

DC-Heating  
 Directly-Heated  
 Connected in Parallel

# KORG

**Nutube**  
**6P1**  
 Twin Triode

## 1. Ratings

Parameter	Symbol	MIN	TYP	MAX	Unit
Operating Temp.	To	-40	-	+85	°C
Storage Temp.	Ts	-50	-	+85	°C
Filament Voltage	Ef #1	0.6	0.7	0.8	V
Grid Voltage	Eg #2	-	-	5.0	V
Anode Voltage	Ea #2	5.0	-	80.0	V
Anode Power Dissipation	Na	-	-	1.7	mW
Insulation Resistance(Anode-Other)	-	3	-	-	MΩ
Insulation Resistance(Grid-Other)	-	3	-	-	MΩ
Color of Illumination	Green				

## 2. Electrical Characteristics

Parameter	Symbol	Test Condition	MIN	TYP	MAX	Unit
Filament Current	If	Eg=Ea=0V	16.0	17.0	20.0	mAdc
Bias Voltage	Bias	la=18.2μA #5#6 Vin=0Vrms #5	1.5	2.5	3.5	Vdc
Voltage Amplification (Vout / Vin)	A	la=18.2μA #5#6 Vin=0.245Vrms, 1kHz	3.7	5.0	6.4	-
Resonance Frequency	Fr #7	la=18.2μA #5#6 Vin=0Vrms #5	-	5.8	-	kHz
Anode Current	Ig #3	Eg=2.0Vdc #2	-	32.0	-	μAdc
Grid Current	Ia #4	Ea=12.0Vdc	-	6.0	-	μAdc
Amplification Factor	μ		-	14.5	-	-
Transconductance	gm		-	54	-	-
Anode Resistance	Ra		-	330	-	kΩ

- #1 Per each filament
- #2 See Fig.1
- #3 Per each grid
- #4 Per each anode
- #5 See Fig.2
- #6 Ia adjusted by 'Bias'

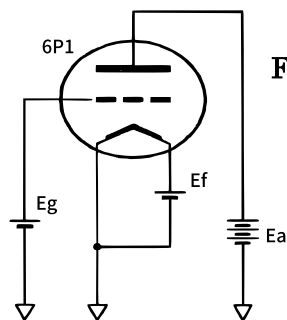


Fig. 1

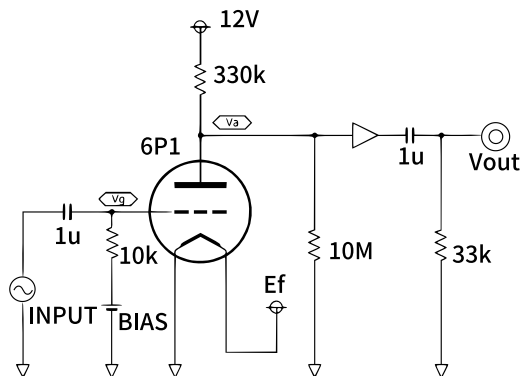


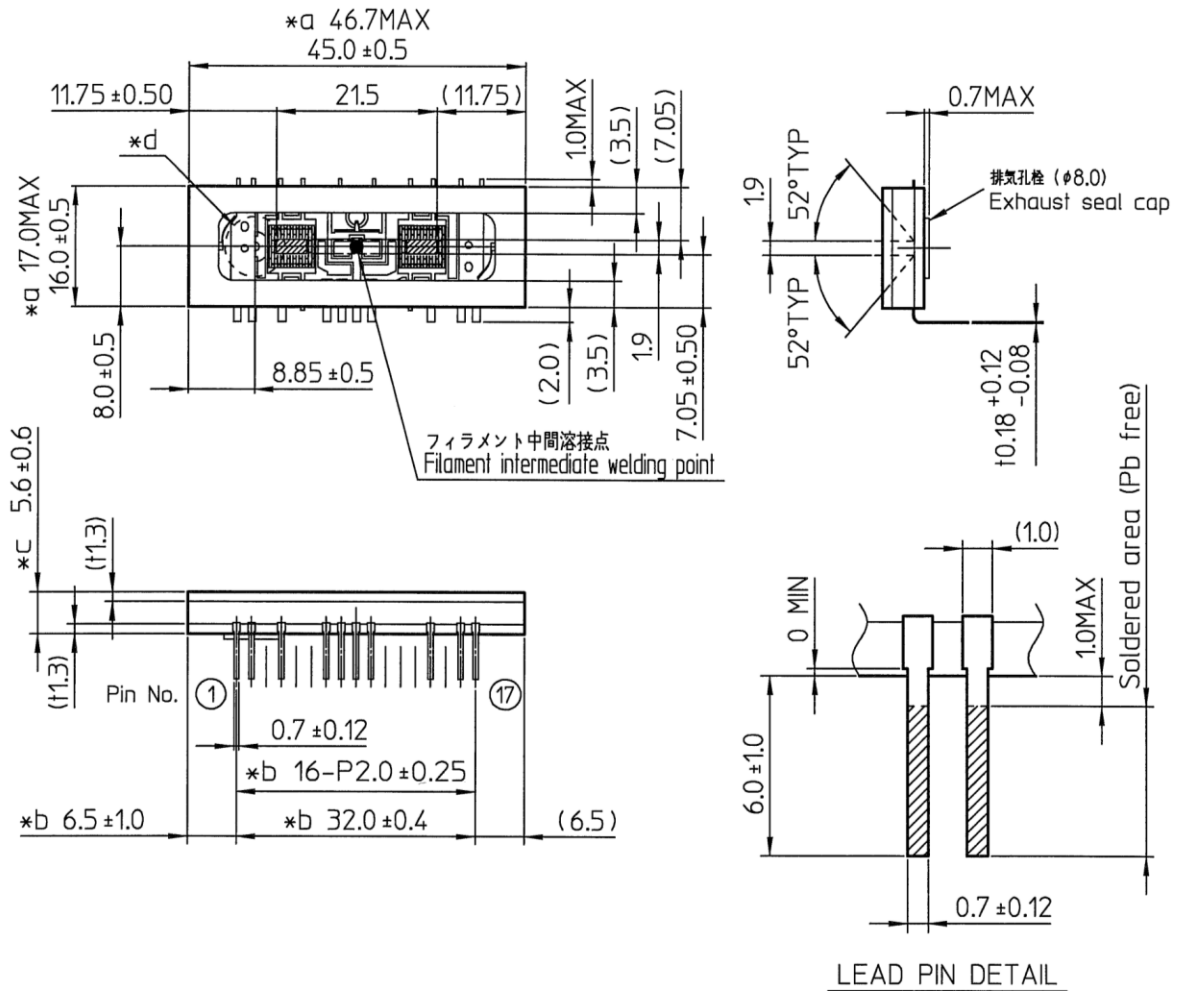
Fig. 2

### Capacitances (Typical)

F1-G1	F1-A1	F1-GND	G1-A1	G1-GND	G1-A2	G1-G2	A1-GND	A1-A2
2-4	2-7	2-8	4-7	4-8	4-10	4-14	7-8	7-10
9.1pF	4.3pF	39.2pF	2.5pF	10.9pF	2.3pF	4.3pF	4.5pF	1.4pF

# Nutube 6P1 External Dimensions

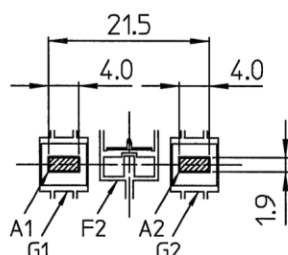
Unit: mm  
 ( ): Reference only  
 参考寸法



- \*a フリットのみ出しを含む寸法とする。  
Including any protruding frit glass.
- \*b 基板底面より3mmの位置の寸法とする。  
Within 3mm from the bottom of the glass substrate.
- \*c 排気孔栓の厚みを含まない。  
Does not include the thickness of the exhaust seal cap.
- \*d 排気孔栓は排気孔の中心から半径6mmの範囲に収まっていること。  
Exhaust seal cap is entirely within a 6mm radius from the center point.

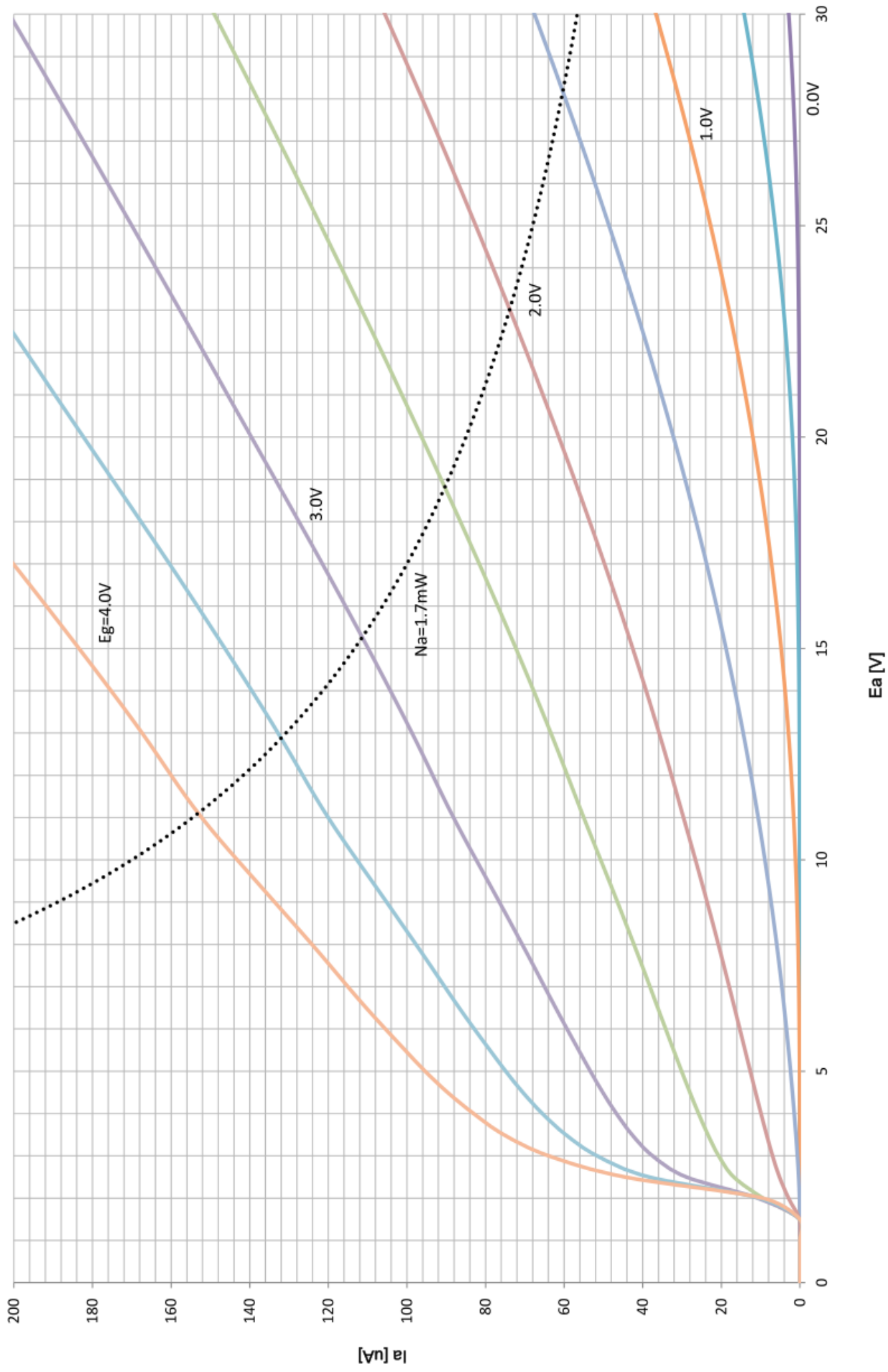
## Pin assignment

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

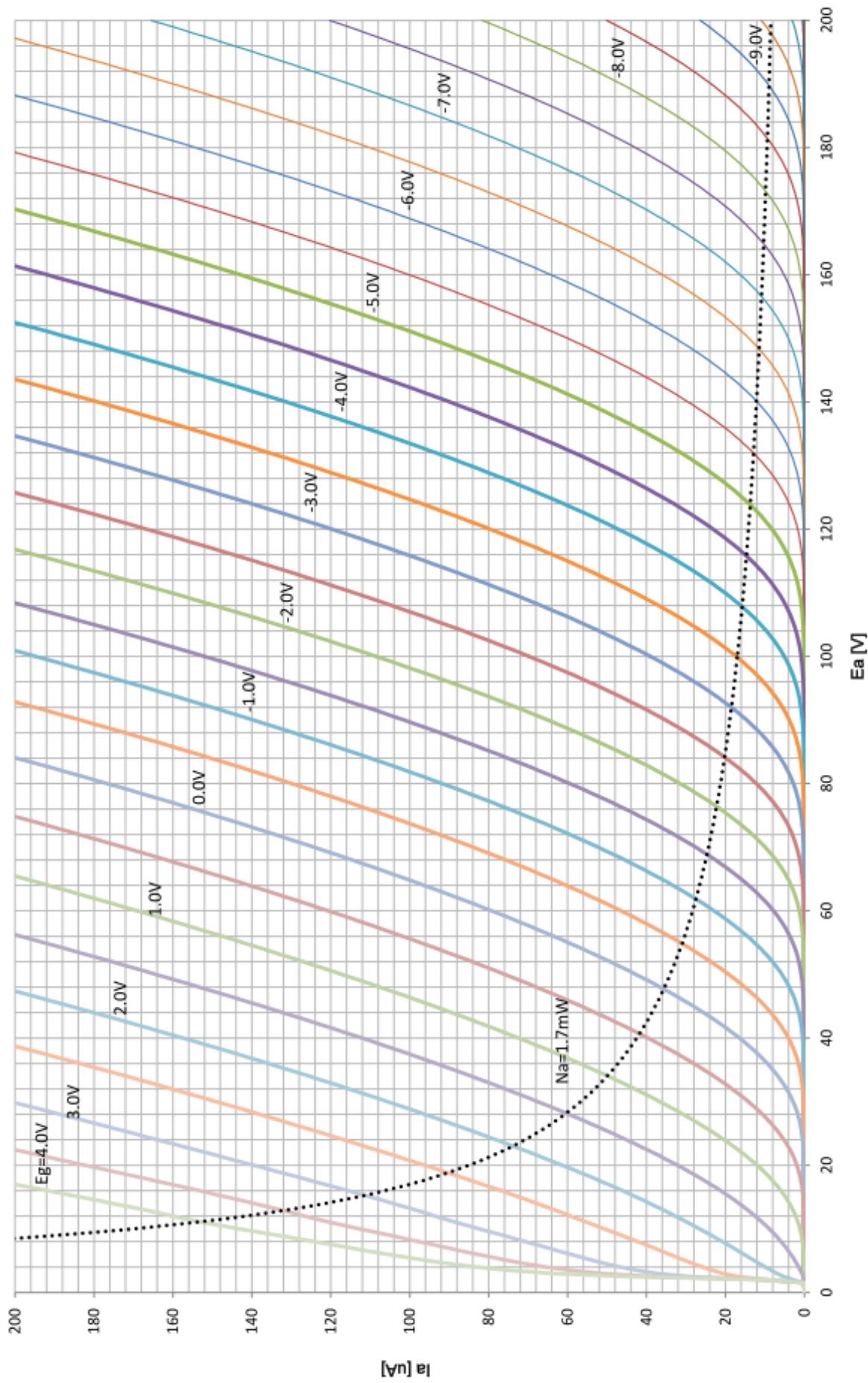


- F1: フィラメント 1 (左)/Filament 1 (Left)
- F2: フィラメント 2 (中間)/Filament 2 (Center)
- F3: フィラメント 3 (右)/Filament 3 (Right)
- NP: ノーピン/No Pin
- G1: グリッド 1/Grid 1
- G2: グリッド 2/Grid 2
- A1: アノード 1/Anode 1
- A2: アノード 2/Anode 2

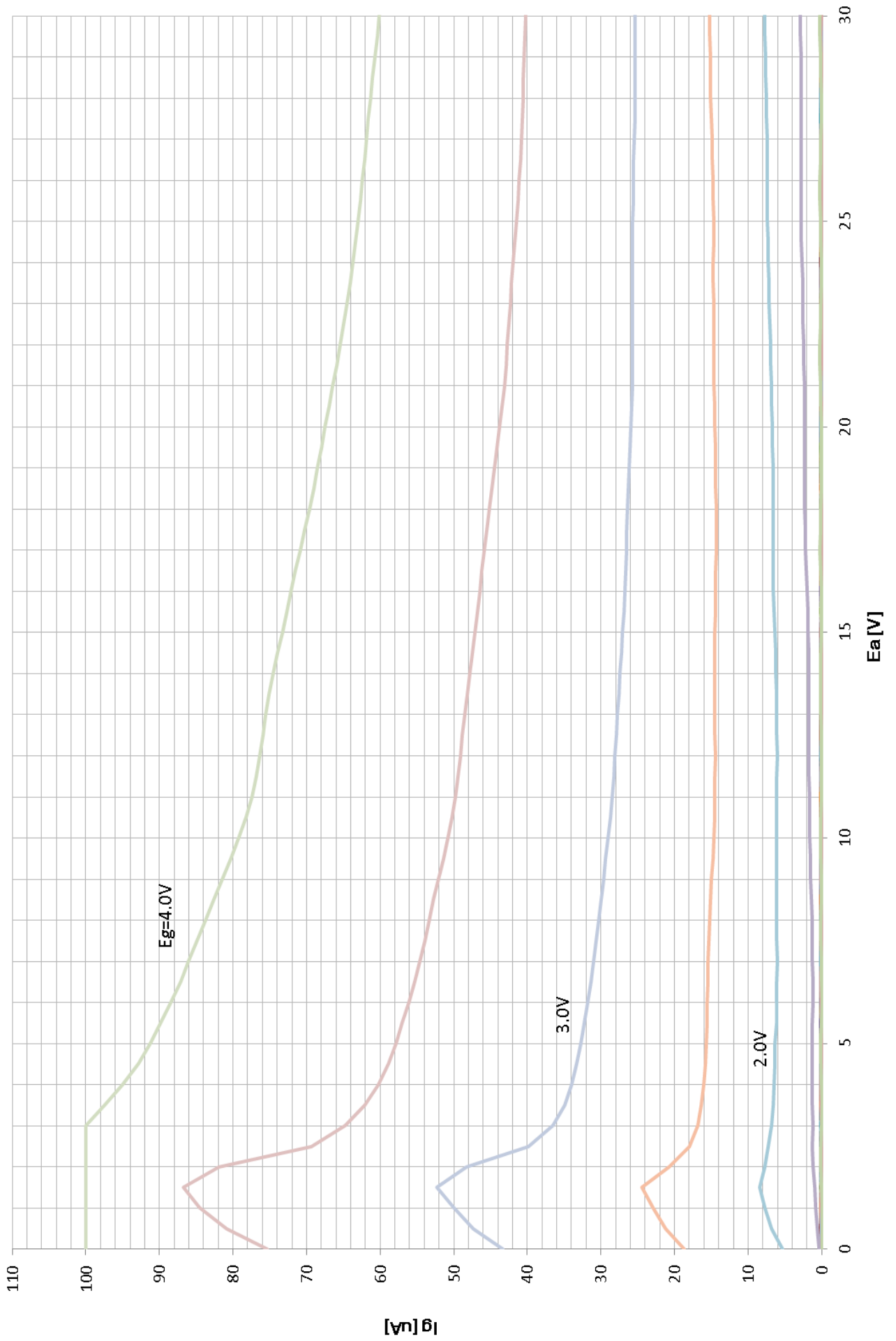
Ea-Ia



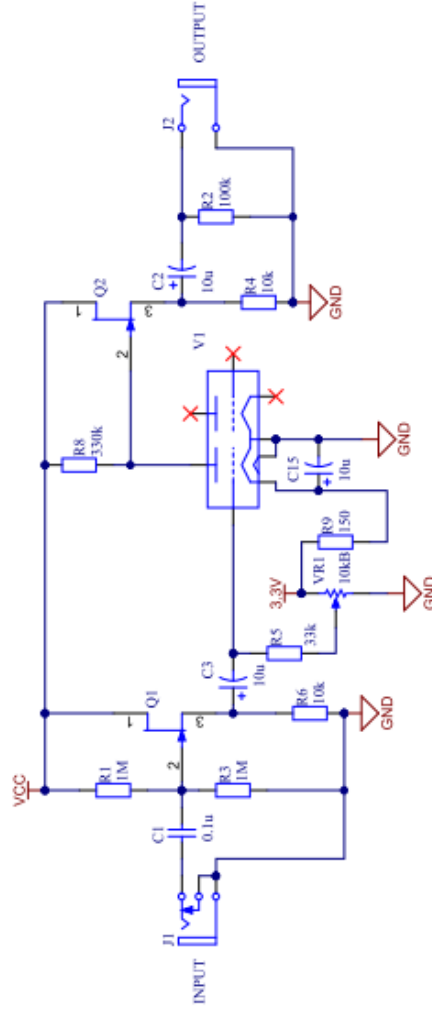
# Ea-Ia



# Ea-Ig



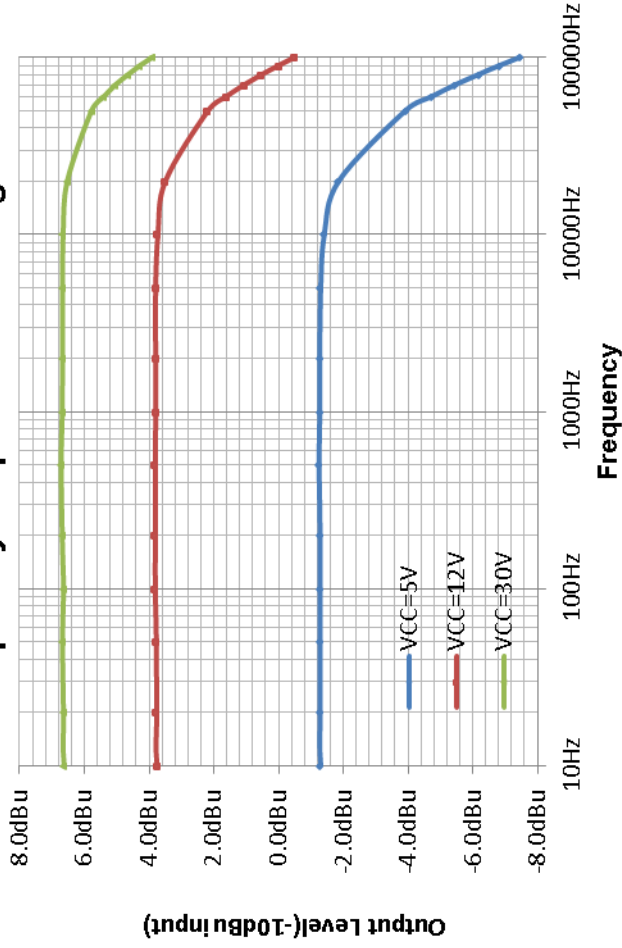
## Nutube Basic Circuit



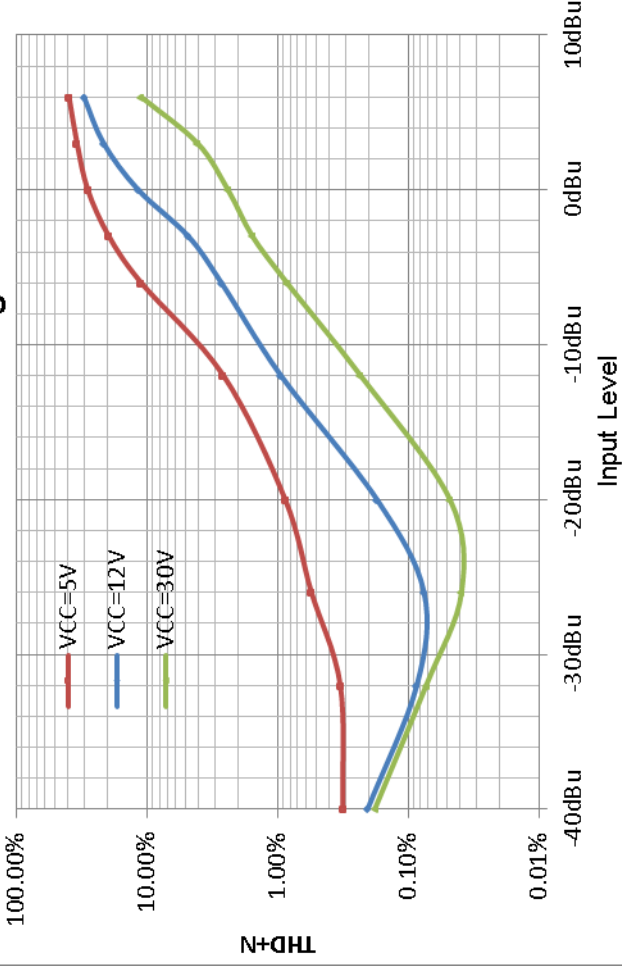
### Application notes

1. C15 reduces residual noise.  
When C15=10uF, residual noise is 9dB less than when without C15.
2. Nutube requires **POSITIVE** grid bias when the VCC voltage is under 40V approximately.  
VR1 adjusts the bias voltage.
3. The approximate circuit gains are:  
9dB(VCC=5V)  
14dB(VCC=12V)  
17dB(VCC=30V)  
  
When R8 varies(VCC=12V):  
9dB(R8=100k)  
13dB(R8=220k)  
14dB(R8=330k)

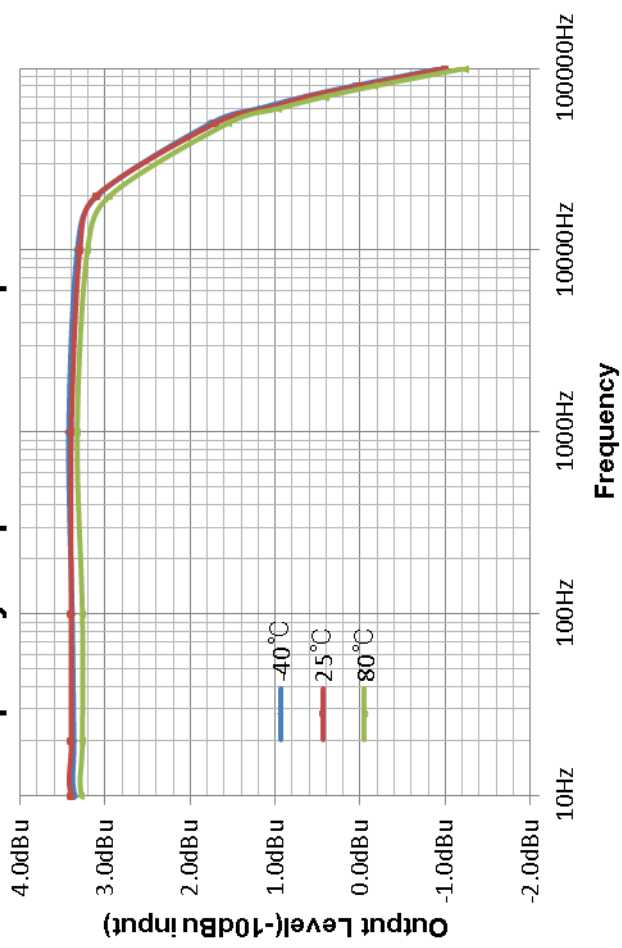
### Frequency response vs voltage



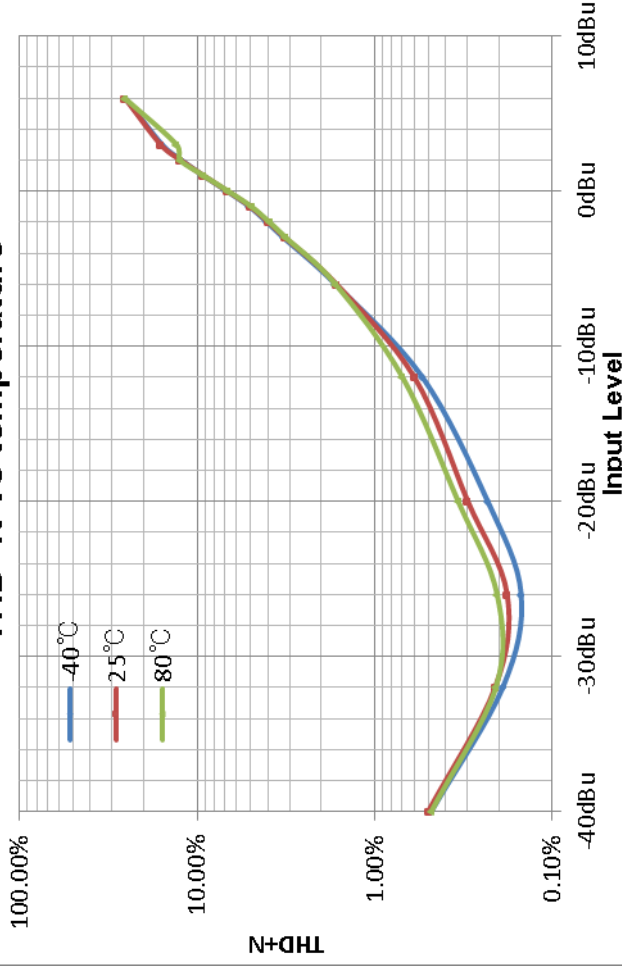
### THD+N vs voltage



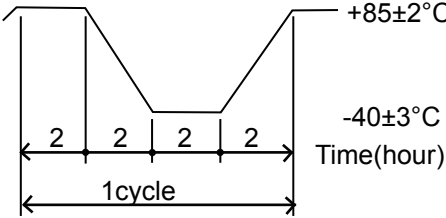
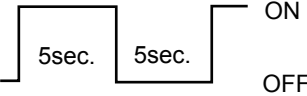
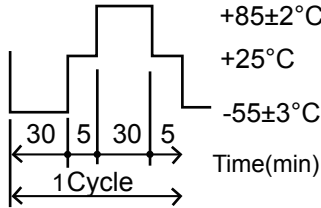
### Frequency response vs temperature



### THD+N vs temperature

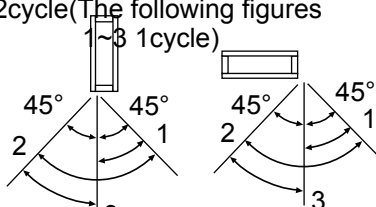


# Nutube 6P1 RELIABILITY TEST

	Test Item	Test Conditions	Conditions
Function Durability Test	Life	Time : 1000hours on at room temperature Drive Condition : Standard operating drive	A
	High Temperature Operation	Temperature : $85\pm 2^{\circ}\text{C}$ Duration : 96hours Drive Condition : Standard operating drive	A
	Low Temperature Operation	Temperature : $-40\pm 3^{\circ}\text{C}$ Duration : 96hours Drive Condition : Standard operating drive	A
	Temperature Cycling	Condition <div style="text-align: center;">  </div> Cycle : 25cycle Drive Condition : Standard operating drive	A
	Filament On-Off	Condition : 5seconds ON-5seconds OFF <div style="text-align: center;">  </div> Cycle : 20,000 Cycle Drive Condition : Filament Voltage=Maximum	B
Environmental Test	High Temperature Storage	Temperature : $85\pm 2^{\circ}\text{C}$ Duration : 96hours Drive Condition : Storage test	C A
	Low Temperature Storage	Temperature : $-50\pm 3^{\circ}\text{C}$ Duration : 96hours Drive Condition : Storage test	A
	Humidity (steady state)	Temperature : $40\pm 2^{\circ}\text{C}$ Humidity : 90~95%RH(No dewing) Duration : 96hours Drive Condition : Storage test	C C
	Thermal shock	Condition <div style="text-align: center;">  </div> Cycle : 5 cycles Drive Condition : Filament Voltage=Maximum	E



## Nutube 6P1 RELIABILITY TEST 2

Test Item	Test Conditions	Criteria	
Physical Characteristics Test	Vibration	Frequency : 10~55~10Hz Total amplitude : 1.5mm Sweep time : 1minute Duration : X·Y·Z=2hours Drive condition : Storage test	D
	Shook	Acceleration : 980m/s Duration time : 6ms Shook time : XX'·YY'·ZZ'=3times Impulse wave : Half sine wave Drive condition : Storage test	D
	Solderability	Solder sort : <b>Sn-0.5Cu-3.0Ag</b> Flux : rosin base Solder pot : 245±5°C Flood time : 3~5seconds Flood area : Dip 3.0mm from the edge of the glass substrate	F
	Soldering heat	1.Solder pot : 350±10°C Flood time : 3+1/0seconds 2.Solder pot : 260±5°C Flood time : 10±1seconds It is immersed from a glass substrate to 3mm at the conditions of either 1 or 2.	D
	Lead Fatigue <Pull>	Weight : S Minimum across section area on the each terminal $S < 0.2\text{mm}^2 \rightarrow 5.0\text{N}$ $S \geq 0.2\text{mm}^2 \rightarrow 10\text{N}$ Keep time : 10±1seconds	G
	Lead Fatigue <Bend>	Weight : 2.5N An angle bend : Right and left 45°=90° Cycle : 2cycle(The following figures 1~3 1cycle) 	G

### CRITERIA

The sign of judgment	Contents of judgment
A	Electric characteristic shall be satisfied approved specification. The brightness shall be not less than 80% of Min. be of Specification.
B	No filament wire broken.
C	No corrosion of a terminal and crack , lack part.
D	No lack part and crack.
E	Electric characteristic shall be satisfied approved Specification. The brightness shall be not less than 80% of Min. of Specificati on. Unusual lack part and crack.
F	Lead pin surface area shall be solder more than 90%.
G	Terminals and a part attaching terminal shall be no damaged and no cracks.

Notes1 : Except an environmental temperature test when there is no specification it carries out at room temperature,

Notes2 : High temperature. low temperature, and a thermal shock test should be satisfied the standard after 24 hours with room teperature.

## Notice and Caution

The content of this specification is subject to change for improvements without notice.

We do not authorize the use of any patents that may be inherent in their specifications. The application and circuit examples in these specifications are for better product understanding only. The examples are illustrated for general use. We do not guarantee these examples to be suitable for your particular application. It is your responsibility to determine their appropriateness for your use. We take no responsibility for circuitry problems in your application. Neither whole nor partial copying of these specifications are permitted without our approval. This product is not designed for military, aerospace, medical or other life-critical applications. If you choose to use this product for these applications, please ask for our prior consultation. This product is not designed to work in a high radiation atmosphere.

### **Warranty Period:**

The specifications or purchase contract will provide details of our warranty. The basic warranty period is one year from purchase.

### **Handling and Usage Precautions:**

Please follow the available appropriate product application notes for maximum performance of the product.

### **Safety:**

The edge of the glass is not perfectly smooth so handle with care.  
When disposing of this product, do not break it for safety concerns.

### **Assembly:**

Please handle carefully to avoid surface scratching during the assembly process. We recommend the use of gloves and finger shields to keep the product clean and the solder surface smooth at the lead pins. Please use shock absorbers when the product is secured with stands inside the fixture to avoid cracking the glass. When cutting the lead pins after soldering avoid applying shock and vibration that exceeds specifications. When bending the lead pins, avoid stress to the corner of the glass where the pins are bent. Overstress may cause glass cracking or breakage and unstable conductivity. The sealing glass may be damaged by acid or alkaline substance. Please carefully select chemicals and fluxes. When chemicals or fluxes are applied, please provide a sufficient washing process. Do not apply ultrasonic cleaning that may cause damage to the filament wires and phosphor materials.

### **Drive:**

Please follow the ratings in the specifications to maximize performance.  
Filament voltage( $E_f$ ) is the important factor to drive the tube properly. Exceeding the recommended conditions will result in a severe reduction in life expectancy and possibly cause other damage. Please design the power section to apply the typical voltage recommended in the specifications.

### **Storage:**

Please follow the environmental conditions described in the specifications. Please avoid storing in high humidity, saline, and sulfur-rich environments. These environmental factors may result in deterioration of the characteristics for soldering lead pins and insulation between lead pins. Extended time storage may result in initial dimming due to the characteristics of a product. We recommend using the product within three months of receipt.

### **Precaution for disposal:**

A part of the display glass package contains lead glass. Please follow the prescribed related regulation and legislation for industrial wastes.

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