Relevant Device

This application note applies to the following device:

BUONO UNO CORE , MassDuino UNO CORE , LC-3000

AC-5000

1 Summary

AC-5000 is a very good AC to DC power supply series, It is compact, stable performance, mainly used for directly from AC power supply scenarios like RF relay control board . It hase 3 voltage for user choice:

AC-5000-5V: Input AC 85 to 265V , Output DC 5V 1000mA

AC-5000-9V: Input AC 85 to 265V , Output DC 9V 600mA

AC-5000-12V: Input AC 85 to 265V , Output DC 12V 500mA

UNO-CORE is a compact version of UNO board , all IO has sink to a double row 2.54mm connector , onboard 3.3V LDO , user will be very easy to add LC-3000 to implement RF connection , UNO-CORE has two MCU version:

BUONO UNO-CORE: use ATMega328P

MassDuino UNO-CORE: use MD-328D

The ATMega328P have 10bit ADC , and MD-328D support 10bit/12bit/16bit ADC , here we use MassDuino UNO-CORE with 12bit ADC , to get more accuracy of ADC.

UNO-CORE have no onboard USB to UART convertor , so here we need a USB to UART cable , INHAOS have a number of choice for the USB to UART cable:

UC-2102 : http://www.inhaos.com/product_info.php?products_id=120

UC-340G : http://www.inhaos.com/product_info.php?products_id=15 9

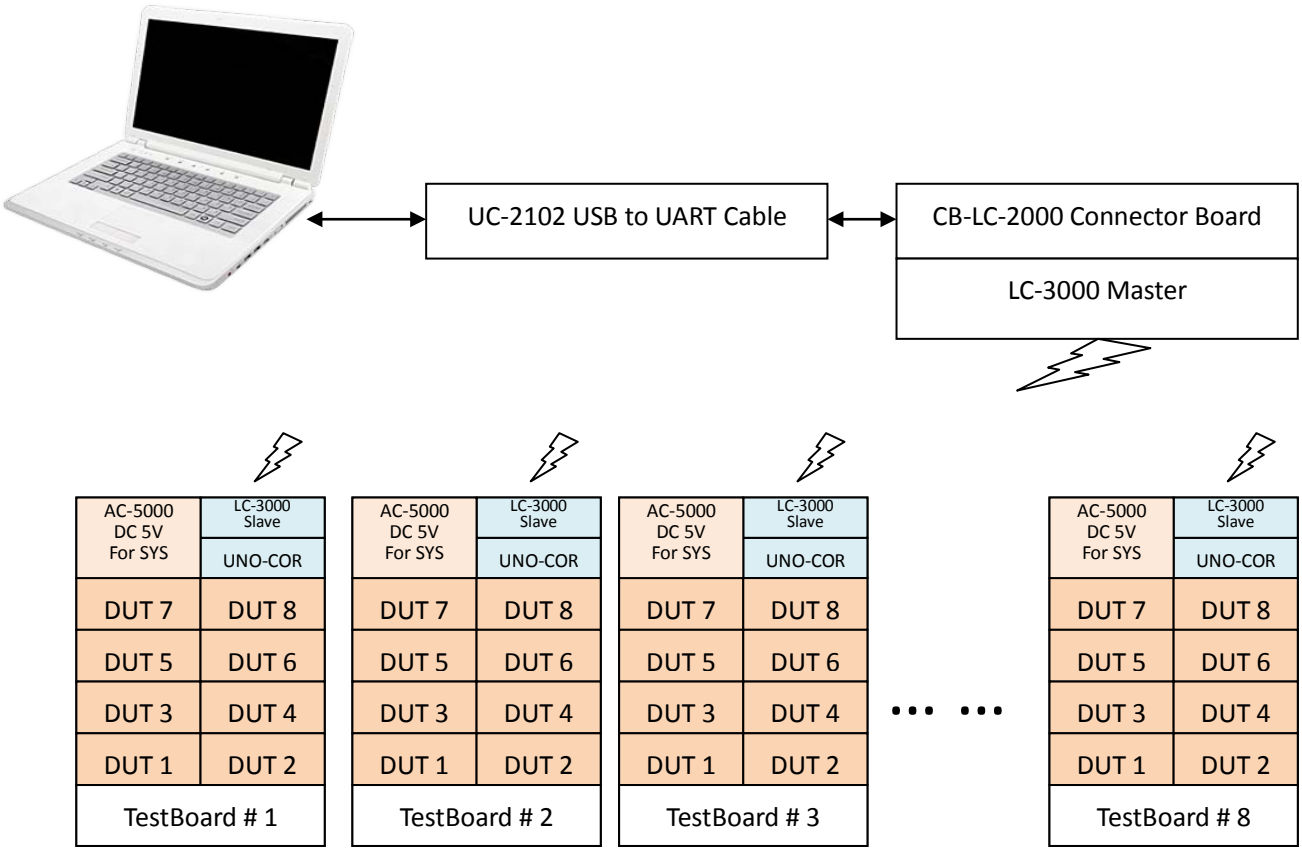
AC-5000 : http://www.inhaos.com/product_info.php?products_id=160

MassDuino UNO-CORE: http://www.inhaos.com/product_info.php?products_id=158

Here have a very important step in all AC to DC power supply production, it's burn-in test, about the burn-in test , please refer to: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwi5tJXL2dPMAhXDjpQKHRe9Cl8QFggdMAA&url=http%3A%2F%2Fwww.tek.com%2Fdocument%2Fapplication-note%2Fburn-testing-techniques-switching-power-supplies%3Fasset%3D2080&usg=AFQjCNH5QCwGoRrQ4fQJ_3bO5SYP-LB7Ag

We have adopted a over traditional Burn-in Test more rigorous testing methods, with full loading and 4Hours constant output , and we measurement the voltage each one sec during the testing. After this test method, the quality of all products can be fully guaranteed.

2 System structure



In this system , every test board can be test 8 pcs of DUT , the UNO-CORE have 8-ch of 12bit ADC , it will measurement the DUT every one sec , and then sent to PC via LC-3000

If we made 8 sets of test board , which means we can test 64 pcs AC-5000 DUT at the same time.

2.1 About the Test Board:

The schematic of the test board show in below

Each DUT with a const load , the value is :

AC-5000-5V: Load resistor = 5.1R 20W , rated power = 4.9W

AC-5000-9V: Load resistor = 15R 20W , rated power = 5.4W

AC-5000-12V: Load resistor = 24R 20W , rated power = 6W

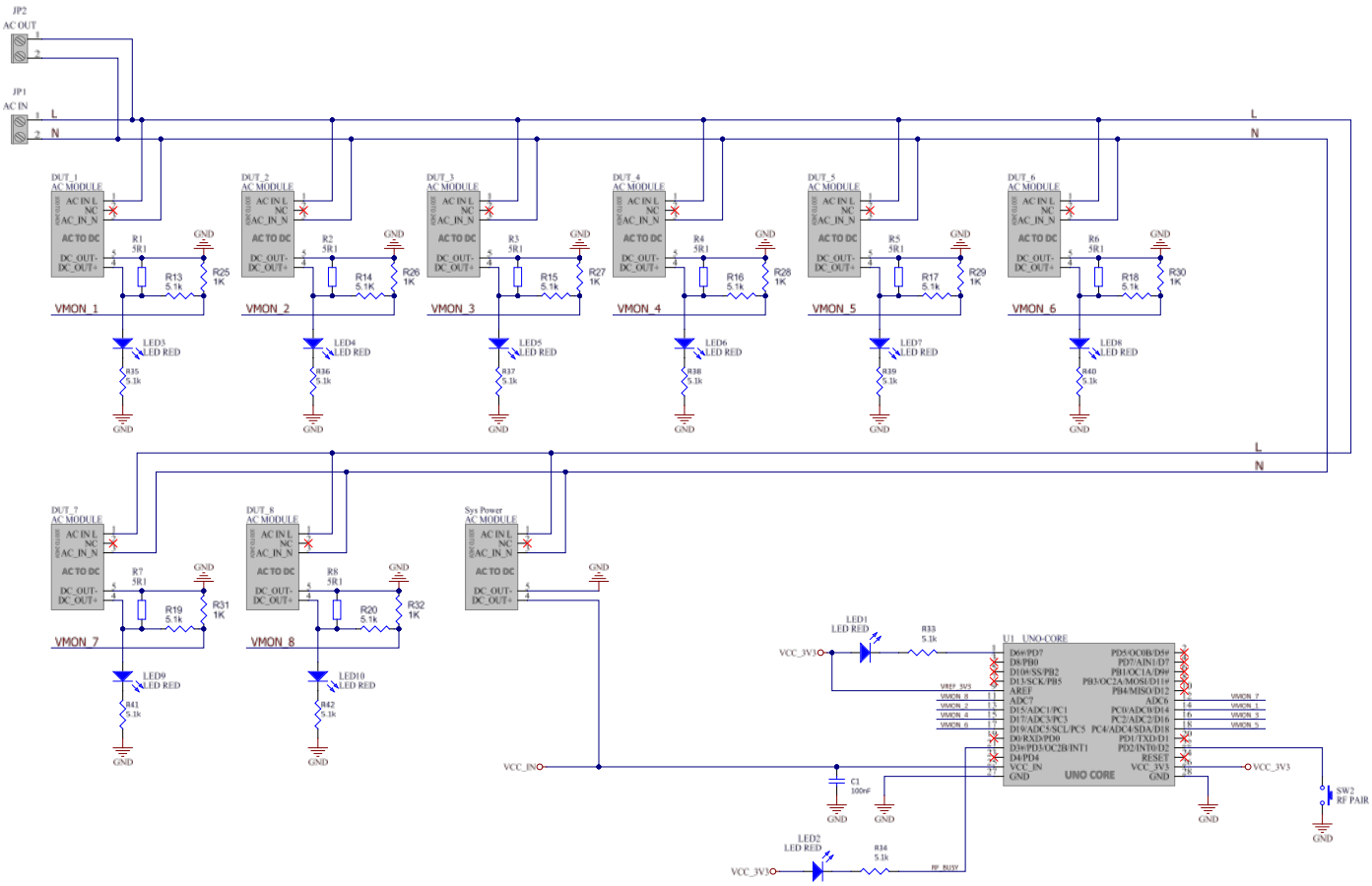
Since the ADC reference is 3.3V , so we need a voltage divider to extend input range , the input range is :

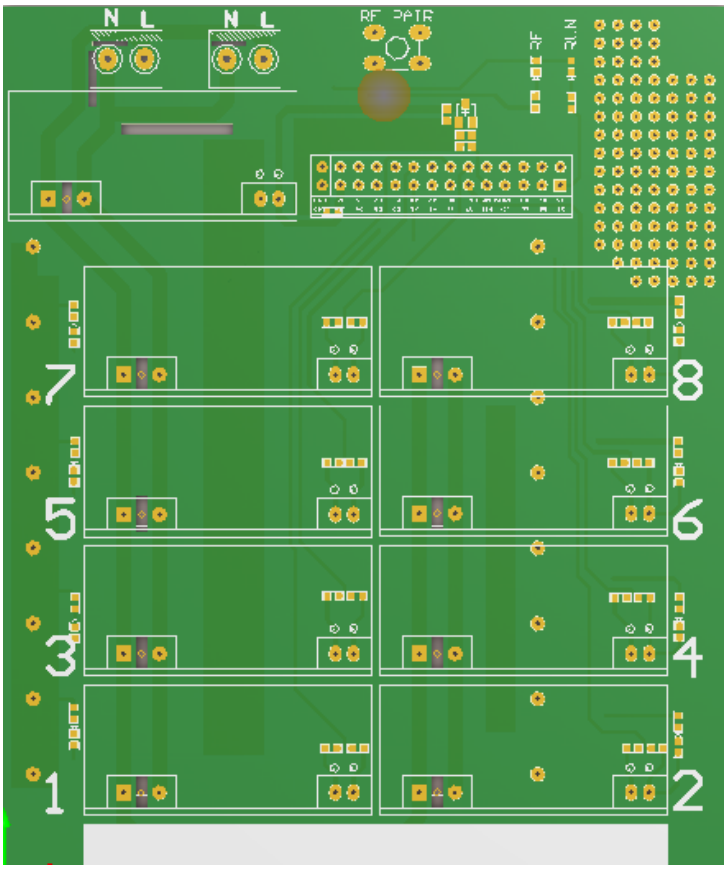
Max Input = 1K / (1K + 5.1K) * 3.3V = 20.13V

We used 12bit resolution for ADC , so the voltage resolution is:

Resolution = Max Range / (2^12) = 4.915mV

For this application , it is very good resolution.


JP2
AC OUT
JP1
AC IN
L
N
DUT_1 AC MODULE
DUT_2 AC MODULE
DUT_3 AC MODULE
DUT_4 AC MODULE
DUT_5 AC MODULE
DUT_6 AC MODULE
DUT_7 AC MODULE
DUT_8 AC MODULE
Sys Power AC MODULE
AC TO DC
VMON_1
VMON_2
VMON_3
VMON_4
VMON_5
VMON_6
VMON_7
VMON_8
LED3 LED RED
LED4 LED RED
LED5 LED RED
LED6 LED RED
LED7 LED RED
LED8 LED RED
LED9 LED RED
LED10 LED RED
LED1 LED RED
LED2 LED RED
U1 UNO-CORE
UNO CORE
VCC_3V3
VCC_IN
GND
SW2
RF PAIR


RF PATH
1
2
3
4
5
6
7
8

2.2 About LC-3000

LC-3000 is a Multi-to-Multi (M2M) 2.4GHz wireless uart module , it contains multi Master and multi Slave , any Master can be talking to any Slave if they are paired. The Feature of LC-3000 in below:

1, Multiplex Master and multiple Slave can be paired each other.

2, Any Master can be communication to Any Slave .

3, Master can not communication with Master and Slave are also.

4, After paired , the communication format is:

=AAA:DDDDDDD<CR LF>

Which:

"=" is a fixed symbol

AAA is other side's address , every module have it's own 4Bytes of UID, AAA is the last byte in Decimal.

":" is a fixed symbol

DDDDDDD: is the data what you want to sent , the max lenght is 240 Bytes.

<CR LF> : is fixed symbol , with 2 bytes of hex data “0x13 0x10”

For example:

If Master(Add 010) want sent a string "Hello" to Slave (Add 013) , you should print below data to Master:

=013:Hello<CR LF>

The Slave will be get data:

=010:Hello<CR LF>

If the Salve want to reply "OK" , you should print below data to Slave:

=010:OK<CR LF>

The Master will be get data:

=013:OK<CR LF>

3 Using LC-3000 in Arduino IDE

Although the LC-3000 has been simple enough to use, and we still wrote a Arduino Lib for it, Some code reference as below.

```
#include <LC3000.h>
#include <LC3000_Config.h>

LC3000 lc01(2, 3);    //configPin, busyPin

void setup()
{
    Serial.begin(115200);
    lc01.begin(LC3000_WriteFunc, LC3000_EventProc, LC3000_SerialListenFunc);
}

void loop()
{
    lc01.doLoop();
    AdcReadProcess(); // Read ADC
    Keyboard_Process(); // Key Scan
    if (g_TimerState)
    {
        g_TimerState = false;
        SendADCValue();  //Sent ADC Data
        g_LedState = !g_LedState;
        if( g_LedState )
```

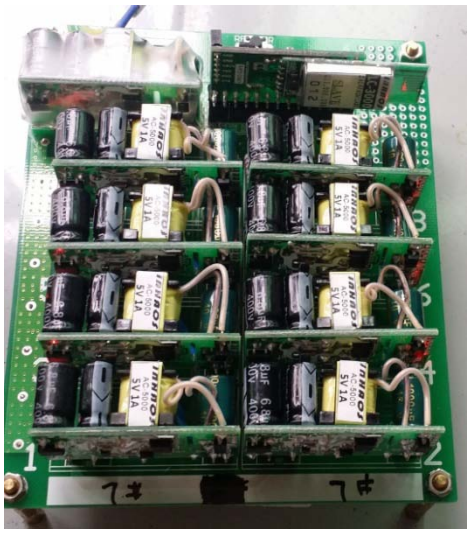
```
        {
            digitalWrite( PIN_LED , HIGH );
        }
        else
        {
            digitalWrite( PIN_LED , LOW );
        }
    }
}

void serialEvent()
{
    while (Serial.available())
    {
        // get the new byte:
        byte inChar = Serial.read();
        lc01.receiveByte(inChar);
    }
}
void LC3000_WriteFunc(uint8_t *wData, uint16_t len)
{
    Serial.write(wData, len);    //USE SERIAL1
    // Serialx.write(wData, len);    //USE SERIAL 2,3,4...
    // mySerial.write(wData, len);  //USE SOFTWARE SERIAL
}
//For Soft Serial Listen Process
void LC3000_SerialListenFunc()
{
}

bool LC3000_EventProc(uint8_t eventType, uint16_t cmdOrGroup, uint8_t *eventData, uint16_t eventDataLen)
{
    switch (eventType)
    {
    case LC_EVENT_DATA:
        break;
    case LC_EVENT_BROADCAST:
        break;
    case LC_EVENT_RESPONSE:
        break;
    }
    return true;
}
```

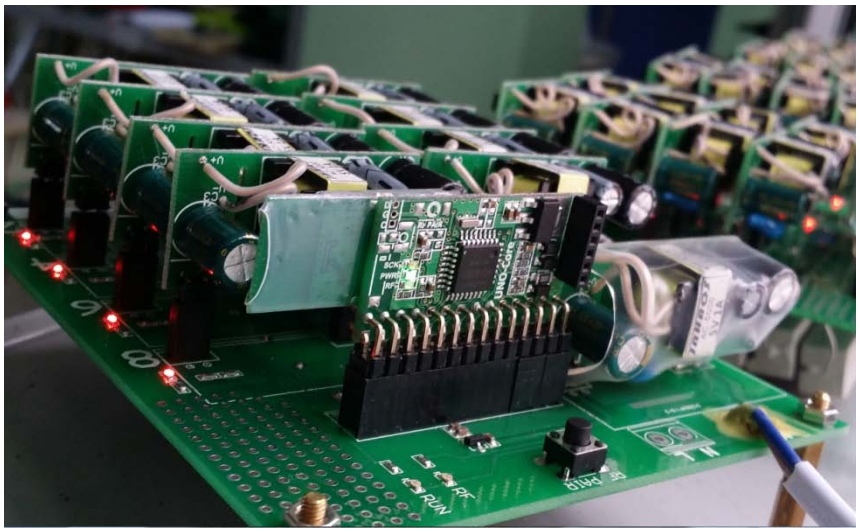
More about the LC-3000 using , Please refer to the relevant documentation.

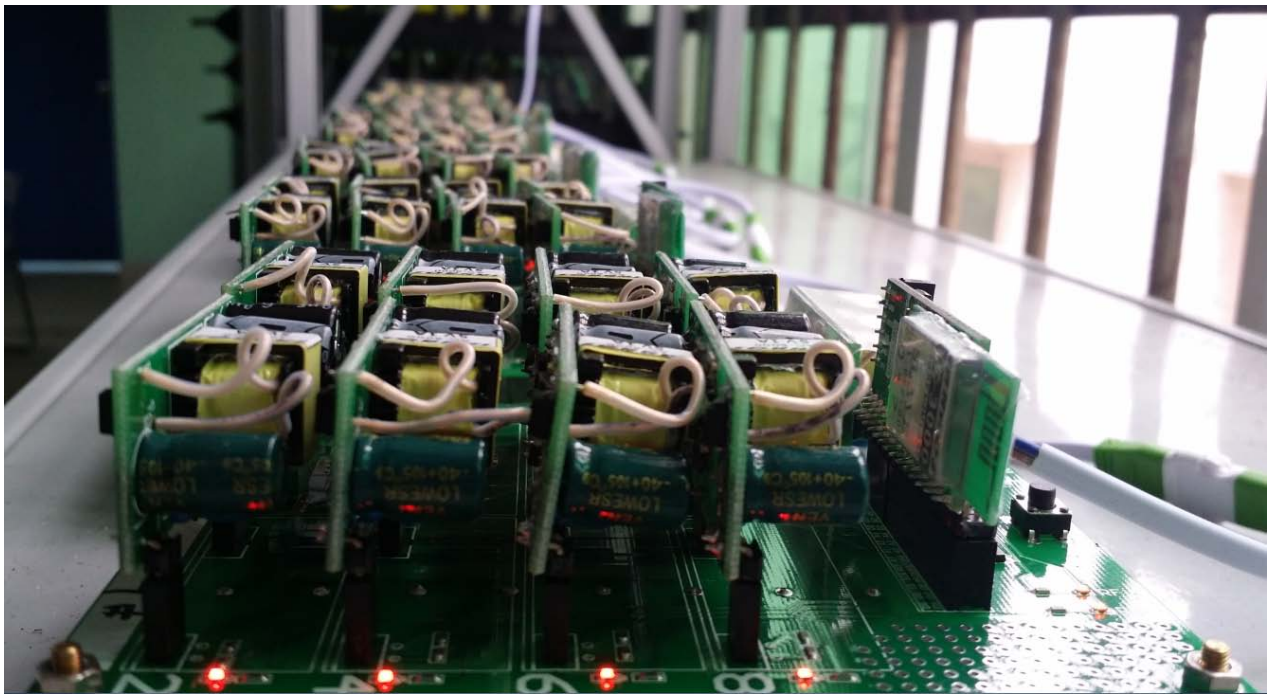
4 PC Software

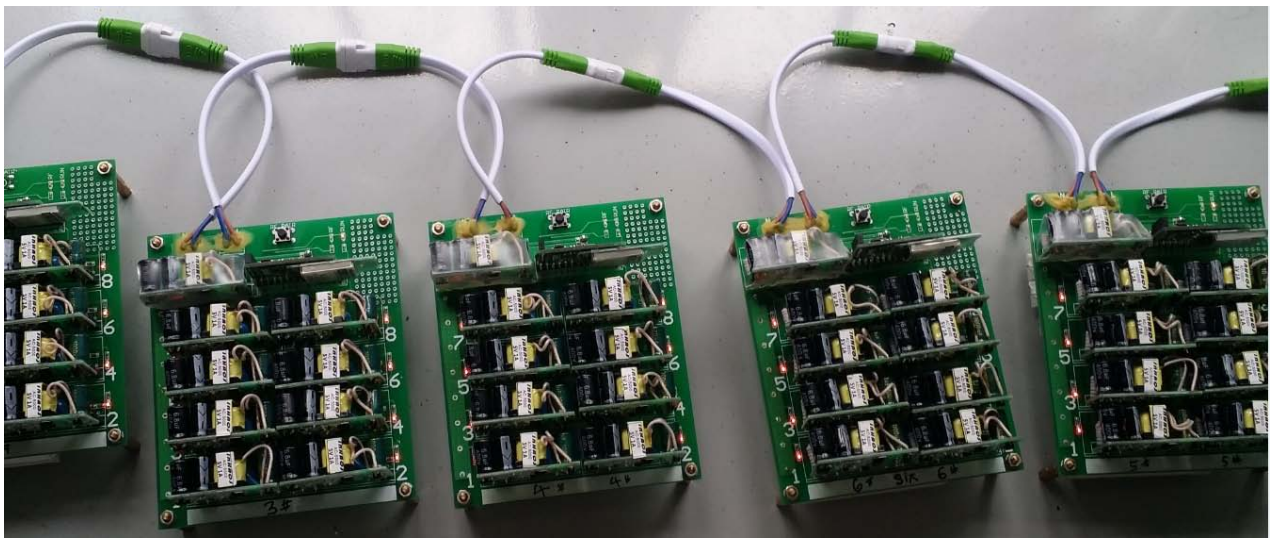
We also wrote a PC software to record the data , all test data will be show on a chart and can be save as a CSV files , the PC software is write by VB2013.

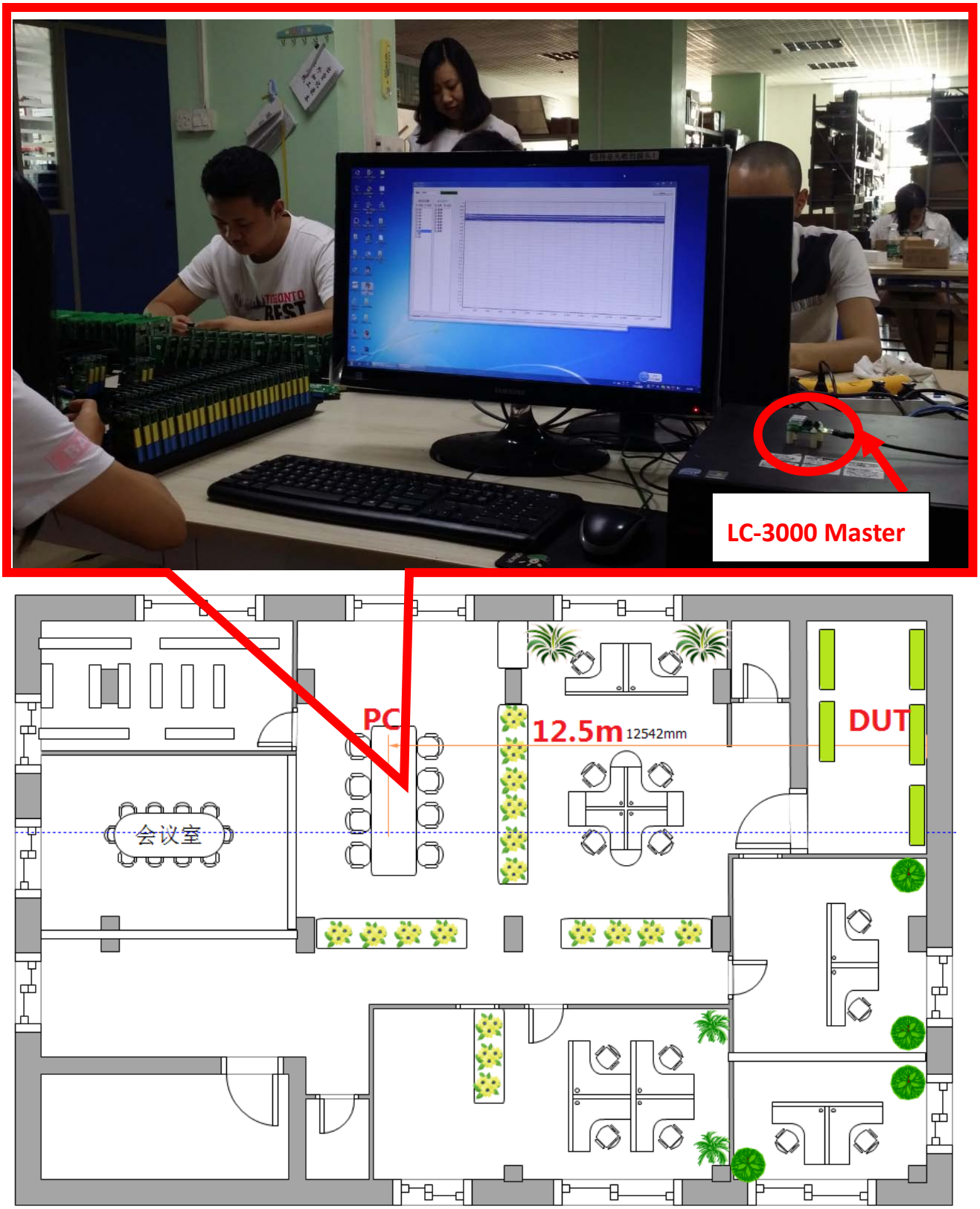
5 Real picture



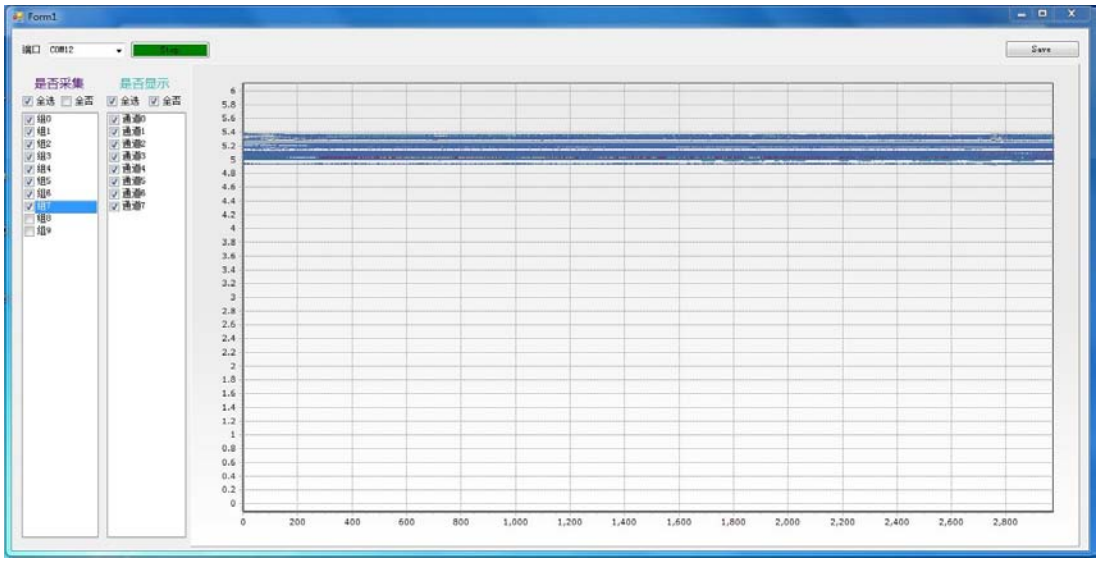






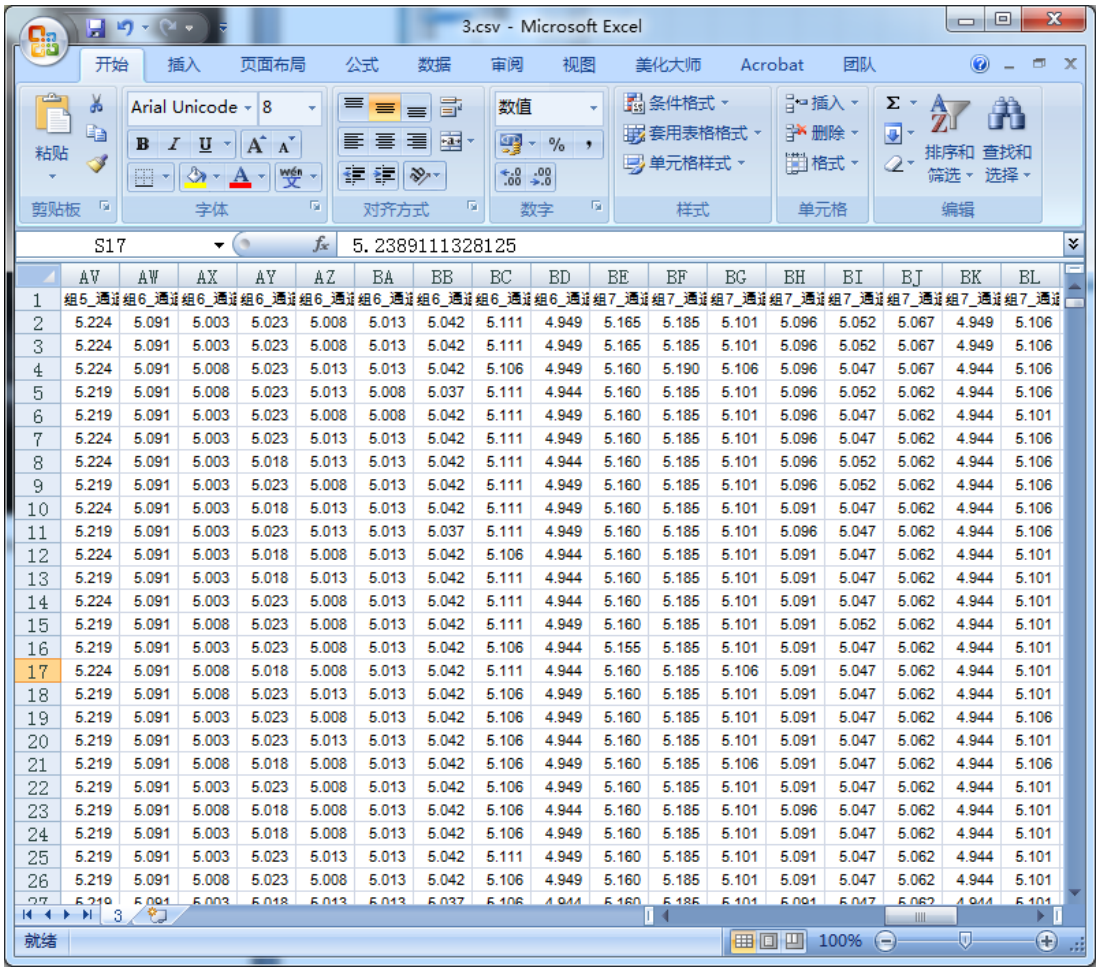


PC from the DUT distance of about 10m, through 2.4GHz RF signal communication between them, the reality shows that communication is very stable for a long time.



The chart show that the voltage is very stable in whole test processing.

Also we can see the detailed test data log in a .csv files.



	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL
1	组5_通道	组6_通道	组6_通道	组6_通道	组6_通道	组6_通道	组6_通道	组6_通道	组6_通道	组7_通道	组7_通道	组7_通道	组7_通道	组7_通道	组7_通道	组7_通道	组7_通道
2	5.224	5.091	5.003	5.023	5.008	5.013	5.042	5.111	4.949	5.165	5.185	5.101	5.096	5.052	5.067	4.949	5.106
3	5.224	5.091	5.003	5.023	5.008	5.013	5.042	5.111	4.949	5.165	5.185	5.101	5.096	5.052	5.067	4.949	5.106
4	5.224	5.091	5.008	5.023	5.013	5.013	5.042	5.106	4.949	5.160	5.190	5.106	5.096	5.047	5.067	4.944	5.106
5	5.219	5.091	5.008	5.023	5.013	5.008	5.037	5.111	4.944	5.160	5.185	5.101	5.096	5.052	5.062	4.944	5.106
6	5.219	5.091	5.003	5.023	5.008	5.008	5.042	5.111	4.949	5.160	5.185	5.101	5.096	5.047	5.062	4.944	5.101
7	5.224	5.091	5.003	5.023	5.013	5.013	5.042	5.111	4.949	5.160	5.185	5.101	5.096	5.047	5.062	4.944	5.106
8	5.224	5.091	5.003	5.018	5.013	5.013	5.042	5.111	4.944	5.160	5.185	5.101	5.096	5.052	5.062	4.944	5.106
9	5.219	5.091	5.003	5.023	5.008	5.013	5.042	5.111	4.949	5.160	5.185	5.101	5.096	5.052	5.062	4.944	5.106
10	5.224	5.091	5.003	5.018	5.013	5.013	5.042	5.111	4.949	5.160	5.185	5.101	5.091	5.047	5.062	4.944	5.106
11	5.219	5.091	5.003	5.023	5.013	5.013	5.037	5.111	4.949	5.160	5.185	5.101	5.096	5.047	5.062	4.944	5.106
12	5.224	5.091	5.003	5.018	5.008	5.013	5.042	5.106	4.944	5.160	5.185	5.101	5.091	5.047	5.062	4.944	5.101
13	5.219	5.091	5.003	5.018	5.013	5.013	5.042	5.111	4.944	5.160	5.185	5.101	5.091	5.047	5.062	4.944	5.101
14	5.224	5.091	5.003	5.023	5.008	5.013	5.042	5.111	4.944	5.160	5.185	5.101	5.091	5.047	5.062	4.944	5.101
15	5.219	5.091	5.008	5.023	5.008	5.013	5.042	5.111	4.949	5.160	5.185	5.101	5.091	5.052	5.062	4.944	5.101
16	5.219	5.091	5.003	5.023	5.008	5.013	5.042	5.106	4.944	5.155	5.185	5.101	5.091	5.047	5.062	4.944	5.101
17	5.224	5.091	5.008	5.018	5.008	5.013	5.042	5.111	4.944	5.160	5.185	5.106	5.091	5.047	5.062	4.944	5.101
18	5.219	5.091	5.008	5.023	5.013	5.013	5.042	5.106	4.949	5.160	5.185	5.101	5.091	5.047	5.062	4.944	5.101
19	5.219	5.091	5.003	5.023	5.008	5.013	5.042	5.106	4.949	5.160	5.185	5.101	5.091	5.047	5.062	4.944	5.106
20	5.219	5.091	5.003	5.023	5.013	5.013	5.042	5.106	4.944	5.160	5.185	5.101	5.091	5.047	5.062	4.944	5.101
21	5.219	5.091	5.008	5.018	5.008	5.013	5.042	5.106	4.949	5.160	5.185	5.106	5.091	5.047	5.062	4.944	5.106
22	5.219	5.091	5.003	5.023	5.008	5.013	5.042	5.106	4.949	5.160	5.185	5.101	5.091	5.047	5.062	4.944	5.101
23	5.219	5.091	5.008	5.018	5.008	5.013	5.042	5.106	4.944	5.160	5.185	5.101	5.096	5.047	5.062	4.944	5.101
24	5.219	5.091	5.003	5.018	5.008	5.013	5.042	5.106	4.949	5.160	5.185	5.101	5.091	5.047	5.062	4.944	5.101
25	5.219	5.091	5.003	5.023	5.013	5.013	5.042	5.111	4.949	5.160	5.185	5.101	5.091	5.047	5.062	4.944	5.101
26	5.219	5.091	5.008	5.023	5.008	5.013	5.042	5.106	4.949	5.160	5.185	5.101	5.091	5.047	5.062	4.944	5.101

If you meet some question , please contact us : support@inhaos.com