Capacitance mater Board for PCI Express
ZM-C2H-PE

This product is a capacitance mater card compliant with PCI Express bus and equipped with functions for measuring the electrostatic capacity (C) and coefficient of loss (D) of high-capacity ceramic capacitors at high speed and with high accuracy.

It is equipped with two channels of ports that can perform four-terminal measurement of capacitor capacity, and each channel can be set with a separate range and perform measurement separately.

Windows device driver is supported with this product.

* The contents in this document are subject to change without notice.
* Visit the CONTEC website to check the latest details in the document.
* The information in the data sheets is as of December, 2024.

* Specifications, color and design of the products are subject to change without notice.

Features

- **High-capacity ceramic capacitor measurement**
This product can measure the electrostatic capacity (C) and coefficient of loss (D) of 400pF to 1.4mF ceramic capacitors.

Measurement frequencies of 1kHz and 120Hz and measurement voltages of 1.0Vrms and 0.5Vrms are available.

- **Equipped with two channels of four-terminal measurement ports**
This product is equipped with two channels of ports that can perform four-terminal measurement of capacitor capacity, and each channel can be set with a separate range and perform measurement separately.

- **Capable of high-speed measurement**
The electrostatic capacity (C) and coefficient of loss (D) can be measured in 2msec at a frequency of 1kHz and in 10msec at a frequency of 120Hz.

- **Capable of capacity measurement at constant voltage**
This product has a function that automatically adjusts the output voltage so the voltage applied to the measurement target (capacitor) becomes the set voltage. Consequently, it is possible to measure the capacity of the capacitor with a constant measurement voltage at all times without being affected by voltage drops caused by, for example, the cable.

- **Built-in trigger synchronization signal output function**
This function applies voltage to the measurement target only during measurement, reducing characteristic changes due to heat generated by this target. Furthermore, the measurement signal is not applied when the connection is changed, reducing contact wear.

- **Built-in contact check function**
This function checks whether all four terminals are connected during four-terminal measurement.

- **Built-in correction functions**
This product has built-in open and short-circuit correction functions for eliminating measurement errors caused by the measurement jig or cable.

- **Windows support device driver**
Using the device driver API-TOOL makes it possible to create applications of Windows. In addition, a diagnostic program by which the operations of hardware can be checked is provided.

Included Items

Product ...1
Please read the following ... 1

Specifications

Function specification

Item		Specifications
Measurement function	Isolated specification	Un-Isolated
	Measurement item	C (electrostatic capacity), D (coefficient of loss; tanδ)
	Measurement channel	2ch
	Measurement method	Four-terminal measurement
	Measurement frequency	120Hz±1%, 1kHz±1%
	Measurement signal level	0.5Vrms±10%, 1Vrms±10%
	Measurement range	4nF to 1.4mF
	Equivalent circuit mode	Series, parallel equivalent circuit mode
	Measurement time	2.0ms(min.)(Measurement frequency 1kHz) 10.0ms(min.)(Measurement frequency 120Hz)
	Trigger function	Internal trigger
	Correction function	Open, short
	Measurement terminal connector	SMB Connector
	Connecting distance	Less than 3m
Common	Memory address	Occupies 256MB
	Power consumption	3.3V 850mA(Max.), 12V 1500mA(Max.) *1
	Supplemental Power connector	PCI-E 6pin connector
	Supplemental power supply voltage	12V±8%
	Bus specification	PCI Express Base Specification Rev.2.0 x1
	Dimension (mm)	242.3(L) x 111.15(H)
	Weight	450g

*1   If the measurement target is short circuited or the measurement end is short circuited to ground, a maximum current of approximately 3.5A may flow through the 12V power supply.

Installation Environment Requirements

| Item	Specifications
Operating ambient temperature	0 - +50℃
Warm-up time	30 minutes or more
Operating ambient humidity	10 - 90%RH (No condensation)
Floating dust particles	Not to be excessive
Corrosive gases	None
Standard	VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA

Measurement accuracy

When |D| ≤ 0.1, cable length 1.0 m, ambient temperature 23°C±5°C

Measurement range setting (Measurement range)	Specifications	
	120Hz	1kHz
4nF (400pF - 4nF)	C: ±0.3% D: ±0.004	C: ±0.3% D: ±0.004
40nF (4nF - 40nF)	C: ±0.3% D: ±0.004	C: ±0.3% D: ±0.004
400nF (40nF - 400nF)	C: ±0.3% D: ±0.004	C: ±0.3% D: ±0.004
4uF (400nF – 4uF)	C: ±0.3% D: ±0.004	C: ±0.3% D: ±0.004
40uF (4uF - 40nF)	C: ±0.3% D: ±0.004	C: ±0.3% D: ±0.004
400uF (40uF – 400uF)	C: ±0.3% D: ±0.004	—
1.4mF (400uF – 1.4mF)	C: ±1.5% D: ±0.008	—

*In the case of |D| > 0.1, the measurement value is a reference value.

Physical Dimensions

242.3(L)

111.15(H)

[mm]
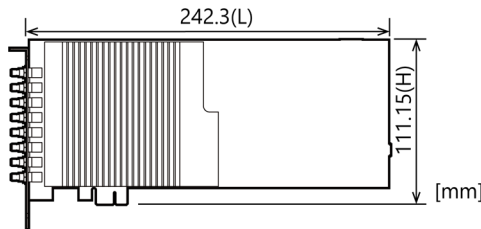
The standard outside dimension (L) is the distance from the end of the card to the outer surface of the slot cover.

Support Software

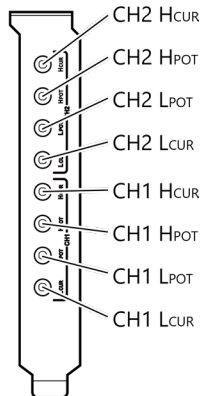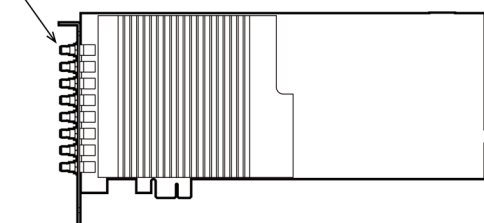| Name	Contents	How to get
Windows Version Impedance mater driver API-ZM(WDM)	The Windows device driver is provided as a form of Windows API functions. Various sample programs such as C# and Visual Basic .NET , Visual C++ etc. and diagnostic program useful for checking operation is provided.	Download from the CONTEC website *1

*1 Download the files from the following URL.
https://www.contec.com/download/

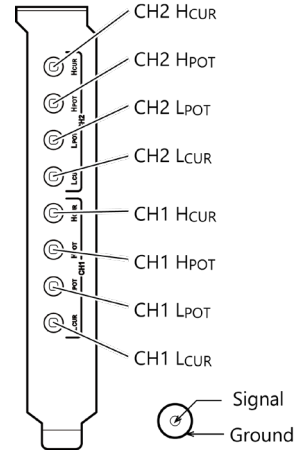## Connecting to the Measurement Target

Connecting an Interface Connector

To connect the measurement to this product, plug the cable from the device into the interface connector (H_{CUR}, H_{POT}, L_{POT}, L_{CUR}) shown below.

Interface Connector
(H_{CUR}、H_{POT}、L_{POT}、L_{CUR})

CH2 H_{CUR}
CH2 H_{POT}
CH2 L_{POT}
CH2 L_{CUR}
CH1 H_{CUR}
CH1 H_{POT}
CH1 L_{POT}
CH1 L_{CUR}

Signal Layout of Interface Connector

CH2 H_{CUR}
CH2 H_{POT}
CH2 L_{POT}
CH2 L_{CUR}
CH1 H_{CUR}
CH1 H_{POT}
CH1 L_{POT}
CH1 L_{CUR}
Signal
Ground

| Signal name	Description
H_{CUR}	High-side terminal of the measurement signal application terminal.
H_{POT}	High-side terminal of the voltage measurement terminal of the measurement signal.
L_{POT}	Low-side terminal of the voltage measurement terminal of the measurement signal.
L_{CUR}	Low-side terminal of the measurement signal application terminal.
Ground	Ground common to the measurement signal.

*1   Ground is not isolated between CH1, CH2, and the PC.

⚠ CAUTION

- Do not use any connection configurations other than four-terminal measurement connections. Doing so may lead to malfunctions.
- Measurements with DC bias applied are not supported. Do not apply voltage to the measurement terminal.
- Do not leave the measurement target short circuited or connect it with a capacity larger than the measurement range for a long time. Doing so may make the device hot, leading to malfunctions.

Four-terminal Measurement

Connect the H_{CUR} and H_{POT} terminals to one side of the measurement target and the L_{CUR} and L_{POT} terminals to the other terminals of the measurement target. Short-circuit the H_{CUR} and H_{POT} terminals as well as the L_{CUR} and L_{POT} terminals as close to the terminals of the measurement target as possible. Also, connect a point between the grounds of the H_{CUR}, H_{POT}, L_{CUR}, and L_{POT} terminals to the measurement end side.

Board Side

H_{CUR}
H_{POT}
L_{POT}
L_{CUR}

Measurement Target
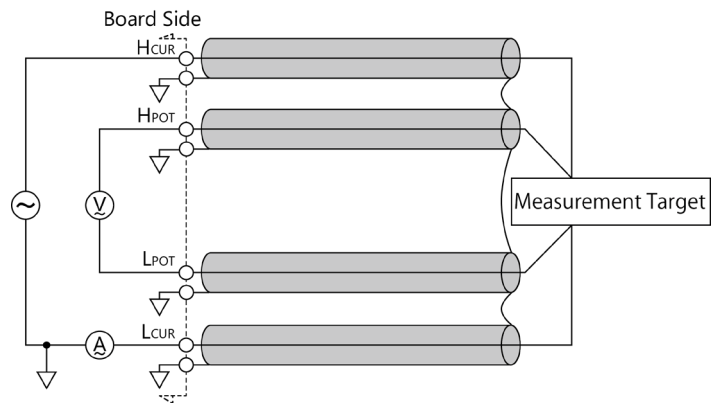
⚠ CAUTION

- If a point between the grounds of the H_{CUR}, H_{POT}, L_{CUR}, and L_{POT} terminals is not connected to the measurement end side, measured value variations may increase.
- Accurate measurements may not be possible due to the connection method if the card is affected by noise or if there is a large distance between the card and the measurement target.
- Conversion data fluctuates when the measurement terminal is not connected. Connect nothing to the measurement terminal of the unused channel.
- Normal measurement may not be possible if the resistance of the measurement cable is high. Ensure that the resistance including the contact resistance is 1Ω or less or is sufficiently small in relation to the impedance of the measurement target at the measurement frequency.
- Use a coaxial cable with a characteristic impedance of 50Ω for the connecting cable.
- Do not connect a charged capacitor. Doing so may lead to malfunctions.
- When H_{CUR} and H_{POT} or L_{CUR} and L_{POT} are released, a maximum voltage of ±5V may be output..

Circuit Block Diagram
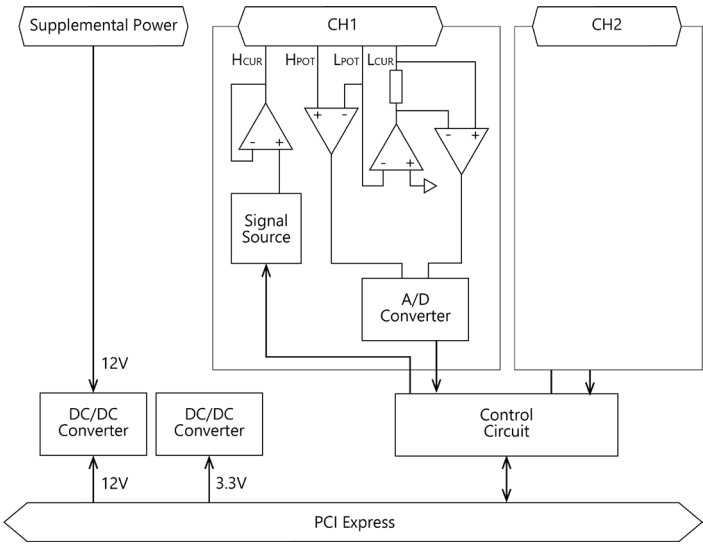
Component Names
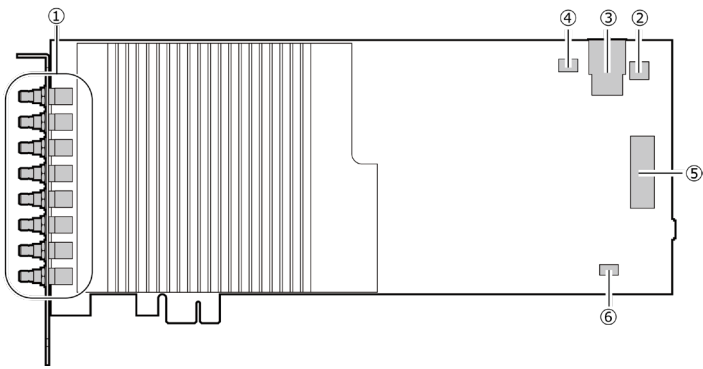
No.	Name	No.	Name
1	Interface Connector	4	LED
2	Board ID Setting Switch	5	Interface Connector 2
3	Supplemental Power Supply Connector	6	Setting Switch