



MAGIC AC GTIG-200P

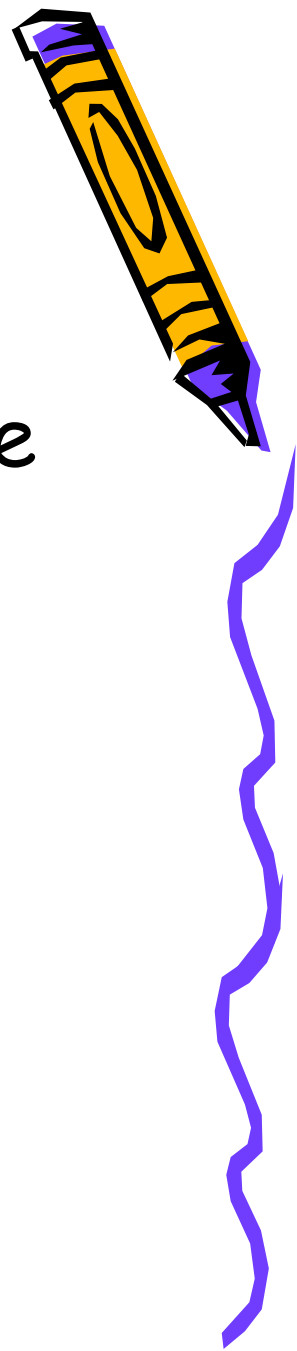
Shanghai WTL Welding Equipment
Manufacture Co.Ltd

March.2018



Catalogue

- 1、Introduction of working principle
- 2、Introduction of main circuit
- 3、Introduction of control circuit
- 4、Introduction of panel circuit
- 5、Troubleshooting
- 6、Component test

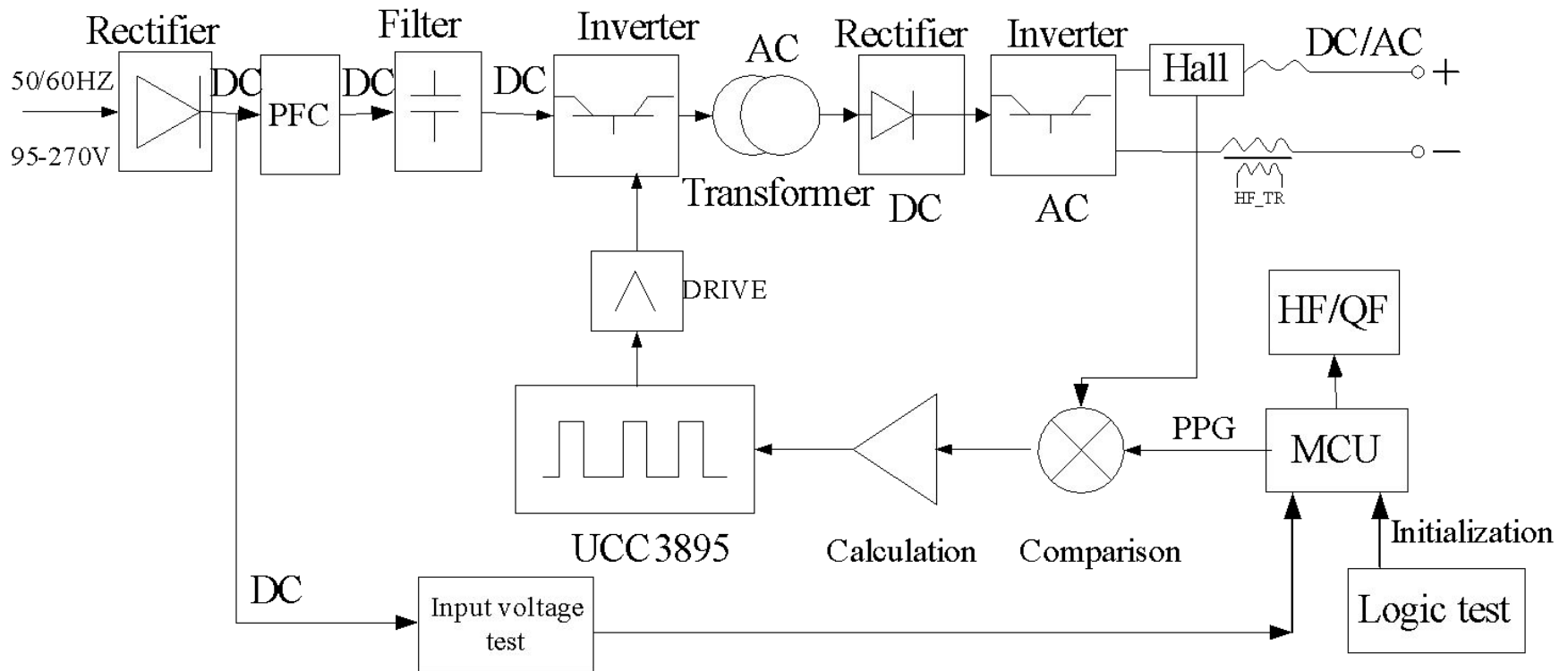


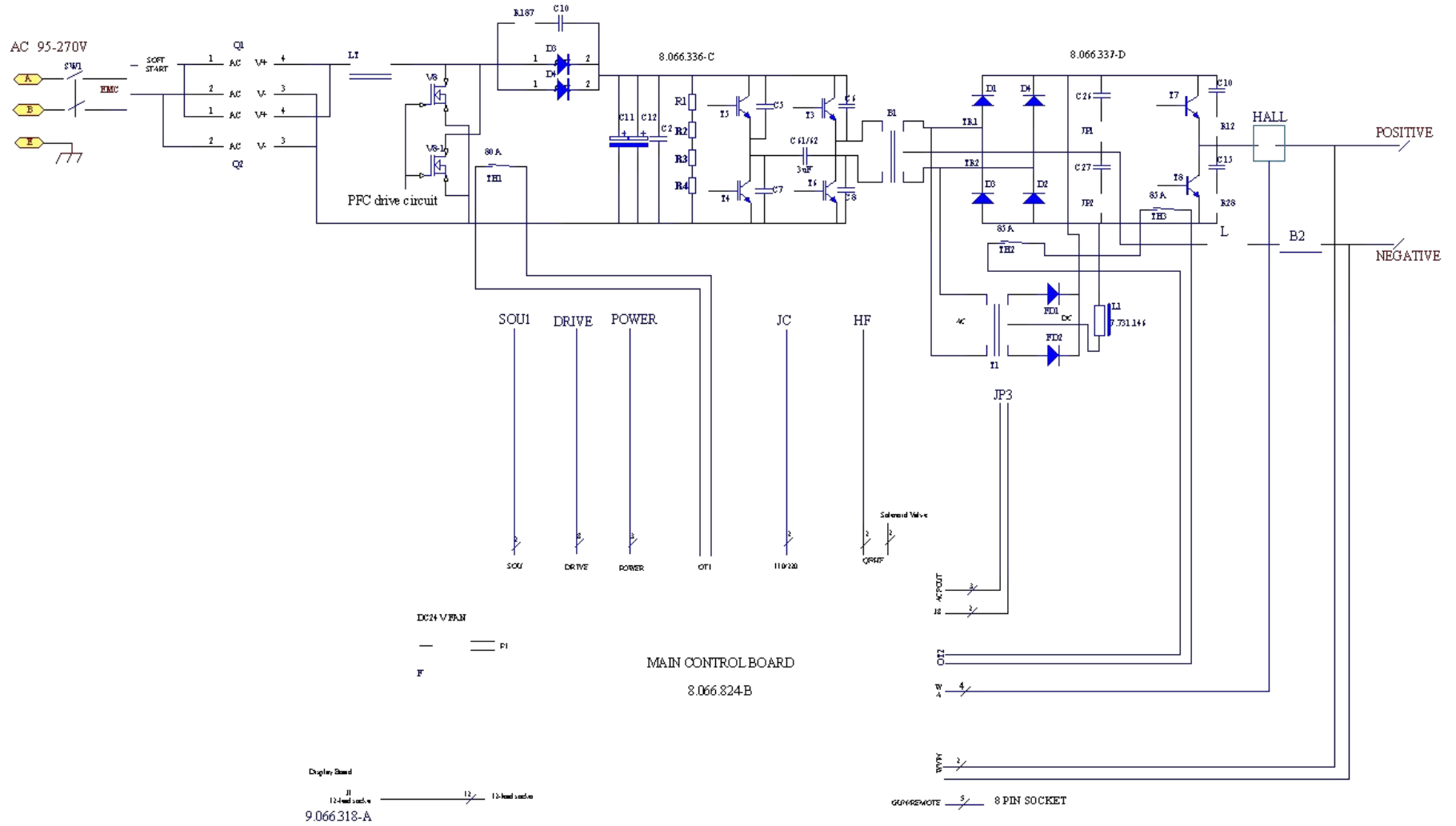


1. Introduction of working principle



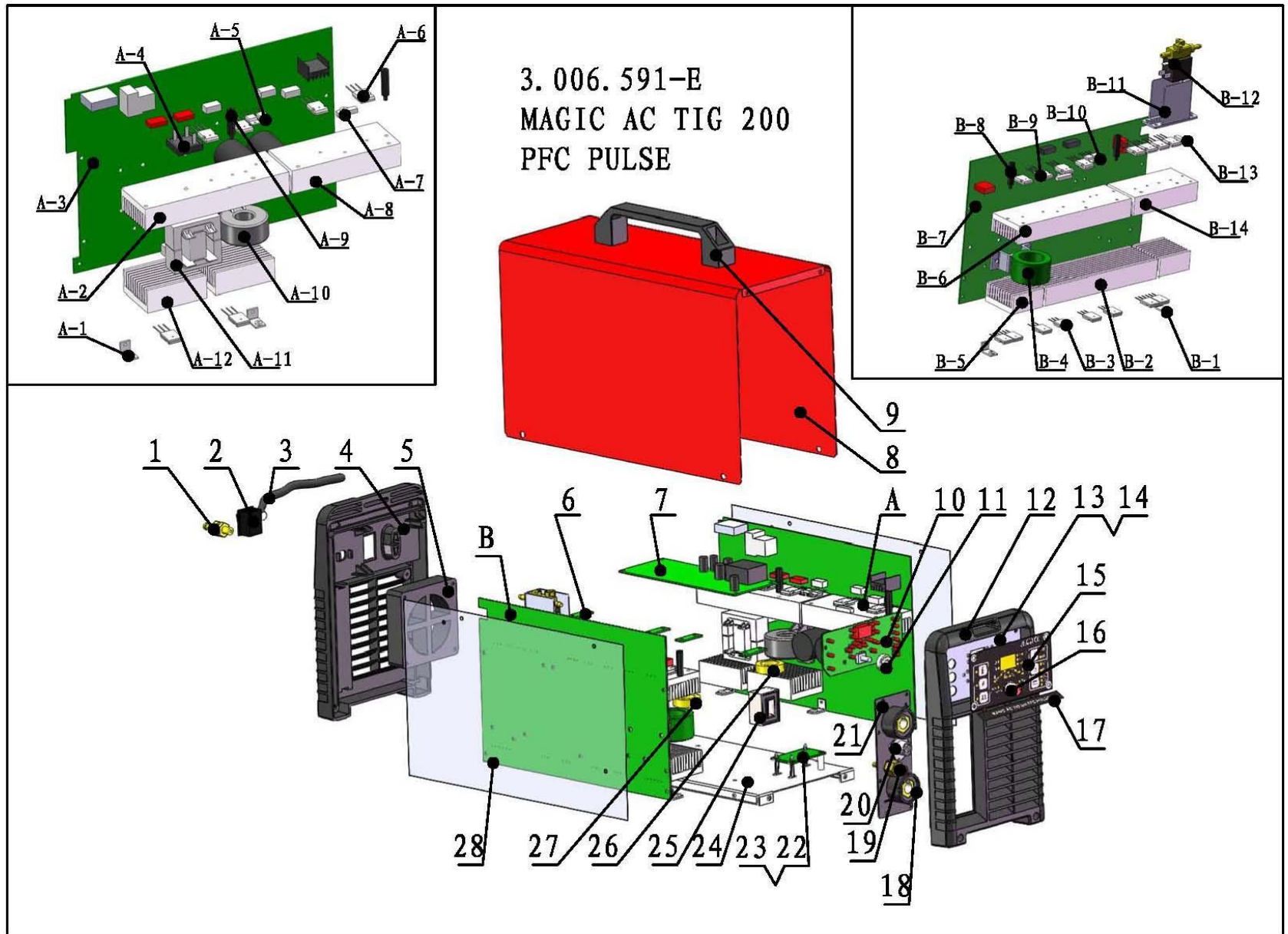
working principle (MAGIC AC GTIG-200P)





System chart (MAGIC AC GTIG-200P)

Explosive drawing



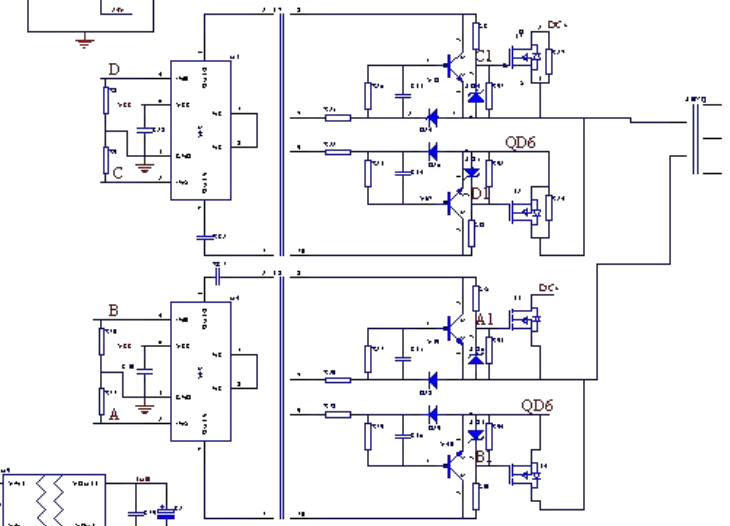
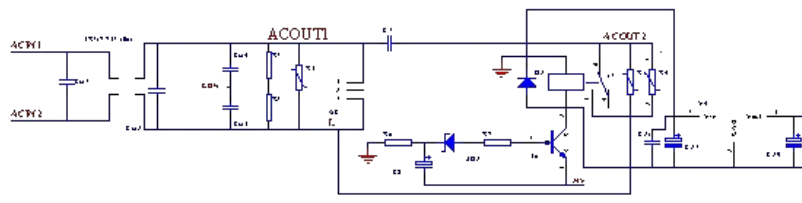
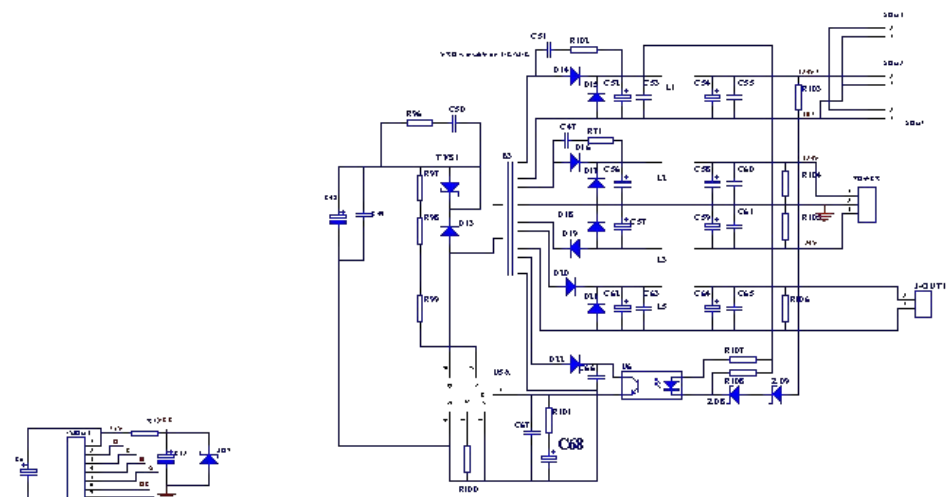
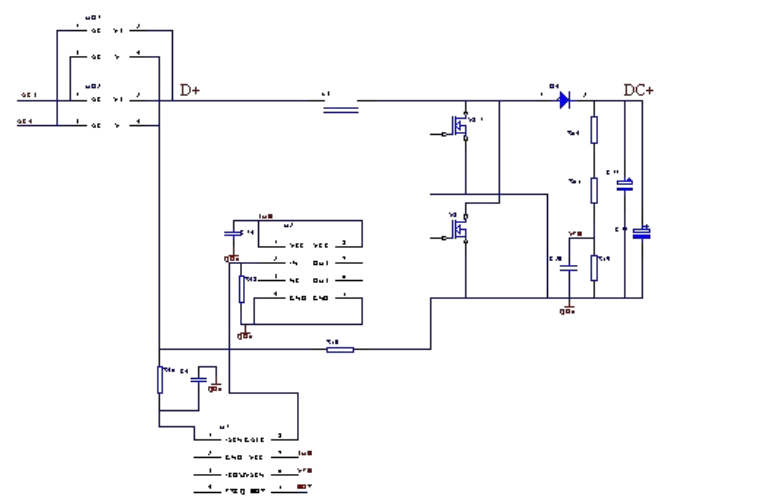
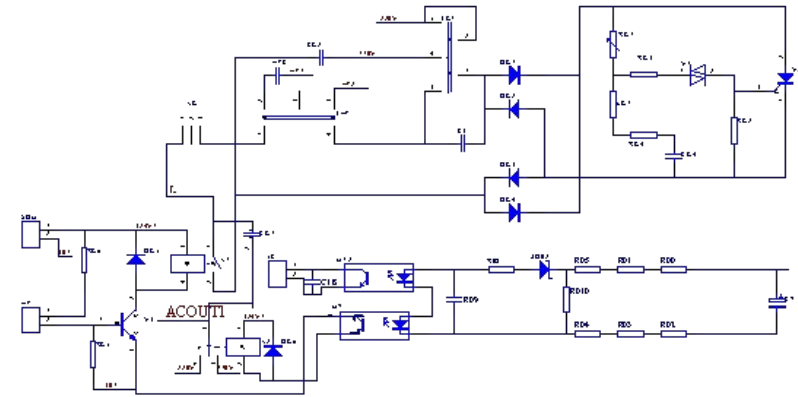
Component listing

| Serial number | material number | material name | quantity |
|---------------|-----------------|----------------------------|----------|
| 1 | 8.462.116 | Fast plug | 1.00 |
| 2 | 7.232.735 | switch | 1.00 |
| 3 | 7.154.404 | power cable | 1.00 |
| 4 | 8.068.620 | Rear panel | 1.00 |
| 5 | 7.720.020 | fan | 1.00 |
| 6 | 8.123.047 | Connection lump | 6.00 |
| 7 | 5.496.824-B | control board | 1.00 |
| 8 | 8.301.590 | cover | 1.00 |
| 9 | 8.253.020 | handle | 1.00 |
| | 8.104.300 | English caution label | 1.00 |
| 10 | 5.496.318-A | panel board | 1.00 |
| 11 | 8.712.304 | Encoder insulation washer | 1.00 |
| 12 | 8.069.620-B | front panel | 1.00 |
| 13 | 8.306.591 | rear plate shrouding board | 1.00 |
| 14 | 7.224.300-B1 | Switch cap | 6.00 |
| 15 | 8.103.591-E | mask | 1.00 |
| 16 | 7.458.330-R1 | knob | 1.00 |
| 17 | 8.104.591 | Type label | 1.00 |
| 18 | 7.152.312-A | fast female seat | 2.00 |
| 19 | 8.462.028-H | front gas connection | 1.00 |
| | 8.940.003 | copper nut | 1.00 |
| 20 | 7.132.116-B | aero socket | 1.00 |
| 21 | 8.123.449 | output assembly board | 1.00 |
| 22 | 5.496.821-C | Gun switch isolation board | 1.00 |
| 23 | 7.503.015 | PC board interval column | 3.00 |
| 24 | 8.055.595 | Bottom panel | 1.00 |
| 25 | 7.321.102-A | hall | 1.00 |
| 26 | 6.271.591 | inductance | 1.00 |
| 27 | 6.271.590 | inductance | 1.00 |
| 28 | 8.713.590 | Insulation sheet | 2.00 |
| 29 | 7.511.249 | brace | 1.00 |
| 30 | 8.860.591 | nameplate | 1.00 |
| 31 | 8.103.685 | Input label | 1.00 |

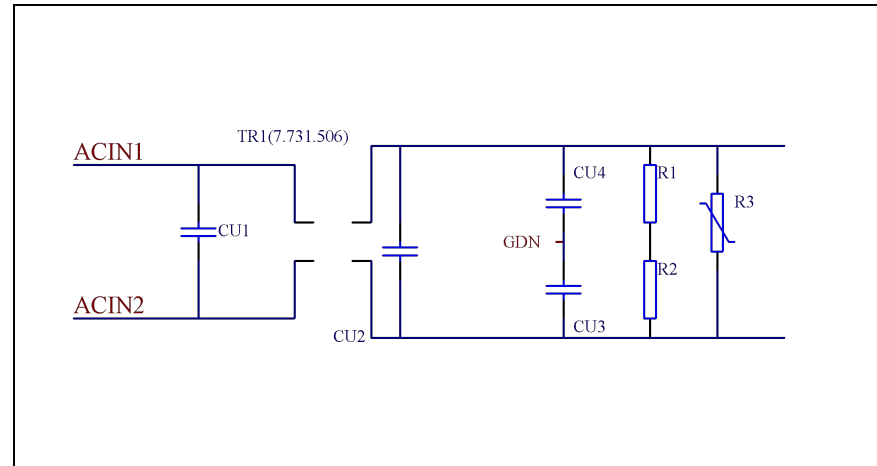
| | | | |
|------|-------------|----------------------------------|-------|
| A | | MAGIC 200 PFC DC inverter module | |
| A-1 | 8.123.641 | Support bar(1) | 4.00 |
| B-1 | | | |
| A-2 | 8.425.595 | Heat sink(6) | 1.00 |
| A-3 | 5.496.336-C | MAGIC 200 PFC DC inverter board | 1.00 |
| A-4 | 7.411.021 | bridge | 1.00 |
| A-5 | 7.421.541 | FRD | 2.00 |
| | 8.713.182 | Isolation lump | 4.00 |
| A-6 | 7.425.553 | IGBT | 6.00 |
| A-7 | 7.231.280 | thermal rely | 1.00 |
| A-8 | 8.425.597 | Heat sink(8) | 1.00 |
| A-9 | 7.503.530-A | Isolation column | 4.00 |
| B-8 | | | |
| | 7.927.104-A | Plastic screw | 6.00 |
| A-10 | 6.190.100 | PFC | 1.00 |
| A-11 | 6.185.590 | in transformer | 1.00 |
| A-12 | 8.425.596 | Heat sink(7) | 2.00 |
| B | | MAGIC 200 PFC AC inverter module | |
| B-2 | 8.425.593 | Heat sink(4) | 1.00 |
| B-3 | 7.421.180 | FRD | 8.00 |
| | 8.713.184 | Isolation lump(4) | 8.00 |
| B-4 | 6.174.590 | HF | 1.00 |
| B-5 | 8.425.592 | Heat sink(3) | 2.00 |
| B-6 | 8.425.590 | Heat sink(1) | 2.00 |
| B-7 | 5.496.337-C | MAGIC 200 PFC AC inverter board | 1.00 |
| B-9 | 7.425.670 | IGBT | 8.00 |
| | 8.713.180 | Isolation lump | 14.00 |
| B-10 | 7.421.544 | FRD | 2.00 |
| B-11 | 8.123RM.923 | Gas valve mounting box | 1.00 |
| B-12 | 7.253.013 | Tow-way solenoid valve | 1.00 |
| B-13 | 7.231.285 | thermal rely | 2.00 |
| | 8.713.600 | Isolation sheet | 3.00 |
| B-14 | 8.425.591 | Heat sink(2) | 1.00 |

2、 Introduction of main circuit

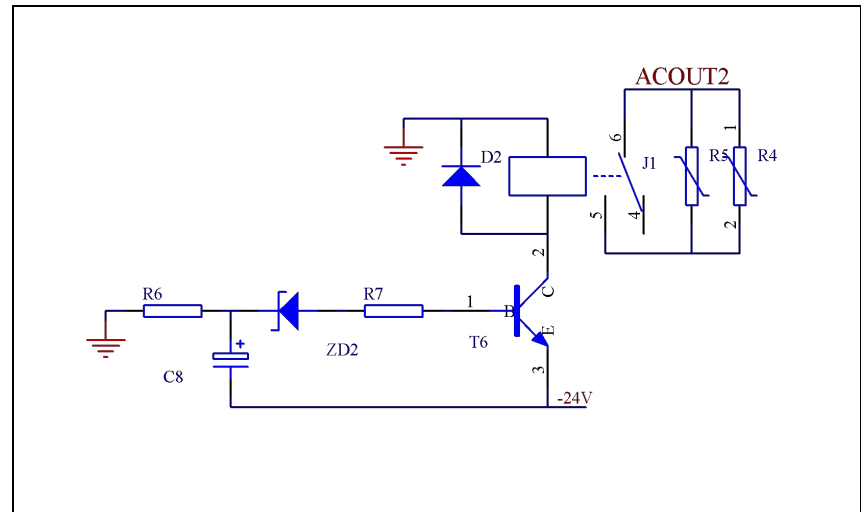
main circuit of Full-bridge Inverter



Part1: In order to pass the EMI test we use an EMC filter interpose between the AC source.



Part2: Because of the big current when Instant start the Machine the soft starter has be used to Reduce the current impact .





PFC technology=green power energy

- $P=UI \cos\varphi$
- $\cos\varphi=0.99$
- High power efficiency
- Global input voltage:95V---270V
- Avoid input voltage fluctuant

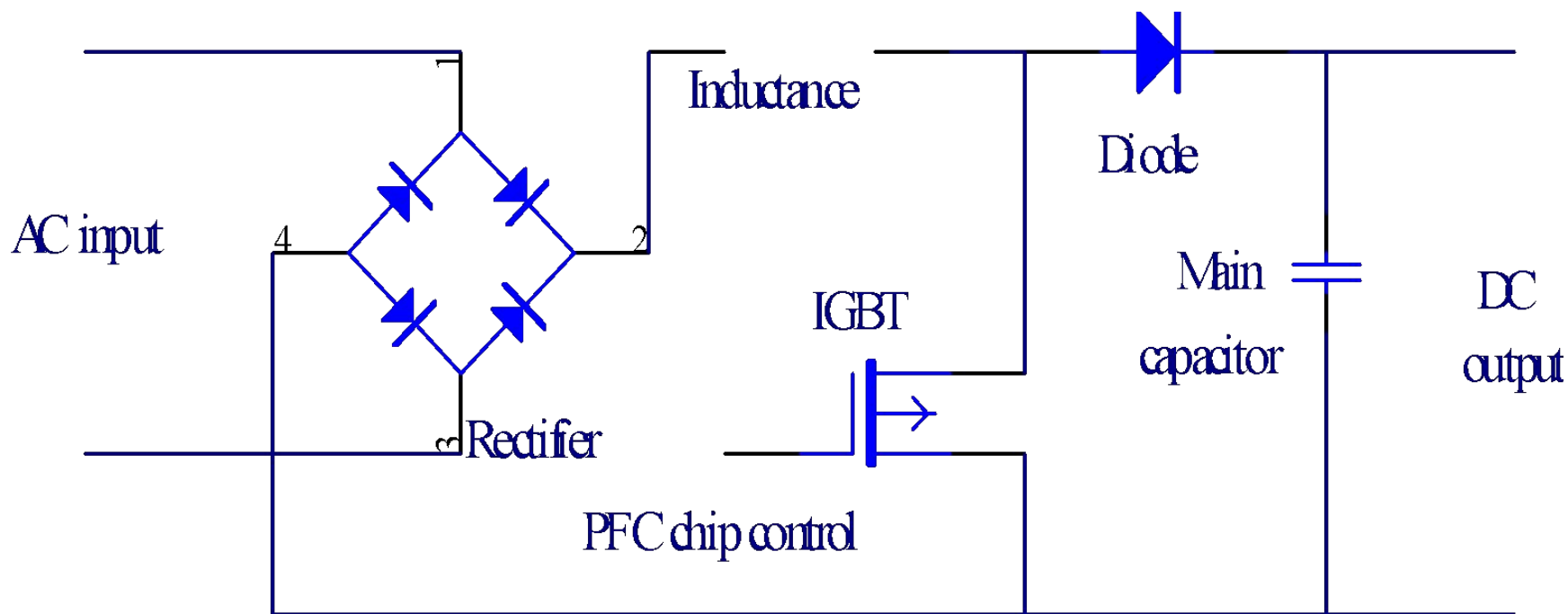


PFC chip and theory

- ICE3PCS03G(see the PDF document)
- Power input : 95V~270VAC
- PFC output: 360(working)~385(open circuit)
VDC



PFC theory: Boost

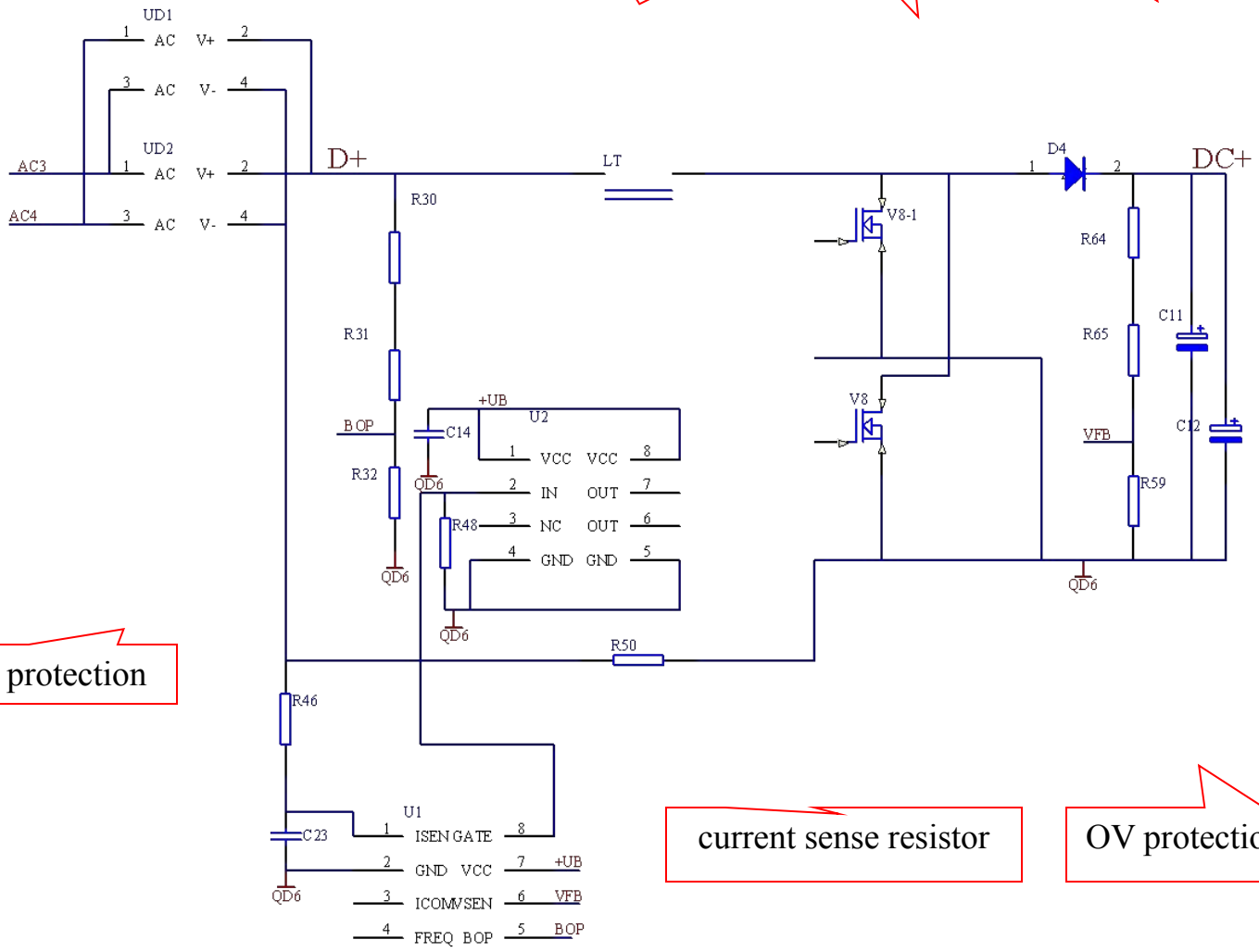




PFC Inductance

IGBT

FRD



Brownout protection

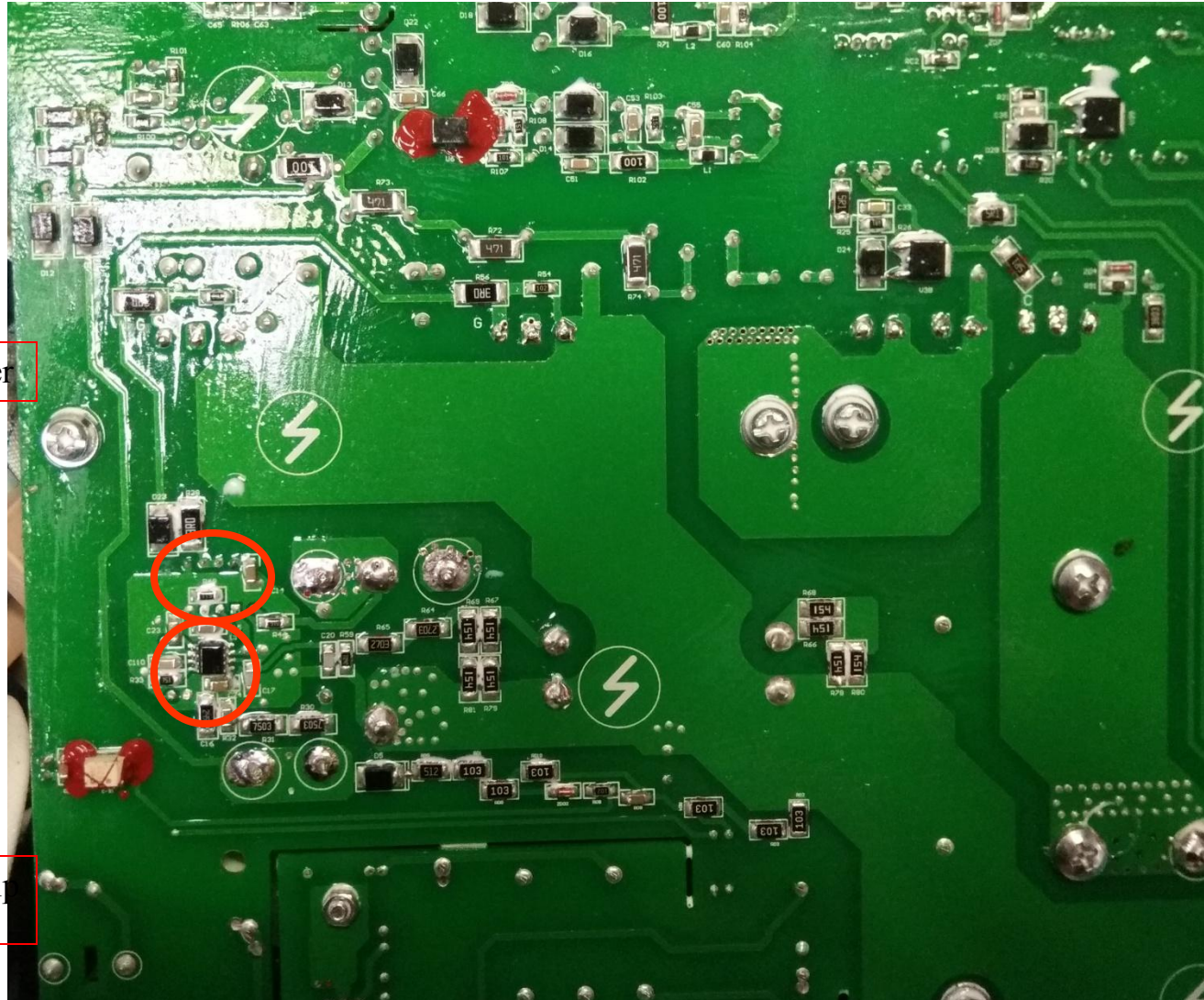
current sense resistor

OV protection

PFC circuit



Photo of PFC part

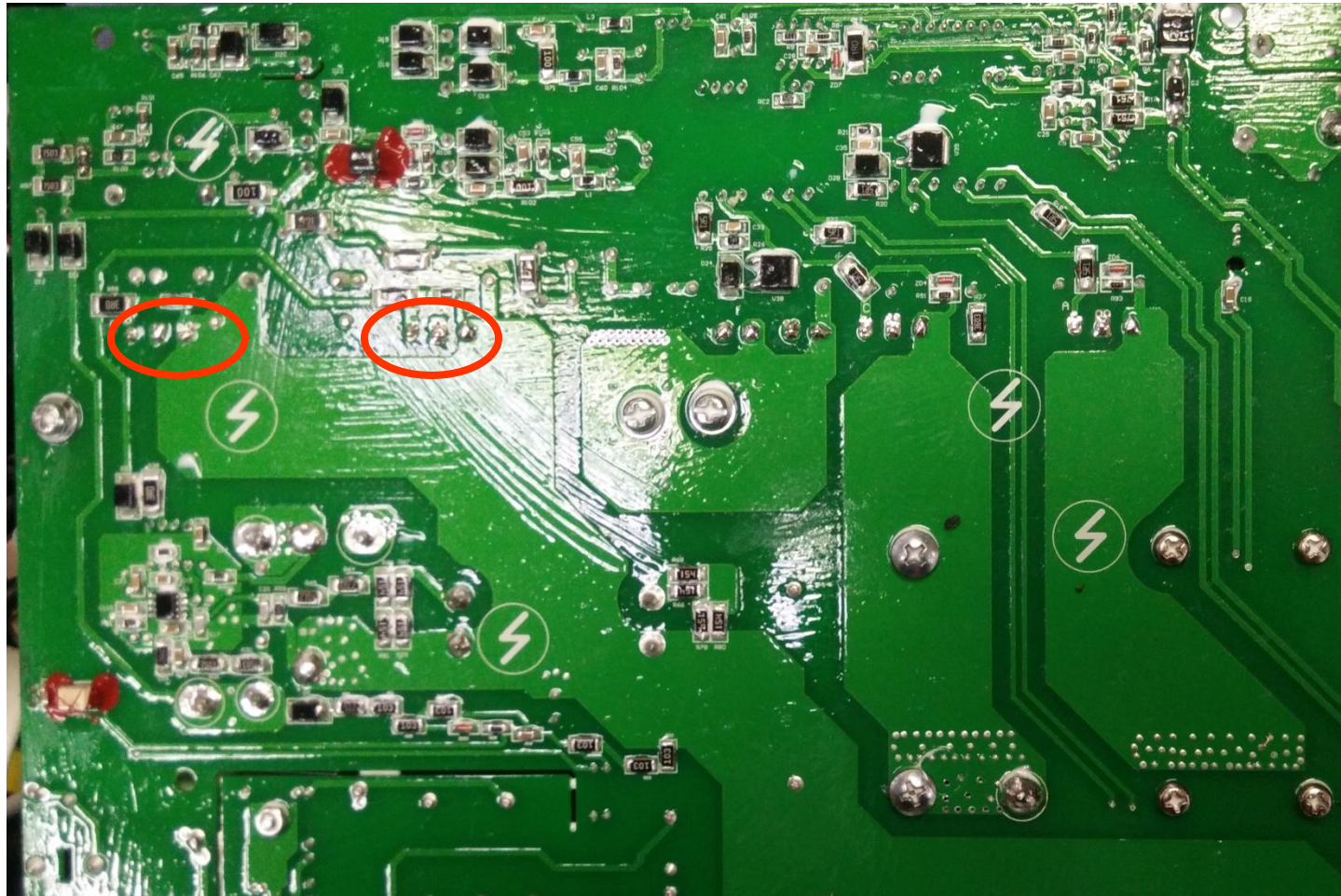


U3 PFC IGBT driver

U1 PFC control chip



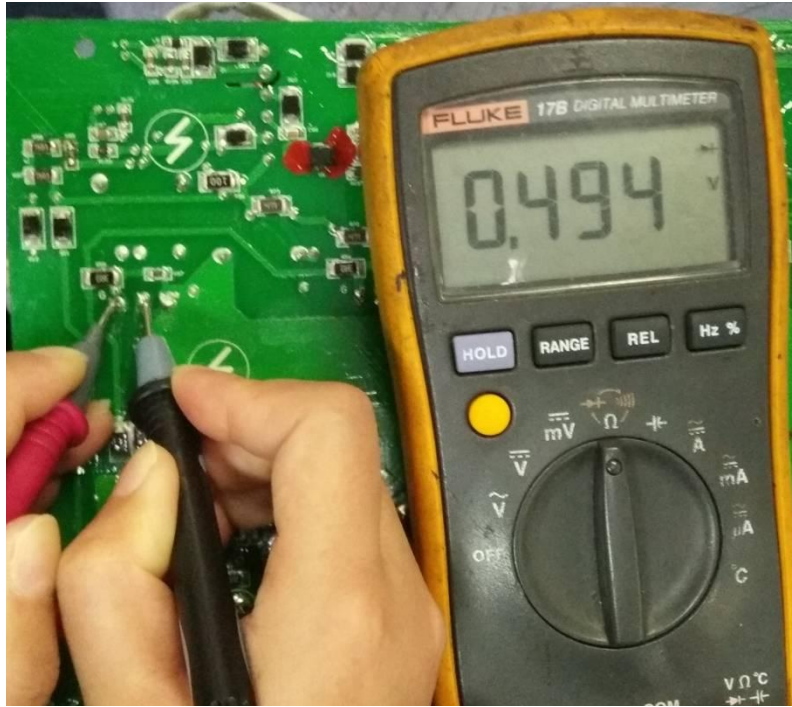
The location of PFC IGBT



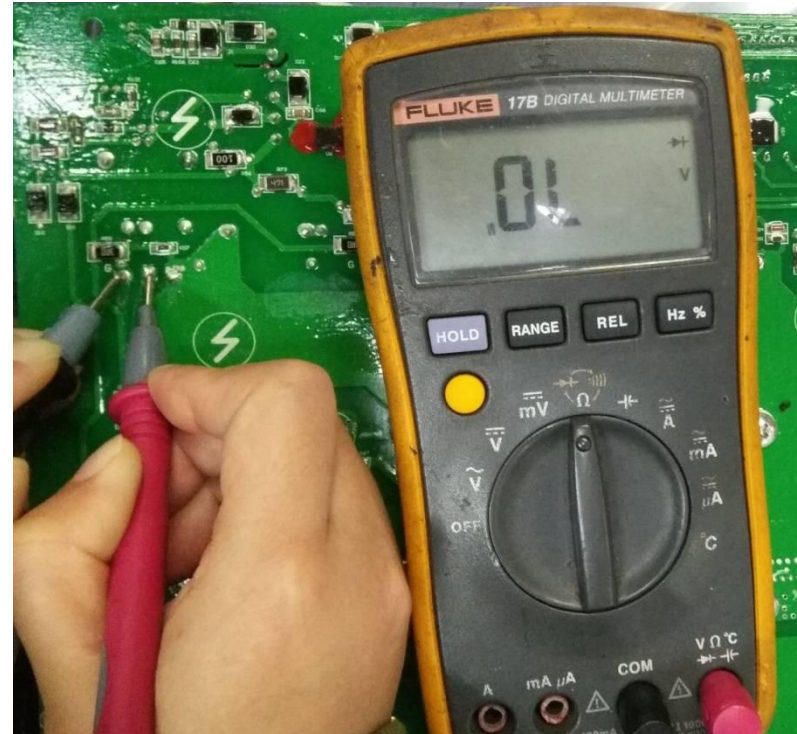


Preparation of test PFC IGBT

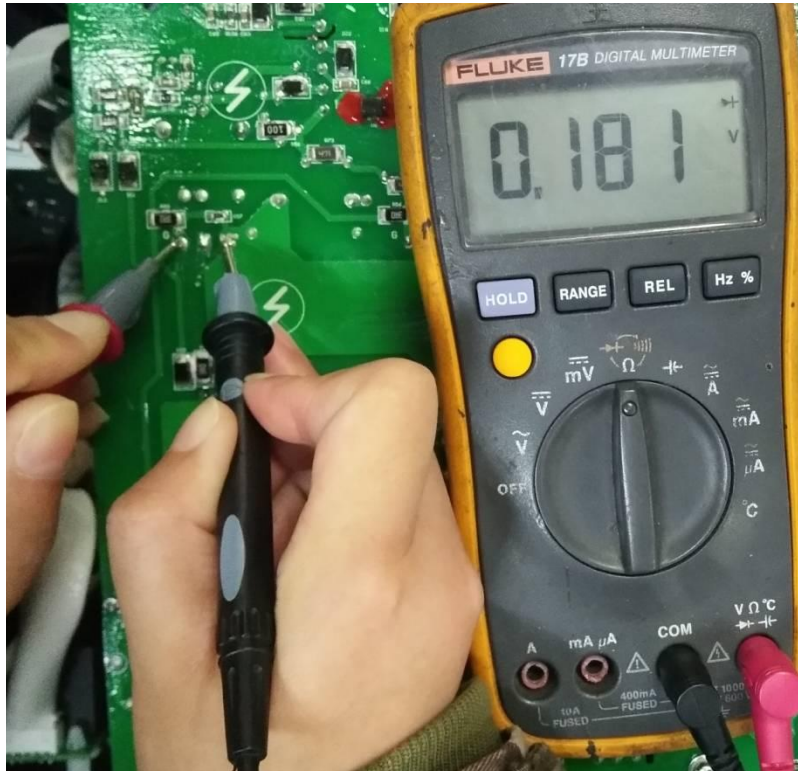
- 1、 We must Switch off the machine
- 2、 After 5 minutes we can test .
- 3、 Turn the rotary switch to test diode.
- 4、 keep 3 seconds when we test every step.
- 5、 If the result we test as similar as the following picture .we can say the IGBT is good. Otherwise there are some IGBT damaged.



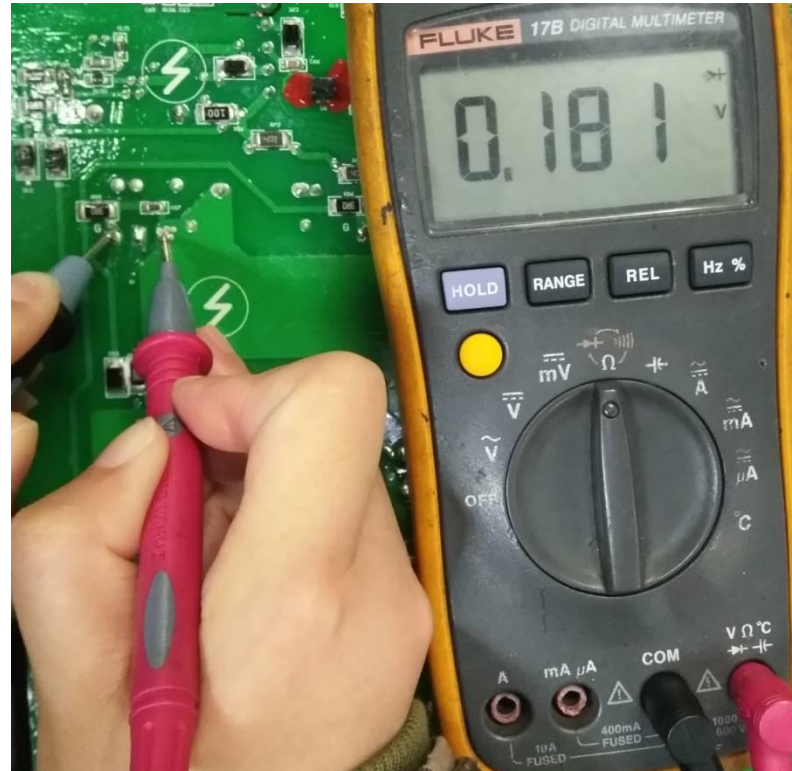
PFC IGBT
Test(A-1)



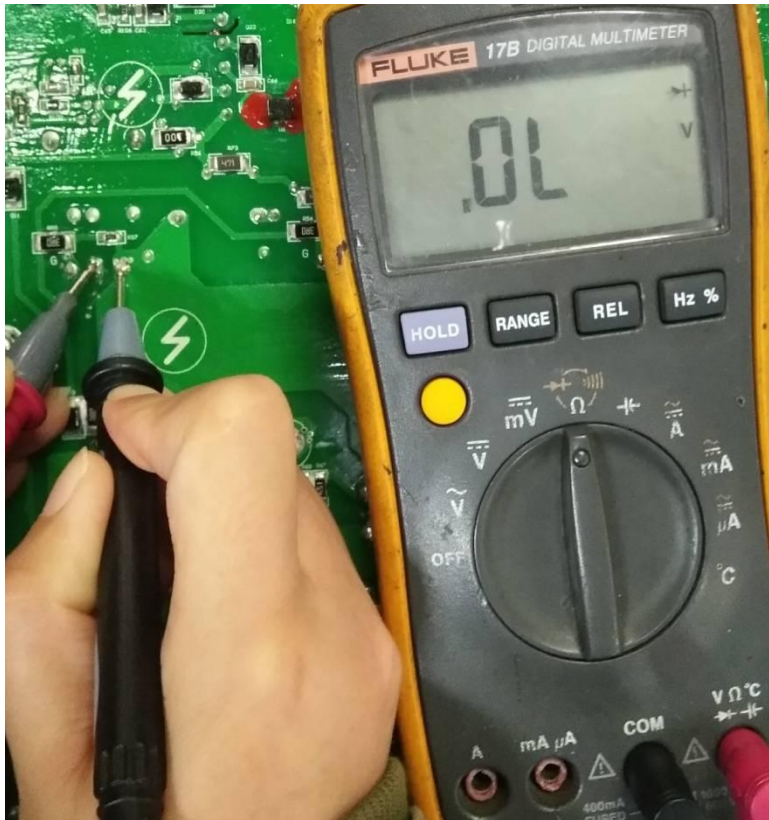
PFC IGBT
Test(A-2)



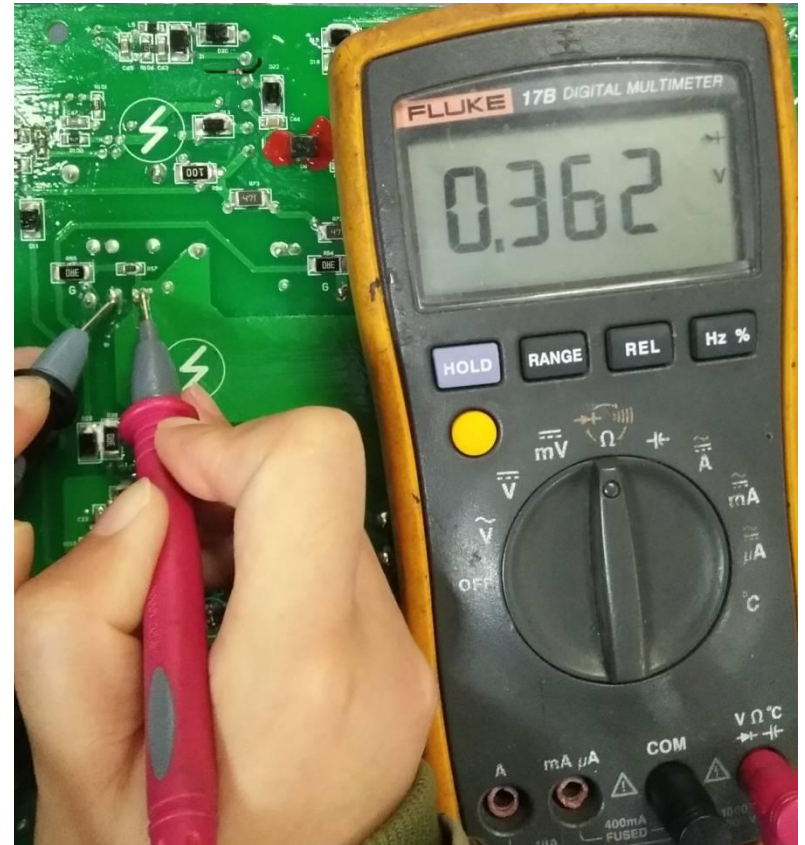
PFC IGBT
Test(A-3)



PFC IGBT
Test(A-4)



PFC IGBT
Test(A-5)

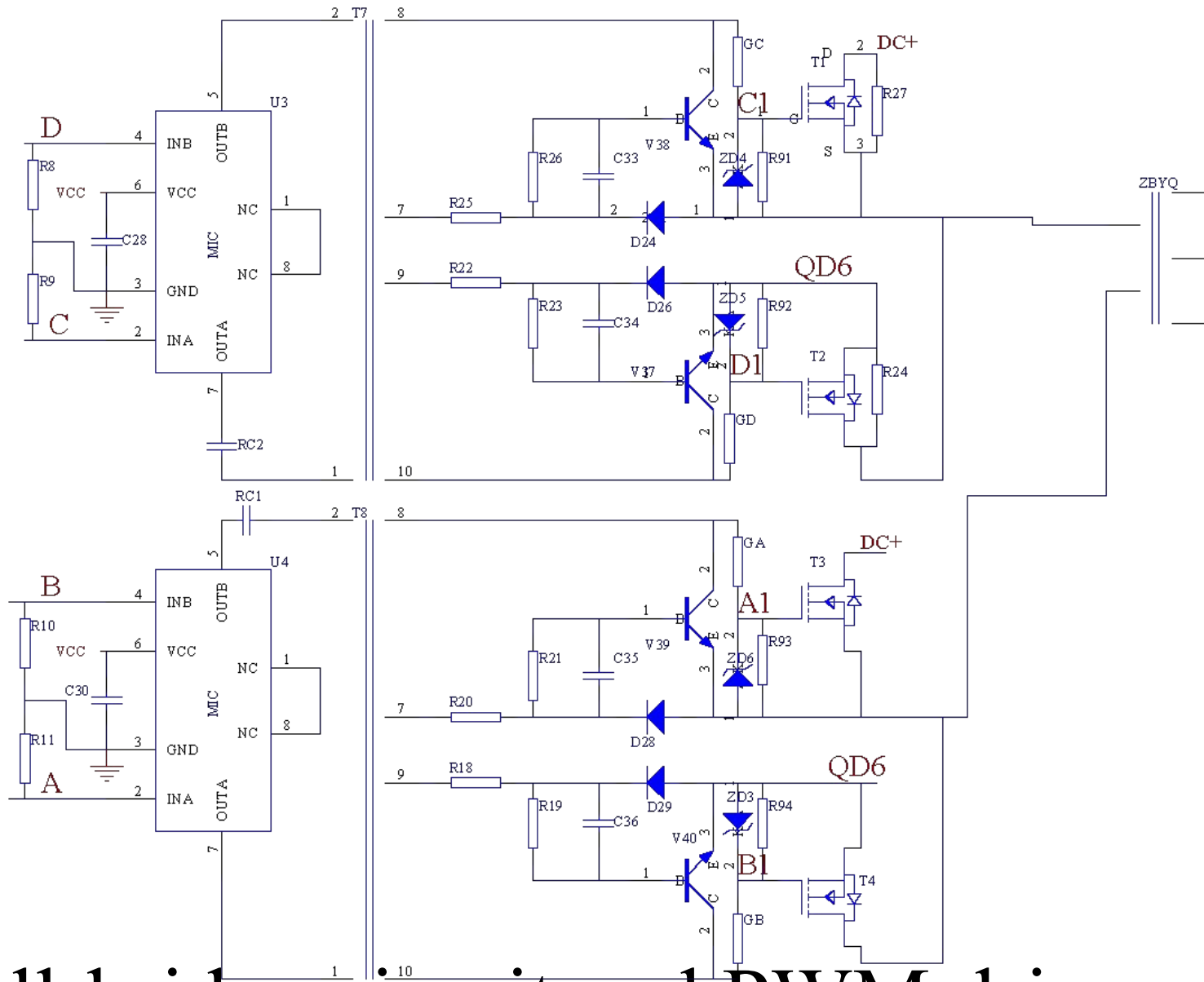


PFC IGBT
Test(A-6)



Solutions when the IGBT is damaged

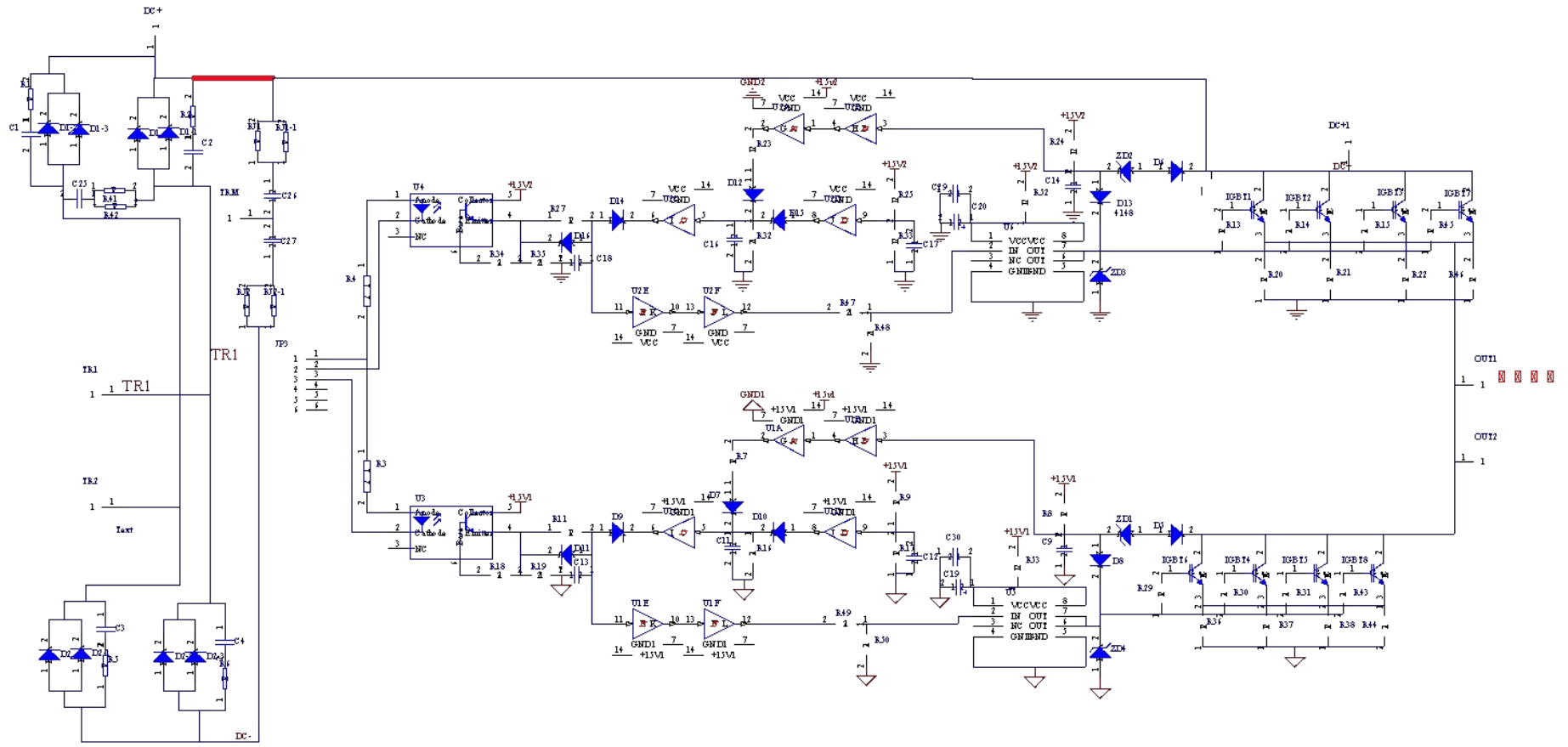
- 1、 Check the circuit of PFC IGBT driver may be there are some components damaged.
- 2、 Remove IGBT one by one and test as following page.
- 3、 Replace IC TC4420.
- 4 、 Replace PFC control chip ICE3PCS03G .



Full-bridge circuit and PWM driver

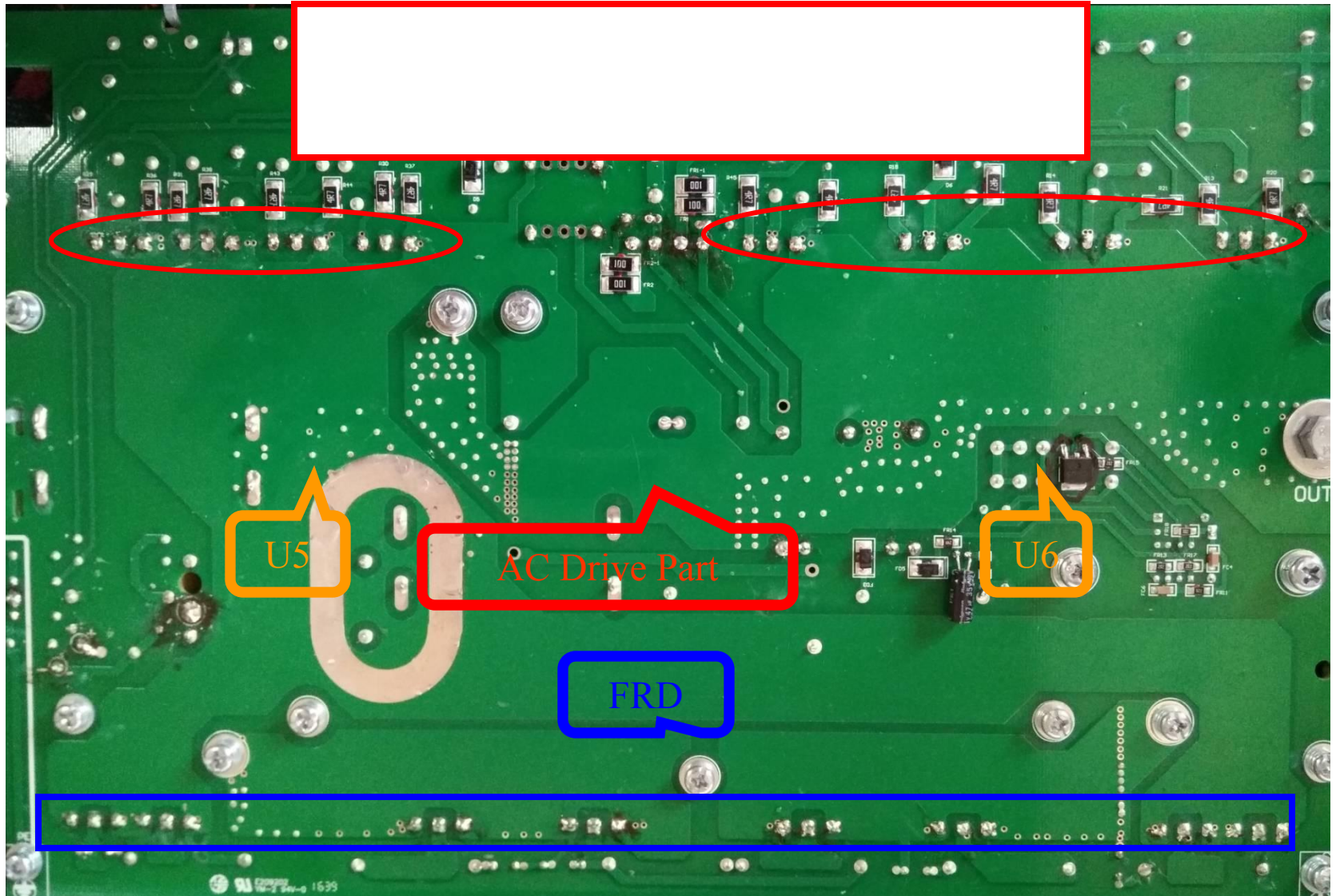


Part5: Through the transformer and full-wave rectifier Circuit and full bridge inverter Getting what we want the current and voltage





The locations of AC IGBT



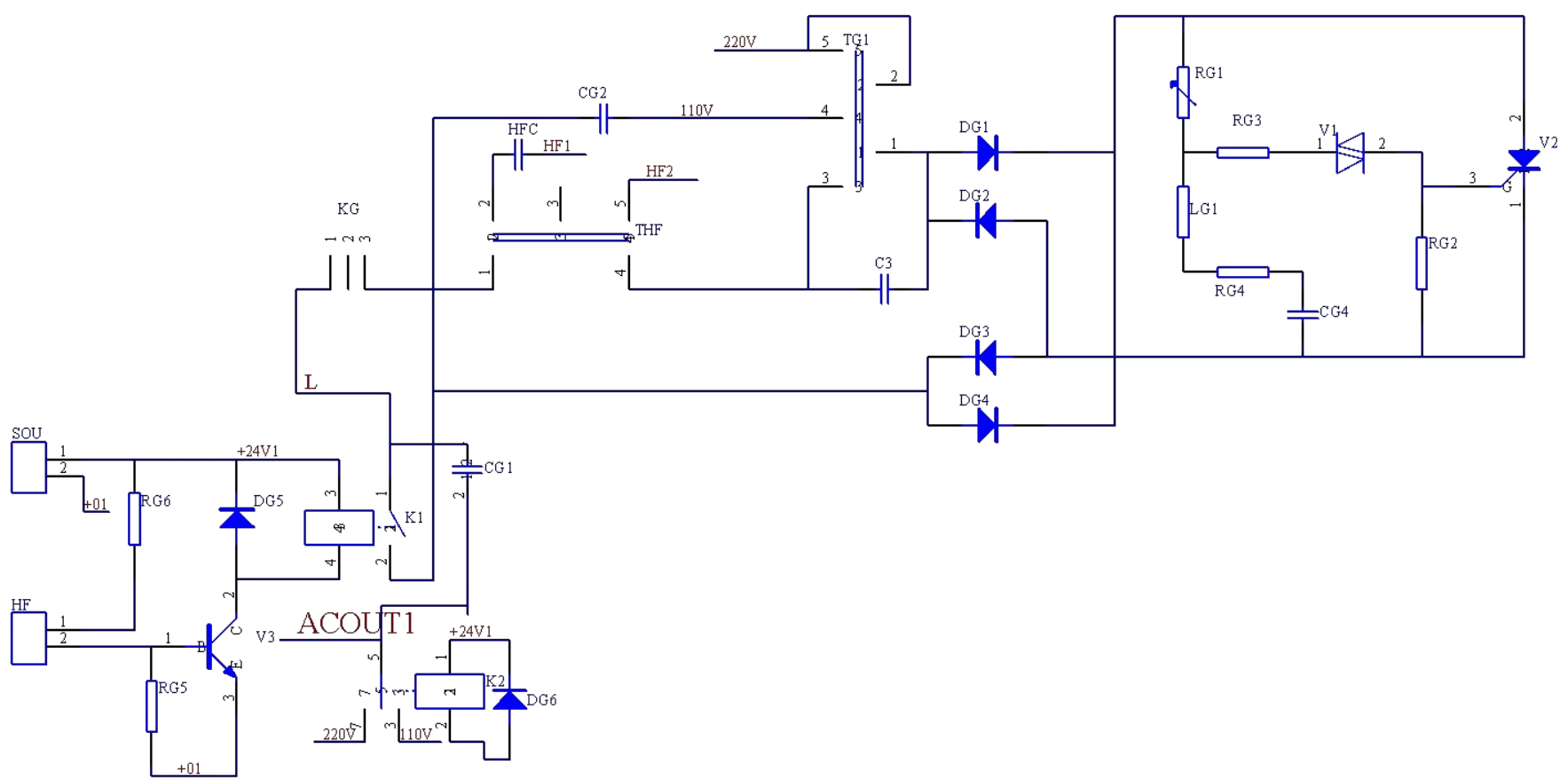


Solutions when the IGBT is damaged

- 1、 Check the circuit of AC IGBT driver may be there are some components damaged.
- 2、 Remove IGBT one by one and test as following page.
- 3、 Replace IC TC4420 and CD4066.
- 4 、 Replace CNY17-4.



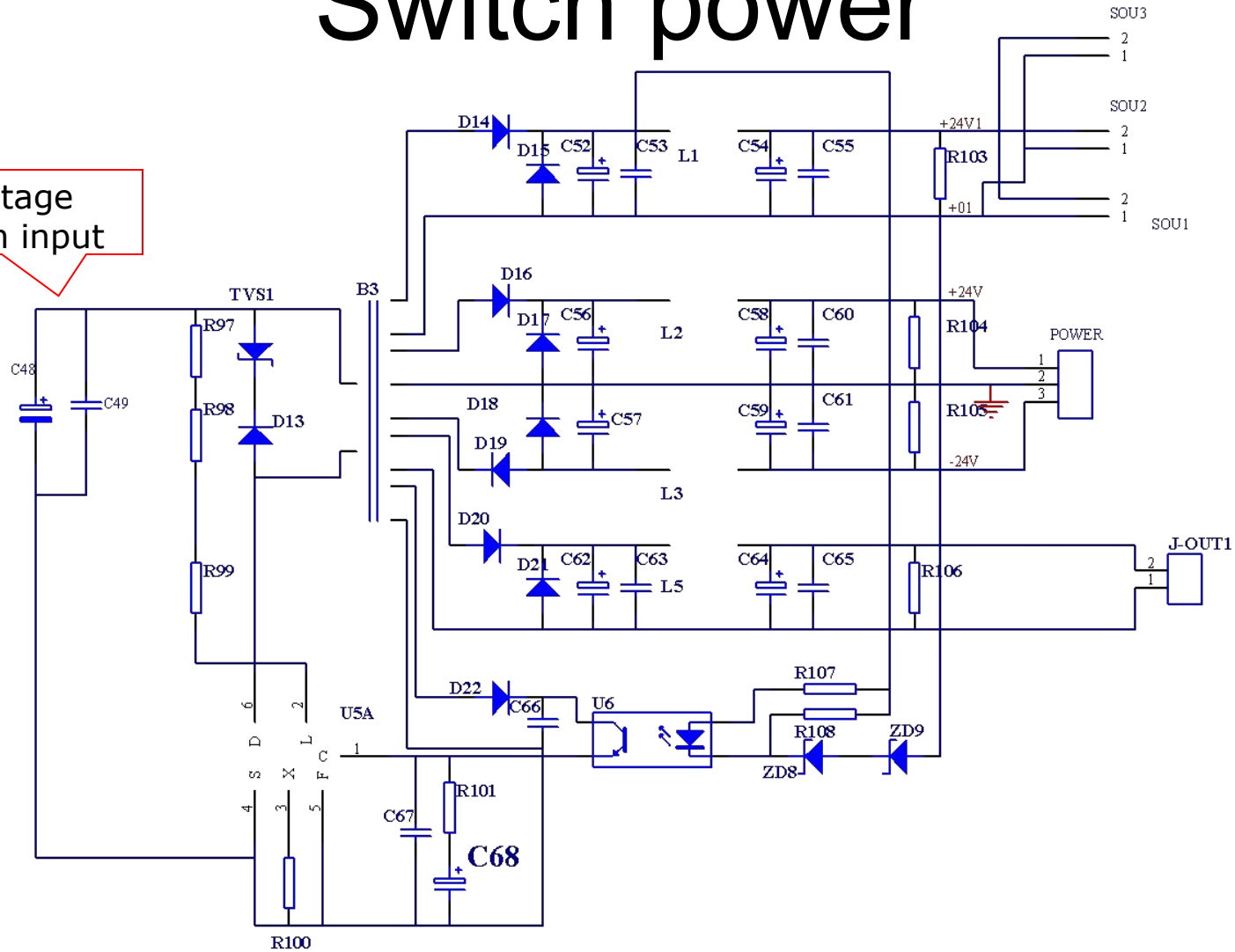
Part6: Schematic of HF part





Switch power

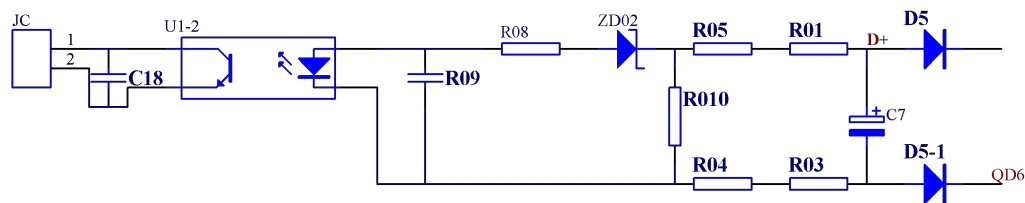
Overtoltage protection input



Part7:the switch power supply +24V and -24V power for the machine

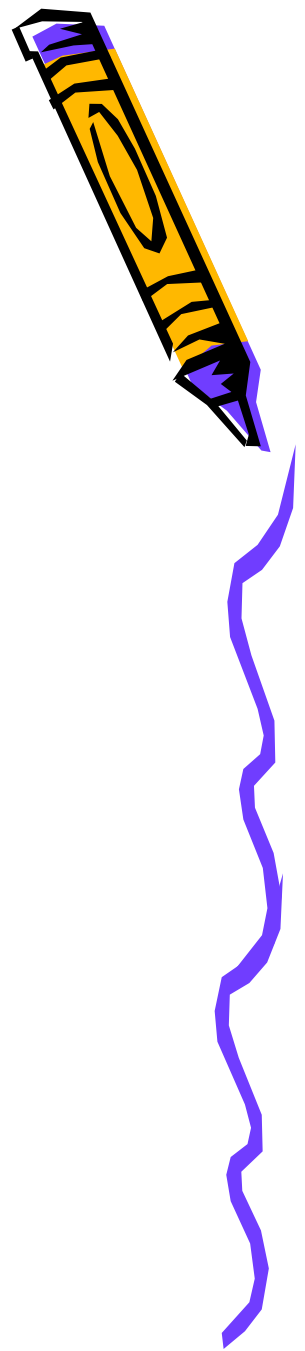


110V/220V input test circuit



Control PCB
judge

Voltage
sampling

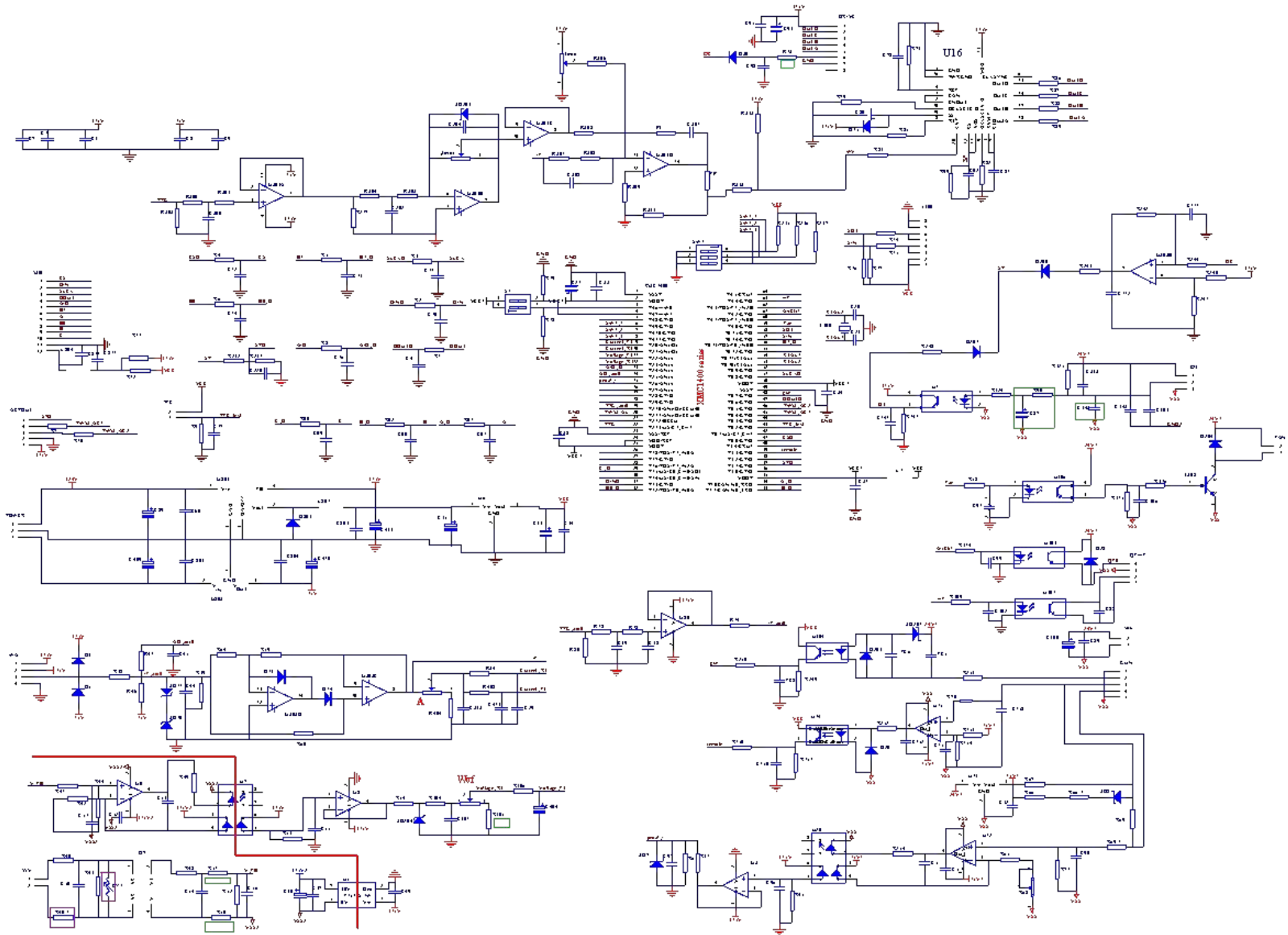


3、 Introduction of control circuit



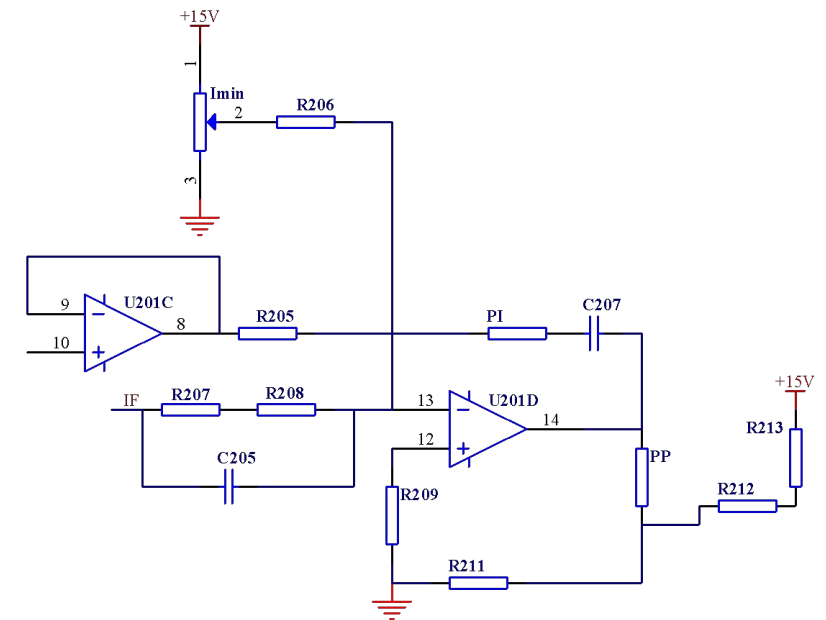


Introduction of control circuit

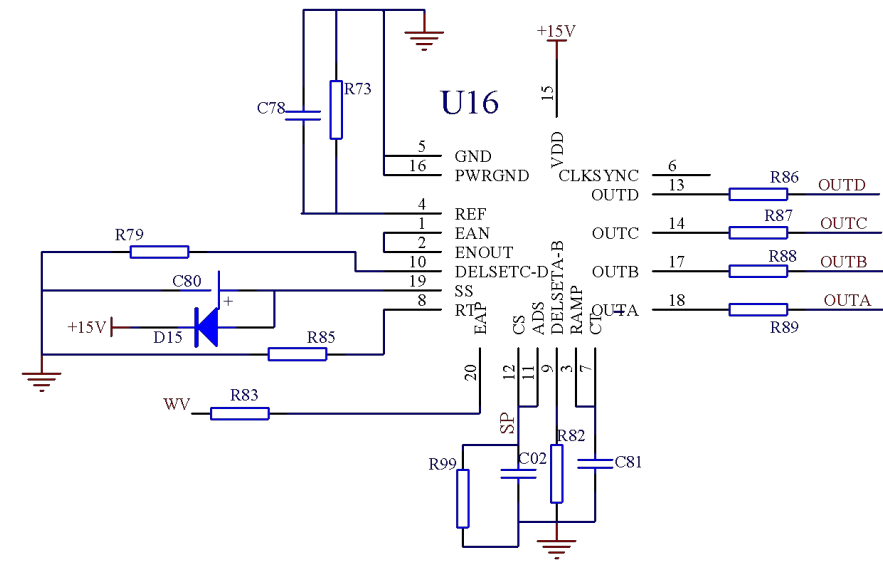




Part 1: current comparison and PI adjust.



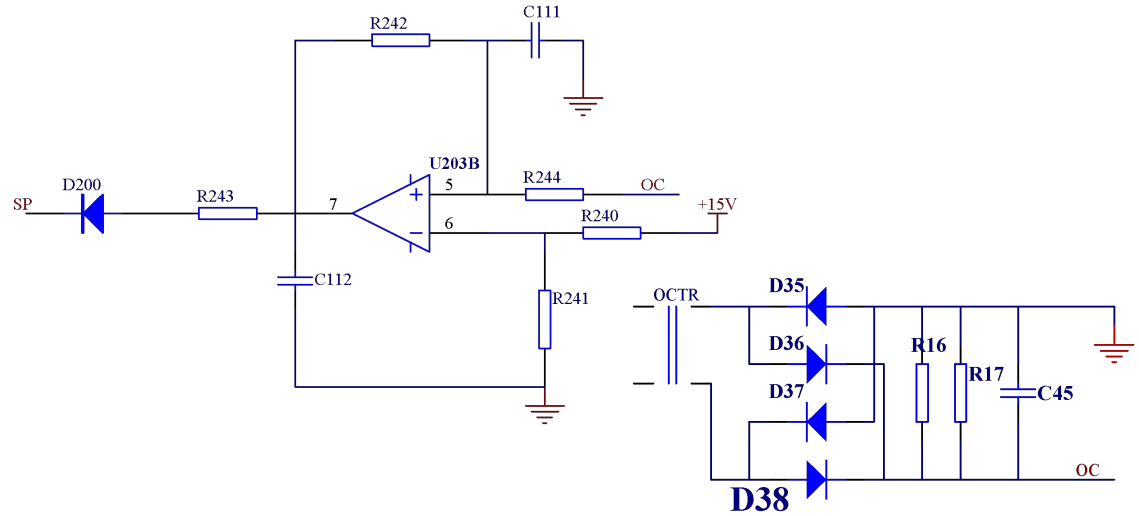
Part 2: UCC3895 PWM output





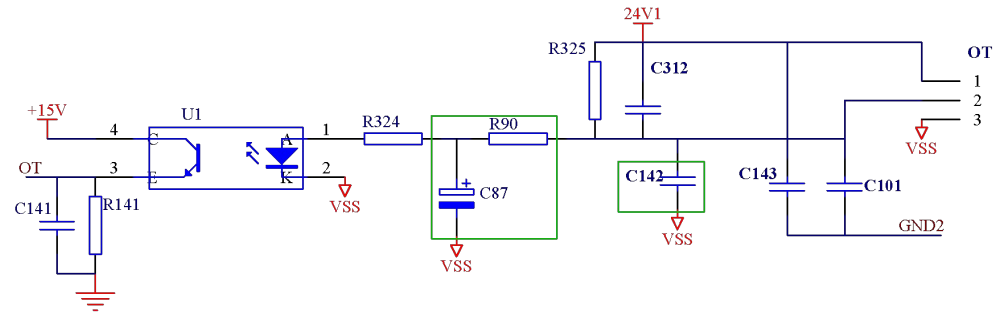
Part 4: OC test

When the current exceeds the maximum Current we set , the OC Signal will turn high level And the PWM Signal will be blocked until we switch Off the machine And switch on again.

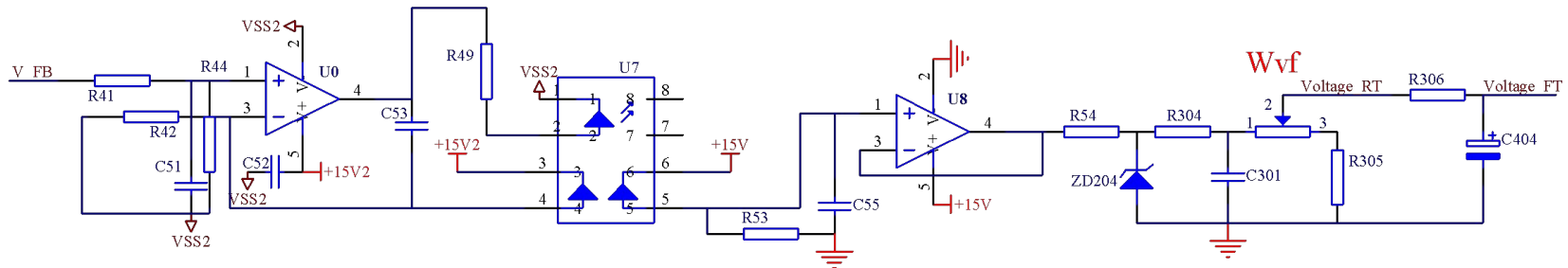
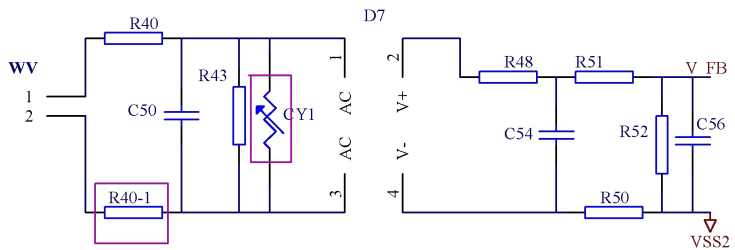


Part 5: OT Test

In this machine we use Thermal Test .

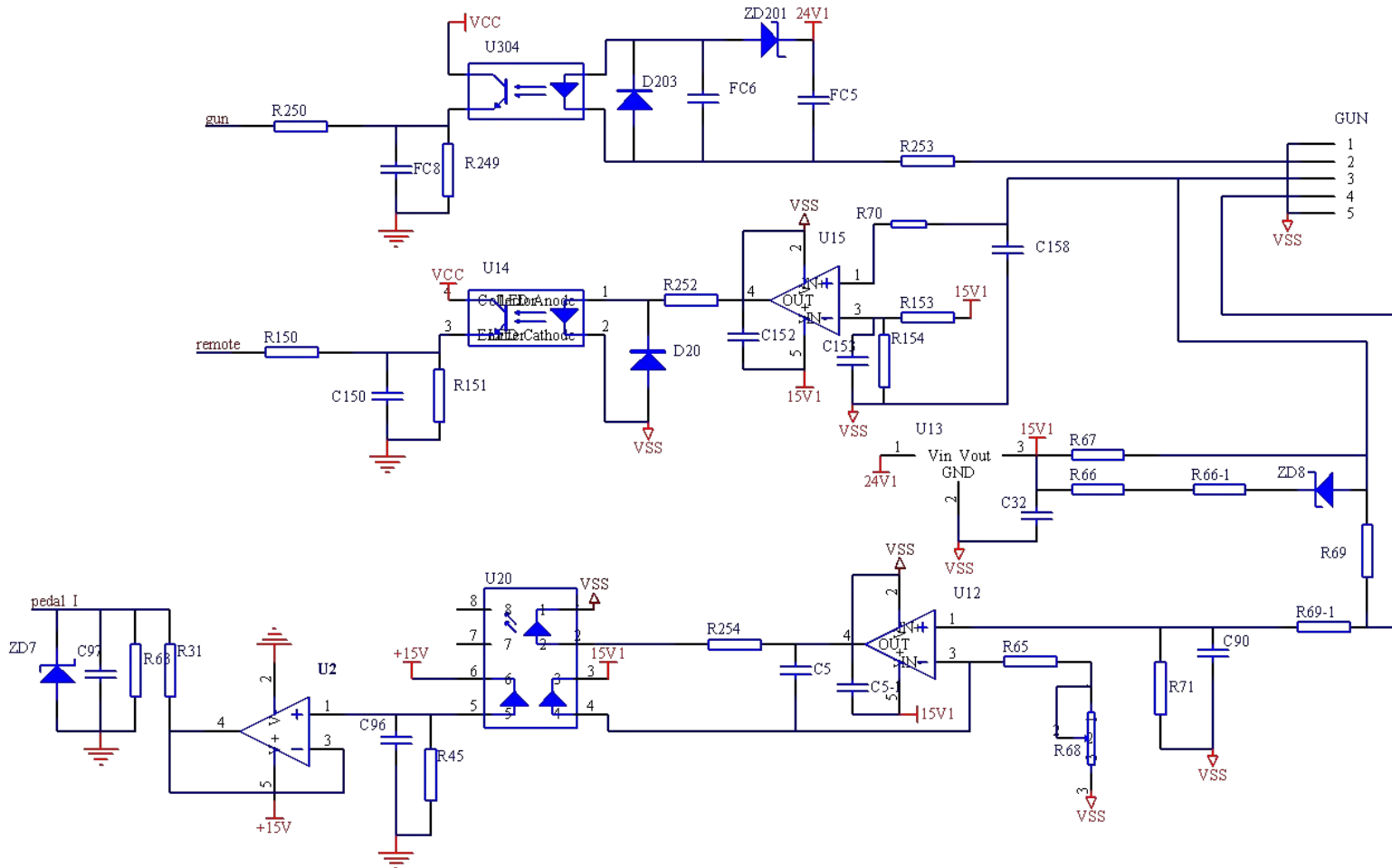


Part 6: voltage test



Part 7: gun, remote, pedal.

The Connector GUN connect to the air socket on the front panel cover to control gun, remote and pedal respectively.





View of control board

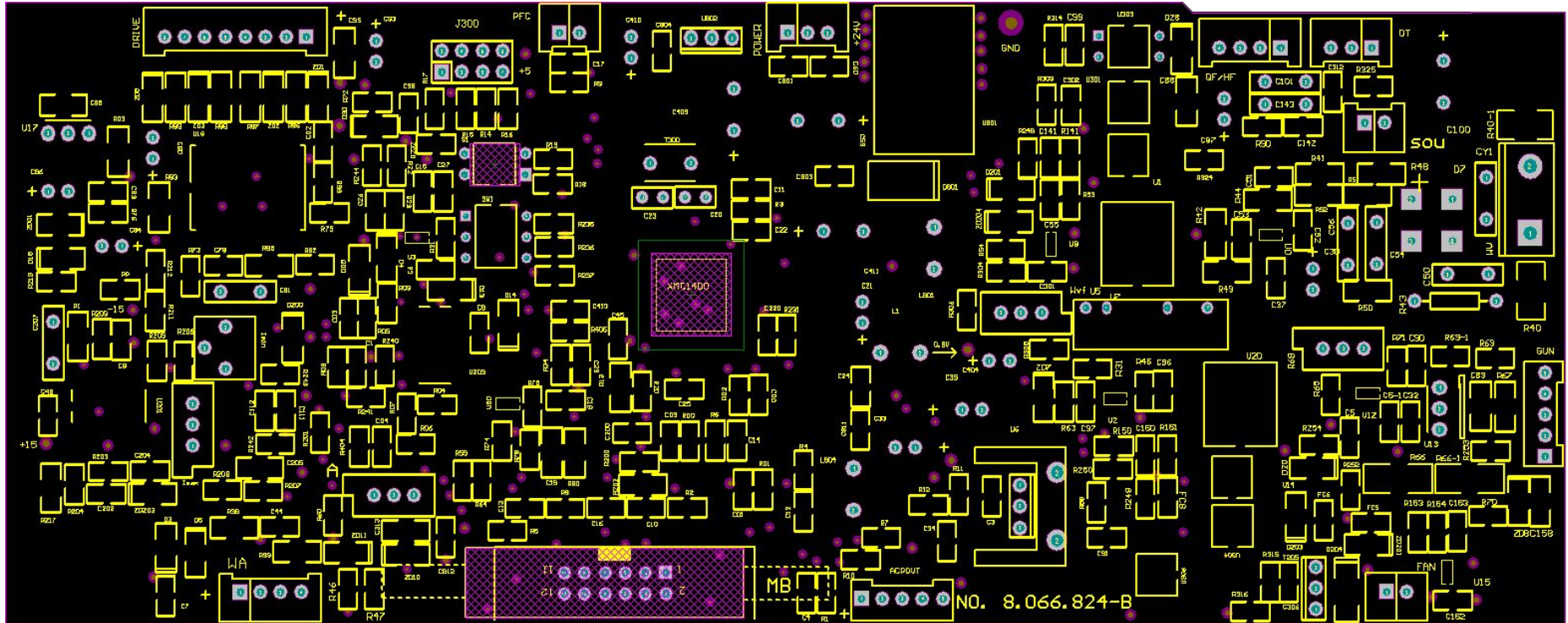




Photo of control board

DRIVER

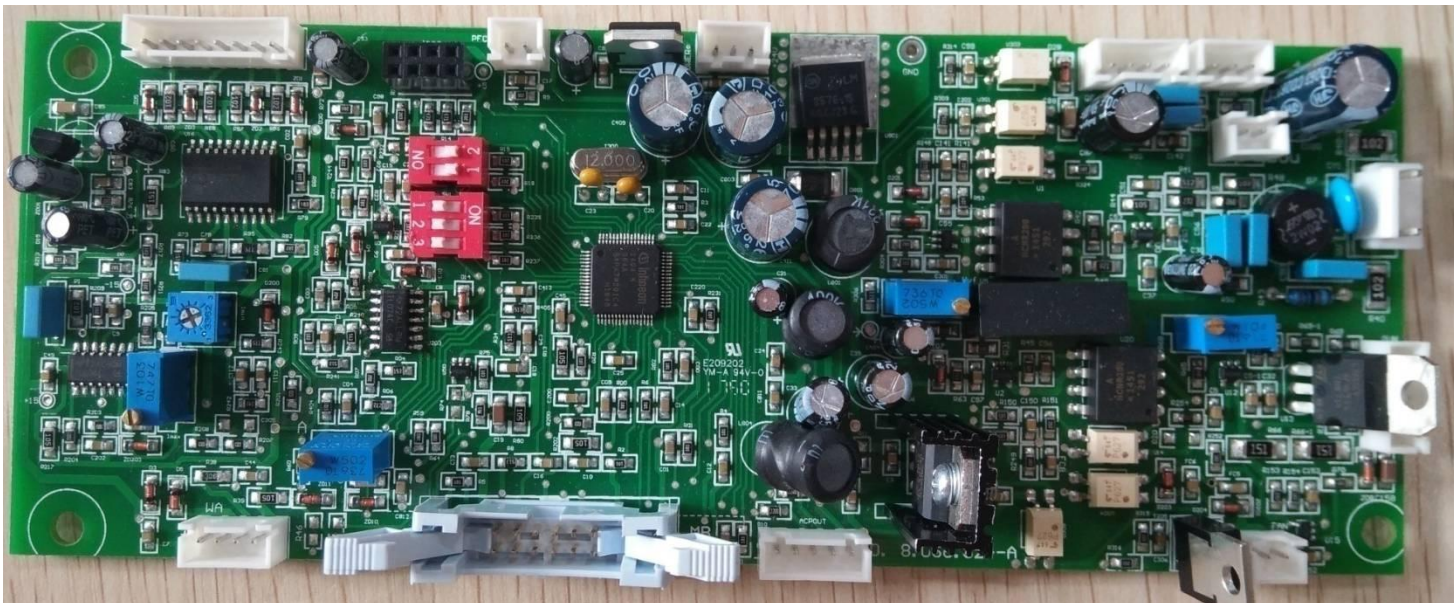
PFC

POWER

QF/HF

OT

SOU



WVIN

IFB

MB12

ACPOUT

FAN

GUN/REMOTE



- FAN ---- Connected with the FAN of the machine. 1_-24V, 2_ GND
- OT ---- Connected with the temperature sensor to provide over-temperature signal. 1_NTC-GND, 2_OT, 3_NTC.
- PFC ---- Connected with the main board to judge the input voltage.
- IF ---- Connected with HALL sensor to sample current signal.
1_+15V, 2_-15V, 3_Iist-In, 4_GND.
- DRIVER ---- Connected with DC main board to provide PWM signal and control board power. 1_+15V, 2_out-D, 3_out-C,4_out-B, 5_out-A, 6_OC, 7_GND, 8_-24V.
- WVIN----Connected with the output to sample voltage signal.1_+, 2_-.
- SOU---- Connected with main board. 1_VSS, 2_24V1.



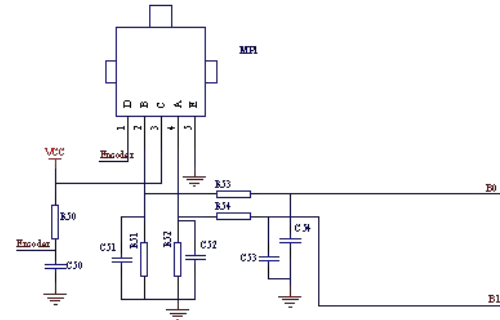
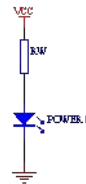
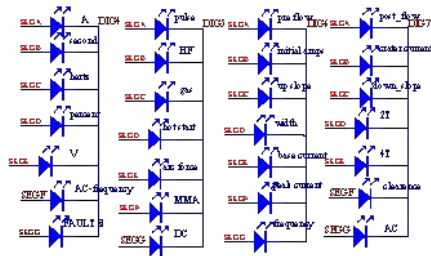
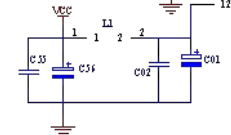
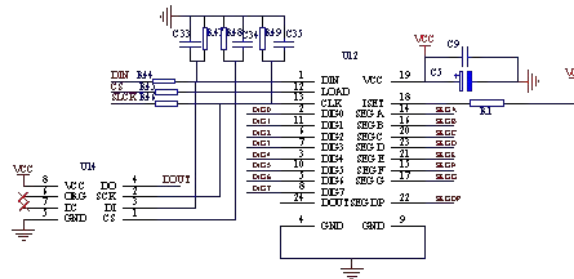
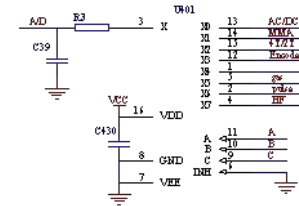
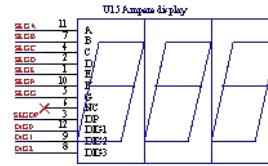
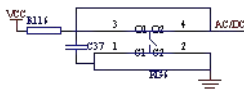
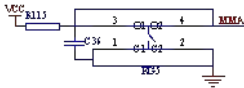
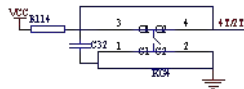
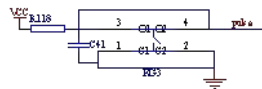
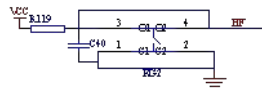
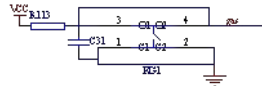
- GUN/REMOTE ---- Connected with the gun and remote to provide signal
- POWER ---- Connected with main board. 1_+24V, 2_GND, 3_-24V.
- MB12---- Connected with panel board .
- QF/HF---- Connected with gas valve and main board to provide signal.
- DRIVER ---- Connected with AC main board to provide PWM signal and control board power. 1_+15V, 2_GND, 3_AC1,4_AC2.



4、 Introduction of panel circuit



Electrical drawing of panel circuit





panel PCB

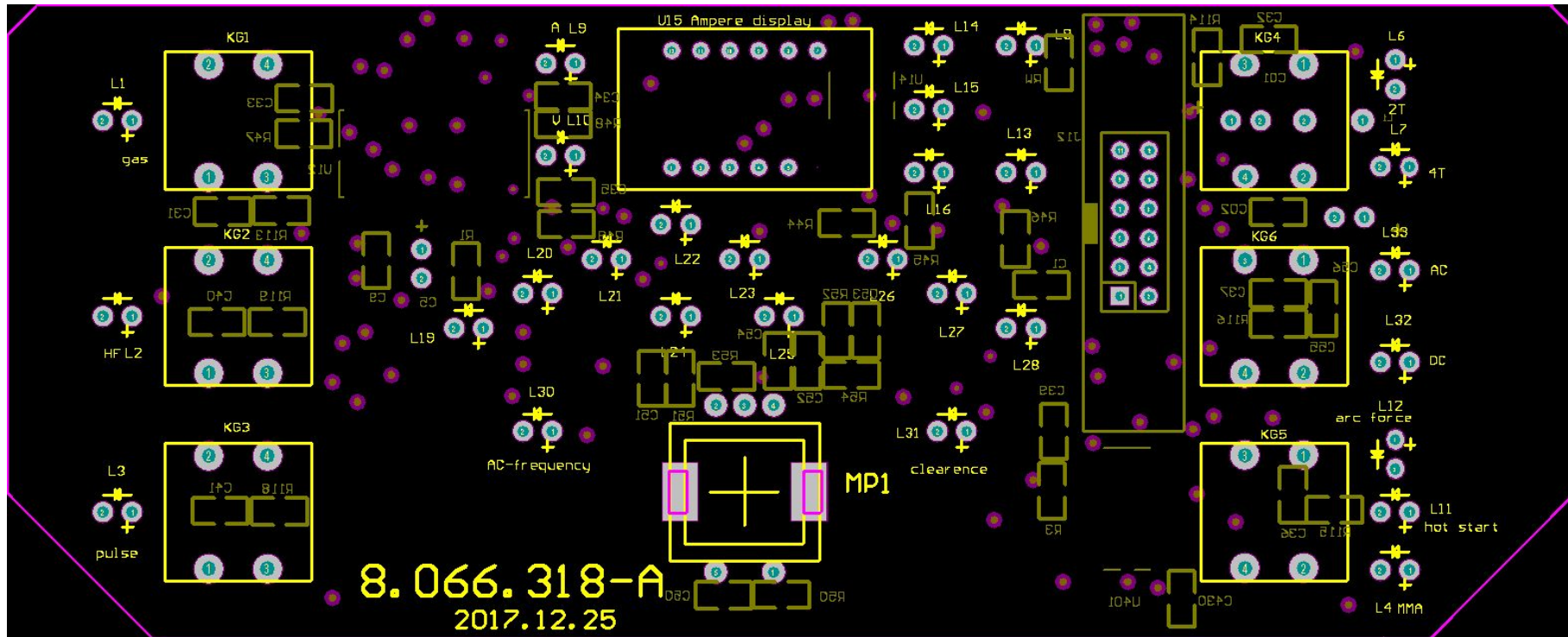




Photo of panel board

Current display

LED1: power display

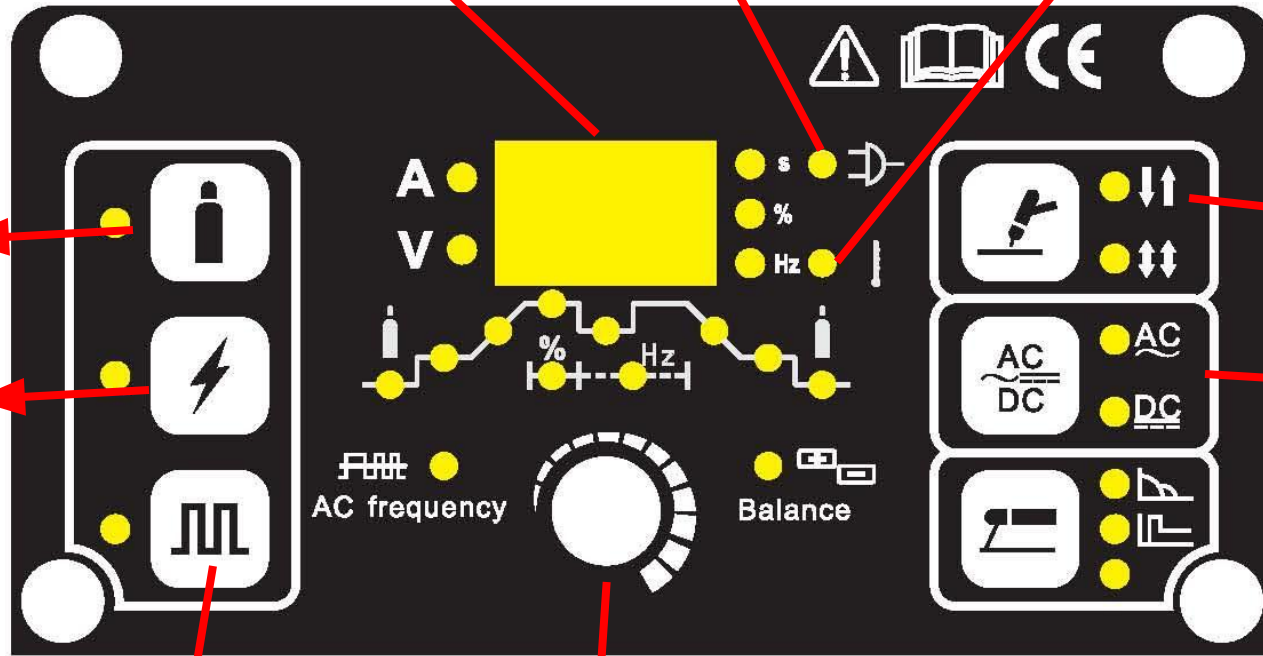
LED2: Over-temperature or Over-current alarm

Gas check

HF

PULSE

Process selection



2T/4T

AC/DC

| Common troubles | Solutions |
|--|---|
| 1. When starting the power source, the fan works, but the power light is not on. | Open the shell and check the welding connector of the front panel and control panel or replace it. |
| 2 When starting the power source, the power light is on, but the fan doesn't work. | <p>(1) Something unusual is blocked in the blade. Clear it out.</p> <p>(2) The fan is damaged. Replace the fan with the same type.</p> <p>(3) The connector of fan not connect to the machine.</p> |
| 3 When starting the power source, the fan and the power light work normally at the beginning but stop working later. | Over-voltage input. Check the input voltage. |
| 4. When starting the machine, the power light keeps flickering. | <p>(1) Check whether there are some Component damaged on control board .</p> <p>(2) Check whether there are IGBT damaged. (refer to IGBT test) .</p> <p>(3) Replace the transformer of the B1 switch power supply on the main board and the U1 TOP244 Integrated Circuit.</p> |

| | |
|--|---|
| <p>5. The current can't be adjusted.</p> | <p>The current adjustment potentiometer is damaged. Replace the potentiometer with the same type.</p> |
| <p>6. The current is infinite.</p> | <p>HALL is damaged. Replace the HALL with the same type.</p> |
| <p>7. When starting the machine, the chief switch of input power source trips instantaneously.</p> | <p>Replace the 5016rectifying bridge.</p> |
| <p>8. When starting the machine, the fan and the power light work normally, but there's no voltage and circuit output.</p> | <p>(1) Check the output of the No. 13、14 pin and No. 17、18 pin of UCC3895 on the control board (refer to UCC3895 test) ,if the control board works well. Otherwise, please replace it.</p> <p>(2) If the voltage of control board is right, the problem may arise in the main board. Then, use the multimeter to check the IGBT (refer to IGBT test of wave) If the circuit occurs or an obvious evidence of explosion appears. We must switch off machine and check whether there are IGBT (refer to IGBT test) or FRD (refer to FRD test) damaged.</p> |



5、 Troubleshooting

A-1:When the machine is turned on , the power LED is not on.

Resolution:

1. There is no input voltage , check whether there is input voltage of the connection box on the rear panel;
2. The power LED is damaged or there is a poor contact , repair the inside circuit of the power LED;
3. There is something wrong with the main board , repair it.

A-2:The digital display is not intact.

Resolution:

The nixie tube on the digital display is damaged , change it or change the front panel.

A-3: The max/min welding current is not agree with the out-factory set value.

Resolution:

1. If the min welding current is not agree with the out-factory set value , adjust the I_{min} potentiometer on the control board;
2. If the max welding current is not agree with the out-factory set value , adjust the I_{max} potentiometer on the control board.

A-4: The display welding current is not agree with the actual current.

Resolution:

1. The min display welding current is not agree with the actual current, value , adjust the A potentiometer on the control board;
2. 1. The max display welding current is not agree with the actual current, value, adjust the A potentiometer on the control board.

A-5: The welding current can not be adjusted.

Resolution:

1. The welding current potentiometer on the panel is damaged or has a poor contact , repair or change it;
2. The control board is damaged , repair or change it.

A-6: the alarm LED is on , maby the following situation

1. Over temperature: 1) the welding current is too large, decrease the output welding current; 2) using it with too much time , the fan is damaged, decrease the loading duty. Cycle , repair or change the fan.
2. Over voltage : the input power is unstable , insert an stable or small fluctuation input.
3. Lacking voltage: 1) voltage : the input power is unstable , insert an stable or small fluctuation input; 2) there are too many electric equipments , decrease the number.
4. over current : there is unusual current in the main circuit , check the main circuit and PCB.

B-1:When the machine is turned on , the fan doesn't work.

Resolution:

- 1.There is something locking the fan blades , remove it.
- 2.The fan starting capacitance is damaged , change it.
- 3.The fan is damaged , change it.

B-2:There is no no-loading voltage.

Resolution:

Check the main circuit and PCB.

B-3:The display no-loading voltage is not agree with the actual voltage.

Resolution:

The no-loading voltage has a wrong setting, adjust the A potentiometer on the control board.

B-4:There is no output current when welding.

Resolution:

- 1.The output cables are not connecting to the both poles of the machine , connecting them.
- 2.The welding cables are damaged , repair or change them.
- 3.The earth wire is not connecting or there is a poor contact , check and correct it.

B-5:When welding , it is not easy to start arc or it is too easy to paste electrode.

Resolution:

- 1.Quick coupling is loose or has a poor contact , check and fasten it;
- 2.There is oil or garbage on the work piece , check and remove it;
- 3.Hot arc starter adjustment is too small , increase the arc starter adjustment.

B-6:It is easy to break the arc.

Resolution:

1. Arc adjustment is too small , increase the arc starter adjustment.
2. Arc is too long when welding , use short arc.

B-7:The depth of the molten pool is not enough.

Resolution:

- 1.The welding current adjustment is too small , increase it.
2. Arc is too long when welding , use short arc.
- 3.The arc force adjustment is too small , increase it.

B-8:Arc flutters when TIG welding .

Resolution:

- 1.Airflow interference , use sheltering method eliminate Airflow interference.
2. Electrode drifts from center. 1)adjust electrode angle When welding .
2) change for new electrode .

B-9:Arc can not be concentrated.

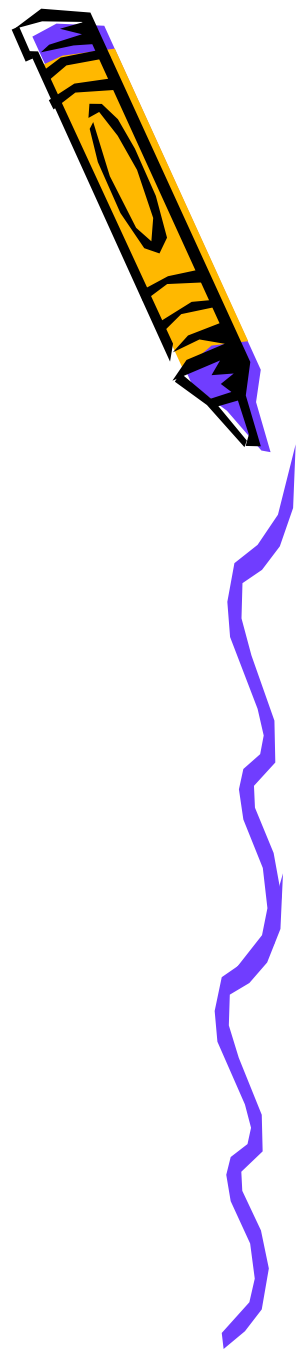
Resolution:

1. Gas disturbing, remove it using the way of keeping out;
2. The electrode is partial , adjust the angle of it or change it.
3. The action of a magnetic field.1)lean the electrode to the opposite of the magnetic:2)change the position of the earth wire , or add earth wire on the both sides of the workpiece;3)use short arc.



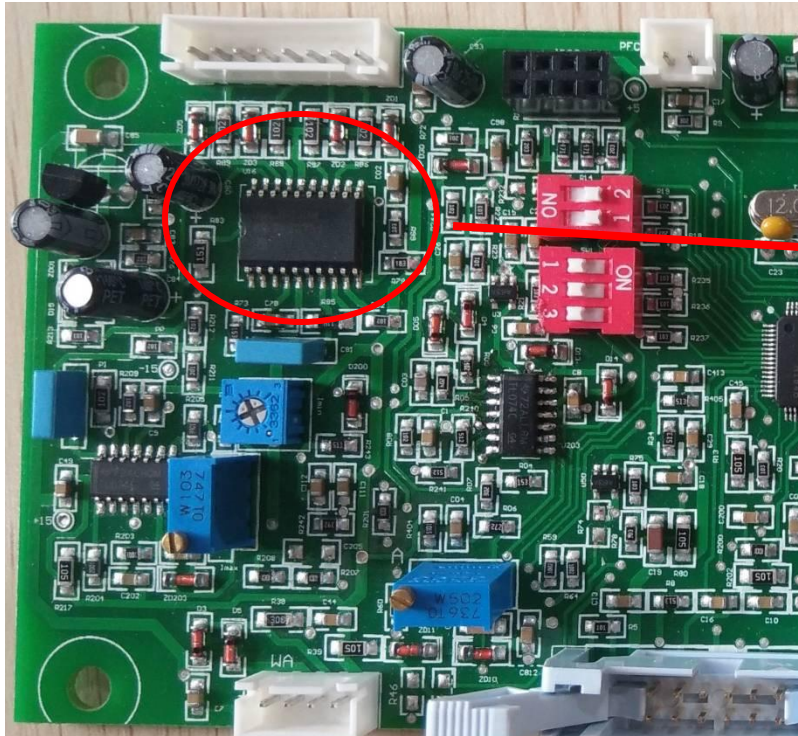
6. Component test

1. UC3895 Test
2. IGBT Test
3. FRD Test





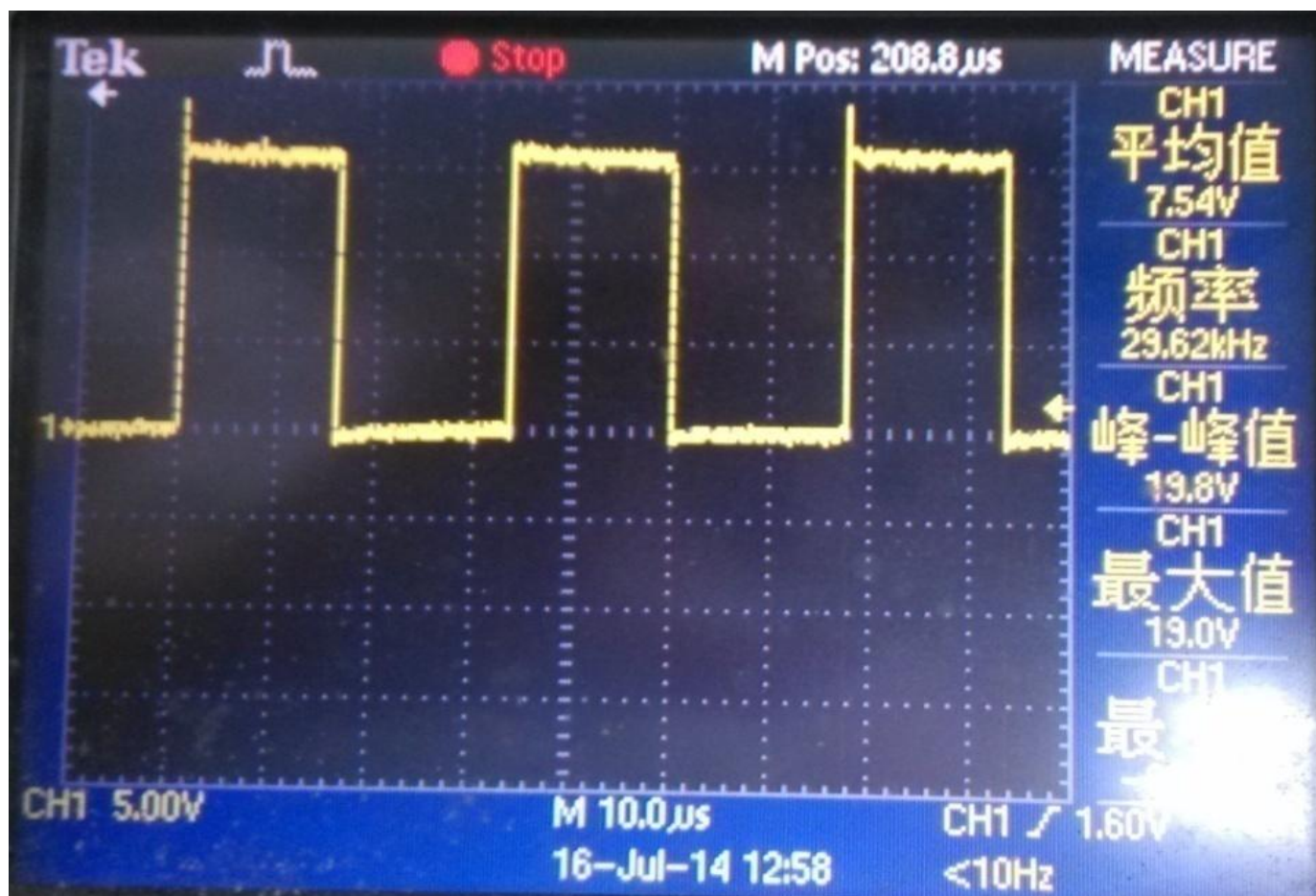
UC3895 Testing



We can use the oscilloscope test pin 13, 14 and pin 17, 18, if the wave as good as the following figure, then the control board works well .

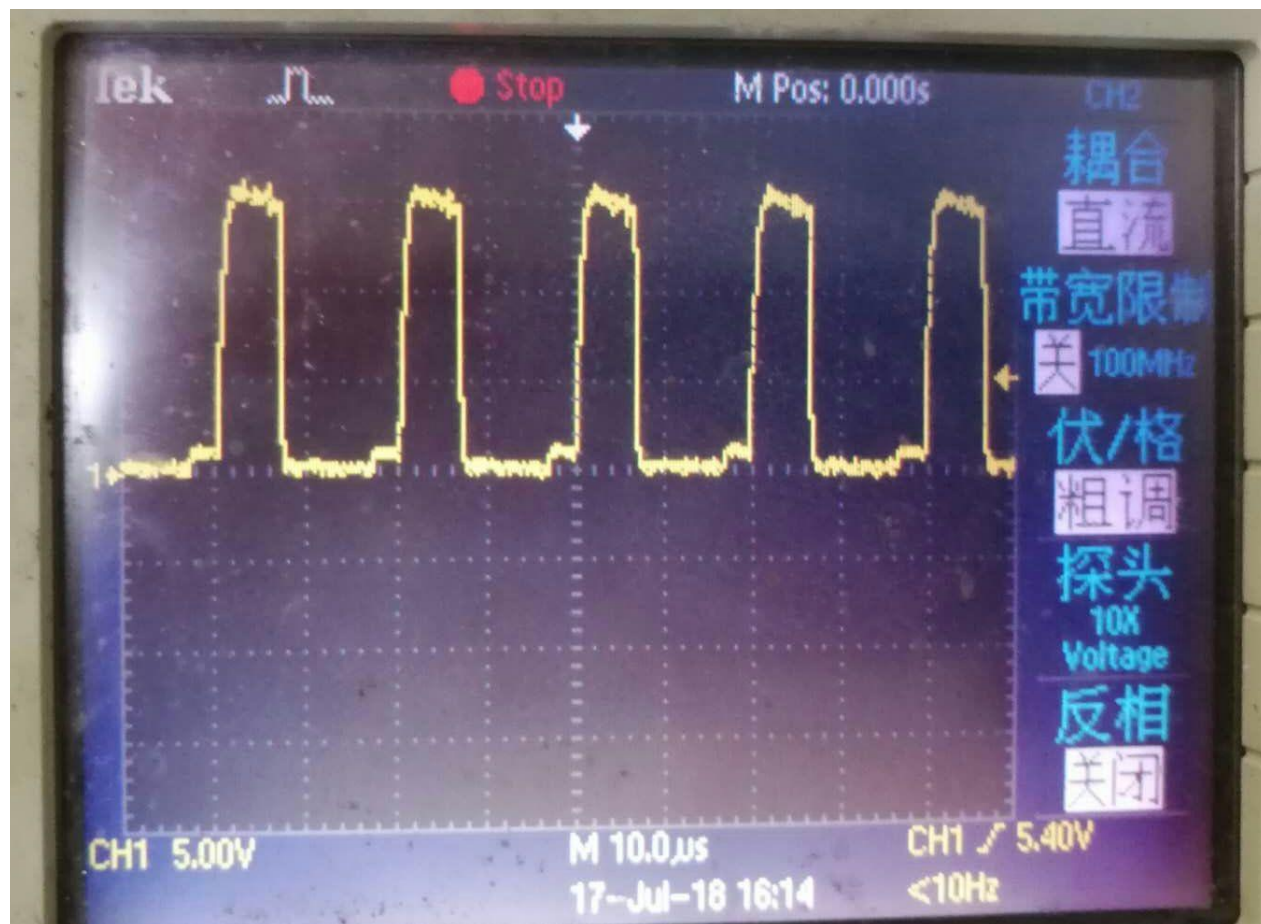


Wave of UCC3895 pin 13 or pin 14、17、18



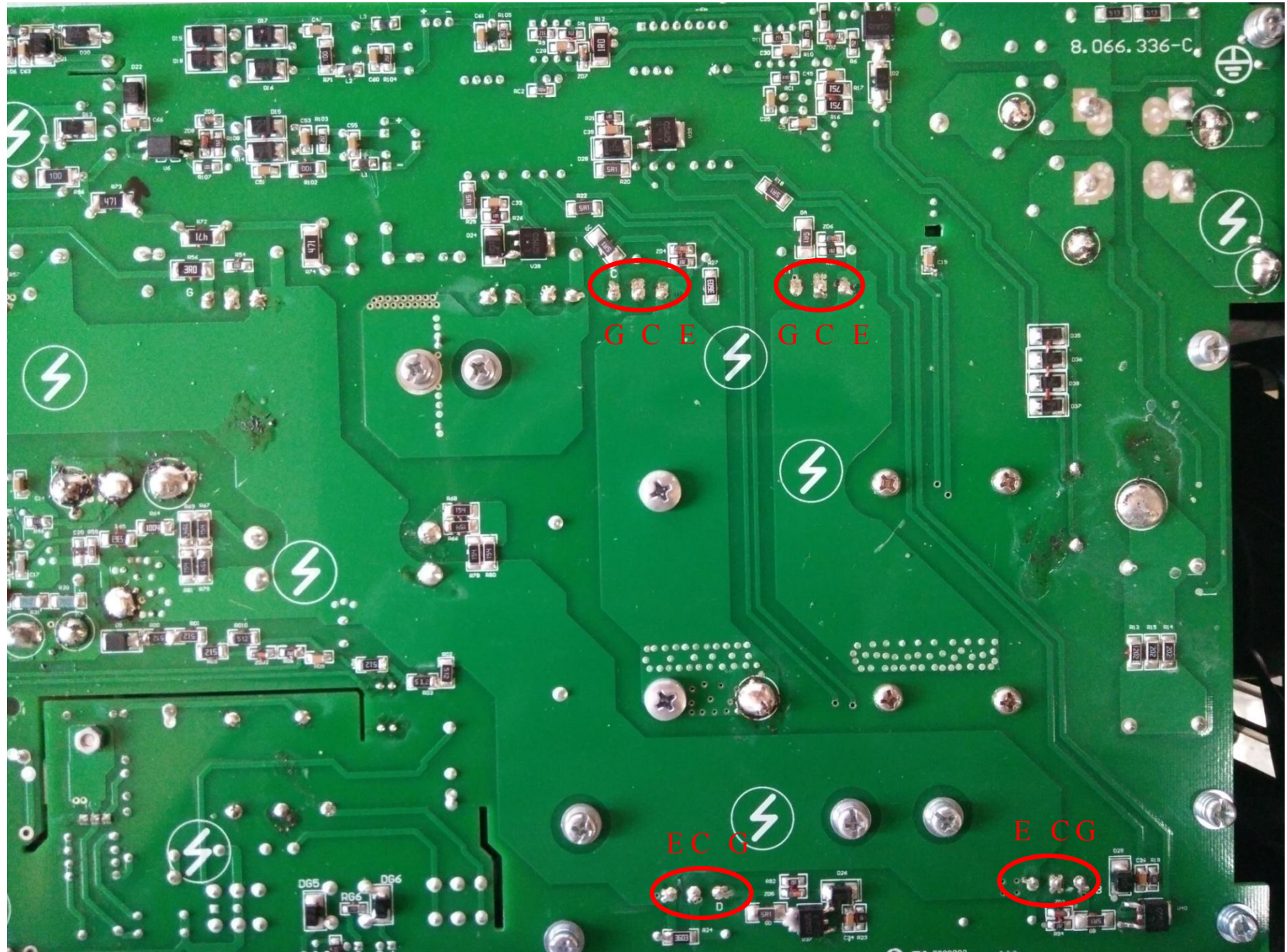


Wave of IGBT pin 1 and pin 3





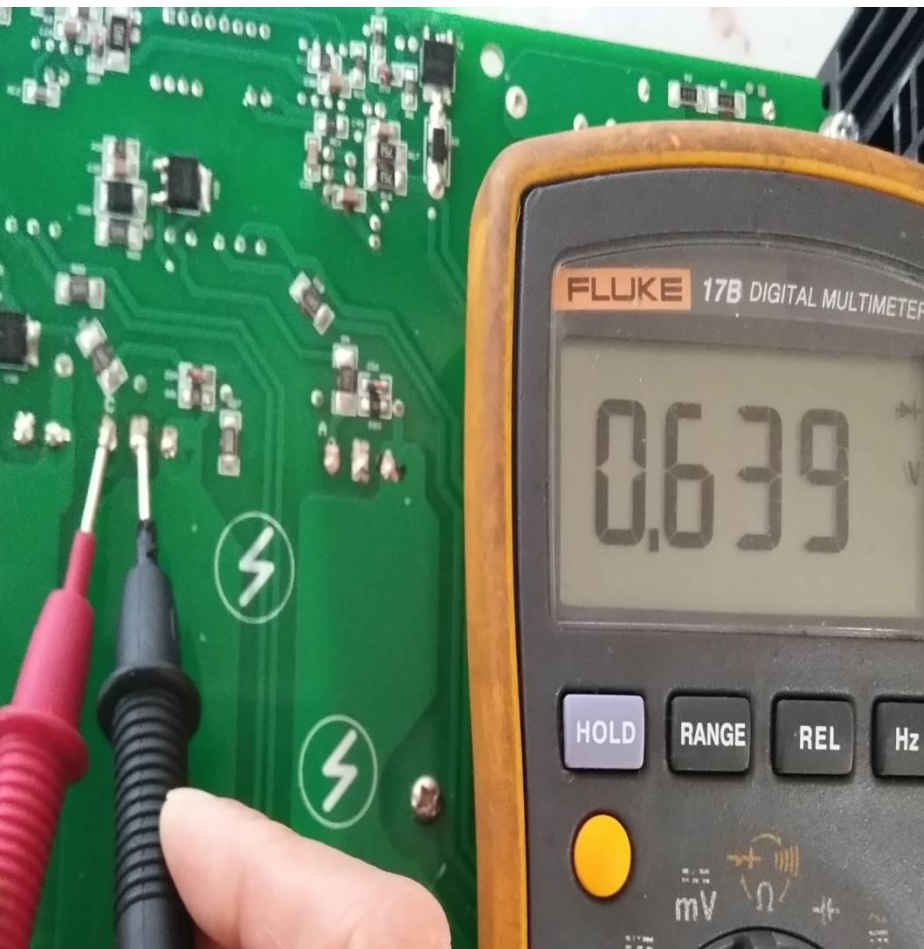
The location of IGBT



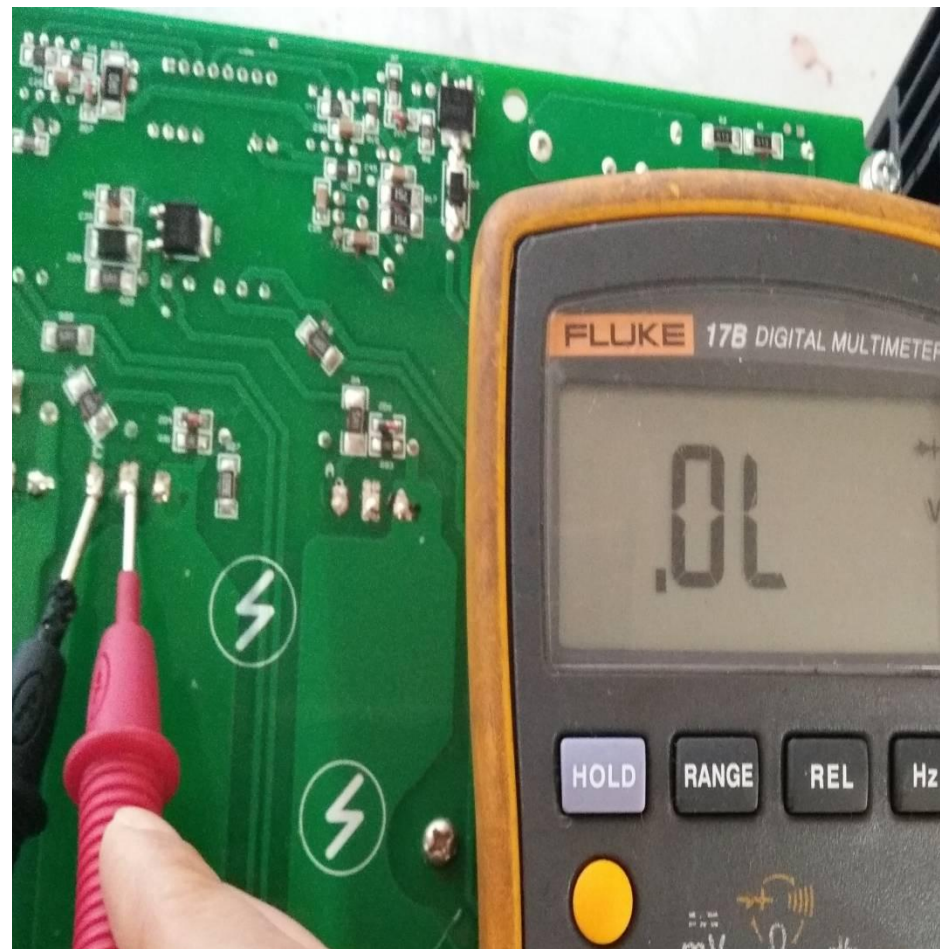


Preparation of test IGBT

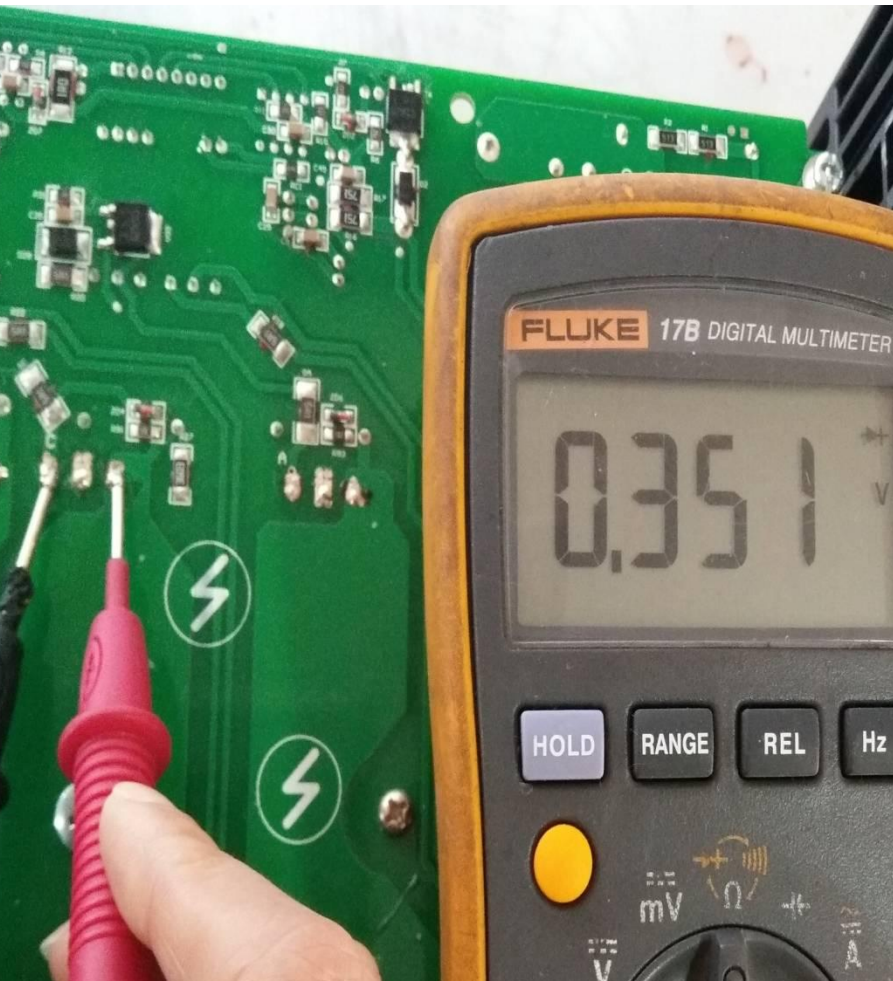
- 1、 We must Switch off the machine
- 2、 After 5 minutes we can test .
- 3、 Turn the rotary switch to test diode.
- 4、 keep 3 seconds when we test every step.
- 5、 If the result we test as similar as the following picture .we can say the IGBT is good. Otherwise there are some IGBT damaged.



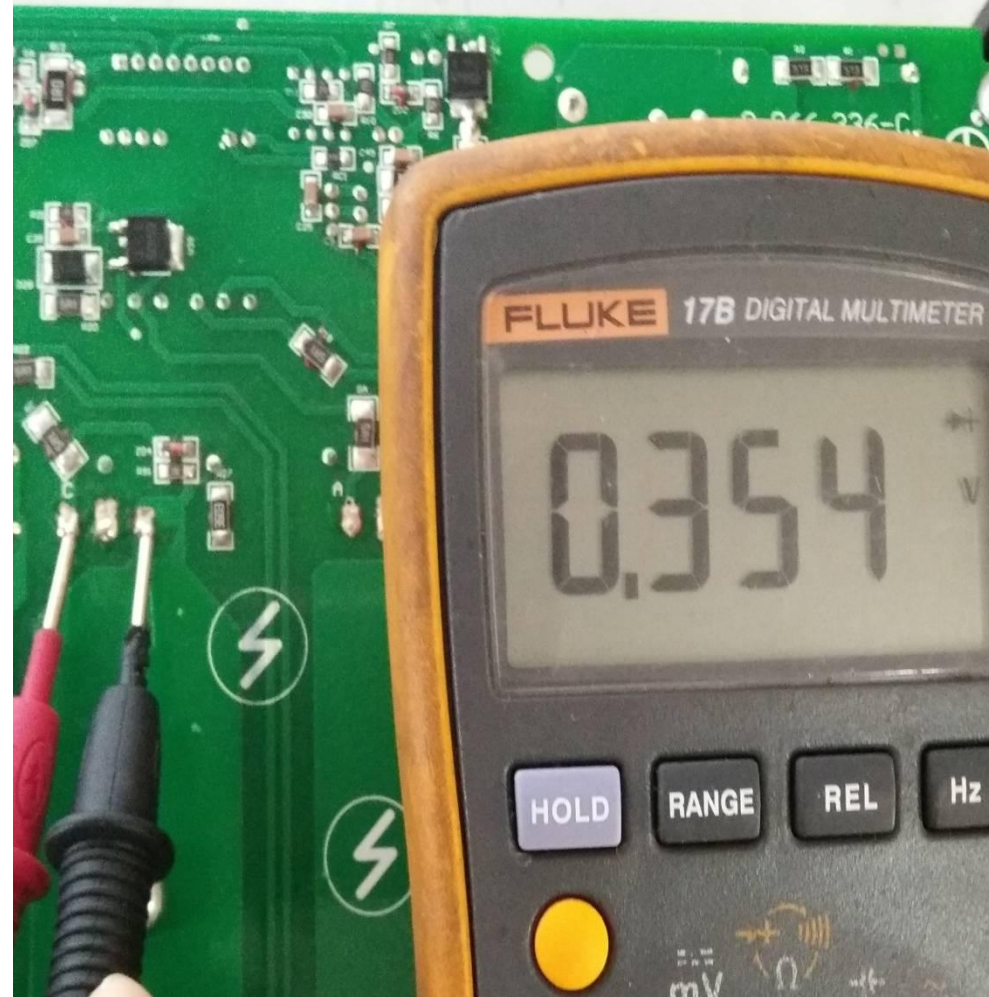
IGBT Test(A-1)



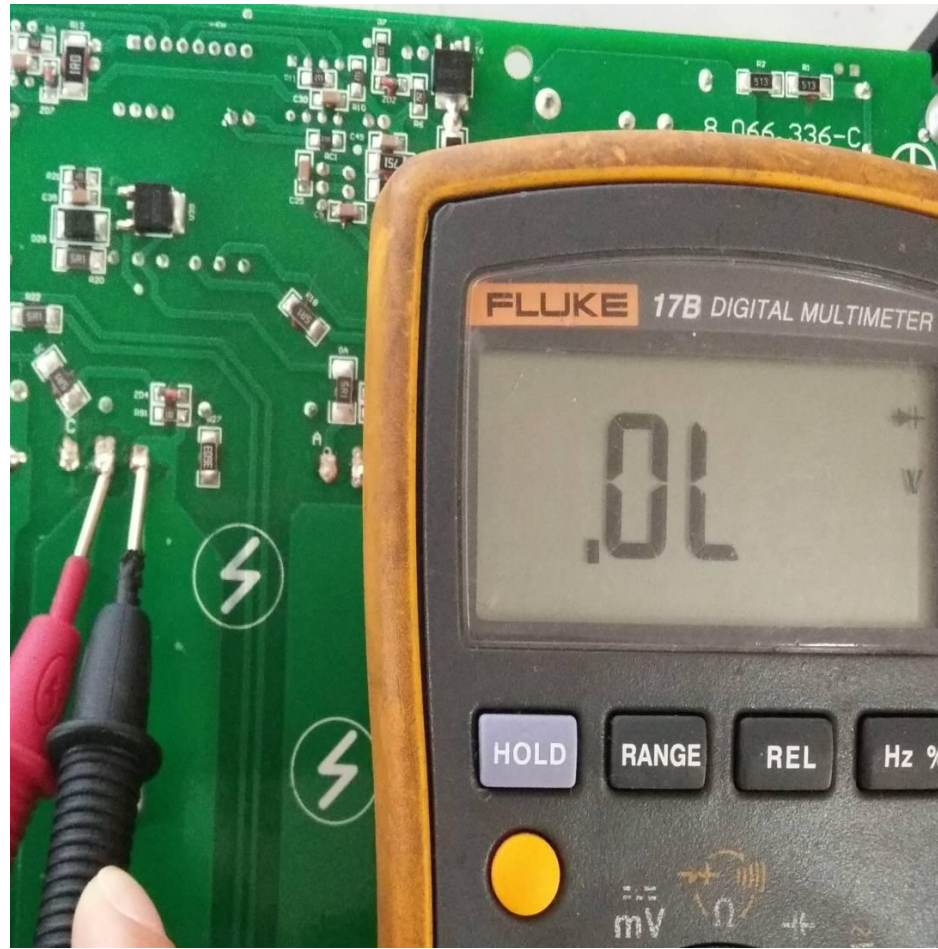
IGBT Test(A-2)



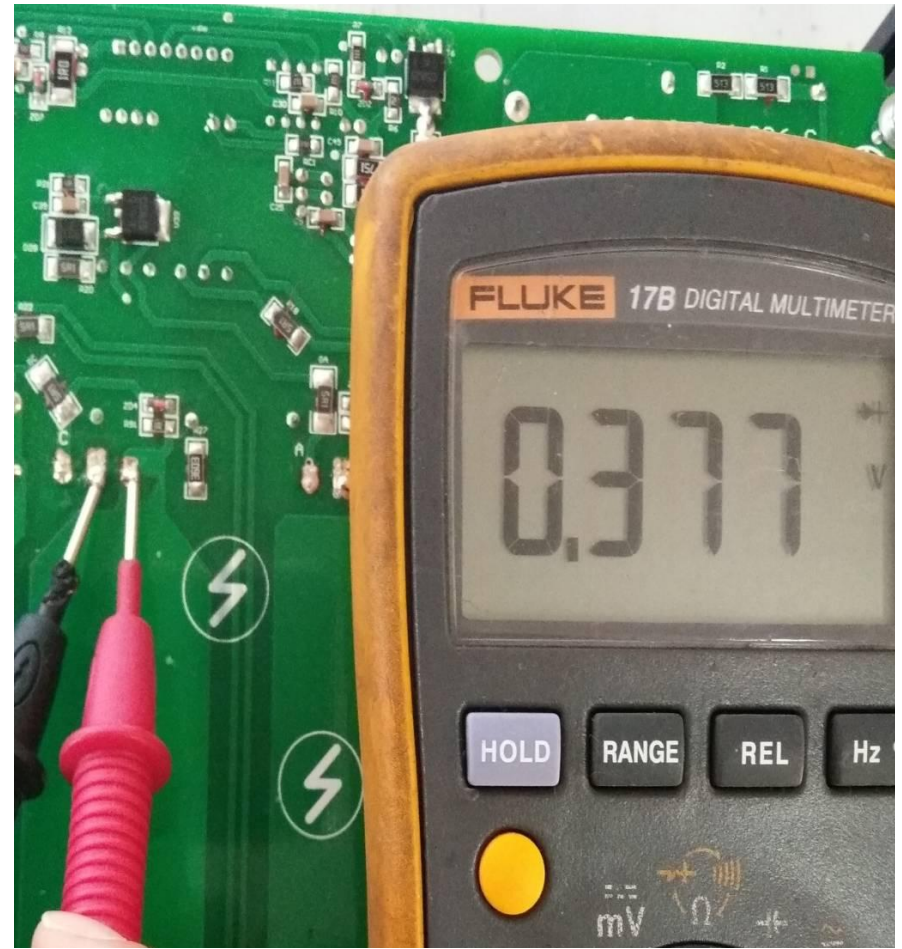
IGBT Test(A-3)



IGBT Test(A-4)



IGBT Test(A-5)

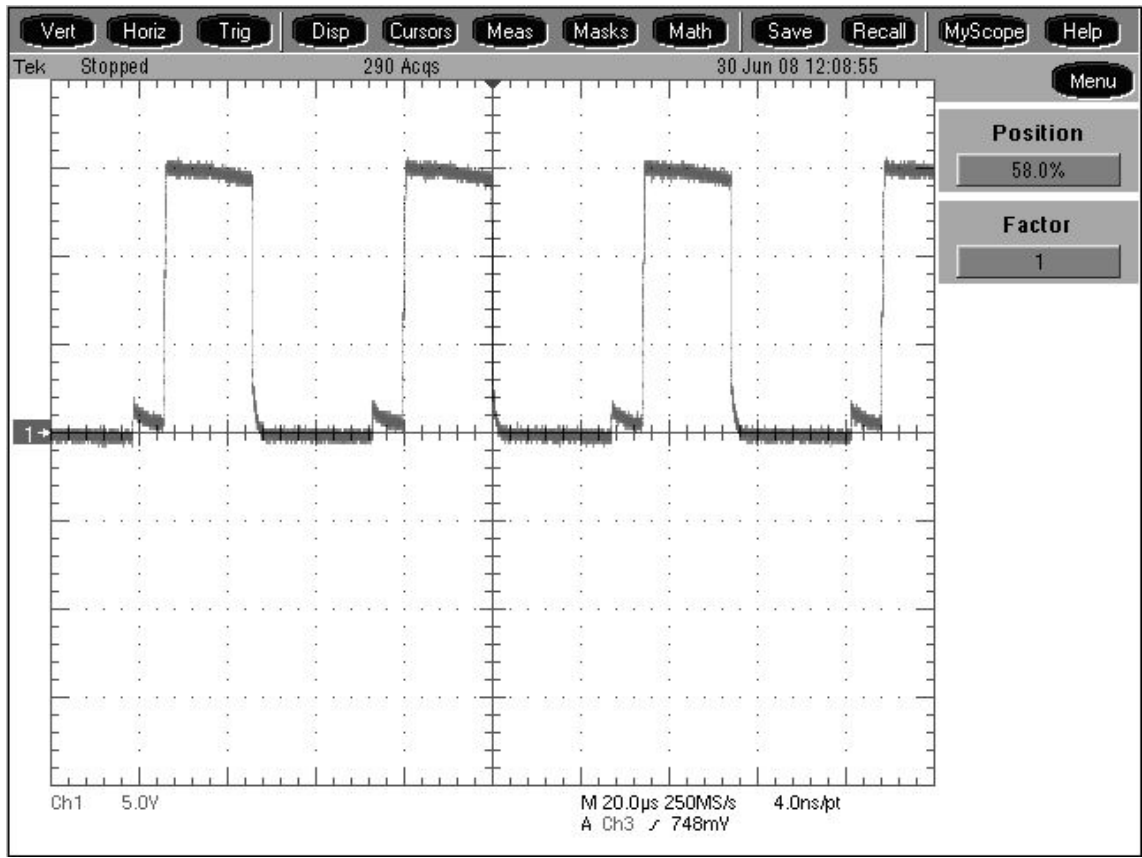


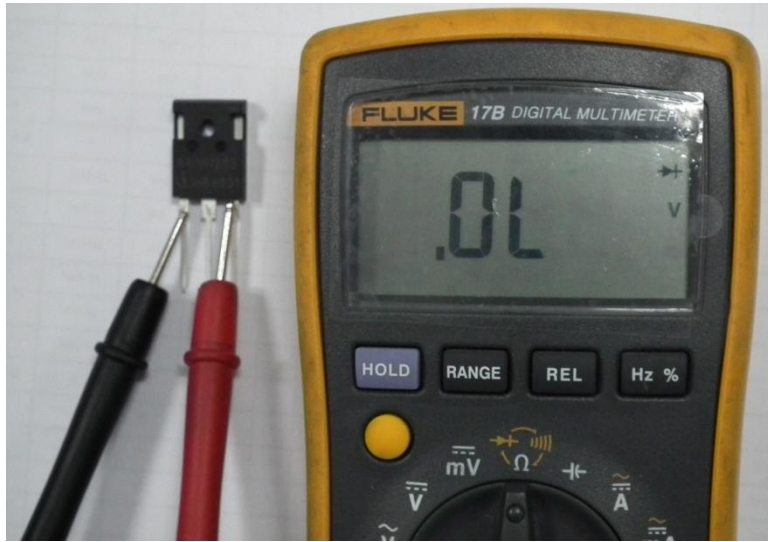
IGBT Test(A-6)



Solutions when the IGBT is damaged.

- 1、 Check the circuit of IGBT driver, may be there are some components damaged.
- 2、 Remove IGBT one by one and test as following page.
- 3、 After we Remove the damaged IGBT. Check the IGBT drive wave (between the G、 E) as same as the below.
- 4、 If not ,we must Replace Components of driver circuit .
- 5、 Replace IC MIC 4424.
- 6、 If the wave is ok .Replace the damaged IGBT.





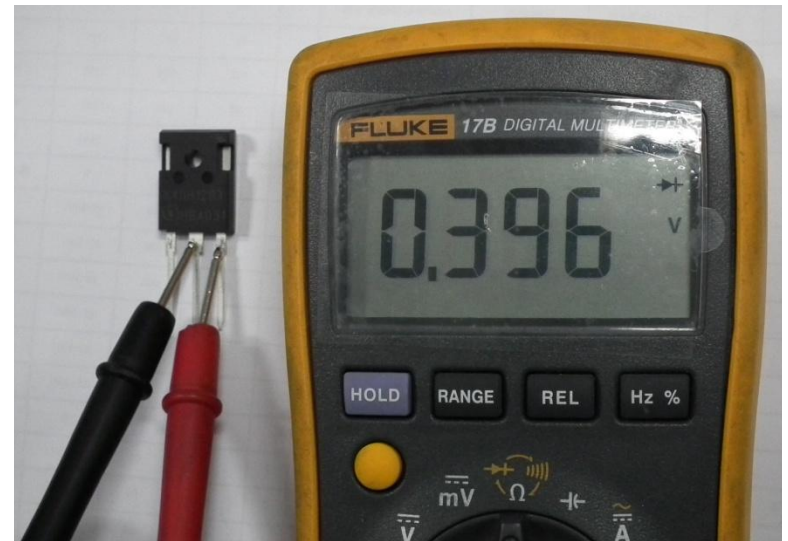
IGBT Test(B-1)



IGBT Test(B-2)



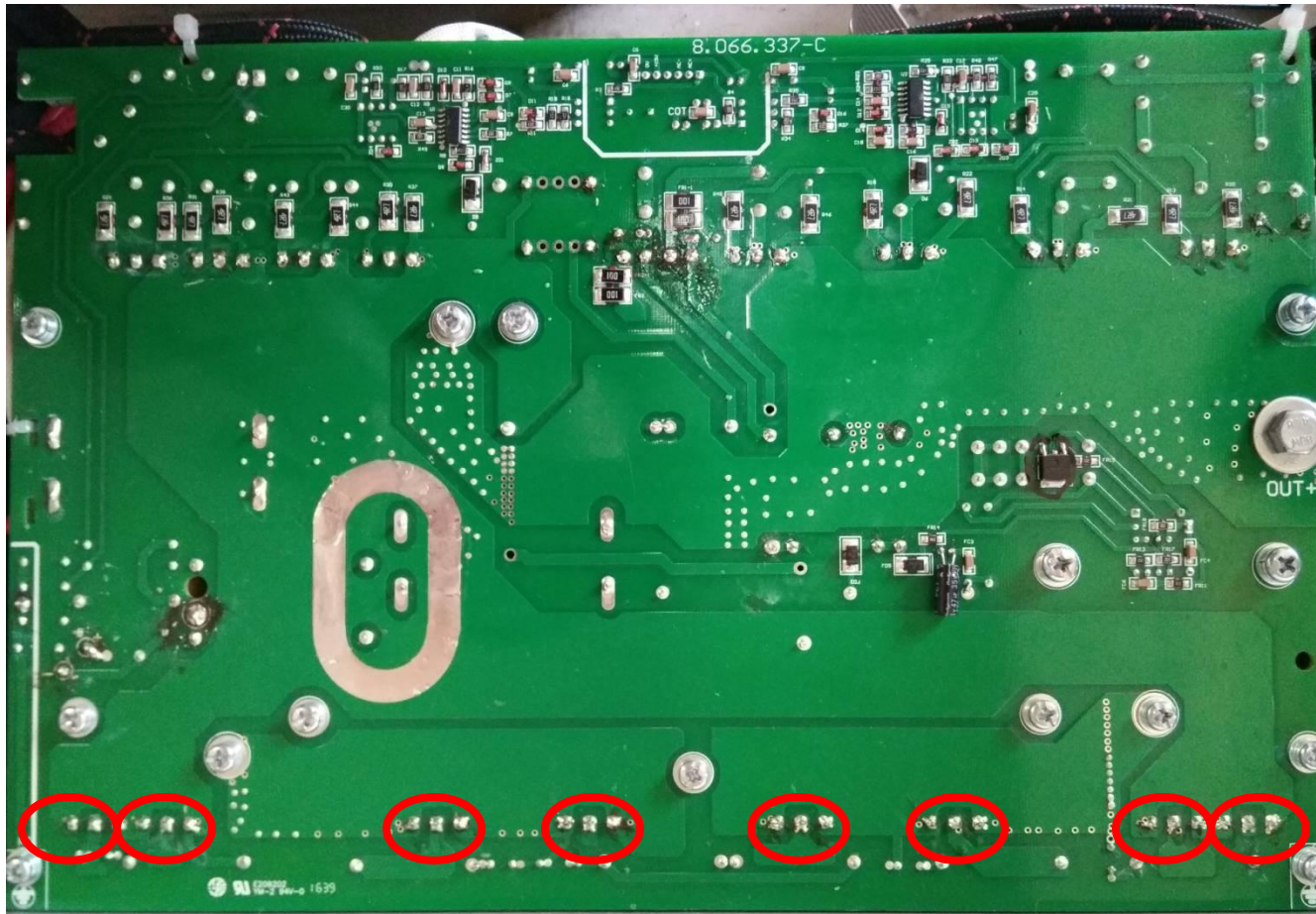
IGBT Test(B-3)



IGBT Test(B-4)



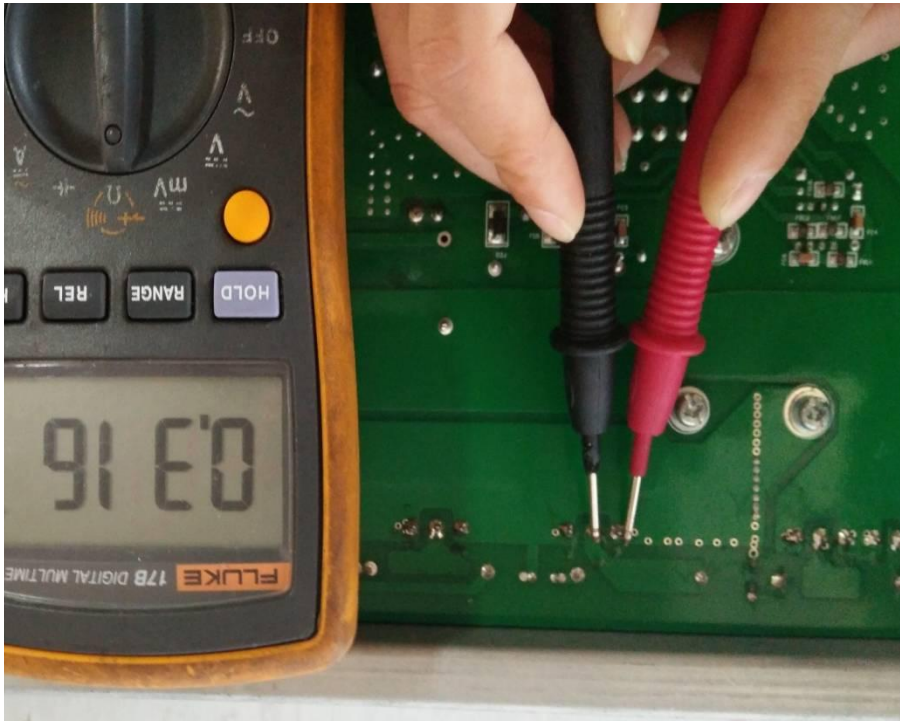
The location of FRD



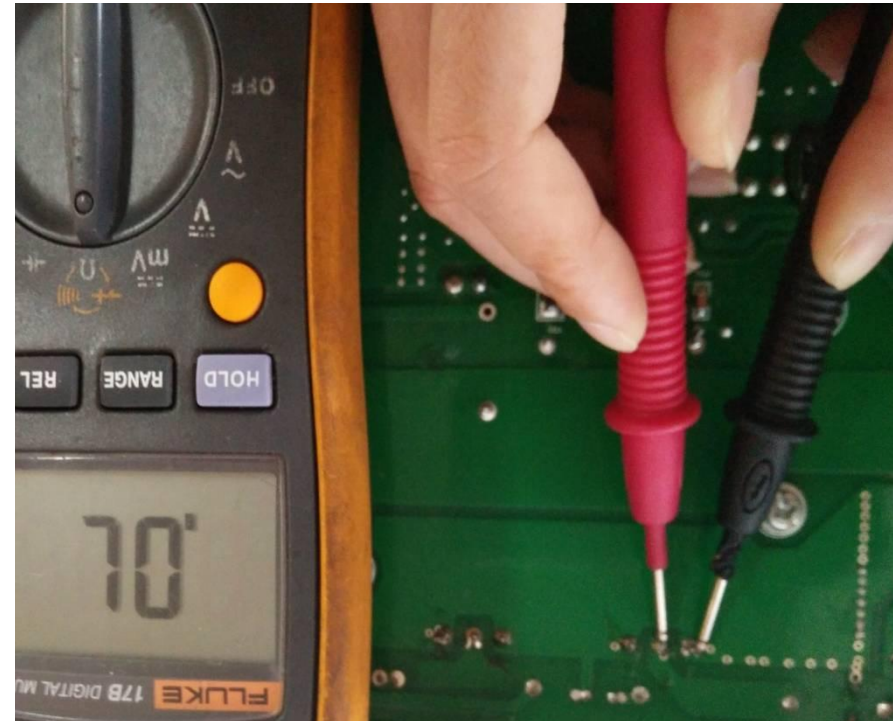


Preparation of test FRD

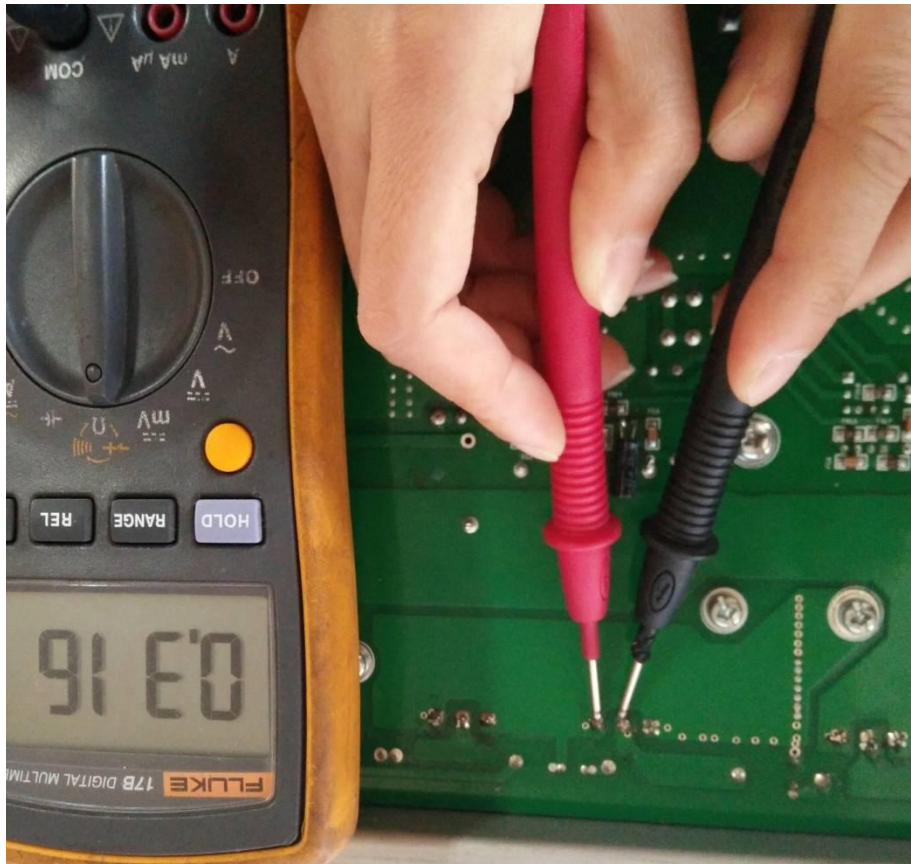
- 1、 We must Switch off the machine
- 2、 After 5 minutes we can test .
- 3、 Turn the rotary switch to test diode.
- 4、 keep 3 seconds when we test every step.
- 5、 If the result we test as similar as the following picture .we can say the FRD is good. Otherwise maybe some MUR are damaged.



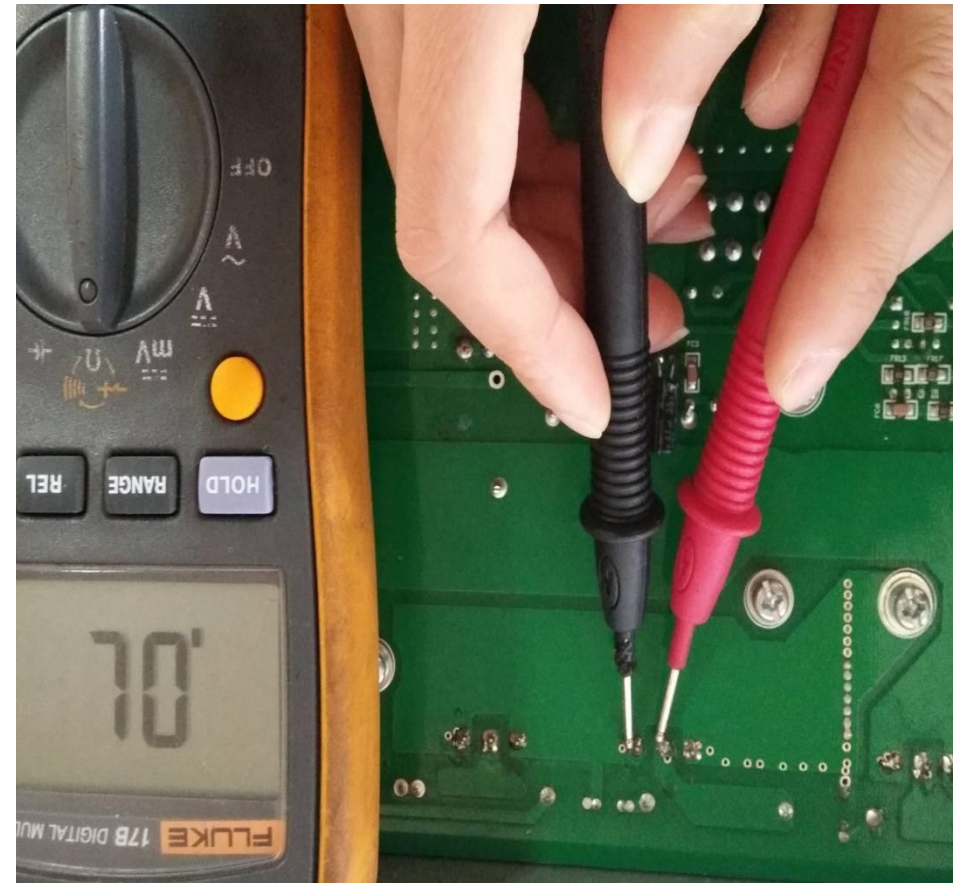
FRD Test(A-1)



FRD Test(A-2)



FRD
Test(A-3)



FRD Test(A-4)



Solutions when the FRD is damaged

- 1、 Remove FRD one by one and test as following page.
- 2、 Replace the damaged FRD.



FRD Test(B-1)



FRD Test(B-2)



FRD Test(B-3)



FRD Test(B-3)



FRD Test(B-4)



Q & A



Thanks for your
attention!!!