Optical Isolated Voltage Probe

OP6031A (3V~2500V/150MHz)

OP6033A (3V~2500V/350MHz)

OP6035A (3V~2500V/500MHz)

Preface

First of all, thank you for purchasing our products, this instruction manual is the description about the function, usage, operation attention points, etc. Before use, please read the instructions carefully and use correctly.

Manual annotation will use the following symbols to distinguish.

This symbol means it is harmful to the machine and human body; you must strictly follow the instruction manual to operate.

Warning **In the case of wrong operation, the user risk injury. The content under this mark records the relevant matters needing attention to avoid such dangers.**

Notice **The user may suffer minor injuries and material damage with the wrong operation. To avoid such situation, the matters under this mark need**

Note **This symbolizes important note about how to use the machine.**

To the safely use the machine, you must abide by the following safety precautions strictly. The violation against the manual is likely to damage the protective function of the machine. In addition, the company is not responsible for any safety problem caused by the violation of matters needing attention in operation.

- Please be careful to the danger of electric shock and pay attention to highest input voltage.
- Do not operate in wet or combustible conditions.
- Make sure the circuit under test is turned off before access it to the probe.
- Turn off the circuit after the measurement, and then remove the probe.
- When BNC cables are connected to the oscilloscope or other devices, ensure the BNC terminal is well grounded.
- Check the probe skin and probe lead regularly. If there is any breakage, stop using it immediately.

OP6000 series products briefing

Model	Maximum Input Voltage	Bandwidth	Attenuation Ratio
OP6031A	2500Vpk(2000X)	150MHz	20X(standard) 2X/500X/2000X (optional)
OP6033A	2500Vpk(2000X)	350MHz	20X (standard) 2X/500X/2000X (optional)
OP6035A	2500Vpk(2000X)	500MHz	20X (standard) 2X/500X/2000X (optional)

1. Introduction

OP6000A seriesis the latest optical isolated voltage probe with remarkably high CMRR. The CMRR of traditional differential probe decreases fast in high-frequency range, as a result, measuring the small voltage signal waveform (e.g., the driving voltage when measuring the upper MOSFET of the half-bridge circuit) under high CM interference voltage accurately become a extremely hard task. OP6031/6032 applies optical isolation technologies and gains remarkably high CMRR in all working bandwidth, helping our customers to deal with these kinds of challenging measurement with low cost.

Product Characteristics:

- Bandwidth over 500MHz
- Isolation voltage over 60kV
- High CMRR
- Can be calibrated and zeroed online without disconnecting from the tested equipment
- Automatic sleep function at the transmitting end (automatically wakes up when the receiving end is powered on; automatically sleeps 5 seconds after the receiving end is powered off)
- High precision in wide temperature range
- Able to measure gate voltage drive of Si/SiC/GaN and other power devices
- Able to measure high-frequency current of Si/SiC/GaN and other power devices with coaxial shunt CSD series.
- 2 Chargeable batteries that can be replaced to keep the probe work continuously

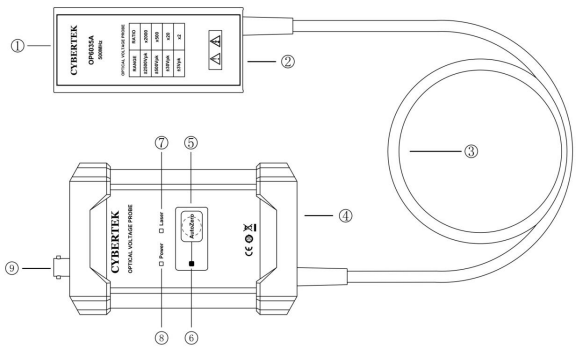
2. Application

OP6000A series can be widely applied in the R&D, debugging or maintenance of switching power supply, motor driver, new energy inverter, converter, LED power supply, household appliances and other electrical power devices.

- Floating signal test
- The gate driving signal measurement of upper bridge MOSFET can also be applied to the measurement of high-speed driving waveform of SiC and GaN.
- Small signal measurement of differential mode under high common mode voltage

3. Products and Accessories

Probe



① **Input connector**: MMCX interface. Attenuator for connecting products. Standard CK-AT20XB (20X), optional CK-AT2XB (2X), CK-AT500XB (500X), CK-AT2000XB (2000X), can be selected according to voltage measurement needs.

② **BATTERY indicator**: lighted green under normal condition; lighted red under insufficient power supply, please change the battery in time.

③ **Optical fiber**: connecting the front-end light emitter and rear-end light receiver, 1.5m in length.

NOTE

Please refer to the tips below when using:

- **Do not put heavy objects on the optical fiber to avoid any stress on it.**
- **Do not squeeze or curl the optical fiber and do not curl the optical fiber into a loop diameter less than 10cm.**
- **Do not twist or knot on optical fiber and do not pull it hard.**
- **Do not drop the E/O transmitter and O/E receiver, as the impact will possibly damage the inner optical components.**
- **Do not drop heavy objects like chairs or wheels on the optical fiber as they could possibly damage it.**
- **Please put the optical isolated probe back to its suitcase as delivered.**
- **Check the optical fiber carefully before use, if there is any damage please stops using immediately.**
- **For better precision, please begin testing after a warm-up of 3~5 minutes.**

④ **Power supply connector**:5V USB power interface. Please use our company's standard 5V, 2A adapter.

⑤ **Automatic zero adjustment button:** realizes automatic calibration and zero adjustment of output signals.

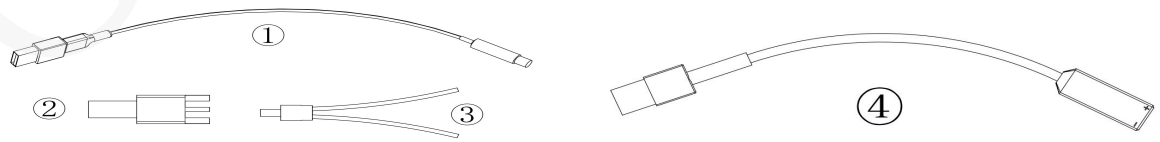
⑥ **Automatic calibration indicator**: The flashing indicator light indicates that the product is automatically calibrated and zeroed. Two beeps and the light goes out indicate successful calibration; If the indicator light remains on and accompanied by a buzzer for one second after calibration, it indicates calibration failure.

⑦ **Laser indicator**:When the indicator light is on, it indicates that there is laser input, and when the indicator light flashes, it indicates that there is no laser input. If the indicator light is flashing, please check if the front switch is turned on or if the battery is fully charged.

⑧ **Power indicator**: O/E receiver power indicator.

⑨ **Output connector**: standard BNC output connector, connected with standard BNC cable to the oscilloscope.

Attenuator



① **Attenuator**: the attenuator will connect the USB socket of the probe and SSMB RF female socket of the circuit under test. Attenuator have different models with ratio of 20X or 2X, corresponding with range between ±30V / 3V.The standard configuration is 20X. Users can choose proper attenuator according to the signal under test and set the attenuation parameter on oscilloscope.

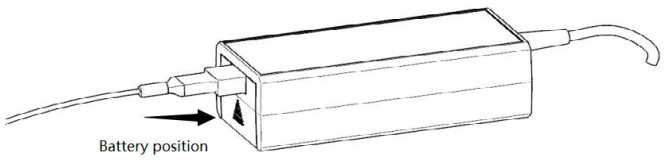
② **SSMB male socket**: to gain higher CMRR, users can directly weld the socket to the component or the circuit board of the device under test. The closer SSMB male socket is welded to the connecting line of the component, the higher CMRR will be.

③ **SSMB Male socket to DuPont connector**: easy to use in the case of low requirements for CMRR.

④ **Attenuator (optional)**：500X, 2000X attenuators are optional. The corresponding measurement ranges

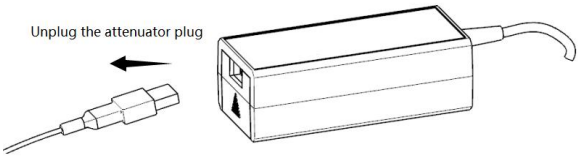
are ± 500V and ± 2500V respectively.

Battery

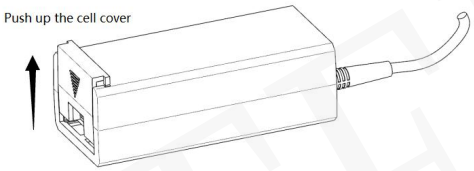


The product is equipped with two 7.4V/950mAh lithium batteries as standard, as shown in the figure above: battery installation position. In this design, after inserting the attenuator, the attenuator plays a limiting role, and the battery cannot be removed. If you need to remove the battery for charging, refer to the following steps:

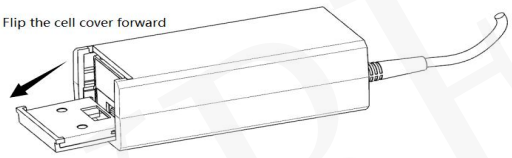
First



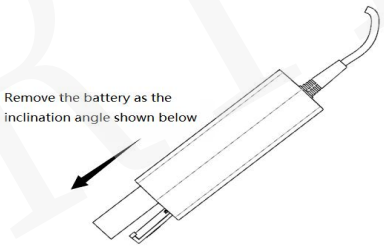
Second



Third

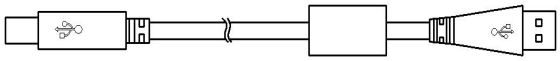


Fourth

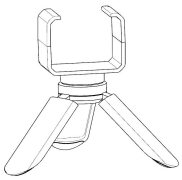


Accessories

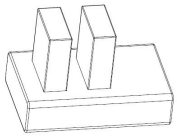
Coaxial output cable (CK-310):
1m, connecting oscilloscope and other equipment



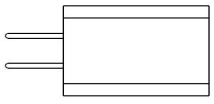
USB cable (CK-315 AM-BM, 1.5m)
O/E receiver power supply cable



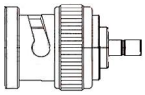
E/O transmitter support frame (CK-690)
(Provide support during test)



Battery charger set (CK-691)
(Including one charger, two batteries and one cable)



Power supply adaptor (CK-605)*2
(5V/2A: for battery charging or receiver power supply)



CK-25（BNC/SSMB-JJ）

CK-322 (SSMB male to RG316 wire approximately 10cm)

4. Electric Specification

Model	OP6031A	OP6033A	OP6035A
Bandwidth(-3dB)	150MHz	350MHz	500MHz
Rise time	≤ 2.3ns	≤ 1.0ns	≤ 0.7ns
Typical values of host noise (Vrms)	2.5mV	2.5mV	3mV
Terminal impedance	**1MΩ**		
Output voltage range	**±1.5V**		
DC precision	≤±1%（0~40℃）		

Range Selection (Attenuation Ratio)	CK-AT2XB	CK-AT20XB	CK-AT500XB	CK-AT2000XB
Maximum Differential Voltage under Test (DC + Peak AC)	±3V	±30V	±500V	±2500V

Isolation Voltage (DC + Peak AC)	±60kV	
Input Impedance	2X	1MΩ//16pF
	20X	1MΩ//6pF
	500X	10MΩ//3pF
	2000X	10MΩ//3pF
Delay Time	Host	About 13ns
	BNC(1m)	5ns
CMRR Typical Value (Using 20X plug connector and SSMB socket)	DC-10MHz	160dB
	10MHz-100MHz	100dB
	100MHz-300MHz	90dB
	300MHz-500MHz	80dB
Battery specifications	Capacity	7.4V/950mA
	Operating Time	About 8h
	Standby time	About 30 days
Rear-end Power Supply	USB 5V/2A	
Auto-zero set function	YES	

5. Mechanic Specification

Model		Parameter
Probe Size	Front-end E/O Transmitter	Around 103*46*34mm
	Rear-end O/E Receiver	Around 125*82*43mm
Attenuator Length		Around 200mm
Cable Length		Around 1.5m
BNC Output Cable(CK-310)		Around 1m
Probe Weight		Around 520g

6. Environmental Specification

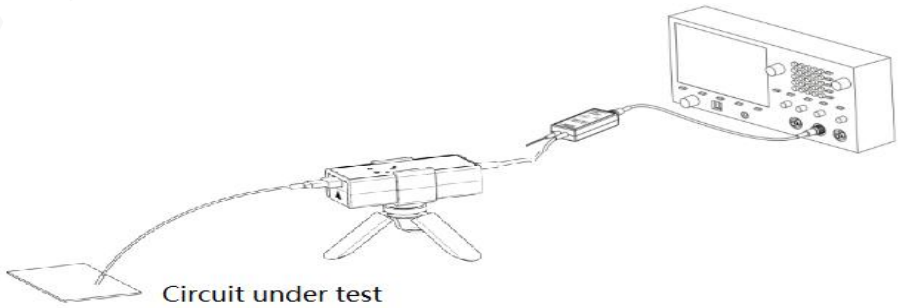
Model	Parameter
Operating Temperature	0℃～50℃
Storage Temperature	-30℃～70℃
Operating Humidity	≤85%RH
Storage Humidity	≤90%RH
Operating Altitude	3000m
Storage Altitude	12000m

7. Operating Process

Attention:

1. Please use our company's standard adapter for power supply (5V, 2A).

- User need to estimate the range of voltage under test and plug-in the proper attenuator before operating.
- Insert the standard 5V 2A adapter of our company into the USB power supply port of the receiving end, and automatically calibrate and zero.(About 20 seconds)
- Connect the BNC signal cable between rear-end of the probe and oscilloscope, setup attenuation ratio according to the plug. Adjust the sensitivity of the oscilloscope according to voltage under test.
- Connect the SSMB plug of the attenuator with the SSMB socket of the circuit under test.
- Turn on the power supply of the circuit under test and begin testing.
- Put the front-end box of the probe overhead if possible to decrease the interference from high-voltage pulse circuit.
- Because the front-end of the probe is directly connected with the high voltage of the circuit under test, please switch off the power supply of the circuit under test first before touching the probe.
- To save the battery power, turn off the switch when you don't need it.
- Please charge in time if the power indicator of the front-end box turns yellow.
- The typical connection diagram is shown below:



8. Important Tips:

Warning

Do not touch the front-end box of the probe when measuring signals with high floating ground voltage.

9. Maintenance

- Keep the probe clean and dry.
- Clean the probe with soft and dry cloth if needed, do not use chemicals to clean the probe.
- Put the probe back to original case when it's not needed and keep it in a cool, clean and dry place.
- When transporting the probe, be sure to put it into the shockproof packaging provided by our company.
- Do not pull the input or output cable hard to avoid damage.

10. Warranty

Please refer to the warranty card instruction.

11. Packaging list

Name	Number	Name	Number
Voltage Probe	1	Battery charger kit (CK-691)	1
20X Attenuator (CK-AT20XB)	1	O/E transmitter support frame (CK-690)	1
SSMB male socket to DuPont cable connector (CK-321)	2	BNC/SSMB-JJ(CK-25)	1
SSMB male socket (CK-23)	10	SSMB(M)/RG316(CK-322)	1
BNC output cable(CK-310)	1	Instruction manual	1
USB power supply cable（CK-315 AM-BM 1.5m）	1	Warranty card	1
Power supply adaptor 5V/2A(CK-605)	2	Calibration report	1

Packing list for optional attenuators

	CK-AT2XB	CK-AT500XB	CK-AT2000XB
CK-201(2.54_2p)	-	5	-
CK-202（5.08_2p）	-	-	5

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