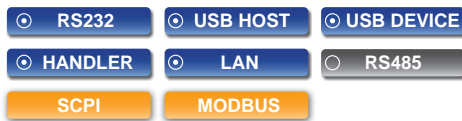
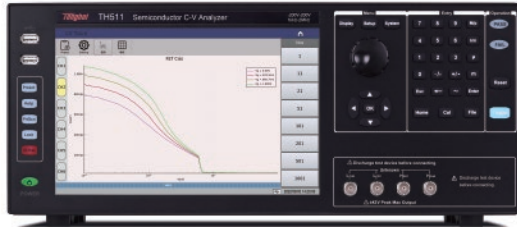


# TH510Series | Semiconductor C-V Characteristic Analyzer

## 2 Models (1kHz-2MHz)



### Brief Introduction

- TH510 series semiconductor C-V characteristic analyzer is an analysis instrument designed by Changzhou Tonghui for semiconductor materials and components design and research.

TH510 series semiconductor C-V characteristic analyzer innovatively adopts new generation technologies such as dual CPU architecture, Linux underlying system, 10.1-inch capacitive touch screen, Chinese and English operation interface, built-in instruction and help, etc., It is suitable for fast and automatic integration and sorting of production lines and can meet laboratory research and development and analysis.

The design frequency of TH510 series semiconductor C-V characteristic analyzer is 10kHz-2MHz, the  $V_{GS}$  voltage can reach  $\pm 40V$ , and the  $V_{DS}$  voltage can reach 200V/1500V, which is enough to meet the CV characteristic test and analysis of semiconductor components such as conventional diodes, triodes, MOS tubes and IGBTs. Thanks to the 10.1-inch capacitive touch screen with a resolution of 1280\*800, TH510 series semiconductor C-V characteristic analyzer can display four parameters on the same screen, all settings, monitoring, sorting parameters, status, etc. can be displayed on the same screen Display, avoiding the tedious operation of frequent switching.

### Application

- **Semiconductor components/Power components**  
Parasitic capacitance test and C-V characteristic analysis of diodes, triodes, MOSFETs, IGBTs, thyristors, integrated circuits, optoelectronic chips, etc.
- **Semiconductor material**  
Wafer dicing, C-V characteristic analysis
- **Liquid crystal material**  
Elastic constant analysis

### Feature

- 10.1-inch capacitive touch screen, resolution 1280\*800, Linux system
- Dual CPU architecture, the fastest test speed of 0.56ms (1800 times/second)
- Three test methods: spot test, list scan, and graphic scan (option)
- Four parasitic parameters (Ciss, Coss, Crss, Rg) are measured and displayed on the same screen
- Integrated design: LCR + high voltage source + channel switching
- Standard 2-channel test, which can test two devices or dual-chip devices at the same time, the channel is the most Up to 6 channels can be expanded, channel parameters are stored separately
- Fast charging, shortens capacitor charging time and enables fast testing
- Fast turn-on test Conduction
- Automatic delay setting
- High Bias: VGS: 0 -  $\pm 40V$ , VDS: 0 - 200V/1500V
- 10 bin sorting

Parameter	TH511	TH512
Channels	2 (Could be extended to 6)	
Test Frequency	10kHz-2MHz	
Test Parameter	Ciss,Coss,Crss,Rg	
$V_{GS}$ Range	0 - $\pm 40V$	
$V_{DS}$ Range	0 - 200V	0 - 1500V

### Size and Weight

Volume(mm): 430(W)x177(H)x265(D)

Net weight: about 16kg

### Accessory

- Standard : One power cord  
TH26063B test fixture
- Optional : 200V channel board  
1500V channel board  
Graphic scanning software

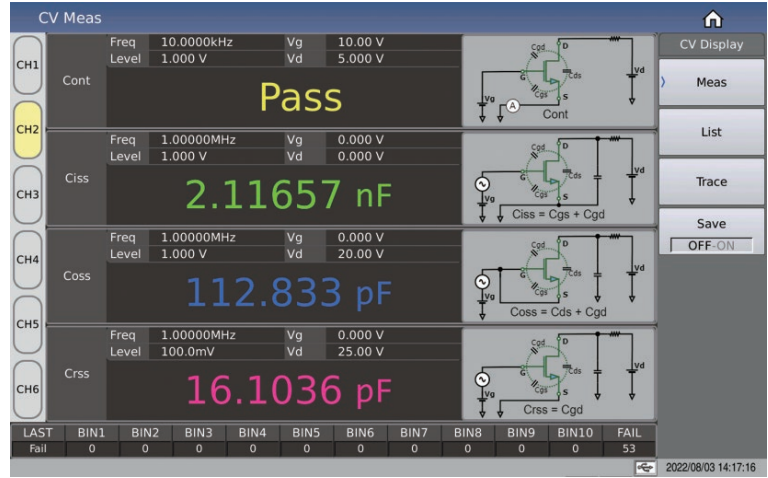
## Notable Features

### A. Single-spot test, 10.1-inch large screen, four parasitic parameters are displayed on the same screen, so that the details can be seen at a glance.

10.1-inch touch screen, 1280\*800 resolution, Linux system, Chinese and English operation interface, support keyboard, mouse, LAN interface, which brings unparalleled operation convenience.

The four most important parasitic parameters of MOSFET: Ciss, Coss, Crss, Rg directly display the measurement results on the same interface, and display the equivalent circuit diagram of the four parameters at the same time, which is clear at a glance.

Up to 6 channels of measurement parameters can be quickly recalled, and the sorting results are directly displayed on the same interface.



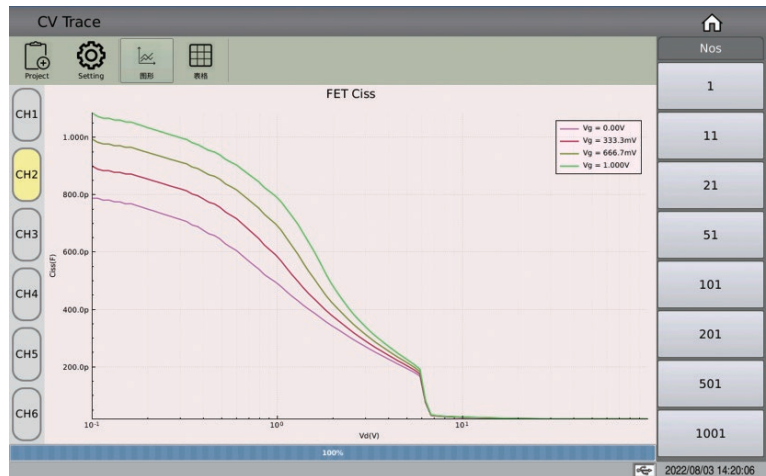
### B. List scan, flexible combination

TH510 series semiconductor C-V characteristic analyzer supports testing and analysis of up to 6 channels and 4 measurement parameters. The list scan mode supports any combination of different channels, different parameters, and different measurement conditions, and can set the limit range and display the measurement results.

Pt	Func	CH	Freq	Level	Vg	Vd	Value	P/F
1	Ciss	1	1.00000MHz	30.00mV	0.000 V	25.00 V	555.737pF	---
2	Coss	1	1.00000MHz	30.00mV	0.000 V	25.00 V	938.163pF	---
3	Crss	1	1.00000MHz	30.00mV	0.000 V	25.00 V	835.084pF	---
4	Rg	1	1.00000MHz	30.00mV	0.000 V	0.000 V	11.7126 Ω	---
5	Ciss	2	1.00000MHz	30.00mV	0.000 V	0.000 V	2.12106nF	---
6	Coss	2	1.00000MHz	30.00mV	0.000 V	0.000 V	2.03281nF	---
7	Crss	2	1.00000MHz	30.00mV	0.000 V	0.000 V	805.309pF	---
8	Rg	2	1.00000MHz	30.00mV	0.000 V	0.000 V	3.07505 Ω	---
9	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	894.105pF	---
10	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	891.027pF	---
11	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	894.955pF	---
12	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	895.862pF	---
13	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	893.066pF	---
14	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	906.774pF	---
15	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	897.478pF	---
16	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	898.262pF	---
17	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	897.786pF	---
18	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	893.826pF	---
19	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	898.032pF	---
*20	Ciss	1	1.00000MHz	30.00mV	0.000 V	0.000 V	892.597pF	---

### C. Graphic scan function (option)

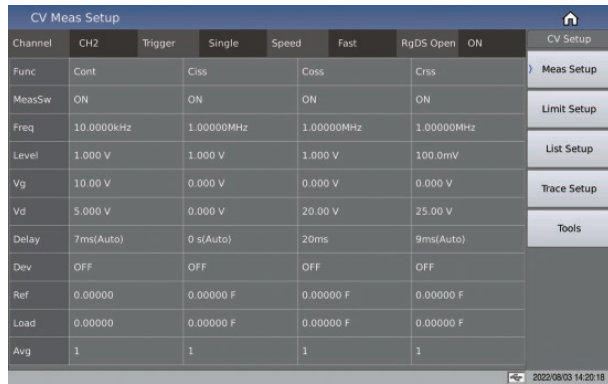
TH510 series semiconductor C-V characteristic analyzer supports C-V characteristic curve analysis, can realize curve scanning in logarithmic and linear ways, and can display multiple curves at the same time: multiple curves with the same parameter and different Vg; multiple curves with the same Vg and different parameters .



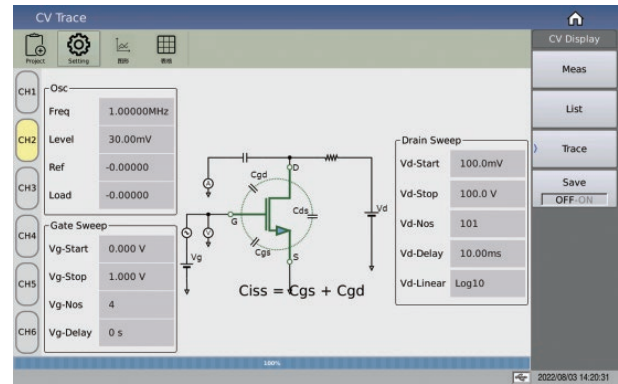
### D.Simple and quick setup

The parameters can be selected arbitrarily and can be turned on and off. Turning off the parameters can effectively save time and data transmission; the delay time can be set automatically or by itself; the gate resistance can be selected from drain-source short-circuit or drain-source open circuit.

Using a graphical setting interface, the function parameters correspond to the schematic settings at a glance.



Spot test setting interface



CV scan setting interface

### E.10 BINS sorting and programmable HANDLER interface

The instrument provides 10 grades of sorting, which provides the possibility for customer product quality classification, and the sorting results are directly output to the HANDLER interface.

When connecting with automation equipment, how to configure the output of the HANDLER interface has always been a difficult problem for automation customers. The TH510 series fully visualizes the pin position of the HANDLER interface, input and output methods, corresponding signals, and response methods, making automatic connection easier.

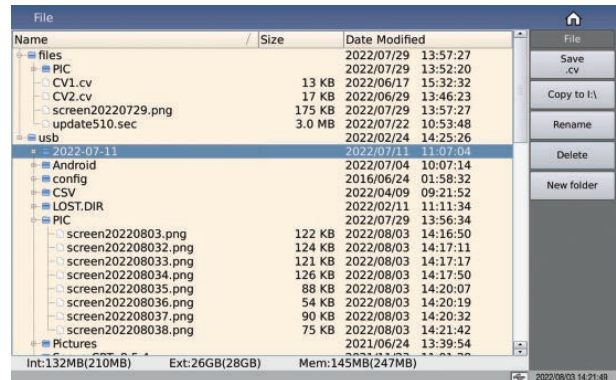
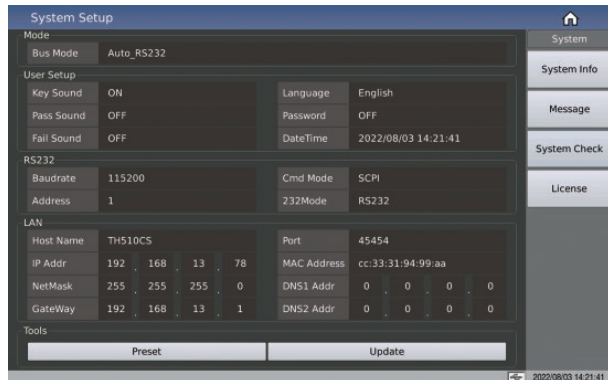


### F.Support customization, intelligent firmware upgrade

Tonghui Instrument is open to customers. All interfaces and instruction sets of the instrument are open design. Customers can program integration or customize functions by themselves. If there is no hardware change in customized functions, they can be updated directly through firmware upgrade.

The instrument itself has perfect functions, BUG solutions, function upgrades, etc., can be updated by upgrading the firmware (Firmware) without returning to the factory.

The firmware upgrade is very intelligent, which can be carried out through the system setting interface or the file management interface, intelligently search the instrument memory, external USB flash drive or even the upgrade package in the local area network, and automatically upgrade.

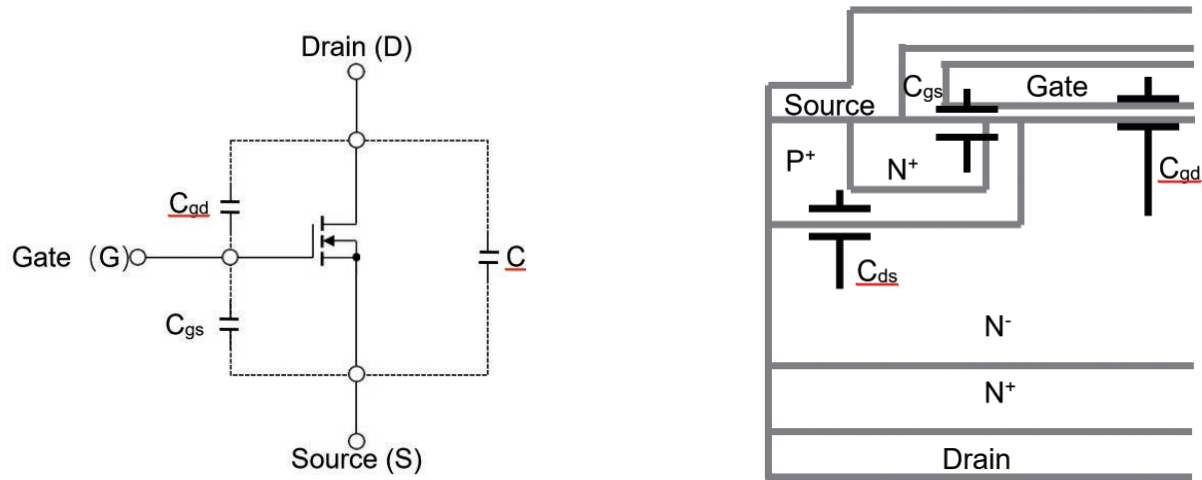


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## G. Knowledge of parasitic capacitance of semiconductor components

In high-frequency circuits, the parasitic capacitance of semiconductor devices often affects the dynamic characteristics of semiconductors, so the following factors need to be considered when designing semiconductor components.

In the design of high-frequency circuits, it is often necessary to consider the influence of the diode junction capacitance; the parasitic capacitance of the MOS tube will affect many aspects such as the operation time, driving ability and switching loss of the tube; the voltage dependence of the parasitic capacitance is also in the circuit design. Crucially, take the MOSFET as an example.



Parameter	Description	Test principle
C <sub>is</sub>	input capacitance	Drain-source short, capacitance between gate and source measured with AC signal, C <sub>iss</sub> = C <sub>gs</sub> + C <sub>gd</sub>
C <sub>os</sub>	output capacitance	Gate to source shorted, capacitance between drain and source measured with an AC signal, C <sub>oss</sub> = C <sub>ds</sub> + C <sub>gd</sub>
C <sub>rs</sub>	reverse transfer capacitance	The source is grounded, and the capacitance between the drain and the gate measured with the AC model, also known as the Miller capacitance, is equivalent to the gate-drain capacitance. C <sub>rss</sub> = C <sub>gd</sub>
R <sub>g</sub>	Gate input resistance	R <sub>g</sub> is defined as a drain-source short, and occasionally as an open-drain

Technical Parameter

Model		TH511	TH512	
Channel		2 (2/4 Ch Optional)		
Display	Display	10.1-inch capacitive touchscreen		
	Ratio	16:9		
	Resolution	1280×RGB×800		
Test Parameter		C <sub>ISS</sub> , C <sub>OSS</sub> , C <sub>RSS</sub> , R <sub>g</sub> . Four parameter selectable arbitrarily		
Test Frequency	Range	10kHz-2MHz		
	Accuracy	0.01%		
	Resolution		10mHz	1.00000kHz-9.99999kHz
			100mHz	10.0000kHz-99.9999kHz
			1Hz	100.000kHz-999.999kHz
		10Hz	1.00000MHz-2.00000MHz	
Test Level	Voltage Range	5mVrms-2Vrms		
	Accuracy	± (10% x Setting Value+2mV)		
	Resolution	1mVrms	5mVrms-1Vrms	
		10mVrms	1Vrms 2Vrms	
V <sub>GS</sub>	Range	0 - ±40V		
	Accuracy	1% x Setting Voltage+8mV		
	Resolution	1mV	0V - ±10V	
		10mV	±10V - ±40V	
V <sub>DS</sub>	Range	0 - ±200V	0 - ±1500V	
	Accuracy	1%×Setting Voltage + 100mV		
Output Impedance		100Ω, ±2%@1kHz		
Computation		Absolute deviation Δ from nominal value, percent deviation from nominal value Δ%		
Calibration Function		OPEN, SHORT, LOAD		
Measurement Range		1-255 times		
AD Conversion Time (ms/time)		Fast+: 0.56ms (> 5kHz), Fast: 3.3ms, Middle: 90ms, Slow: 220ms.		
Basic Accuracy		0.1%		
C <sub>ISS</sub> , C <sub>OSS</sub> , C <sub>RSS</sub>		0.00001pF - 9.99999F		
R <sub>g</sub>		0.001mΩ - 99.9999MΩ		
Δ%		± (0.000% - 999.9%)		
Multi-Function Parameter List	Spots	20 spots, the average number can be set for each spot, and each spot can be sorted separately		
	Parameter	Test Frequency, V <sub>g</sub> , V <sub>d</sub> , Channel		
	Trigger Mode	Sequence SEQ: After one trigger, measure at all sweep points, /EOM/INDEX output only once.		
Step: perform a sweep point measurement per trigger, each point outputs /EOM/INDEX, but the list scan comparator result is only output at the last /EOM				

Graphic Sa n	Sa nning Spots	Any Spot is optional, up to 1001 Spots	
	Result Display	Multiple curves with the same parameter and different Vg; multiple curves with the same Vg and different parameters.	
	Display Range	Real-time automatic, locked	
	Coordinate ruler	Logarithmic, linear	
	Parameter	Vg、Vd	
	Trigger Mode	Single	Manual trigger once, complete one scan from the start spot to the end spot, and start a new scan with the next trigger signal
		Continuous	Infinite loop scan from the start spot to the end spot
Result Storage	Graphics, files		
Comparators	Bin	10Bin、PASS、FAIL	
	Bin Deviation Setting	Deviation, Percent Deviation, Off	
	Bin Mode	Tolerance, continuous	
	Bin Count	0-99999	
	Bin Judgement	A maximum of four parameter limit ranges can be set for each bin. The corresponding bin number will be displayed within the setting range of the four test parameter results. If it exceeds the set maximum bin number range, FAIL will be displayed. Test parameters without upper and lower limits will be automatically ignored.	
	PASS/FAIL india tion	Satisfy Bin1-10, the PASS light on the front panel is on, otherwise the FAIL light is on.	
Data Storage	201 measurement results can be read in batches		
Storage File	Internal	About 100M non-volatile memory test setup file	
	External USB	Test setup files, screenshots, log files	
Keyboard Lock	Lockable front panel buttons, other functions to be expanded		
Interface	USB HOST	2 USB HOST interfaces, which can be connected to the mouse and keyboard at the same time, and only one U disk can be used at the same time	
	USB DEVICE	Universal Serial Bus socket, small type B (4 contact positions); compliant with USB TMC-USB488 and USB2.0, female connector for connecting external controllers.	
	LAN	10/100M Ethernet, 8 pins, two speed options	
	HANDLER	Used for Bin signal output	
	RS232C	Standard 9-pin, c o e d	
	RS485	Can receive modification or external RS232 to RS485 module	
Boot Warm-up Time	60 Minutes		
Power consumption	100-120VAC/198-242VAC Option, 47-63Hz		
Power consumption	More than 130VA		
Dimensions (WxHxD) mm	430x177x405		
Weight	16g		