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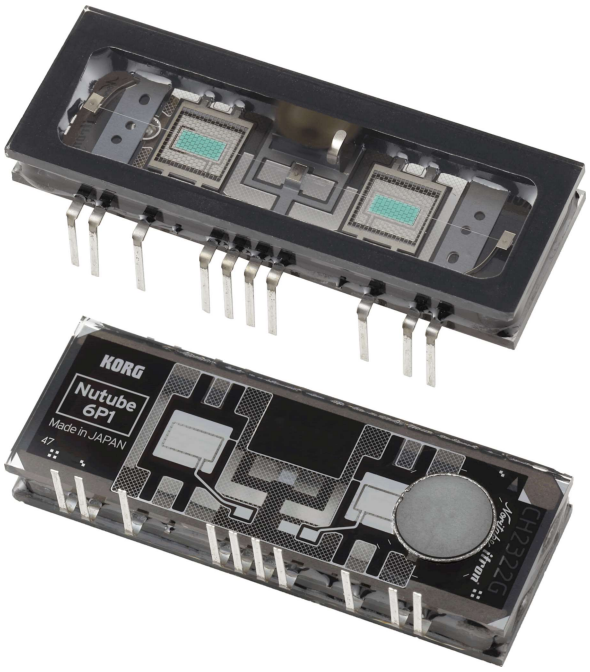
Application notes for Nutube

Advantages



Low power consumption –

Only 12mW per each channel

Low voltage –

Operating from 5V

High quality –

Made in Japan

STRUCTURE

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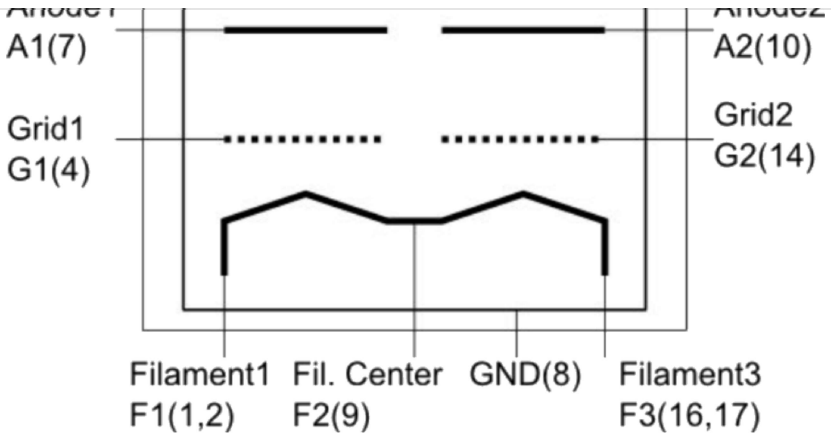

Electrical characteristics

Nutube delivers excellent linearity, close to that of an ideal twin triode.

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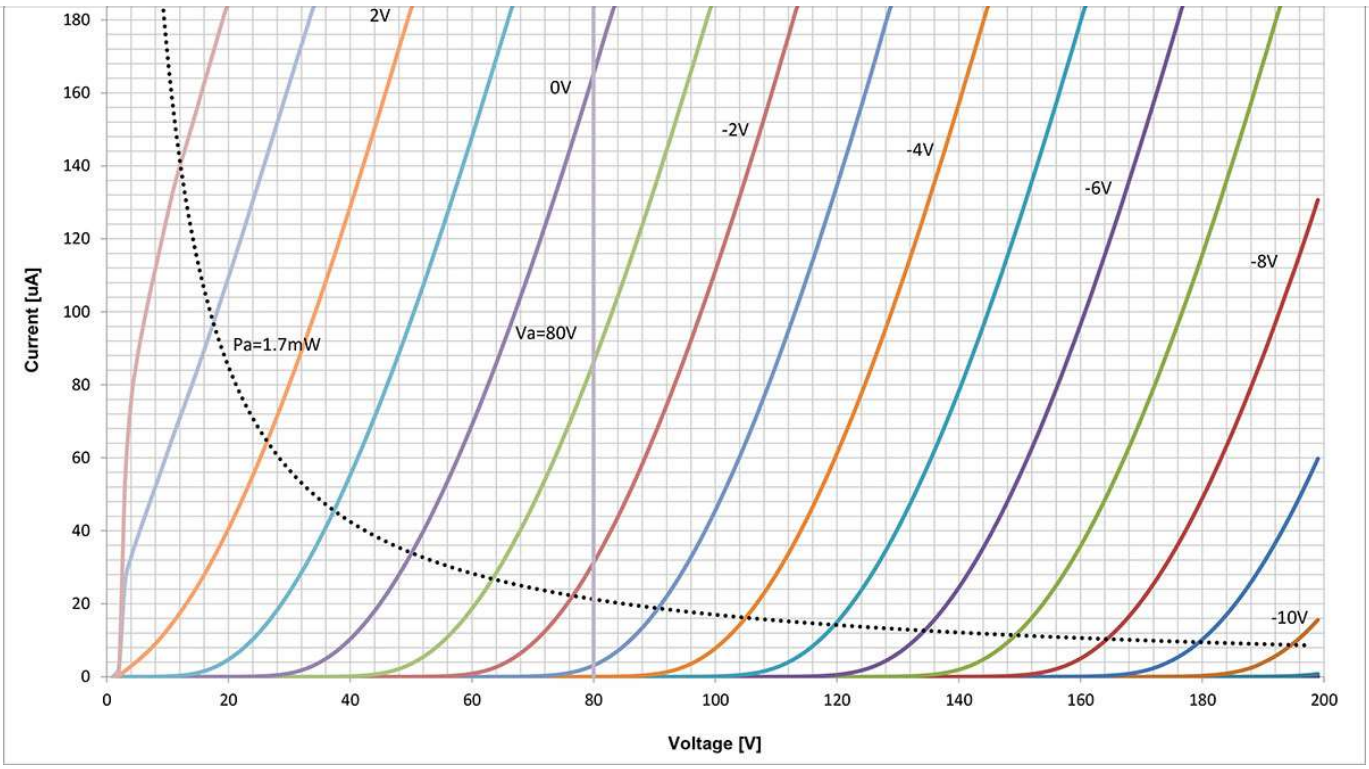

Dimensions

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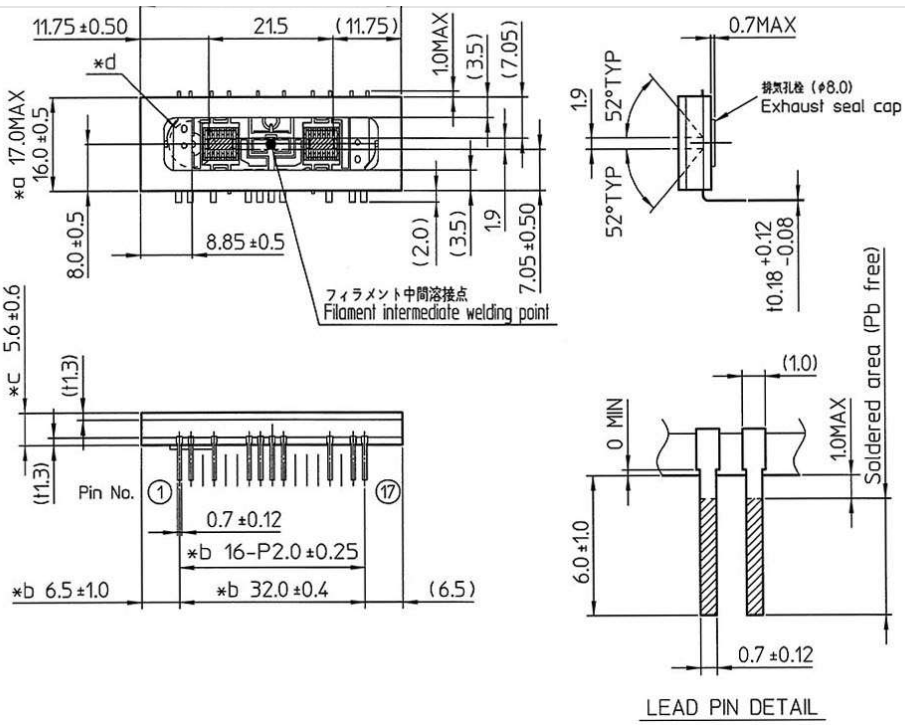

Pin assignments & hole sizes

Pin assignments

Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Assignment	F1	F1	NP	G1	NP	NP	A1	GND	F2	A2	NP	NP	NP	G2	NP	F3	F3

F1 : Filament 1（Left）
F2 : Filament 2（Center）
F3 : Filament 3（Right）
NP : No Pin
GND : Internal shield, connect to GND

G1 : Grid 1
G2 : Grid 2
A1 : Anode 1
A2 : Anode 2

PCB hole arrangements. φ=1.0mm recommended.

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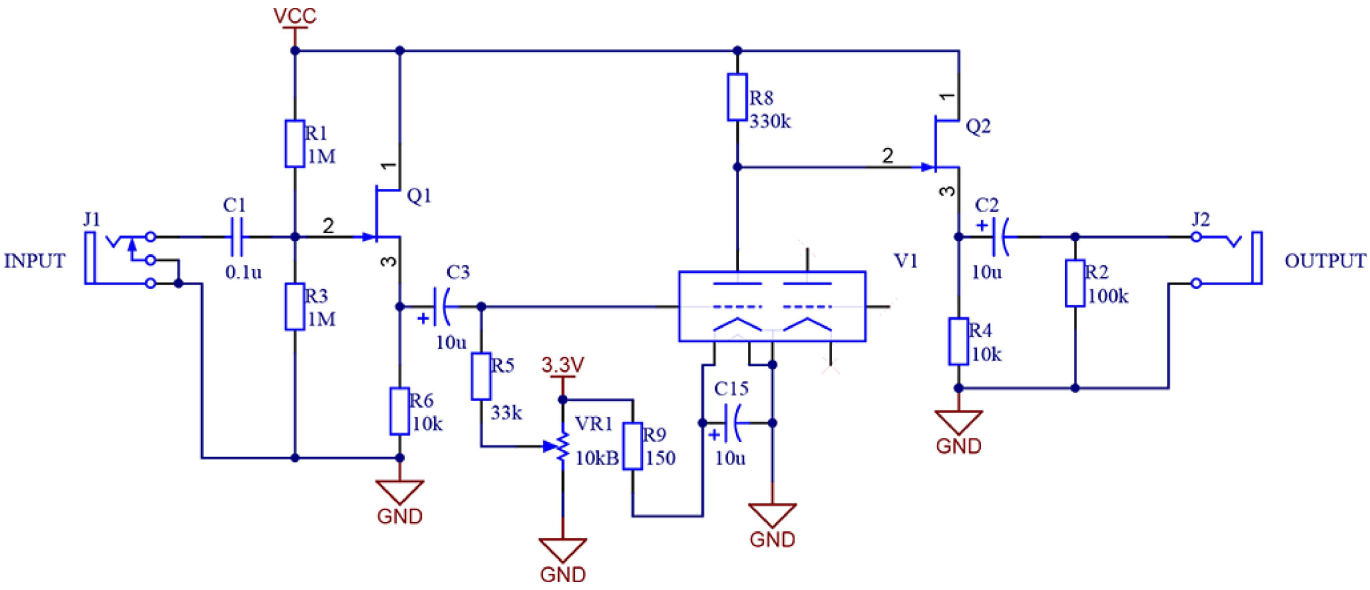
Basic circuit of Nutube

Example of a single amplifier



Audio characteristics(1)

VCC=12V

Anode load=330kΩ

Gain	14dB
Maximum output	10dBV
S/N ratio(A-weighted)	102dB

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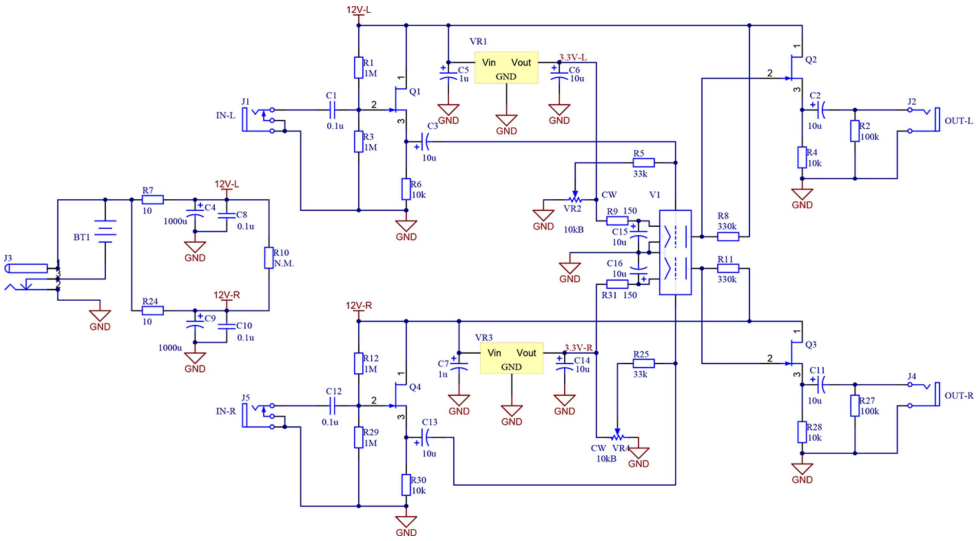
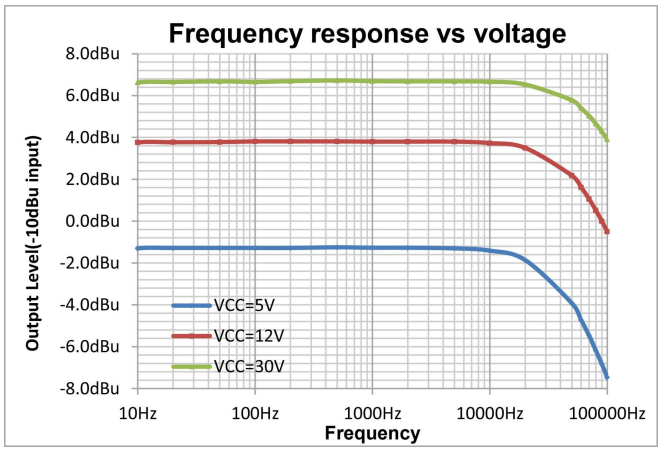
Crosstalk 10kHz	-70dB
Crosstalk 100kHz	-55dB

Measurement circuit

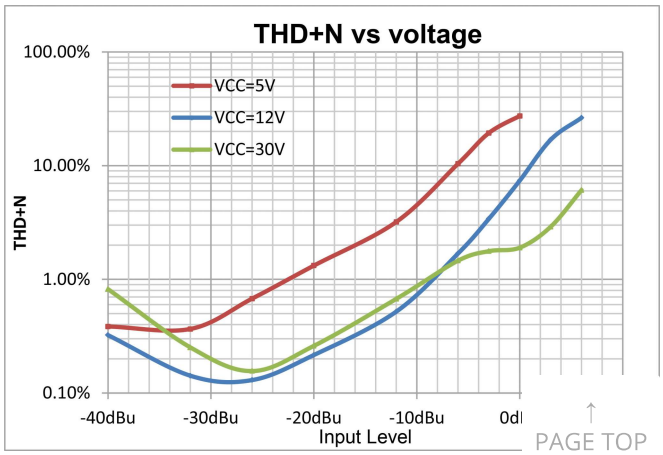


Audio characteristics(2)

Frequency responses



THD+N



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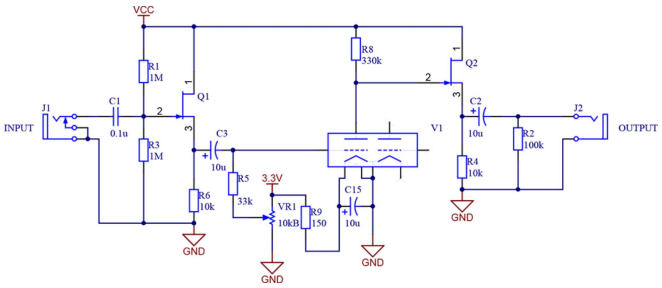
Power supply / Anode load

Power supply voltage(VCC) :5 – 80V

Please note: power supply exceeding the permitted limits will void any warranty.Recommended anode load resistances : 100k – 330kΩ



Audio characteristics on each VCC voltage

	5V	9V	12V	30V
Gain	8dB	13 dB	14dB	17dB
Max Output	-2dBV	7dBV	10dBV	20dBV
S/N	91dB	99 dB	102 dB	110 dB

Audio characteristics on each anode load resistance(VCC=12V)

	100k	220k	330k
Gain	9dB	13dB	14dB
Cut-off	380k	100k	

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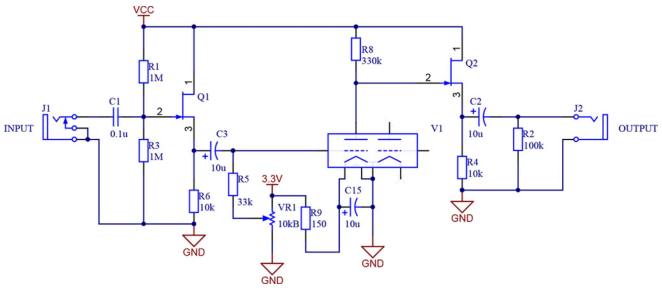
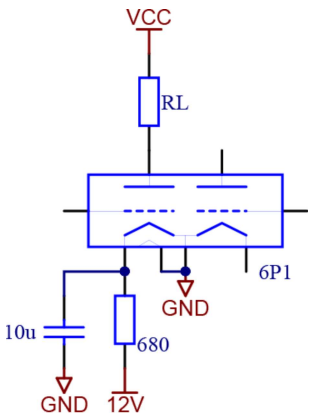
Biasing voltage / resistance



Grid biasing:2 – 3V(VCC=12V)
Use of trim pot is recommended for precise adjustment the of biasing voltage.Biasing resistance:10k – 33kΩ
Considerable grid current will not allow large biasing resistance. Grid current is around 30μA at maximum.

Filament ratings

Filament circuits



Filament rating:0.7V 17mA(41Ω)
Direct current is recommended.
Inserting capacitor(10μF or more) between filament and GND improves residual noise.

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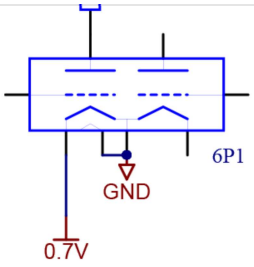


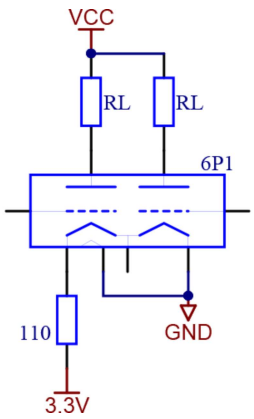
Recommended resistance values connecting to filament on each VCC voltage.

12V	680Ω
9V	470Ω
5V	240Ω
3.3V	150Ω

Using both cirucuits

Parallel connection

Series connection



Parallel connection of filaments enables to have each filament to have the same voltage.

In series connection, the filament current is half of that of parallel connection, which would imprc battery life.

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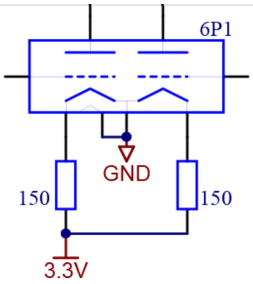


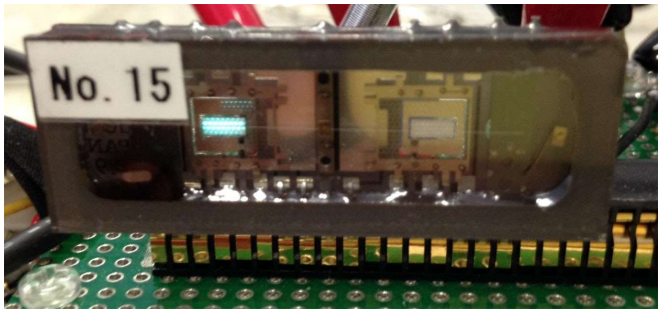
Warning

DO NOT exceed filament rating (0.7V 17mA).

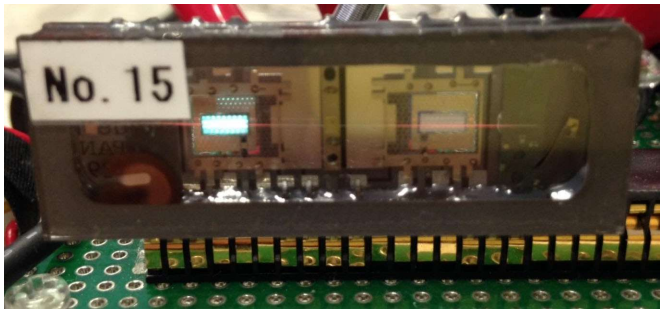
Excess filament voltage will easily burn out the filament!

A red-heated filament shows excess voltage.

Normal state Filament 0.7V 17mA



Exceeded filament current(25mA)



To prevent microphonic noise

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External vibration reaches the tube mainly through the mounted circuit board and also via the air around the tube.

1.To prevent any vibration from the circuit board (Fig.1)
insert some cushioning(a sponge or something equivalent and soft) between Nutube(or the board mounting Nutube) and the main circuit board. The harness connecting Nutube and the main circuit board should be soft and thin enough.

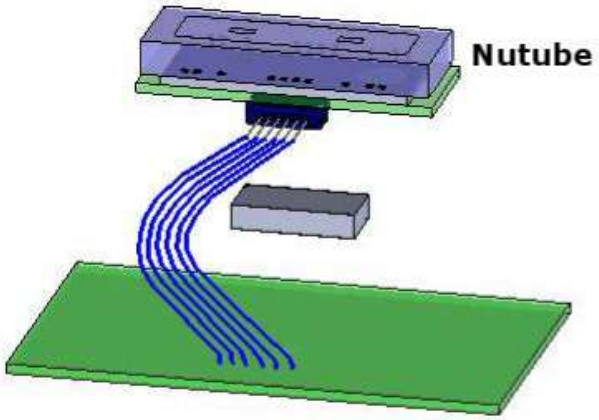

Fig.1

2.Prevent any vibration from the air (Fig.2)
The vibration of the air (sound) reaching the surface glass of Nutube can cause the microphonic noise especially high frequencies (a metallic sound) .

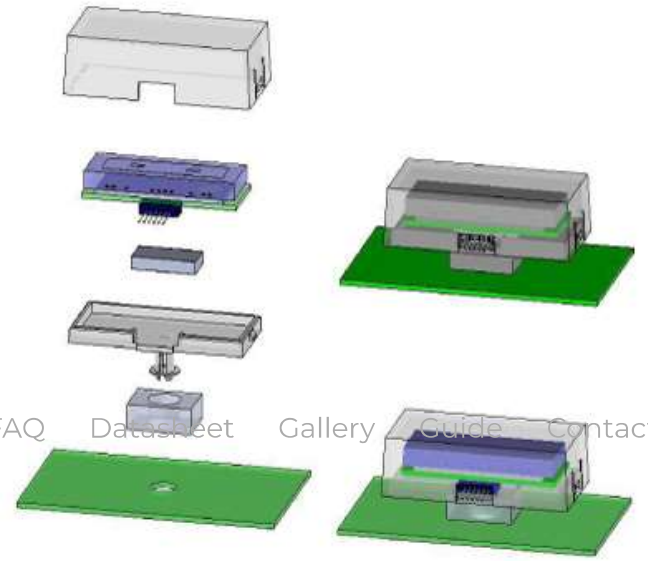

Fig.2

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Placing Nutube in a protective box/case helps prevent such vibrations.
Using acoustic material in the chassis further reduces the noise.
Placing a heavy metal plate (e.g. lead) on the surface of a Nutube can also reduce noise.

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