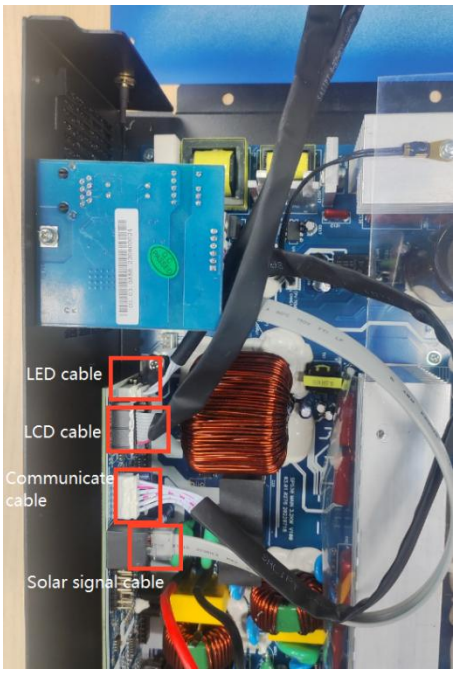
SP520 series Service Manual

1. Unit disassemble Step

① Remove the screws of top cover and wire cover.

② Take out wire cover and open the top cover.

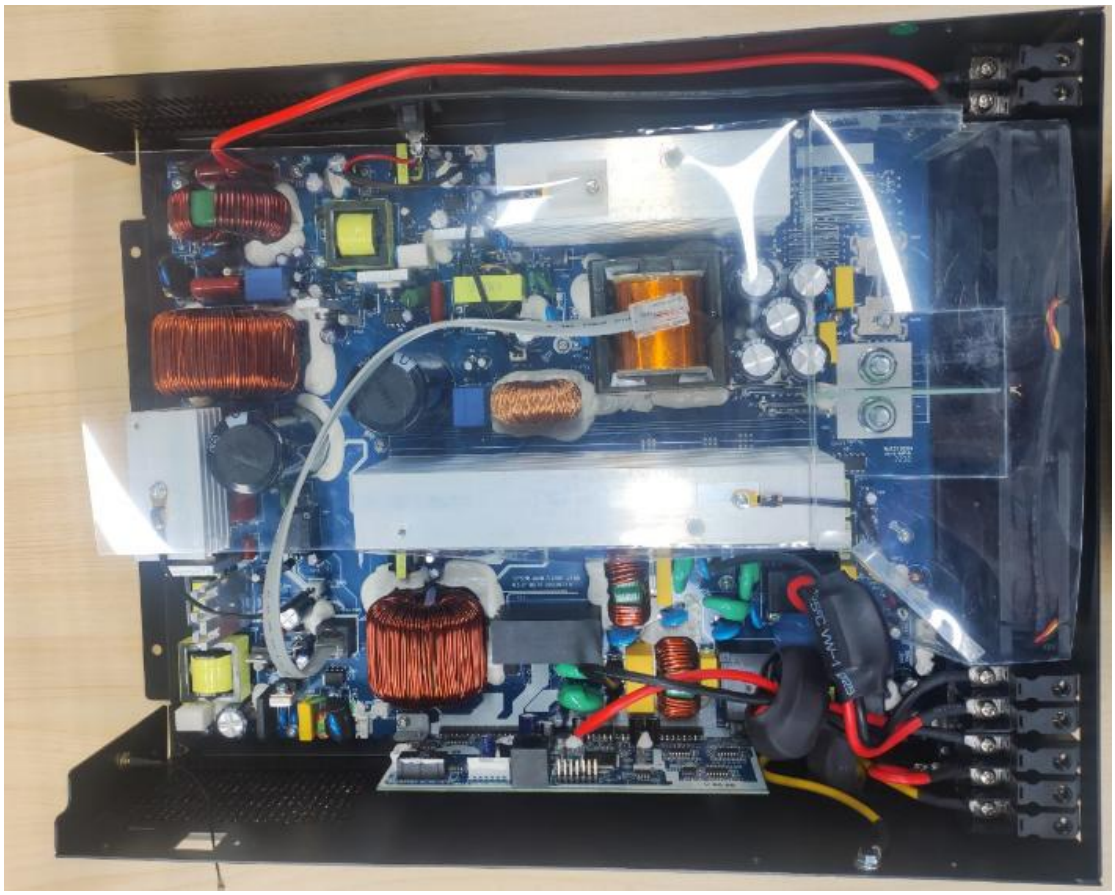
③ Unplug LCD&LED&communication&Solar sampling signal cables from control board.



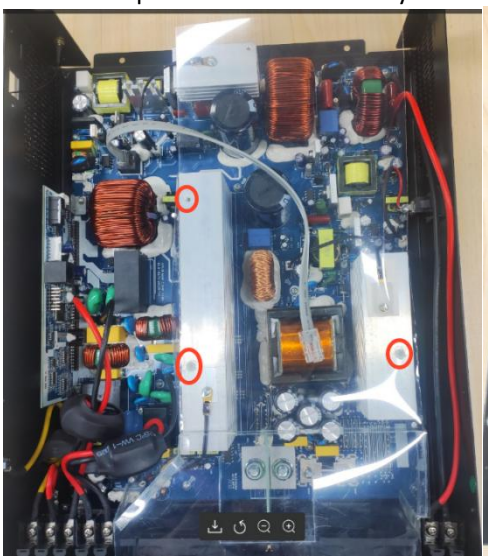
④ Remove the screws of communication board

⑤ Remove the antenna,Then take out the communication board.

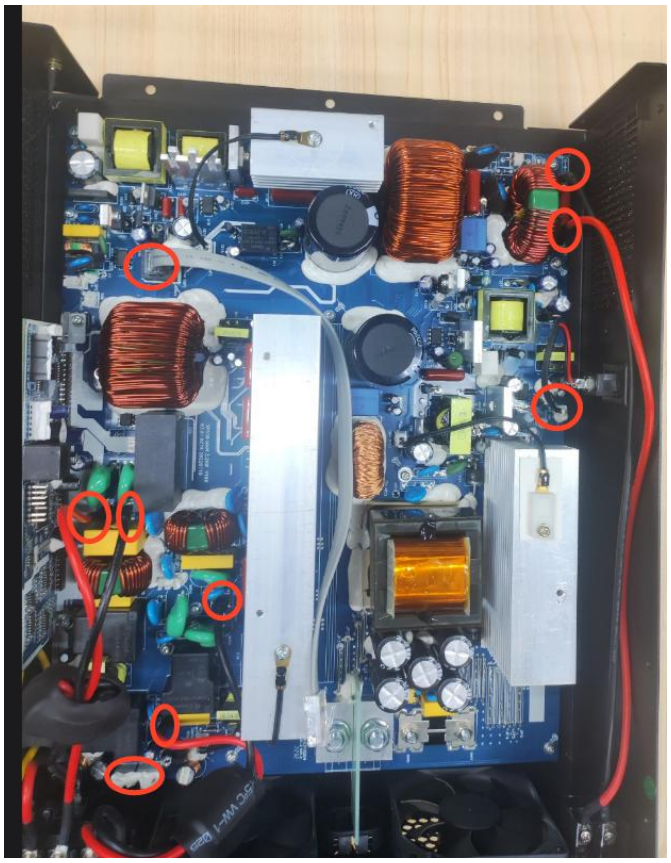
⑥ Take out top cover.



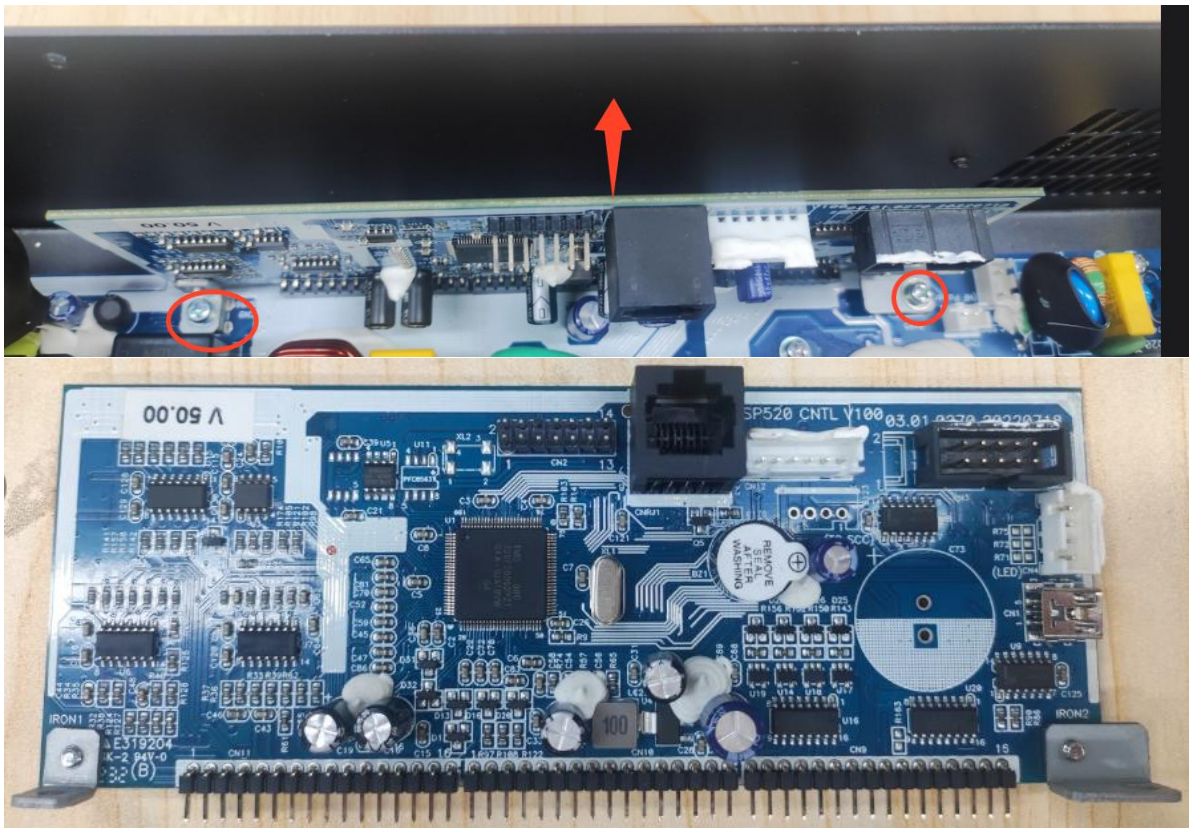
⑦ Take out the plastic nails and PVC mylar



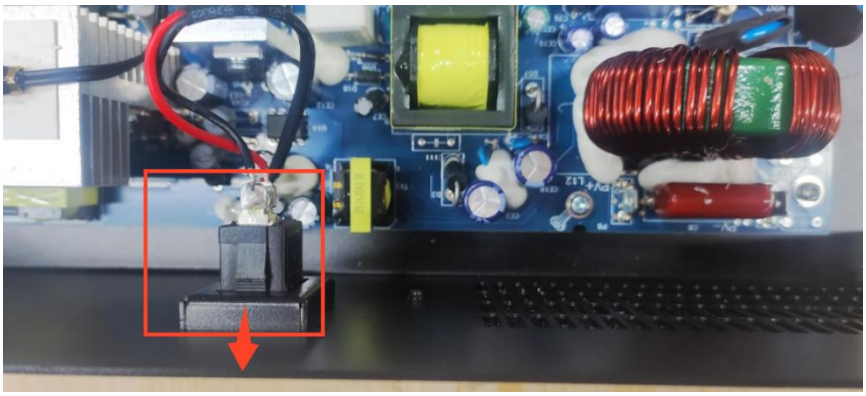
⑧ Remove these cables from the main board.



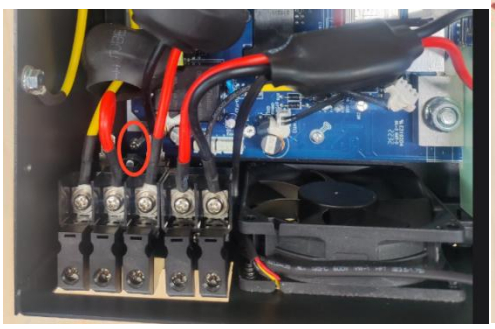
⑨ Remove 2 screws as below; Then take out the control board

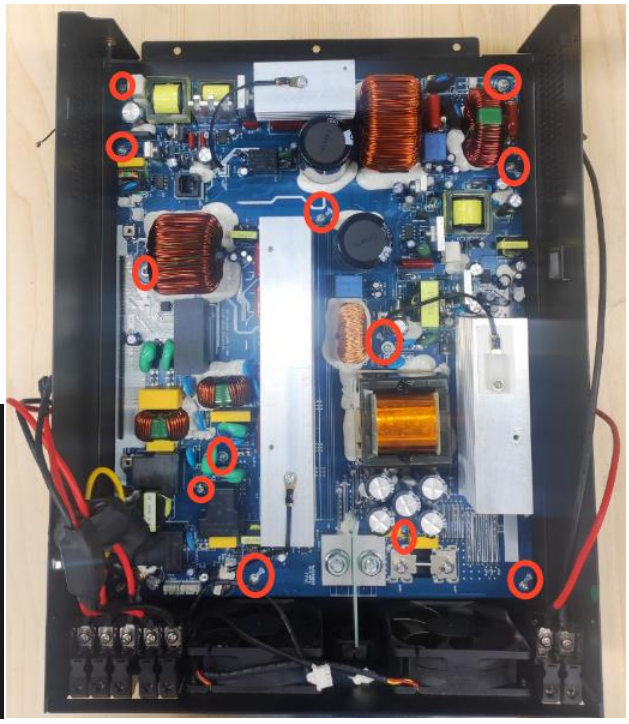


⑩ Take out main switch.



⑪ Remove 13 screws from main board.

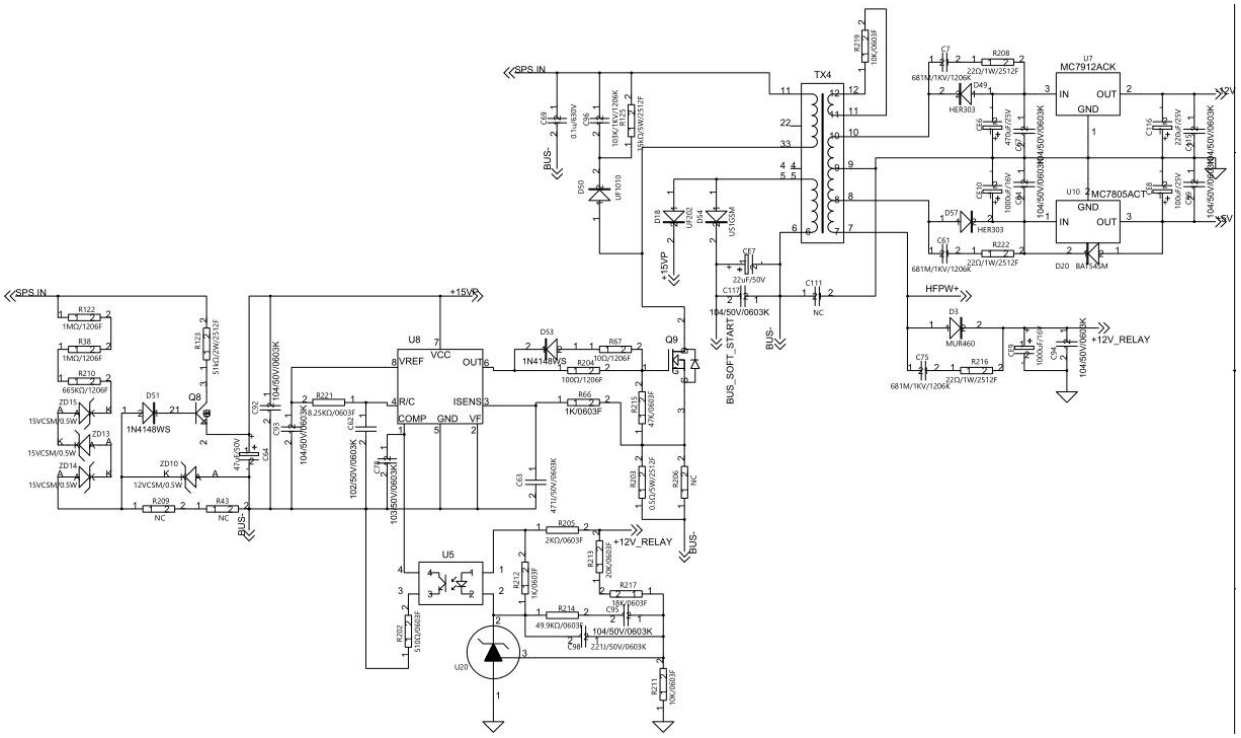


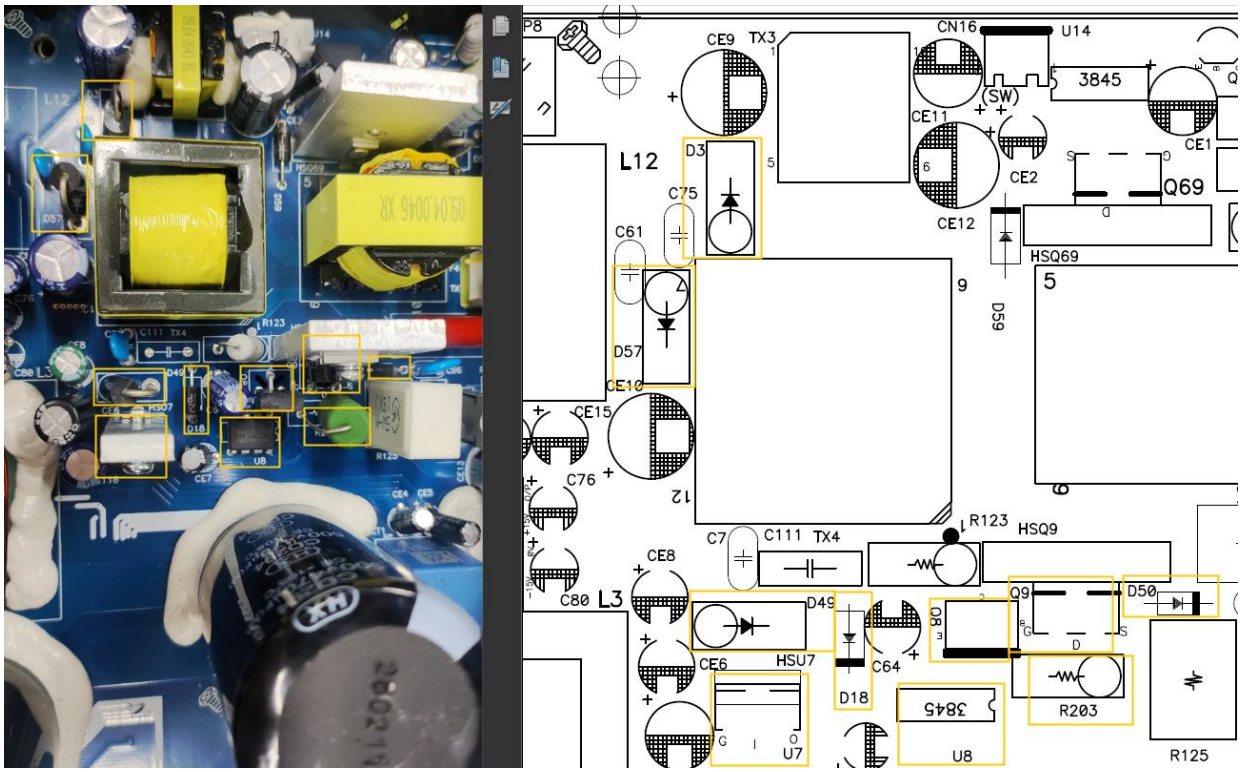


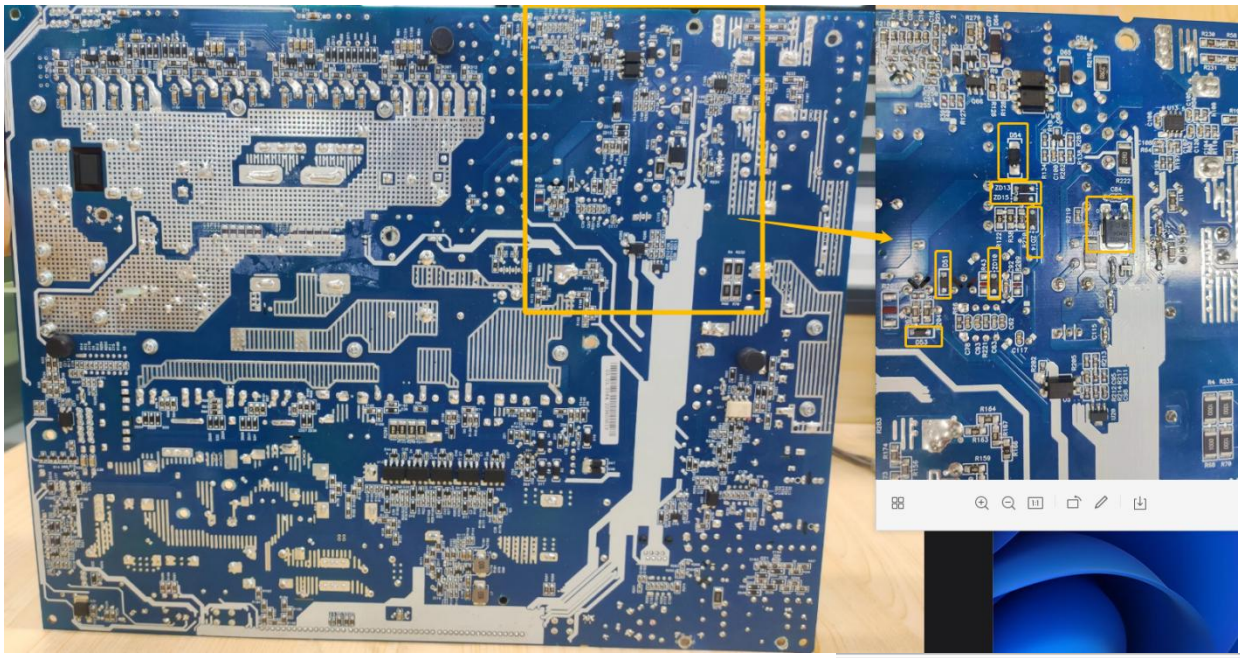
⑫ Take out main board.

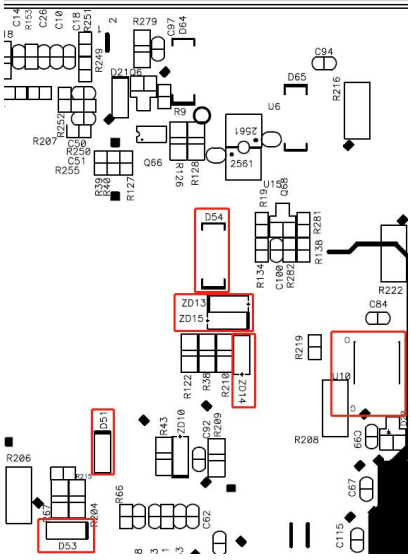
2. Function block issue checking

2.1 Main SPS



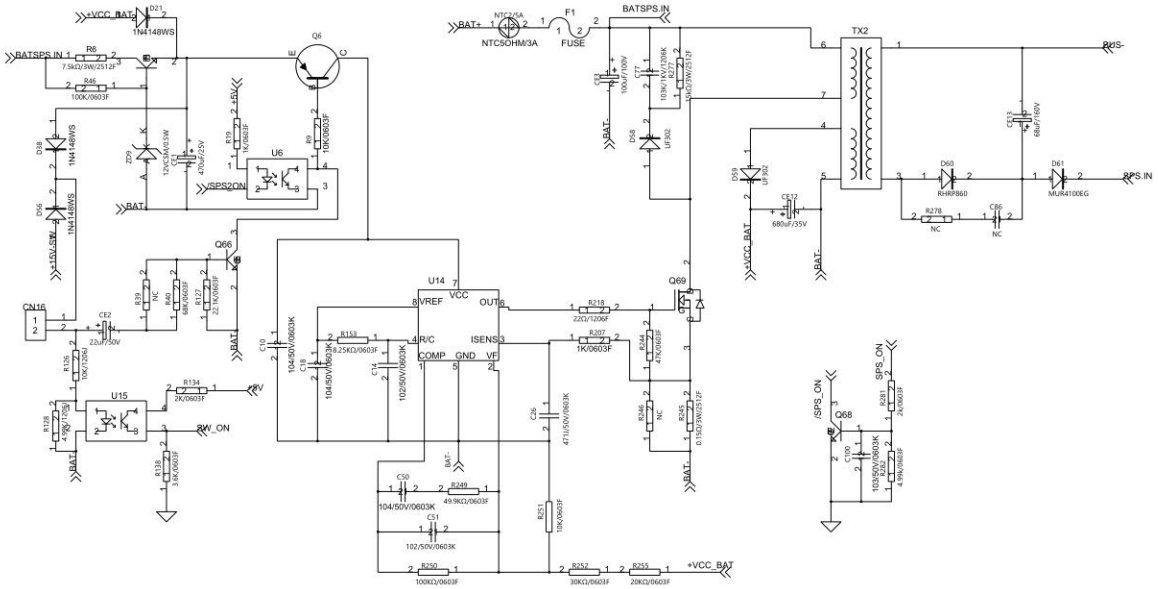






Components	Normal range(Value)	Remark
D50 D PANJIT/UF1010 1A 1000V UFST AXI TAP	VF=0.466V REF	Multi meter diode position
Q9 MOSFET IX/IXFP7N100P 7A 1000V N BULK TO-220	VSD=0.385V REF VGD=OL REF	Multi meter diode position
R203 RES 不燃性树脂型绕线 5W 0.5 J RAD KINK N-IND	0.8 Ohm	Multi meter resistance position
D49,D57 D IO/HER303 3A 200V UFST AXI DO-27 TAP	VF=0.42V REF	Multi meter diode position
D3 整流二极管 MUR460G, 600V/4A, DO-201AD	VF=0.184V REF	Multi meter diode position
U7 IC LIN ST/L7912CV 3P/TO-220	PinI-PinG:0.422V PinO-PinG:0.184V	Multi meter diode position
U10 IC LIN ON/MC78M05CDTRKG DPAK-3 SMD	PinG-PinI:0.415V PinG-PinO:0.674V	Multi meter diode position
D18 D PANJIT/UF202 2A 200V UFST AXI TAP	VF=0.44V REF	Multi meter diode position
D54 US1G, 400V/1A, SMA	VF=0.423V REF	Multi meter diode position
ZD13,ZD14,ZD15 ZD NXP/BZT52-C15 0.41W 15V SOD123F SMD	VF=0.711V REF	Multi meter diode position
ZD10 ZD PANJIT/BZT52-C12 0.41W 12V SOD123F SMD	VF=0.73V REF	Multi meter diode position
U8 IC PWM CNTL ON/UC3845BNG DIP-8	Pin5-Pin7:20.67K Ohm Pin6-Pin5:47K Ohm	Multi meter resistance position
Q8 UTC/2SC5353BL 3A 750V NPN BULK TO-126C	VBE=0.564V VBC=0.542V	Multi meter diode position
D51 1N4148W(T4) SOD123	VF= 0.55V REF	Multi meter diode position

2.2 BAT SPS



设计：	文件名称： <Title>	图号：<Note>
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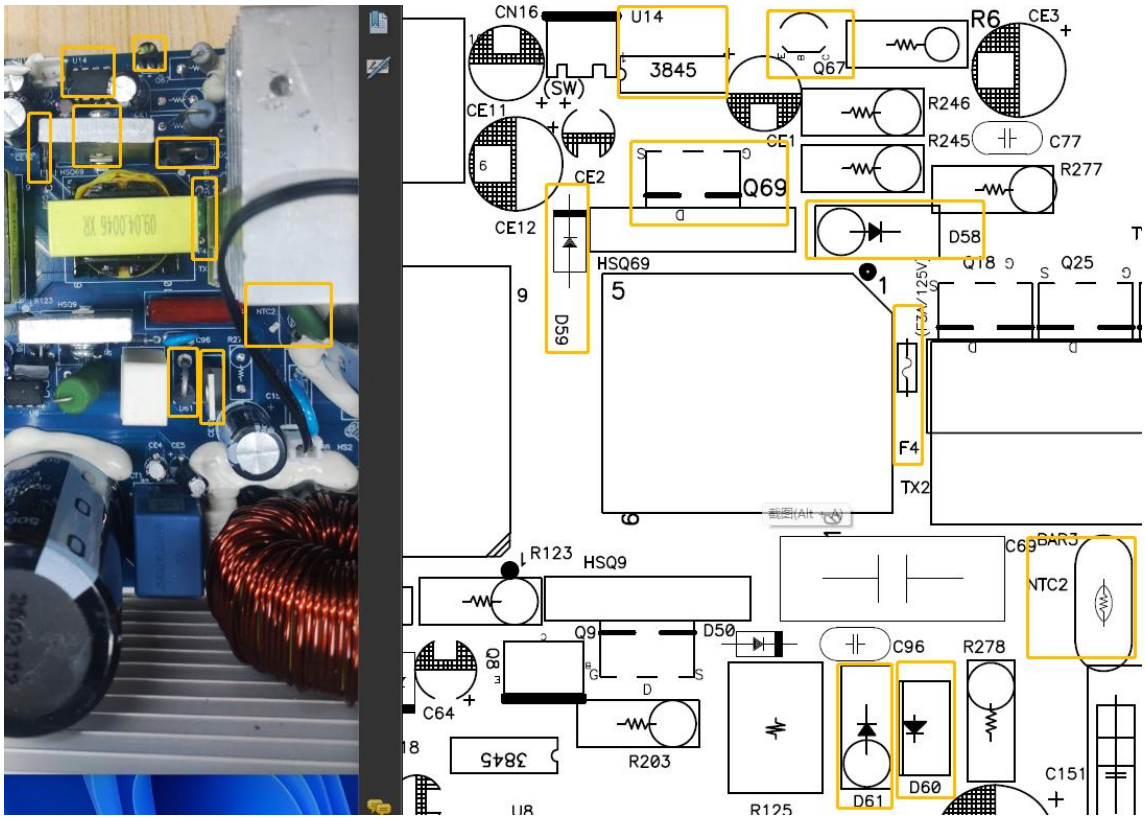
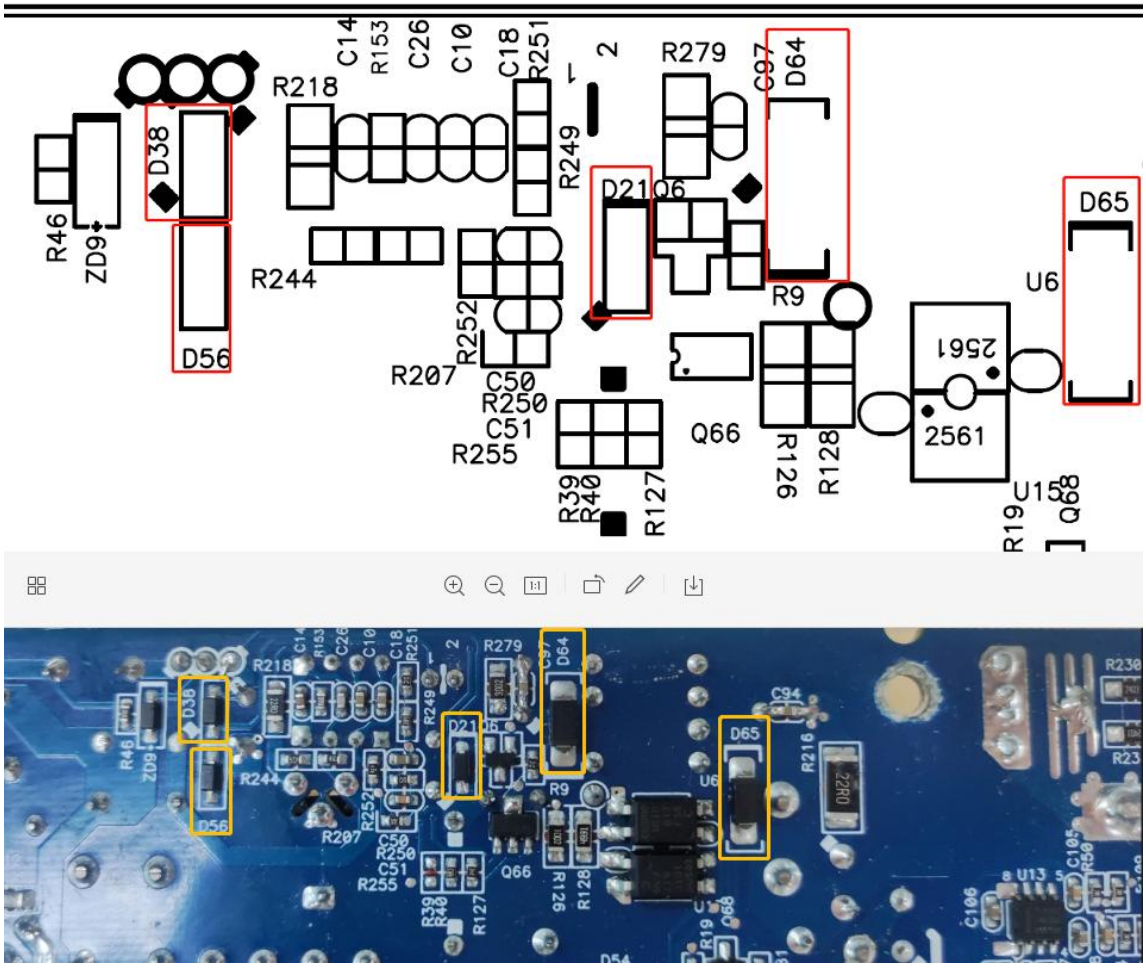
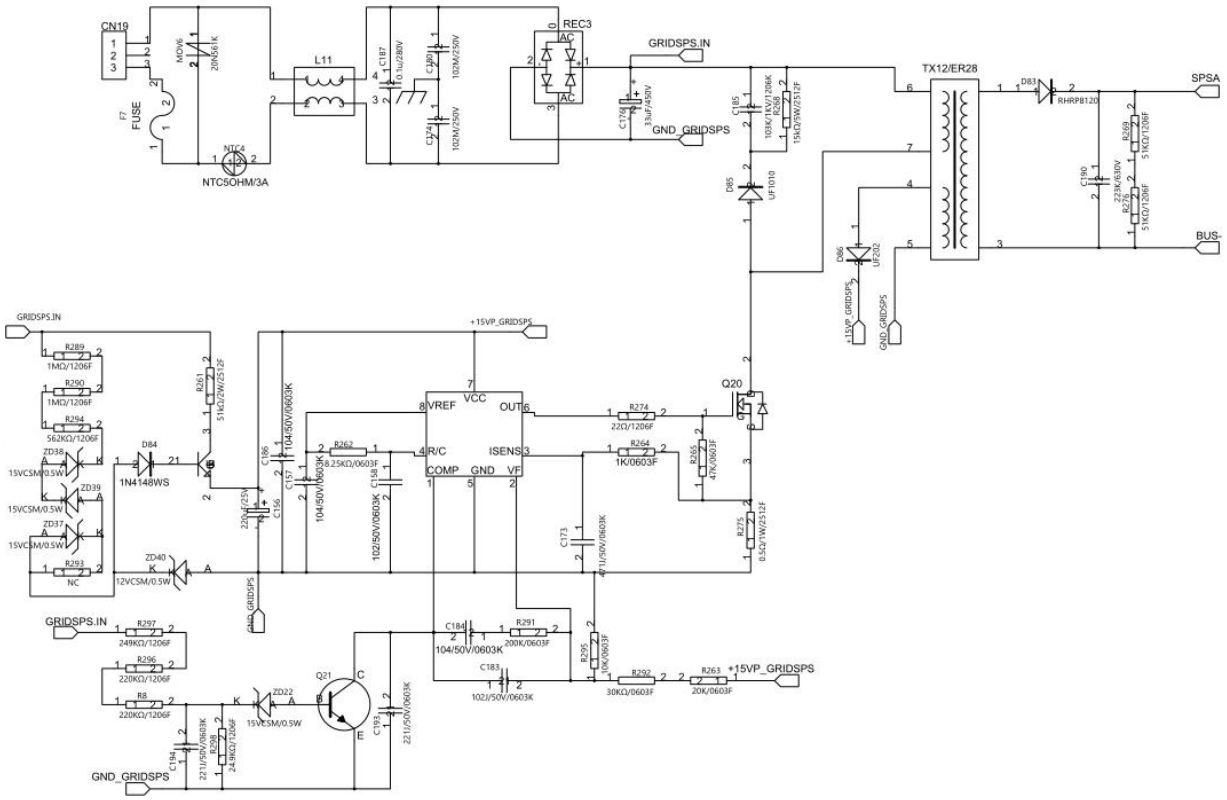
批准：	制成板型号：	产品型号： <Note>
日期：	第 <1> 页 共 页	FRECON

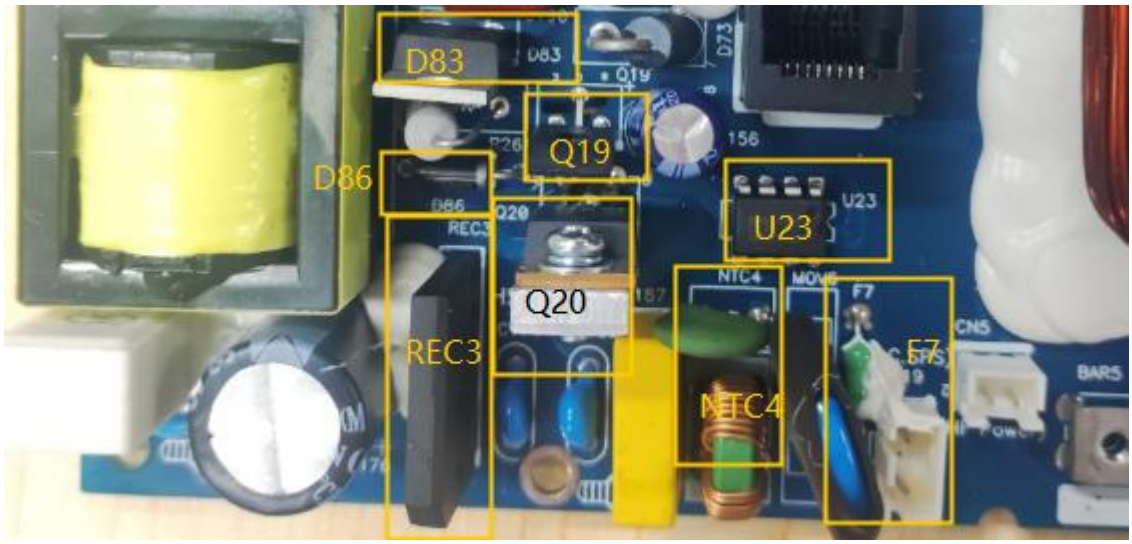




Components	Normal range(Value)	Remark
NTC2 THERMISTOR NTC 5OHM 5A SCK13055LSY	5 Ohm	Multi meter resistance position
F1 FUSE JFC1206-1150FS 1.5A SMD	0.2 Ohm	Multi meter resistance position
D58 D PANJIT/ER302 3A 200V UFST AXI DO-201AD TAP	VF= 0.428V REF	Multi meter diode position
Q69 IRF640NPbF_18A_200V_R15_ N_TO-220	VSD=0.41V REF VGD=OL REF	Multi meter diode position
D59 D PANJIT/UF202 2A 200V UFST AXI TAP	VF= 0.438V REF	Multi meter diode position
D60 D FC/RHRP860 8A 600V SFST RAD BULK	VF= 0.396V REF	Multi meter diode position
D61 D ON /MUR4100ERLG 4A 1000V UFST RAD TAP	VF=0.433V REF	Multi meter diode position
R245 RES 不燃性树脂型绕线 3W 0.15 J N-IND	0.4 Ohm	Multi meter resistance position
U14 IC PWM CNTL ON/UC3845BNG DIP-8	Pin7-Pin5:77.9K Ohm Pin6-Pin5:47K Ohm	Multi meter resistance position
D64 D PANJIT/RS1J 1A 600V SMD	VF=0.469V REF	Multi meter diode position
D21,D38,D56 1N4148W(T4) SOD123	VF=0.546V REF	Multi meter diode position
Q67 TR UTC/MPSA44L 300MA 400V NPN TAP TO-92	VBE=0.625V VBC=0.618V	Multi meter diode position

2.3 AC SPS



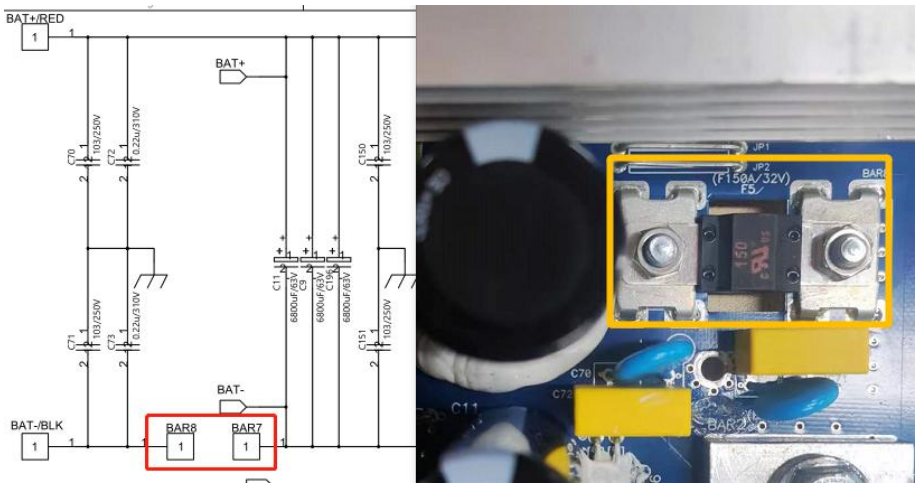


Components	Normal range(Value)	Remark
D83 D FC/RHRP8120 8A 1200V UFST RAD BULK	VF= 0.412V REF	Multi meter diode position
D86 D PANJIT/UF202 2A 200V UFST AXI TAP	VF= 0.445V REF	Multi meter diode position
REC3 D PAJ/GBU4M 4A 1000V UFST RAD BULK	VF= 0.482V REF	Multi meter diode position
Q20 MOSFET VISHAY/IRFBG30 3.1A 1000V N BULK TO-220	VSD= 0.488V REF VGD=OL REF	Multi meter diode position
U23 IC PWM CNTL ON/UC3845BNG DIP-8	Pin7-Pin5:34K Ohm Pin6-Pin5:47K Ohm	Multi meter resistance position

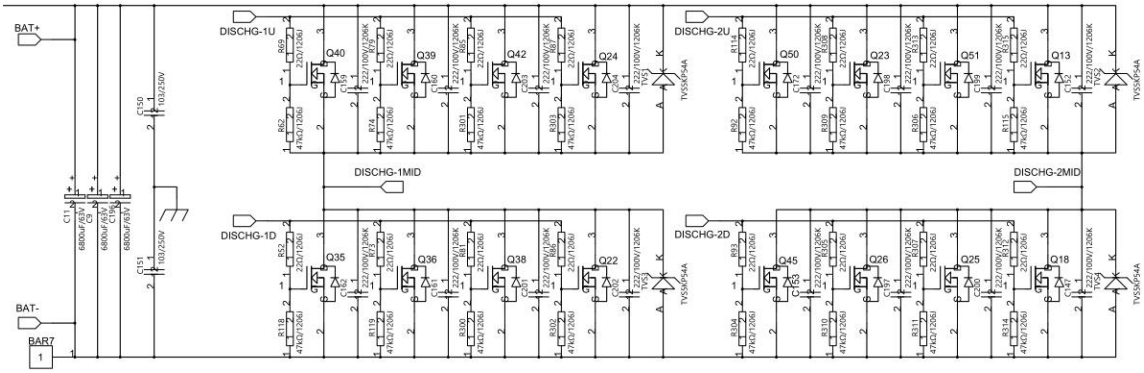
F7 FUSE 瑞珣/20N-030H/L 3A 125V	0.4 Ohm	Multi meter resistance position
NTC4 THERMISTOR NTC 10 OHM 3.0A	10.2 Ohm	Multi meter resistance position

2.4 DC-DC (Converter)

Check DC fuse was open or not.

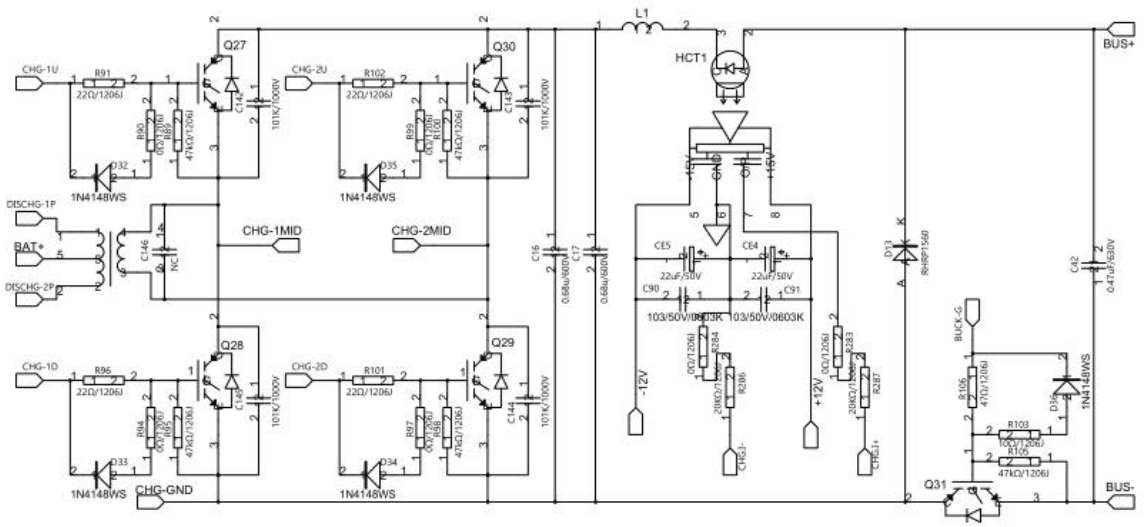


DC-DC DISCHARGE MOS



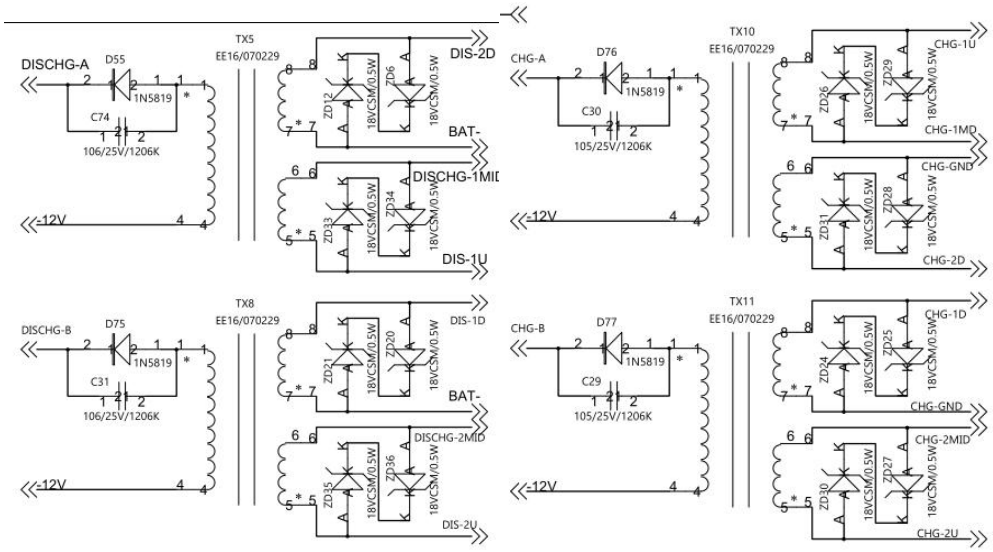
Components	Normal range(Value)	Remark
Q13 Q18 Q22 Q23 Q24 Q25 Q26 Q35 Q36 Q38 Q39 Q40 Q42 Q45 Q50 Q51 MOSFET NCEP85T25 250A 85V N BULK TO-220	VSD=0.41V REF VGD=0.948V REF	Multi meter diode position

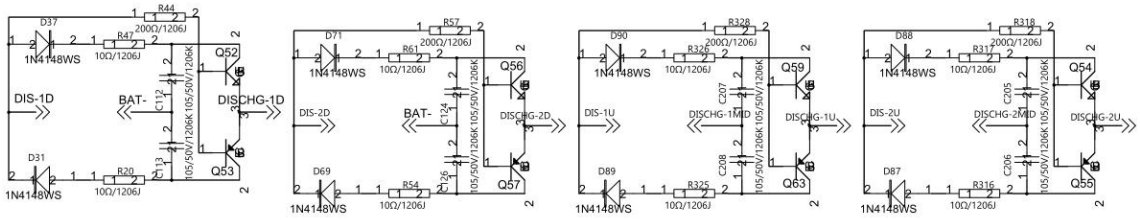
DC-DC CHARGE circuit

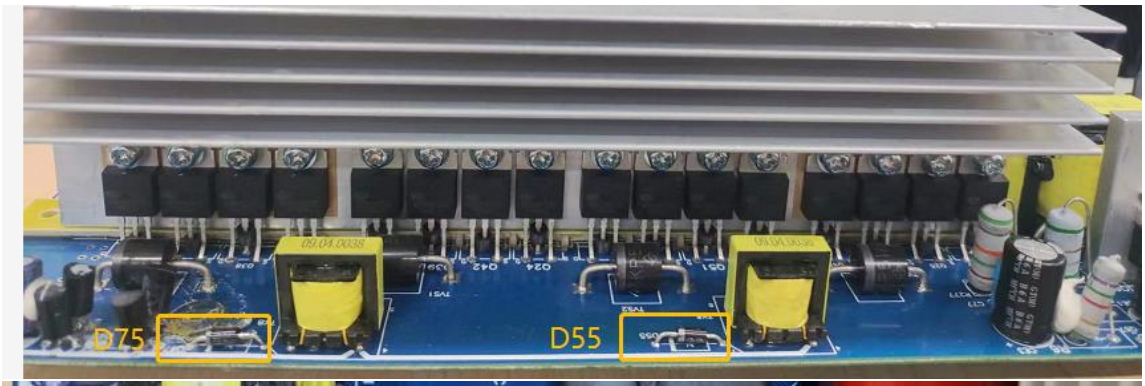


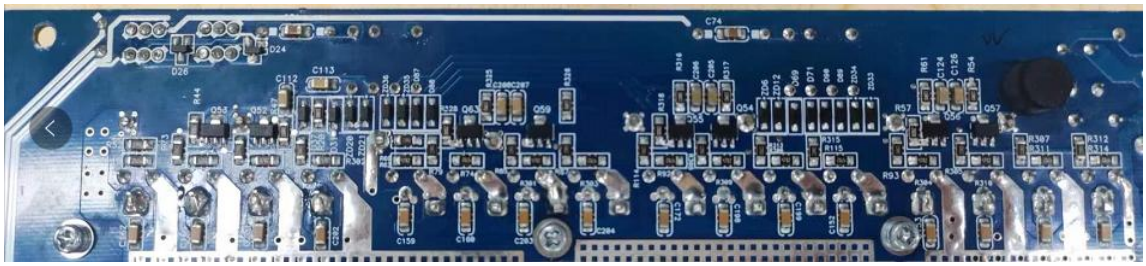
Components	Normal range(Value)	Remark
Q27,Q28,Q29,Q30 IGBT SL/SGT50T65SDM1P7 50A 650V TO-247	VSD=0.346V REF VGD=0.357V REF	Multi meter diode position
Q31 IGBT SL/SGT50T65SDM1P7 50A 650V TO-247	VSD=0.365V REF VGD=1.77V REF	Multi meter diode position
D13 D FC/RHRP1560 15A 600V UFST RAD BULK	VF= 0.363V REF	Multi meter diode position

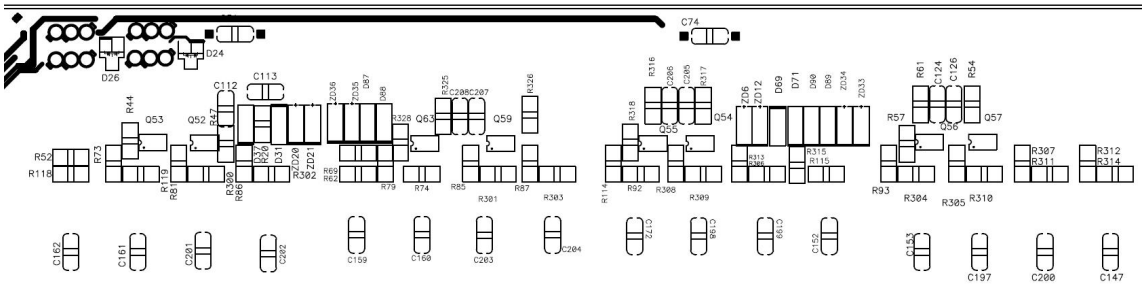
Driver circuit checking









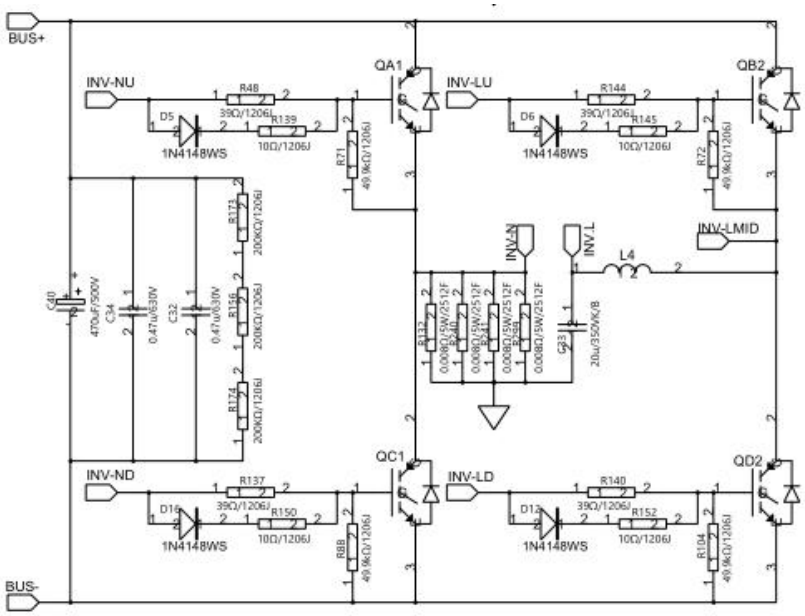


Components	Normal range(Value)	Remark
D55 D75 D76 D77 D PANJIT/1N5819 1A 40V SCKY AXI TAP	VF= 0.18V REF	Multi meter diode position
ZD6, ZD12, ZD33, ZD34, ZD21, ZD20, ZD35, ZD36, ZD26, ZD29, ZD31, ZD28, ZD24, ZD25, ZD30, ZD27	VF= 0.656V REF	Multi meter diode position

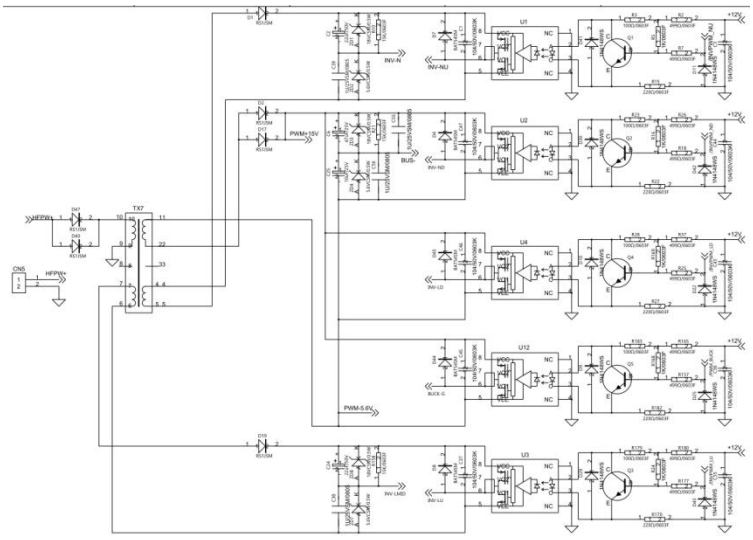
ZD PANJIT/MMSZ5248B 0.5W 18V SMD		
D37,D31,D71,D69,D90,D89,D88,D87 1N4148W(T4) SOD123	VF= 0.54V REF	Multi meter diode position
Q52,Q56,Q59,Q54 TR UTC/2SD1624 3A 50V NPN SOT-89	VBC=0.6V REF VBE=0.6V REF	Multi meter diode position
Q53,Q57,Q63,Q55 TR UTC/2SA1020 2A 50V PNP SOT-89	VCB=0.59V REF VEB=0.59V REF	Multi meter diode position
R69,R79,R85,R87,R114,R308,R313,R315,R52,R73,R81,R93,R305,R307,R312 22Ω/1206F	22 ohm	Multi meter resistance position
R47,R20,R61,R54,R326,R325,R317,R316 10Ω/1206F	10 ohm	Multi meter resistance position

2.5 DC-AC(Inverter)

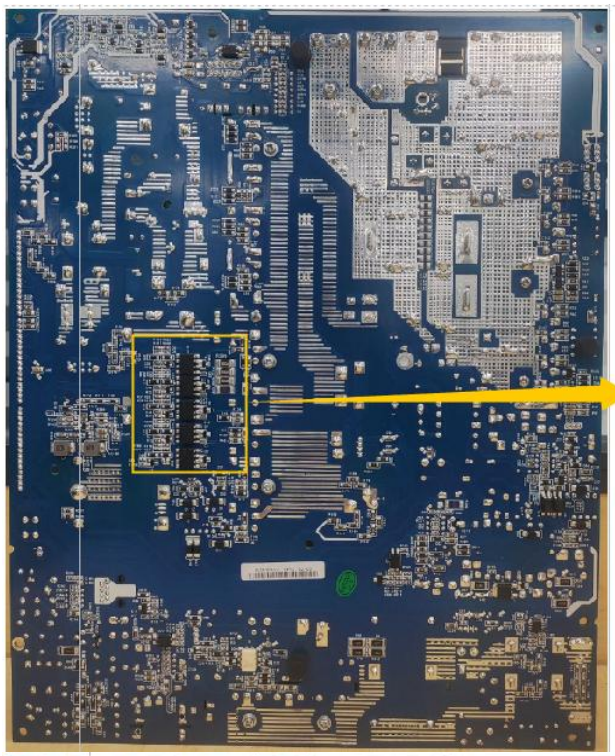
Inverter diagram

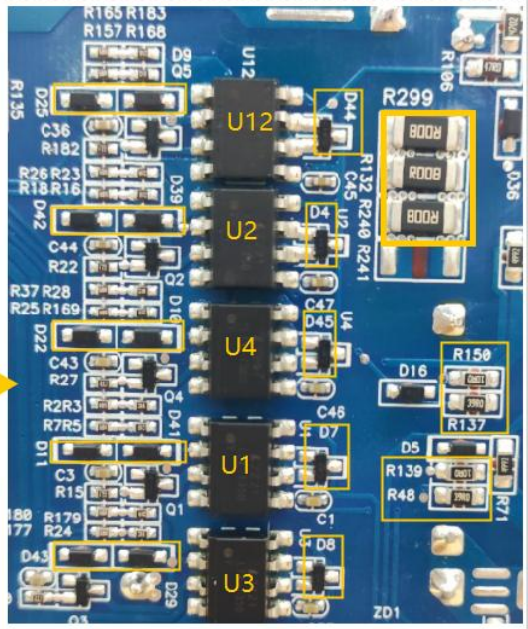


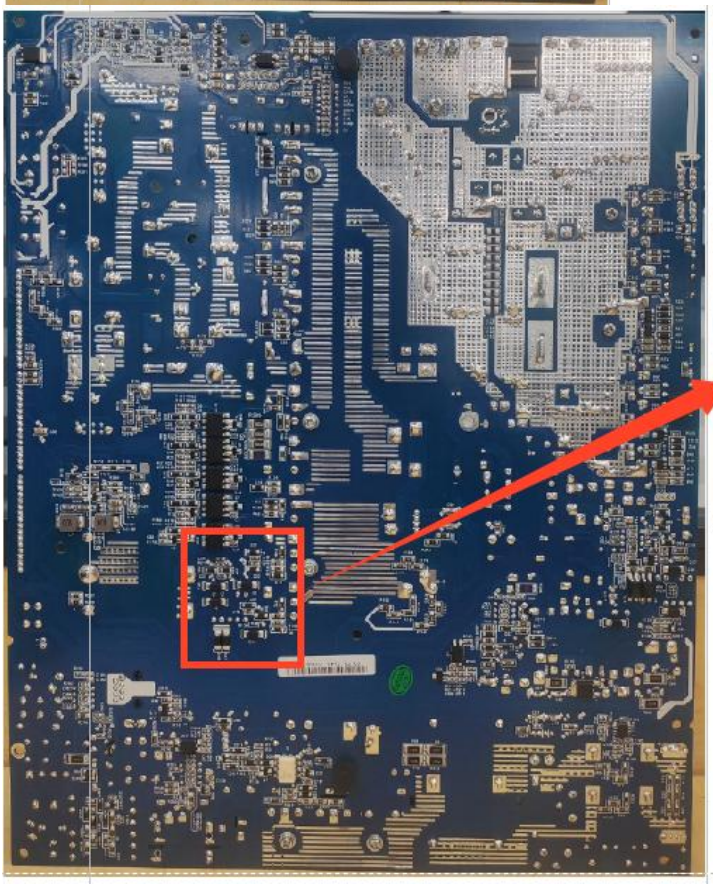
Inverter driver circuit

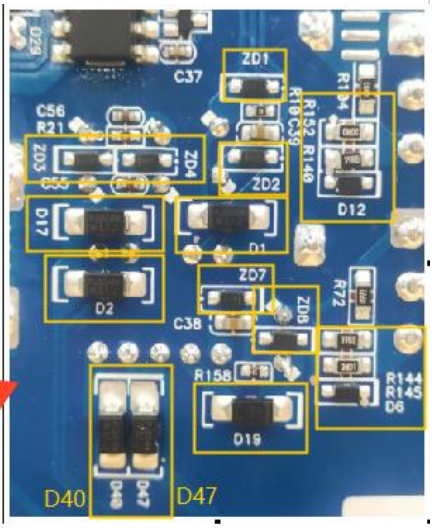



QB2
QD2
QA1
QC1




U12
U2
U4
U1
U3
R299
D16
R150
R137
D5
R139
R48
ZD1

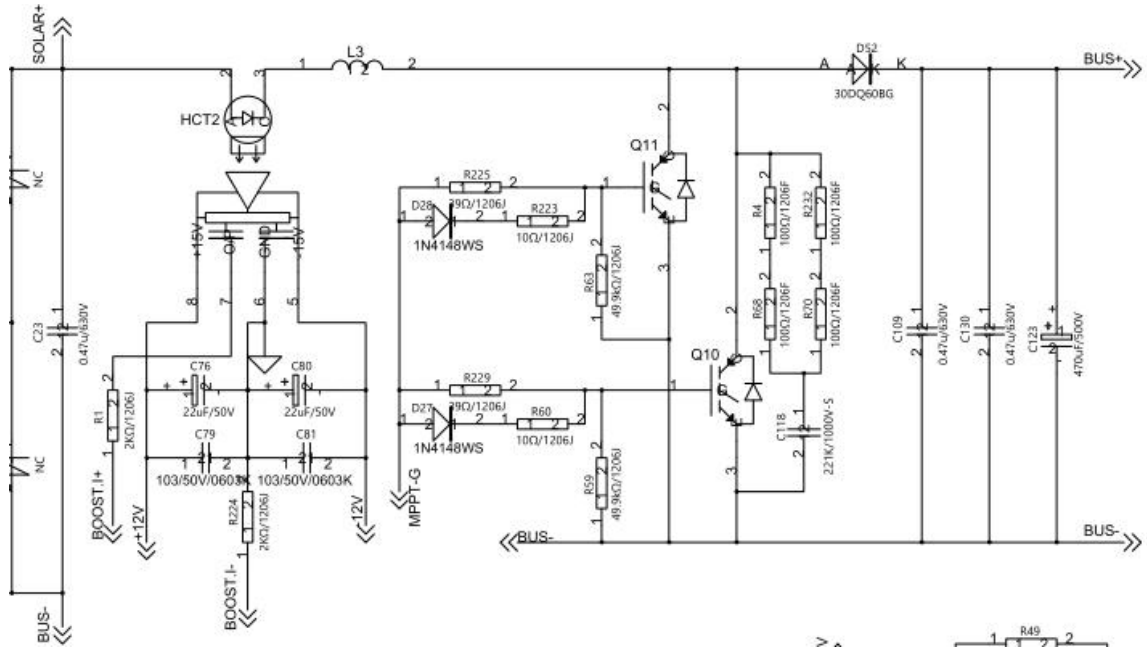



ZD1
ZD4
ZD2
D12
D17
D1
D2
ZD7
ZD8
C38
R158
D19
D40
D47

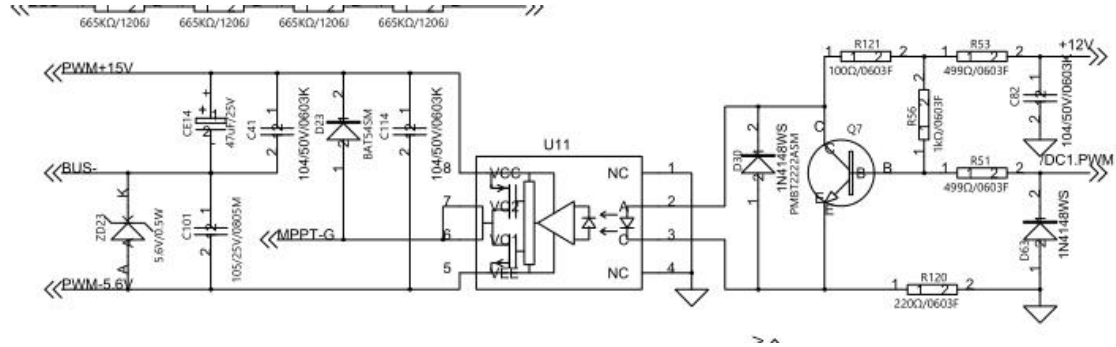
Components	Normal range(Value)	Remark
QA1,QB2,QC1,QD2 IGBT SL/SGT50T65SDM1P7 50A 650V TO-247	VEC=0.37V REF VGC=1.77V/1.85V REF	Multi meter diode position
R48,R144,R137,R140 39Ω/1206F	39 Ohm	Multi meter resistance position
R139,R145,R150,R152 10Ω/1206F	10 Ohm	Multi meter resistance position
R299,R132,R240 0.008Ω/2512F	0.4 Ohm	Multi meter resistance position
D1,D19 D PANJIT/RS1J 1A 600V SMD	VF= 0.472V REF	Multi meter diode position
D2,D17 D PANJIT/RS1J 1A 600V SMD	VF= 0.445V REF	Multi meter diode position
D40,D47 D PANJIT/RS1J 1A 600V SMD	Short circuited by winding;VF=0V is normal	Multi meter diode position
ZD1,ZD3,ZD8 ZD PANJIT/MMSZ5248B 0.5W 18V SMD	VF=0.675V REF	Multi meter diode position
ZD2,ZD4,ZD7 ZD PANJIT/BZT52-C5V6 0.41W 5.6V SOD123F SMD	VF=0.687V-0.71V REF	Multi meter diode position
D7,D4,D45,D44,D8 D PANJIT/BAT54 0.2A 30V SMD	VF=0.196V REF	Multi meter diode position
D41,D39,D10,D9,D29,D11,D42,D22,D25,D43 1N4148W(T4) SOD123	VF=0.463V/0.518V	Multi meter diode position
U1,U2,U4,U12,U3 PC925LENIP0F/LTV-T350S-ID	V2-3=0.605V REF V6-8=0.196V REF V5-6=0.395V REF V5-8=0.45V REF	Multi meter diode position

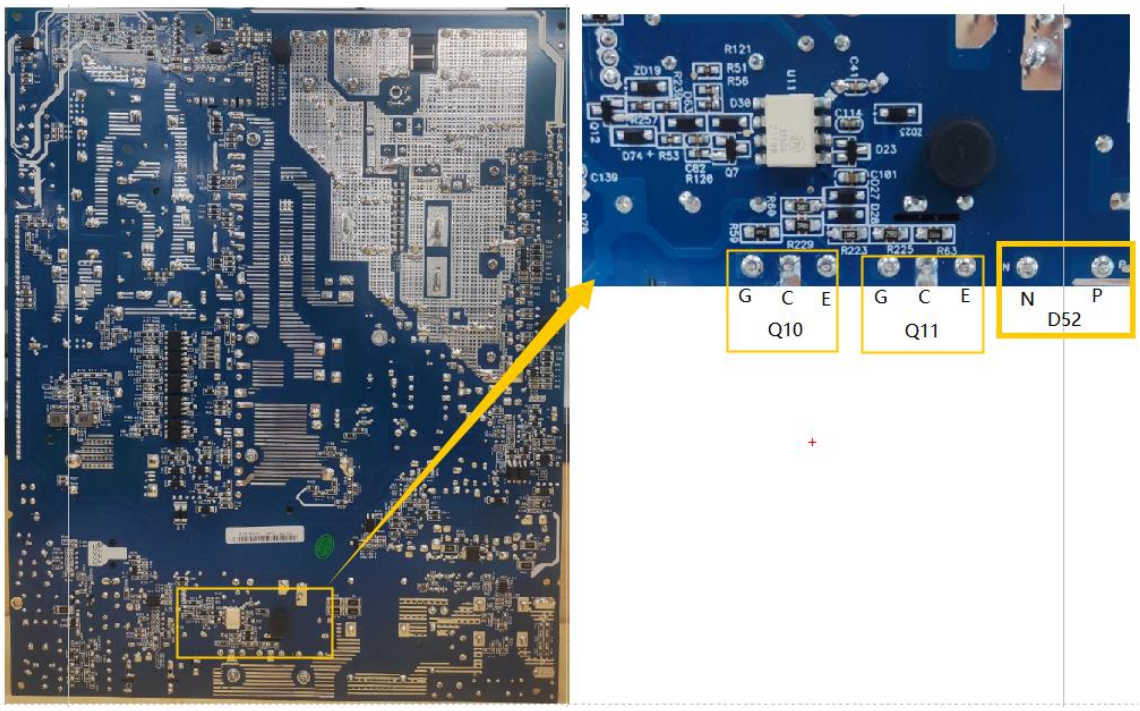
2.6 Boost(Solar MPPT)

Boost circuit



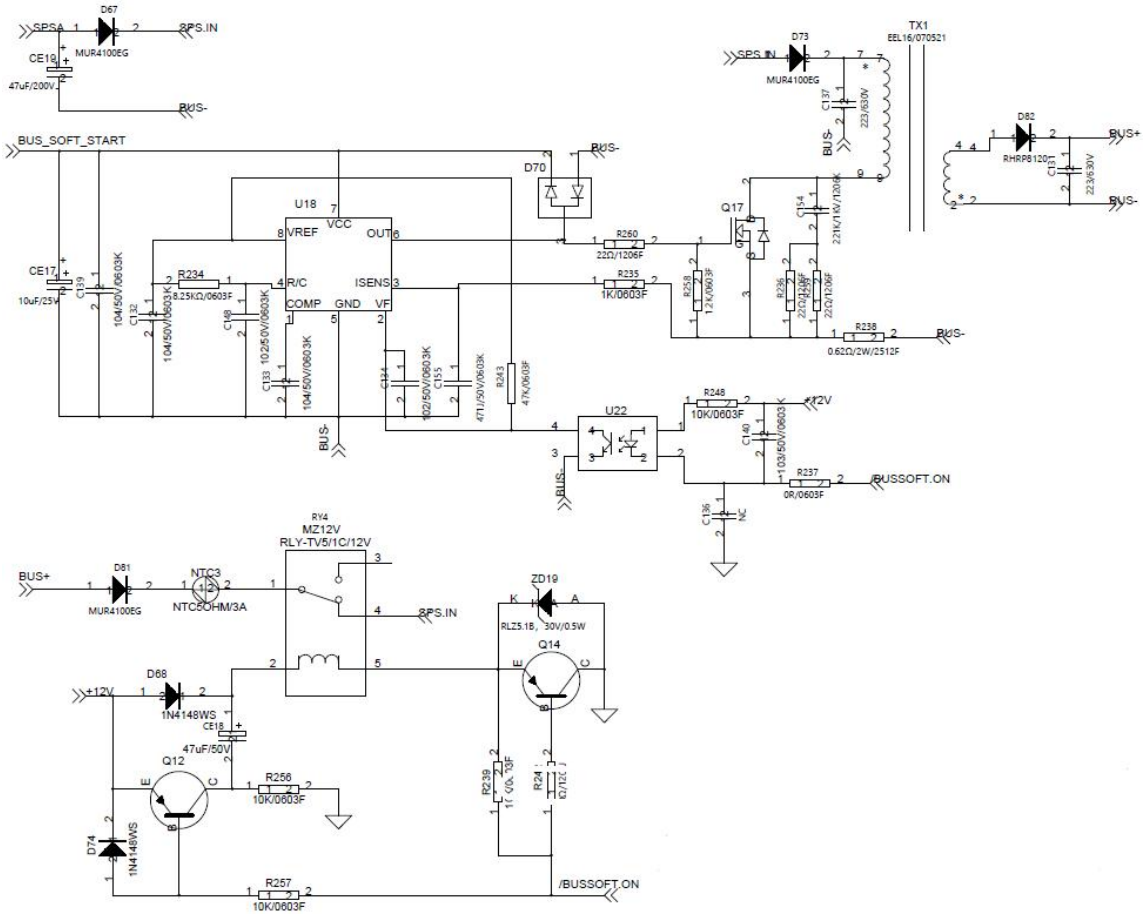
Boost driver circuit

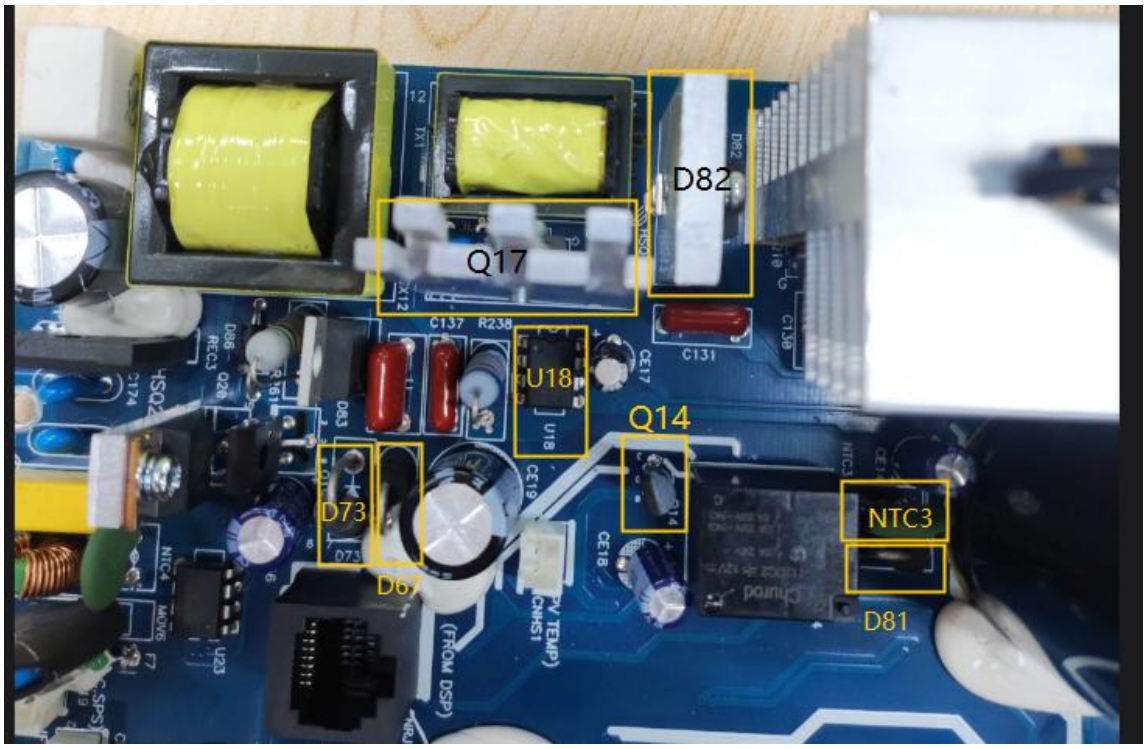




Components	Normal range(Value)	Remark
Q10,Q11 IGBT SL/SGT50T65SDM1P7 50A 650V TO-247	VEC=0.349V REF VGC=1.708V REF	Multi meter diode position
D52 D APT/30DQ60BG 30A 600V UFST RAD TO-247 BULK	VF= 0.359V REF	Multi meter diode position
R225,R229 39Ω/1206F	39 Ohm	Multi meter resistance position
R223,R59 10Ω/1206F	10 Ohm	Multi meter resistance position
D30,D63 1N4148W(T4) SOD123	VF= 0.463V/0.518V REF	Multi meter diode position
D23 D PANJIT/BAT54 0.2A 30V SMD	VF= 0.194V REF	Multi meter diode position
ZD23 ZD PANJIT/BZT52-C5V6 0.41W 5.6V SOD123F SMD	VF= 0.685V REF	Multi meter diode position
U11 FOD3150A SOP8	V2-3=0.6V REF V6-8=0.194V REF V5-6=0.406V REF V5-8=0.442V REF	Multi meter diode position

2.7 BUS soft start





Component	Normal range (Test data)	Remark
D67,D73,D81 D ON /MUR4100ERLG 4A 1000V UFST RAD TAP	VF= 0.43V REF	Multi meter diode position
D82 D FC/RHRP8120 8A 1200V UFST RAD BULK	VF= 0.418V REF	Multi meter diode position

Q17 MOSFET VISHAY/IRFBG30 3.1A 1000V N BULK TO-220	VDS=0.492V VDG=0.882V	Multi meter diode position
U18 IC PWM CNTL ON/UC3845BNG DIP-8	Pin6-Pin5:1.2K Ohm	Multi meter resistance position
Q14 TR CJ/2SA1020 2A 50V PNP TAP TO-92NL	VCB=0.624V REF VEB=0.625V REF	Multi meter diode position
NTC3 THERMISTOR NTC 5OHM 3A	5.7 Ohm	Multi meter resistance position
R238 RES 2W 0.62 J RAD KINK N-IND TAP	0.9 Ohm	Multi meter resistance position

3. Trouble shooting

3.1Code “01”

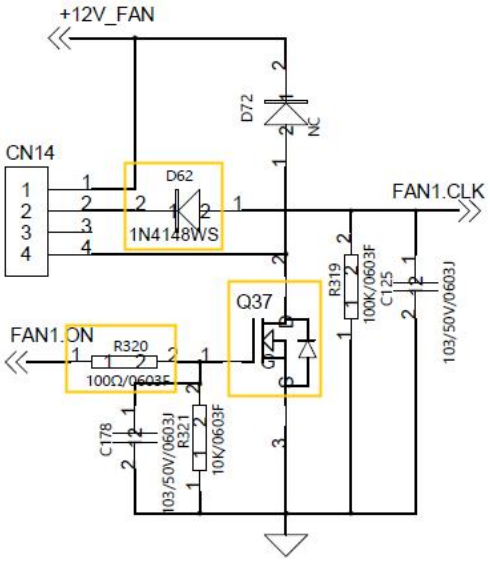
Reason: Fan work abnormally.

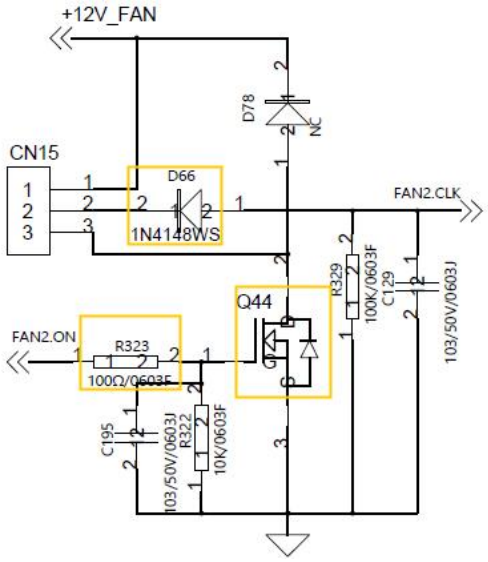
a. Check Fan was locked by something or not.

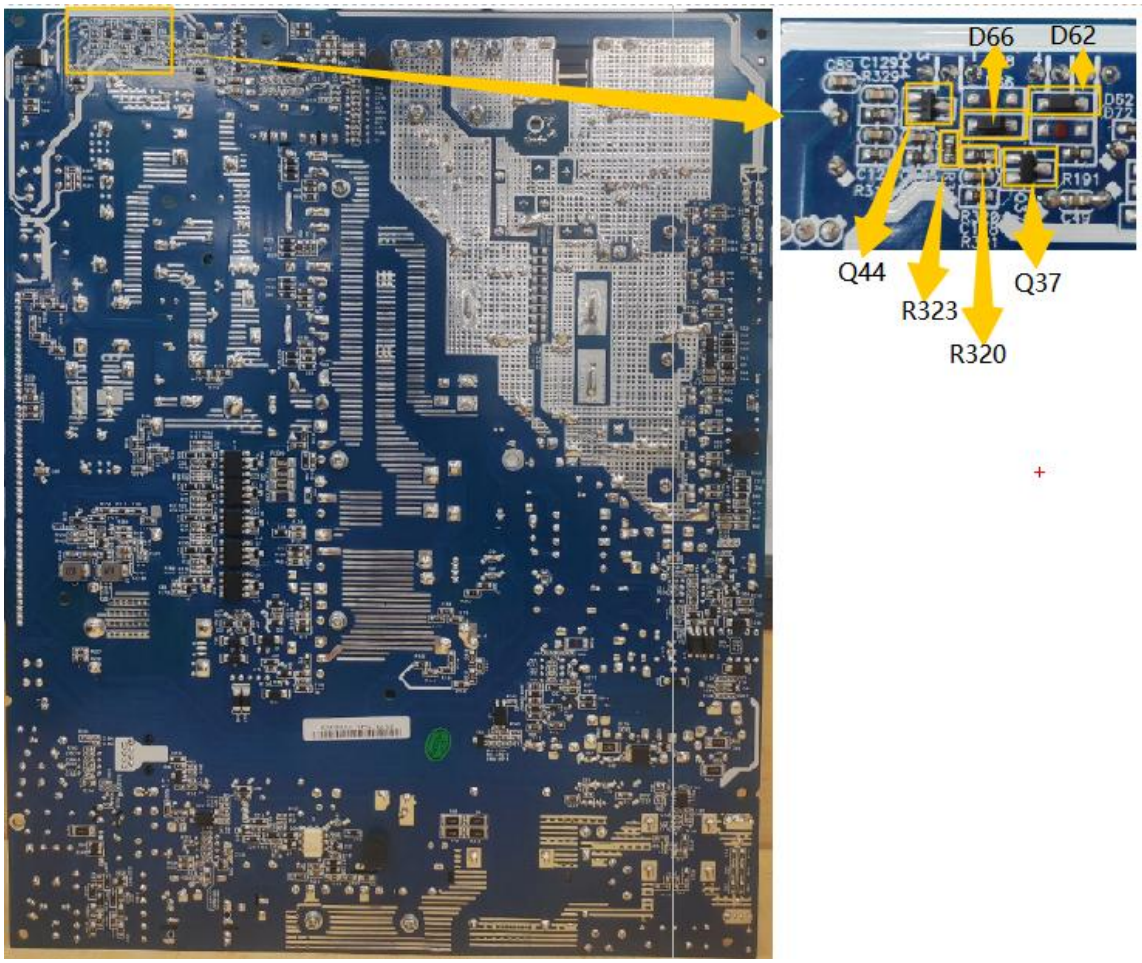
b. Check Fan wire connection was reliable.

c. Fan damaged? Replace new fans to check “01” code disappeared or not.

d. Fan driver circuit damaged, need to check the circuit components and repair. Check the components as below were damaged or not, if yes, replace them.







Check the components by multi meter:

Component	Normal range (Test data)	Remark
D62, D66 Diode 1N4148	VF=0.57 REF	Multi meter diode position
Q37, Q44 MOSFET UT3404	Vsd=0.46 REF Vgd=1.72 REF	Multi meter diode position
R320, R322 100Ω/0603F	R=100 Ohm REF	Multi meter resistance position

3.2Code “02”

Reason: Over temperature.

a. Check installation site, the unit cannot install in a confined space.
b. Check and clean the dust proof net.
c. Check NTCs connections were reliable.
d. Check NTC was damage or not.

Component	Normal range (Test data)	Remark
NTC1,2,3	13.5 kOhm REF	

e. Check circuit components.

Component	Normal range (Test data)	Remark
Resisters	750 Ohm	

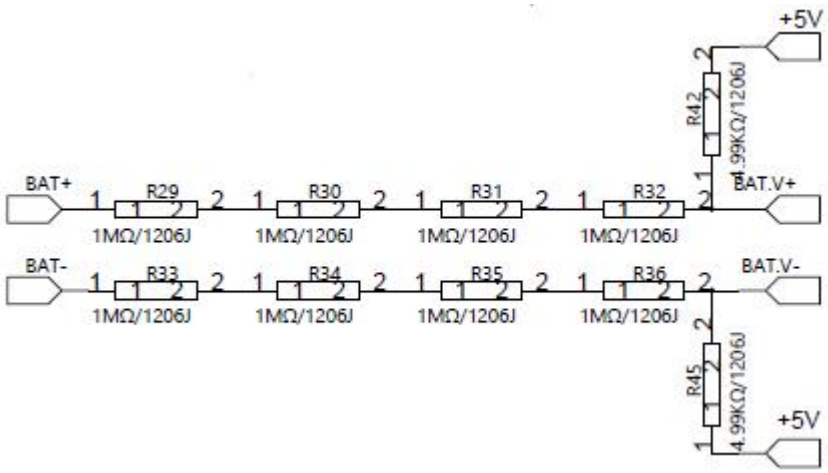
3.3Code “03”/“04”

Reason: Battery voltage is too high/low.

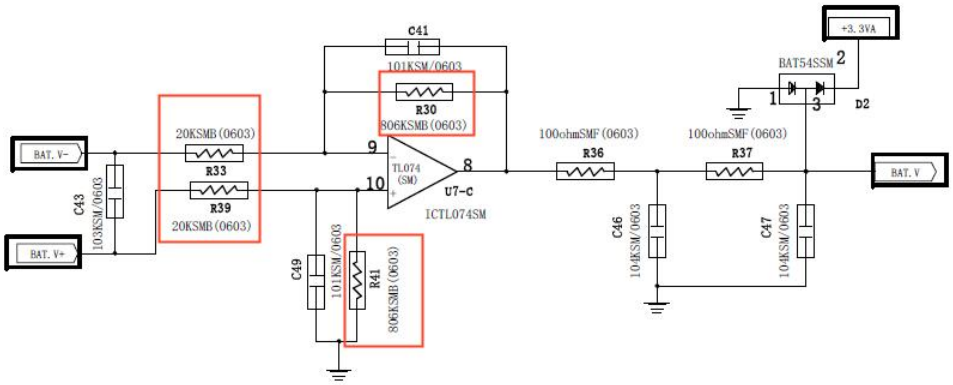
a. Check battery voltage level is in the range for the unit.

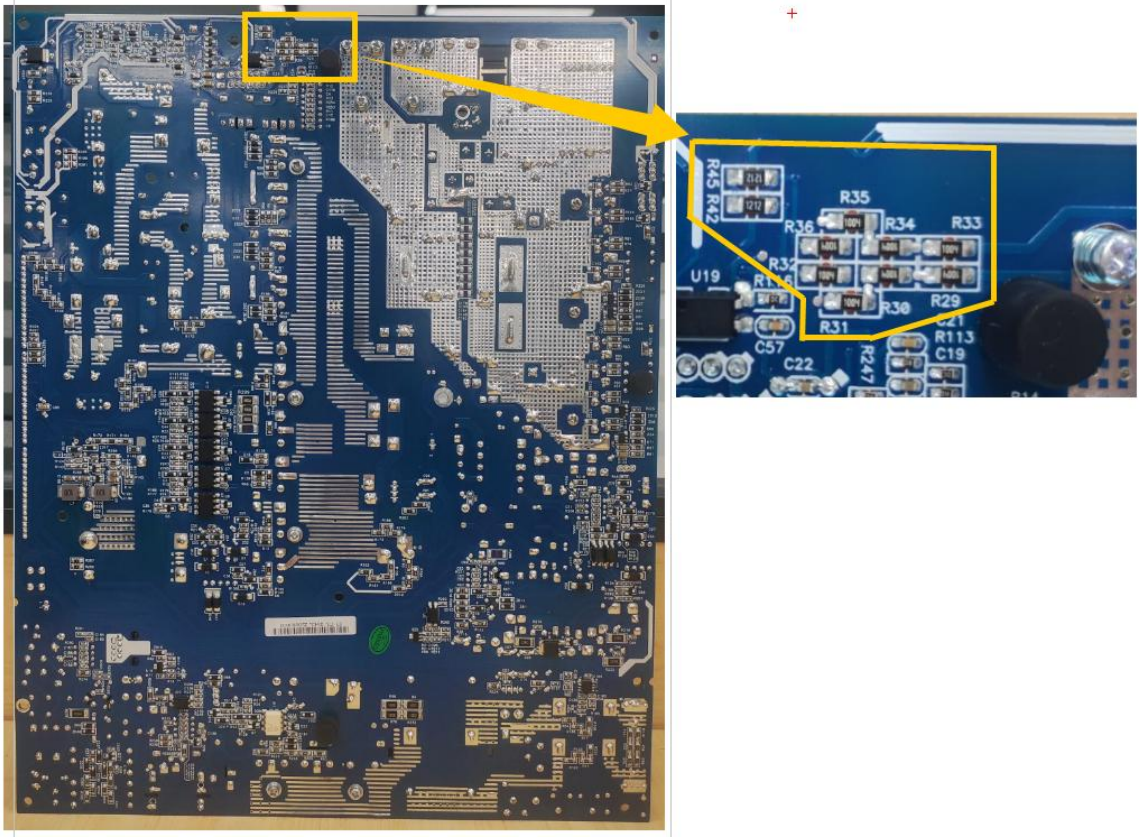
b. Battery voltage detection circuit damage? Check these resisters value as shown.

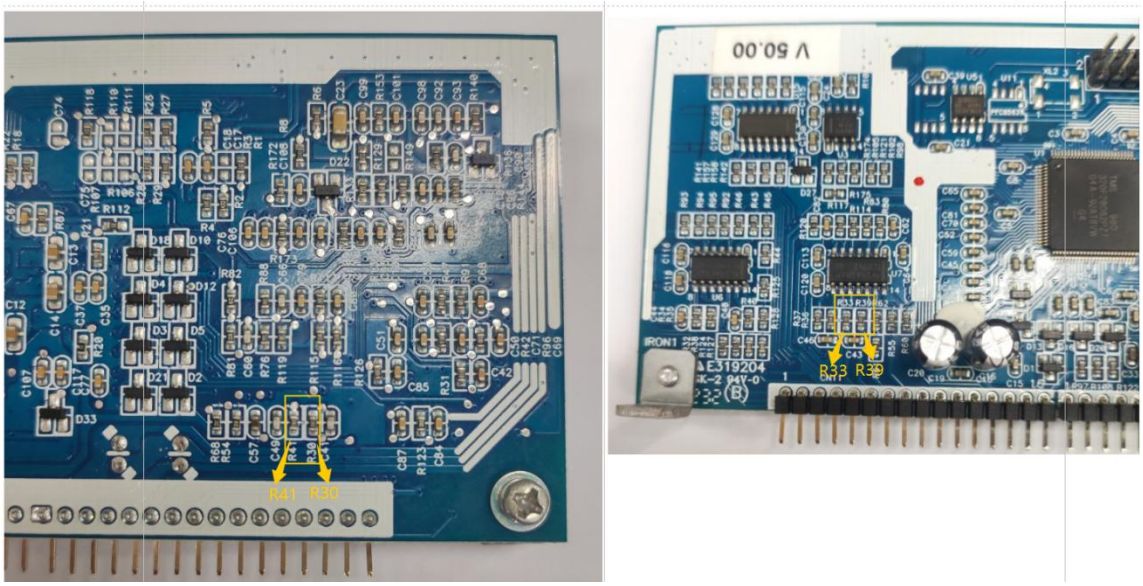
On the main power board：



On the CNTL board







Component	Normal range (Test data)	Remark
R29, R30, R31, R32, R33, R34, R35, R36 1M/1206F	1M Ohm	Multi meter diode position
R42, R45 12.1K /1206F	12.1K Ohm	Multi meter diode position
R33, R39 20KΩ/0603F	20K Ohm	Multi meter diode position
R30, R41 806KΩ/0603F	806K Ohm	Multi meter diode position

c. Charger circuit damage? Checking the components refer to 2.1(important point Check U7) and 2.4.

3.4Code “05”

Reason:Output short circuited or over temperature is detected by internal converter components.

a. Check if wiring is connected well and remove abnormal load.
b. Check whether the air flow of the unit is blocaked or whether the ambient temperature is too high

3.5Code “07”

Reason:Overload time out

a. Overload error. The inverter is overload 110% and time is up.Reduce the connected load by switching off some equipment.

3.6Code“06”/“58”

Reason:Output voltage is too high/low:Output abnormal (Inverter voltage below than 190Vac or is higher than 260Vac)

a. Reduce the connected load.
b. If option “a” cannot solve the problem, it needs to be disassembled and repaired according to the previous chapters 1 and 2

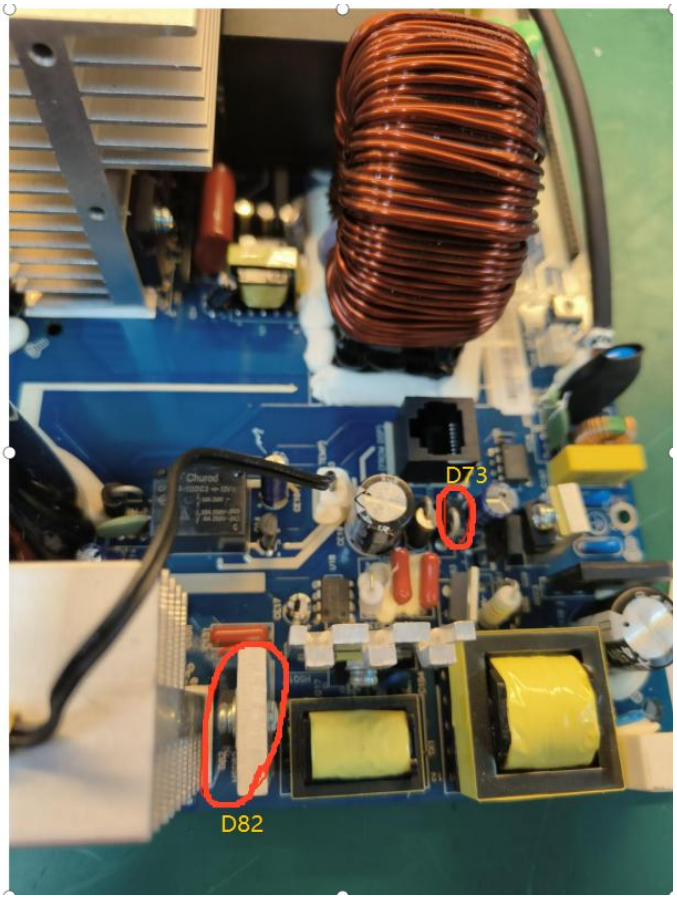
3.7Code “09”

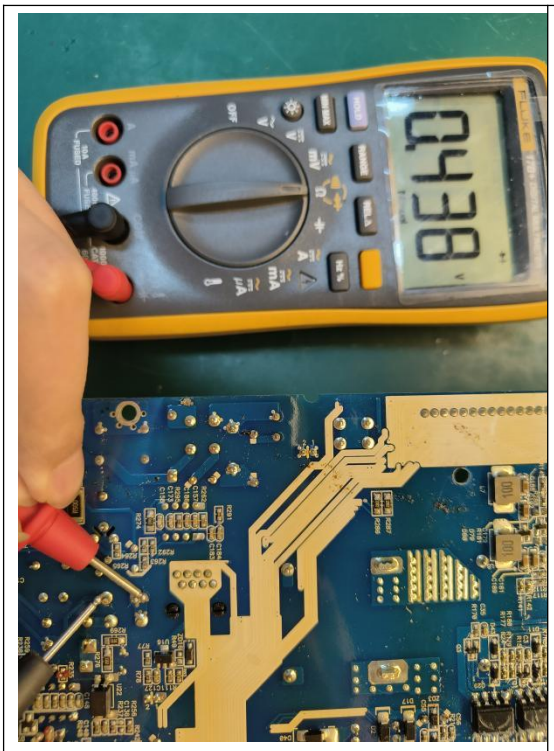
Reason:Bus soft start failed.It needs to be repaired according to the following points （a、b、c）

a.Resistors and Pads checking.

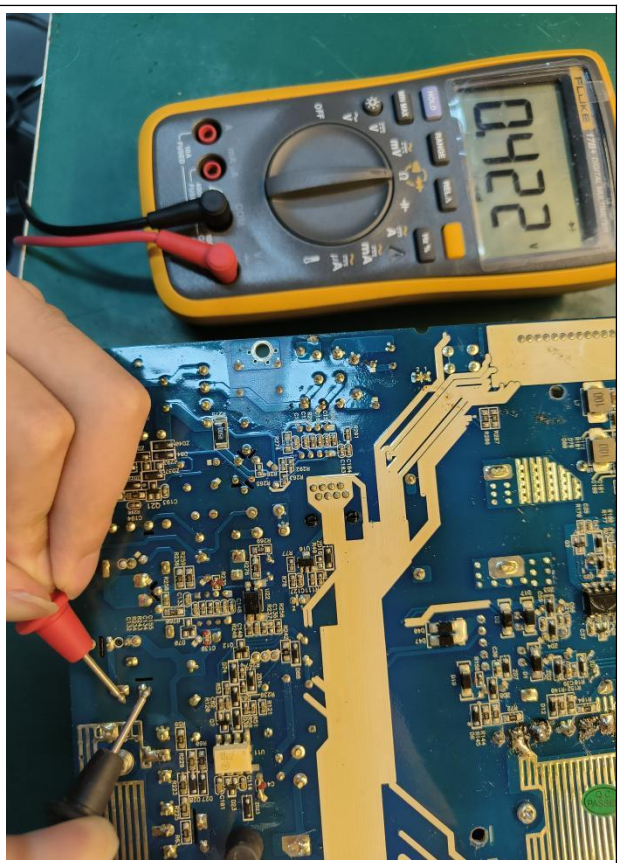
Position	Value	Remark
R159,R160,R161, R163,R164,R167	1MΩ/1206J	1.Make sure those that the pads of those resistors are ok, re-solder and test again. 2.If those resistors are broken, need to be replaced as the same specifications.
R162,R166	0Ω/1206J	

b.Bus soft start diode checking.





D73 VF=0.438V



D82 VF=0.422V

Component	Normal range (Test data)	Remark
D73 D ON /MUR4100ERLG 4A 1000V UFST RAD TAP	VF= 0.43V REF	Multi meter diode position

D82 D FC/RHRP8120 8A 1200V UFST RAD BULK	VF= 0.418V REF	Multi meter diode position

Checking the components refer to 2.5 BUS soft start

c. INV IGBT(QA1,QB2,QC1,QD2) CHECK

Checking the components refer to 2.5 DC-AC（Inverter）