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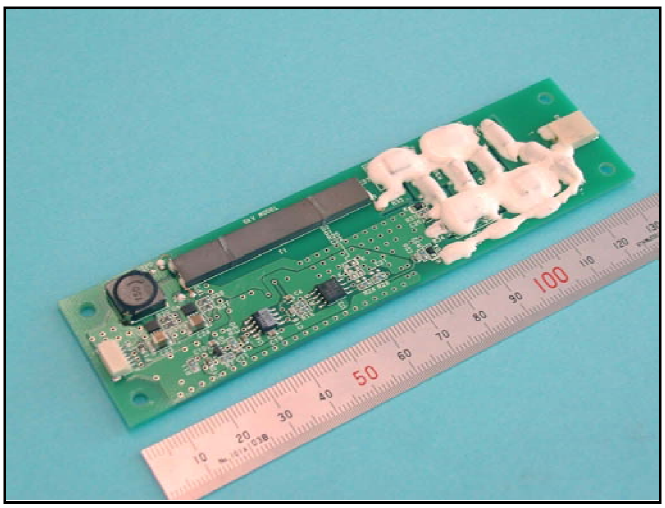
Date: May 26.2009
DWG. No.: AS-A8041

Product Specifications

Product Name: PZT High Voltage Power Supply

Product Number: PPT05P5020XA2



Approval:

0 Revision History

Table 0.1 Revision History

No.	Reason of Revision	Date	Rvsd	Appd
0	First	May/26/2009	Endo	

1 Application

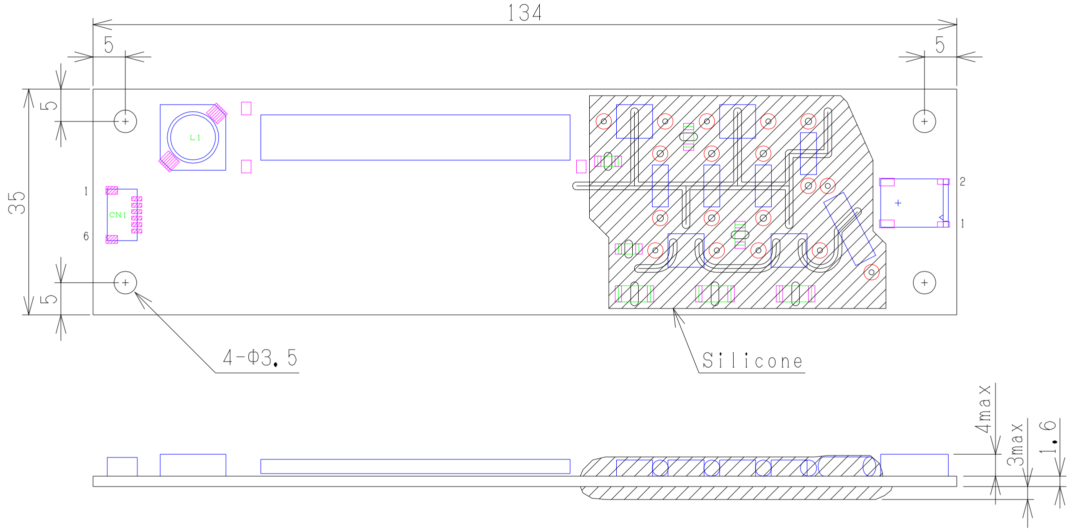
This specification applies to the PZT High Voltage Power Supply PPT05P5020XA2.

2 Electrical characteristic

Table 2.1 Electrical characteristic

Items	Symbol	Specification	Remarks
Input voltage	VBAT	9.5V - 14V	
Output voltage range	Vout	0V to +5000V max	Vcon = 0 – 2.1V
Input current	Iin	0.8A max	
Output power	Pout	5W max	
Control voltage	VCMP	0V – 2.1V	
Shut-off current	Doff	> 4.4+/-0.3mA	
Ripple	Rip	1%p-p max	

3 Dimension



Unit:mm

Length	Tolerance
<4	±0.2
4 ~ <16	±0.3
16 ~ <74	±0.5
74 ~ <250	±0.8
250 ~<1000	±1.2

※ Installation dimensions tolerance of a part is ±0.5mm.

Fig. 3.1 Dimension

4 Input & Output connector

1) CN1: Input connector - SM06B-SRSS-TB（JST）

Table 4.1 CN1 Pin assign

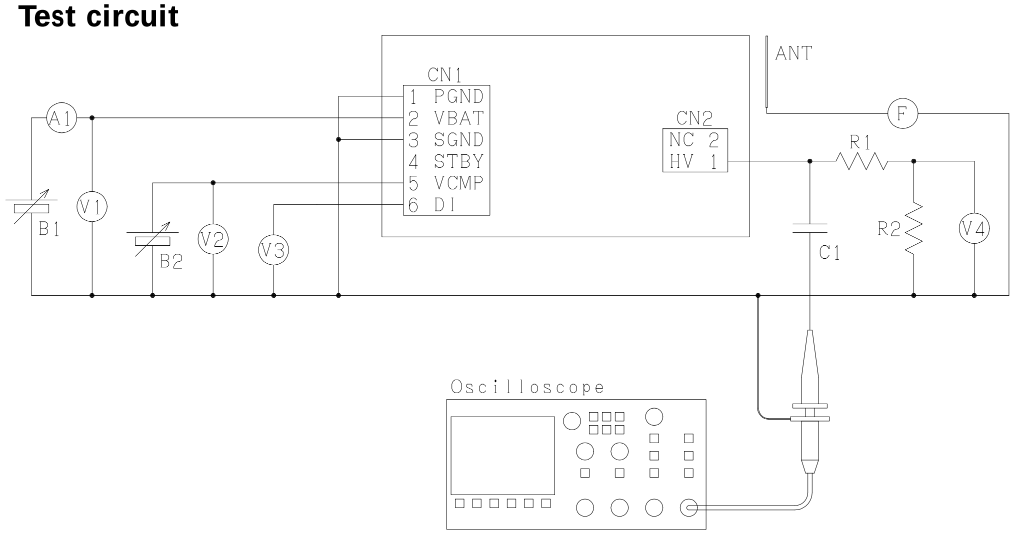
Pin	Symbol	Function	Remarks
1	PGND	GND	0V
2	VBAT	Input Voltage	9.5V - 14V
3	SGND	GND	0V
4	STBY	Standby control	No use
5	VCMP	Output Voltage control	0V – 2.1V -> Output 0V – 5000V
6	DI	Output Current monitor	$DI(V) = -1000 \cdot \left(\frac{V_{out}}{90 \cdot 10^6} + I_{out} \right)$

2) CN2: Output connector - SM02B-BHSS-1 (JST)

Table 4.2 CN2 Pin assign

Pin	Symbol	Function	Remarks
1	HV	Output	Output Voltage 0V – 5000V
2	NC	Non connection	

5 Test circuit



A1: Ammeter; V3 and V4: Volt meter; F: Frequency counter — Agilent 34401A
B1, V1: Power supply and Volt meter for Main power. — Agilent 6633B
B2, V2: Power supply and Volt meter for VCMP — ADVANTEST R6240A
Oscilloscope: Measure the ripple — Tektronix TDS3014B
ANT: Antenna for detects the frequency.
R1: Load resistor. R2: 10kohm for detects the Iout.
C1: 2.2nF/20kV for detects the ripple.

Fig. 5.1 Test circuit

6 Environment / reliability

1) Operation temperature:	0°C to +55°C
2) Operation humidity:	10% RH - 90% RH (No dew-condensation)
3) Storage temperature:	-10°C to +75°C
4) Storage humidity:	5% RH - 95% RH (No dew-condensation)
5) Vibration:	Frequency: 5Hz > 55Hz > 5Hz, sweep time: 1 minute
	Amplitude: 1.5mmp-p XYZ each direction / 2 hours
6) Shock:	Acceleration 50G / 6ms
	XYZ each direction 3 times, Total 18 times

7 Attention

1) High Voltage: High voltage occurs in the output of the PZT power supply. Disconnect the DC/DC converter from the power supply during the work.
2) Storage and transport
   a. Avoid placing the unit under dusty environments or under gas corrosive atmospheres.
   b. Preferably, temperature and humidity conditions should be about 5°C to 35°C and 45-75% RH. Avoid environments having very high temperature (> 55°C), high humidity (>90% RH) and a rapid change in temperature.
   c. Keep the product in a packing material during the delivery. The product should not gain a load (weight) when you take it from the package or when you pile it up.
3) Handling
   a. Please do not bend this product in your assembly process.
   b. Please do not use the product after you drop it accidentally because it might get unusual vibrations or shocks when it is dropped.
   c. Please do not strongly push the transformer of the product in your process.

8 About NCC product number.

PPT05 P5020XA2

- 2 → Revision
- A → Design number
- X → Customer number
- 20 → Output voltage
- P → Output polarity P=(+),N=(-)
- 05 → Output power
- PPT → PIEZO Power Supply

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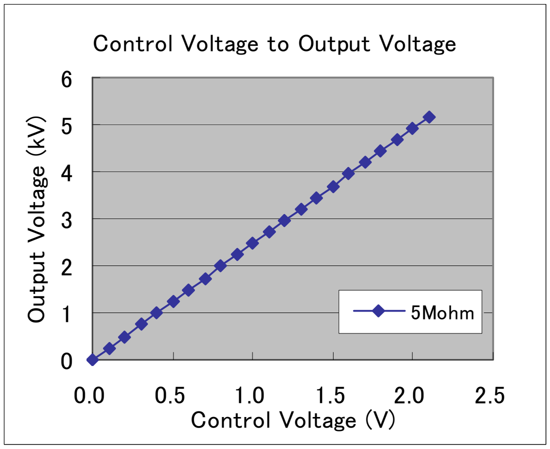
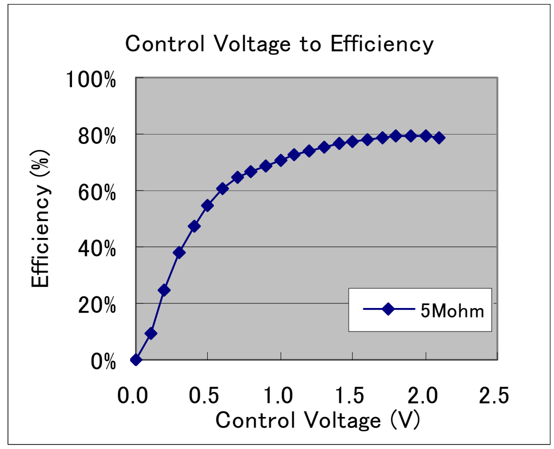
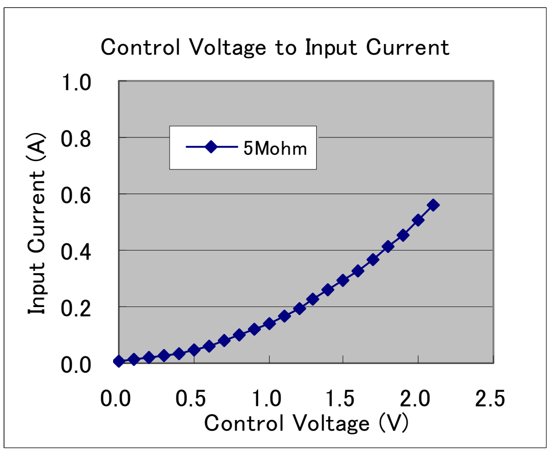
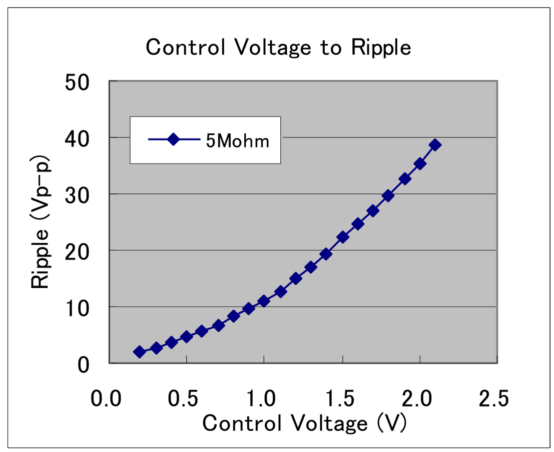
9 Control Voltage Response (Vcc=12V)

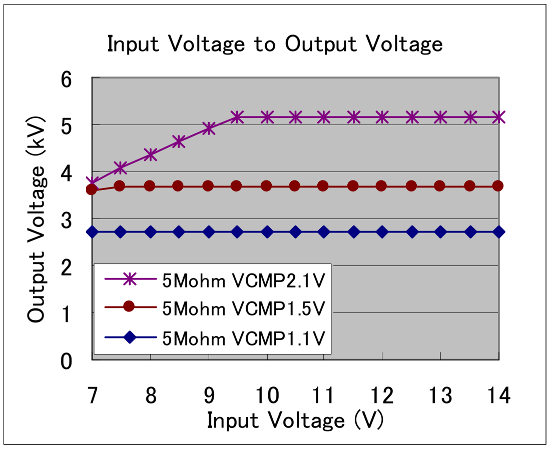


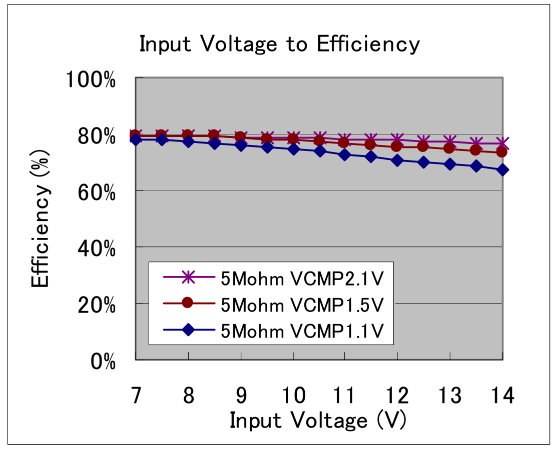


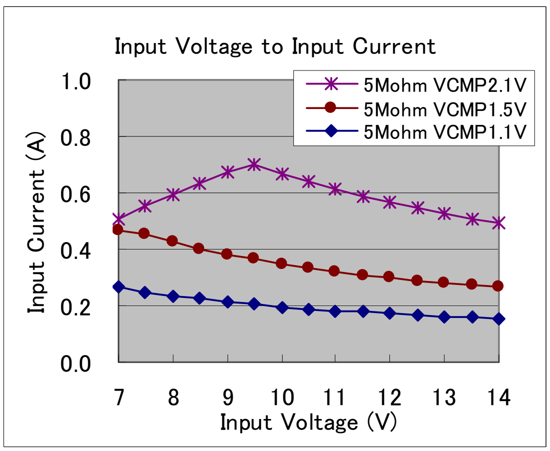


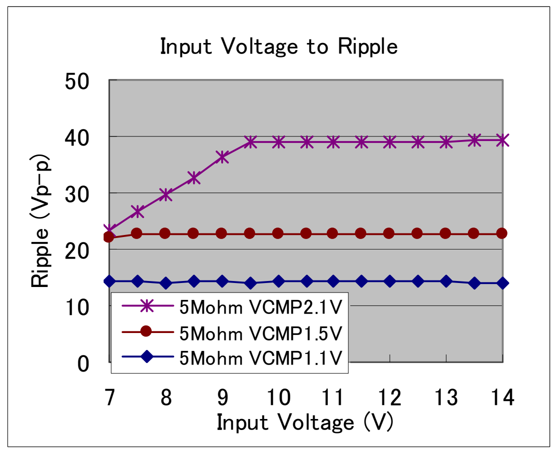


10 Input Voltage Regulation Response





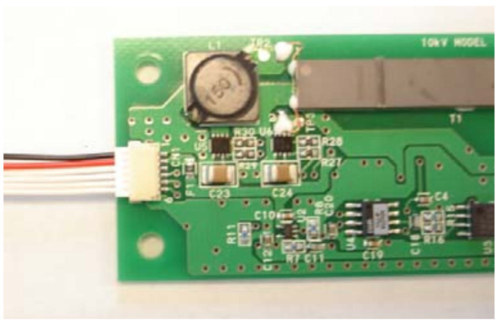




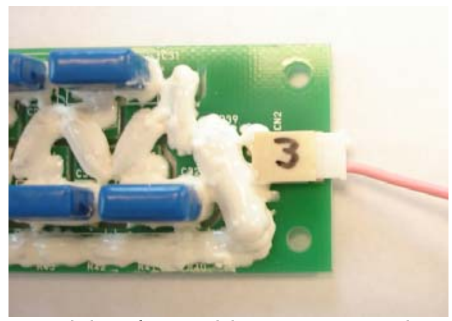
11 How to Test the DC-DC evaluation module

Inside of the package you will find the DC-DC module/s and the required input and output connection wires. Please strip the free end of the wires to your needs.

1. Connect the wires to the low voltage and high voltage connectors of the module. The connectors are single position connectors, so they will only fit in one way. The figure below provides a view of what the connection should look like.



Low voltage side connector. Ground is the black wire and VBAT (9.5-14Vdc) is the red wire.



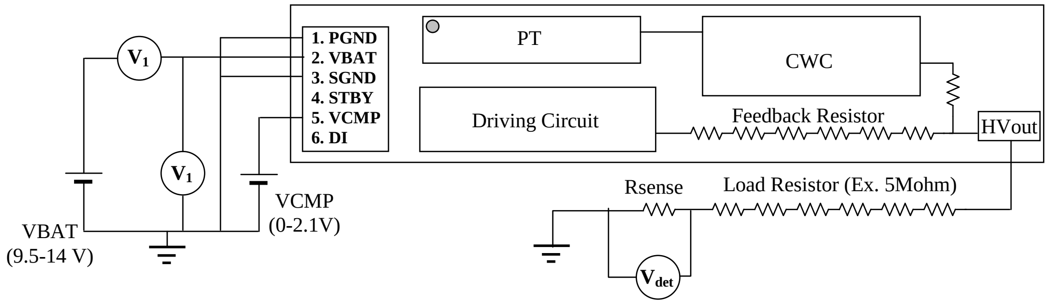
High voltage side connector. The high voltage wire is the pink wire, this provides VHV-DC

2. Connect an OUTPUT resistor (acting as a load) between HVout and Gnd. The nominal equivalent load is 5Mohm, which corresponds to 5kV and 5W output power. For higher power loads (like 2.5Mohm), the DC/DC converter operates but will not reach 5kV. The operation characteristics, at different load/power levels, are given in the attached Data Sheet plots. For lower power loads than the nominal (for instance 10Mohm, i.e. 2.5W), the DC/DC converter will provide full regulation.

3. A sensing resistance of 10kohm, for instance, may be added in series with the load to measure the output voltage with a high impedance multimeter as “Vdet”. The voltage in Vdet will be proportional to Vout as:

$$V_{\det} = \frac{R_{sense}}{R_{load} + R_{sense}}$$

4. Prepare the connection for two power supplies (VBAT and VCMP): One power supply will provide the power to the driver (VBAT 9.5V to 14Vdc). The second power supply will provide the control of the output voltage (VCMP 0 to 2.1Vdc). By varying the voltage in PIN 5-VCMP, the output voltage will be varied from 0 to 100% Vout max (i.e. 5kV). Refer to the following schematic for the connections.



Suggested initial testing set-up includes:

VBAT = 12Vdc;

VCMP = 0V (to be regulated from 0V to 2.1V after turning-on power supply)

Rload = 5Mohm;

Rsense = 10kohm

STBY pin disconnected.

Initially, this will provide zero output voltage when VBAT is turned on (since VCMP is “0”). From this point, VCMP can be varied between 0 to 2.1 V so the output voltage will increase from 0 to 5kV.

5. The module includes a Standby Pin (PIN STBY). The threshold voltage of the STBY pin is 2V. When STBY sees a voltage higher than the threshold, the converter is ON (operates). When “STBY” sees a “low” (a value lower than the threshold), the converter will be OFF (turns off). The STBY pin is internally pulled up to VDD in the circuit. Thus, if “STBY” of CN1 is not connected, the voltage will reach 5kV (in the case of VBAT=12V) and the circuit will operate normally. Thus, if STBY function is not required during tests the pin can be left open. This will trigger the operation immediately after turning on the power supply.

Note that if STBY is floating, when the VBAT is connected the circuitry detects an initial “Ground” level in the pin STBY till the voltage reaches VDD=12V. This may be just a few milliseconds. During this time, the output may show a small increase in the voltage and then reduce to zero as soon as STBY pin meets the threshold level.

A proper turn-on for the power supply is to keep STBY at Ground, then connect the power supply (this power the circuitry but maintains the output voltage at zero due to STBY = “0”). Once STBY is connected to a voltage higher than 2V, the output voltage will reach the value set-up by VCMP.

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6. The DI pin provides a voltage that is proportional to the output current. Voltage at pin "DI" shows the following value:

$$\text{Vpin DI} = -R_{DI} \times (\text{Iout} + \text{Vout} / R_{feedback})$$

$$R_{DI} = 1\text{kohm},\ R_{feedback} = 90\text{Mohm}$$

So, in case of Iout=1mA/Vout=5kV, the voltage at DI will show around -1.056V.

Note that when Vout is positive (case of this converter), "DI" value is negative.

7. Short-circuit protection: The short-circuit protection can be implemented through the DI signal and the STBY pin through external circuitry. Short-circuit protection can be internally implemented in the final circuit design based on specific module needs.