CA Pro thermal analyzer

product specification

V2.0

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1 Introduction

CA Pro series thermal analyzer applies the principle of infrared detection and imaging to detect and measure the data of object temperature that changes with time, and can store and analyze the reliability of the measured results in infinite time. CA Pro thermal analyzer is suitable for circuit design, component detection, heat dissipation and conduction material detection, atomization gas of electronic cigarettes and other thermal field detection.

【CA Pro device】 【CA Pro software】

1.1 Software application scope

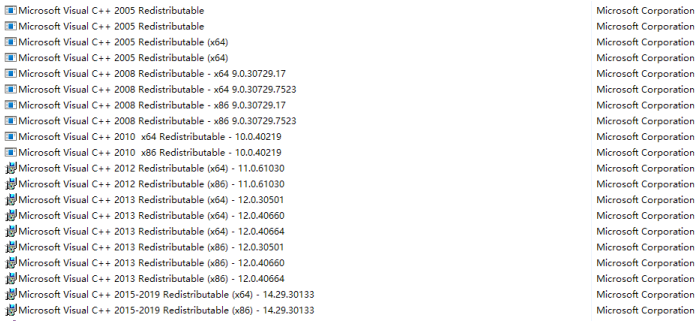
- Rationality verification of heating experiment, thermal simulation and heating in circuit design;
- Positioning, detection and repair of leakage, short-circuit and open circuit of PCBA;
- Comparison and evaluation of mobile phones or other smart devices;
- Malfunction troubleshooting of short circuit, open circuit and

leakage of circuit boards;

- Temperature control of electronic cigarette atomizers;
- Material uniformity analysis;
- Thermal analysis of heat conduction and heat dissipation materials;
- Detection of heat dissipation capability of products;
- Evaluation and comparison of the heating condition of the equipment;

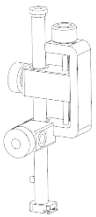
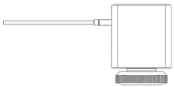
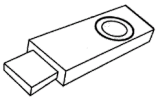
1.2 System requirements

- The computer operating system proposed Win10 or above;
- Minimum computer configuration:
  - Intel i5 or above;
  - Memory: minimum of 4G, 8G or above recommended;
- In case that the operation of numerous data curve applications and 3D temperature is needed, Intel i7 and 8G memory or above are recommended;
- Microsoft Visual C++ Redistributable (2005-2019) patch shall be installed on the computer, otherwise the software will not run;



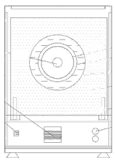
2 Product List

2.1 CA Pro list

Component	Quantity	Style
Support frame	1	
Circuit board placing backplane	1	
Lens branch of CA Pro series thermal analyzer	1	
Hex screw	4	
Hex wrench	1	
USB-TYPE C	1	
Analysis software User manual	1	
Certification	1	

2.1 CA Pro Option list- Expansion fittings

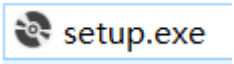
Option: Expand the backplane and lengthen the support rod to accommodate the large PCBA.

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

3 Connection Mode

Below is the connection figure,

Open the USB flash disk attached with the device package, unzip STAD_Setup.zip, and click setup.exe to install thermal analyzer software:



Connect the thermal analyzer and the computer through USB cable. After the connection, power on the thermal analyzer and run the exe file of the thermal analyzer software on the computer. It can work when is displayed on the upper right corner of the software.

4 Specifications:

Parameter	CA-20	CA-30	CA-60
IR Resolution	260*200	384*288	640*512
Spectral Range	8~14um		
NETD	<60mK@25℃	<50mK@25℃	
FOV	42° X32°	41.1° X30.8°	45.75° X37.3°
Image Frequency	25Hz		
Focus mode	Manual focus		
Working temperature	-10℃~+55℃		
Measurement and Analysis			
Object Temperature Range	-10℃~450℃	-10℃~550℃	-10℃~550℃
Temperature measurement method	Highest Temp.,Lowest Temp. and Avg Temp.		
Temperature measurement accuracy	±2 or ±2% for -10℃~120℃, and ±3% for 120℃~550℃		
Measuring distance	30mm ~ 1500mm	40mm ~ 2000mm	
Temperature correction	Manual/Automatic		
Emissivity correction	Adjustable within 0.1-1.0		
Data sampling frequency	It can be configured flexibly, such as 20FPS, 10FPS, 5FPS, 1FPS.		
Image file	Full-temperature JPG thermogram (Radiometric-JPG)		
Video file	MP4		
Device dimension			
Product size	220mm x 172mm x 241mm	346mm x 220mm x 341mm	
Data acquisition accessories (not included in standard configuration)			
Heating table	Standard configuration of 2 oiling test holes of resistance heating wires, which can be customized		
	Customized adjustment of the simulated suction degree, duration and times of the suction pump		
Data acquisition	Recording of temperature data without time limit, including temperature change data, data corresponding to resistance heating wires and resistance values, data corresponding to simulated		

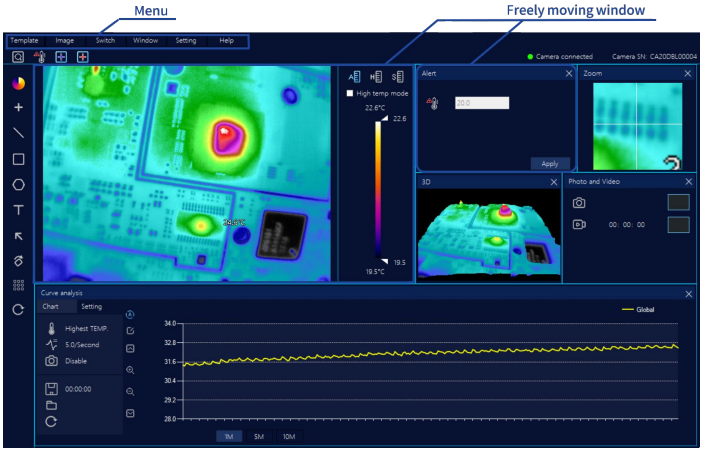
	power supply time and temperature, and calculation of heating uniformity

5 CA Pro Features

5.1 Modular windows

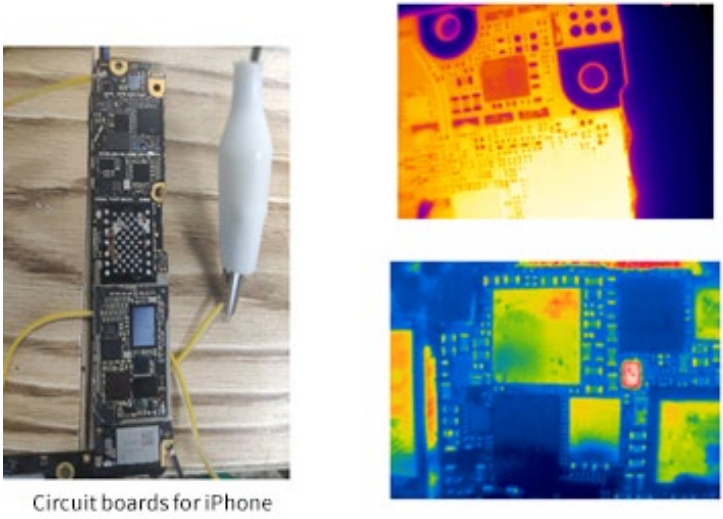
The software of thermal analyzer is designed with modular window, and users can run the functions in window menu.

- Modular design can adapt to different application scenarios.
- The window can move freely and zoom in and out.
- All data can be displayed on the screen at the same time, which is convenient for analysis.
- According to different application scenarios, there will be different software windows, and consumers can create their own application templates.

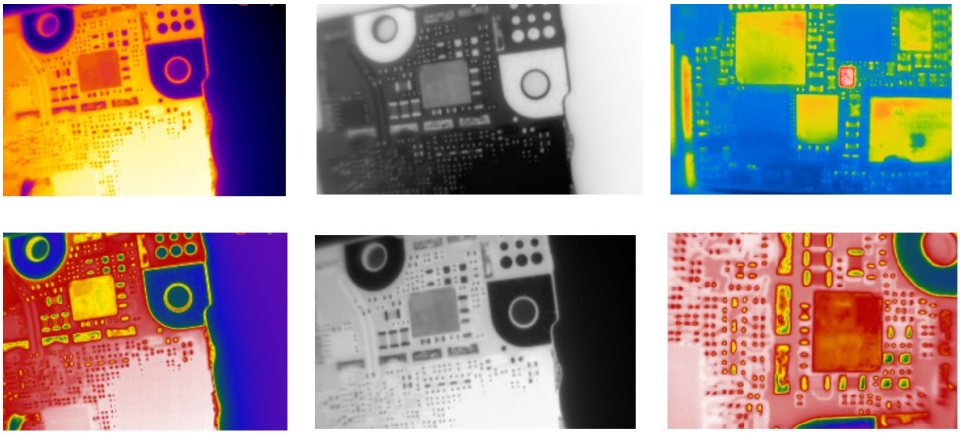


5.2 High Resolution

16 kinds of color palettes for various applications.



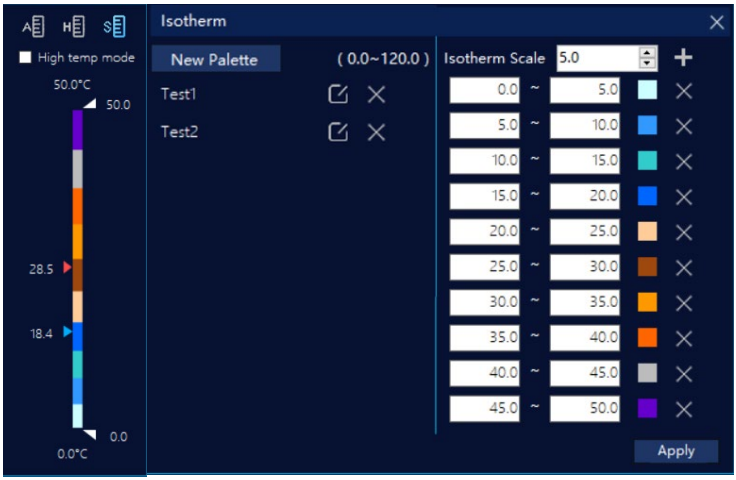
[Figure: Heat Map of Circuit Board for iPhone]



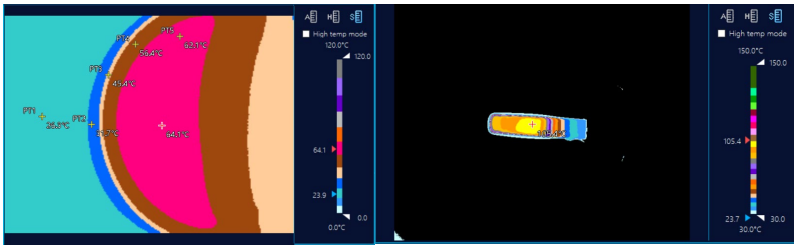
[Figure: Circuit Board Details Shown with Different Color palettes]

5.3 Isotherm

The corresponding temperature range can be displayed with multiple colors, and the set temperature range will not change with the dynamic change of the color palette. It is suitable for the long-term comparison test of the measured object, and the temperature colors will not change due to the interference of background temperature.



[Figure: Custom Settings of Isotherms]



[Figure: Temperature Distribution of Heat Conduction and Dissipation Materials Shown with Isotherms]

5.4 Storing temperature data

5.4.1 Infinite record temperature data

Temperature data and information can be recorded indefinitely and

saved in CSV format, and the temperature sampling frequency can be flexibly configured, including 20FPS, 10FPS, 5FPS and 1FPS.

Basic Information

temperature: ℃; Display TEMP.:Highest TEMP.; Interval:1.0/Second; Over-TE

No.	Date & Time	Max	Avg	Maximum Temp. a
1	2022-01-04-16:06:03-8110	72.8	24.6	
2	2022-01-04-16:06:04-8450	84.6	25.3	
3	2022-01-04-16:06:05-8523	95.3	26.2	
4	2022-01-04-16:06:06-8594	105.3	27	
5	2022-01-04-16:06:07-8686	115.1	27.9	
6	2022-01-04-16:06:08-8593	123.6	28.5	
7	2022-01-04-16:06:09-8435	132.5	29.2	
8	2022-01-04-16:06:10-8261	139.5	29.9	
9	2022-01-04-16:06:11-8041	147.1	30.4	
10	2022-01-04-16:06:12-8884	153.3	31.1	
11	2022-01-04-16:06:13-8720	160.6	31.6	
12	2022-01-04-16:06:14-8543	166.2	32.2	
13	2022-01-04-16:06:15-8332	171.7	32.7	
14	2022-01-04-16:06:16-8094	176.9	33.2	
15	2022-01-04-16:06:17-8942	180.8	33.6	
16	2022-01-04-16:06:18-8833	185.5	34.1	
17	2022-01-04-16:06:19-8735	189.4	34.5	
18	2022-01-04-16:06:20-8582	193.9	34.9	
19	2022-01-04-16:06:21-8345	197	35.3	
20	2022-01-04-16:06:22-9164	200.5	35.7	
21	2022-01-04-16:06:23-9092	195.3	35.5	

Basic Information

temperature: ℃; Display TEMP.:Highest TEMP.; Interval:16.0/Second;

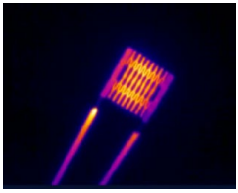
No.	Date & Time	Max	Avg	PT1
1	2022-01-04-17:56:52-6120	23.4	21.8	21.2
2	2022-01-04-17:56:52-6712	23.4	21.8	21.2
3	2022-01-04-17:56:52-7372	23.4	21.8	21.2
4	2022-01-04-17:56:52-7972	23.4	21.8	21.2
5	2022-01-04-17:56:52-8601	23.4	21.8	21.2
6	2022-01-04-17:56:52-9240	23.4	21.8	21.2
7	2022-01-04-17:56:52-9851	23.4	21.8	21.2
8	2022-01-04-17:56:53-0553	23.4	21.8	21.2
9	2022-01-04-17:56:53-1102	23.3	21.8	21.2
10	2022-01-04-17:56:53-1721	23.5	21.8	21.2
11	2022-01-04-17:56:53-2342	23.3	21.8	21.2
12	2022-01-04-17:56:53-2972	23.8	21.8	21.2
13	2022-01-04-17:56:53-3600	24	21.8	21.2
14	2022-01-04-17:56:53-4214	23.4	21.8	21.2
15	2022-01-04-17:56:53-4838	23.3	21.8	21.2
16	2022-01-04-17:56:53-5467	23.5	21.8	21.2
17	2022-01-04-17:56:53-6119	23.5	21.8	21.2
18	2022-01-04-17:56:53-6722	23.5	21.8	21.2
19	2022-01-04-17:56:53-7341	23.4	21.8	21.2
20	2022-01-04-17:56:53-7975	23.4	21.8	21.2
21	2022-01-04-17:56:53-8590	23.3	21.8	21.2
22	2022-01-04-17:56:53-9234	23.3	21.8	21.2
23	2022-01-04-17:56:53-9849	23.4	21.8	21.2
24	2022-01-04-17:56:54-0554	23.5	21.8	21.2
25	2022-01-04-17:56:54-1087	23.5	21.8	21.2

[Figure: Temperature Data at Different Sampling Frequencies]

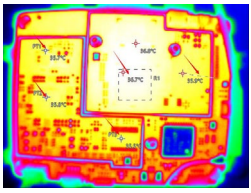
5.4.2 Image storage

Two kinds of trigger-trap images and storage methods:

- The system automatically takes thermal pictures and stores them according to the setting of temperature threshold.

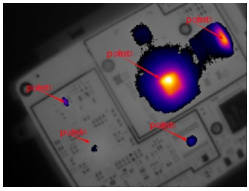


[Figure: Resistance Heating Wire]

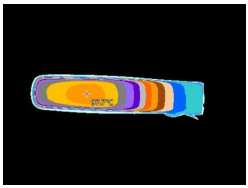


[Figure: Circuit Board]

- The system is equipped with the function of manually taking heat pictures and storing them.

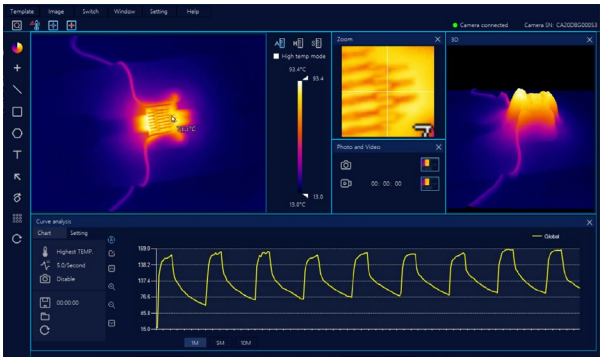


[Figure: Circuit Board in High Temperature and Highlighting Mode]



[Figure: Heat Conduction Material]

- The system is equipped with the full-screen video recording.



5.5 Analysis of infrared thermal imaging data

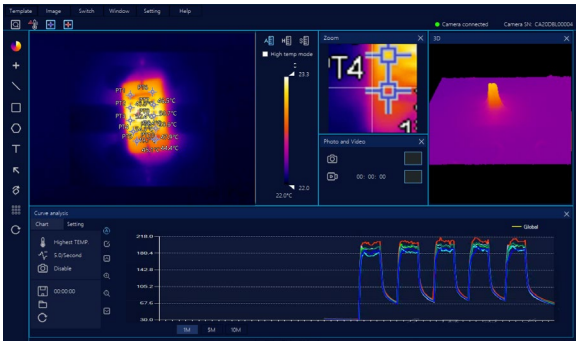
5.5.1 Analysis of temperature changes with graphics

It supports to draw a variety of graphics on the video image and detail observed object, which is suitable for analyzing the transient change of temperature and uniformity design of product:

- It supports to draw 60 graphics on video images, including: 40

points and 20 lines, rectangles and polygons drawing, including equal scale graphics.

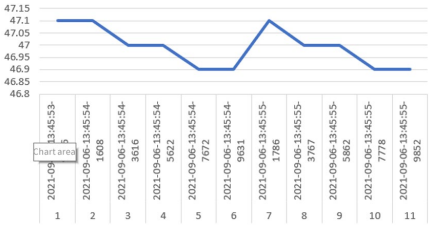
- It supports the automatic drawing of equal scale graphics on video images.

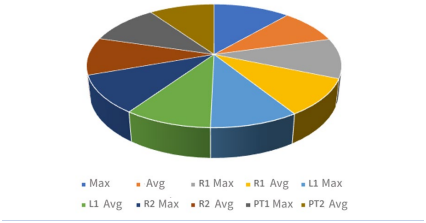


5.5.2 Curve analysis

The data include the global maximum temperatures changed with time, global average temperature, and the corresponding regional temperature, initial image of full video, over-temperature pictures, etc. of 60 kinds of graphics. It can be used to analyze the heating/cooling rate of products, temperature uniformity of products in runtime, batch product consistency, performance, etc.

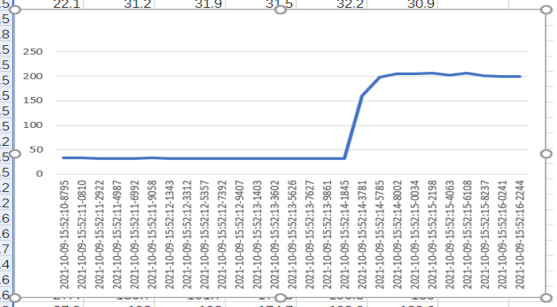
- Automatic tracking of global maximum temperature and global average temperature data;
- Maximum temperature and average temperature of 60 kinds of graphics;





[Analysis of Temperature Changed with Time] [Temperature Distribution]

Date & Time	Max	Avg	PT1	PT2	PT3	PT4	PT5	Maximum	Averag
2021-10-09-15:52:10-8795	32.8	22	31.5	32.2	32.2	32.2	30.9		
2021-10-09-15:52:11-0810	32.8	22	31.5	32.2	32.2	31.9	30.9		
2021-10-09-15:52:11-2922	32.5	22	31.5	32.2	31.5	32.2	30.9		
2021-10-09-15:52:11-4987	32.5	22.1	31.2	31.9	31.5	32.2	30.9		
2021-10-09-15:52:11-6992	32.5								
2021-10-09-15:52:11-9058	32.8								
2021-10-09-15:52:12-1343	32.5								
2021-10-09-15:52:12-3312	32.5								
2021-10-09-15:52:12-5357	32.5								
2021-10-09-15:52:12-7392	32.5								
2021-10-09-15:52:12-9407	32.5								
2021-10-09-15:52:13-1403	32.5								
2021-10-09-15:52:13-3602	32.2								
2021-10-09-15:52:13-5626	32.5								
2021-10-09-15:52:13-7627	32.5								
2021-10-09-15:52:13-9861	32.2								
2021-10-09-15:52:14-1845	32.2								
2021-10-09-15:52:14-3781	159.6								
2021-10-09-15:52:14-5785	198.6								
2021-10-09-15:52:14-8002	204.7								
2021-10-09-15:52:15-0034	204.4								
2021-10-09-15:52:15-2198	206.6								
2021-10-09-15:52:15-4063	202.6								
2021-10-09-15:52:15-6108	205.8	27.9	192	192	174.7	192.2	183.6		
2021-10-09-15:52:15-8237	200.7	27	189.8	189.8	174.2	189.9	180		
2021-10-09-15:52:16-0241	199.4	28	191	189.7	175.5	189.9	182		
2021-10-09-15:52:16-2244	199.4	28.4	192.7	190.5	175.5	190.1	178.6		



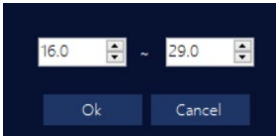
[Temperature Data & Temperature Rise Analysis]

5.5.3 Curve analysis

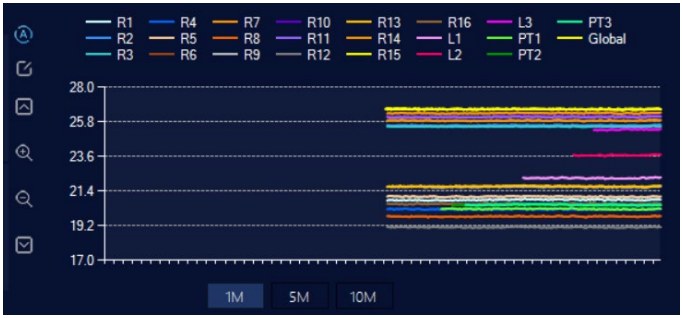
Curve analysis shows the temperature status of products that change with time, and conducts real-time analysis of the heating/cooling rate of products, temperature uniformity of products in runtime, batch product consistency, performance, etc.

- Display global maximum temperature and global average temperature data;
- Display the changing curve of maximum temperature or average temperature of 60 kinds of graphics;

- Display the temperature change process in multiple time: 1 minute, 5 minutes and 10 minutes
- Set temperature range displayed by the curve;



[Temperature Display Range]



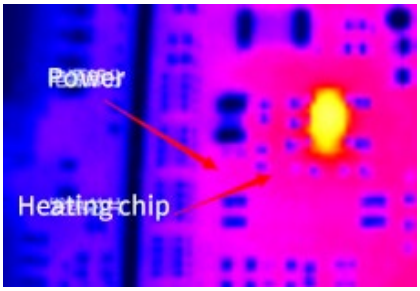
[Curve Analysis Chart]

5.6 Other features

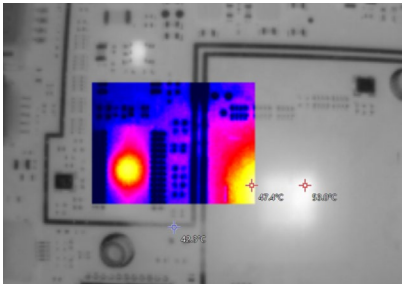
5.6.1 Multiple color palettes modes and marking

The dynamic color palette, extended color palette, fixed color palette can meet different application requirements.

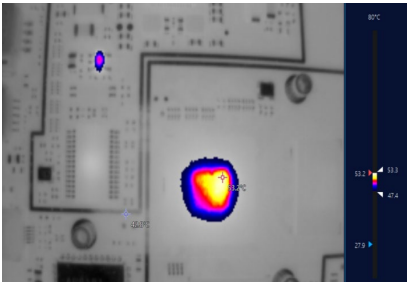
- Global display of temperature distribution of video images can be observed by dynamic color palette.
- Quick search of defects can serve for fast positioning of short circuit leakage, and expanded color palette can be applied.
- Material detection can be applied to compare different materials, and fixed color palette can be applied.
- Text and arrow marks can be carried out on the thermal imaging.



- The detail inspection to the ROIs.



- Setting the temperature range in the video image region separately can be used to find the first, second, third ... high temperature points of the circuit board then to find the current leakage position.

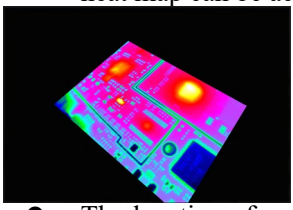


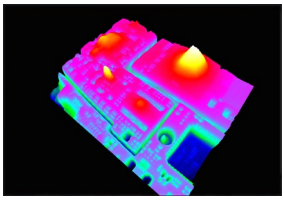
5.6.2 Thermal field analysis

Thermal field analysis: In the design of hardware circuit, 3D

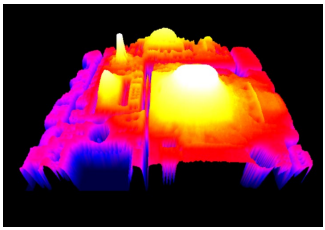
temperature field can be introduced to check the dissipation design of circuit board and whether the circuit thermal design is reasonable, as well as the occurrence of ultra-small current leakage. 3D temperature field can be used to observe the distribution of thermal field of circuit board from a more comprehensive perspective, saving the time for product inspection.

- By pressing the space bar, quick switch between 3D and 2D heat map can be achieved.

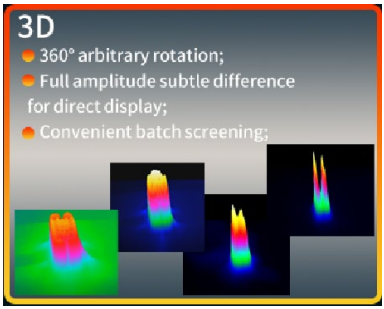




- The location of very small current leakage can be determined with 3D mode.

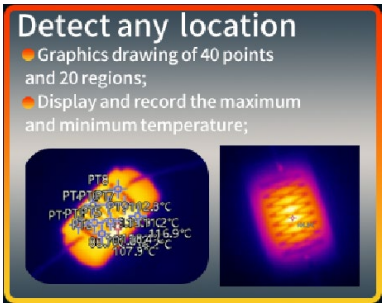


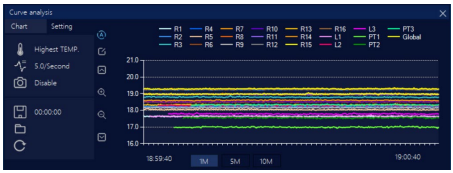
- 3D temperature conditions can be displayed at the same time to capture rapid pulse temperature changes.



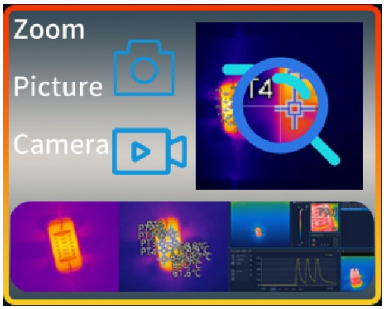
5.6.3 Other application features

- The curve can simultaneously display and record data in 40 points and 20 regions.





- The mouse-following amplification is convenient for magnification, accurate point and line temperature measurement of some small objects.



5.7 Exquisite structural design

5.7.1 Multiple adjusting knobs to adjust the lens quickly and stably

Multiple adjusting knobs can be used for up, down, left, right, tilt and fine adjustment of lens.

It can quickly adjust the distance, fine-tune of the distance with

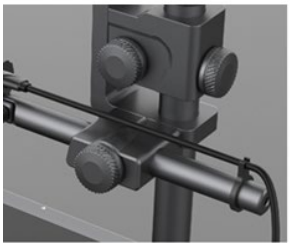
double knobs, and adjust the front and back and the tilt of the lens. The lens can be applied to adjust the focal length, with the working distance ranging from 20mm to 1m.

5.7.2 Expandable baseboard

Single baseboard can be used when the working table is narrow, and large-area double baseboard can be applied in the detection of large circuit board.

5.7.3 Standard, detachable and extensible 1/4 inch screw holes

With the standard 1/4 inch (1/4") screw hole and detachable bracket, it can adapt to different tripods and universal frame, and extend the application requirements (most tripods on the market are 1/4" screw hole).

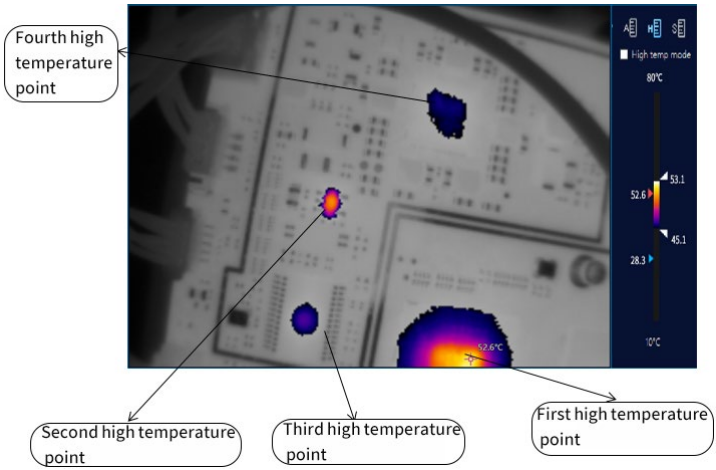


6 Application Cases

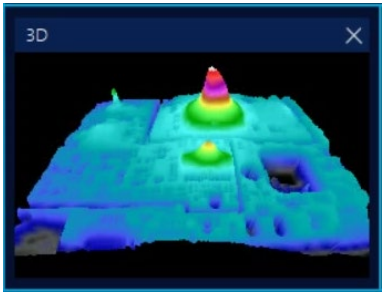
6.1.1 Circuit board troubleshooting

Troubleshooting of mobile phones, computers, projectors and circuit boards of home appliances.

- For the searching of leakage position of circuit board, different temperature points can be applied to determine the leakage elements.

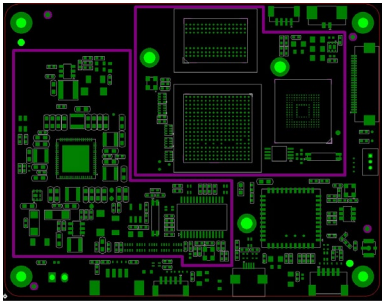


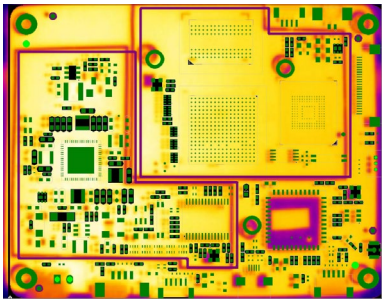
- The very small current leakage of circuit board can be determined with 3D image, and together with the stabilized voltage supply, the pulse change of leakage temperature can be determined, and the minimal current leakage element can be located.



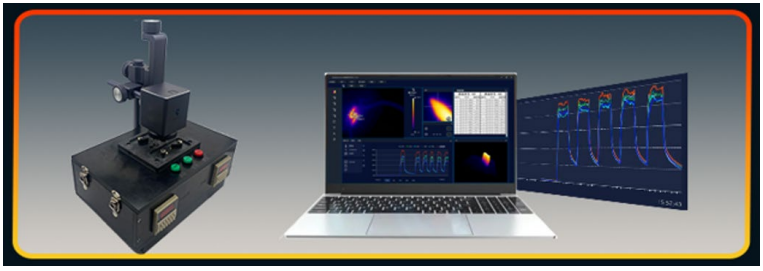
6.1.2 Circuit design

- The provision of richer and more flexible functions serves for collecting thermal field experiment and detection data in circuit design.
- Combined with thermal simulation software, it can check whether the circuit board design is consistent with the theory.
- Isotherm can mark a temperature region as a color, which is convenient to improve the unreasonable point of low-power circuit board design.
- A more flexible temperature and width setting can highlight different temperature ranges of the circuit board, which is easy to find the first, second, ...high temperature point.
- More abundant temperature curve recording methods is suitable for different experimental applications.
- Experimental data recording: For circuit design, in the state of power, the circuit board temperature changes with time can be recorded, and the alarm temperature can be set to automatically take the video photos in overtemperature.
- The integration of circuit board position diagram and thermal imaging serves for quick correspondence to component information.





6.1.3 Quality test of res Quality test of resistance heating wires of electronic cigarettes istance heating wires of electronic cigarettes



Atomizers of electronic cigarettes shall be heated up quickly in a short period to reach a high temperature, so that they can fully burn e-liquid and form smoke. Hence, the heating part of the atomizer is very important. The special detector for the atomizer of Dianyang Technology can automatically collect data to assist in determining the standard data value and quantifying.

Harmful gases may be generated because of low speed and insufficient combustion.
- The sampling rate of 0.04S can be used in auxiliary debugging and determination of the heating time of the resistance heating wires.

Inconsistent atomization of oil injection level may be brought because of uneven heating.
- The oil injection level can be tested at 40 points and 20 regions.

It is impossible to realize quantification with artificial suction nozzle.
- Customized adjustment of suction strength, length and time for automatic operation can free manpower.

When the heating cannot reach the specified temperature, quick atomization cannot be achieved.
In suction, it may cause users to increase suction and e-liquid will overflow.
- High temperature detection at 0-550°C is applied to test the high temperature tolerance range of materials of resistance heating wires.

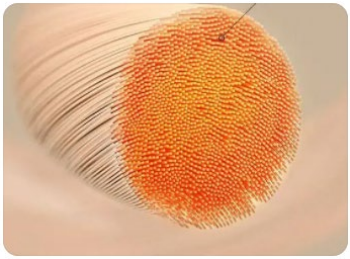
The power boards from different manufacturers is tested to determine whether they can match with the atomizer.
- The installation method is simple, and it can be used for the auxiliary screening of the power boards with different schemes of different manufacturers.

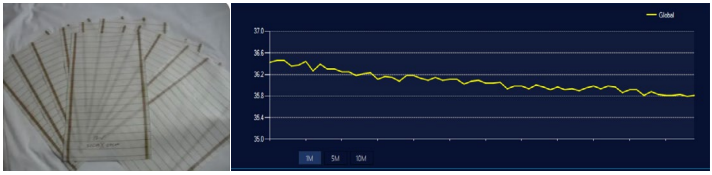
It can be used to detect a large number of resistance heating wires.
- It can be used for the independent test tooling for multiple resistance heating wires.

6.1.4 Self-heating material design

Through curve observation and temperature data analysis, the design of self-heating materials can be improved:

- Customized overtemperature alarm threshold to detect the maximum temperature of materials and assist designers in the material safety design;
- Curve analysis chart for the show of temperature change of materials in real time to help designers determine the time of the storage temperature of materials;
- High and low temperature curves with equal scale for the detection of the uniformity of heat conduction of materials;





6.1.5 Design of temperature controller

Through curve observation and analysis, the circuit and algorithm of temperature controllers are improved:

- Selection of PT100;
- PID algorithm;
- Too long sampling time;

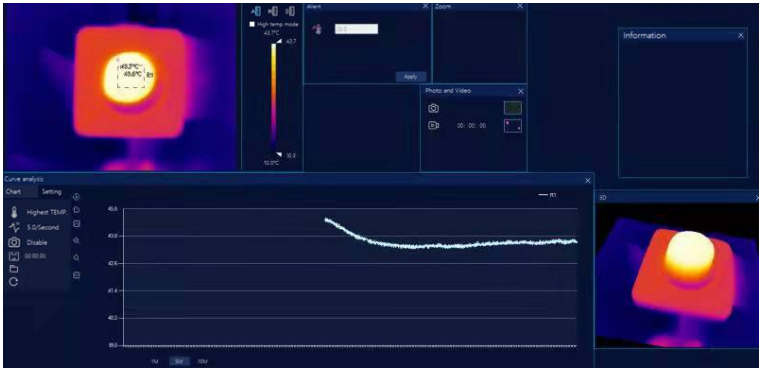


Figure I: High-quality Temperature Controller

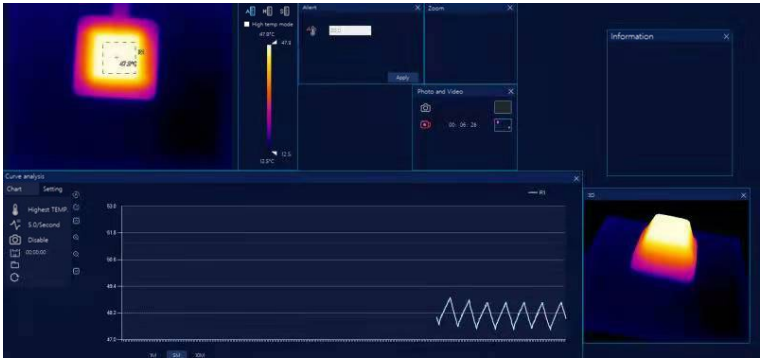
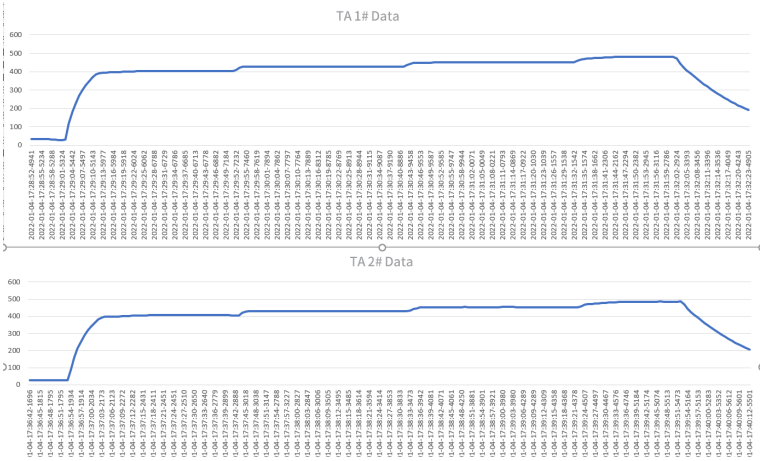


Figure II: Temperature Controller in Need of Improvement

6.1.6 Analysis of data consistency

According to the temperature data recorded by the thermal analyzer, the temperature trend of the product is analyzed to determine the stability of the product at different temperatures. It is suitable for temperature data trend analysis of batch products.

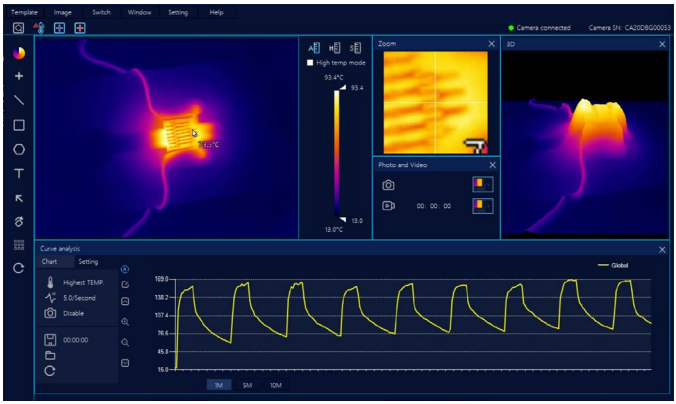


[Figure: Temperature Observation Data of Resistance Heating Wire]

6.1.7 Chart analysis and temperature rise rate detection

It can collect 20 temperature data per second, and can completely capture the rapid heating trend of products as time changes.

Date & Time	Max	Avg	PT1	PT2	PT3	PT4	PT5	Maximum Averag
2021-10-09-15:52:10-8795	32.8	22	31.5	32.2	32.2	32.2	30.9	
2021-10-09-15:52:11-0810	32.8	22	31.5	32.2	32.2	31.9	30.9	
2021-10-09-15:52:11-2922	32.5	22	31.5	32.2	31.5	32.2	30.9	
2021-10-09-15:52:11-4987	32.5	22.1	31.2	31.9	31.5	32.2	30.9	
2021-10-09-15:52:11-6992	32.5							
2021-10-09-15:52:11-9058	32.8							
2021-10-09-15:52:12-1343	32.5							
2021-10-09-15:52:12-3312	32.5							
2021-10-09-15:52:12-5357	32.5							
2021-10-09-15:52:12-7392	32.5							
2021-10-09-15:52:12-9407	32.5							
2021-10-09-15:52:13-1403	32.5							
2021-10-09-15:52:13-3602	32.2							
2021-10-09-15:52:13-5626	32.5							
2021-10-09-15:52:13-7627	32.5							
2021-10-09-15:52:13-9861	32.2							
2021-10-09-15:52:14-1845	32.2							
2021-10-09-15:52:14-3781	159.6							
2021-10-09-15:52:14-5785	198.6							
2021-10-09-15:52:14-8002	204.7							
2021-10-09-15:52:15-0034	204.4							
2021-10-09-15:52:15-2198	206.6							
2021-10-09-15:52:15-4063	202.6							
2021-10-09-15:52:15-6108	205.8	27.9	192	192	174.7	192.2	183.6	
2021-10-09-15:52:15-8237	200.7	27	189.8	189.8	174.2	189.9	180	
2021-10-09-15:52:16-0241	199.4	28	191	189.7	175.5	189.9	182	
2021-10-09-15:52:16-2244	199.4	28.4	192.7	190.5	175.5	190.1	178.6	



7 Product Packaging

The packing list of the thermal analyzer is as follows:

No.	Item	Quantity
1	Baseboard	1
2	Main supporting frame	1
3	Crossbar and host of thermal imaging camera	1
4	USB type C power cable	1
5	Baseboard screws	4 (2 of them are spare screws)
6	Extension support rod	1
6	Quick Operation Instruction	1
7	Hexagon wrench	1
8	USB support clip	1