Noise Measurement Amplifier

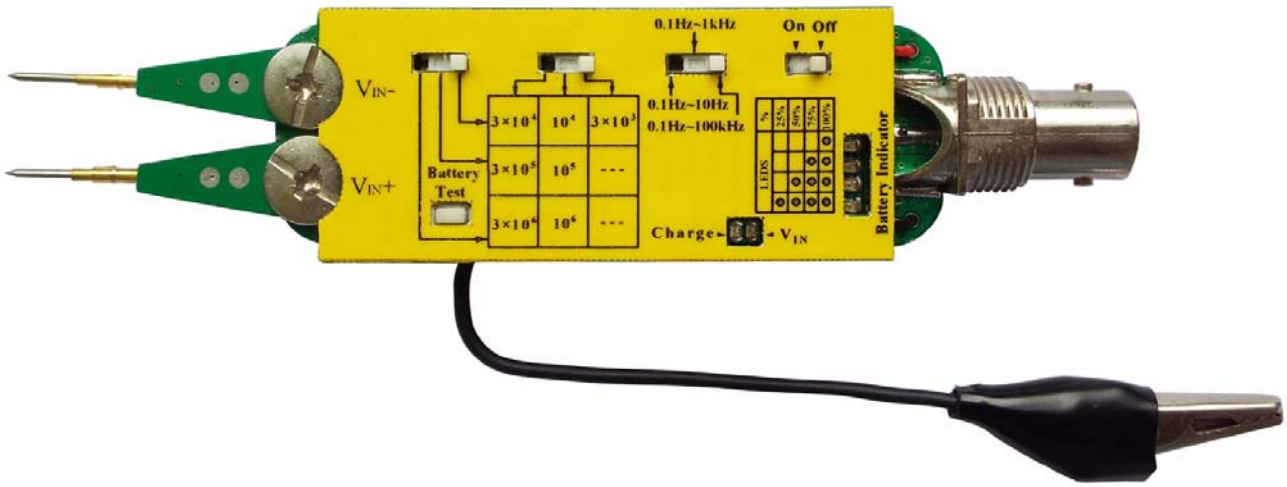


Figure 1. Physical Photos of ATNMA1.0

MAIN FEATURES

Built-in rechargeable battery

Magnifications: 3,000×, 10,000×, 30,000×, 100,000×, 300,000×, 1,000,000×, 3,000,000×

Three filter bandwidths: 0.1Hz ~ 10Hz, 0.1Hz ~ 1kHz, 0.1Hz ~ 100kHz

LED low battery indicator function

BNC output terminal

Input probes with adjustable span

100 % Lead (Pb)-free and RoHS Compliant

INTORDUCTION

This noise measurement amplifier, ATNMA1.0, is designed to test ultra low noises which cannot be measured by oscilloscope, such as nV and µV level noises, for electronic modules. This amplifier measures the noise signals through touching the point that needs testing, then amplifies the detected noise signals, and select the measuring range of frequencies. The rechargeable battery energy is 500mAH, can be used more than 20 hours. The rechargeable battery full voltage is 4.2V. The low noise amplifier includes one rechargeable battery, one coaxial cable, some probes.

This noise measurement amplifier assembly has 5 portions:

1. Amplify Magnifications

For example:

3000×:

Measure the noises between 1µV to 100µV. Toggle magnification switch S2 to S2-1 and S5 to S5-1.

10,000×:

Measure the noises between 0.1µV to 1µV. Toggle magnification switch S2 to S2-2 and S5 to S5-2.

300,000×:

Measure the noises less than 0.1µV. Toggle magnification switch S2 to S2-3 and S5 to S5-3.

10,000,000×:

Measure the noises less than 1nV. Toggle magnification switch S2 to S2-3 and S5 to S5-3.

Please see the switches location in figure 2 and figure 3.

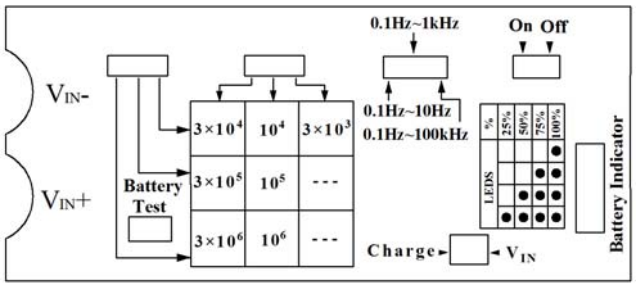


Figure 2. Physical Label of ATNMA1.0

2. Noise Frequency Range

0.1Hz ~ 10Hz: toggle S2 to S2-1

0.1Hz ~ 100 kHz: toggle S2 to S2-2

0.1Hz ~ 1 kHz: toggle S2 to S2-3

Please see the switches location in figure3

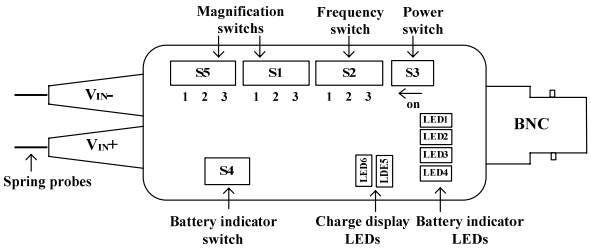


Figure 3. Functions and Locations of ATNMA1.0

3. Battery Capacity Monitor

Observe battery LEDs when press battery indicator switch on. When four power indication LEDs all lit, it means the battery is full, voltage of the battery is more than 4.0V; three power indication LEDs on, voltage of the battery is more than 3.8V; two power indication LEDs lit, voltage of the battery is more than 3.6V; if only one LED is on, the circuit does not work, recharging the battery is necessary, otherwise the battery will be damaged. Please see the capacity monitor demonstration in figure 5.

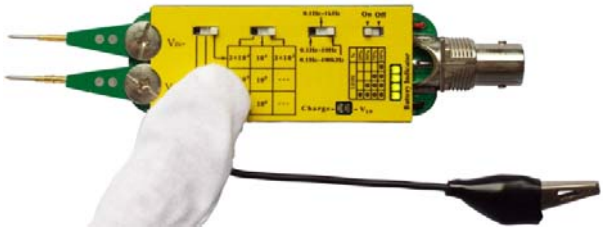


Figure5. Capacity Monitor of ATNMA1.0

4. Battery Charging Display

Charging display LEDs LED5, LED6 will be on when charging well, only when the charging voltage over 7.2V or less than battery voltage, LED5 turns off; LED6 is lit when in charging mode. Battery charging display show in figure 6.

Figure6. Charging Display of ATNMA1.0

5. Battery Indication

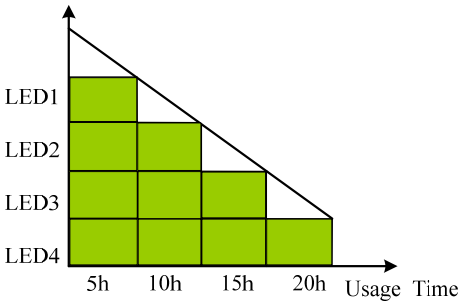


Figure7.Power Show Time of ATNMA1.0

INPUT AND OUTPUT MODLE

Rotatable probe input:

Adjust the angles of the spring probe to make it contact the point to be tested. Hold the amplifier by hand just like a pen. Two probes contact with together, open an angle of more than 100°.

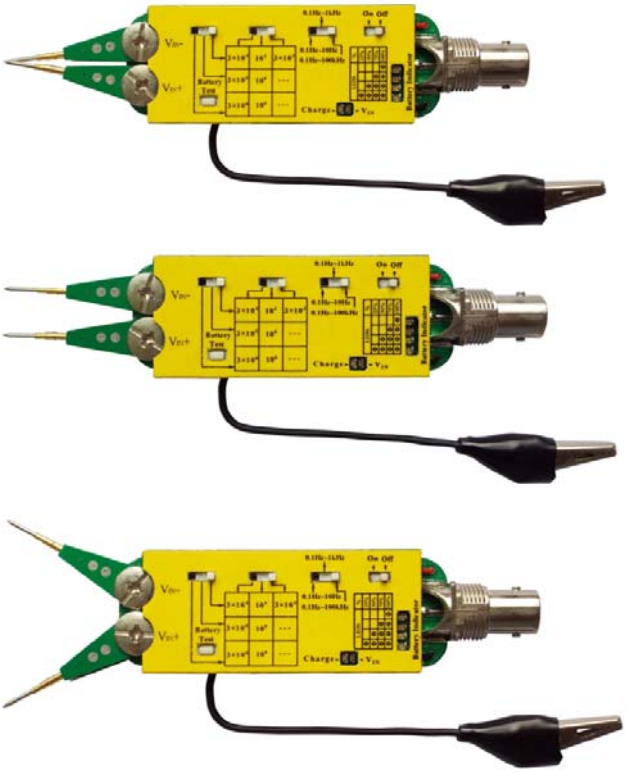


Figure8. Probe Angle Figure of ATNMA1.0

Coaxial cables output: Use coaxial cable to connect between the BNC and oscilloscope. The type of the coaxial cable line is SYV-50-2-41.

APPLICATION METHOD

Adjust the angles of the spring probe angles to contact the point to be tested by two screws, connect coaxial cable well, and push on the power switch. At this time press the

monitoring battery switch, power indication LEDs lit. Then select the filter frequency range, toggle two switches at the same time and observe the oscilloscope and adjust suitable magnifications (oscilloscope waveform is observable but not saturated).

CALCULATION METHOD

To calculate the ultimate noise value, two data need to be measured. One data is $V_{O(P-P)}$, the noise value of no power supply module, and the other is $V_{C(P-P)}$, the noise value of working well. The formula is as follows.

$$V_{IN-TOT-PP} = \frac{V_{OUT-PP}}{G} \quad (1)$$

$$V_{IN-TOT-RMS} = \frac{V_{IN-TOT-PP}}{6.6} \quad (2)$$

$$V_{IN-TOT-RMS} = \sqrt{V_{IN-AMP-RMS}^{2} + V_{N-DUT-RMS}^{2}} \quad (3)$$

$$V_{N-DUT-RMS} = \sqrt{V_{IN-TOT-RMS}^{2} - V_{IN-AMP-RMS}^{2}} \quad (4)$$

$$V_{N-DUT-PP} = V_{N-DUT-RMS} \times 6.6 \quad (5)$$

V_{OUT-PP} is the peak to peak voltage of the tested circuit with power supply from oscilloscope;

G is magnification of the noise measurement amplifier;

$V_{IN-TOT-PP}$ is the total peak to peak voltage of the input terminal;

$V_{IN-TOT-RMS}$ is the total root mean square voltage of the input terminal;

$V_{IN-AMP-RMS}$ is the root mean square voltage of noise measurement amplifier;

$V_{N-DUT-RMS}$ is the root mean square voltage of device under test;

$V_{N-DUT-PP}$ is the final peak to peak noise value of the device under test ;

$V_{N-DUT-RMS}$ is the final root mean square noise value of the device under test ;

For example:

When in 0.1Hz~10Hz, V_{OUT-PP} is $2.0V_{P-P}$, amplify magnification G is 2000×, the peak to peak noise voltage is 0.778μV; the root mean square noise value of the device under test is 5.14μV.

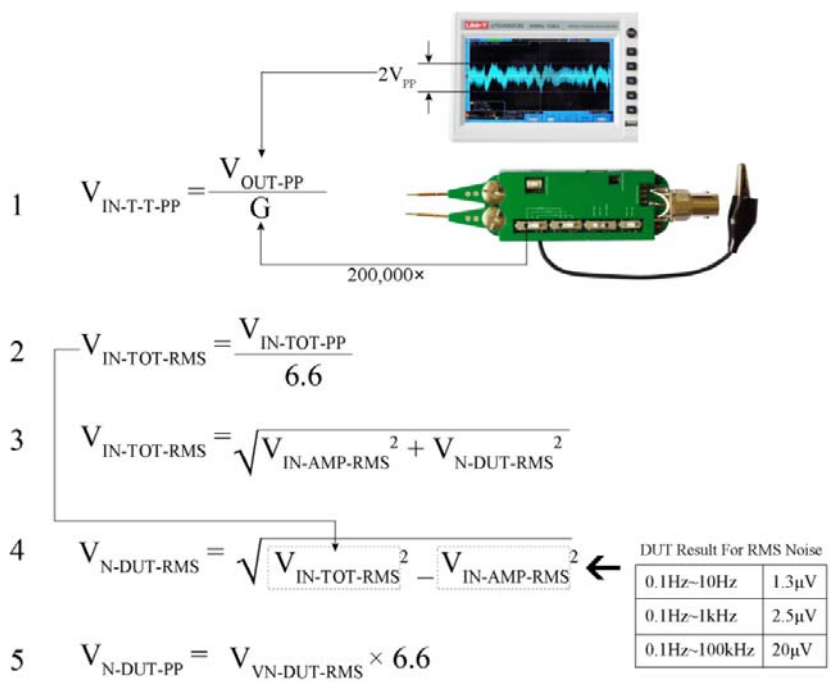
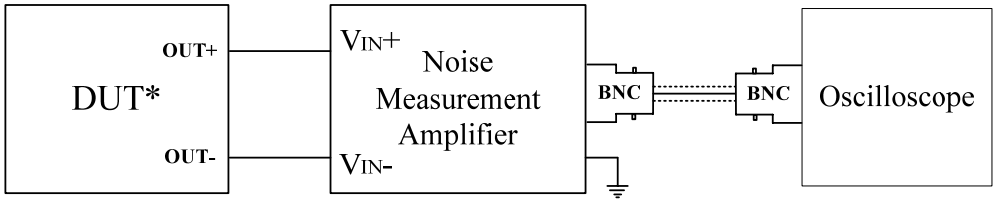


Figure 9. Calculation formula Diagram of ATNMA1.0



DUT* : Device Under Test

Figure 10. Application Drawing of ATNMA1.0

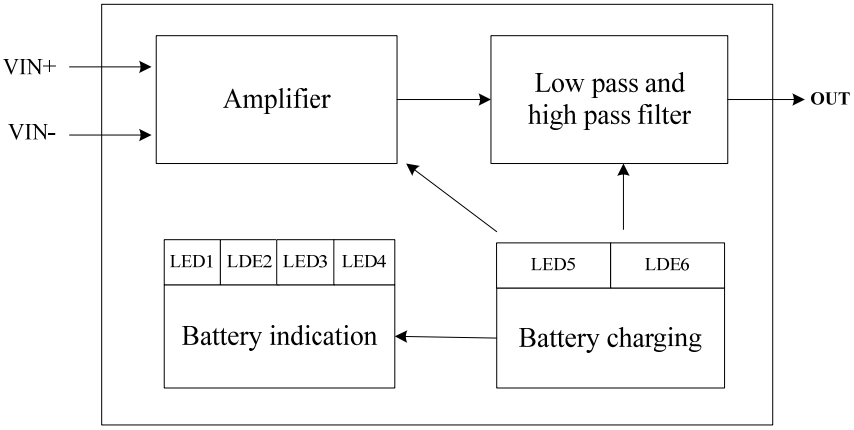


Figure 11. Internal Block Diagram of ATNMA1.0

AMPLIFIER ITSELF NOISE

Table 1 show the amplifier itself noise at different frequency.

Table 1

Bandwidth	Amplifier noise
0.1Hz-10Hz	150nV
0.1Hz-1kHz	600nV
0.1Hz-100kHz	800nV

APPLICATION PRESENTATION

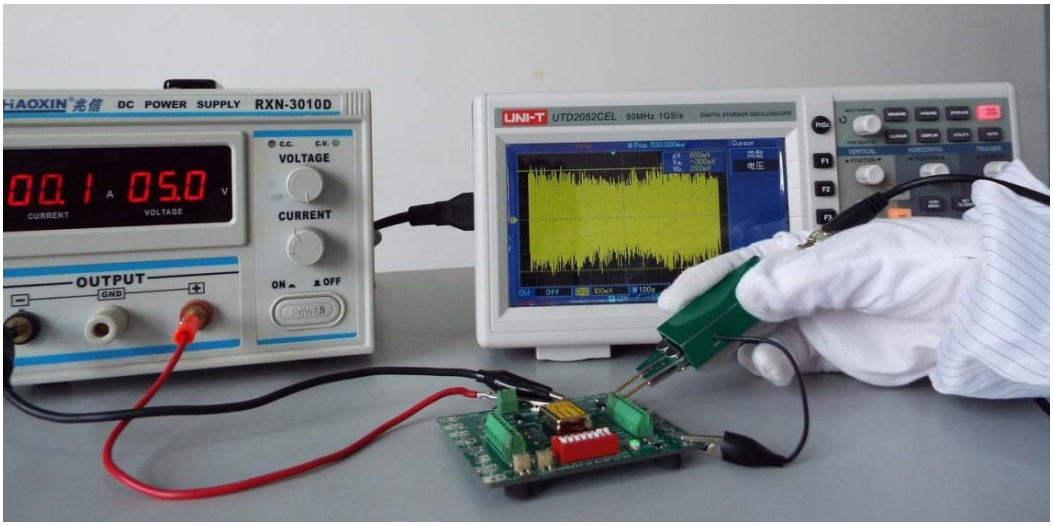


Figure 12. Application Presentation Photo of ATNMA1.0

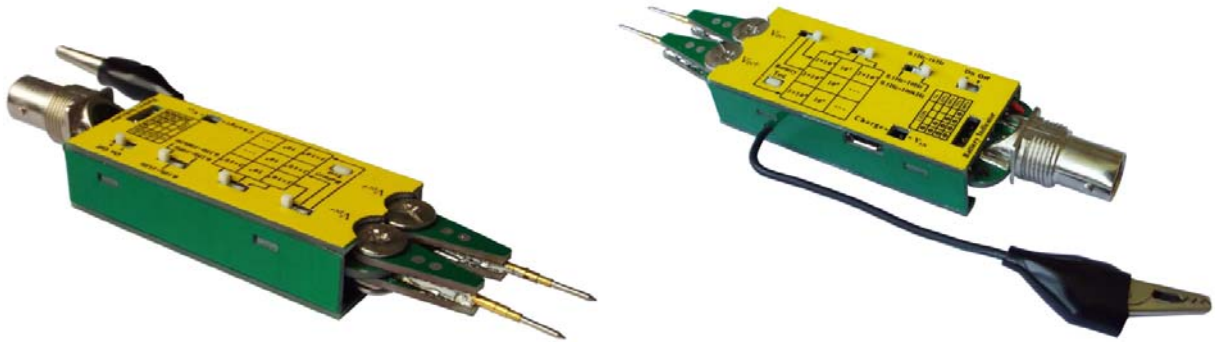


Figure 12. Side View of ATNMA1.0

ACCESSORIES

Figure 13. BNC-BNC Connector 1.5m Coaxial Cable

Figure 14. Charger and USB cable of ATNMA1.0

ORDERINGINFORMATION

Part #	Description		
ATNMA1.0	Noise Measurement Amplifier		
Quantity (pcs)	**1 – 4**	**5 – 9**	**‡10**
Unit Price	$189	$169	$149

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