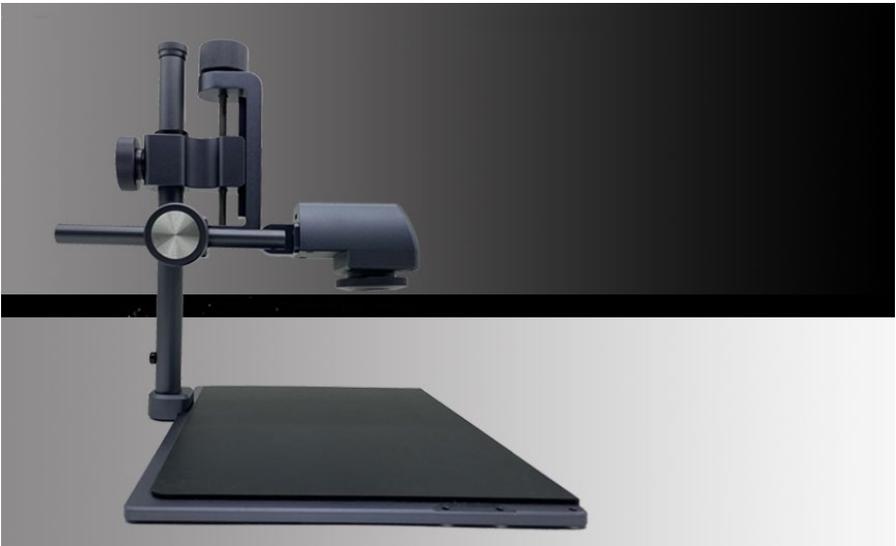




# **CA-10 PCBA Thermal Analyzer**

## **Product Introduction**

### **English version (V1.0)**



## **Copyright Notice**

The copyright of all contents in this manual owned by Shenzhen Dian Yang Technology Co., Ltd. It is not allowed to copy or translate in any way without this company's permission. The manual is not bonded in any way, and with no expression of position or other implication. The product specifications and information mentioned in this manual are for reference only, and the contents are subject to change without notice.

---

---

## Contents

1	Product Introduction .....	2
1.1	CA-10 Introduction of PCBA thermal analyzer.....	2
1.2	CA-10 application of PCBA thermal analyzer.....	2
2	Product List.....	4
2.1	CA-10 List.....	4
2.2	CA-10 Option list- Expansion fittings.....	4
2.3	CA-10 Option list--Test parts of PCBA thermal designer .....	5
3	Assembly Method.....	6
3.1	Instructions for main engine .....	6
3.2	Assembly instructions for main components.....	7
3.3	Device connection .....	8
4	Specifications.....	10
5	Instruction of SoftMenu .....	12
5.1	Software download and installation .....	12
5.1.1	Software Download Address:.....	12
5.1.2	Installation.....	12
5.2	Software connection screen .....	12
5.3	Main interface description .....	13
5.4	Functional area description .....	16
5.4.1	Toubleshoot .....	16
5.4.2	3D analysis .....	19
5.4.3	Comparison .....	21
5.4.4	Circuit design function.....	25
6	Description of Application Mode .....	33
6.1	Skills of micro-current leakage detection .....	33
6.2	Skills of short circuit detection.....	35
6.3	Comparative analysis and detection skills for screening defective products.	37
6.4	Aging and testing skills of renovation of components.....	38
7	Precautions for instrument use: .....	40

# 1 Product Introduction

---

## 1.1 CA-10 Introduction of PCBA thermal analyzer

CA-10 PCBA Thermal Analyzer of Shenzhen Dian Yang Technology Co., Ltd. (DytSpectrumOwl), is a special equipment for detection of thermal field, which can provide mass data for experiment of heat and thermal simulation in the process of design and development of PCBA products. It is also a special equipment for maintenance of PCBA. In case of malfunctions, such as leakage or short-circuit, then the temperature will rise abnormally. Thermal analyzer will detect the rise temperature, quickly locate the leakage or short-circuit device position and repair it in time. In addition, it can also be used to detect components, such as component of power module. Mass data can be obtained through the thermal analyzer in the protection of the device when the temperature is detected overheat.

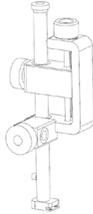


## 1.2 CA-10 application of PCBA thermal analyzer

- Localization, detection and repair of leakage, short-circuit and open circuit of PCBA;
- Comparison and evaluation of mobile phones or other smart devices;
- Malfunction maintenance of short circuit, open circuit and leakage of PCBA;
- Power consumption design of hardware circuit;
- Test of overheat protection components;
- Reasonability verification of heating experiment, thermal simulation and heating in circuit design;
- Detection of cooling capacity of products;
- Evaluation and comparison of heating condition of the product;

## 2 Product List

### 2.1 CA-10 List

Component	Quantity	Style
Support frame	1	
Circuit board placing backplane	1	
Lens branch of thermal analyzer	1	
Hex screw	4	
Hex wrench	1	
USB-TYPE C	1	
Analysis software	1	Download address:
Certification	1	
Instruction Booklet	1	

### 2.2 CA-10 Option list- Expansion fittings

Option: Expand the backplane and lengthen the support rod to accommodate the large PCBA.

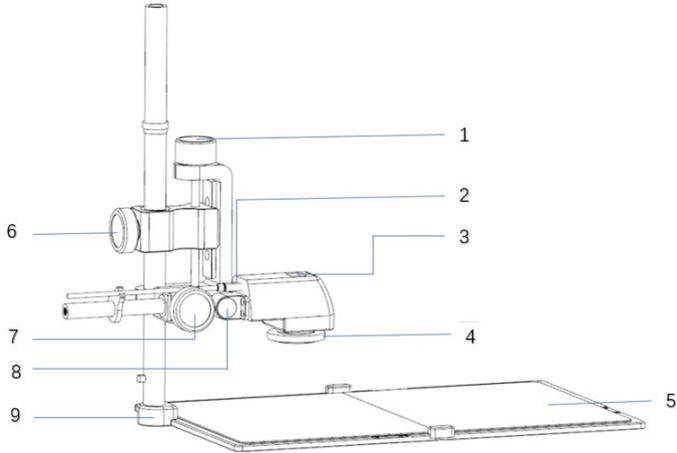
Component	Quantity	Style
Extension rod of support rod	1	
Circuit board placing backplane	1	
Hex screw	4	

### 2.3 CA-10 Option list--Test parts of PCBA thermal designer

Component	Quantity	Style
Emulated test box	1	
USB temperature sensor	1	

# 3 Assembly Method

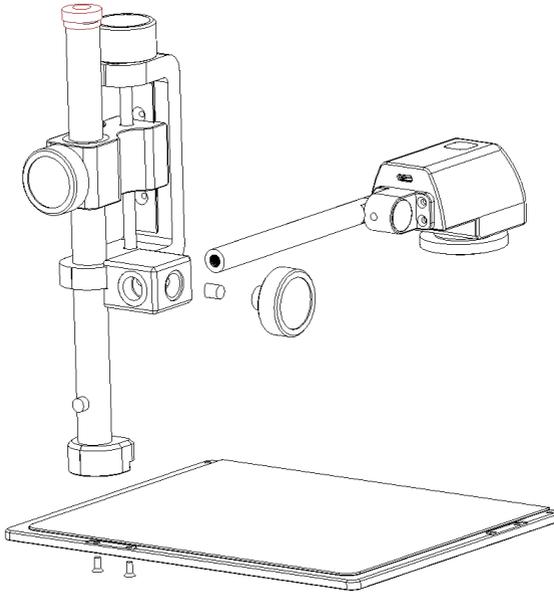
## 3.1 Instructions for main engine



No.	Description	Function
1	The lens height fine-tuning knob	Finely adjust the lens height
2	TYPE-C interface	Standard interface, a power supply
3	Switch:	on/off of lens
4	Focus knob	Adjust the focal length
5	Backplane	Single backplane/double backplane (foldable backplane)
6	The lens height coarse adjusting knob	Quickly adjust the lens height

7	The camera fixed knob	Adjust the front and rear position of the camera
8	Camera tilt knob	Adjust the up and down tilt of the camera
9	Fixed parts of vertical bar	Disassemble and replace of backplane

### 3.2 Assembly instructions for main components



*Figure 1*

Step 1, install the support frame on the backplane and fix it at the bottom of the backplane with two screws.

Step 2, install the lens branch of thermal analyzer on the support

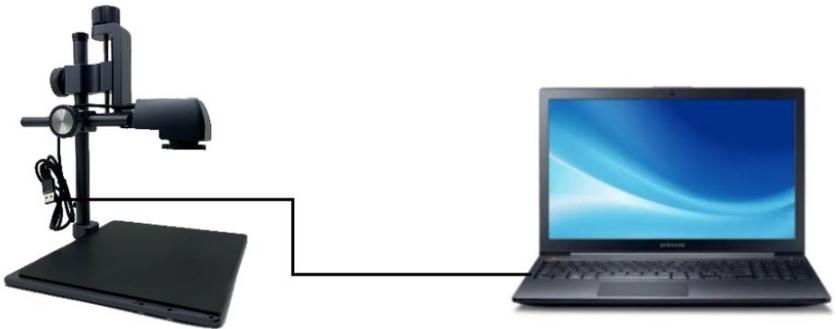
frame as shown in the figure, and tighten the bolt for fixing.

Step 3, install the USB cable buckle on that rear end of the lens branch of thermal analyzer.

Step 4, connect the USB cable, and the type C to the analyzer.

### 3.3 Device connection

Connect the USB Type C cable in the accessories to the USB ports of the computer and the device. It is recommended to connect to a USB 3.0 or above port. Open the DytSpectrumOWL software, you can start to observe the thermal imaging video of the measured object.



*Figure2*

The user can change the size, definition and angle of the video display by adjusting the knob in the Figure3.

The lens height fine-tuning knob can finely adjust the lens height and change the size of the measured object in the video.

The lens height coarse adjustment knob can quickly adjust the lens height and quickly change the size of the measured object in the video.

The focus knob can make the video of the object clear in the screen.

The camera fixed knob, users can adjust the front and rear position of the camera.

Camera tilt knob, users can adjust the up and down tilt of the camera.

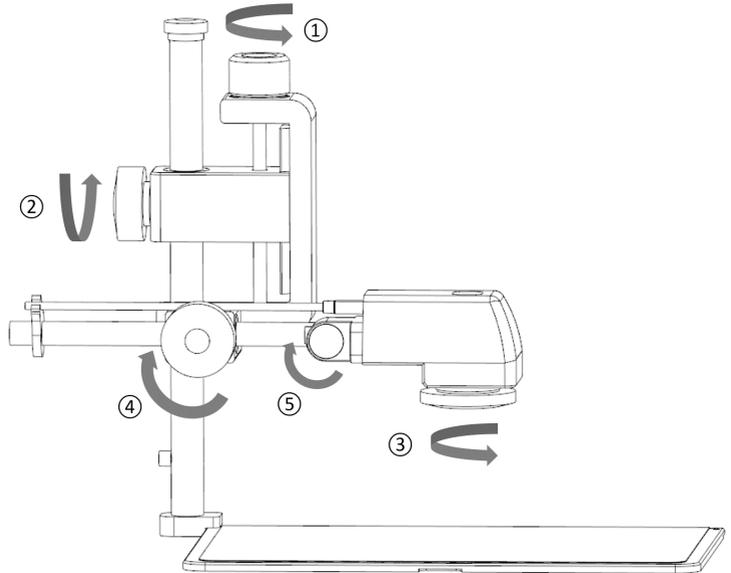


Figure3

# 4 Specifications

CA-10 PCBA Thermal Analyzer:

Parameter		Specification
<b>Thermal camera parameters</b>	Thermal imaging resolution	260*200
	Frame	25Hz
	NETD	70mK@25°C
	FOV	34.4 in horizontal, 25.8 in vertical
	Lens	4mm adjustable focus lens
	Temperature range	The proofread temperature is-10 - 120°C (can be extended to 550°C, and additional costs will be incurred for customized modification of high temperature)
	Temperature measurement accuracy	±2°C or ±2%
<b>Interface</b>	Power	DC 5V(USB Type-C)
	Power on/off	Long press the power button for 1 second to power on, long press 3 seconds to power off.
	Connection method	USB Type C Cable
<b>Circuit board placing backplane</b>	Backplane	One main engine (one optional expansion board, detachable splicing type)
<b>Bracket</b>	Adjusting	The 4 adjusting knobs can quickly adjust up

	knob	and down, finely adjust the lens, adjust the camera front and rear, and the tilt of lens
<b>Physical parameters</b>	Dimensions	Standard: 220mm x 172mm x 241mm;
		Assemble additional accessories: 346mm x 220m x 341mm
	Packing size	Packaging: 376mm x280mm x105mm
	Net weight	Standard: 1.1kg (Options: +0.5kg)
<b>Working environment</b>	Temperature	Best working temperature:-10°C~55°C
	Humidity	<95%
<b>Minimum software and hardware requirement</b>	System	Win10 (recommended) win7
	CPU & RAM	i3 & 4G
	Update	Manually or automatic update via internet

# 5 Instruction of SoftMenu

---

## 5.1 Software download and installation

### 5.1.1 Software Download Address:

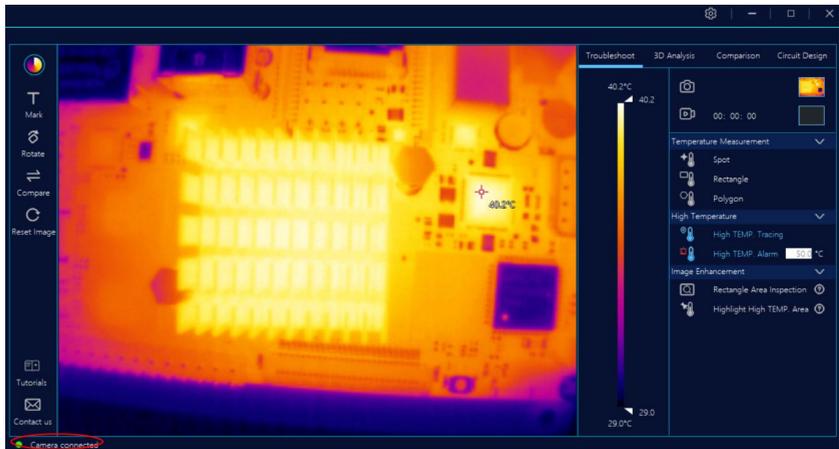
[http://114.115.130.132:8080/dytfiler/downloadGET?fileName=Software/CA10D/CA10D\\_1.0.0\\_en](http://114.115.130.132:8080/dytfiler/downloadGET?fileName=Software/CA10D/CA10D_1.0.0_en)

### 5.1.2 Installation

It is recommended to use Microsoft WIN10 system.

## 5.2 Software connection screen

Connect the USB cable to the computer and open the software. After connection, turn on the thermal analyzer and open the thermal analysis software. If  is displayed in the lower left corner of the main interface, it means that the device is connected, and the thermal image will be displayed.



### 5.3 Main interface description



Palette selection. Choosing different colors, different colors will be displayed more clearly to indicate boards failures.



Using arrows to mark on the screen, or adding comments with words.



It includes mirror horizontally and mirror vertically.



"Space" is the shortcut key, which is used to switch quickly between the detection image and the initial 2D image, for example: the switch of detection image and the non-detection image, and the switch of 2D and 3D images.



Reset the image to the on-line initial image.



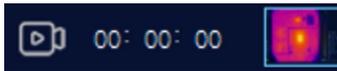
Looking through the software tutorial.



Taking photo and browsing picture.



Photographing the screen, and the picture is the main screen.  
browse the pictures just taken;



Video recording and video file

browsing. Photographing the software screen (including the main  
screen and menu function). Video files can be viewed.



Setting: usage of thermal analyzer.

Function setting	Instruction
Settings->General->Language	Three languages available: "Simplified Chinese", "English" and "Traditional Chinese".
Settings->General->Temperature Follow Mouse	The mouse is on the thermal image to determine whether to display the temperature
Settings->General->Temperature Unit	The temperature unit supports "°C" and "°F".
Settings->General->Alarm Sound	There are 8 kinds of temperature alarm sound to choose.
Settings->General->Alarm Duration (S)	Setting of alarm duration, including sound and flashing time of thermal image.
Settings->General->3D Contrast	Support 5 contrast levels.

Level	
Settings->Storage->Picture Folder	Path setting of photo storage location.
Settings->Storage->Video Folder	Path setting of video storage location.
Settings->Storage->Data Folder	Data recording path setting for Graph analysis.
Settings->Camera Parameters->Emissivity	Emissivity setting range: 0.01-1.00
Settings->Camera Parameters->Distance (m)	Camera observation range: 0-5m
Settings->Camera Parameters->Humidity (%)	Camera humidity parameter setting range: 0-100
Settings->Camera Parameters->Correction (°C)	Camera revised parameter settings, the temperature unit is the same as the general -> temperature unit settings (°C or °F).
Settings->Camera Parameters->Reflected temperature (°C)	Camera reflection temperature settings, the temperature unit is the same as the general -> temperature unit settings (°C or °F).
Settings->Camera Parameters->Ambient temperature (°C)	Camera ambient temperature settings, the temperature unit is the same as the general -> temperature unit settings (°C or °F).
Settings->Update->Auto Detect	Switch settings of automatic detection and update of software.
Settings->Update->Manual Detect	Manual detection and update of software.
Settings->About	Official website of the company.



**Troubleshoot** - detect leakage and short circuit of circuit board.

**3D Analysis** - using 3D mode to check the thermal field state of the circuit board, which is mainly applied to analyze the heating situation of the whole circuit board.

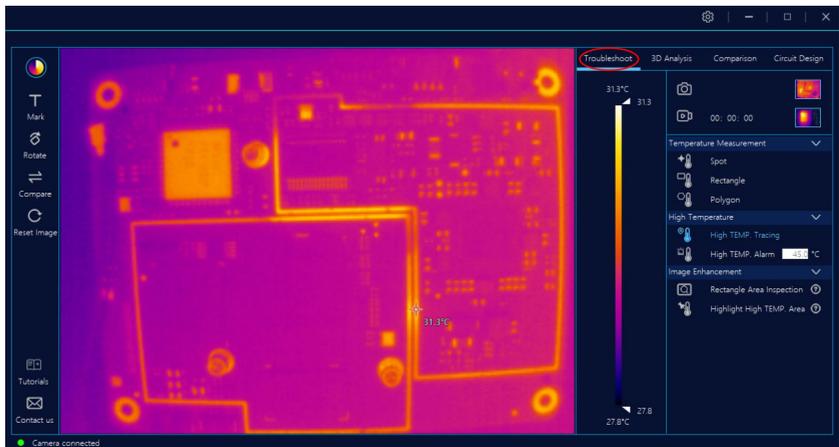
**Comparison** - it can be used for comparing sample parts and test parts, mainly for inspecting defective products and quality test of whether components are refurbished.

**Circuit design**- detection function of thermal images in circuit design, mainly used in the development and design of PCBA, through the analysis of temperature data and pictures to determine whether the cooling of PCBA is reasonable.

## 5.4 Functional area description

### 5.4.1 Troubleshoot

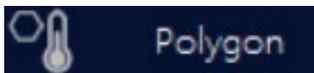
Troubleshoot - locate the position of faulty components, find failure points and make rapid maintenance, mainly applied to short circuit, open circuit, leakage, capacitor breakdown, circuit damage, circuit degradation and so on.



Spot - It can display the temperature value of any point on the main screen. On the main screen, clicking "Point Temperature Measurement" can view the temperature of the current point, when X appears, you can delete the point temperature.



Rectangle - In the main screen, drawing a rectangle box to display the highest temperature point and temperature value in it. Moving and deleting the rectangular temperature measuring box by clicking on the rectangle box.



Polygon - It is possible to draw a polygon of any shape in the main screen to display the highest temperature point and temperature value in the polygon. Moving and deleting the rectangular temperature measuring box by clicking on the polygonal box.



Turning on the high temperature tracking, the position and temperature value of the highest temperature point will be displayed in real time in the main screen, rectangle and polygon in the main screen.



When the high temperature alarm switch is turned on and the temperature threshold is set, and if the temperature at any point in the main screen exceeds the threshold, the software will send out an alarm, and the main screen frame will flash a red border. The alarm sound and

duration are set in of .

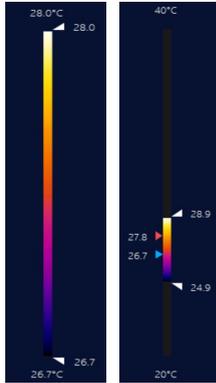


When the detailed check switch in the rectangle box is turned on, the rectangular area inside will display the current color of color palette, while the outside will display black and white, which is convenient for detailed check of components in the rectangle box. Meanwhile, the color change of the temperature bar only has an effect on the inside area at this time.

When the detailed check switch in the rectangle box is turned on, and there is no rectangle in the main screen, then the software will automatically add a rectangle.

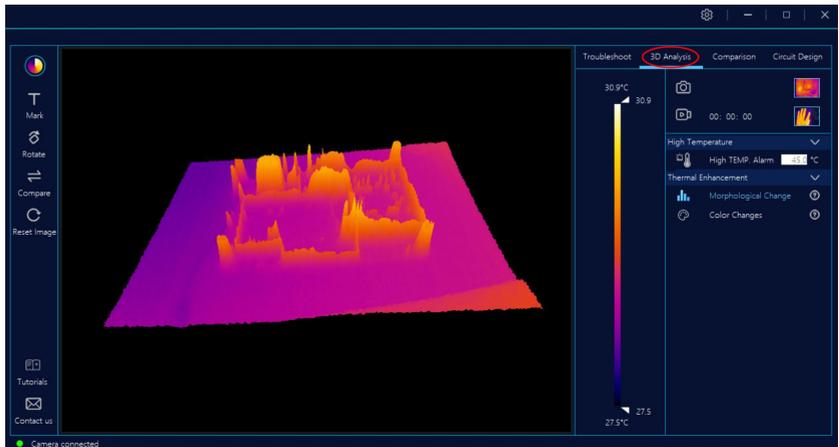


When the switch of highlight high temperature zone is turned on, the current dynamic temperature bar will change into a fixed temperature range.



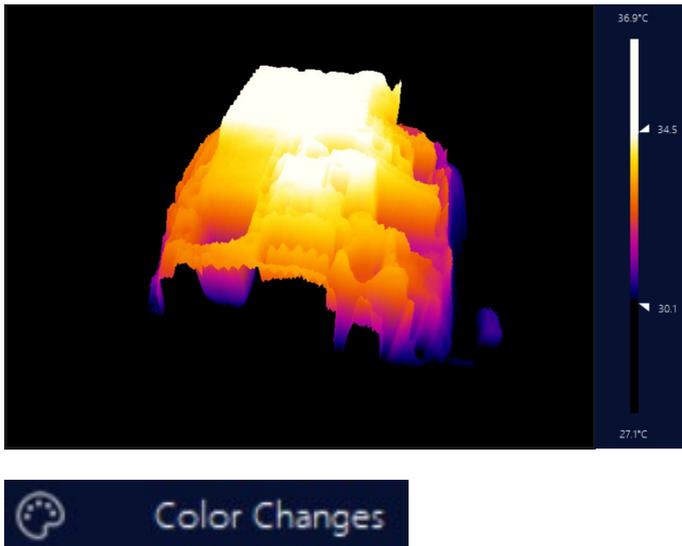
## 5.4.2 3D analysis

3D analysis - Using 3D mode to check the thermal field state of the circuit board, which is mainly applied to analyze the heating situation of the whole circuit board Thermal field distribution, a temperature state diagram showing the 3D mode of the circuit board, as shown below: The vertical part embodies the temperature of each point on the Z axis of the circuit board.



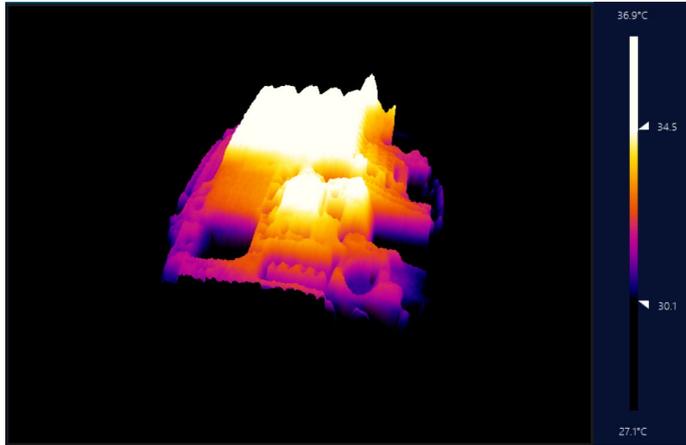
Morphological Change - Shape change needs to be used together with the temperature width color palette. Pull the up and down arrows of the temperature bar under the "Shape Change", as shown below.

For the thermal field pattern of the circuit board, its color will not change, and the part that is higher than the arrow of the high temperature bar and lower than the arrow of the low temperature of the bar is not displayed.

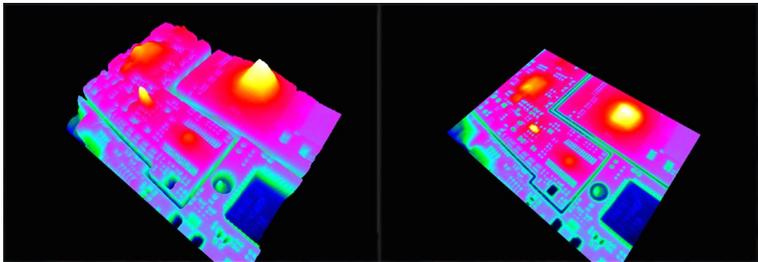


Color Changes - Color change needs to be used together with the temperature width color palette. Under the "Color Change", pull the up and down arrows of the temperature bar.

For the thermal field pattern of the circuit board, its shape will not change, and the color will change according to the arrow of the temperature bar. The part higher than the arrow of the high temperature in the temperature bar will be displayed as white, while the part lower than the arrow of the low temperature will be displayed as non-black.



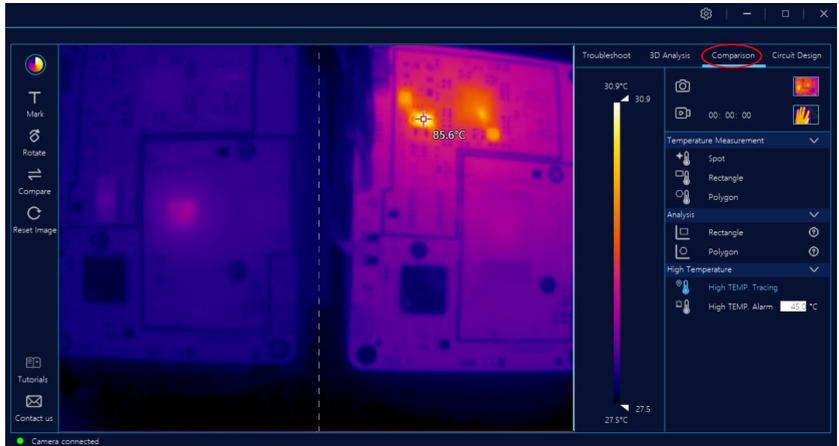
3D $\Leftrightarrow$ 2D switch: can be switched through the "Compare" on left of main menu, and can also be switched through the "space key"



### 5.4.3 Comparison

It is capable to detect the temperature change and the difference between the accepted board and the defective board, and also to check the temperature change of components in the energized state, thus to judge the defect position of the defective board. During the material inspection, it can also be used in comparison between accepted devices and sampling devices to judge whether there is any problem with sampling devices.

Main screen:



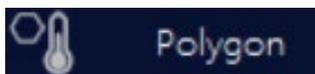
The left side is the standard sample and the right side is the contrast one on the main screen.



Click the “Spot” to check the temperature value of every point on the main screen.



For “Rectangle”, the matrix can only be drawn on the left sample area. The right area can be automatically added the same shape according to the size and position of the left. Click the rectangular temperature measurement to check whether there is a large deviation between the highest temperature and temperature value of the sample and the control. If so, the control may have quality problem.

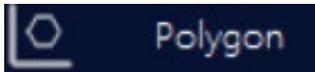


For “Polygon”, the polygon can only be drawn on the left sample

area. The right area can be automatically added the same shape according to the size and position of the left. Click the polygon temperature measurement to check whether there is a large deviation between the highest temperature and temperature value of the sample and the control. If so, the control may have quality problem.



For “Rectangular”, it will pop up a temperature curve screen, so please view its detailed explanation.



For “Polygon”, it will pop up a temperature curve screen, so please view its detailed explanation.



When the high temperature tracking switch is turned on, it will display the highest temperature position and temperature value in the rectangle box and polygonal box, as well as in the whole picture.



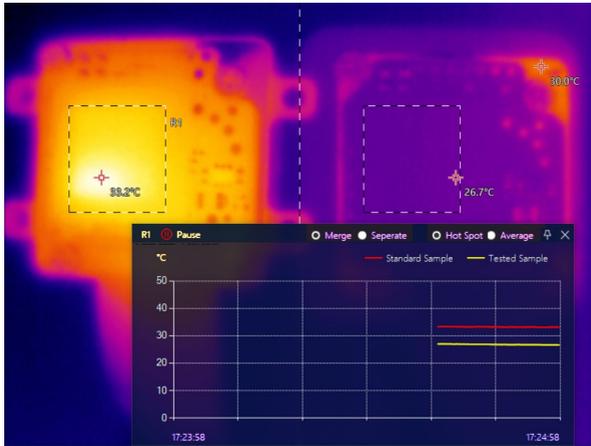
When the high temperature alarm switch is turned on and the temperature threshold is set, and if the temperature at any point in the main screen exceeds the threshold, the software will send out an alarm, and the main screen frame will flash a red border (the alarm sound and duration are set in ).

### **Detailed temperature curve**

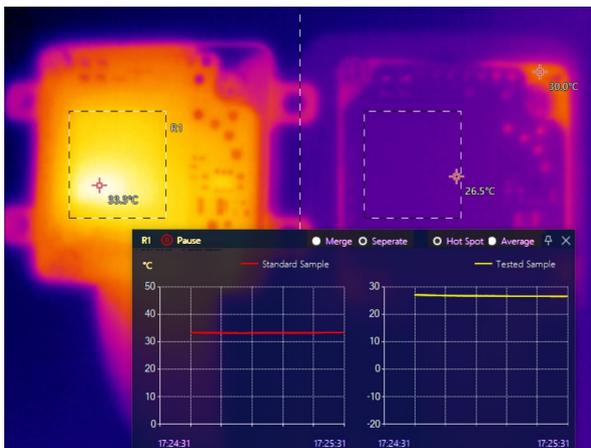
When the temperature rectangle box on the left is drawn, the

rectangle box on the right is automatically added, and the temperature trend map of the two boxes is displayed.

**Merge** - It means the temperature of the two boxes superimposed together, which can be compared to view. As shown below:



**Separate** - It uses two trend maps respectively to show the temperature in different rectangle boxes. as shown below:

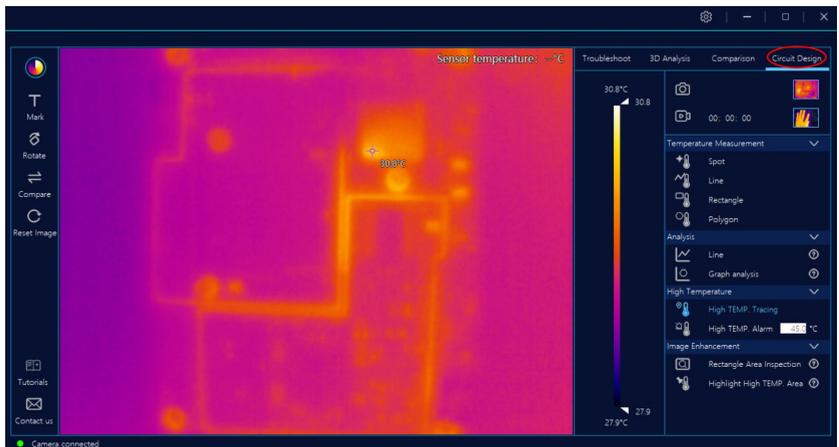


The temperature trend can be set to the highest temperature and the average temperature in the region.

## 5.4.4 Circuit design function

The main purpose of design of circuit is to assist the thermal design of PCBA. It provides temperature monitoring data about heating experiment and thermal simulation for the design of PCBA product, and analyzes historical data through excel and chart tools to judge whether PCBA cools well. It can also evaluate and compare the heating conditions of different thermal materials.

The functions of the analysis software are still being updated, and more detailed functions will be applied for simulation and cooling of the products in the future.



Spot - It can display the temperature value of any point on the main screen. On the main screen, clicking "Point Temperature Measurement" can view the temperature of the current point, when X appears, you can delete the point temperature.



Line - In the main screen, drawing a line to display the highest temperature or average temperature on it.



Rectangle - In the main screen, drawing a rectangle box to display the highest temperature point and temperature value in it. Moving and deleting the rectangular temperature measuring box by clicking on the rectangle box.



Polygon - It is possible to draw a polygon of any shape in the main screen to display the highest temperature point and temperature value in the polygon. Moving and deleting the rectangular temperature measuring box by clicking on the polygonal box.



For line temperature analysis, it means that all temperature points on a line are displayed on a graph.



As shown in the picture, the straight line A on the left is the starting point and line E is the end point.

On the line temperature chart on the right, the real-time temperature of each point on the AE line is displayed in real time on the vertical axis.

Click on the abnormal changing point on the line of the map, and the corresponding position will be automatically marked on the AE line of the thermal image.

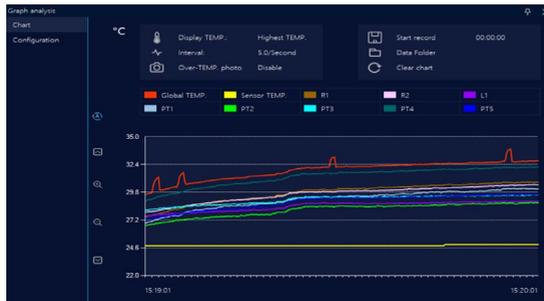


Chart analysis: the main function at present: first, show the real-time temperature status of PCBA with charts, including the ambient temperature outside PCBA, the bulk temperature, point temperature, line temperature, the point temperature, the line temperature, rectangular temperature, and the polygon temperature of PCBA; second, store the temperature data of the chart and the over-temperature photos, which can be synchronously stored to the computer hard disk; third, analyze historical data and pictures through excel and chart tools.

## Chart analysis description:

Use the "Temperature Measurement" function of the main interface on the thermal image, and open the chart analysis interface by right-click

"  " on the thermal image or click "  " on the right menu.



## Chart display:

"  " or "  " is used to display temperature, see the main interface  for details.

 Display TEMP.: Highest TEMP.

Display temperature. The recorded temperature of charts and excel are displayed in maximum or on average.

 Interval: 5.0/Second

The time span is displayed in sampling interval and curve chart. The maximum sampling interval is 5 frames per second, and Excel data are recorded in this way.



When the observed temperature of PCBA exceeds the threshold, it will synchronize excel data to take alarm pictures. When the sampling interval is greater than 1/Second, pictures will be taken in every 1 second.



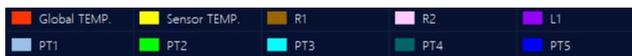
Data records: Click to record, and the data will be recorded in excel, including: Data collection time, maximum temperature, average temperature, over-temperature photo records, basic information and initial picture records; When the function is used in over-temperature, the picture will be obtained and stored when the temperature exceeds the threshold.



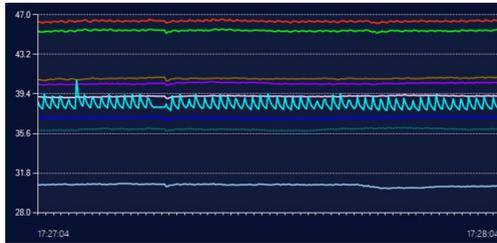
Location of data, storage position of data and alarm picture, including excel data table, initial picture and alarm images.



Clear the chart, clear the current graph display, and start collection and display at the current time.



Curve colorbar, supports observation in 10 different areas, including ambient temperature outside PCBA (sensor temperature), bulk temperature of PCBA, and temperature of 5 points and 3 lines/rectangles/arbitrary shape areas.



Temperature curve screen, the horizontal axis is used to display the time (calculated by sampling interval), and the vertical axis is used to display the temperature. The temperature is recorded from right to left.



Automatically adjust the vertical scale of chart.

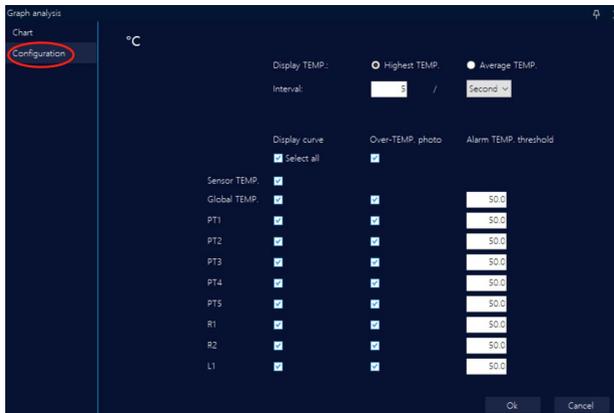


Manually adjust the upper and lower positions of temperature curves.



Manually adjust the vertical scale of chart.

### Chart configuration:



<b>Configuration function</b>	<b>Instruction</b>
Chart Analysis-> Configuration-> Display Temperature	The temperature is displayed as the highest temperature or average temperature.
Chart Analysis-> Configuration-> Sampling Interval	The maximum sampling interval is 5 frames per Second. The sampling interval is set in Second and Minute.
Chart Analysis-> Configuration-> Display Curves	Display settings of curves include: Sensor temperature, bulk temperature, point temperature (1 ~ 5), line temperature (0 ~ 3), rectangle temperature (0 ~ 3), polygon temperature (0 ~ 3).
Chart Analysis-> Configuration-> Over-temperature Photography	Function of over-temperature photo is associated with curve display and alarm threshold. First, set the curve to be displayed, then set whether to enable over-temperature photographing, and finally set the temperature threshold according to the observed object.
Chart Analysis-> Configuration-> Alarm Threshold	Setting of temperature threshold of over-temperature photographing function.



When the high temperature tracking switch is turned on, it will display the highest temperature position and temperature value in the rectangle box and polygonal box, as well as in the whole picture.



When the high

temperature alarm switch is turned on and the temperature threshold is set, and if the temperature at any point in the main screen exceeds the threshold, the software will send out an alarm, and the main screen frame will flash a red border (the alarm sound and duration are set in

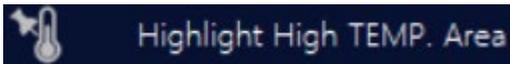


of ).

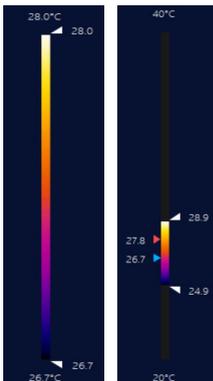


When the detailed check switch in the rectangle box is turned on, the rectangular area inside will display the current color of color palette, while the outside will display black and white, which is convenient for detailed check of components in the rectangle box. Meanwhile, the color change of the temperature bar only has an effect on the inside area at this time.

When the detailed check switch in the rectangle box is turned on, and there is no rectangle in the main screen, then the software will automatically add a rectangle.



When the switch of highlight high temperature zone is turned on, the current dynamic temperature bar will change into a fixed temperature range.



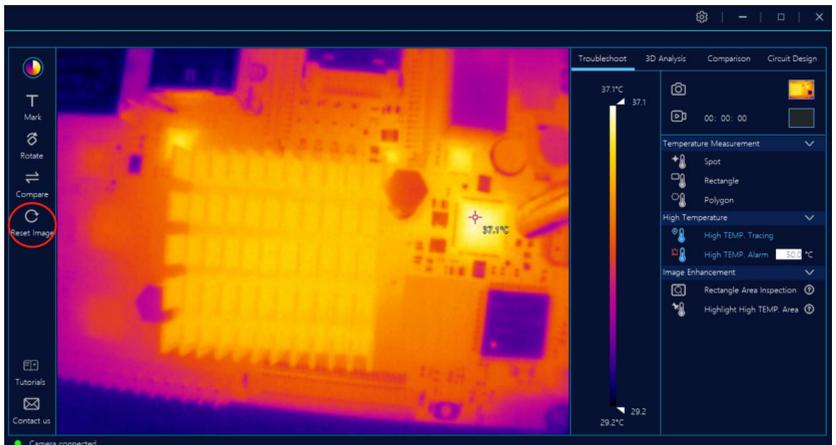
## 6 Description of Application Mode

### 6.1 Skills of micro-current leakage detection

Connect the faulty board with a stabilized power supply. When the voltage is adjusted to the rated voltage of the circuit board, it will display current, which can generally be judged as leakage in this case.



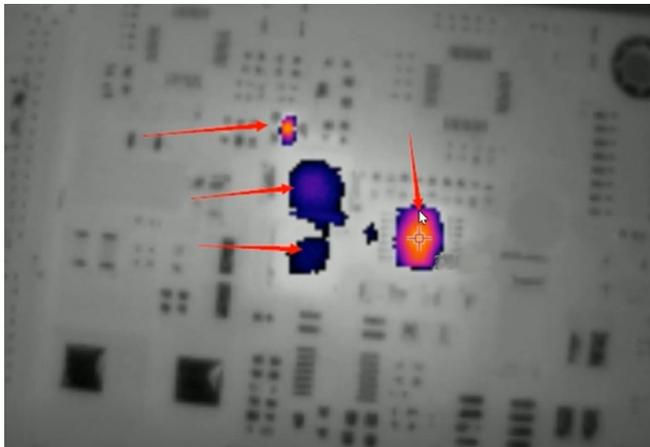
Before leakage detection, you can enter the software interface and click the screen reset to remove the previous distraction.



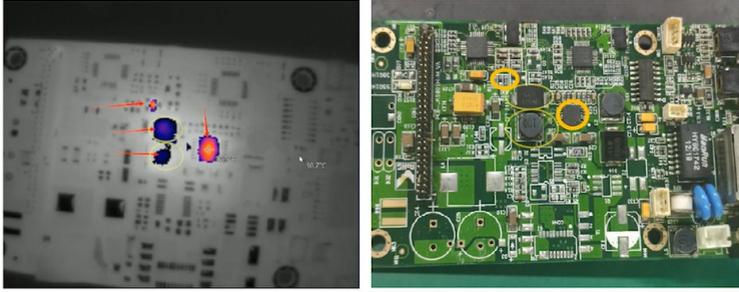
The suspected leakage point will be displayed by pulling the upper and lower temperature width arrows (shortcut keys are  $\uparrow$   $\downarrow$ ).



As shown below, there are 4 suspected leakage points.



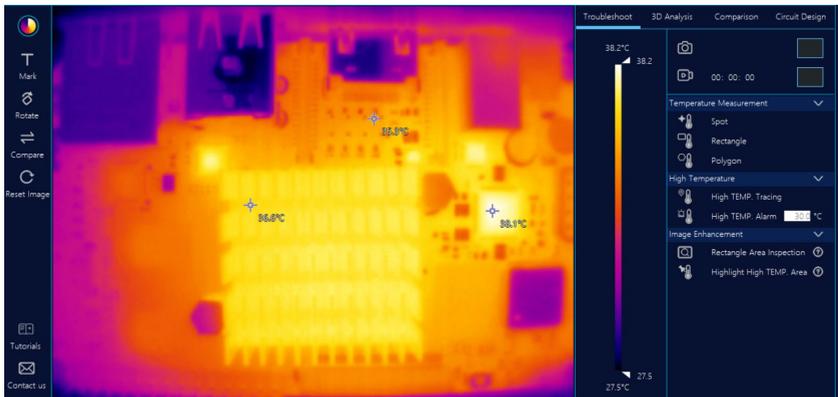
Then compare the components on the circuit board and determine the device with leakage.



In this circuit board case, it's finally determined that the capacitor is leaking in the yellow circle in the upper left corner.

## 6.2 Skills of short circuit detection

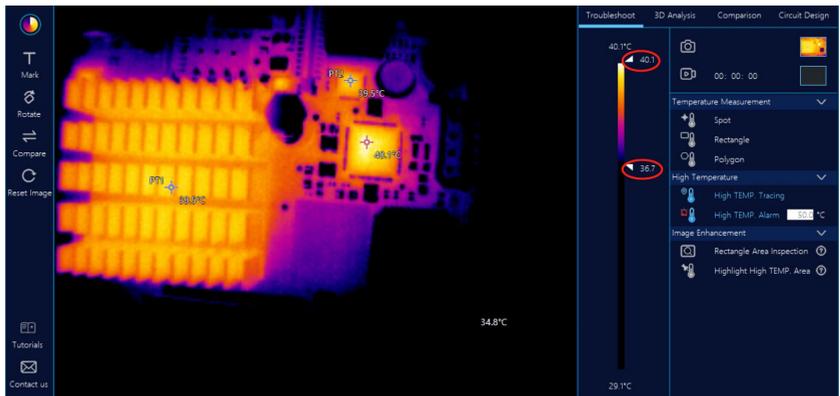
When the circuit board is short-circuited, power-on detection will damage the circuit, so it needs to lower the voltage, or when connecting the circuit, the power supply part is connected in series with a resistor to prevent secondary damage to the circuit product during power-on detection.



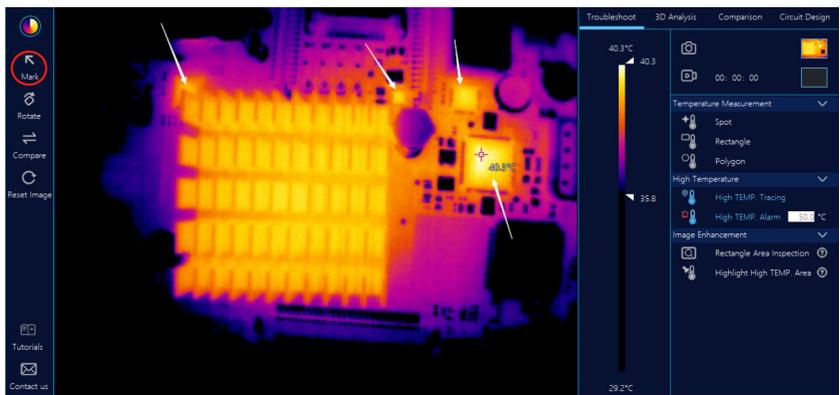
## How to detect the short circuit:

Step 1: select  in the menu on the left and clear all the records of the last operation.

Step 2: drag the down arrow of the temperature bar and several temperature high points in the main screen will be highlighted.



Step 3: drag the down arrow of the temperature bar and several temperature high points in the main screen will be highlighted.

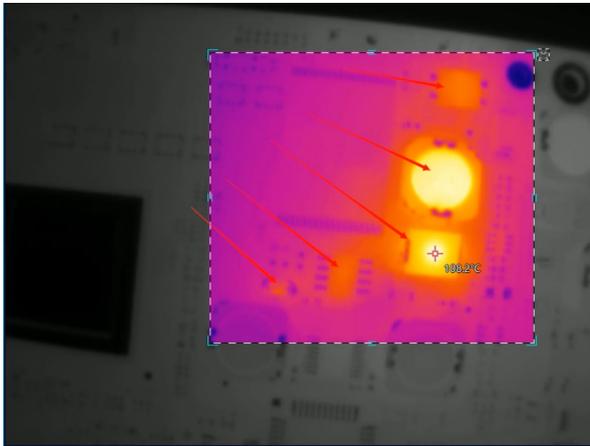


Mark several suspicious devices with label items for easy positioning.

Step 4: Turn on the switch.



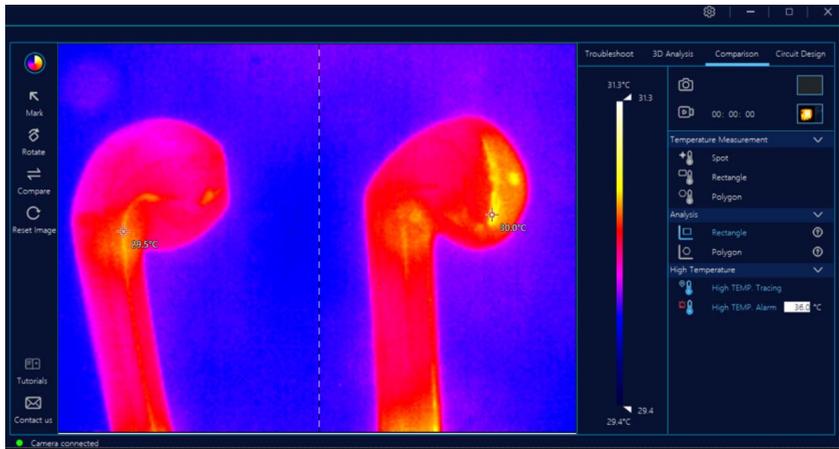
Step 5: you can draw a large rectangle box to restrict all the marked suspicious short-circuit points, or you can draw a rectangle box for each suspicious point, and the color will show in the rectangle box, while black and white image will show outside.



Step 6: at this point, pulling the arrow of the color palette (or using the shortcut of ↓↑) will only change the color in the rectangle box.

Step 7: judging which component is in the short circuit according to its features.

### 6.3 Comparative analysis and detection skills for screening defective products



Place the sample on the left and the test product on the right of the backplane.

Draw a detection area in the main screen, for example: rectangle, polygon, etc., the right area will appear the same area box accordingly. Place the test product in the right area box, preferably in the same place and position as on the left. Then switch on the high temperature tracking

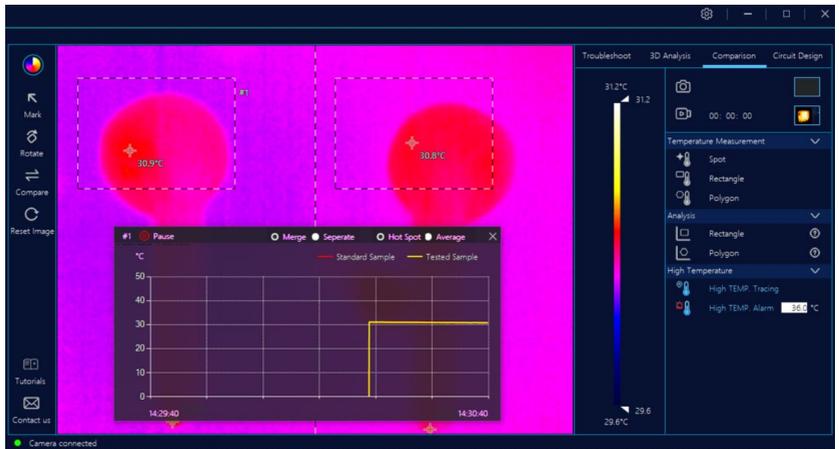
function  High TEMP. Tracing.

Check the position of the high temperature point and whether the temperature difference is too large. If the high temperature of the test product on the right is too large, there may be defective products.

## 6.4 Aging and testing skills of renovation of components

For component testing, it requires a period of time to analyze in operation, you should put a standard sample on the left side in the double-plate comparison function area, and then select

 Rectangle or  Polygon.



In rectangular area analysis, it will pop up the temperature curve picture. It can be judged whether to renovate or not according to the difference of temperature curves of components in operation.

For example: If the average temperature in the area of the test product is much higher than that of the sample, it indicates that the aging of the test product is relatively severe and the product a long-time service.

## **7 Precautions for instrument use:**

---

Precautions:

1. When detecting the circuit board, the smooth surface of some chips on it will reflect light, which may disturb the circuit diagnosis and cause false hot spots; therefore, it requires to tilt from time to time or tilt the lens to an angle to check whether the hot spots are the same after eliminating reflection;
2. The circuit board detection and failure inquiry should be carried out under the power-on state instead of power-free state;
3. In a dry environment, you may as well ground the rack or backplane to prevent the accumulation of static electricity;
4. Windows 10 is the prefer recommended system for software, and you can try to use the corresponding operating system if conditions permit;
5. For adjustable focus lens, when screwed to the top, you should not rotate hard to prevent lens damage
6. Don't press the lens adjustment ring with your fingers strongly when adjusting the dip angle of lens, or it will be easily damaged.