Component Parameter Test Instruments

C. TH2828/TH2828A Precision LCR Meter
TH2828S Automatic Component Analyzer

Features

- Auto balancing bridge method with the widest impedance measurement range
- 4-terminal pair configuration to eliminate electromagnetic couple of test leads
- Basic accuracy: 0.05 %(TH2828/TH2828S), 0.1 %(TH2828A)
- Maximum test frequency up to 1 MHz
- AC test signal programmable to 20V (optional)
- Maximum measurement speed up to 30 meas/sec
- 6-digit display resolution
- 22 parameter combinations available
- Output signal Impedance: 30 Ω and 100 Ω selectable
- 10 points list sweep function
- Internal DC bias source ± 40V/100mA(optional)
- External DC bias 40A (optional two paralleled TH1776)
- Automatic level control function (ALC)
- Test signal level monitor function
- 20 control settings files can be saved in the internal non-volatile memory
- Built-in comparator:10-bins and bin counters
- RS232C, HANDLER, GPIB (option for TH2828A)
- 2m/4m cable length extension
- USB interface for external memory of set data
- 320×240 dot-matrix large graphic LCD display
- Chinese and English language user interface selectable

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TH2828/TH2828A/TH2828S

Brief Introduction

TH2828/TH2828A/TH2828S is a new generation impedance test instrument with the most advanced technique of auto balancing bridge in the world.It fulfills all the measurement needs for components and materials with its high basic accuracy (0.05%/0.1%),wide frequency range (from 20 Hz to 1MHz) and impedance range (up to 100MΩ).The instrument is especially suitable for low dissipation factor(D)capacitor and high quality factor (Q) inductor measurement .The high power measurement conditions of up to 20V test signal level and 40 A DC bias current and list sweep function make it easy to extend user's capability of component evaluation.Four-terminal pair terminal configuration which eliminates the electromagnetic coupling of test leads,extends the low impedance measurement range ten times down of the normal five-terminal configuration instrument.

TH2828/TH2828A/TH2828S is a powerful tool for component design,component inspection,quality control and measurement on production line.It's also a powerful tool for design and research of circuit and materials(electronic material and non-electronic material).

With its excellent performance,TH2828/TH2828A/TH2828S is in conformity with commercial and military standards,for example IEC and MIL standards.

Various Measurement Device

Passive:Impedance measurement of capacitor,inductor,magnetic core,resistor, transformer,chip module,network component,etc.

Semiconductor:Varactor C-V characteristic,parasitic parameter analysis of transistor and IC

Others:Impedance evaluation of PCB,relay,switch,cable,battery,etc.

Dielectric Material:Permittivity and dissipation angle evaluation of plastic, ceramic,etc.

Magnetic Material:Magneto conductivity and dissipation angle evaluation of ferrite,non-crystal materials.

Semiconductor Material:Permittivity,conductivity and C-V characteristics of semiconductor materials.

LCD Material:Permittivity,elasticity and C-V characteristics of LCD unit.

Versatile Component and Material Measurement Capability

Discovery the multi-characteristic of inductor

With its wide test frequency(20Hz--1MHz) and excellent performance,Th2828/TH2828A can accurately analyze the characteristics of inductor and magnetic materials.

By using the optional TH10301(100 mA DC bias source),TH2828/TH2828A can accurately analyze high frequency inductor,communication transformer and filter under low DC bias current.By using TH1775DC Bias Current Source,TH2828/TH2828A can analyze high power and current inductor under a DC bias current up to 40A.

Accurate measurement for ceramic capacitor

Ceramic material and capacitor are mainly measured under 1KHz and 1MHz. Most ceramic capacitors have the feature of low dissippation.The C and D parameters of a ceramic capacitor vary obviously with the test signal level.

With its wide test frequency,high accuracy,6-digit resolution and automatic level control function (ALC),TH2828/TH2828A can measure the ceramic capacitor and material accurately and reliably.

Capacitance characteristic measurement for LCD Unit

Capacitance -Voltage($C\text{-}V_{AC}$) characteristic is the main characteristic used to evaluate a LCD material .For $C\text{-}V_{AC}$ measurement ,general instrument has a weakness,whose maximum test voltage level is not high enough.

TH2828/TH2828A with the Optional TH10301 can provide a programmable test signal voltage up to 20 Vrms with 1% resolution. So TH2828/TH2828A can measure the $C\text{-}V_{AC}$ characteristic of a LCD material under the most suitable condition you need.

Measurement for semiconductor material and component

Oxide-layer capacitance (Cox) and semiconductor impurity density are the main characteristics to evaluate a MOSFET.All of these parameters can be calculated from the measurement result of $C\text{-}V_{DC}$.

With its wide test frequency(20 Hz to 1 MHz) and internal ±40V programmable DC Bias Soure.TH2828/TH2828A can measure the $C\text{-}V_{DC}$ easily.

The extended cable and probe are needed for measuring semiconductor component on silicon-water.The optinal 2 m/4 m extended cable can efficiently reduce the error due to cable extension.

TH2828/TH2828A can also measure the parasitic parameters of diodes and transistors.

Meeting the Measurement Needs in Various Fields

R&D of New Materials and Components

The basic measurement accuracy of 0.05% / 0.1% greatly increases the measurement reliability of TH2828/TH2828A.With its 6-digit resolution ,the instrument can identify the slight change of a component, especially

for measuring the low dissipation capacitor.

Enhancing Production Line Efficiency

■ The high measurement speed (30meas/sec) can greatly increase test throughput.

The built-in comparator,cable length compensation and HANDLE interface make it easy to build an automatic component test system.

The internal non-volatile memory and USB disk can save the setting time and reduce operation errors.

User's Friendly Interface

Simple Operation of front panel

■ All control settings,softkeys and monitor information are directly displayed on the 320x240 dot-matrix large LCD.The interactive Softkeys make the key operation simple and efficient.

Non-volatile Memory for Storing Measurement Settings

■ TH2828/TH2828A's build-in non-volatile memory can save 20 control setting files. The USB disk(TH2828 only) makes it possible that the setting files can be shared by more instruments.Doing so will greatly reduce operation errors and enhance efficiency.

Flexible Data Communication modes

■ Th2828/TH2828A's GPIB interface(optional for TH2828A) makes it possible to build an automatic component test system and communicate with each other. On the other hand the low cost RS232 interface makes it easy to communicate with a computer.

General Specifications

Operation Temperature And Humidity		0°C − 40°C, ≤ 90%RH
Power Requirements	Voltage	99V−121VAC,198V−242VAC
	Frequency	47.5Hz − 63Hz
Power Consumption		≤ 100VA
Dimensions (W×H×D)		430mm×185mm×490mm
Weight		Approx. 15 kg

Ordering Information

TH2828 Precision LCR Meter
TH2828A Wide-frequency LCR Meter
TH2828S Automatic Component Analyzer

Instrument Accessories

TH26005C	4 terminal test fixture
TH26011B	4 terminal pair Kelvin test clip leads
TH26010	Gilded shorting plate
TH10002	GPIB interface board (only TH2828S)
TH26025	USB interface board (only TH2828S)
TH26026	32MB USB disk (only TH2828S)

Options

TH26047	4 terminal test fixture
TH26048	4 terminal test fixture
TH26006	Axial component test module
TH26007	Core inductor test fixture
TH26008A	SMD component test fixture
TH26009B	SMD Kelvin test tweezers
TH10301	20Vrms/40V DC power amplifier/DC bias board
TH10401	2m/4m cable length operation
TH10002	GPIB interface board
TH10202	Handler/Scanner interface board
TH12019	TH2828 RS232C control software
TH12020	TH2828A RS232C control software

Specifications

Measurement function			
Test Parameters		|Z|, |Y|, C, L, X, B, R, G, D, Q, θ, ESR (equivalent series resistance), Rp (equivalent parallel resistance)22 parameter combinations available	
Equivalent Circuit		Series and Parallel	
Math Function		Deviation and Percent Deviation	
Range	Mode	Auto, Hold, Manual	
	Subsection	9 sects: 10Ω, 30Ω, 100Ω, 300Ω, 1kΩ, 3kΩ, 10kΩ, 30kΩ, 100kΩ	
Trigger mode		Internal, Manual, External, BUS	
Measuring Time (≥1kHz)		Fast:32ms(25ms@1MHz),Med: 90ms, Slow:650ms	
Average Time		1—255	
Delay Time		0—60s, with step of 1ms	
Calibration Function		Open/Short frequency pint, full frequency correction, Load correction	
Measurement Terminal		4 terminal pair	
Test Cable Length		Standard: 0m, 1m Option: 2m, 4m	
Display mode		Direct, Δ, Δ%, bin No, bin counter, list sweep, V/I (voltage/current monitor)	
Display		320×240 dot-matrix graphic LCD display	
Test signal			
Signal Frequency	TH2828	20 Hz − 1MHz 6000 selectable frequencies	
	TH2828A	50Hz − 1MHz 44 selectable frequencies : 50Hz,60Hz,80Hz,100Hz,120Hz,150Hz,200Hz,250Hz,300Hz,400Hz,500Hz,600Hz,800Hz,1kHz,1.2kHz,1.5kHz,2kHz,2.5kHz,3kHz,4kHz,5kHz,6kHz,8kHz,10kHz,12kHz,15kHz,20kHz,25kHz,30kHz,40kHz,50kHz,60kHz,80kHz,100kHz,120kHz,150kHz,200kHz,250kHz,300kHz,400kHz,500kHz,600kHz,800kHz,1MHz	
	TH2828S	20Hz—1MHz,Resolution:1mHz	
	Accuracy	0.01%	
Output Impedance		30 Ω and 100 Ω selectable	
Measurement signal mode	Normal	voltage or current program selectable at the measurement terminals when they are opened or shorted, respectively	
	Constant level	Maintain selected voltage or current value at the DUT independent of component impedance change	
AC measurement level signal	Standard	Normal V	5mVrms — 2Vrms
		Normal I	50μArms — 20mArms
		Constant level V	10mVrms — 1Vrms
		Constant level I	100μArms — 10mArms
	Option TH10301	Normal V	5mVrms — 20Vrms
		Normal I	50μArms — 200mArms
		Constant V	10mVrms — 10Vrms
		Constant I	100μArms—100mArms
DC bias	Standard	0V, 1.5V, 2V DC	
	TH10301 option	Range	Resolution
		±(0.000 — 4.000)V DC	1mV
		±(4.002 — 8.000)V DC	2mV
		±(8.005 — 20.000)V DC	5mV

Measurement Display Range	
|Z|, R, X	0. 01mΩ — 99.9999MΩ
|Y|, G, B	0. 01nS — 99.9999S
C	0. 00001pF — 9.99999F
L	0.01nH — 99.9999kH
D	0.00001 — 9.99999
Q	0.01 — 99999.9
θ (DEG)	-179.999º — 179.999 º
θ (RAD)	-3.14159 — 3.14159
Δ%	-999.999% — 999.999%

List Sweep Function	
A maximum of 10 frequency or test signal level points can be swept. Single or continuous test mode can be performed. When Option 001 is installed, DC bias level points can also be swept.	
Comparator and interface	
Comparator	10-bin sorting and bin counter for measurement parameters IN/OUT judgment for sub parameters
Bin counter	0—999999
List sweep comparator	HIGH/IN/OUTdecision output for each point in the list sweep table
Input protection	
Internal circuit protection, when a charged capacitor is connected to the Unknown terminals. The maximum capacitor voltage can be calculated: $V_{max}=1/\sqrt{C}$ where: $V_{max}\leq 200V$ C is in Farads	
Other Function	
Memory	20 instrument setting files can be stored/ loaded from the internal non-volatile memory. 40 additional setting files can also be stored/ loaded from USB disk(only TH2828S)
GPIB, RS232C	All instrument control settings, measured values, comparator limits and list sweep tables can communicate with computer or other instruments through GPIB (optional for TH2828A) or RS232C.
Options	
TH10301	Power amplifier/DC Bias Increasing AC test signal up to 20 Vrms/0.2 Arms. Extend bias voltage up to ±40V DC
TH10401	2m/4m Cable Length Operation Extend test cable length capability. Adds 2m and 4m cable length operation.
TH10202	Handler interface Nine pairs of High/Low limits can be input providing 10-bin sorting for L, C, or |Z|. The handler interface provides the interface with an automatic component sorting machine. All signals are optically isolated.
Accuracy(For detail refer to operation manual)	
Test conditions	Warm up Time: ≥30 minutes Ambient Temperature: 23±5ºC Test Signal Voltage: 0.3Vrms – 1Vrms Correction: Open, Short Test cable length: 0 m
|Z|, |Y|, C, L, X, B, R, G,	Ae = ±[A+(Ka+Kb+Kc)×100] (% of reading) 1. A is basic accuracy factor as in figure 1 and 2 2. Ka and Kb is impedance proportional factors Ka is use for impedances below 500Ω Kb is use for impedances below 500Ω 3. Kc is calibration interpolation. Direct correction frequencies: Kc=0, All Other frequencies :Kc=0.0003 4. D ≤ 0.1, for C, L, B measurement Q ≤ 0.1, for R, G measurement
D	±[Ae/100] (direct reading of D) Here, A=[A+(Ka+Kb+Kc)×100]

Q (Qx×De<0.1)		$\pm\left[\left(Q_x^2\times D_e\right)/\left(1\mp\left(Q_x\times D_e\right)\right)\right]$ Here, Qx is measured Q value, De is the D's accuracy
θ	DEG	±[Ae/100] (direct radian)
	RAD	±[(180/π)×(Ae/100)] (direct angle)

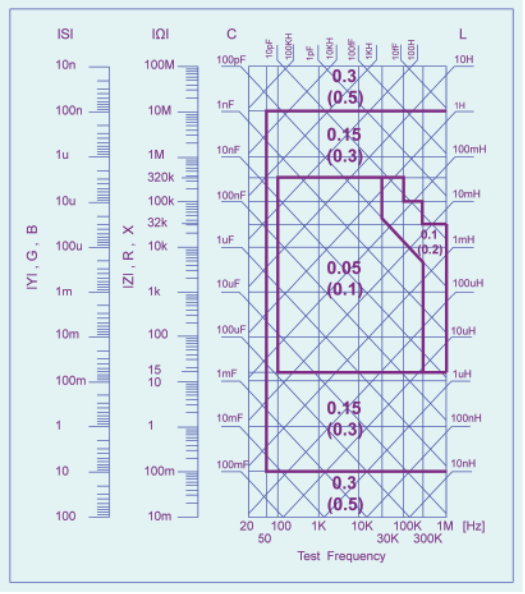

Figure1: Basic accuracy factor A of TH2828/TH2828S

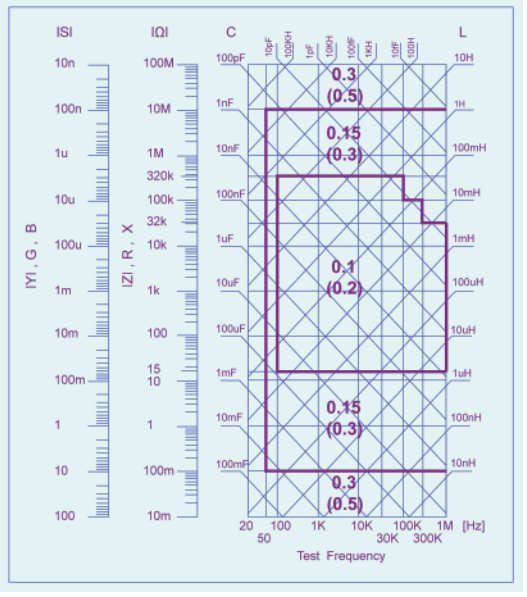

Figure 2: Basic accuracy factor A of TH2828A

Note: 1. Test signal level: 0.3Vrms-1Vrms, Out of this range,refer to user's manual.
2. Upper number: MEDIUM and SLOW integration
3. Lower number: SHORT integration.