

INSTRUCTION MANUAL

TT-SI 9110

100MHz Active Differential Probe



TESTEC

These probe is in compliance with EN61010-031:2002+A1:2008
CAT III, Pollution Degree 2

1. Safety Terms and Symbols

Terms appear in this manual:



WARNING. Warning statements identify conditions or practice that could result in injury or loss life.



CAUTION. Caution statements identify conditions or practice that could result in damage to this product or other property.

Safety Symbols



Connect it to safety earth ground using the wire recommended in the user's manual.



High voltage danger



The symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

2. General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this probe or any products that connected to it.

Observe Maximum Working Voltage

To avoid any injury, do not use the probe under the condition that the voltage between either input lead or earth is above 1000Vrms CAT I. This voltage rating applies to both settings 1/100 & 1/1000.

Must be Grounded

This probe is grounded with the shell of BNC connector and an auxiliary grounding terminal, through the grounding conductor of the power cord of the measurement instrument. Before making connections to the input leads of this probe, ensure that the output BNC connector is attached to the BNC connector of the measurement instrument and the auxiliary grounding terminal is connected to a proper ground, while the measurement instrument is properly grounded.

Do Not Operate Without Covers

To avoid electric shock or fire hazard, do not operate this probe with covers removed.

Do Not Operate in Wet/Damp Conditions

To avoid electric shock, do not operate this probe in wet or damp conditions.

Do Not Operate in Explosive Atmosphere

To avoid injury or fire hazard, do not operate this probe in an explosive atmosphere.

Avoid Exposed Circuit

To avoid injury, remove jewelry such as rings, watches, and other metallic objects. Do not touch exposed connections and components when power is present.

Use Proper Power Source

To ensure this probe function well, use four AA cells or 6VDC/60mA or regulated 9VDC/40mA mains adaptor or power lead. Do not operate this probe from a power source that applies more than the voltage specified.

Do Not Operate With Suspected Failures

If you suspect there is damage to this probe, have it inspected by qualified service personnel.

Cleaning

Use a soft cloth to clean the dirt. Prevent damage to probe. Avoid immersing the probe. Avoid using abrasive cleaners. Avoid using chemicals contains benzene or similar solvents.

3. Description

By enabling conventional oscilloscopes to display and measure in-circuit waveforms that are referenced to high common mode voltages. The differential probe extends the measurement capability of oscilloscopes in electronic power converters, inverters, motor speed controls, switch mode power supplies, and many applications.

4. Installation

- a. Simply plug-in the BNC output connector to the vertical input of a general purposed oscilloscope or other measurement instrument, and connects the auxiliary grounding terminal to a proper ground. The measurement instrument must have a ground referenced.
- b. Connect an appropriate power source to this probe and or enter the batteries, then turn it on.
- c. Select the proper attenuation ratio. When measuring signals below 700V switch the attenuation ration to 1/100 in order to get higher resolution and less noise ratio. Otherwise, set the attenuation ratio to 1/1000.



WARNING. To protect against electric shock, use only the accessories supplied with this probe.

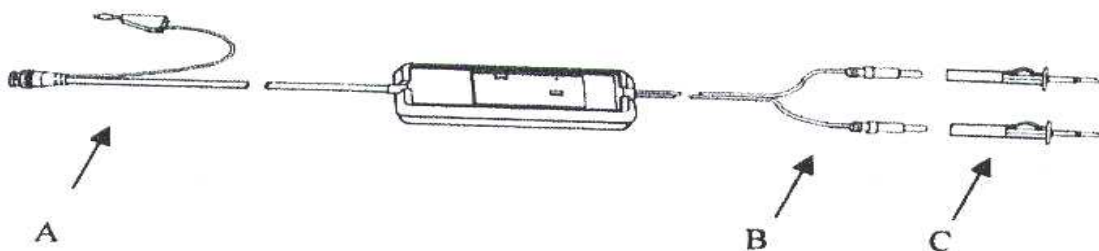
- d. Using the appropriate probe accessories, connect the inputs to the circuits under measurement.



CAUTION. This probe is to carry out differential measurement between two points on the circuit under measurement. This probe is not for electrically insulating the circuit under measurement and the measuring instrument.

5. Appearance

The differential probe looks as follows.



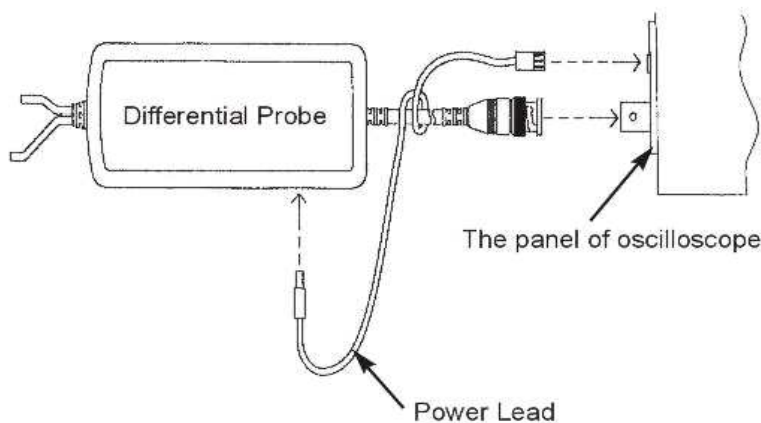
- a. Output Cable The BNC output connector and an auxiliary grounding terminal are connected to the oscilloscope.
- b. Input Leads The input leads of the differential probe connect to the HV alligator clips that come with the probe.
- c. Sprung Hooks The sprung hooks are connected safely to test points in circuits under measurement.

6. Offset Adjustment

If the offset voltage is too large, short the input leads and turn the adjust variable resistor (DC voltage adjustment) which you find in the hole of the panel by using a flat-head screwdriver until the offset voltage is lowest.

7. Available Power Sources

- a. 4 x AA batteries
- b. Mains adaptor (6VDC/60mA or regulated 9VDC/40mA),
- c. Lemo® Power Cord, for oscilloscopes with power output - Lemo® connector.
- d. Probus® Power Cord, for oscilloscopes with power output - Probus® connector.
- e. USB Power Cord, for oscilloscopes which offer USB connector.



8. Accessories

Type	Order-No.	Description
TT-SI NT	15100	Mains Adapter
TT-SI HC	15160	Hardcase
TT-SI PROBUS	15150	Power Lead with PROBUS-Connector
TT-SI LEMO	15151	Power Lead with LEMO-Connector
TT-SI USB	15152	Power Lead with USB-Connector
TT-SI EPL1	15140	1 to 3 Power Splitter
TT-SI EPL2	15141	1 to 4 Power Splitter

9. Specifications

	TT-SI 9110
Bandwidth	DC to 100MHz (-3dB)
Attenuation Ratio	1:100 / 1:1000
Accuracy	±2%
Rise Time	3,5ns
Input Impedance	4MΩ // 7pF each side to ground
Input Voltage - Differential Range	1:100 ±140V (DC+peak AC) or 140Vrms 1:1000 ±1400V (DC+peak AC) or 1000Vrms
Input Voltage - Common Mode Range	1:100 and 1:1000 ±1400V (DC+peak AC) or 1000Vrms
Input Voltage - Absolute Max. Common Mode	1:100 and 1:1000 ±1400V (DC+peak AC) or 1000Vrms
Input Voltage - Absolute Max. Differential Mode	1:100 and 1:1000 ±1400V (DC+peak AC) or 1000Vrms
Measurement Category	CAT III
Output Voltage - Swing	±1,4V (into 50kΩ load)
Output Voltage - Offset (typical)	<±5mV
Output Voltage - Noise (typical)	0,9mVrms
Source Impedance (typical)	50Ω (for using 1MΩ input system oscilloscope)
CMRR (typical)	-80dB @60Hz, -60dB @1MHz
Ambient Operating Temperature	-10°C to 40°C
Ambient Storage Temperature	-30°C to 70°C
Ambient Operating Humidity	25% to 85% RH
Ambient Storage Humidity	25% to 85% RH
Power Requirements - Standard	4 x AA Cells
Power Requirements - Optional	Power lead or Mains Adapter (6VDC/60mA or regulated 9VDC/40mA)
Length of BNC Cable	90cm
Length of Input Leads	60cm
Weight	500g
Dimensions (LxWxH)	202mm x 83mm x 38mm

- a. The supplied voltage must be less than 12V and greater than 4.4V, otherwise the probe could be damaged or can't be operated properly.
- b. Polarity is "+" inside and "-" outside. For wrong polarity, built-in circuit protects the probe, no danger or damage will occur.
- c. When the voltage of the cells become too low, the power indicator on the will flicker.

10. 'Differential', 'Common Mode' and 'Absolut max.' Voltage

Range limit is the lesser of the 'DC+Peak AC' and RMS values.

Input voltage at positive input lead = $V(+)$ / Input voltage at negative input lead = $V(-)$

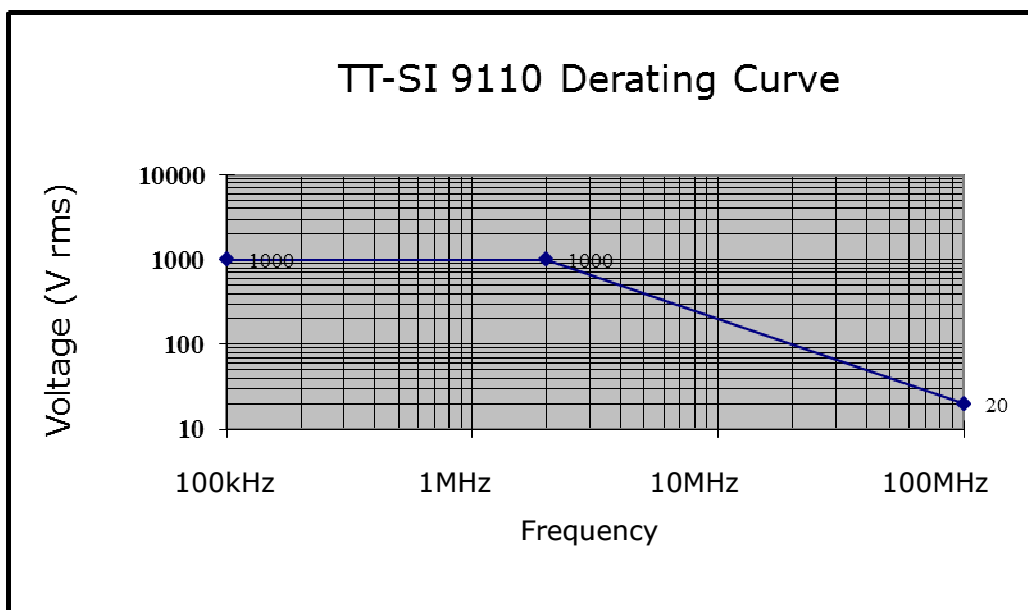
- **Differential Range= $V(+)$ – $V(-)$**

- **Common Mode Range= $[V(+)$ + $V(-)$] /2**

The input-specification of differential range and common mode range has to be meet at the same time so that output specification could be meet. Absolute Max. Voltage is defined for when the input condition do not meet specification of differential range and common mode range. Under this condition, the output of probe could not be guaranteed within specification. When larger then this condition, the probe maybe broken.

11. Derating Curve

The derating curve of the absolute maximum input voltage in common mode is shown as follows.



12. Inspection Procedure

- Connect the BNC output connector to the vertical input of a general purposed oscilloscope.
- Install four AA cells or connect an appropriate mains adaptor or power lead to the correct line voltage.
- Set the oscilloscope input coupling to DC and the 1V/div. Center the trace on the display.
- Connect the inputs of the probe to power lines.
- Set the range of the probe to 1/100.
- Then, a 50Hz/60Hz sine-wave of proper amplitude will be displayed on the screen of the oscilloscope and this means the probe is working properly.

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