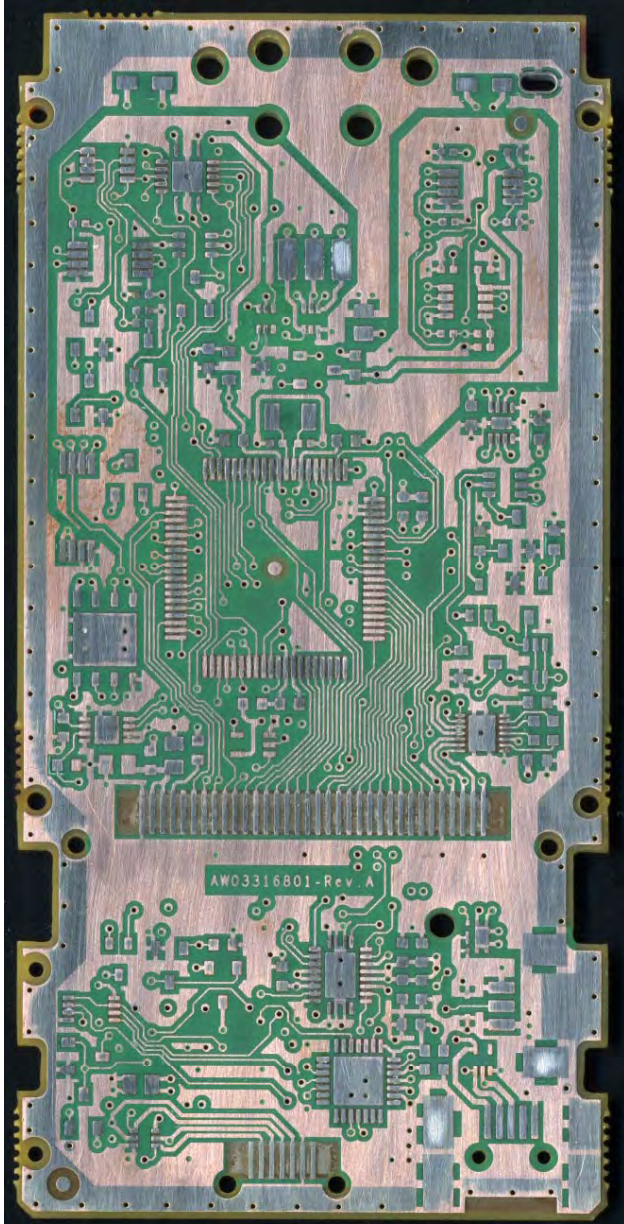


Photo 7-1. Layer 1 (Top View)

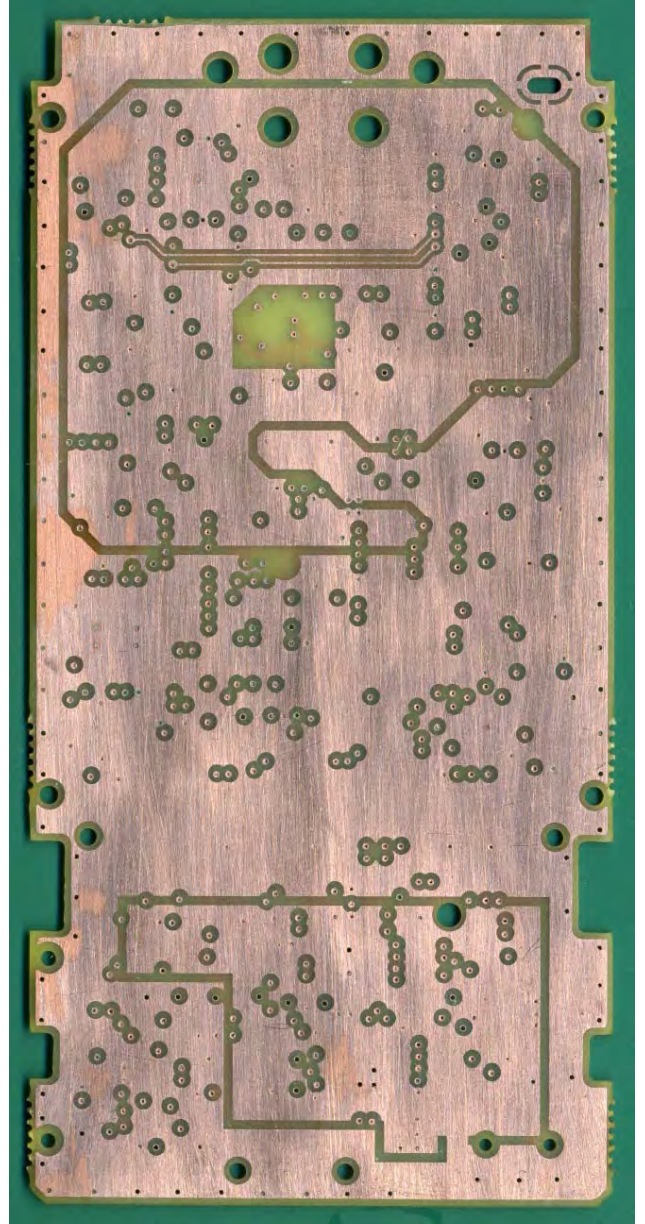


Photo 7-2. Layer 2(Top View)

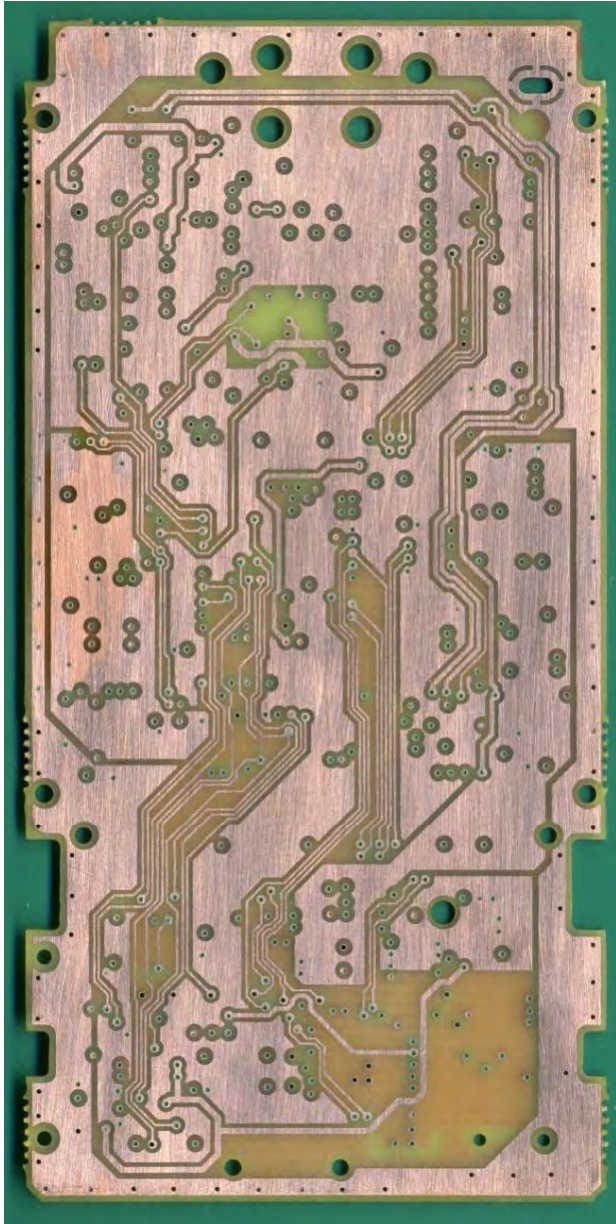


Photo 7-3. Layer 3 (Top View)

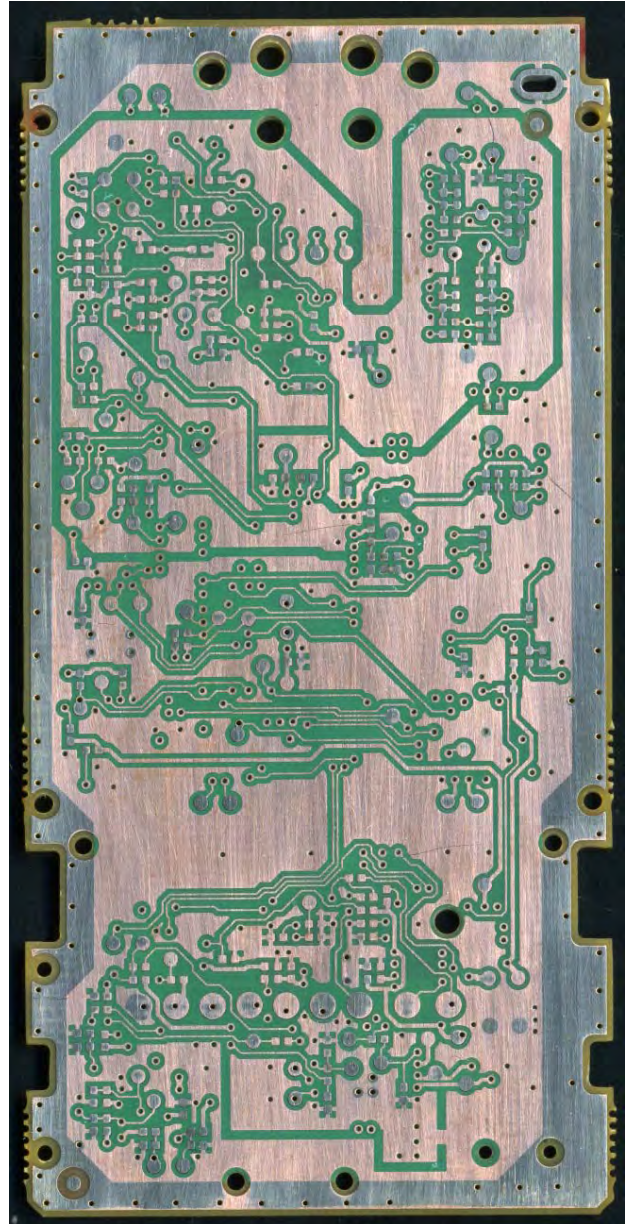


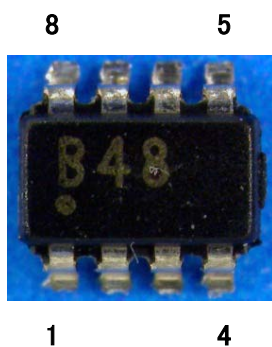
Photo 7-4. Layer 4 (Top View)

Elements

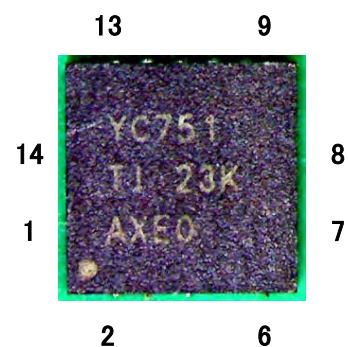
D002,D003



U004,U024



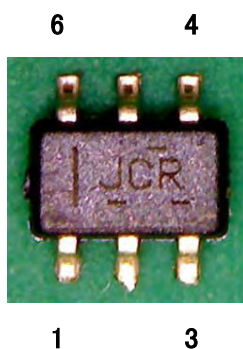
U005



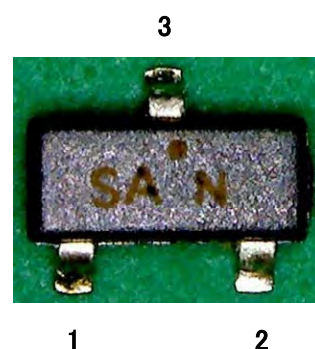
U006,U023



U007



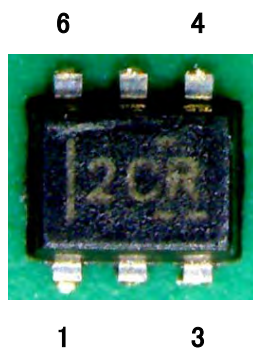
Q008,Q009,Q010,Q011,Q071



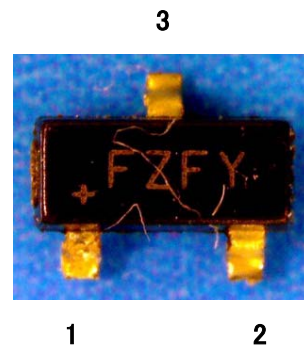
U016



U017,U073



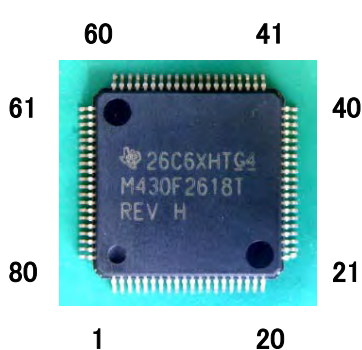
U018



Q019,Q037,Q070



U032



X033



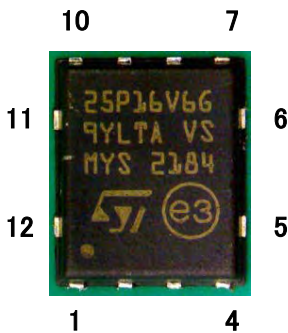
Photo 8-1. PCB-mounted components -1 (Top View)

Elements

U036



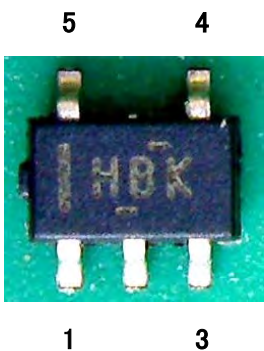
U038



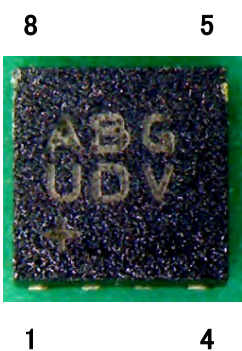
U039



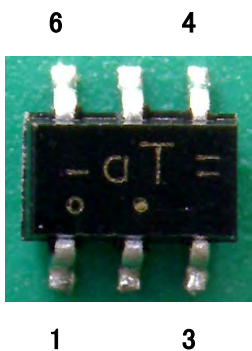
U046



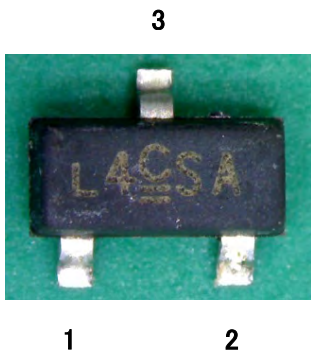
U051



U052



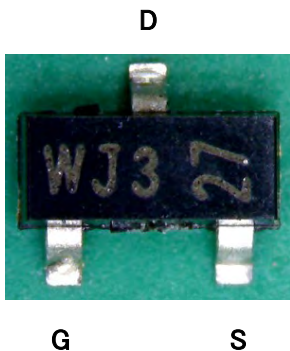
Q053,Q055



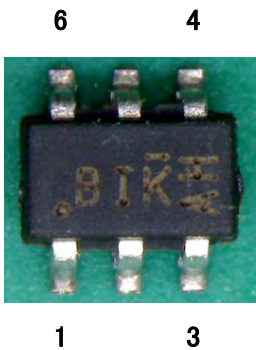
D054



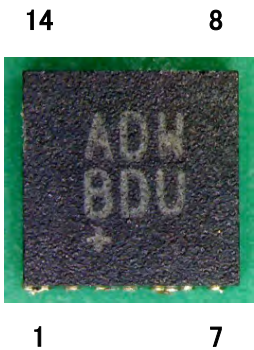
Q056,Q069



U057



U058



D067



Photo 8-2. PCB-mounted components-2 (Top View)

Elements

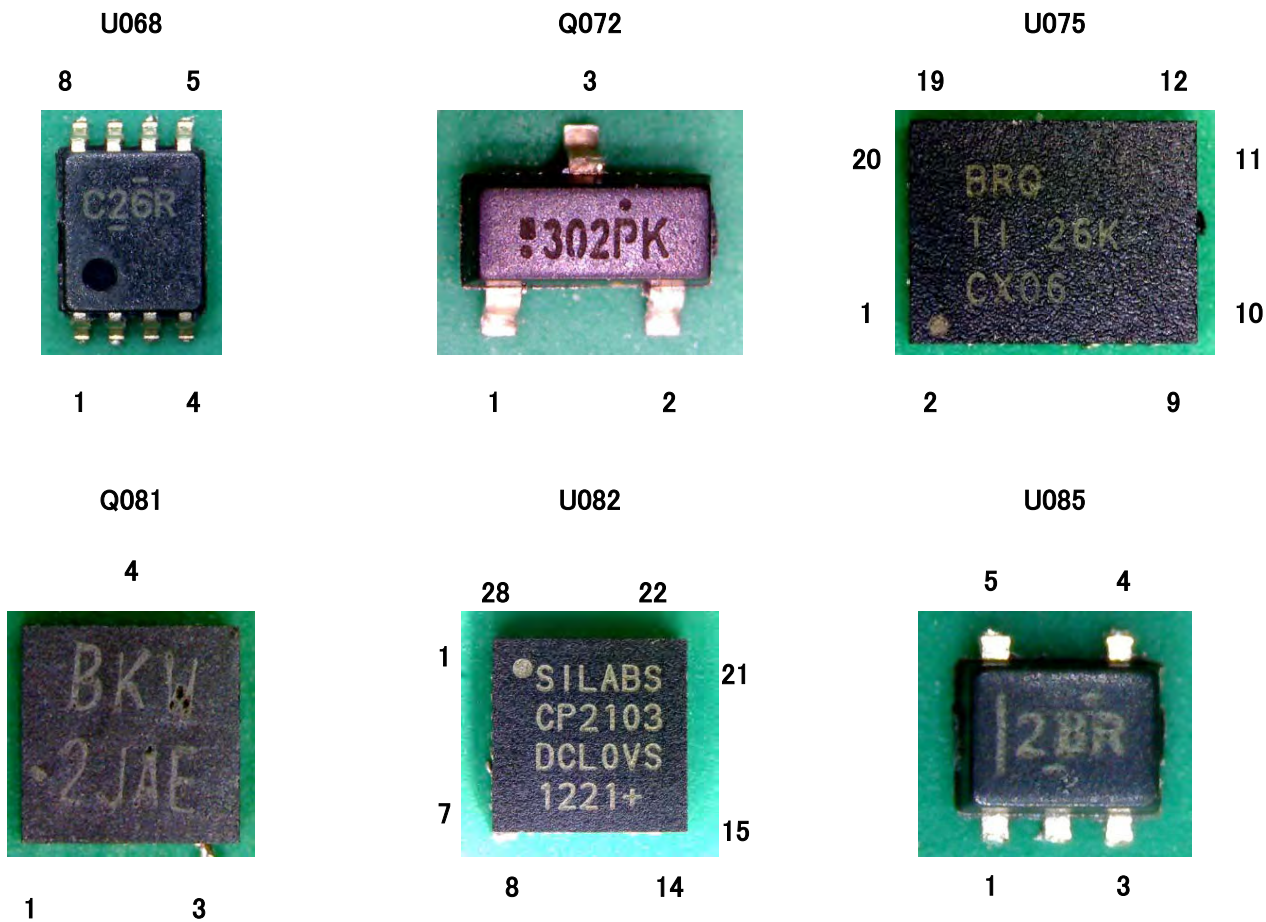
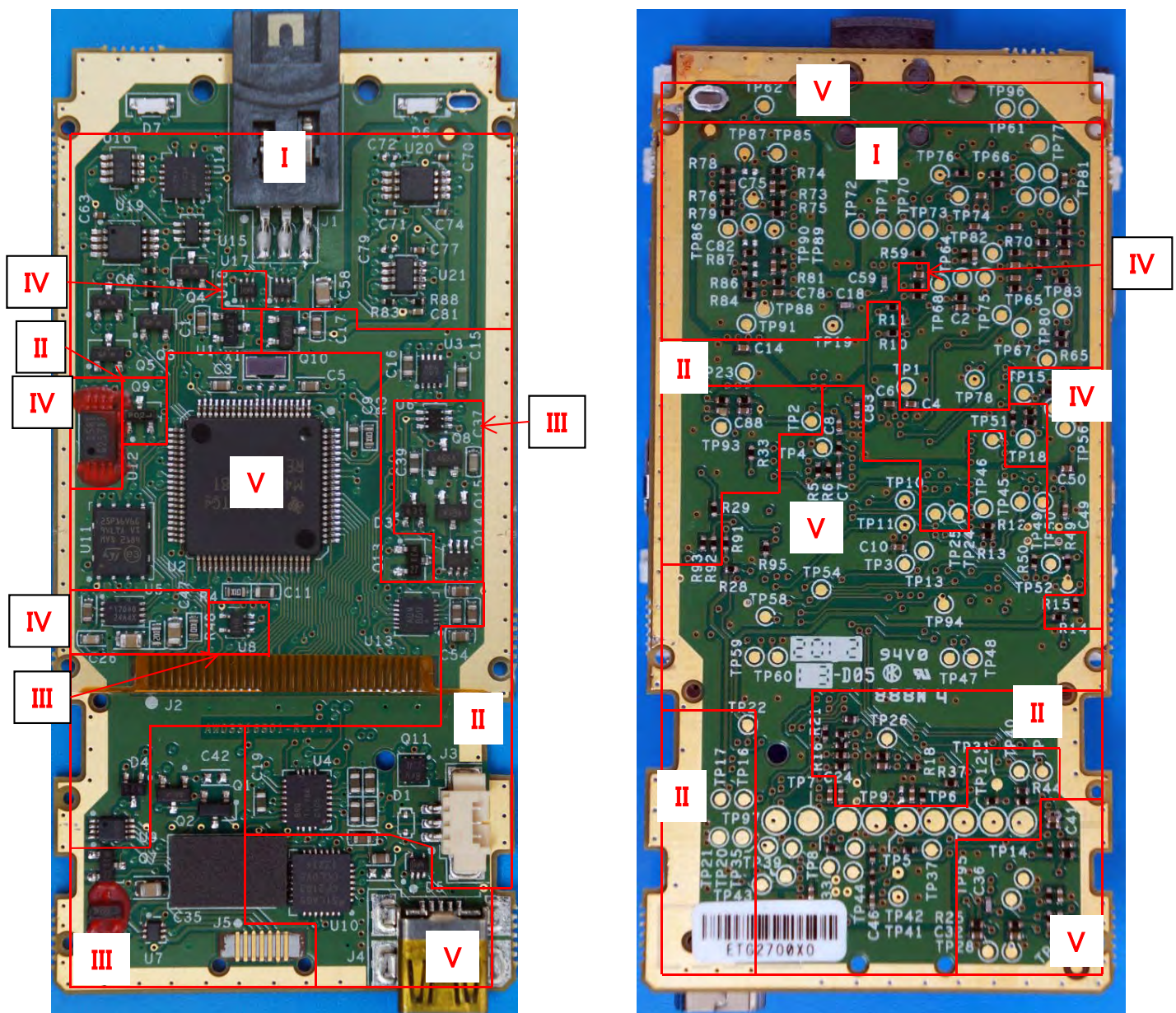


Photo 8-3: PCB-mounted components-3 (Top View)



Top View

Bottom View

- I Fig_A-1 Peripheral Analog Amp.
- II Fig_A-1 Peripheral Power Management
- III Fig_A-1 Peripheral Push Switch
- IV Fig_A-1 Peripheral MPU Peripheral
- V Fig_A-2 MCU, LCD, USB

Photo.9 Analysis Area

Block Diagram

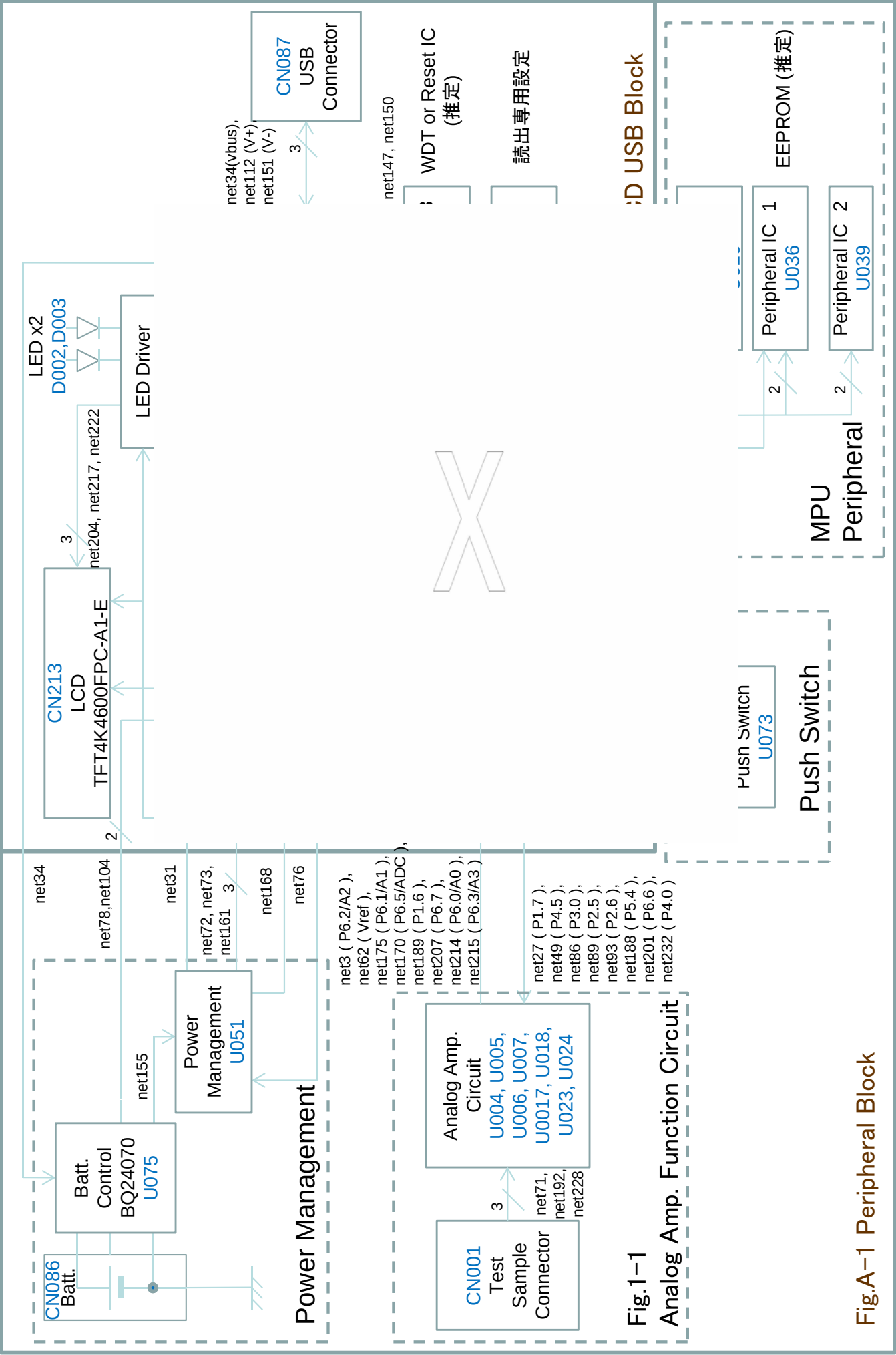


Fig.1 Function Block Diagram

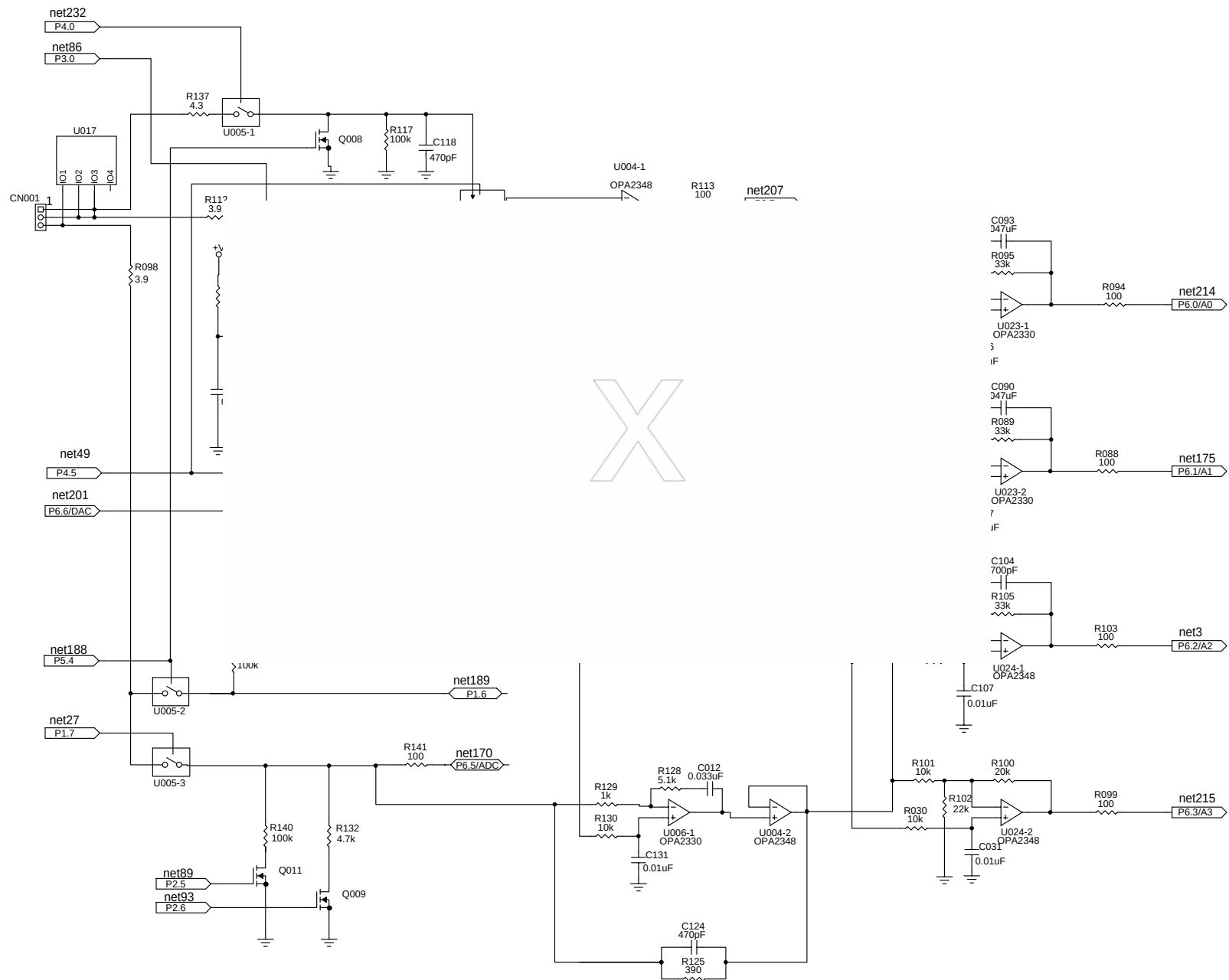


Fig.1-1 Analog Amp. Function Circuit

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Component Layout

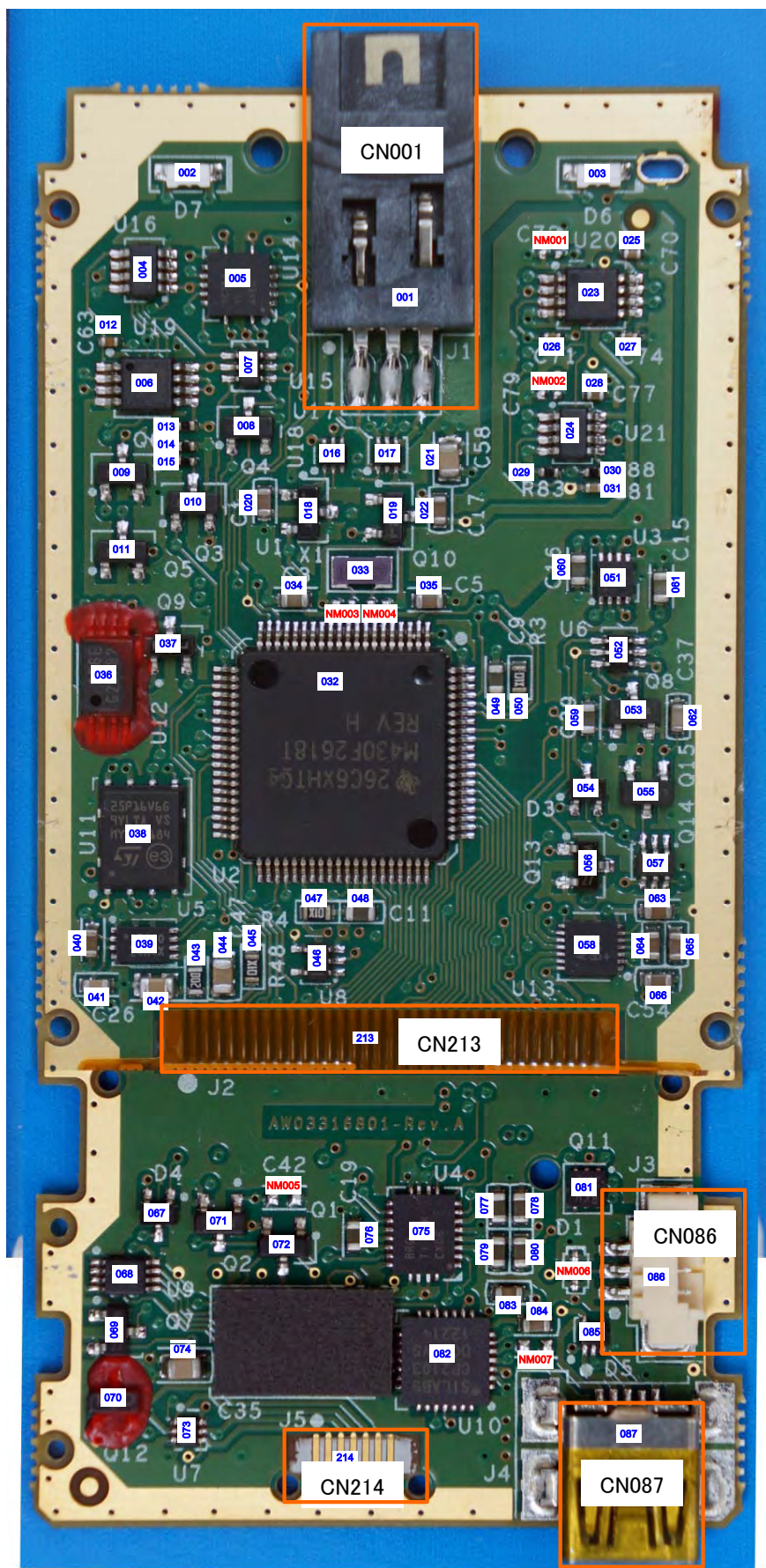


Photo A-1. Mounted components positioning (Top View)

Component Layout

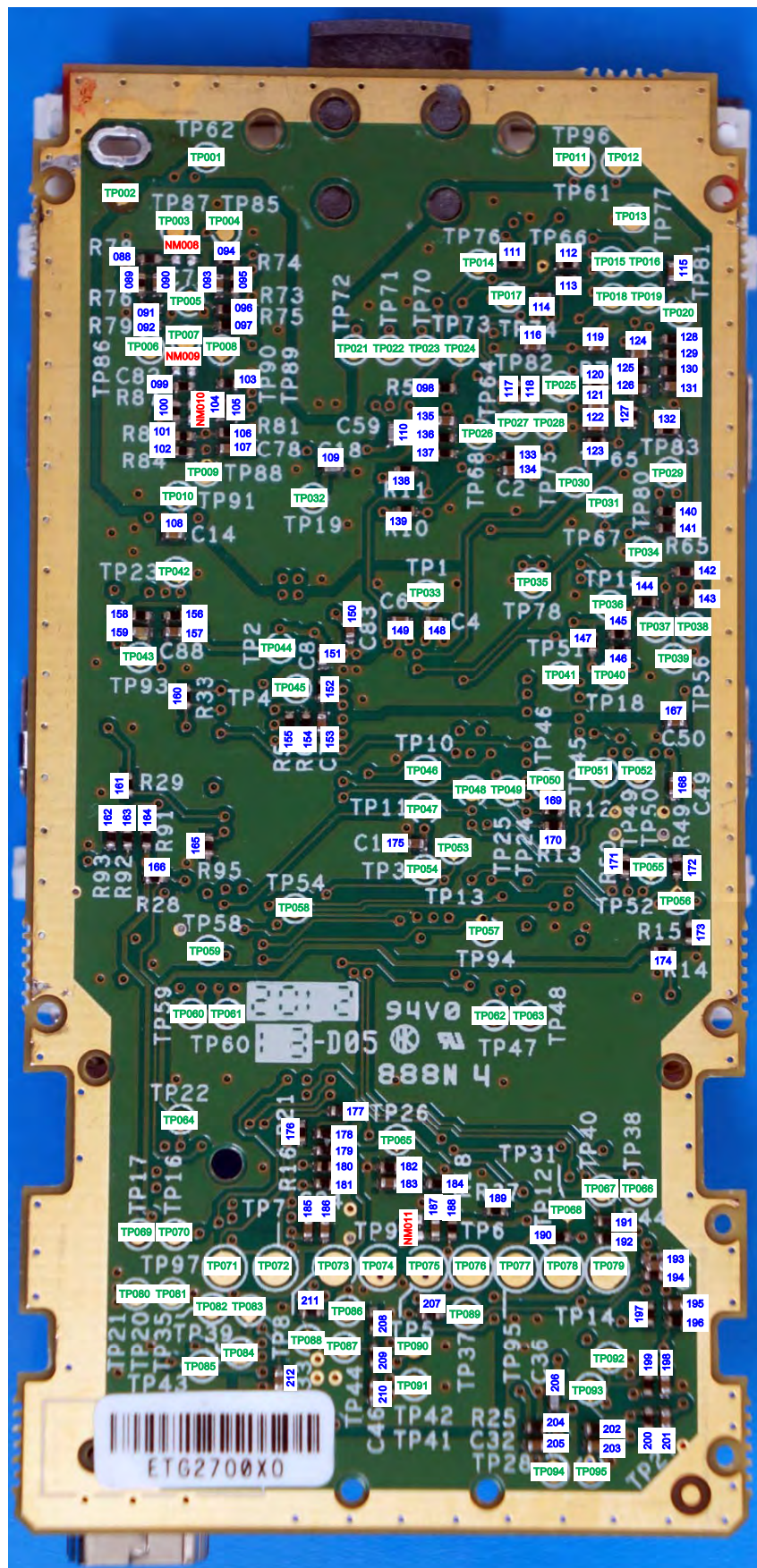
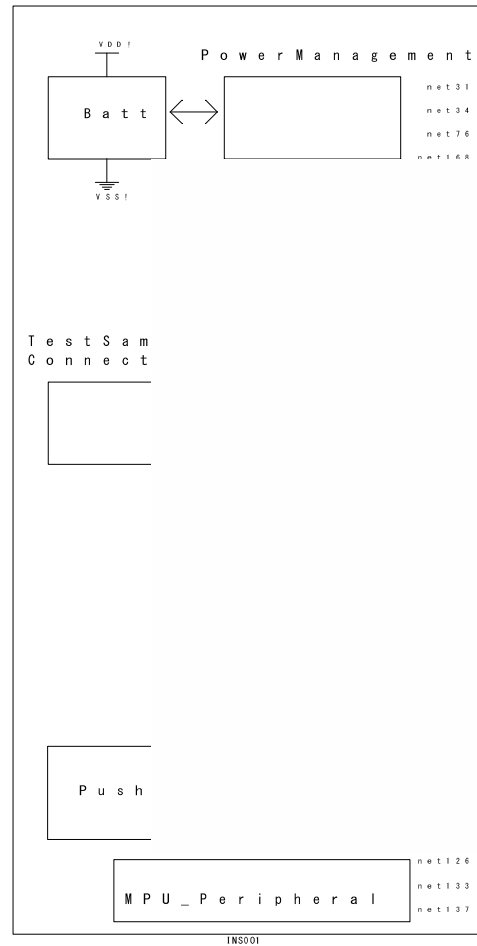
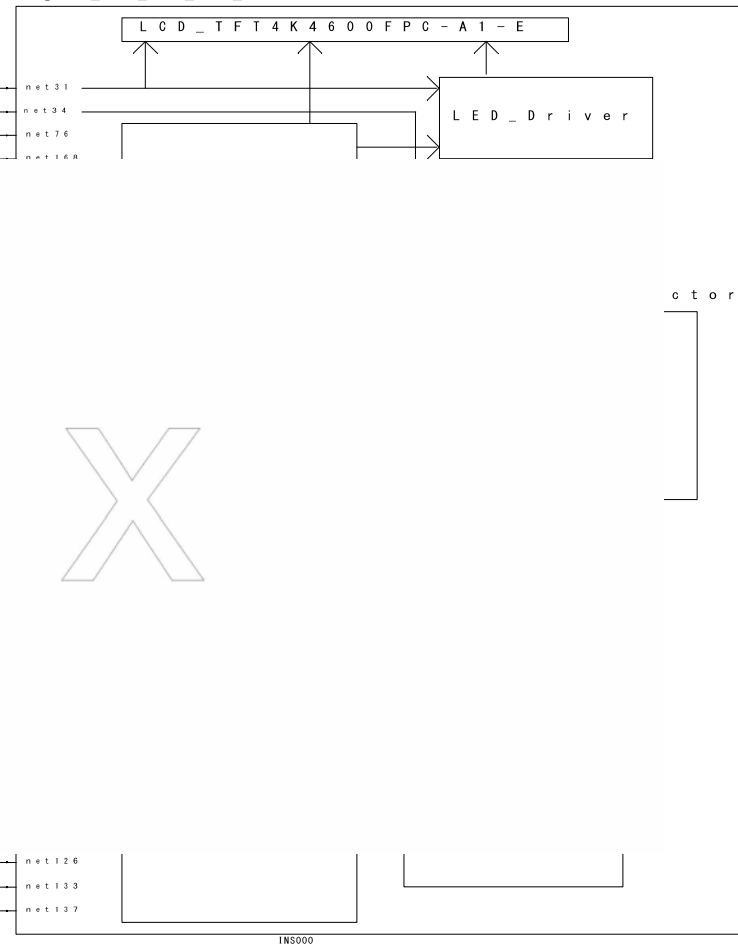


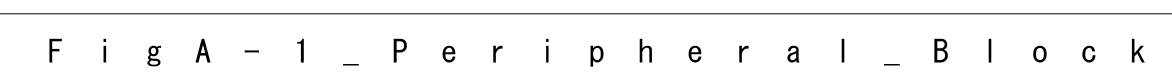
Photo A-2. Mounted component positioning (Bottom View)

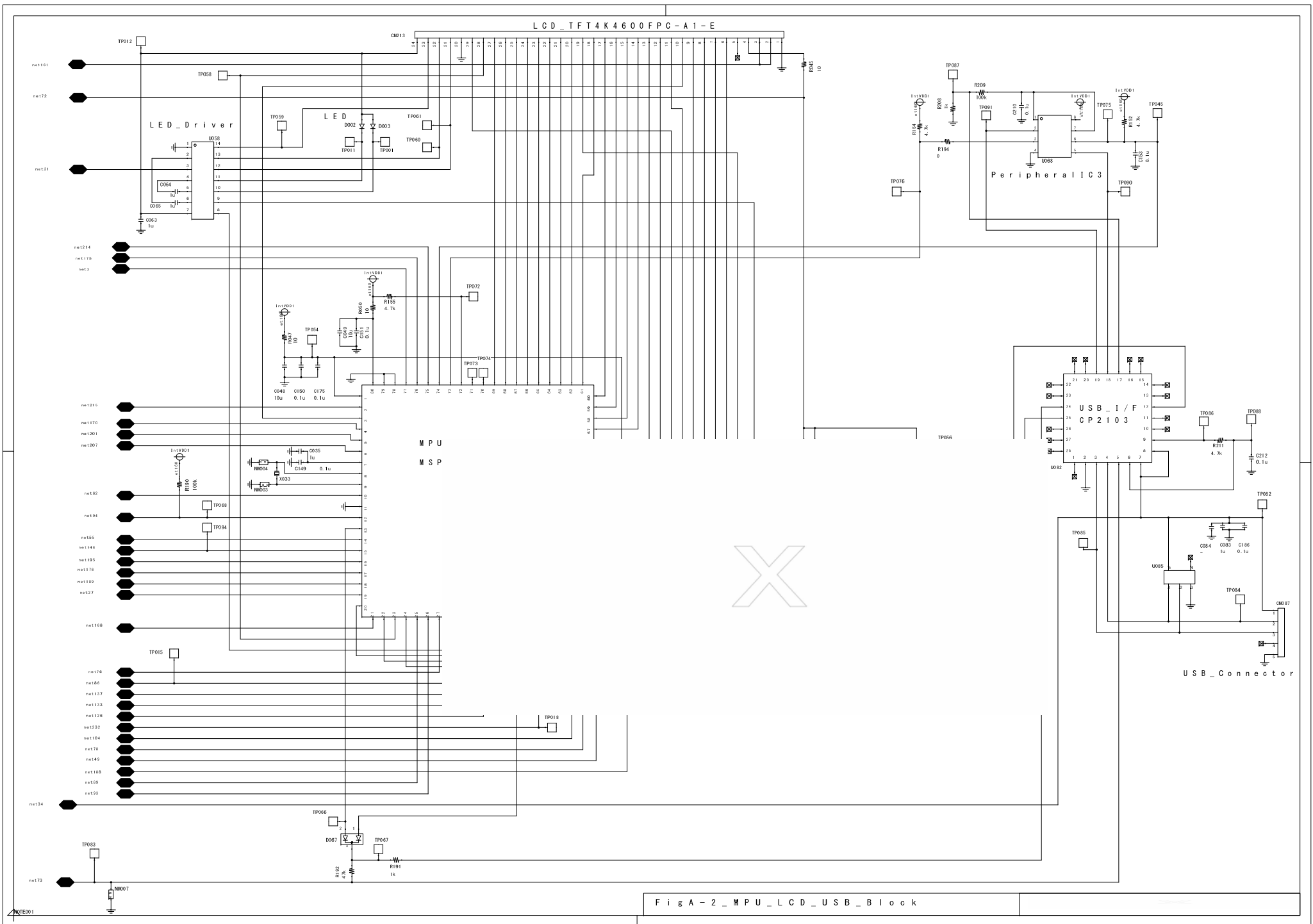
FigA-1_Peripheral_Block



FigA-2_MPU_LCD_USB_Block







Appendix

Table.A-1 Component Specifications

No	Silk	Marking	Supplier	Function	Nominal	Measure	Remark
001	J1	-	-	Connector 3pin	-	-	-
002	D7	-	-	LED	-	-	-
003	D6	-	-	LED	-	-	-
004	U16	B48 (裏) 23N2	Texas Instruments	IC OPA2348 1MHz, 45μA, CMOS, Rail-to-Rail OPERATIONAL AMPLIFIERS Value Line Series	-	-	cf. datasheet
005	U14	YC751 TI 23K AXEO	Texas Instruments	IC TS3A4751 0.9-Ω LOW-VOLTAGE SINGLE-SUPPLY QUAD SPST ANALOG SWITCH	-	-	cf. datasheet
006	U19	TI ロゴ OA OCGQ (裏) 0AS WVXY	Texas Instrun	OPA2330	-	-	cf. datasheet
007	U15	JCR	Texas Instrun		-	-	cf. datasheet
008	Q4	SA N	-		-	-	-
009	Q6	SA N	-		-	-	-
010	Q3	SA N	-		-	-	-
011	Q5	SA N	-		-	-	-
012	C63	-	-		33u F	33.76n F	inference
013	-	-	-		24k ohm	24.83k ohm	inference
014	-	-	-		24k ohm	24.85k ohm	inference
015	-	-	-		20 ohm	616.6 ohm	inference
016	U18	OBS	Texas Instrun		-	-	cf. datasheet
017	U17	2CR	Texas Instrun		-	-	cf. datasheet
018	U1	FZFY (裏) CAF	-		-	-	-
019	Q10	P02 L	-		-	-	-
020	C1	-	-		1u F	1001.7n F	inference
021	C58	-	-		1u F	102.97n F	inference
022	C17	-	-		1u F	1027.9n F	inference
023	U20	TI ロゴ OA OCGQ (裏) 0AS WVXY	Texas Instrun		-	-	cf. datasheet
024	U21	B48 (裏) 23N2	Texas Instrun		-	-	cf. datasheet
025	C70	-	-		1u F	96.21n F	inference
026	C71	-	-		1u F	10.457n F	inference
027	C74	-	-	Capacitor	0.01u F	10.658n F	inference
028	C77	-	-	Capacitor	0.1u F	96.19n F	inference
029	R8	-	-	Resistor	10k ohm	9.914k ohm	inference
030	R88	-	-	Resistor	10k ohm	9.909k ohm	inference
031	C81	-	-	Capacitor	0.01u F	10.467n F	inference
032	U2	TI ロゴ 26C6XHTG4 M430F2618T REV H	Texas Instruments	IC MSP430F2618 MIXED SIGNAL MICROCONTROLLER	-	-	cf. datasheet
033	X1	M222E7	-	Crystal	-	-	-
034	C3	-	-	Capacitor	1u F	1000n F	inference
035	C58	-	-	Capacitor	1u F	994.5n F	inference
036	U12	C56E G25782	-	IC	-	-	-

No	Silk	Marking	Supplier	Function	Nominal	Measure	Remark
037	Q9	P02 L	-	Transistor	-	-	-
038	U11	25P16V6G 9YLTA VS MYS 2184 ST $\square \neq$ e3	STMicroelectronics	IC M25P16 512 Kbit to 32 Mbit, Low Voltage, Serial Flash Memory With 40 MHz or 50 MHz SPI	-	-	cf. datasheet
039	U5	17040 24A4X	-	IC	-	-	-
040	-	-	-	Capacitor	1u F	999.6n F	inference
041	C26	-	-	Capacitor	0.01u F	10.613n F	inference
042	-	-	-	Capacitor	0.01u F	8.335u F	inference
043	-	200	-	Resistor	20 ohm	20.05 ohm	inference
044	C47	-	-	Capacitor	-	702u F	inference
045	R48	01X	-	Resistor	-	354 ohm	inference
046	U8	HBK	-	IC	-	-	-
047	R4	01X	-	Resistor	-	588 ohm	inference
048	C11	-	-	Capacitor	-	85u F	inference
049	C9	-	-	Capacitor	-	303u F	inference
050	R3	01X	-	Resistor	-	382 ohm	inference
051	U3	ABG UDV	-	IC	-	-	-
052	U6	-aT=	-	IC	-	-	-
053	Q8	L4CSA	-	IC	-	-	-
054	D3	43t	-	IC	-	-	-
055	Q15	L4CSA	-	IC	-	-	-
056	Q13	WJ3 27	NXP	IC	-	-	cf. datasheet
057	Q14	BIK AH	-	IC	-	-	-
058	U13	ADW BDU	-	IC	-	-	-
059	C39	-	-	Capacitor	-	892u F	inference
060	C16	-	-	Capacitor	-	68u F	inference
061	C15	-	-	Capacitor	-	79u F	inference
062	C37	-	-	Capacitor	-	96u F	inference
063	-	-	-	Capacitor	-	105n F	inference
064	-	-	-	Capacitor	-	1.4n F	inference
065	-	-	-	Capacitor	-	3.9n F	inference
066	C54	-	-	Capacitor	-	0.9n F	inference
067	D4	42t	-	IC	-	-	-
068	U9	C26R	-	IC	-	-	-
069	Q7	WJ3 27	NXP	IC	-	-	cf. datasheet
070	Q12	P02 L	-	IC	-	-	-
071	Q2	SA N	-	IC	-	-	-
072	Q1	302PK	-	IC	-	-	-
073	U7	2CR	Texas Instrumer	IC	-	-	cf. datasheet
074	C35	-	-	Capacitor	-	35n F	inference
075	U4	BRQ TI 26K CX06	Texas Instrumer	IC	-	-	cf. datasheet
076	C19	-	-	Capacitor	-	834u F	inference
077	-	-	-	Capacitor	-	79u F	inference
078	-	-	-	Capacitor	-	56u F	inference
079	-	-	-	Capacitor	-	11u F	inference
080	-	-	-	Capacitor	-	29u F	inference
081	Q11	BKW 2JAE	-	Transistor	-	-	-
082	U10	SILABS CP2103 DCL0VS 1221+	SILICON LABS	IC CP2103 SINGLE-CHIP USB TO UART BRIDGE	-	-	cf. datasheet
083	-	-	-	Capacitor	1u F	1003.1n F	inference
084	-	-	-	Capacitor	- F	- F	lost
085	D5	2BR	-	IC	-	-	-
086	J3	-	-	Connector 3pin	-	-	-
087	J4	-	-	Connector 5pin	-	-	-
088	R78	-	-	Resistor	100 ohm	99.97 ohm	inference
089	-	-	-	Resistor	33k ohm	33.01k ohm	inference
090	-	-	-	Capacitor	0.047u F	46.21n F	inference
091	R76	-	-	Resistor	750 ohm	748 ohm	inference
092	R79	-	-	Resistor	10k ohm	9.938k ohm	inference

No	Silk	Marking	Supplier	Function	Nominal	Measure	Remark
093	-	-	-	Capacitor	0.047u F	46.02n F	inference
094	R74	-	-	Resistor	100 ohm	100.05 ohm	inference
095	-	-	-	Resistor	33k ohm	32.95k ohm	inference
096	R73	-	-	Resistor	160 ohm	159.79 ohm	inference
097	R75	-	-	Resistor	10k ohm	9.957k ohm	inference
098	R59	-	-	Resistor	3.9 ohm	4.026 ohm	inference
099	R87	-	-	Resistor	100 ohm	100.02 ohm	inference
100	-	-	-	Resistor	20k ohm	20.96k ohm	inference
101	R86	-	-	Resistor	10k ohm	10.436k ohm	inference
102	R84	-	-	Resistor	22k ohm	21.44k ohm	inference
103	-	-	-	Resistor	100 ohm	100.2 ohm	inference
104	-	-	-	Capacitor	4700p F	4.819n F	inference
105	-	-	-	Resistor	33k ohm	32.96k ohm	inference
106	R81	-	-			.578k ohm	inference
107	C78	-	-			.448n F	inference
108	C14	-	-			.253n F	inference
109	C18	-	-			.100n F	inference
110	C59	-	-			.148n F	inference
111	-	-	-			9.45k ohm	inference
112	-	-	-			4.101 ohm	inference
113	-	-	-			01.35 ohm	inference
114	-	-	-			8.12n F	inference
115	-	-	-			6.39n F	inference
116	-	-	-			7.38n F	inference
117	-	-	-			9.36k ohm	inference
118	-	-	-			.466n F	inference
119	-	-	-			2.11n F	inference
120	R70	-	-			4.79k ohm	inference
121	-	-	-			1.59n F	inference
122	-	-	-			.511n F	inference
123	-	-	-			8.75k ohm	inference
124	-	-	-			.460n F	inference
125	-	-	-			390.7 ohm	inference
126	-	-	-			5.47n F	inference
127	-	-	-			4.82k ohm	inference
128	-	-	-			.978k ohm	inference
129	-	-	-			998.3 ohm	inference
130	-	-	-			.939k ohm	inference
131	-	-	-			.374n F	inference
132	-	-	-			.669k ohm	inference
133	-	-	-			99.96 ohm	inference
134	C2	-	-			4.46n F	inference
135	-	-	-			6.37n F	inference
136	-	-	-			.678k ohm	inference
137	-	-	-			4.237 ohm	inference
138	R10	-	-			.669k ohm	inference
139	R11	-	-			39.03 ohm	inference
140	-	-	-			99.5k ohm	inference
141	R65	-	-			106 ohm	inference
142	-	-	-			.672k ohm	inference
143	-	-	-			2.84k ohm	inference
144	-	-	-			.675k ohm	inference
145	-	-	-			99.3k ohm	inference
146	-	-	-			.691k ohm	inference
147	-	-	-			3.337 ohm	inference
148	C4	-	-			5.21n F	inference
149	C6	-	-			5.54n F	inference
150	C83	-	-	Capacitor	0.1u F	94.71n F	inference
151	C8	-	-	Capacitor	0.1u F	93.53n F	inference
152	-	-	-	Resistor	4.7k ohm	4.694k ohm	inference
153	C7	-	-	Capacitor	0.1u F	92.27n F	inference
154	R6	-	-	Resistor	4.7k ohm	4.678k ohm	inference
155	R5	-	-	Resistor	4.7k ohm	4.724k ohm	inference
156	-	-	-	Resistor	20k ohm	19.837k ohm	inference
157	C88	-	-	Capacitor	0.068u F	66.6n F	inference
158	-	-	-	Resistor	100k ohm	98.98k ohm	inference
159	-	-	-	Capacitor	0.22u F	228n F	inference
160	R33	-	-	Resistor	750k ohm	736k ohm	inference
161	R29	-	-	Resistor	620k ohm	606.6k ohm	inference
162	R93	-	-	Resistor	39k ohm	40.15k ohm	inference
163	R92	-	-	Resistor	10k ohm	9.963k ohm	inference
164	R91	-	-	Resistor	100k ohm	99.35k ohm	inference
165	R95	-	-	Resistor	100k ohm	98.91k ohm	inference
166	R28	-	-	Resistor	100k ohm	99.51k ohm	inference
167	C50	-	-	Capacitor	0.1u F	96.18n F	inference
168	C49	-	-	Capacitor	0.1u F	98.12n F	inference
169	R12	-	-	Resistor	100k ohm	99.63k ohm	inference
170	R13	-	-	Resistor	100k ohm	99.45k ohm	inference
171	R50	-	-	Resistor	100k ohm	99.29k ohm	inference

No	Silk	Marking	Supplier	Function	Nominal	Measure	Remark
172	R49	-	-	Resistor	100k ohm	99.24k ohm	inference
173	R15	-	-	Resistor	150 ohm	150.15 ohm	inference
174	R14	-	-	Resistor	150 ohm	150.27 ohm	inference
175	C10	-	-	Capacitor	0.1u F	94.86n F	inference
176	R21	-	-	Resistor	100k ohm	99.19k ohm	inference
177	-	-	-	Resistor	1k ohm	997.2 ohm	inference
178	-	-	-	Resistor	160k ohm	168.09k ohm	inference
179	-	-	-	Resistor	10k ohm	9.918k ohm	inference
180	-	-	-	Resistor	10k ohm	10.458k ohm	inference
181	-	-	-	Resistor	0 ohm	0.117 ohm	inference
182	-	-	-	Resistor	33k ohm	32.79k ohm	inference
183	-	-	-			94.66n F	inference
184	R18	-	-			40.17k ohm	inference
185	C24	-	-			95.36n F	inference
186	-	-	-			93.05n F	inference
187	-	-	-			99.18n F	inference
188	-	-	-			99.2k ohm	inference
189	R37	-	-			17.923k ohm	inference
190	-	-	-			99.06k ohm	inference
191	R44	-	-			997.7 ohm	inference
192	-	-	-			46.77k ohm	inference
193	-	-	-			93.96n F	inference
194	-	-	-			0.114 ohm	inference
195	C41	-	-			98.22n F	inference
196	-	-	-			99.56k ohm	inference
197	-	-	-			4.659k ohm	inference
198	-	-	-			95.99n F	inference
199	-	-	-			32.84k ohm	inference
200	-	-	-			32.8k ohm	inference
201	-	-	-			94.78n F	inference
202	-	-	-			32.82k ohm	inference
203	-	-	-			95.72n F	inference
204	R25	-	-			32.98k ohm	inference
205	C32	-	-			94.76n F	inference
206	C36	-	-			0.136n F	inference
207	-	-	-			4.676k ohm	inference
208	-	-	-			994.6 ohm	inference
209	-	-	-			99.27k ohm	inference
210	C46	-	-			96.22n F	inference
211	-	-	-			4.679k ohm	inference
212	-	-	-			94.95n F	inference
213	J2	-	-	Connector 34pin	-	-	-
214	J5	-	-	Connector 7pin	-	-	-

*(Prefix)+(Number) in schematic diagrams

Function	Prefix
Capacitor	C
Connector	CN
Crystal	X,Y,U
Battery	BATT
Diode	D
Zener Diode	ZD
Fuse	F
IC	U
Inductor	L
LED	D
Resistor	R
Switch	SW
Thermistor	TH
Transformer	TR
Transistor	Q
Variable Resistor	VR