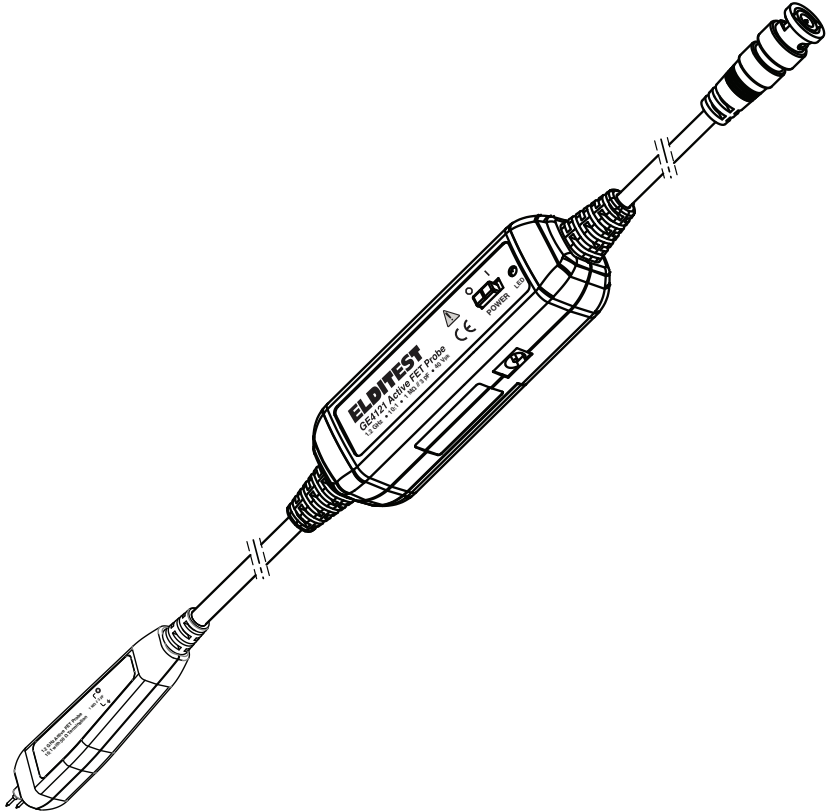




CT4121 User Manual

Safety Summary

To avoid personal injury and/or product damage, review and comply with the following safety precautions. These precautions apply to both operating and maintenance personnel and must be followed during all phases of operation, service, and repair of this probe.

A **WARNING** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in injury or death to personnel.

A **CAUTION** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in damage to or destruction of parts or the entire product.

Inspect the Probe

Inspect the probe and accessories for cracks and frayed or broken leads before each use. If defects or damages are noted, DO NOT USE the probe.

Handle Carefully

Handle the probe with care to avoid injury, especially when fitted with sharp tips.

Dry Conditions

Hands, shoes, floor and work bench must be dry. Avoid making measurements under humidity, dampness or other environmental conditions that might affect safety.

Do Not Remove Probe Housing

Removal of the probe's housing may expose you to electric shock. If necessary, disconnect the inputs and outputs of the probe before opening the case.

Hazardous Contact

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

Unexpected Charges

Hazardous voltages may be present in unexpected locations in circuitry

being tested when a fault condition in the circuit exists. Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.

Grounded Instruments

Use only grounded instruments. Do not connect the probe's ground lead to a potential other than earth ground. Always make sure the probe and the instrument are grounded properly.

Use Only in Office-Type Indoor Setting

The probe is designed to be used in office-type indoor environments. Do not operate the probe:

- In the presence of noxious, corrosive, or flammable fumes, gases, vapors, chemicals, or finely-divided particulates.
- In environments where there is a danger of any liquid being spilled on the probe.
- In air temperatures exceeding the specified operating temperatures.
- In atmospheric pressures outside the specified altitude limits or where the surrounding gas is not air.

Not for Critical Applications

This probe is not authorized for use in contact with the human body or for use as a component in a life-support device or system.

Do Not Substitute Parts

Do not install substitute parts or perform any unauthorized modification to the instrument.

Only Qualified Personnel

This probe should only be used by personnel who are trained, experienced, or otherwise qualified to recognize hazardous situations and who understand the safety precautions necessary to avoid possible injury when using such a probe.

Observe Maximum Working Voltage

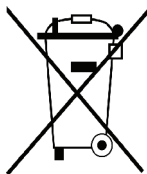
Do not use the CT4121 above 40 V (DC + AC peak) CAT I between each input lead and earth.

Use Proper Power Source

Do not operate this probe from a power source that applies more than the voltage specified.

Compliance Statements

Disposal of Old Electrical & Electronic Equipment



(Applicable in the European Union and other European countries with separate collection systems). This product is subject to Directive 2012/19/EU of the European Parliament and the Council of the European Union on waste electrical and electronic equipment (WEEE), and in jurisdictions adopting that Directive, is marked as being put on the market after August 13, 2005, and should not be disposed of as unsorted municipal waste. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

This probe is in compliance with IEC-61010-031 CAT I, Pollution Degree 2.



1 Introduction

Overview

The CT4121 is a compact FET probe with very high input resistance and low input capacitance. With a 1.2 GHz bandwidth, this probe is ideal for timing analysis or troubleshooting high speed logic circuits, for design verification of disk drives, as well as for wireless and data communication design. The CT4121 can measure up to ± 40 V (DC + AC peak). Compatible with oscilloscopes from all major manufacturers, the probe is powered by the included 9 V battery or direct from the oscilloscope using the included USB power lead.

Features:

- 1.2 GHz bandwidth (-3 dB)
- Up to ± 40 V (DC + AC peak)
- Attenuation 10x
- High accuracy ($\pm 2\%$)
- Power indicator LED
- SMD accessory kit

Initial Inspection

This probe is tested prior to shipment therefore it is ready for immediate use upon receipt. An initial physical inspection should be made to ensure that no damage has been sustained during shipment. After the inspection, verify the contents of the shipment.

Kit Contents:

- Active FET probe
- 50 Ω feed-through terminator (CT2944-50)
- USB power lead (CT4122)
- 9 V battery
- Offset adjustment tool
- User manual
- SMD kit
 - (2) SMD test clip, gray (CT3659-8)
 - (2) MicroLeads, 0.8 mm, Pin-Jack, 5 cm, Black/Red

- (2) MicroLeads, 0.8 mm, Pin-Jack, 10 cm, Black/Red
- (4) Ground pin, bent
- (6) Test tip, uninsulated, 0.8 mm x 11.6 mm

2 Product Overview

CT4121 Description

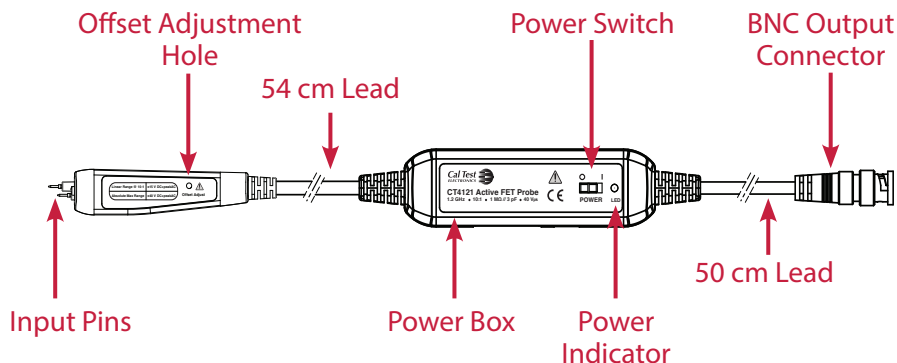


Figure 1 Front Panel Diagram CT4121

3 Using the Probe

Power Connection

Slide open the battery compartment and attach a 9 V battery to the snap connector. Place the battery inside compartment and then slide the cover back in place. See Figure 2.

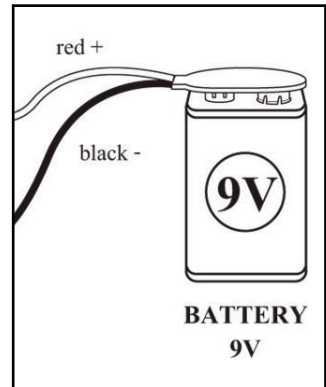
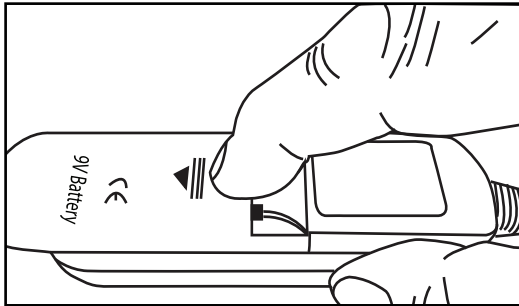


Figure 2 Battery Connection

Alternatively, connect the 9 VDC power lead to the power jack on the probe. See Figure 3. Connect the lead to a USB power source.

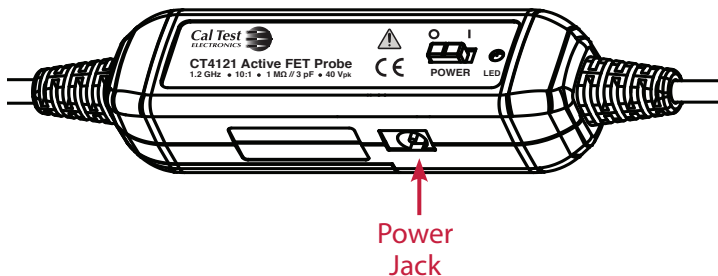


Figure 3 Power Jack

WARNING

At the time of powering on the probe, the input leads must not be connected to an item to be tested. Never operate the probe with the case open.

Inspection Procedure

1. Connect the BNC output connector to the vertical input of the oscilloscope.
2. Power on the probe.
3. Set the attenuation setting on the oscilloscope to match the probe (10x).
4. Set the oscilloscope input to DC coupling and .5V/div. Center the trace on the display.
5. Connect the input pins of probe to a function generator and select a square-wave output of 10 V amplitude and 100 kHz frequency.
6. A 100 kHz square-wave of 1V amplitude will be displayed on the screen of the oscilloscope. This indicates the probe is working properly.

Getting Started

1. Attach the desired SMD accessories to the inputs
2. Connect the BNC output connector to the vertical input of the oscilloscope.
3. Power on the probe.
4. Set the attenuation setting on the oscilloscope to match the probe (10x).
5. Connect the inputs to the circuit to be tested.

Vertical Scale on Oscilloscope

The actual vertical scale of the oscilloscope is equal to the attenuation factor (10x) multiplied by the range of vertical scale selected on the oscilloscope. For example, with the oscilloscope on 2.0 V/div, the real vertical scale is $10 \times 2.0 = 20$ V/div. This value applies when the oscilloscope is set to a 50 Ω input impedance input. If the oscilloscope is set to the typical 1 M Ω , the actual vertical scale will be cut in half to 10 V/div. See Table 1.

Vertical Scale on Oscilloscope				
Scope Input Impedance	Probe Attenuation Setting	Actual Attenuation Setting	Vertical Scale Reading on the Oscilloscope	Actual Vertical Scale of the Oscilloscope
50 Ω	10x	10x	2.0 V/div	20 V/div
1 M Ω	10x	5x	2.0 V/div	10 V/div

Table 1 Oscilloscope Readings

4 Cleaning

This probe does not require any particular cleaning. If necessary, clean the case with a cloth slightly moistened with soapy water. Make sure the probe is completely dry before reconnecting it to an oscilloscope.

WARNING

Dry the probe thoroughly before attempting to make voltage measurements.

CAUTION

Do not subject the probe to solvents or solvent fumes as these can cause deterioration of the probe body and cables.

5 Specifications

All specifications apply to the unit after a temperature stabilization time of 20 minutes over an ambient temperature range of $25\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.

Electrical Specifications

Parameter	Characteristics
Bandwidth (-3dB)	1.2 GHz
Rise Time (probe only)	291 ps
Attenuation ratio	10x
Accuracy	$\pm 2\%$
Input Dynamic Range (DC + AC peak)	$\pm 15\text{ V}$
Maximum Input Voltage (DC + AC peak)	$\pm 40\text{ V}$
Input Impedance	1 M Ω // 3 pF typical
Output Voltage Swing	$\pm 1.5\text{ V}$ (driving 50 Ω oscilloscope input)
Offset (typical)	$\pm 5\text{ mV}$
Adjustable output offset range	$\pm 28\text{ mV}$
Noise (typical)	0.3 mVrms
Source Impedance	50 Ω
Power Supply	9 V battery (included) or CT4122 USB power lead (included) or CT3723 power adapter (optional)
Safety Specifications	IEC 61010-031 CAT I

Mechanical Characteristics

Parameter	Characteristics
Weight	200 g
Dimensions	83 x 19 x 14 mm
Cable Length	120 cm (Total)

Environmental Characteristics

Parameter	Characteristics
Operating Temp/Humidity	-10°C to 40°C / Up to 85% RH
Storage Temp/Humidity	-30°C to 70°C / Up to 85% RH
Pollution Degree	Pollution Degree 2
Altitude	Operating: 3,000 m Nonoperating: 15,300 m

Specifications are subject to change without notice. To ensure the most current version of this manual, please download the current version from our website: caltestelectronics.com

Performance Data Plots

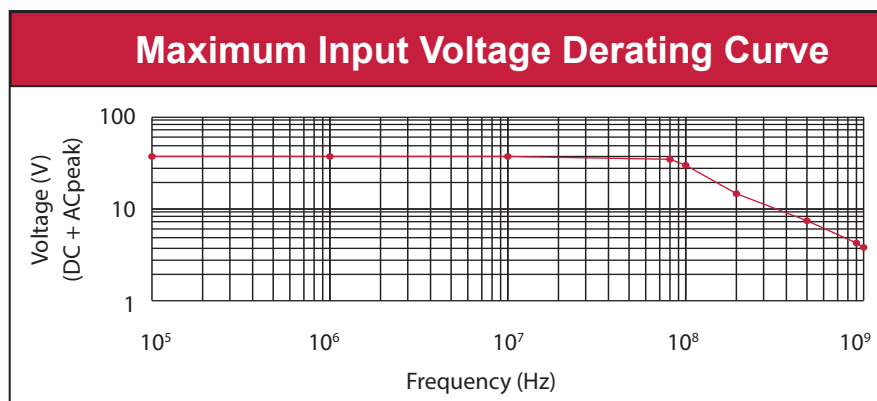


Figure 4 Maximum Input Voltage Derating Curve

Frequency Response

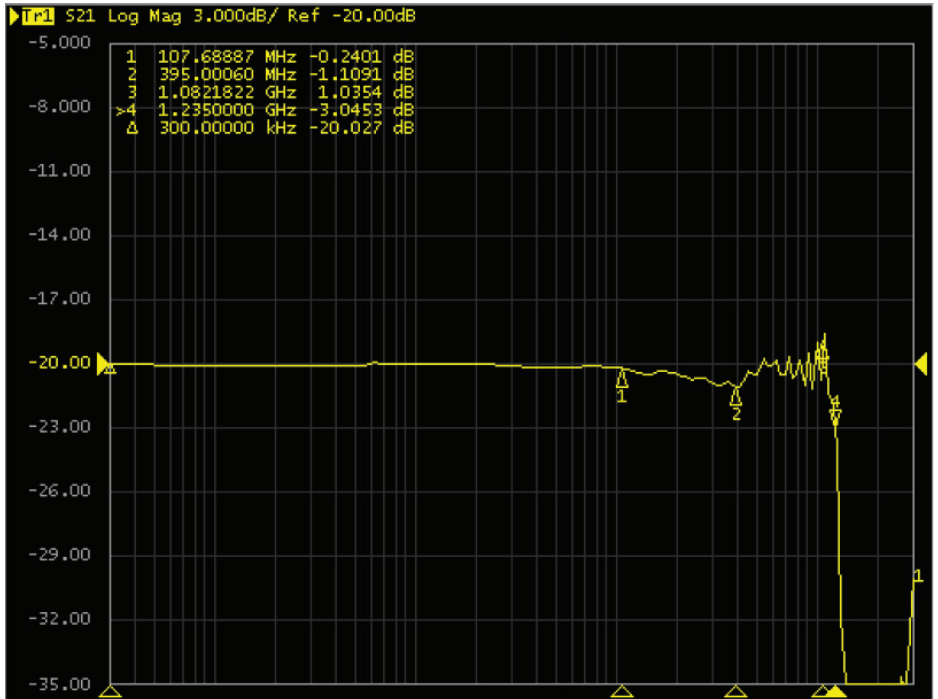
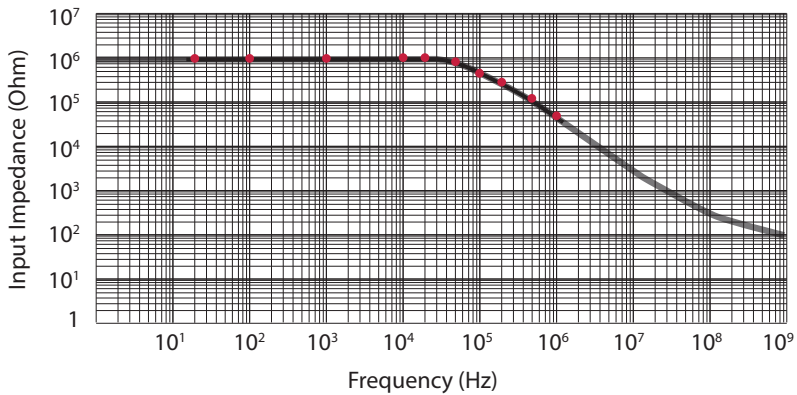


Figure 5 Frequency Response of CT4121

Input Impedance vs Frequency Data Graph



Black - Measured by LCR meter

Grey - Simulated by Altium software

Figure 6 *Input Impedance vs Frequency Data Graph*

6 Service & Warranty Information

Limited One-Year Warranty

Cal Test Electronics warrants this product to be free from defective material or workmanship for a period of 1 year from the date of original purchase. Under this warranty, Cal Test Electronics is limited to repairing the defective device when returned to the factory, shipping charges prepaid, within the warranty period.

Units returned to Cal Test Electronics that have been subject to abuse, misuse, damage or accident, or have been connected, installed or adjusted contrary to the instructions furnished by Cal Test Electronics, or that have been repaired by unauthorized persons, will not be covered by this warranty.

Cal Test Electronics reserves the right to discontinue models, change specifications, price, or design of this device at any time without notice and without incurring any obligation whatsoever.

The purchaser agrees to assume all liabilities for any damages and/or bodily injury which may result from the use or misuse of this device by the purchaser, his employees, or agents.

This warranty is in lieu of all other representations or warranties expressed or implied and no agent or representative of Cal Test Electronics is authorized to assume any other obligation in connection with the sale and purchase of this device.

Service

If you have a need for calibration or repair services, technical or sales support, please contact us:

22820 Savi Ranch Parkway
Yorba Linda, CA 92887
800-572-1028 or 714-221-9330
caltestelectronics.com

Notes

