

## **Traduction libre et approximative de l'article 2 de 2 sur l'amplificateur Kanéda 209** **tiré du livre ISBN 978-4-416-11010-2 p. 257 à 270<sup>1</sup>**

About 20 years ago, fully symmetric amplifier with AC power supply was a generational change from battery-operated DC amplifier because to some extent, the idling current to the output stage required and drive in the battery power supply was low in terms of current capacity practicality. However, in recent years of lithium/ion batteries, those large current capacities were developed. The price of those batteries has also lowered.

It is adopted as a record in power and the current of each stage of the fully symmetric amplifier by reducing as much as possible the number of components. Thereby realizing a highly practical battery drive DC amplifier. This time, I will specifically introduces the fabrication procedure.

### **For this unit power amplifier in 8 Ohms**

I posted a schematic of the present amplifier in fig.11 of the past article. In this article, you can see the schematic in fig. 15. Changes are Tr1, Tr2 phase correction of 620 ohms + 330 pF on the drain side. The emitter power is Tr4, voltage +18.34 V and Tr.5 of emitter voltage are +18.34V. Tr10 and Tr11 have some base resistances of 22kΩ and 510 ohms.

This amplifier is more than one. If you remove the element, it was designed like the ultimate simple amplifier that does not function as an amplifier. Circuit configuration path to head "Huon" amplifier. was not only added to the word limiter that all subsequent second stage "Metarugi". If the load is 8 ohms impedance, it will be a catcher down transistor charm. But there will also be want to use a low-impedance speaker of about 4 ohms to pull the woofer. Therefore, in order to widen the range of more compatible, I also try to announce 4 ohms power amplifier.

### **4 ohms power amplifier**

Fig. 16 is 4 ohms impedance for the power amplifier. To say that for 4 ohms is corresponding to any impedance if 4 ohms or more. Of course, you use the speaker of 8 ohms. Collector current of the output stage load impedance is halved is doubled. Collector current of the drive stage is also doubled; collector output current of the voltage amplifier stage is also required twice. Although, margin in the output current of the voltage amplification stage (second stage differential anchor any one or better, cut up to two-stage constant-current circuit, a differential amplifier operating in a marginal collector current (1mA) is its margin.

The second stage differential amplifier (Tr4, Tr5) to a constant current circuit (Tr12, Tr13). At the same time you add the (Tr4, Tr5) the collector current from 1mA, 4 ohms for the amplifier was increased to 3mA.

To operate the constant current circuit, and the power supply voltage of one of the voltage amplification stage, the higher the output stage supply voltage one « Domu C » is needed there. However, this more, I do not want to increase the number of battery because; constant current circuit also operates in one « Domu C ».

Let the base of Tr12, Tr jump to it. The order of the voltage diode D1, D2 made in the direction voltage cooperation and only 1.2V.

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<sup>1</sup> Traduction effectuée par Sébastien Lessard

It operates a constant current circuit in the last minute of the low voltage. Collectors of Tr12 are connected to the base of the output stage Tr7. So the collector-base voltage of Tr Russia 16, become one  $15.60\text{ V} - (-15.69\text{V}) = 0.09\text{V}$ . Ingredients « Ipora » Tr to work with such a low voltage.

D1, current flowing through the D2 to take advantage of the drain current of the first stage was constant current circuit Tr3. Therefore, shadow to  $V_f$  source voltage less likely to be sound, by reducing the number of parts at the same time and to ensure the current  $I_k$  stable constant current circuit, it has more simplified.

LED for power indicator...

(fin de la p.257)

Fig. 17: output power primary distortion rate.

It was put in a L.ch and are put in the resistance with the same voltage drop as the one by LED occurs in R.ch. What you put in series to a constant current LED circuit even it may be a resistance, but people anxious put the LED in R.ch. This may be arranged as a dummy.

4 ohms for the amplifier is the minute you painting collector current force marriage of the second-stage differential amplifier, increases hFE furnace 9 of this stage, more open gain, NFB amount also increases. For NFB stabilization « T Takumi ».

The collector is not a ground. It is connected to the output terminal, to the ground. When you connect it, if you reduce the closed gain, it becomes NFB amount of force « Utsuku ». When the output of large amplitude and parasitic oscillation, note the force thing to the negative side of the waveform.

### **8 ohms amplifier compared to 4 ohms**

In order to confirm the effect of the two-stages constant-current circuits, let us compare the output power to distortion characteristics of the amplifier to the amplifier 4 ohms. Distortion characteristics of the amplifier even made an amplifier of the same circuit, two subtle changes in the characteristics of the individual Tr. So we compared the characteristics of their characteristics and constant current circuit without constant current circuit in the same amplifier.

Fig. 17: The states of the load impedance legend are 8 ohms, data compared to the 8 ohms amp and amplifier 4 ohms, two properties in this condition. There is overlap but the difference is slightly distortion in the vicinity of 10W for 8 ohms.

More of the amplifier is slightly less. In more than 8 ohms unforced, simple and 8 ohms. It can be sufficiently satisfied with 0 for the amplifier.

This time, the legend is to 4 ohms. Try to compare the custom of both amplifiers. 8 ohms for the amplifier is going to be a little painful behavior. Fig.:18 show the comparison data. 10W is the difference between the two characteristics less in the following output range. In the range of 1 to 9W, I prefer the 8 ohms for the amplifier. They are gone rather distortion force. Even at 8 ohms for the amplifier, if the following output is low, it can be used enough.

However, attached is a difference that was evident in the 10W or more regions. Output increases as the difference is going to open, maximum output of 8 ohms amplifier is 24W. It is 20 or more times the distortion factor of 4 ohms for the amplifier. Again low  $R_L$ , in high power applications you need 4 ohms for the amplifier.

### Effect of the constant current circuit

Two stages constant current circuit. Why necessary to high-power amplifier with output current of the differential amplifier of the fig.: 19. Figure 19 (a) is a 8 ohms, (b) is for 4 ohms.

Dry of the output stage flops voltage « Takumi » 2 voltages increase column throw it out overcurrent determined by the base emitter resistance between the center of the product of “Doraipu” current and the output stage. In 8 ohms, trying to note that it is what the collector current  $I_{c4}$ ,  $I_{c5}$  of the drive current force “Isamu” differential amplifier.

On the other hand, “Doraipu” current at 4 ohms for the amplifier is the difference between current  $I_{c4}$   $I_{c5}$  plays one  $I_k$  of the current  $N_a$  of collector current and the constant current circuit. Determine the output stage collector current at the time of no signal (idling current). Cleverly 1 at the time of no signal, it is skillful 2.

The 8 ohms amplifier,  $I_{c4}$ ,  $I_{c5}$  is in response to  $V_{I1}$ ,  $V_{I2}$ ,  $I_{c4} = V_{I1}/R_b$ ,  $I_{c5} = V_{I2}/R$  and decided we bill freedom cannot be set.

Fig.: 15:  $V_n = 1.2V$ ,  $V_{I2} = 1.2V$ , so mind  $R_b = 1.2$  kohms,  $I_{c4}$  and  $I_{c5}$  become a small current of 1.mA.

4 ohms amplifier:  $I_{c5} - I_k = V_{I1}/R_b$ ,  $I_{c4} - I_k = V_{I2}/R_b$ , and you set the difference current to the target value 1 introduction,  $I_k$  depending on, you can freely set the  $I_{c4}$  and  $I_{c5}$ .

In Figure 16:  $I_k = 2mA$ ,  $I_{c4} = 3mA$ ,  $I_{c5} = 3mA$ . 3mA. Set  $I_{c4}$  and  $I_{c5}$  to three times the 3mA. Replace the output power pin over click power low four times it becomes 4mA.

Fig.: 19: Tsukasa differential amplifier of the output current (for 8 ohms)

It will become my thing. The mystery may be considered in the following manner. Medium the collector current other non-signal when collector “DenYoshi” surface of the differential amplifier.

In mind, to change between  $2I_{c0} - 0$ , therefore in the “sc” amplifier,  $I_p \text{ climb} = I_p 2I_{c0} - I_{c0} = I_{c0} = 1mA$ .

In the case of 4 ohms amplifier:  $I_{c0} = 3mA$ .  $I_c$  range of variation is 6mA to 0mA. Therefore beat = 6mA - 2mA = 4mA. If the  $I_{c0} = 4mA$ , because it set to  $I_k = 3mA$ , change of  $I_c$  range is 8mA to 0mA. Therefore  $I_p = 8mA - 3mA = 5mA$ . In Figure 18, 8 ohms amplifier in 4 ohms load, you can use until the output of the low. That child can be used until the “Ngong” at this time it becomes door. This amplifier with 8 ohms load in can be operated, if the same beat 20W. It is used to. The same output power is proportional to the legend. If you ask any more of output, constant current circuit is needed.

### Temperature compensation

Important elements over the semiconductor amplifier and a temperature compensation of  $I_o$ . If this is not appropriate, the output voltage over the ambient temperature 0 “mosquitoes Domo” varies in some cases.

Simple amplifier such as this unit becomes dangerous in the state of thermal runaway. 0 of the temperature compensation is how functions and “Runoka”. Let's look at Figure 19 (a) Determine the zero five plays to VBC 5. To control the  $I_o$ , it is sufficient to control the VBC5.

VBC5's voltage of the sum of the voltage from  $T_h$  occurring in the parallel example connection of the drain load resistance 1.5kO occurring voltage from  $V_{d1}$  and the thermistor  $T_h$  resistance.  $V_{d1}$ ,  $V_{d2}$  change by  $I_{d1}$ ,  $I_{d2}$ . The reduction. However  $I_{d1} + I_{d2}$ . Therefore, determined  $V_{d1}$ ,  $V_{d2}$  constant current.

The circuit  $T_r3$  is maintained at a constant value. Here it points important. Voltage  $V_{d1}$ ,  $V_{d2}$  “Hakahi” by signal, and without a hand in  $L_a 2$ , since the control extraneous voltage  $V_{Th}$  to signal

Th is Tr of the output stage Tr, is thermally coupled to. Great stone force more bass. Let's say the temperature was force splitter of Tr. Then temperature of Th also rises to resistance value input switching. That VTh is reduced, VBC4, VBC5 et al. also reduced, IC5, 1C4 mosquitoes off, the fence will, VI1, VI2 is also reduced. These change to a smaller Io. It serves to undo the first "Kokuhi".

Io months when the decrease is in the opposite direction to a variation. The temperature compensation of Io at a reasonable time delay mosquito leading to a delay over 9 is too short. When the Io not catch up to "Kokuhi", it increased Io mosquitoes. It vibrates at reduced or Ri. Finally it will be thermal runaway when the amplitude increases gradually. This is a very dangerous state.

Temperature compensation method using a thermistor, by the current value and the resistance value of the parallel resistance flowing through the thermistor, can set the temperature coefficient of the terminal voltage to some extent freely. In the method of using the forward voltage of the diode, the temperature coefficient of voltage will be determined by the diode.

FIG. 20 is a charger for the lithium-ion battery. Li used in the present machine

An antistatic circuit is built. Automatic charging stop circuit is required. Single constant current circuit or a current from the DC power supply to. It may be charged through the limiting resistor. Once charging is terminated, the battery pack is automatically disconnected from the external circuit. It is unnecessary, but if you complete any one force flow power of the four, and is separated from all the power pack and ending to the rest of the pack smear charge. Thus DC power supply is required for each pack.

Link Man stock Board to DC power supply. Company switching AC adapter. It uses four SPS-1201P-S or equivalent. This input is 100-240V, in the switching regulator of the output force Mori 2V / 1A, but anywhere in the world you can use DC power. Arrival at the AC plug, the output battery plug (outside +) and "Kokuhori" enter the para connection and wiring to the AC cord and AC plug. Length output is appropriate code. It was cut into the output through a resistor wired to plug.

It may use a constant current circuit made with such LM338 to charge. However, we need one by one constant current circuit per each battery pack. To become, the long-awaited power amplifier. Because he was designed to super-simple, charger also wants to simplify. There in the constant current circuit is not used, it was decided to use a current limiting resistor (4.7 ohms/5W).

If you use a current limiting resistor at the initial charging, have voltage "yao" of battery charging current force "Utsuku" flow, the charging progresses made voltage force "Hanawa-ku" of battery, no charging current force "Sha".

In addition to lithium-ion battery and switching AC adapter, I had been looking to "Goto Akihiko" of the "Time Machine Records." He has a high talent to find the capacity of the equipment that serves the application problem to readers.

LED during charging seed lights, charging final: "Field, AkiraHitoshi 1, Tsutomu 2, Nobeni 3 (Datsusain)".

Figure 21: semiconductor electrode connection

I want to add a charge indicator, such as the one entrusted LED mosquitoes sheath lamp. What kind of circuit would be good? Hint, application of flea "~Tsu Terry check" circuit check voltage is 12V.

### **Production**

\*\*\*Retranchée ici, une section de quelques paragraphes qui n'est pas sortie clairement à l'OCR.\*\*\*

Figure 23: mature bond

This amp is versatile. I can use even in 8 ohms to 4 ohms. It plans to use the 4 ohms of speakers may be make a no 1 “Eyor” simple for 8 ohms.

FIG. 24 is a 8 ohms for the power amplifier board. The output stage of the unit but AC power amplifier and diggers 1 or the same, because it is “Nagisa” properly simplify voltage amplifier stage force, empty space is generated in the substrate to have the channel in this space.

There is a method to use for multi-amplifier by incorporating the filter.

While floating over base and I think the circuit, to the placement of the parts from the input side to the output side. First, placing a resistor with respect to this height, placing the FET or Tr height are aligned naturally. Since there is no temperature strength “Hanawa-ku” made parts in the unit, diodes and skeleton down resistance by wiring in close contact with the substrate is good. Tr6, Tr7 of 19 ablative more lines (Daiei wire 20 core code chili one, except, since more to make a line). Direct to line, the wiring point, “Shine Sri”, District 1 in the preliminary solder. Solder 19 is wound around the line like this: in addition to the base and emitter. It should be no more than 3cm. Re is true skeleton resistance Tr. since be placed in, cases of Tr. It is not shorted to Ana cap. Searching, it is because to place apart.

Tr4, Tr5 et al. are bending lightly on the lead wires. Through hole of the substrate to line the case from the first plate away about 4mm. Once you've placed force of a substrate, the substrate back distribution for the line, we want to fix the support 20mm to the four corners of the substrate front side.

Back wiring is according to the current value; use both the line than the 19 and seven from the line (from 7 strands of Mogami electricity new gun 2497). Phase correction capacitor 330pF is placed in the back side of the substrate.

During are with an underline the figure, it's only the wiring L.ch.

FIG. 25 is 4 ohms for the power amplifier board. The constant current circuit is added to the 8 ohms substrate. The value of the emitter resistor and VR of the second stage differential amplifier “Kawa” I have. In addition, one first-stage constant current circuit changed the switch and LED. In the figure, underline L.ch, upper line wiring der of R.ch.

That mosquito also support side, to place the LED over last name inside and correspondingly also to have the wiring on the board.

FIG. 26 is a protection circuit DC detection board. Although in this board there is free space also, for the angle hanging type of substrate to align the interval of the power amplifier board and the mounting holes must but from “Yochikaraumiru”.

FIG.27 is protection circuit control section board under that. There is different from the board of the conventional AC power amplifier part. Since the power supply voltage is low, and the lower main point is 6V parallel regulator mosquitoes, it was V0 is on distribution point (SW for turning off, NSPB500S) is that point HB05066X of series resistance 1.3kO. The position has also changed.

The order of the substrate fabrication is as follows. First, it wants to place a part of the Tr1, Tr6. IC plugs the pin into wide one example the substrate to match the pattern pitch. 2, 5, 10, 13 pin are connected to the turn the task go by the line than 7. The preparative 15mm support the four corners of the substrate front side. The Ri attached to the substrate back wiring. Tr1, and extends the pin Tr6 to fit the substrate pitch is from the base 90 degrees bend group. It plugged into the plate. Tr1, Tr6 are through the insulating mica, the substrate is fixed directly to the power supply unit bottom plate. Finally, Tr1, Tr6 soldered to pattern the of the pin.

Tr1, Tr6 instead are using the power supply unit bottom plate as a radiator is actually heat dissipation loss. Power off again. Therefore, this machine power one works that place synthesis that guarantees the time tract, the DC detection board and the control board battery. By integrating “Lee” check board and the

lower the suspension in the center of the amplifier

There, Tr1, Tr6, the radiator is not required, it need only be arranged on the substrate.

In the SW of the amplifier power supply is integrated, it becomes unnecessary. The wiring position of SW shorted may be set to, the power supply unit shock "Roh" to turn on and off the SW.

Figure 24: 8 ohms power amplifier board

8 ohms for power amplifier. There is free space on the substrate. 2SC1161 argument of error + over blanking stage 2SC959 or 2SC960.

Fig.: 28 battery check board. It is Tr7, Tr8 and the substrate at the same time, the substrate from bending a pin, plug in, to be soldered. Case force engineering of this unit of the case, the amplifier unit is from Takachi Electric Industrial.

Fig. 25: power board for 4 ohms. Both power supply unit are from 2497 wire 0.18mm. Than 19 pieces out of Daiei wire 20 Shinmoto-sen 0.18 mm.

Chen uses to that the 0S49-20-33BX.

Figure 29-32 amplifier unit case processing drawing their front panel "Geinko". Control, in addition to power-on or SW (standby SW) of VR and the LED division arrive for the indicator. The borrowing pin jack on the rear panel, speaker terminal, get XLR connector mosquitoes for power. The stick to the bottom plate is just rubber feet.

Figure 32 is a right side panel. This 180 degrees rotates the left "Saidopane" to become Le. The side panel output stage Tr is fixed and function as a radiator. Let the Tr fixed and the two among the 3mm screw, crimp end to one side replace the "children", to bring out the lead wire of the collector. By the way, how to fix the output stage Tr to the side panel, Tr of exchange real.

Fig. 33: "kenogen" quickly becomes a possible way. Exchange each side panel "Ikara Zunamari" is "Ang" substrate for mounting. Angle is taken through a 5mm spacer on the upper frame. Give, to lower Ri the substrate with a 15mm support and put a spacer, the hump in support of side board.

Fig.: 34 to 36: "rotekuta" LED is attached. Push the "riatoken" to pass the power supply leads in Le XLR connector for "Shrewsbury" and "Nog Tteri" over division arrived. It was the battery charge. In order, it is easy to attach and detach the XLR connector plug on the rear panel right and arrange the another one.

The bottom plate and the protection circuit control unit board in addition to the battery check board fix the loop terminal. This pin used to relay the power supply and the protection times beard DET terminal. Screw "Domesuru" the lead with a Y-shaped crimp terminal to terminal.

### **Wiring technique**

The wiring of the amplifier section is in the following order. We wired the power cord to the power XLR connector for in the beginning. After fixing the angle is because soldering iron is less likely to "cheese dish" against the angle. Power cord in Daiei wire to +-15V and 0V 30 core, + 17.2V and DET to 20 core. The orientation of the code in the printed code surface, "DAIEI" basis of D press the power supply side, that is, connector side. Code together more L.ch, R.ch of two.

Connector from the raised solder will put the "Roh \ Sunda" to. Of course, connection was preliminary solder to keep actors of terminal. Since 6pXLR connector pin have interval force, or enough to confirm there is no short wiring of bi "Shikama". Then attach the output stage Tr to the side panel, and a lead wire

of Tr, Th, it brings out the lead wire. Collector and emitter 30 core, the base 20 core, Th also to 20 cores. The board is fixed to the angle, the output Tr and Th is wiring of the lead wire to the substrate. This is better to remove the lower frame when the internal of the coercive path control board power supply unit. Since lithium-ion battery current capacity is large, we need strict protection circuit but it is easy to wiring. 0V line 30 core and the other 20 core.

The external wiring of the board will be the speaker. The orientation of the code is "D" 2 between the terminals and the substrate, the gain VR, SW, LED, power supply side. Do "Takumi", the pay set between judges Vo normal LED and the substrate protection times plate wiring in Ino pattern spacing force the town center. Also it will be wiring between the road DC detection units.

Finally, put the input pin jack and the substrate care. The substrate and the SW, it makes the « pay prefecture » between LED fertilizer in Mogami 2497. Also wiring 10p harmonica direction of "Xie Capel" is printing surface in a small MOGAMI 2 pieces of 1 bit the terminal adjacent "M" is the signal source use. As in 2 organized by clogging pin jack side to the one terminal to the Y-shaped crimp pin and screw « Domesuru ».

Wiring of the power supply unit is in the following order. Battery check board is fitted with a + U bottom plate to the case, is connected between prefecture (?) already and one Vo, these bets check the Mino protection circuit controller board and the foreign "Taru" voltage. Thought, it makes a case between over "Tsu". "DoTakumi" soil, it approaches the barrel voltage force intuition V LED care.

### **Settle to the line**

#### **Adjustment method**

Adjustment will be in the order of the power supply unit and the amplifier unit. The adjustment of the power supply unit is the only check to the protection circuit. Put the XLR plug of battery, "Cherikusuru" the voltage of judges Vo in the state of the power S eating off, it would be a voltage close to 0V, word SW were into +-Vo. When turned on, it is the provisions of the voltage. The voltage is close to the judge's +-17V in full charge.

Then it would be "Lee a Det" terminal and 0V terminal 1line in one shun data, "tsu ji" to that guarantee "mamoru" time road 2 Operates, LED mosquito desired for protector lights, shut allowed to 0V is Vo is down, the battery check "Sai-ko" El Mosquitoes to sheath lights.

The power SW is turned off, unplug the 1 the power plug, and put again 1. Protection circuit is reset, it becomes judges Vo mosquito average pressure-glance value when you turn on the "Den" suddenly SW.

After completion check one of the power supply unit up to here, but the connected DC detection unit of the amplifier, check also DC detection input around 1.2V to 1.5V battery between the outside 1 DC detection. Input and ground wiring of the power amplifier output for a moment once we see. 1 protection circuit is operating at, but OK, resets the "protection circuit, to test by changing the electrode of the battery. Do this test for both channels. Then return based on wiring.

When you have finished "Ekkuka" to keep before the adjustment of the power amplifier and V, set the gain to Vr1 is max, Vr2 set to full. VRmax short plug to the input, spin...

FIG. 34: power front 1 panel.

FIG. 35: power Riano agile.

FIG. 36: power bottom plate

....Since the board is attached to the aluminum angle; it is wiring "Oyo U" future of remodeling from the

bottom plate side.

Figure 37: gain frequency twisted sectional (8 ohms) is 56.0dB. There is only pure semiconductor amplifier, despite the low supply voltage. Off frequency  $f_c$  (-3dB) is 37kHz, the product of A and  $f_c$  to evaluate the high-frequency characteristics,

$$A_{fc} = 631 (56.0\text{dB}) \times 37\text{kHz} = 23.3\text{MHz}$$

It can be said that it is the wideband amplifier when compared to 7.78MHz of hybrid amplifier (5702 + 2SB541). Closed press the  $A_{nf}$  gain: in max (maximum gain), 21.9dB, Gain: in min. 12.8dB. Strange "Ihi" range of gain. It would be 10.1dB is for multi-amplifier.

As it is appropriate changes range, NFB amount Gain: max at 34.1dB, Gain: is 43.2dB at min. Appropriate NFB "Ryodea" as semiconductor amplifier.

Figure 38 is a gain frequency characteristic of the 4 ohms amplifier. A is 50.2dB, it became 5.8dB less than the 8 ohms load.  $f_c$  is 43kHz,  $A_{fc}$  is,

$$A_{fc} = 323 (50.2\text{dB}) \times 43\text{kHz} = 13.9\text{MHz}$$

It is.

$A_{nf}$  Gain: max at 21.8dB, Gain: min at 11.8dB, strange Ihi range is 10.0dB. NFB amount Gain: max at 28.4dB, Gain: become 38.4dB in min.

Figure 39 is the output power versus the distortion rate characteristics of the 8 ohms amplifier. Gain: max and Gain: under the conditions of min, I was measuring the characteristics of 1 kHz and 10 kHz respectively. This unit is only 65mA and less 0. Nevertheless, extremely low distortion has become the gentle characteristics. Gain: min characteristics in the 10 kHz of the more, low-distortion characteristics of 1 kHz is noteworthy.

The maximum output power is 14.3W. Sat.  $\pm 15V$ . You should have high efficiency speakers to take advantage of the full power.

Figure 40: 4 ohms amplifier output power. A distortion rate characteristic of 1 kHz and 10 kHz of two particular Pi difference force. It has become the characteristics. Distortion is "Hopo" fixed up to a maximum output with a child (?). It shows a really class B amplifier seems characteristic. Maximum output charge from the battery is of 24.0W.  $\pm 15V$ , as this such "Haipawaka" the fence obtained were, the Lithium-ion battery of internal impedance is very low.

It has a frequency responsibility assortment lin trial. Phy number Ke.

Figure 41: output impedance "Shuhari Lou marriage" split production (8 ohms)

Figure 42: output impedance frequency transliteration "warichu" (4ohms)

FIG. 41 is the output impedance  $Z_o$  frequency steps of 8 ohms amplifier. Measurements of  $Z_o$  are on/off method, that is, the output voltage during open load; it has been calculated from the output voltage  $Z_o$  when connecting the load 8 ohms or 4 ohms.

"Todoko-sei" the entire band of DC- 100 kHz, Gain: max in 0.1 ohms, Gain: output voltage displacement nurses off of by turning on and off the min in 8 ohms load. The difference and only if it could not be measured. This unit because of the NFB is not a combination of current feedback only voltage feedback, it has become very low name rope production.



FIG. 42 is a Zo frequency characteristic of 4 ohms amplifier. Zo gain a full band: max in 0.16 ohm, Gain: a 8 ohms amplifier as well it as not be measured in min.

For measurement also becomes whether the checkpoint amplifier to normal operation. When it is in operating force cup stability of the amplifier, to waveform at the time of open load it is funny, and large amplitude of the high frequency cannot be output, is somehow less announcement example of r shame frequency characteristics because cannot be Zo measurement in the entire band. It is a strange phenomenon of.

### **The sound of the machine**

If you're listening to music with this unit, and come up aside with a place to stay one after another, there is an inspiring force saying the excitement and surprise. Any AC power amplifier both. It's a sound of a different impression at all. Purity force sounds is very high, it is closest to the sound of the live sound.

Any amplifier, device-specific sound comes out. Purity force "Hanawa" physician authors sound pump more unique sound of the device also appear realistic. But the sound of the machine drive like is a force of the battery drive.

Whether it was braking a unique sound, unique sound is not heard, it's a sound raw itself. Of course glossy sound, it comes the sound of sex appeal. However, the sound is only instrument " ~O Minato" out sound, unique sound of the amplifier does not come hear also speck.

Much as the amount of information forces "Mizoku" because the sound was not heard until now, to come hear the real. We hear an increased bandsman force of the orchestra. As the unit will not be fast power amplifier reaction speed, the rise and the braking of sound in a very sharp way, if you are a sound force monkey, you'll be attracted by the beauty in any Forte, feeling good. Beauty of the lingering after the ff's preminent. It is this much variety of individual instruments sounds'.

To be or give the color, surprisingly it is not only. Among the explosive sound of the orchestra, triangle and "Tan'no-gu" phosphorus, it can be seen to take the mosquito call an hawk. It's an important factor for "Koreka §" music.

Battery dry flop's is also an expressive power of the bass instrument. In representation precisely because the sound is very tight and because of the various sounds that can, heavy sound mosquito swing and overwhelm the hand trees. Instantaneous force of percussion from this amplifier is better than the machine would not do so.

As if beyond the impact sound-power dark -speed, come penetrate to direct. The sound is also quite beautiful. Look also representation of the string of woodwind also brass of Harmony also I just revel in its beauty. Whole body is "Yoridokoroshima" music and sound.

This machine, thanks to the evolution and battery, is one of the evolution of fully symmetric amplifier, is in order to the birth amplifier born. This unit intends filtration's ing valuable. This down -flops want to determine the direction of the future of audio DC down -flops.